Inovance

MD310 Series

General-purpose AC Drive

ARCO CONTROL

:051-37133855-6

:09014284236

WWW.ARCOKALA.COM

User Manual

V0.0

Data code: 19010281

www.Farazcontrol.com

واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

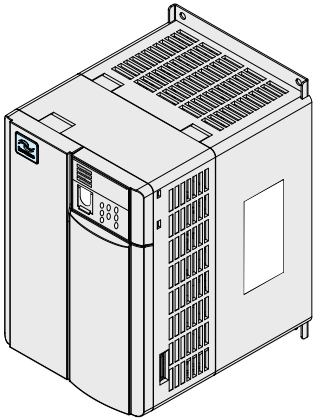
Preface

Thank you for purchasing the MD310 series AC drive developed and manufactured by Inovance.

The MD310 is a general-purpose compact AC drive. It supports open-loop control and V/F control and implements control of AC asynchronous motor with the advanced current vector control technology. It provides coverage of power of 0.4 to 18.5 kW.

It has the RS485 communication interface, achieves the close-loop process control system with the built-in PID function, and supports a maximum of 16 speeds for running. With the wobble function and fixed length control function, it can drive various automation production equipment involving textile, paper-making, wiredrawing, machine tool, packing, food, fan and pump.

This manual is designed to ensure correct use of the drive, including selection, parameter setting, commissioning, maintenance & inspection. Before using the drive, read this manual carefully to have a thorough understanding of the product. Keep the manual well and forward it with the product to end users.



Note

- The drawings in the manual are sometimes shown without covers or protective guards. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions.
- The drawings in the manual are shown for description only and may not match the product you purchased.
- The instructions are subject to change, without notice, due to product upgrade, specification modification as well as efforts to increase the accuracy and convenience of the manual.
- Contact our agents or customer service center if you have any problem during the use.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

■ Product Checking

Upon unpacking, check:

- Whether the nameplate model and AC drive ratings are consistent with your order. The box contains the AC drive, certificate of conformity, user manual and warranty card.
- Whether the AC drive is damaged during transportation. If you find any omission or damage, contact Inovance or your supplier immediately.

■ First-time Use

For the users who use this product for the first time, read the manual carefully. If you have any problem concerning the functions or performance, contact the technical support personnel of Inovance to ensure correct use.

■ CE Certification

The CE certification is in progress and compliance shall be advised at a later date.

■ Standard Compliant

The MD310 series AC drive complies with the international standards listed in the following table.

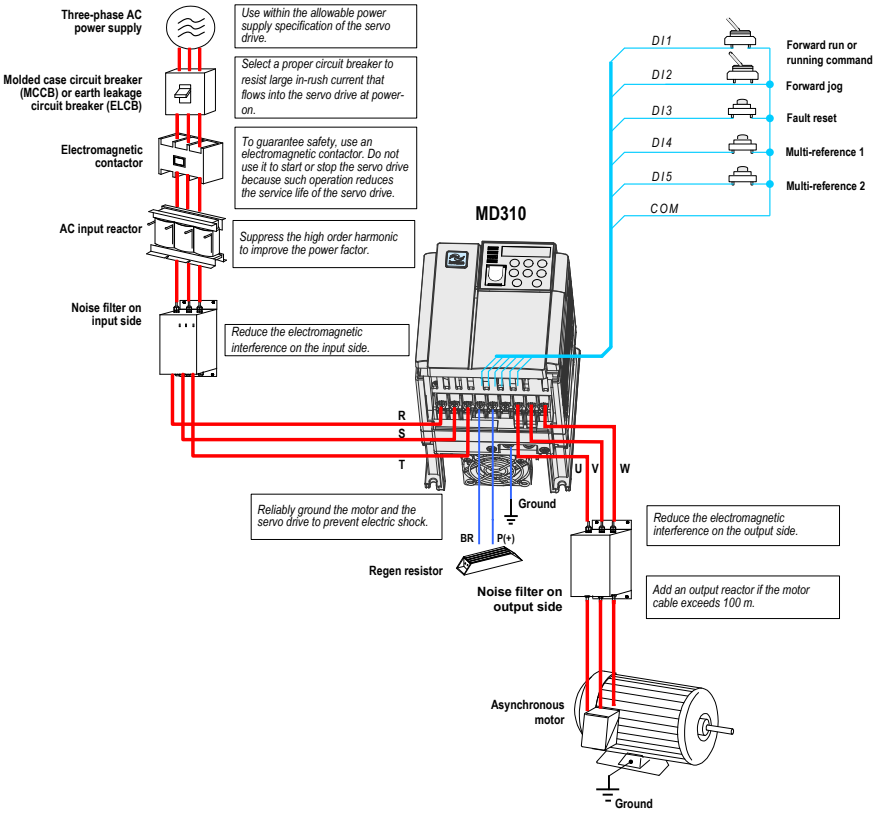
Directive	Directive Code	Standard
EMC directive	2004/108/EC	EN 61800-3 EN 55011 EN 61000-6-2
LVD directive	2006/95/EC 93/68/EEC	EN 61800-5-1

The MD310 series AC drive complies with the requirements of standard IEC/EN 61800-3 on the condition of correct installation and use by following the instructions in chapter 7.

ARCO CONTROL
:051-37133855-6
:09014284236
WWW.ARCOKALA.COM

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

■ Connection to Peripheral Devices



Note

- Never install the capacitor or surge suppressor on the output side of the AC drive. Otherwise, it may cause faults to the AC drive or damage to the capacitor and surge suppressor.
- Inputs/Outputs (main circuit) of the AC drive contain harmonics, which may interfere with the communication device connected to the AC drive. Therefore, install an anti-interference filter to minimize the interference.
- For more details on peripheral devices, refer to related selection guideline.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

■ Description of Peripheral Electrical Devices

Device Name	Mounting Position	Function Description
MCCB	Power receiving side	Cut off the power supply when overcurrent occurs on downstream devices
Contactor	Between MCCB and AC drive input side	Start and stop the AC drive. Do not start and stop the AC drive frequently by switching the contactor on and off (less than twice per minute) nor use it to directly start the AC drive.
AC input reactor	AC drive input side	• Improve the power factor of the input side. • Eliminate the higher harmonics of the input side effectively and prevent other devices from being damaged due to distortion of the voltage waveform. • Eliminate the input current unbalance due to unbalance between the power phases.
EMC input filter	AC drive input side	• Reduce the external conduction and radiation interference of the AC drive. • Decrease the conduction interference flowing from the power end to the AC drive and improve the anti-interference capacity of the AC drive.
AC output reactor	Between AC drive output side and the motor, close to the AC drive	The output side of the AC drive generally has much higher harmonics. When the motor is far from the AC drive, there is much distributed capacitance in the circuit and certain harmonics may cause resonance in the circuit, bringing about the following two impacts: • Degrade the motor insulation performance and damage the motor in the long run. • Generate large leakage current and cause frequent AC drive protection trips. If the distance between the AC drive and the motor is greater than 100 m, install an AC output reactor.

Note

For more details on model selection of peripheral electrical devices, see section 9.3 and Table 11-1.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Contents

Preface....1

Chapter 1 Safety Information and Precautions....10

1.1 Safety Information....10

1.2 General Precautions....13

Chapter 2 Product Information....18

2.1 Product Type Identification....18

2.2 MD310 Model Series and Technical Data....19

2.3 Technical Specifications....20

2.4 Physical Appearance and Mounting Dimensions....24

2.5 Optional Parts....26

2.6 Routine Repair and Maintenance of the MD310....26

2.7 Warranty Agreement....28

Chapter 3 Mechanical Installation....30

3.1 Installation Environment....30

3.2 Mounting Orientation and Clearance....30

3.3 Installation Method and Process....31

3.4 Removal of the Front Cover....32

Chapter 4 Electrical Installation....34

4.1 Main Circuit....34

4.2 Control Circuit....40

4.3 Typical Wiring Example....45

Chapter 5 Operations....48

5.1 Introduction to the Operating Panel....48

5.2 Operating Panel Menu Structure....50

5.3 Overall Arrangement of Function Parameters....53

5.4 Function Parameter Operations....54

5.5 Definition and Operation of the MF.K Key....56

5.6 Viewing Status Parameters....57

5.7 Password Security....59

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Chapter 6 Functions 62
6.1 Start/Stop Command Source 62
6.2 Frequency Reference 66
6.3 Starting and Stopping the AC Drive 73
6.4 Motor Rotation Direction 77
6.5 Multi-reference 79
6.6 Special Functions 80
6.7 Motor Parameters and Auto-tuning 83
6.8 Interfaces 86
6.9 Serial Communication 90
Chapter 7 Function Code Table 92
7.1 Introduction 92
7.2 Standard Parameters 93
7.3 Monitoring Function Codes 117
7.4 Extension Card Communication 118
Chapter 8 Function Parameter Descriptions 120
Group F1: Motor 1 Parameters 129
Group F2: Vector Control Parameters 131
Group F3: V/F Control Parameters 134
Group F4: Input Terminals 141
Group F5: Output Terminals 153
Group F6: Start/Stop Control 159
Group F7: Keypad Operation and LED Display 165
Group F8: Auxiliary Functions 169
Group F9: Fault and Protection 178
Group FA: PID Function 184
Group Fb: Wobble Function, Fixed Length and Count 189
Group FC: Multi-Reference and Simple PLC Function 191
Group Fd: Communication Parameters 194
Group FE: User-Defined Parameters 195
Group FP: Function Parameter Management 196
Group A0: Torque Control and Limit 198

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Group A1: Virtual DI/DO 200
Group A2: Motor 2 Parameters 203
Group A5: Control Optimization 204
Group A6: AI Curve Setting 206
Group AC: AI/AO Correction 207
Group U0: Monitoring Parameters 209
Group U3: Extension Card Communication Parameters 213
Chapter 9 EMC 216
9.1 Definition of Terms 216
9.2 Introduction to EMC Standard 217
9.3 Selection of Peripheral EMC Devices 217
9.4 Shielded Cable 220
9.5 Solutions to Current Leakage 222
9.6 Solutions to Common EMC Interference Problems 223
10 Troubleshooting 226
10.1 Faults and Solutions 226
10.2 Symptoms and Diagnostics 230
Chapter 11 Selection 234
11.1 Selection Guidance of Peripheral Devices 234
11.2 Braking Unit and Regen Resistor 235
Appendix 1 Modbus Communication Protocol 238
Appendix 2 Extension I/O Card (MD310-IO1) 249
Appendix 3 External Operation Panel 252

ARCO CONTROL

:051-37133855-6
:09014284236
WWW.ARCOKALA.COM

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

1

Safety Information and Precautions

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Chapter 1 Safety Information and Precautions

This user manual includes some very important safety warnings and notices. There are two types of safety notice, and you must comply with both types of notice.

DANGER

It indicates that failure to comply with the notice will result in severe personal injury or even death.

WARNING

It indicates that failure to comply with the notice will result in personal injury or damage to property.

Read the following safety information and instructions carefully so that you understand how to install, commission, operate and maintain the MD310 AC drive system. Inovance accepts no liability or responsibility for any injury or loss caused by improper operation of the equipment described in the manual.

1.1 Safety Information

General

DANGER

- Never install the equipment if the equipment shows signs of water damage or damage during transit, or if parts are missing.
- Never install the the equipment if the packing list does not conform to the product you receive.

During Installation

DANGER

- Install the equipment only on fire-retardant or incombustible surfaces such as a metal wall.
- Do not loosen the fixed screws on components. It is especially important not to remove screws that have a red mark.

WARNING

- Do not drop wire ends, screws or other components into the AC drive.
- Select an installation location that is free from vibration and where it is not in direct sunlight.
- If the same cabinet includes more than one AC drive, make additional arrangements to cool the equipment.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Making Electrical Connections

⚠ DANGER

- Electrical connections must be completed only by a qualified technician following the instructions in this user manual.
- The electrical power supply to the MD310 AC drive must include a circuit breaker that isolates the AC drive completely from the supply.
- Isolate the MD310 AC drive from the electrical supply before you start making or modifying electrical connections throughout the system.
- Make sure the MD310 system includes an effective ground connection.

⚠WARNING

- Never connect power cables to the output terminals (U, V, W) of the AC drive. Identify the marks of the cable terminals carefully, and make sure you complete all connections correctly.
- Never connect the braking resistor between the DC bus terminals (+) and (–).
- Use the wire and cable sizes recommended in this user manual.
- Use a shielded cable for connections to the encoder, and make sure you connect the shielding layer to an effective ground.

Before Power-on

⚠ DANGER

- Make sure the voltage class of the power supply is correct for the voltage class of the MD310 AC drive.
- Make sure the input terminals (R, S, T) and the output terminals (U, V, W) are connected correctly.
- Make sure there are no short-circuits in the peripheral circuitry.
- Make sure the cables and wires are secured safely where they cannot become damaged.
- Do not perform a voltage resistance test on any part of the AC drive. The factory performs tests of this type during manufacture and damage might occur if you repeat these tests.

⚠WARNING

- Never power on the AC drive until the drive is covered properly.
- Follow the wiring method described in this user manual to wire all peripheral devices.

After Power-on

⚠ DANGER

- Never open or remove the protective covers of the AC drive when the equipment is powered on.
- Never touch any of the input/output terminals of the AC drive.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

⚠WARNING

- Never touch the rotating part of the motor during motor auto-tuning or while the motor is running.
- Never change the factory settings of the MD310 AC drive.

During Operation

⚠ DANGER

- Do not touch the fan or the discharging resistor, which becomes hot.
- Signal measurements must be made only by a qualified technician.

⚠WARNING

- Prevent objects falling into the MD310 AC drive.
- Follow the correct procedures described in this user manual to start and to stop the MD310 AC drive. Do not start or stop the AC drive by using the power contactor or circuit breaker.

During Maintenance

⚠ DANGER

- Repair and maintenance operations on the MD310 AC drive must be performed only by qualified technicians.
- Do not perform repairs or maintenance operations when the AC Drive is powered on. Follow the repair and maintenance instructions in this user manual.
- Wait for a period of 10 minutes after the AC drive is powered off before allowing any repairs or maintenance work to start, so that hot parts can cool down and to allow the residual voltage on capacitors to discharge safely.
- Disconnect the AC drive from the power supply before starting any repair or maintenance operations.
- Do not connect or disconnect any parts of the AC drive when the system is powered on.
- Always set and check related parameters after the AC drive is replaced.

⚠WARNING

- The rotating motor feeds power back to the AC drive system. Because of this, the AC drive will still be charged even if the motor stops and the power is disconnected. Therefore, disconnect the motor from the AC drive before starting any maintenance on the AC drive.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

1.2 General Precautions

1. Requirements of a residual current device (RCD)

   The AC drive generates high leakage current during running, which flows through the protective earthing (PE) conductor. Thus install a type-B RCD at primary side of the power supply. When selecting the RCD, you should consider the transient and steady-state leakage current to ground that may be generated at startup and during running of the AC drive. You can select a specialized RCD with the function of suppressing high harmonics or a general-purpose RCD with relatively large residual current.

2. High leakage current warning

⚠ DANGER
The AC drive generates high leakage current during running, which flows through the PE conductor. Earth connection must be done before connection of power supply. Earthing shall comply with local regulations and related IEC standards.

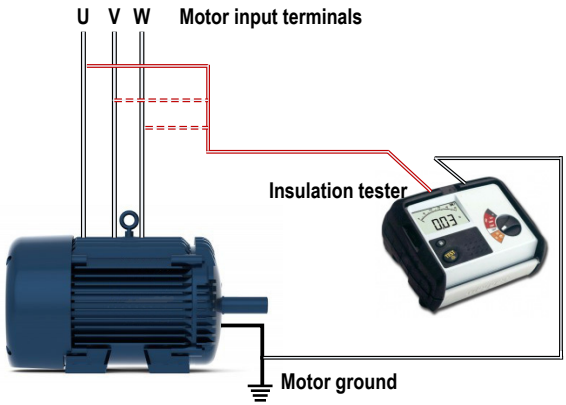
3. Motor insulation test

   Arrange for a qualified technician to perform an insulation test on the motor under the following conditions:

   - Before the motor is used for the first time
   - When the motor is reused after being stored for a long time
   - During regular maintenance checks.

   This precaution detects poor insulation of the motor windings so that early actions can be taken to prevent damage to the AC drive. The motor must be disconnected from the AC drive during the insulation test. A 500 volt insulation tester is recommended for this test, and the insulation resistance must not be less than 5 MΩ.

   Figure 1-1 Connections required for a motor insulation test



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

1. Thermal protection of the motor.

   If the rated capacity of the motor selected does not match that of the AC drive, adjust the motor protection parameters on the operation panel or install a thermal relay in the motor circuit for protection. It is especially important to take this precaution if the AC drive has a higher power rating than the motor.

2. Running at frequencies higher than 50 Hz.

   The MD310 AC drive can output frequencies in the range 0 to 500 Hz. If it is necessary to operate the MD310 AC drive at frequencies higher than 50 Hz, consider the capacity of the machine.

3. Vibration of the mechanical device.

   The AC drive might experience mechanical resonance at some output frequencies. It is possible to avoid this by selecting the jump frequency.

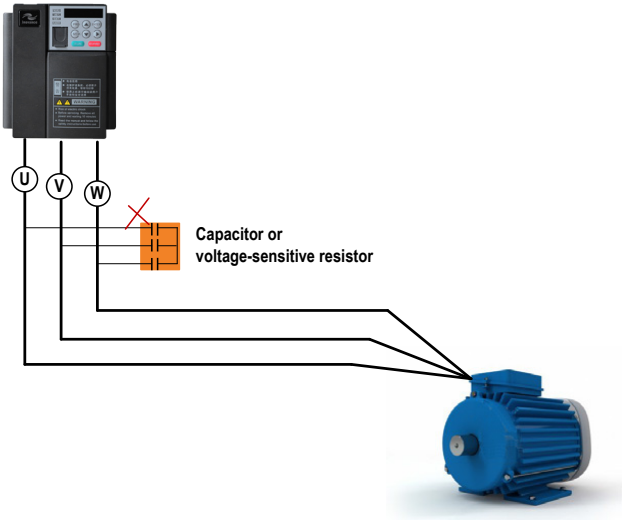
4. Motor heat and noise.

   The output from the MD310 AC drive is a pulse width modulation (PWM) waveform, which contains harmonic frequencies. Because of this, the motor temperature, noise and vibration increase slightly when the AC drive operates at the line frequency (50 Hz).

5. Voltage-sensitive device or capacitor on the output side of the AC drive.

   Do not install a capacitor for improving power factor, or a voltage sensitive resistor for lightning protection, on the output side of the AC drive. This is because the output is a PWM waveform and the AC drive might suffer transient overcurrent or become damaged.

   Figure 1-2 Disallowed connections to the AC drive output



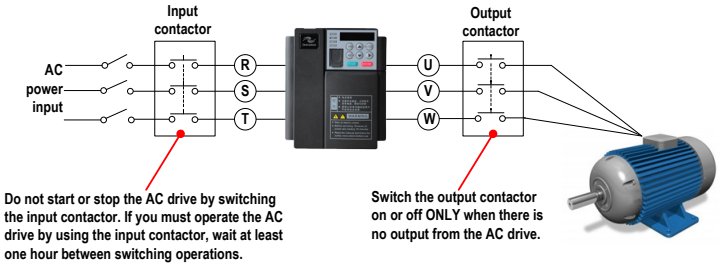
www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

6. Contactor at the I/O terminal of the AC Drive.

   If there is a contactor installed between the input side of the AC drive and the power supply, DO NOT use it to start or to stop the AC drive. However, if there is a real and urgent need to use the contactor to start or to stop the AC drive, make sure the time interval between switching is at least one hour. If the interval between switching is shorter than one hour, this will reduce the service life of the capacitor inside the AC drive.

   If there is a contactor installed between the output side of the AC drive and the motor, do not switch off this contactor when the AC drive is operating. Damage might occur to components inside the AC drive if you switch off the output contactor when the AC drive is operating.

   Figure 1-3 Input and output contactors



7. When the external voltage exceeds the rated voltage range

   Do not operate the AC drive outside the rated voltage range specified in this User Manual. If you operate the AC drive outside its rated voltage range, components inside the AC drive might be damaged. If necessary, use an appropriate voltage step-up or step-down device to match the supply voltage to the rated voltage range for the AC drive.

8. 1Prohibition of three-phase input changed into two-phase input.

   Do not change a three-phase input of the AC drive into a two-phase input.

9. Surge suppressor.

   The AC drive has a built-in voltage-dependent resistor (VDR) for suppressing the surge voltage generated when the inductive loads around the AC drive (for example the electromagnetic contactor, electromagnetic relay, solenoid valve, electromagnetic coil and electromagnetic brake) are switched on or off.

   If the inductive loads generate a very high surge voltage, use a surge suppressor for the inductive load and possibly also use a diode.

Note

Do not connect the surge suppressor to the output side of the AC Drive.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

1. Some special usages

   If your installation requires special cabling that this user manual does not describe, for example to support a common DC bus, contact Inovance for technical support and advice.

2. Disposal

   If it becomes necessary to dispose of any part of the AC drive system, DO NOT attempt to burn the parts on a fire. If you do, the electrolytic capacitors might explode, and the plastic components will create poisonous gases. Treat any parts for disposal as ordinary industrial waste.

3. Adaptable motor

   - The standard adaptable motor is an adaptable four-pole squirrel cage asynchronous induction motor. For other types of motor, select the correct AC drive according to the rated motor current.
   - The cooling fan and rotor shaft of non-variable-frequency motors are coaxial, which results in reduced cooling effect when the motor speed reduces. If variable speed is required, add a more powerful fan or fit a variable-frequency motor in applications where the motor overheats easily.
   - The standard parameters of the adaptable motor have already been configured inside the AC drive. However, it is still necessary to perform motor auto-tuning or to modify the default values based on actual conditions. Otherwise, the running result and protection performance will be adversely affected.
   - The AC drive might cause an alarm or might be damaged when a short-circuit exists on cables or inside the motor. Therefore, perform insulation short-circuit test when the motor and cables are newly installed or during routine maintenance. During the test, disconnect the drive from the tested parts.

ARCO CONTROL
:051-37133855-6
:09014284236
WWW.ARCOKALA.COM

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

2

Product Information

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

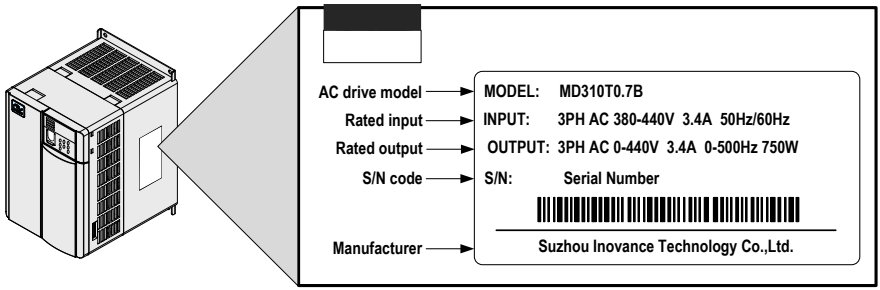
Chapter 2 Product Information

2.1 Product Type Identification

Each model in the range of MD310 AC drive systems has a model number that identifies important characteristics and specifications for that particular unit.

The following figure shows an example of a model number and explains how it is derived from the system specification.

Figure 2-1 Nameplate and designation rules of the MD310



MD310 | T | 0.7 | B

MD310 series AC drive

Mark	Built-in Braking Unit
B	Yes

Mark	Voltage Class
S	Single-phase 220 V
-2T	Three-phase 220V
T	Three-phase 380 V

Mark	0.4	0.7	1.5	…	18.5
Applicable Motor (kW)	0.4	0.75	1.5	…	18.5

ARCO CONTROL
:051-37133855-6
:09014284236
WWW.ARCOKALA.COM

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

2.2 MD310 Model Series and Technical Data

MD310 Models	Power Capacity (kVA)	Input Current (A)	Output Current (A)	Adaptable Motor	
				kW	HP
Single-phase 220 V, 50/60 Hz					
MD310S0.4B	1.0	5.4	2.3	0.4	0.5
MD310S0.7B	1.5	8.2	4.0	0.75	1
MD310S1.5B	3.0	14.0	7.0	1.5	2
MD310S2.2B	4.0	23.0	9.6	2.2	3
Three-phase 220 V, 50/60 Hz					
MD310-2T0.4B	1.5	3.4	2.1	0.4	0.5
MD310-2T0.75B	3.0	5.0	3.8	0.75	1
MD310-2T1.5B	4.0	5.8	5.1	1.5	2
MD310-2T2.2B	5.9	10.5	9.0	2.2	3
MD310-2T3.7B	8.9	14.6	13.0	3.7	5
MD310-2T5.5B	17.0	26.0	25.0	5.5	7.5
MD310-2T7.5B	21.0	35.0	32.0	7.5	10
Three-phase 380 V, 50/60 Hz					
MD310T0.4B	1.0	1.9	1.5	0.4	0.5
MD310T0.7B	1.5	3.4	2.1	0.75	1
MD310T1.5B	3.0	5.0	3.8	1.5	2
MD310T2.2B	4.0	5.8	5.1	2.2	3
MD310T3.7B	5.9	10.5	9.0	3.7	5
MD310T5.5B	8.9	14.6	13.0	5.5	7.5
MD310T7.5B	11.0	20.5	17.0	7.5	10
MD310T11B	17.0	26.0	25.0	11.0	15
MD310T15B	21.0	35.0	32.0	15.0	20
MD310T18.5B	24.0	38.5	37.0	18.5	25

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

2.3 Technical Specifications

Item		Description
Standard functions	Max. frequency	Vector control: 0 to 300 Hz V/F control: 0 to 500 Hz
	Carrier frequency	0.5 to 16 kHz The carrier frequency adjusts automatically depending on load characteristics.
	Input frequency resolution	• Digital setting: 0.01 Hz • Analog setting: Max. frequency x 0.025%
	Control mode	• Sensorless vector control (SVC) • Voltage/Frequency (V/F) control
	Startup torque	• SVC: 0.5 Hz/150% • V/F: 1.0 Hz/100%
	Speed range	• 1:100 (SVC) • 1: 50 (V/F)
	Speed stability accuracy	• ±0.5% (SVC) • 1% (V/F)
	Overload capacity	• 60 minutes for 120% of the rated current • 60 seconds for 150 % of the rated current • 2 seconds for 180 % of the rated current
	Torque boost	• Fixed boost • Customized boost 0.1 % to 30.0 %
	V/F curve	• Straight-line V/F curve • Multi-point V/F curve • N-power V/F curve (1.2-power, 1.4-power, 1.6-power, 1.8-power, square)
	V/F separation	• Complete V/F separation • Half V/F separation
	Ramp mode	• Straight-line ramp • S-curve ramp Four separate acceleration/deceleration time settings in the range of 0s to 6500s.
	DC injection braking	• DC injection braking frequency: 0.00 Hz to max. frequency • DC injection braking active time: 0.0s to 36.0s. • Current level of DC injection braking: 0.0% to 100.0%.
	Jog running	• Frequency range of jog running: 0.00 to 50.00 Hz • Acceleration/Deceleration time of jog running:0.0s to 6500.0s
	Onboard multiple preset speeds	The system implements up to 16 speeds by using simple PLC function or by using digital input signals.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Item		Description
Standard functions	Onboard PID	The system implements the proportional-integral-derivative (PID) function in the closed-loop control.
	Automatic voltage regulation (AVR)	The system maintains a constant output voltage automatically when the line voltage changes through the allowable range.
	Overvoltage and overcurrent stall control	The system limits the output current and voltage automatically during operation to prevent frequent or excessive tripping.
	Torque limit and control	The system limits the torque automatically to prevent frequent overcurrent tripping during operation.
Individualized functions	High performance	The MD310 applies control of an asynchronous motor by using advanced current vector control technology.
	Power dip ride-through	Load feedback energy compensates for any voltage reduction, allowing the MD310 to continue to operate for a short time during power dips.
	Fast current limit	The system applies fast current limiting techniques to avoid frequent overcurrent faults.
	Virtual I/O	Five groups of virtual digital input/outputs (DI/DO) support simple logic control.
	Timing control	Time range: 0.0 to 6500.0 minutes
	Dual-motor switchover	The MD310 can control up to four motors. It controls one motor at a time and then switches over to another, finally implementing switchover amongst the four motors.
	Multiple field buses	The MD310 supports three field buses: • Modbus-RTU • CANlink • CANopen
	Motor overheat protection	Option: The optional input/output (I/O) extension card allows AI3 to receive a signal from the motor temperature sensor input (PT100, PT1000) to implement motor overheat protection.
	Advanced background software	Embedded software operating in the MD310 allows users to configure some operating parameters, and provides a virtual oscilloscope display that shows system status information

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Item		Description
Operation	Command source	Allows different methods of switching between command sources: • Operating panel control • Terminal control • Communication control
	Frequency setting channel	Supports up to 10 frequency setting channels and allows different methods of switching between frequency setting channels: • Digital setting • Analog voltage reference • Analog current reference • Pulse reference • Communication reference
	Auxiliary frequency source	Supports up to 10 auxiliary frequency setting channels, and allows fine tuning of the auxiliary frequency and frequency superposition.
	Input terminals	Standard: • Five digital input (DI) terminals, one of which supports up to 20 kHz high-speed pulse inputs. • Two analog input (AI) terminals, one of which supports only 0 to10 V input, and the other supports 0 to 10 V and 0 to 20 mA current input. Expanded capacity: • Five digital input (DI) terminals. • One AI terminal that supports –10 to 10 V voltage input and PT100/PT1000 motor temperature sensor inputs.
	Output terminals	Standard • Single high-speed pulse output terminal (open-collector) • Single digital output (DO) terminal • Single relay output terminal • Single analog output (AO) terminal that supports either a current output in the range 0 to 20 mA or a voltage output in the range 0 to 10 V. Expanded capacity: • Single extra DO terminal • Single extra relay output terminal • Single extra AO terminal that supports either a current output in the range 0 to 20 mA or a voltage output in the range 0 to 10 V.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

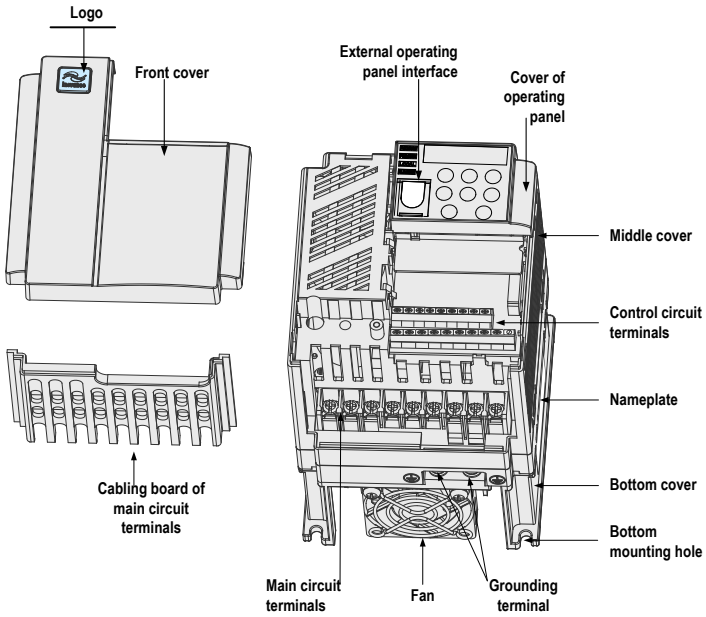
Item		Description
Display and operating panel	LED display	The 6-character LED display shows parameter values.
	Key locking and function selection	Keys on the control panel can be locked or partially locked electronically to prevent accidental operation. The range of some functions can be limited to a permitted range to prevent incorrect settings.
	Protections	The MD310 supports the following protections: • Motor short-circuit detection at power-on • Input/output phase loss protection • Overcurrent protection • Overvoltage protection • Undervoltage protection • Overheat protection • Overload protection
	Optional parts	The I/O extension card is available for use with the MD310 AC drive system.
Environment	Installation location	Install the MD310 AC drive where it is indoors and protected from direct sunlight, dust, corrosive or combustible gases, oil smoke, vapour, ingress from water or any other liquid, and salt.
	Altitude	Below 1000 m
	Ambient temperature	–10°C to 40°C (de-rated if the ambient temperature is between 40°C and 50°C)
	Humidity	Less than 95 % RH non-condensing.
	Vibration	Less than 5.9 m/s² (0.6 g).
	Storage temperature	–20°C to 60°C
	IP level	IP20
	Pollution level	PD2
	Power system	TN, TT

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

2.4 Physical Appearance and Mounting Dimensions

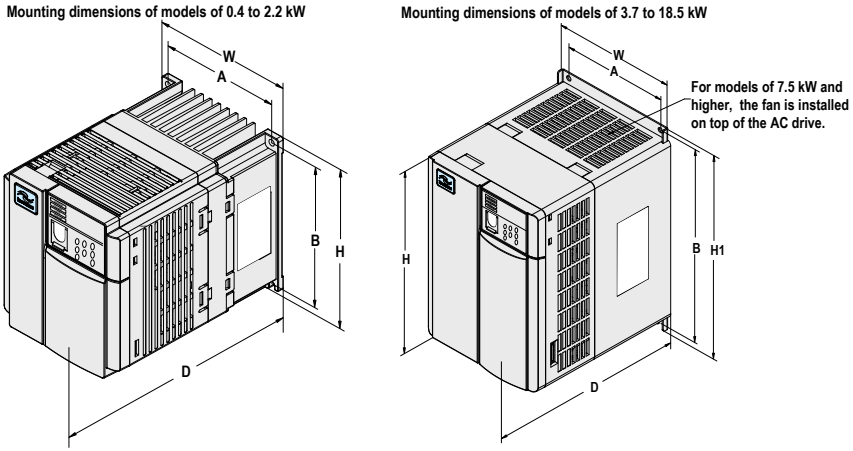
2.4.1 Physical Appearance of the MD310

Figure 2-2 Physical appearance of the MD310



2.4.2 Mounting dimensions of the MD310

Figure 2-3 Mounting dimensions of the MD310



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Table 2-1 Mounting dimensions of the MD310

AC Drive Model	Dimensions (mm)							
	A	B	H	H1	W	D	d	Weight (kg)
Single-phase 220 V								
MD310S0.4B	96	118	128	-	108	148	Ø5.0	1.1
MD310S0.7B						148		1.1
MD310S1.5B						158		1.3
MD310S2.2B					-			
Three-phase 220 V								
MD310-2T0.4B	96	118	128	-	108	148	Ø5.0	1.1
MD310-2T0.7B						148		1.1
MD310-2T1.1B						158		1.3
MD310-2T2.2B	108	198	185	209	130	164	Ø5.0	2.3
MD310-2T3.7B	122	248	234	260	140	171	Ø6.0	3.4
MD310-2T5.5B								
MD310-2T7.5B	160	284	270	298	180	175.5	Ø6.0	5.6
Three-phase 380 V								
MD310T0.4B	96	118	128	-	108	148	Ø5.0	1.1
MD310T0.7B						148		1.1
MD310T1.5B						158		1.3
MD310T2.2B						158		1.3
MD310T3.7B	108	198	185	209	130	164	Ø5.0	2.3
MD310T5.5B								
MD310T7.5B	122	248	234	260	140	171	Ø6.0	3.4
MD310T11B								
MD310T15B	160	284	270	298	180	175.5	Ø6.0	5.6
MD310T18.5B								

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

2.5 Optional Parts

If any operational part is required, specify it in your order.

Table 2-2 Optional parts of the MD310

Optional Part	Model	Function	Remark
Built-in braking unit	AC drive model ending with letter "B"	The single-phase drives of 0.4 to 2.2 kW and the three-phase drives of 0.4 to 18.5 kW have the built-in braking unit as the standard configuration.	-
I/O extension card 1	MD31IO1	It can extend five DIs and one AI (AI3 is used for separation analog input). It can be connected to PT100 and PT1000, and provides one relay output, one DO and one AO.	-
Extension cable	MDCAB	It is a standard 8-core cable and can be connected to MDKE and MDKE7.	The standard length is 3 m.

2.6 Routine Repair and Maintenance of the MD310

2.6.1 Routine Maintenance

The influence of the ambient temperature, humidity, dust and vibration will cause the aging of the devices in the AC drive, which may cause potential faults or reduce the service life of the AC drive. Therefore, it is necessary to carry out routine and periodic maintenance.

Routine maintenance involves checking:

- Whether the motor sounds abnormally during running
- Whether the motor vibrates excessively during running
- Whether the installation environment of the AC drive changes.
- Whether the AC drive's cooling fan works normally
- Whether the AC drive overheats

Routine cleaning involves:

- Keep the AC drive clean all the time.
- Remove the dust, especially metal powder on the surface of the AC drive, to prevent the dust from entering the AC drive.
- Clear the oil stain on the cooling fan of the AC drive.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

2.6.2 Periodic Inspection

Perform periodic inspection in places where inspection is difficult.

Periodic inspection involves:

- Check and clean the air duct periodically.
- Check whether the screws become loose.
- Check whether the AC drive is corroded.
- Check whether the wiring terminals have arc signs.
- Carry out the main circuit insulation test

Note

- Before measuring insulating resistance with megameter (500 VDC megameter recommended), disconnect the main circuit from the AC drive.
- Do not use the insulating resistance meter to test the insulation of the control circuit. The high voltage test need not be performed again because it has been completed before delivery.

2.6.3 Replacement of Vulnerable Components

Vulnerable components of the AC drive include the cooling fan and filter electrolytic capacitor. Their service life is related to the operating environment and maintenance status. Generally, the service life is shown as follows:

Component	Service Life	Possible Damage Reason	Judging Criteria
Fan	2 to 3 years	• Bearing worn • Blade ageing	• Whether there is crack on the blade • Whether there is abnormal vibration noise upon startup
Electrolytic capacitor	4 to 5 years	• Input power supply in poor quality • High ambient temperature • Frequent load jumping • Electrolytic ageing	• Whether there is liquid leakage. • Whether the safe valve has projected. • Measure the static capacitance. • Measure the insulating resistance.

The standard service time indicates the service time when the AC drive is used on the following conditions:

- Ambient temperature: about 30°C on average yearly
- Load rate: below 80%
- Operating rate: below 20 hours per day

You can determine when to replace these parts according to the actual operating time.

2.6.4 Storage

For storage of the AC drive, pay attention to the following two aspects:

1. Pack the AC drive with the original packing box provided by Inovance.
2. Long-term storage degrades the electrolytic capacitor. Thus, the AC drive must be energized once every 2 years, each time lasting at least 5 hours. The input voltage must be increased slowly to the rated value with the regulator.

www.Farazcontrol.com (مهندس رمضان زاده)۰۹۱۲۹۲۷۵۱۵۹ واحد فروش:

2.7 Warranty Agreement

1. Free warranty only applies to the AC drive itself.
2. Inovance will provide 18-month warranty from date of manufacturing for the failure or damage under normal use conditions. If the equipment has been used for over 18 months, reasonable repair expenses will be charged.
   - Reasonable repair expenses will be charged for the damages due to the following causes:
   - Improper operation without following the instructions
   - Fire, flood or abnormal voltage.
   - Using the AC drive for non-recommended function
3. The maintenance fee is charged according to Inovance's uniform standard. If there is an agreement, the agreement prevails.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

3

Mechanical Installation

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Chapter 3 Mechanical Installation

3.1 Installation Environment

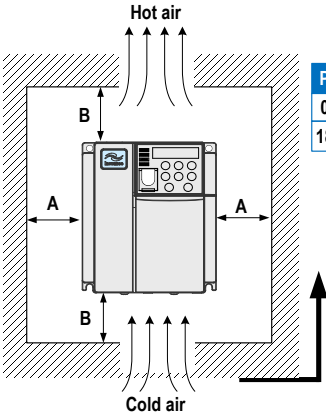
Item	Requirements
Ambient temperature	-10°C to 40°C
Heat dissipation	Install the AC Drive on an incombustible supporting surface and make sure there is sufficient space around the enclosure to allow for efficient heat dissipation. Use strong screws or bolts to secure the enclosure on the supporting surface.
Mounting location	Make sure the mounting location is: Away from direct sunlight Not in an area that has high humidity or condensation Protected against corrosive, combustible or explosive gases and vapours Free from oil, dirt, dust or metallic powders.
Vibration	Make sure the mounting location is not affected by levels of vibration that exceed 0.6 g. Avoid installing the enclosure near to punching machines or other mechanical machinery that generates high levels of vibration or mechanical shock.
Protective enclosure	The MD310 drives of plastic housing must be installed in a fireproof cabinet with doors that provide effective electrical and mechanical protection. The installation must conform to local and regional laws and regulations, and to relevant IEC requirements.

3.2 Mounting Orientation and Clearance

■ Mounting Clearance

The mechanical clearance requirements for the MD310 vary with power classes of the AC drive.

Figure 3-1 Mounting clearance of the MD310



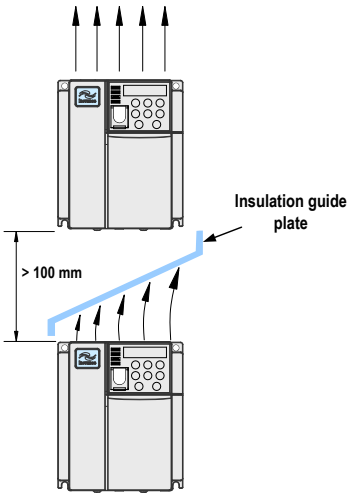
Power Class	Clearance requirements	
0.4 to 15 kW	A ≥ 10 mm	B ≥ 100 mm
18.5 kW	A ≥ 10 mm	B ≥ 200 mm

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

The MD310 series AC drive dissipates heat from the bottom to the top. When multiple AC drives are required to work together, install them side by side.

For the application of installing multiple AC drives, if one row of AC drives need to be installed above another row, install an insulation guide plate to prevent AC drives in the lower row from heating those in the upper row and causing faults.

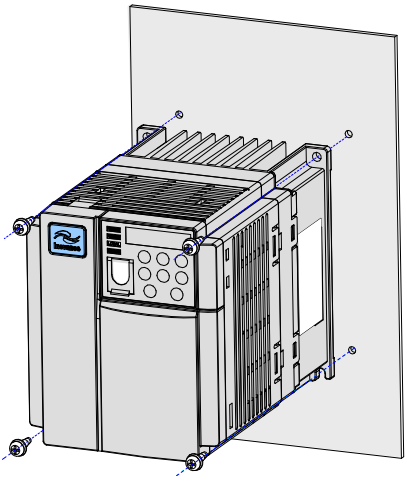
Figure 3-2 Installation of the insulation guide plate



3.3 Installation Method and Process

The MD310 only has plastic housing and supports wall-mounting installation.

Figure 3-3 Wall-mounting installation of the MD310



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

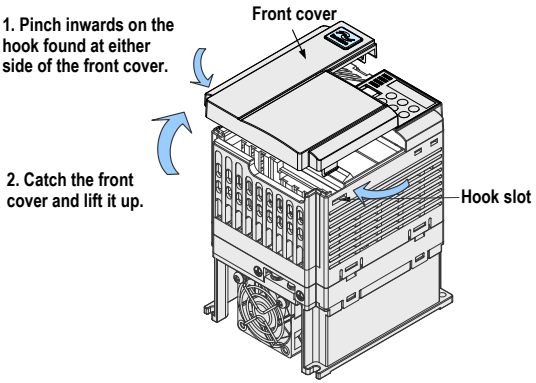
The installation precautions are as follows:

- Reserve the installation clearances as specified in Figure 3-1 to ensure sufficient space for heat dissipation. Take heat dissipation of other components in the cabinet into consideration.
- Install the AC drives upright to facilitate heat dissipation. If multiple AC drives are installed in the cabinet, install them side by side. If one row of AC drives need to be installed above another row, install an insulation guide plate, as shown in Figure 3-2.
- Use the incombustible hanging bracket.
- In scenarios with heavy metal powder, install the heatsink outside the cabinet, and ensure that the room inside the fully-sealed cabinet is as large as possible.

3.4 Removal of the Front Cover

For the MD310 series AC drives, you need to remove the front cover before wiring the main circuit and control circuit. The following figures show how to remove the front cover of the MD310.

Figure 3-4 Removal of the front cover of the MD310



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

4

Electrical Installation

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹(مهندس رمضان زاده)

Chapter 4 Electrical Installation

4.1 Main Circuit

4.1.1 Wiring Diagram

Figure 4-1 Main circuit wiring of the MD310 of single-phase 220 V

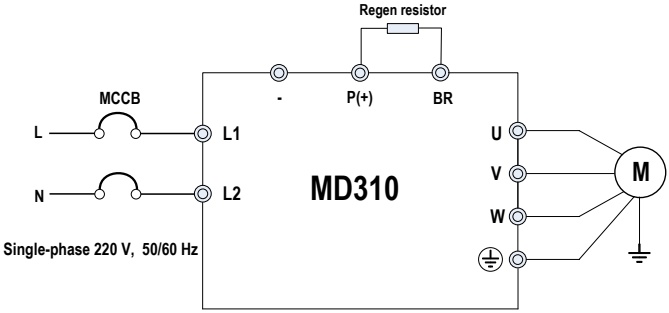


Figure 4-2 Main circuit wiring of the MD310 of three-phase 220 V (7.5 kW and below)

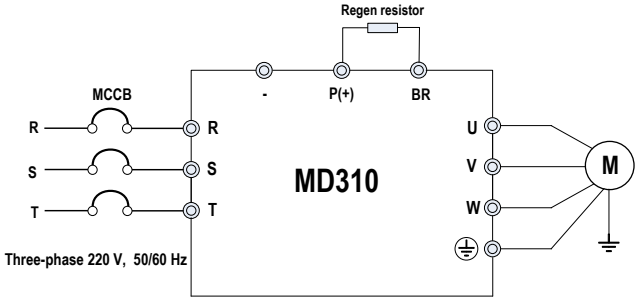
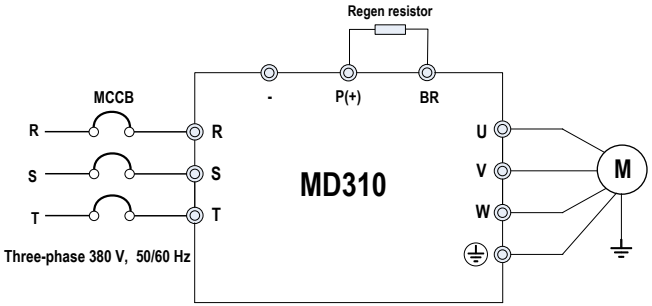


Figure 4-3 Main circuit wiring of the MD310 of three-phase 380/480 V (18.5 kW and below)



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

4.1.2 Terminals

■ Description of Terminals of Single-phase Drive

Terminal	Name	Description
L1, L2	Single-phase supply input	Connections to the single-phase 220 V power supply
(+), (-)	DC bus terminals	Common DC bus input
(+), BR	Regen resistor connection	Connection for the regen resistor
U, V, W	AC drive outputs	Connections to a three-phase motor
⏚	Ground (PE)	Ground connection

■ Description of Terminals of Three-phase Drive

Terminal	Name	Description
R, S, T	Three-phase supply input	Connections to the three-phase power supply
(+), (-)	DC bus terminals	Common DC bus input
(+), BR	Regen resistor connection	Connection for the braking resistor for AC drive units (220 V) of 7.5 kW and below and for AC drive units (other voltage classes) of 18.5 kW and below
U, V, W	AC drive outputs	Connections to a three-phase motor
⏚	Ground (PE)	Ground connection

Pay attention to the following precautions at wiring:

- Power input terminals L1, L2 or R, S, T
- The cable connection on the input side of the AC drive has no phase sequence requirement.
- DC bus terminals P(+), (-)
  - Terminals (+) and (-) of DC bus have residual voltage after the AC drive is switched off. After indicator CHARGE goes off, wait at least 10 minutes before touching the equipment. Failure to comply may result in electric shock.
  - The cable length of the braking unit must not exceed 10 m. Use twisted pair wire or tight pair wires for parallel connection.
  - Do not connect the braking resistor directly to the DC bus. Otherwise, it may damage the AC drive and even cause fire.
- Terminals (+), PB for connecting braking resistor
  - Connect a braking resistor of the recommended model, and ensure that the cable length of the regen resistor must be shorter than 5 m. Otherwise, it may damage the AC drive.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

- AC drive output terminals U, V, W
  - Do not connect a capacitor or surge absorber to the output side of the AC drive. Otherwise, it may cause frequent AC drive faults or even damage the AC drive.
  - If the motor cable is too long, electrical resonance will be generated due to the impact of distributed capacitance. This will damage the motor insulation or generate higher leakage current, causing the AC drive to trip in overcurrent protection. If the motor cable is greater than 100 m long, an AC output reactor must be installed close to the AC drive.
- Terminal ⏚ PE
  - This terminal must be reliably connected to ground and the resistance of the grounding wire must be less than 0.1 Ω. Otherwise, it may cause abnormal running or even damage to the AC drive.
  - Do not connect this terminal to the neutral conductor of the power supply.
  - The impedance of the PE conductor must be able to withstand the large short-circuit current that may arise when a fault occurs.
  - Select the size of the PE conductor according to the following table:

Cross-sectional Area of a Phase Conductor (S)	Min. Cross-sectional Area of Protective Conductor (Sp)
$S \leq 16\ mm^2$	S
$16\ mm^2 < S \leq 35\ mm^2$	$16\ mm^2$
$35\ mm^2 < S$	S/2

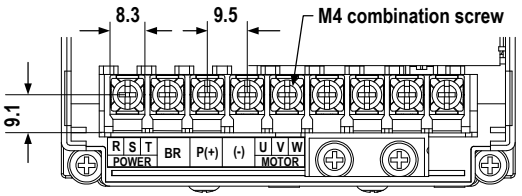
  - You must use a yellow/green cable as the PE conductor.

4.1.3 Recommended Cable Diameter and Mounting Dimensions of Power Terminals

Pay attention to the following aspects before referring to the data in this section:

- The recommended data and models are for reference only. The cable diameter you select cannot be larger than the size in the following figures.
- The prerequisite of cable selection is as follows: Under ambient temperature of 40 °C in steady state, for the recommended diameters of the PVC insulation copper conductor or cable, see section 12.4 of the IEC 60204-1-2005.
- The data in this section is applicable to the three-phase 380 V. For related data of the single-phase or three-phase 220 V, contact Inovance.

Figure 4-4 Dimensions of power terminals of the MD310 of 2.2 kW and below



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Table 4-1 Recommended cable diameter and cable lug model of the MD310 of 2.2 kW and below

AC Drive Model	Rated Input Current (A)	Recommended Cable Diameter (mm^2)	Tightening Torque (N·m)	Recommended Cable Lug Model	
				Ring	Spade
MD310T0.4B	1.9	0.75	1.2	GTNR0.75-4	TNS1.25-4S
MD310T0.7B	3.4	0.75	1.2	GTNR0.75-4	TNS1.25-4S
MD310T1.5B	5.0	0.75	1.2	GTNR0.75-4	TNS1.25-4S
MD310T2.2B	5.8	0.75	1.2	GTNR0.75-4	TNS1.25-4S

Figure 4-5 Dimensions of power terminals of the MD310 of 3.7 to 5.5 kW

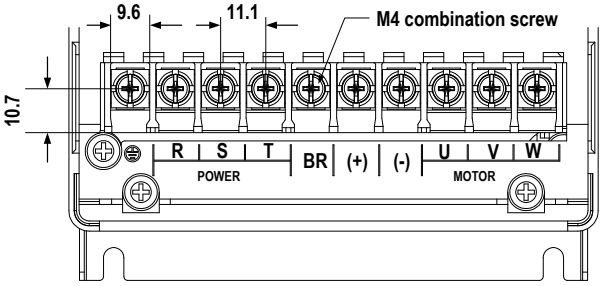


Table 4-2 Recommended cable diameter and cable lug model of the MD310 of 3.7 to 5.5 kW

AC Drive Model	Rated Input Current (A)	Recommended Cable Diameter (mm^2)	Tightening Torque (N·m)	Recommended Cable Lug Model	
				Ring	Spade
MD310T3.7B	10.5	1.5	1.2	GTNR1.25-4	TNS1.25-4S
MD310T5.5B	14.6	2.5	1.2	GTNR2.5-4	TNS2-4S

Figure 4-6 Dimensions of power terminals of the MD310 of 7.5 to 11 kW

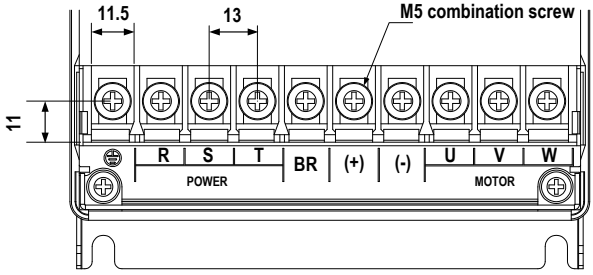


Table 4-3 Recommended cable diameter and cable lug model of the MD310 of 7.5 to 11 kW

AC Drive Model	Rated Input Current (A)	Recommended Cable Diameter (mm^2)	Tightening Torque (N·m)	Recommended Cable Lug Model	
				Ring	Spade
MD310T7.5B	20.5	4.0	2.5	GTNR4-5	TNS3.5-5
MD310T11B	26.0	4.0	2.5	GTNR4-5	TNS3.5-5

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Figure 4-7 Dimensions of power terminals of the MD310 of 15 to 18.5 kW

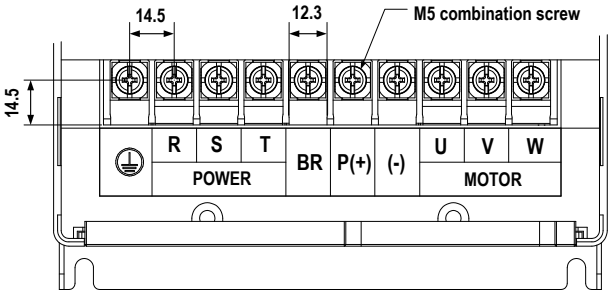


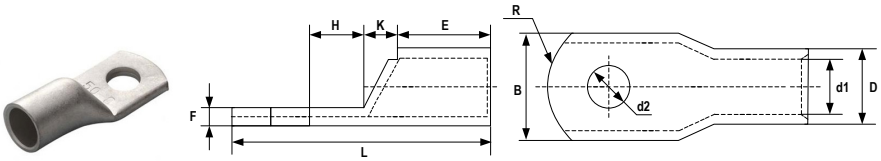
Table 4-4 Recommended cable diameter and cable lug model of the MD310 of 15 to 18.5 kW

AC Drive Model	Rated Input Current (A)	Recommended Cable Diameter (mm^2)	Tightening Torque (N·m)	Recommended Cable Lug Model	
				Ring	Spade
MD310T15B	35.0	6.0	2.5	GTNR6-5	TNS5.5-5
MD310T18.5B	38.5	10.0	2.5	GTNR10-5	TNS8-6

■ Cable Lug Specification

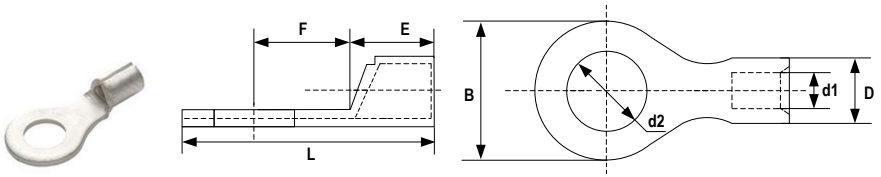
The recommended cable lug is manufactured by Suzhou Yuanli Metal Enterprise.

Figure 4-8 Appearance and dimensions of recommended ring GTNR cable lug



Cable Lug Model	D	d1	E	H	K	B	d2	F	L	R	Crimping Tool
GTNR2.5-4	4.5	2.9	7.0	5.0	2.0	8.0	4.3	1.0	18.0	5.0	RYO-8 YYT-8 RYO-14
GTNR4-5	5.2	3.6	7.0	6.0	2.0	10.0	5.3	10.0	20.0	7.0	
GTNR6-5	6.0	4.2	9.0	6.0	3.0	10.0	5.3	1.0	23.0	7.0	
GTNR10-6	7.0	5.0	9.0	8.0	3.5	12.4	6.4	1.0	27.0	7.0	

Figure 4-9 Appearance and dimensions of recommended ring TNR cable lug

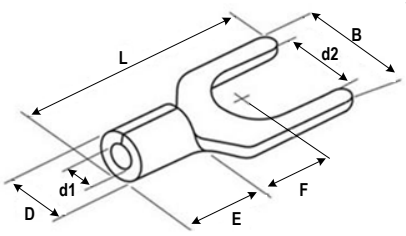


www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Cable Lug Model	Cable Range AWG/MCM	Cable Range mm^2	D	d1	E	F	B	d2	L	Crimping Tool
TNR0.75-4	22-16	0.25-1.0	2.8	1.3	4.5	6.6	8.0	4.3	15.0	RYO-8
TNR1.25-4	22-16	0.25-1.65	3.4	1.7	4.5	7.3	8.0	5.3	15.8	AK-1M

Figure 4-10 Appearance and dimensions of recommended spade TNS cable lug





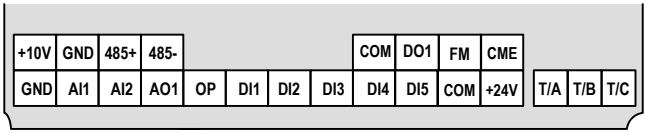
Cable Lug Model	Cable Range AWG/MCM	Cable Range mm^2	D	d1	E	F	B	d2	L	Crimping Tool
TNS1.25-4S	22-16	0.5-1.6	3.4	1.9	4.7	6.5	6.4	4.3	16.0	RYO-8
TNS1.25-4S	22-16	0.5-1.6	3.4	1.9	4.7	6.5	6.4	4.3	16.0	YYT-8
TNS2-4S	16-14	1.0-2.6	4.0	2.4	4.7	6.5	6.4	4.3	16.0	
TNS3.5-5	12-10	2.6-4.6	5.0	3.4	6.4	8.0	8.0	5.3	18.0	
TNS5.5-5	12-10	4.6-6.6	5.6	3.6	6.5	8.0	9.0	5.3	19.5	
TNS8-6	8.0	6.6-10.5	7.0	4.6	8.6	8.5	12.2	6.7	24.0	

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

4.2 Control Circuit

4.2.1 Terminal Descriptions

■ Terminal Arrangement



■ Terminal Function

Table 4-5 Description of the use of control circuit terminals

Type	Terminal		Name	Description
Power supply	+10V	GND	+10 V power supply	Provides a +10 V power supply to an external unit. Generally used to supply an external potentiometer of 1 to 5 kΩ Max. output current: 10 mA
	+24V	COM	+24 V power supply	Provides a +24 V power supply to an external unit. Generally used to supply the DI/DO terminals and external sensors Max. output current: 200 mA
	OP		Input terminal of external power supply	Connect to +24V by default. Connect to either +24V or COM, determined by the setting of jumper J7 When DI1 to DI5 need to be driven by external signals, OP must be disconnected from + 24 V and connected to an external power supply (remove jumper J7).
Analog inputs	AI1	GND	Analog input 1	• Input voltage range: 0 to 10 VDC • Input resistance: 22 kΩ
	AI2	GND	Analog input 2	• Input range: 0 to 10 VDC/4 to 20 mA • Input resistance: 22 kΩ
Digital inputs	DI1	OP	Digital input 1	• Optically-coupled isolation compatible with dual-polarity inputs • Input resistance: 2.4 kΩ • Voltage range for inputs: 9 to 30 V
	DI2	OP	Digital input 2	
	DI3	OP	Digital input 3	
	DI4	OP	Digital input 4	
	DI5	OP	High-speed pulse input	In addition to having the same features as DI1 to DI4, DI5 can also be used for high-speedpulse inputs. Max. input frequency: 20 kHz

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

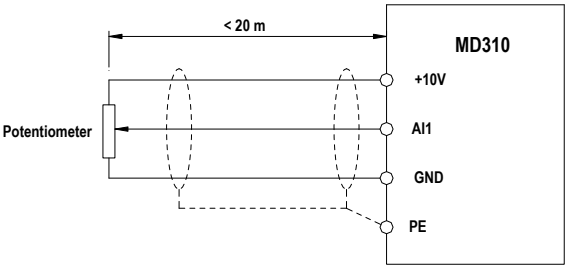
Type	Terminal		Name	Description
Digital outputs	DO1	CME	Digital output 1	Multi-function open-collector output
	FM	COM	High-speed pulse output	Output voltage range: 0 to 24 V Output current range: 0 to 50 mA. The output frequency range of DO1 and FM is 0 to 50 kHz. The jumper J6 shorts CME and COM by default.
Analog output	AO1	GND	Analog output 1	Either a voltage or a current output, determined by the setting of jumper J5. Output voltage range: 0 to 10 V Output current range: 0 to 20 mA.
Communication	485+	485-	Communication interface	RS485 communication bus interface, Modbus protocol Communication rate: 300 to 115200 bps Max. number of nodes: 32 Terminal matching resistor switch: S1 (both DIP switches must be set to ON.)
Relay outputs	T/A	T/B	Normally-closed (NC) terminal	Contact driving capacity: 250 VAC, 0.2 A 30 VDC, 1 A
	T/A	T/C	Normally-open (NO) terminal	
Auxiliary interfaces	J1		External operating panel interface	Connect to an external operating panel.
	Extension card interface		Interface for the 40-core terminal and optional cards (I/O extension card and various bus cards)	

4.2.2 Wiring Diagrams

■ AI1 Wiring

Analog signals at low levels can suffer from the effects of external interference. To reduce this effect, it is important to use shielded cables shorter than 20 m long to carry analog signals.

Figure 4-11 Wiring method for use with analog input 1



In applications where the analog signals suffer from the effects of severe external interference, install a filter capacitor or a ferrite magnetic core at the source of the analog signal.

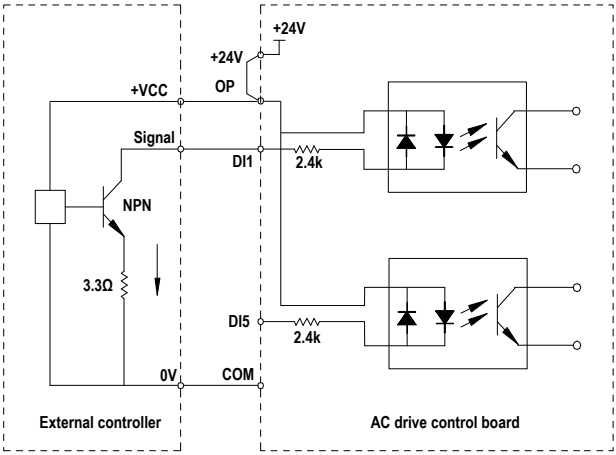
www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

■ DI1-DI5 Wiring (Sink, Source)

Where possible, use shielded cables shorter than 20 m long to carry digital signals. If the installation uses active driving, it is necessary to use filters to prevent the digital signals causing interference on the power supply. In these circumstances, you are recommended to use the contact control mode.

1. SINK wiring

Figure 4-12 Wiring in SINK mode



SINK mode is the most commonly used wiring mode. It is also the default wiring mode, in which the +24V and the OP terminals are shorted.

To apply an external power supply, remove the jumper J7, connect the positive side of the external power 24V to the OP terminal, and connect the negative side of the external power to the corresponding DI terminal via the contact on the external controller.

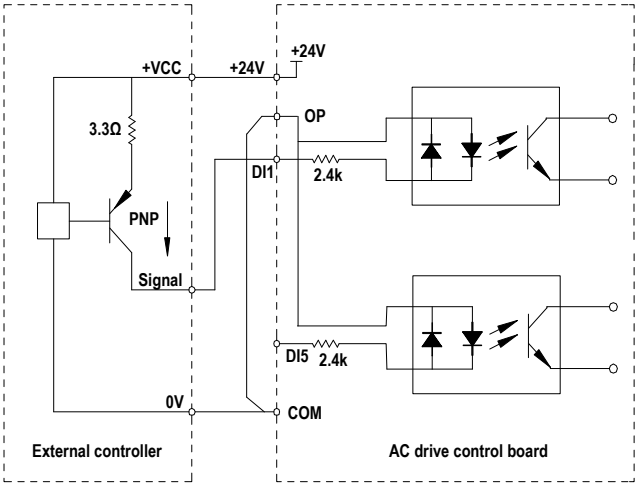
In the SINK wiring mode, do not connect the DI terminals of different AC drives in parallel, otherwise a digital input fault will occur. If it is necessary to connect different AC drives in parallel, connect a diode in series at the digital input. The diode characteristics must satisfy the following requirements:

- Forward current rating If: >10 mA
- Forward voltage drop Vf: <1 V

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

2. SOURCE wiring

Figure 4-13 Wiring in SOURCE mode



To use the SOURCE wiring mode, connect the OP terminal to the COM terminal with J7, and connect +24V to the corresponding DI terminal via the contact on the external controller.

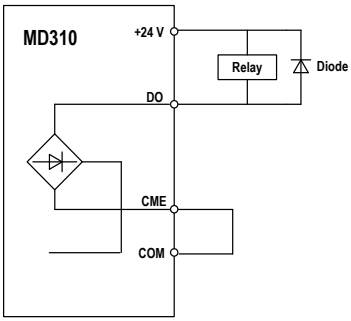
To apply an external power supply, remove the jumper J7, connect the negative side of the external power 24V to the OP terminal, and connect the positive side the corresponding DI terminal via the contact on the external controller.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

■ DO Wiring

When the digital output terminal must drive the relay, it is necessary to install an absorption diode across the relay coil. This diode prevents inductive switching transients causing damage to the 24 VDC power supply. The absorption diode must have a forward current rating of 50 mA.

Figure 4-14 DO wiring diagram



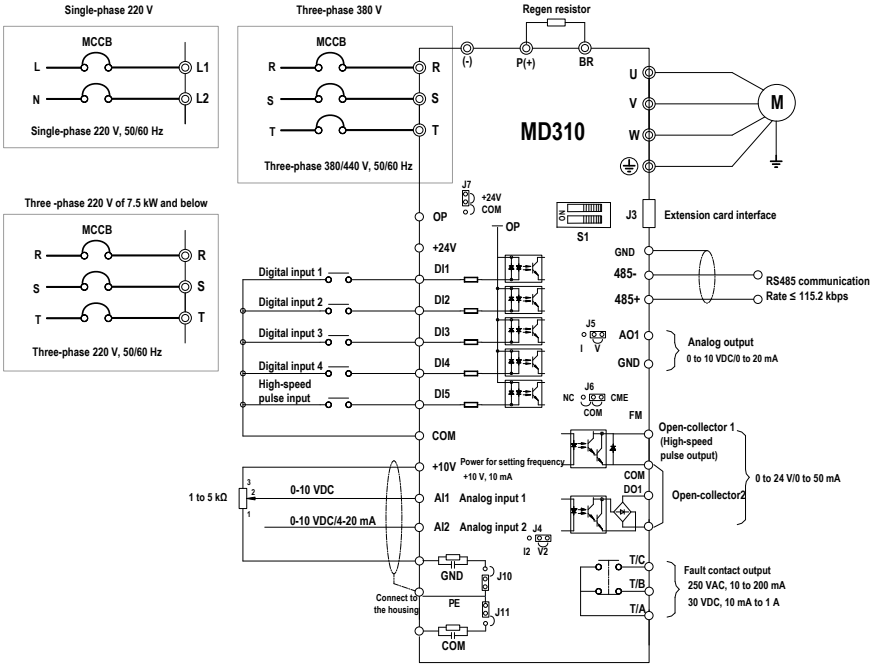
When the FM terminal is used for FMP continuous pulse output, it allows the maximum frequency output of 100 kHz.

Note

- Be careful to install the absorption diode with the correct polarity, to prevent damage to the 24 VDC power supply when there is a digital output.
- CME and COM are internally insulated, but are shorted by the jumper J6. In this case, DO1 is driven by +24 V by default. Remove the jumper J6 and connect the external power to the CME terminal. if you need to drive DO1 from an external power supply.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

4.3 Typical Wiring Example



Note

- ◎indicates the main circuit terminal, and ○indicates the control circuit terminal.
- Select the regen reslstor according to your actual requirement. For details, see the selection guidance of the regen resistor.
- Run the signal cables and power cables separately. If the signal cables cross over with the power cables, attempt to make them cross over at 90°. It's better to use STP cable as signal cable and use three-core cable as power cable. The specification of the power cables must be larger than cables of common motor or must comply with the requirement in this manual.
- J4 and J12 are the jumpers of the RS485 communication terminal resistor. When connecting the terminal resistor, connect them to the RS485 simultaneously. When the terminal resistor is not connected, connect them to the NC simultaneously.
- T/A, T/B and T/C are used on the condition that the rated current is 0.2 A and the working voltage is 250 VAC. When the load current is very large or capacitive load is applied, add auxiliary relays. Otherwise, the contact of the output relays may be damaged.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

5

Operations

www.Farazcontrol.com ۰۹۱۲۹۲۷۵۱۵۹(مهندس رمضان زاده) واحد فروش:

Chapter 5 Operations

5.1 Introduction to the Operating Panel

The operating panel, shown in Figure 4-1, allows you to monitor system operation, modify parameters and start or stop the MD310.

Figure 5-1 Details of the operating panel



■ Status Indicators

There are four red LED status indicators at the top of the operating panel.

Indicator	Indication
FWD/REV	OFF indicates reverse motor rotation.
	ON indicates forward motor rotation.
REMOTE	OFF indicates the MD310 is under the operating panel control.
	ON indicates the MD310 is under the terminal control.
	FLASHING indicates the MD310 is under the communication control.
RUN/ERR	OFF indicates the stop state.
	ON (in green) indicates the running state.
	ON (in red) indicates the fault state.
TUN/TC	ON indicates torque control mode.
	FLASHING SLOWLY indicates auto-tuning state.
	FLASHING QUICKLY indicates a fault condition.

■ LED Display

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

The five-digit LED data display can show the following range of information:

- The frequency reference
- The output frequency
- Monitoring information
- Fault code

■ Key Functions

Key	Name	Function
PRG	Programming	• Enter or exit the Level I menu. • Return to the previous menu
ENTER	Enter	• Enter each level of the menu interface. • Confirm the displayed parameter setting.
▲	Up	• When navigating a menu, it moves the selection up through the screens available. • When editing a parameter value, it increases the displayed value. • When the AC drive is in RUN mode, it increases the speed.
▼	Down	• When navigating a menu, it moves the selection down through the screens available. • When editing a parameter value, it decreases the displayed value. • When the AC drive is in RUN mode, it decreases the speed.
▶	Shift	• Select the displayed parameter in the stop or running state. • Select the digit to be modified when modifying a parameter value
RUN	Run	Start the AC drive when using the operating panel control mode. Note: It is inactive when using the terminal or communication control mode.
STOP/RES	Stop/Reset	• Stop the AC drive when it is in the RUN state. • Perform a reset operation when the AC drive is in the FAULT state. Note: The functions of this key can be restricted by using function F7-02.
MF·K	Multifunction	Perform a function switchover as defined by the setting of F7-01, for example to quickly switch command source or direction.

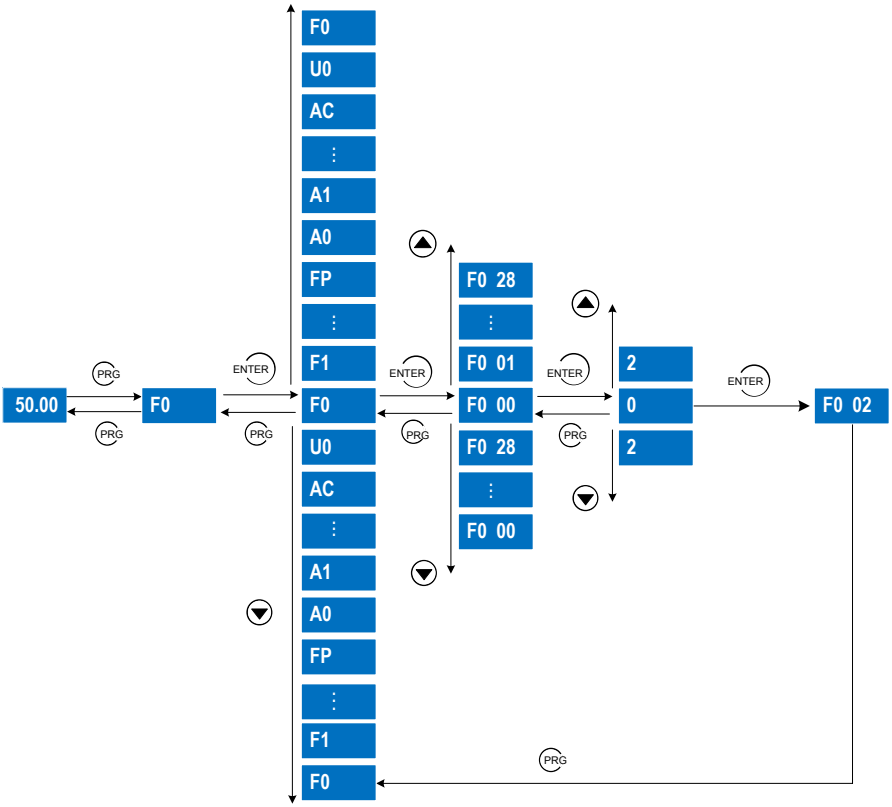
www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

5.2 Operating Panel Menu Structure

The MD310 operating panel has three levels of menu:

1. **Level I - the function parameter group**
2. **Level II - the function parameter**
3. **Level III - the function parameter value**

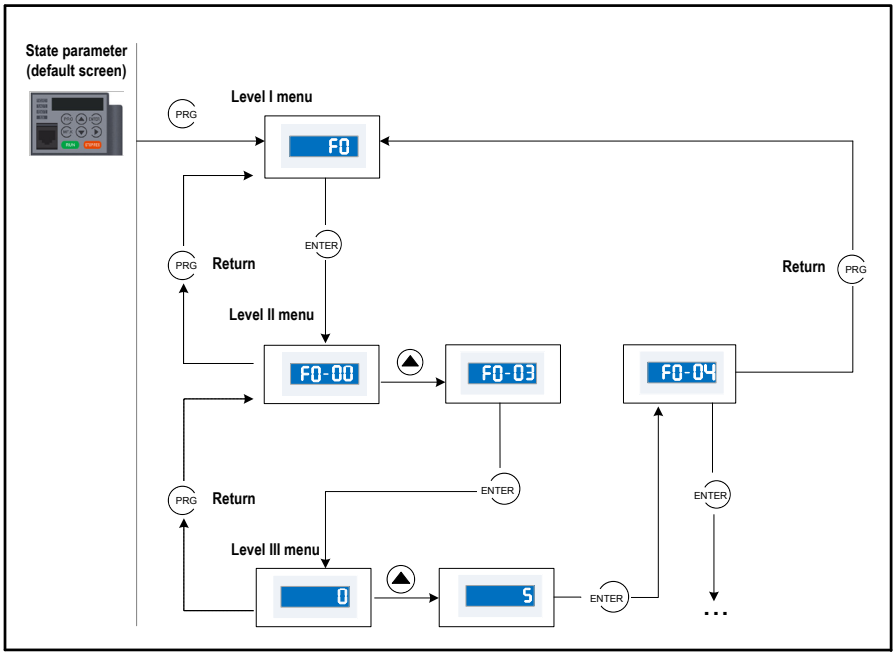
Figure 5-2 Structure of the three levels of menu



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Operation of the three levels of menu is shown in the following figure:

Figure 5-3 Three levels of menu of the operating panel



Press ENTER from a Level III menu to:

1. Save the parameter value you have set
2. Return to the Level II menu, and then
3. Select the next function parameter.

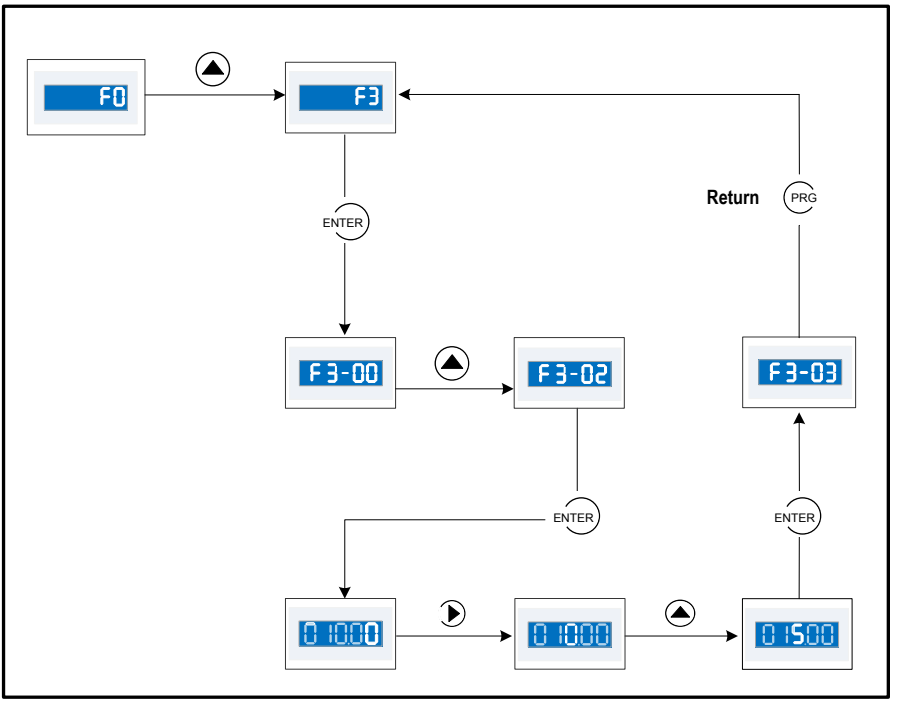
Press PRG from a Level III menu to:

1. Return to the Level II menu without saving the parameter value, and remain at the current function code.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

The following figure shows how to change F3-02 from 10.00 Hz to 15.00 Hz.

Figure 5-4 Change F3-02 from 10.00 Hz to 15.00 Hz



■ Unchangeable Parameters

When operating in Level III menus, if the parameter does not include a flashing digit, then it is not possible to change that parameter. There are two possible reasons for this:

1. The function parameter you have selected is read-only. This is because:
   - The display is showing the AC drive model.
   - The display is showing an actual parameter detected by the system.
   - The display is showing a running record parameter.
2. The displayed function parameter cannot be changed while the AC drive is in the RUN state. You can change these types of parameter only when the AC drive is in the stop state.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

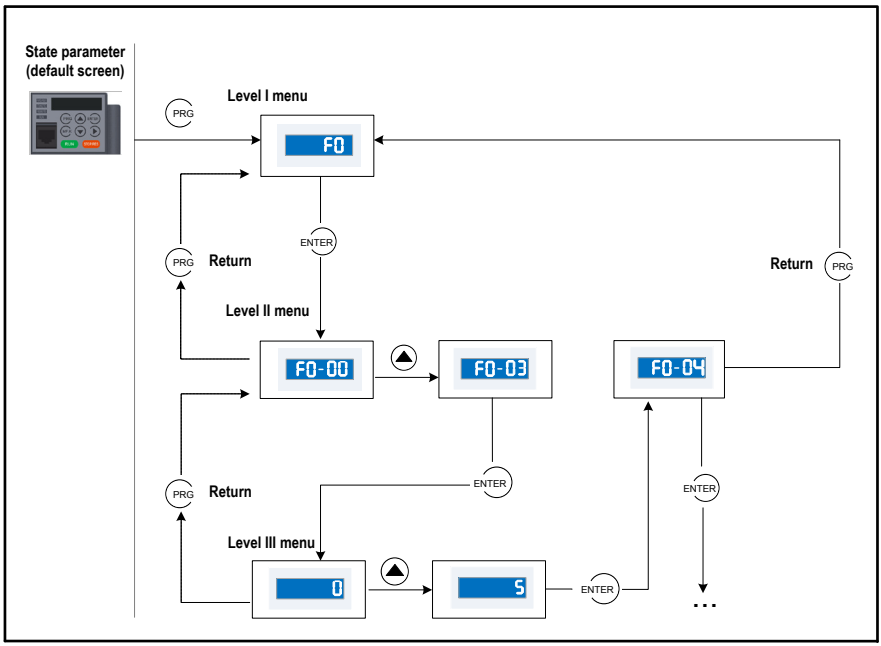
5.3 Overall Arrangement of Function Parameters

The MD310 includes standard functions in group F, and new function groups A and U.

Function Code Group	Description	Remark
F0 to FP	Standard function code group	Standard function parameters
A0 to AC	Advanced function code group	AI/AO correction
U0 to U3	Running state function code group	Display of basic parameters

■ Selection of Function Parameter Group

Figure 5-5 Selection of function parameter group



■ Selection of Displaying A and U Groups

The value you set for function parameter FP-02 determines whether the operating panel displays groups U and A.

Value of FP-02	Group A	Group U
00	Not displayed	Not displayed
01	Not displayed	Displayed
10	Displayed	Not displayed
11 (default)	Displayed	Displayed

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

5.4 Function Parameter Operations

5.4.1 Viewing and Editing Function Parameters

■ Viewing Function Parameters

The MD310 provides three display modes for viewing function parameters, described in Table 4-1.

Table 5-1 Function parameter display modes

Function Code Display Mode	Parameter Name
Base mode	-bASE
User-defined quick-view mode	-USEr
User-modified quick-view mode	--C--

- -bASE

  It includes all function parameters of the MD310. After the operating panel goes to this mode, level I menu is displayed.

- -USEr

  It facilitates you to view and modify the commonly used function parameters. After the operating panel goes to this mode, level II menu is displayed and the function parameter is displayed with letter "u" prefixed, for example, uF3.02 indicates function parameter F3-02.

  The user-defined parameters are included in group FE. A maximum of 30 function parameters can be included in group FE. If F0.00 is set, it indicates that no function parameters are selected. If "NULL" is displayed, it indicates that the user-defined menu is empty.

  A total of 16 function parameters have been stored in the user-defined menu when initialized, as listed in the following table:

  Table 5-2 The 16 function parameters pre-stored in the user-defined menu

Function Code	Parameter Name	Function Code	Parameter Name
F0-01	Motor 1 control mode	F0-02	Command source selection
F0-03	Main frequency reference setting channel selection	F0-07	Frequency source superposition selection
F0-08	Preset frequency	F0-17	Acceleration time 1
F0-18	Deceleration time 1	F3-00	V/F curve setting
F3-01	Torque boost	F4-00	DI1 function selection
F4-01	DI2 function selection	F4-02	DI3 function selection
F5-02	Relay function (T/A-T/B-T/C) selection	F5-07	AO1 function selection
F6-00	Start mode	F6-10	Stop mode

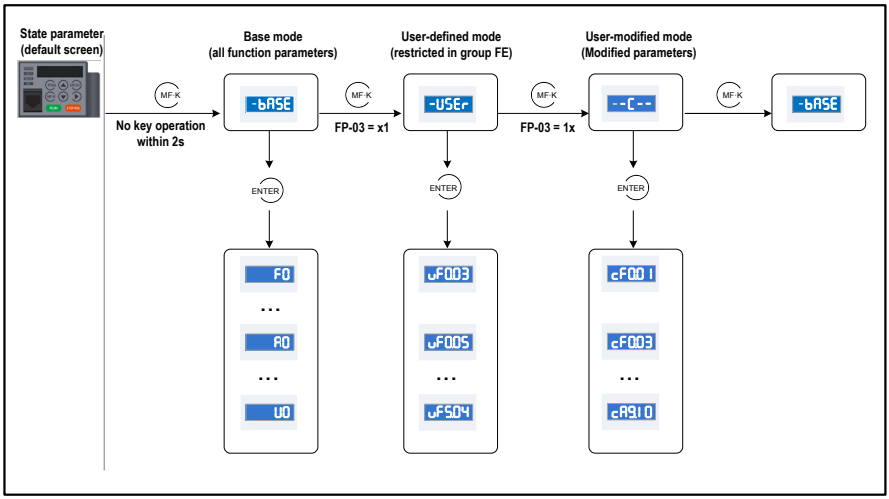
www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

- --C--

It includes the function parameters that are modified to a non-default value and thus is generated by the drive automatically. After the operating panel goes to this mode, level II menu is displayed.

Press MF·K to cycle through the three function parameter display modes. In each mode, the method you use to view and modify parameter value is the same as shown in Figure 4-3.

Figure 5-6 Switching between the three function parameter display modes



The value you set for function parameter FP-03 determines whether the operating panel displays the quick-view user-defined and the quick-view user-modified function groups. The base mode is always available.

Table 5-3 Setting FP-03 to select the quick-view display modes

Value of FP-03	User-modified group	User-defined group
00	Not displayed	Not displayed
01	Not displayed	Displayed
10	Displayed	Not displayed
11 (default)	Displayed	Displayed

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

■ Editing Function Parameters

This editing method is mostly used in on-site commissioning.

- Pressing ▲ and ▼ in Level I menu is to quickly change the function parameter group.
- Pressing ▲ and ▼ in Level II menu is to quickly increase or decrease the function parameter number.
- Pressing ▲ and ▼ in Level III menu is to quickly increase or decrease the function parameter value. To save the setting, press ENTER. To cancel the setting, press PRG .

5.5 Definition and Operation of the MF.K Key

You can define the function (command source switchover or the drive running direction switchover) of the MF·K key in F7-01. For details, see the description of F7-01.

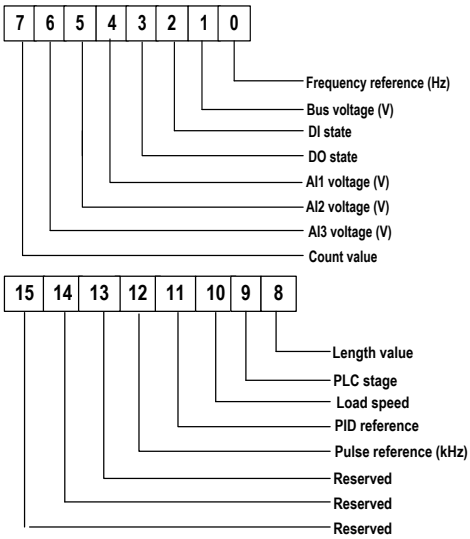
www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

5.6 Viewing Status Parameters

You can press the ▶ key to view the drive's stop or running status parameters. Whether a status parameter is displayed is determined by the binary bit converted from the value of F7-03 (LED display running parameters 1), F7-04 (LED display running parameters 2) and F7-05 (LED display stop parameters).

In the stop state, a total of 13 status parameters can be displayed, as listed in the following table.

Function Code	Parameter name	Setting Range	Default
F7-05	LED display stop parameters	0000 to FFFF	33



If a parameter needs to be displayed in the stop state, set the corresponding bit to 1, and set F7-05 to the hexadecimal equivalent.

For example, if the parameters frequency reference, bus voltage, AI1 voltage and pulse reference need to be displayed, do as follows:

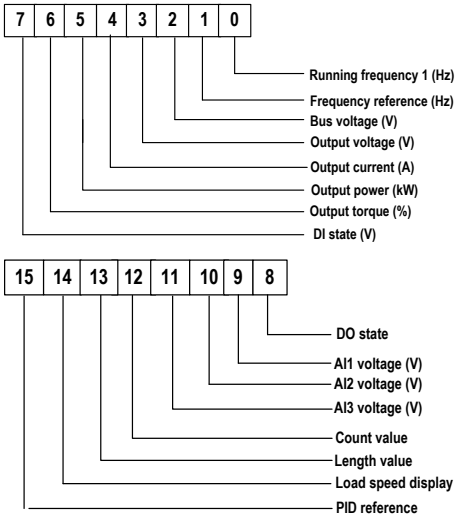
1. Set the binary bits to 0001 0000 0001 0011.
2. Convert the binary number to the hexadecimal equivalent 1013H.

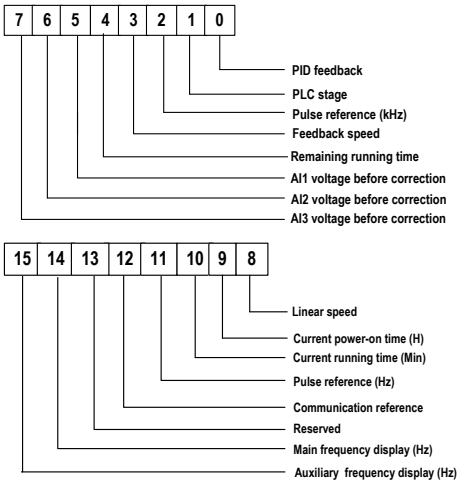
The operating panel displays the value H.1013.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

During the drive running, five running status parameters are displayed by default: running frequency, frequency reference, bus voltage, output voltage and output current.

Function Code	Parameter name	Setting Range	Default
F7-03	LED display running parameters 1	0000 to FFFF	1F
F7-04	LED display running parameters 2	0000 to FFFF	0





You can set a maximum of 32 parameters that can be viewed during drive running according to the binary bits of these two parameters. The display starts from the lowest bit of F7-03.

If a parameter needs to be displayed during the running, set the corresponding bit to 1, and set F7-04 to the hexadecimal equivalent.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

For example, if the parameters running frequency, bus voltage, output voltage, output current, output power, output torque and PID feedback need to be displayed, do as follows:

1. Set the binary bits of F7-03 to 0000 0000 0111 1101 and F7-04 to 0000 0000 0000 0001.
2. Convert the binary number to the hexadecimal equivalent: F7-03 to 007D and F7-04 to 0001.

The operating panel displays H.1043 and H.0801.

5.7 Password Security

The MD310 AC drive provides a security protection function that requires a user-defined password. Function parameter FP-00 controls this function.

When FP-00 has the default value zero, it is not necessary to enter a password to program the MD310.

To enable the password protection, do as follows:

1. Set a non-zero value for FP-00. This value is the user-defined password.
2. Make a written note of the value you have set for FP-00 and keep the note in a safe location.
3. Press ENTER to exit the function parameter editing mode.

The password protection is successfully enabled. Then when you press PRG, the display shows "------". You must enter the correct password to enter the programming menu.

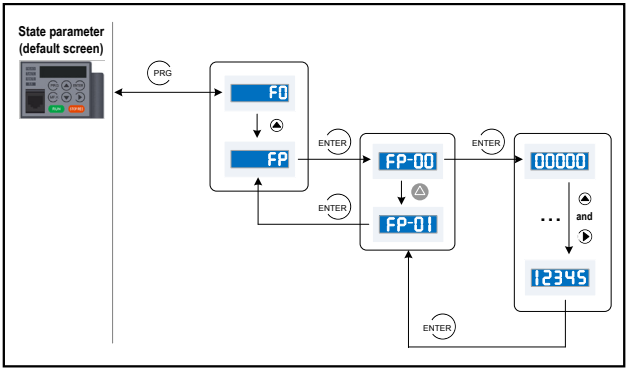
To remove password protection, do as follows:

1. Use the current password to enter the function parameter editing mode.
2. Set FP-00 to zero.
3. Press ENTER to exit the function parameter editing mode.

The password protection is successfully removed.

The following figure gives an example, showing how to set the password to 12345.

Figure 5-7 Set the password to 12345.



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹(مهندس رمضان زاده)

6

Functions

www.Farazcontrol.com ۰۹۱۲۹۲۷۵۱۵۹(مهندس رمضان زاده) واحد فروش:

Chapter 6 Functions

6.1 Start/Stop Command Source

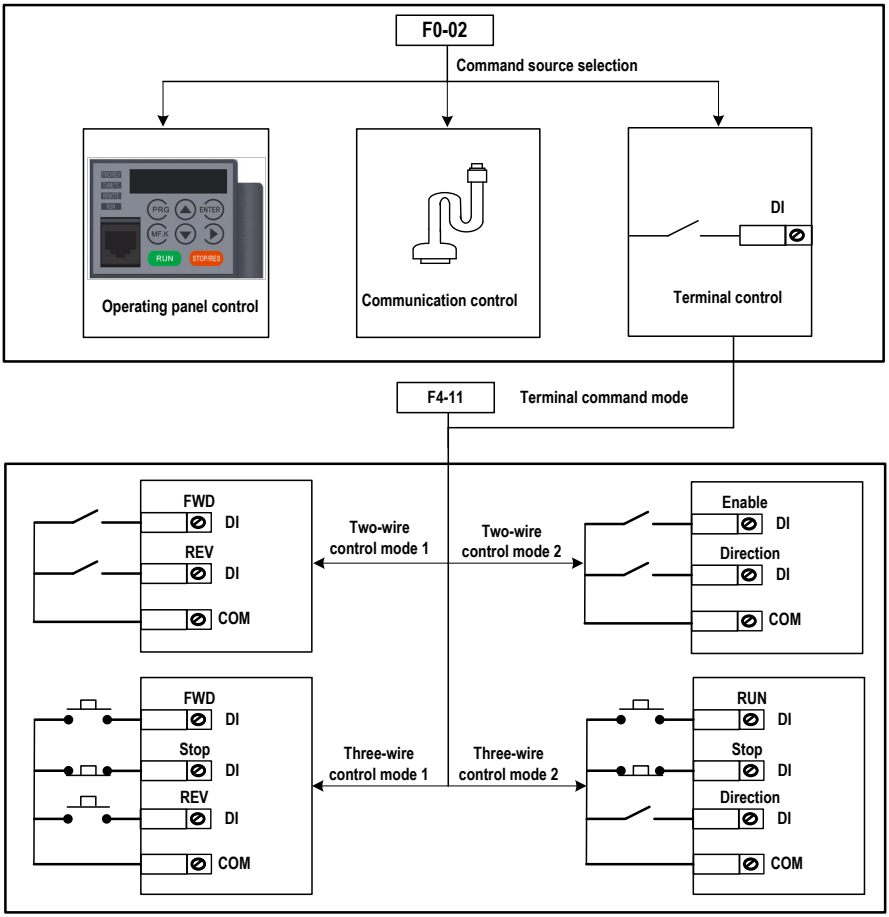
The MD310 AC drive has the following three control methods to start and to stop the MD310 AC drive.

- Operating panel keys
- Terminal control
- Communication control

You can select the proper control mode in function parameter F0-02.

Value of F0-02	Description
0 (default)	Operating panel control (LOCAL/REMOT indicator OFF) • Press RUN to start the AC Drive. • Press STOP/RES to stop the AC Drive.
1	Terminal control (LOCAL/REMOT indicator ON) A digital input terminal must be defined as the Start/Stop command source
2	Communication control (LOCAL/REMOT indicator FLASHING) Start/Stop control is by using the Modbus-RTU, CANlink or CANopen communication protocol.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

1. Terminal control

The terminal control mode applies to installations where the Start and Stop signals come from:

- A DIP switch or electromagnetic button, or
- A dry contact signal source

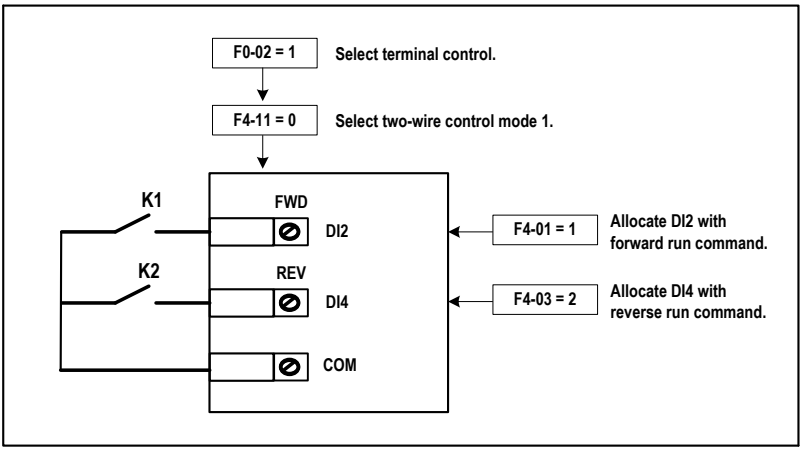
Function code F4-11 sets the switch signal mode used by the MD310.

Function codes F4-00 to F4-09 select the input terminal for the Start/Stop signal.

Example 1

Figure 6-1 shows how to select a DIP switch as the Start/Stop command source, and to allocate the forward run signal to DI2 and the reverse run signal to DI4.

Figure 6-1 Select a DIP switch for Start/Stop control



In this example:

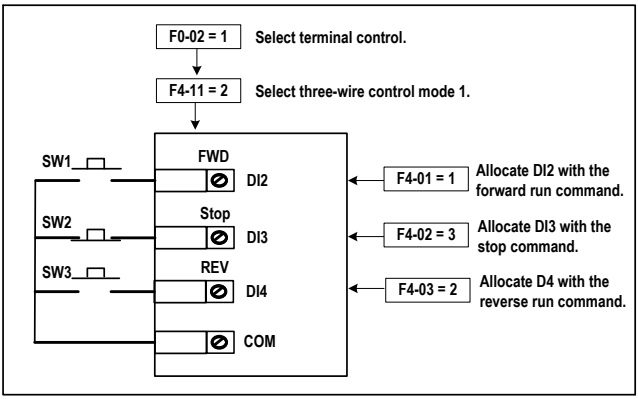
- When K1 is closed, the AC drive instructs the forward run command. When K1 is open, the AC drive stops.
- When K2 is closed, the AC drive instructs the reverse run command. When K2 is open, the AC drive stops.
- If K1 and K2 are both open or closed simultaneously, the AC drive stops.

Example 2

Figure 6-2 shows how to select an electromagnetic button as the Start/Stop command source, and to allocate the Start signal to DI2, the Stop signal to DI3, and the reverse rotation signal to DI4.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Figure 6-2 Select an electromagnetic button for Start/Stop control



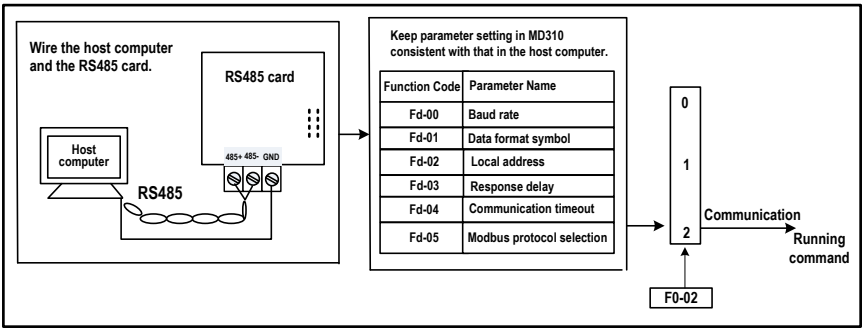
In this example:

- SW2 must remain closed during the start sequence and during normal RUN operation.
- The AC drive stops immediately after SW2 opens.
- Signals from SW1 and SW3 are valid only after SW2 closes.
- The running state of the AC drive is determined by the actions of all three buttons.

2. Communication control

The most common configuration for the MD310 uses a host computer to control the AC drive through a communication link such as RS485, CANlink, or CANopen.

Figure 6-3 Start/Stop control using the communication control mode



With function parameter Fd-04 set to a non-zero value, the MD310 stops the drive system automatically if the communication link times out. This is a safety feature that prevents the AC drive running continuously and without control if faults occur in the communication cable or the controlling computer.

The communication port of the MD310 supports the Modbus-RTU protocol. Communication is possible only if the host computer supports the Modbus-RTU master station protocol.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

6.2 Frequency Reference

The AC Drive provides two frequency setting channels:

- The main frequency setting channel
- The auxiliary frequency setting channel

You can easily switch between the two frequency setting channels. You can also perform superposition between the two frequency setting channels by setting the calculation formula to meet the different control requirements of different scenarios.

6.2.1 Setting the Main Frequency Reference

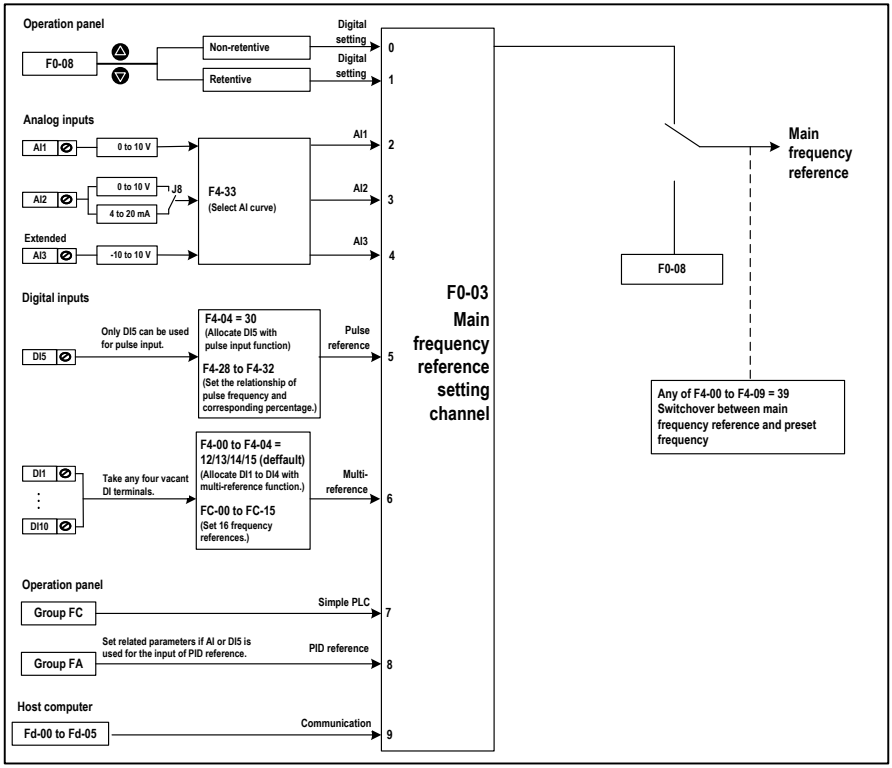
The main frequency reference has nine setting channels.

- Digital setting (Up/Down modification, non-retentive at power down)
- Digital setting (Up/Down modification, Retentive at power down)
- AI1
- AI2
- AI3
- Pulse reference
- Multi-reference
- Simple PLC
- Communication reference

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

F0-03 selects a proper setting channel to set the main frequency reference.

Figure 6-4 Select a proper setting channel to set the main frequency reference



As Figure 6-4 shows, you can set the running frequency by:

- Setting a function code.
- Making a manual adjustment
- Controlling an analog input
- Using a multi-speed terminal
- Using an external feedback signal
- Using an internal PID regulator
- Using the host computer

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

6.2.2 Use with the Auxiliary Frequency Reference

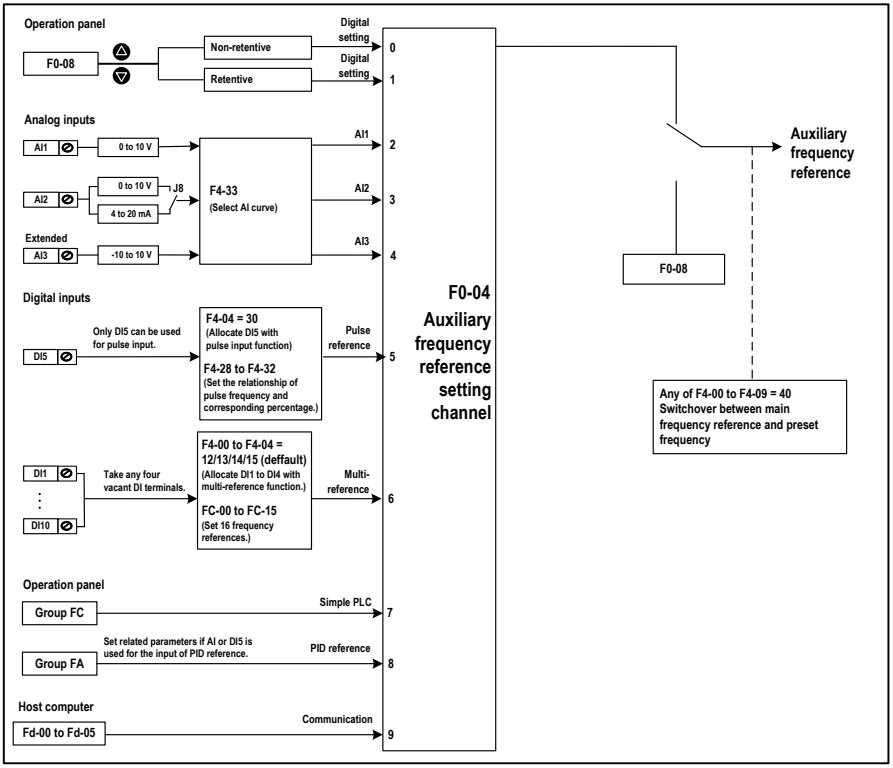
The auxiliary frequency reference has the same nine setting modes.

- Digital setting (Up/Down modification, non-retentive at power down)
- Digital setting (Up/Down modification, Retentive at power down)
- AI1
- AI2
- AI3
- Pulse reference
- Multi-reference
- Simple PLC
- Communication reference

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function parameter F0-04 selects setting mode for the auxiliary frequency reference.

Figure 6-5 Select a proper setting channel to set the auxiliary frequency reference

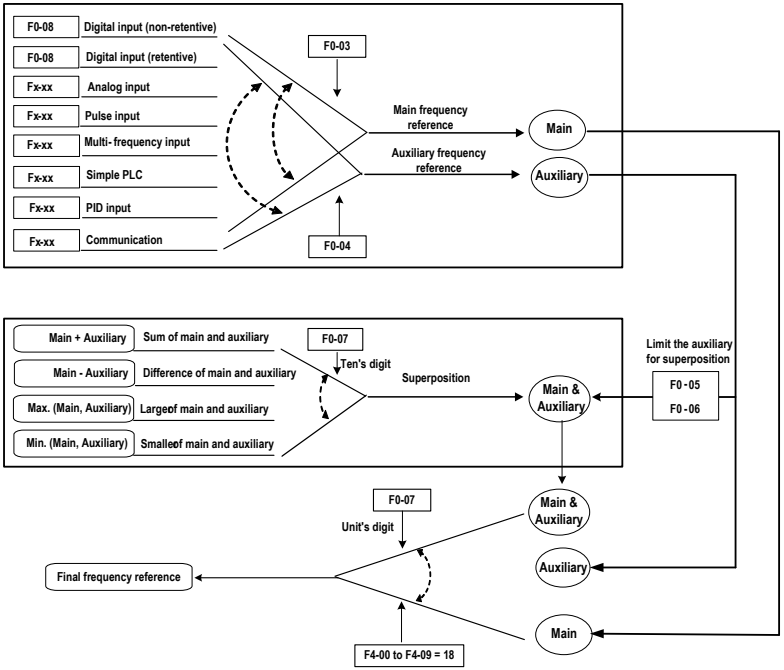


www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function parameter F0-07 sets the relationship between the final frequency reference and the main and auxiliary frequency reference. Table 5-1 shows how the values of F0-07 control the final frequency reference.

F0-07	Frequency reference superposition selection	Unit's digit: Frequency setting channel selection 0: Main frequency setting channel 1: Main and auxiliary superposition (superposition relationship determined by ten's digit) 2: Switchover between main and auxiliary 3: Switchover between main and "main and auxiliary superposition" 4: Switchover between auxiliary and "main and auxiliary superposition"	00
		Ten's digit: main and auxiliary superposition relationship) 0: Main + Auxiliary 1: Main - Auxiliary 2: MAX (Main, Auxiliary) 3: MIN (Main, Auxiliary)	

Figure 6-6 Relationship between the final frequency reference and the main and auxiliary frequency reference



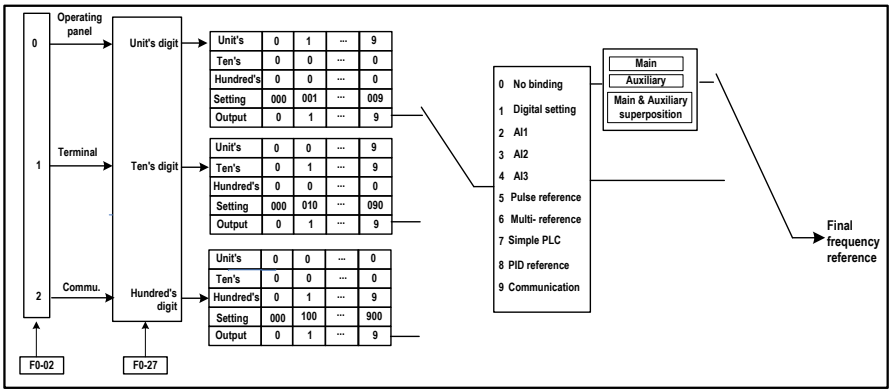
www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Superposition between the main and the auxiliary can be used for closed-loop speed control. An example of this is to use the main to set the required frequency and to use the auxiliary for automatic adjustment. Closed-loop control is implemented when this method is used with switchover performed by an external DI terminal signal.

6.2.3 Binding Command and Frequency Source

It is possible to bind the three command sources separately to frequency setting channel.

Figure 6-7 Bind the three command sources separately to frequency setting channel

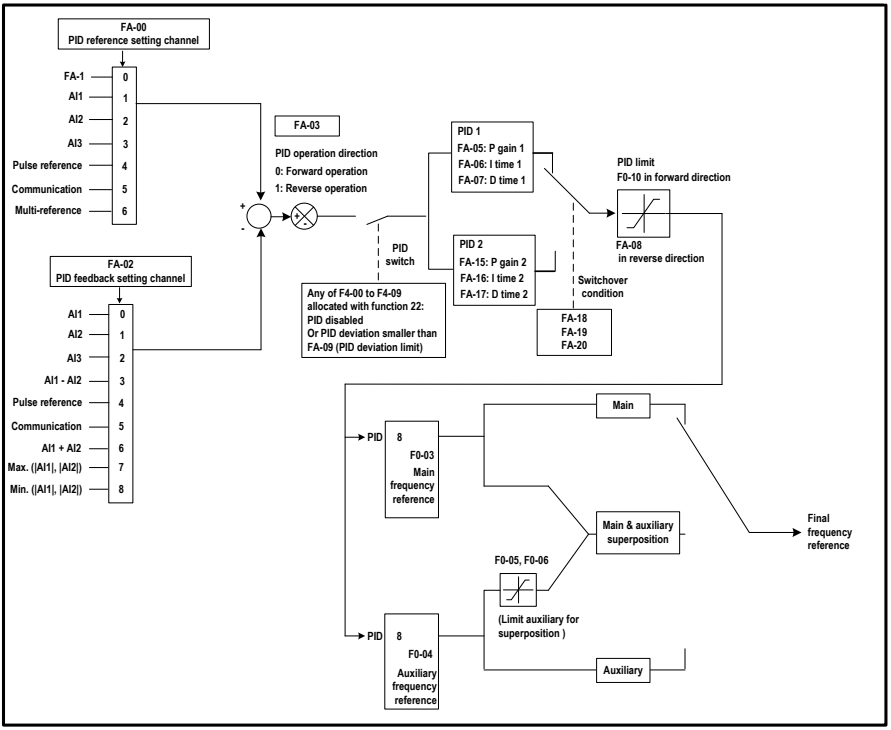


www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

6.2.4 PID Control of Frequency Reference

The MD310 has a built-in Proportional-Integral-Differential (PID) regulator. When used as the frequency source, the PID regulator can implement automatic adjustment of progress control, such as constant temperature, constant pressure, and tension control.

Figure 6-8 PID control of frequency reference



When using PID frequency closed-loop control, function code F0-03 (main frequency setting channel selection) must be set to value 8 (PID). The PID-related parameters are set in group FA, as shown in Figure 6-8.

The MD310 has two built-in equivalent PID calculating units. You can set the features, such as adjustment speed and accuracy, for the two units separately based on the actual conditions in use. Switchover between the two units can be automatic or by using an external DI terminal.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

6.3 Starting and Stopping the AC Drive

6.3.1 Start Mode

The MD310 supports three start modes:

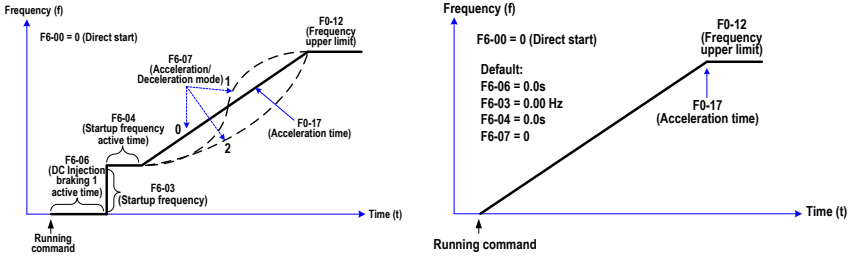
- Direct start
- Catching a spinning motor
- Pre-excited start

Function code F6-00 sets the start mode.

- Function code F6-00 = 0 sets the direct start mode.

  Direct start mode is suitable for a low-inertia load. Figure 34 shows an example of the frequency curve for this mode. DC injection braking before start is appropriate for driving loads such as an elevator or a crane. Startup frequency is appropriate for driving loads that have a burst start under the starting torque such as a cement mixer.

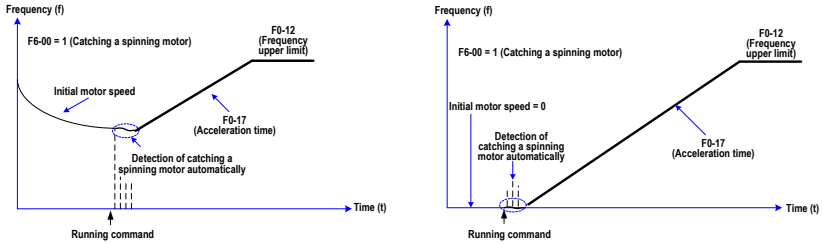
  Figure 6-9 Frequency curve for direct start mode



- Function code F6-00 = 1 sets the catching a spinning motor mode.

  Catching a spinning motor is suitable for a high-inertia load. Figure 5-12 shows an example of the frequency curve for this mode. If the load inertia causes the drive motor to still be turning when the AC drive starts, this mode prevents excessive starting currents from flowing.

  Figure 6-10 Frequency curve for catching a spinning motor mode

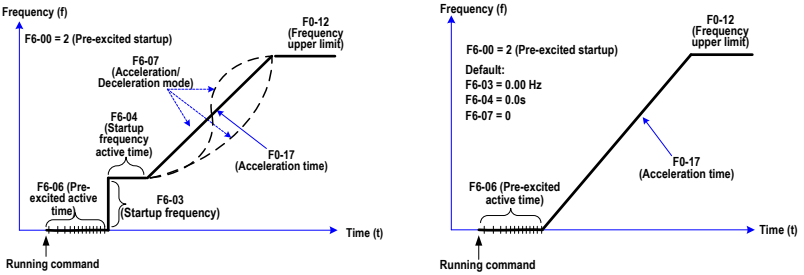


www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

- Function code F6-00 = 2 sets the pre-excited start mode.

  The pre-excited start mode applies only to inductive asynchronous motor. In this mode, the MD310 perform pre-excitation before start, which improves the response time of the asynchronous motor and allows for a short acceleration time.

  Figure6-11 Frequency curve for pre-excited start mode



6.3.2 Stop Mode

The MD310 supports two stop modes:

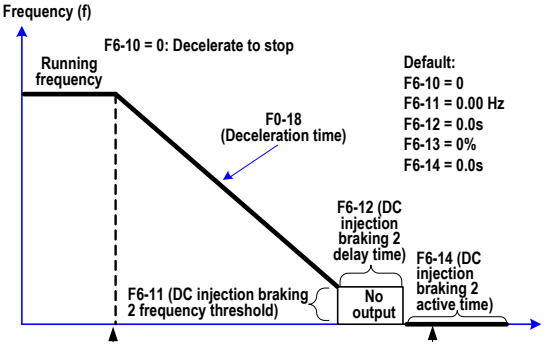
- Decelerate to stop
- Coast to stop

Function code F6-10 sets the stop mode.

- Function code F6-10 = 0 sets the decelerate to stop mode.

  In this mode, the MD310 applies active control to the rate of motor deceleration. Figure 5-14 shows an example of the frequency curve for this mode.

  Figure 6-12 Frequency curve for decelerate to stop mode

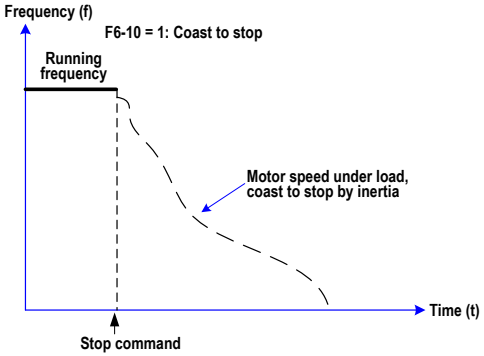


www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

- Function code F6-10 = 1 sets the coast to stop mode.

  In this mode, the MD310 does not control the motor deceleration, and the motor speed reduces according to the load inertia. Figure 5-15 shows an example of the frequency curve for this mode.

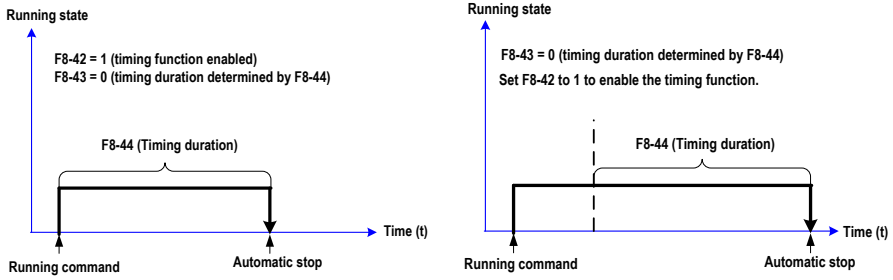
  Figure 6-13 Frequency curve for coast to stop mode



6.3.3 Timing Stop

The MD310 supports timing stop, which is enabled by function parameter F8-42. The timing duration is set in F8-43 and F8-44.

Figure 6-14 Setting of the timing stop function



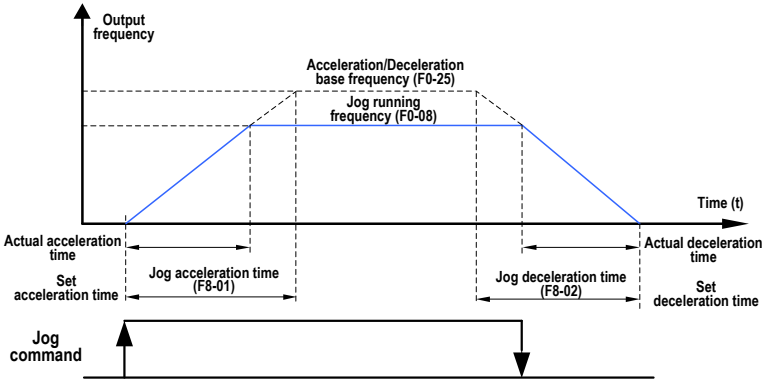
You can set the timing duration by means of analog input (such as potentiometer signal). For details, see the description of F8-43.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

6.3.4 Jog Running

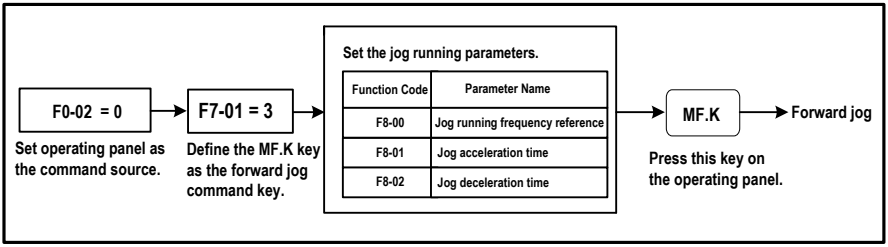
In some applications, the AC drive needs to jog for equipment test or other commissioning operations. In this cause, jog running is required.

Figure 6-15 Setting of the jog running function



■ Control of Jog Running Via Operating Panel

Figure 6-16 Control of jog running via the operating panel



Set the parameters according to Figure 5-18. In the drive stop state, press down the MF·K key. Then the AC drive starts to jog. After you release the MF·K key, the AC drive decelerates to stop.

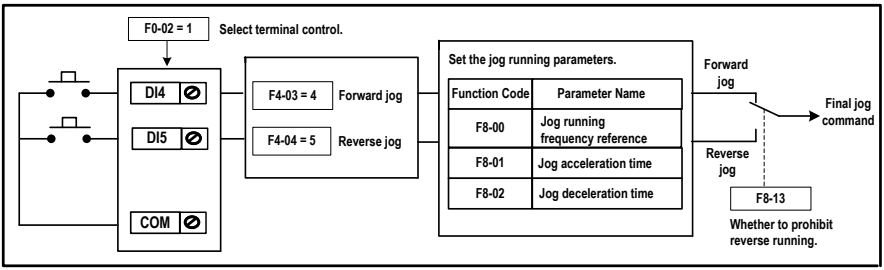
To implement reverse jog running, set F7-01 to 4 and F8-13 to 0, and press down the MF·K key. Then the AC drive starts to jog in the reverse direction.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

■ Control of Jog Running Via Terminals

For equipment that requires frequent jog operations, such as textile machine, control of jog running by using keys or buttons is better.

Figure 6-17 Control of jog running via terminals



Set the parameters according to Figure 5-19. In the drive stop state, press down the FJOG button. Then the AC drive starts to jog. After you release the FJOG button, the AC drive decelerates to stop. The RJOG button is used for jogging in the reverse direction.

6.4 Motor Rotation Direction

- Default rotation direction

With the MD310 using the default settings, press RUN to drive the motor. The motor rotation direction of this operation is regarded the forward direction. If this operation drives the motor in the direction opposite to that required as a default by the equipment, you can change the default motor rotation direction by exchanging any two output (U, V, W) wiring sequence.

Note

- Repair and maintenance operations on the MD310 AC drive must be performed only by qualified technicians.
- Wait for a period of 10 minutes after the AC drive is powered- off before allowing any repairs or maintenance work to start, so that hot parts can cool down and to allow the residual voltage on capacitors to discharge safely.

To change the default motor rotation direction, do as follows:

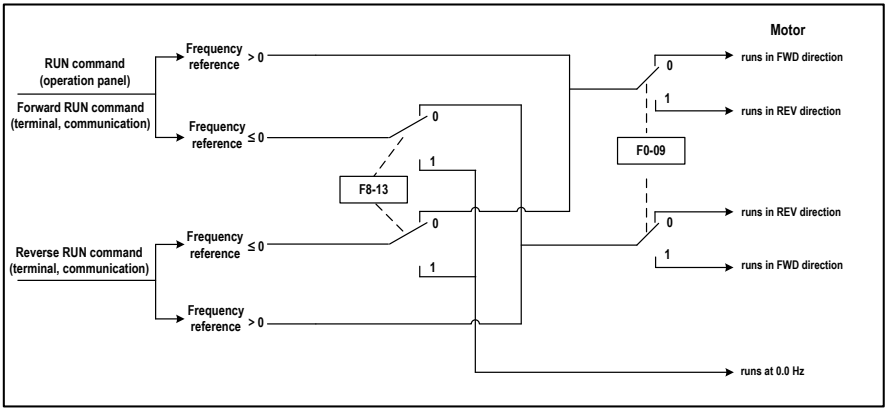
1. Power off the AC drive completely.
2. Wait for at least 10 minutes for the main capacitor in the AC drive to discharge completely.
3. Exchange any two of the cables at the output terminals U, V, W of the MD310. Make this exchange only at the terminals of the MD310.
4. Power on the AC drive and test the motor direction again to make sure the default direction is correct for the controlled equipment.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

- **Reversible rotation**

  For applications where both forward and reverse motor rotation are required, enable the reverse control by setting function code F8-13 = 0. This is the default setting. You can then set the value of function code F0-09 = 1 to use reverse motor rotation, or reset it to 0 to use forward motor rotation.

  Figure 6-18 Reversing the direction of motor rotation



Reverse control in terminal control

If reverse rotation must be available when the command source is terminal control, set function code F8-13 = 0 (the default value). As shown by Figure 5-16, when terminal or communication controls the running frequency of the AC drive (when F0-03 = 9) and reverse control is enabled (F8-13 = 0), the AC drive sets the reverse direction if the frequency reference Fs is a negative value.

If the terminal control gives a command to run in reverse direction, or if the frequency reference is a negative value but reverse control is disabled (F8-13 = 1), the AC drive will run at 0 Hz and there will be no output.

Note

In applications where reverse rotation is prohibited, do not change the function codes to change the direction of rotation, because the function codes will be restored after the AC drive restores the default settings.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

6.5 Multi-reference

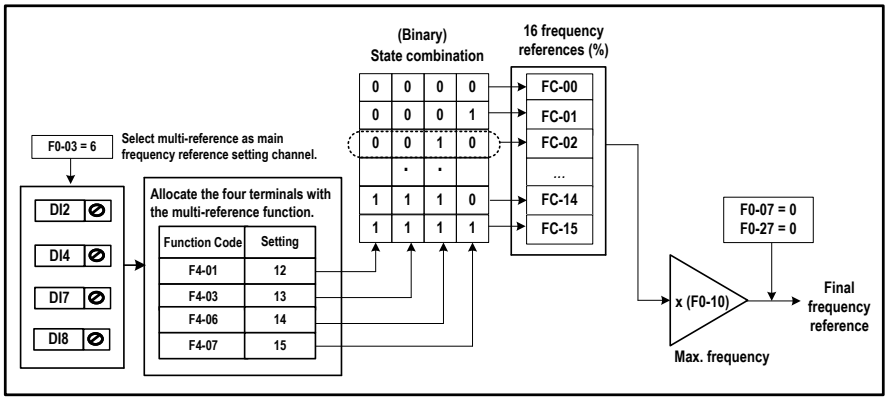
Multi-reference control mode is for use in the cases where it is not necessary to adjust the frequency reference of the AC drive continuously, and where only several frequencies are required.

The MD310 multi-reference control mode supports a maximum of 16 frequency references, controlled by the settings on four DI terminals.

To set the multi-reference control mode, do as follows:

1. **Identify which four digital input terminals to use for multi-reference control mode.**
2. **Set the value of the function code associated with each of these four digital input terminals to a unique value in the range 12 to 15. See the example in the following figure.**

Figure 6-19 Setting of the 16 frequency references



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

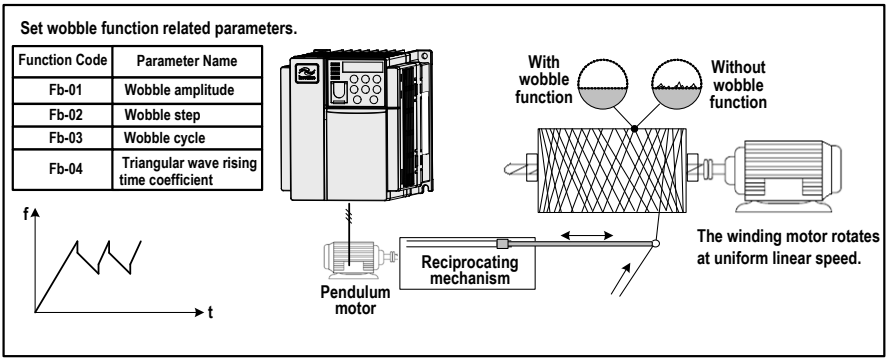
6.6 Special Functions

6.6.1 Wobble Function

For use with textile and chemical fiber processing equipment, the wobble function provided by the MD310 improves uniformity of traversing and winding, as shown in the example of Figure6-20

The wobble function and parameters are set by function codes Fb-00 to Fb-04. For details of these settings, see the descriptions of these function code.

Figure 6-20 Wobble function



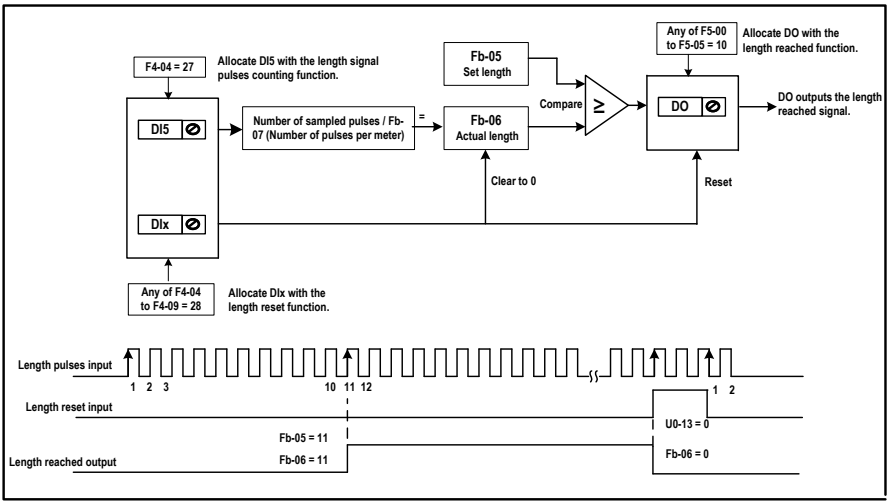
6.6.2 Fixed Length Function

The MD310 has the fixed length control function. The length pulses are sampled by the DI allocated with function 27 (Length count input). The "Actual length" (Fb-06) is obtained by dividing the number of pulses sampled by the value of Fb-07 (Number of pulses per meter). When the actual length in Fb-06 exceeds the set length in Fb-05, the DO terminal allocated with function 10 (Length reached) becomes ON.

During the fixed length control, the length reset operation can be performed via the DI terminal allocated with function 28 (Length reset), as shown in the following figure.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Figure 6-21 Function code setting for fixed length control

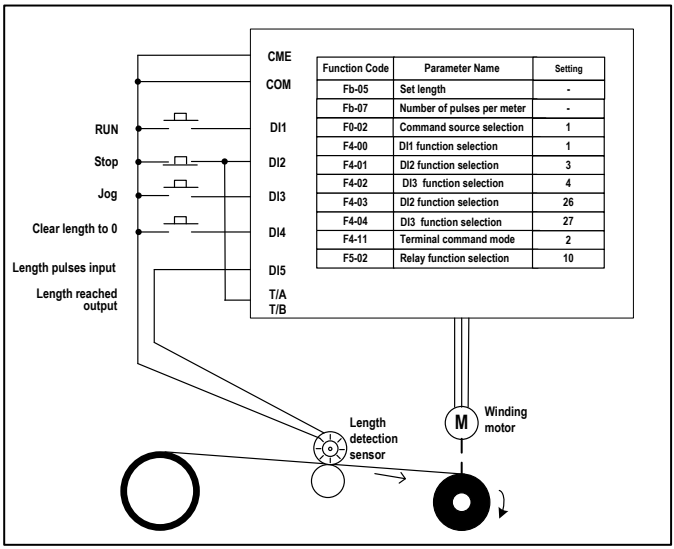


In the fixed length control mode, the direction cannot be identified, and only the length shall be calculated based on the number of pulses.

Only DI5 can be allocated with function "Length count input".

An automatic stop system can be implemented if signal output by the relay with function 10 (Length reached) is fed back to the AC drive input terminal with the stop function, as shown in the following figure.

Figure 6-22 Application example of fixed length control



Function Code	Parameter Name	Setting
Fb-05	Set length	-
Fb-07	Number of pulses per meter	-
F0-02	Command source selection	1
F4-00	DI1 function selection	1
F4-01	DI2 function selection	3
F4-02	DI3 function selection	4
F4-03	DI2 function selection	26
F4-04	DI3 function selection	27
F4-11	Terminal command mode	2
F5-02	Relay function selection	10

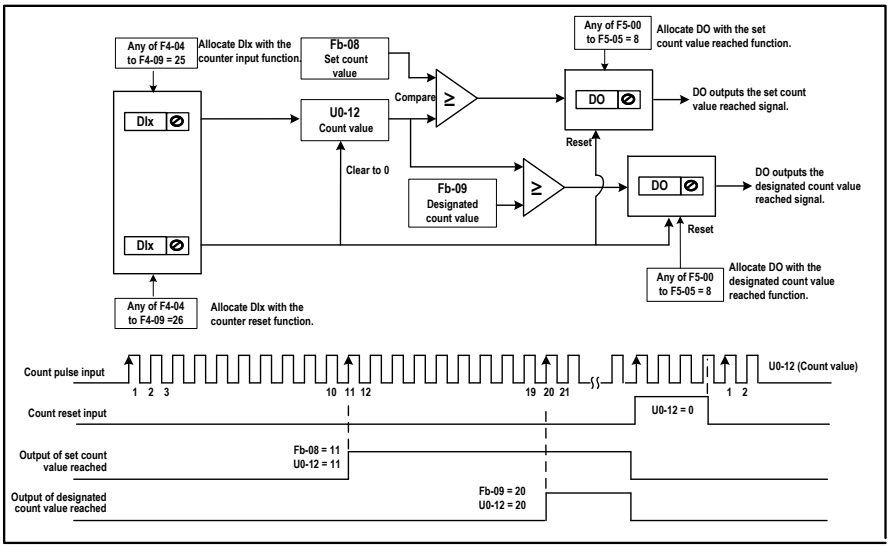
www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

6.6.3 Counting Function

The counting value needs to be collected by the DI terminal that is allocated with function 25 (Counter input). When the count value reaches Fb-08 (Set count value), the DO terminal allocated with function 8 (Set count value reached) becomes ON. Then the counter stops counting.

When the count value reaches Fb-09 (Designated count value), the DO terminal allocated with function 9 (Designated count value reached) becomes ON. The counter continues to count until the value of Fb-08 (Set count value) is reached.

Figure 6-23 Parameter setting in the counting mode



Fb-09 must not be greater than Fb-08.

DI5 must be used when the pulse frequency is high.

The DO terminal that is allocated with function 9 (Designated count value reached) and the DO terminal that is allocated with function 8 (Set count value reached) must not be the same.

No matter whether the AC drive is in running or stop state, the counter will not stop until the set count value in Fb-08 is reached.

The count value is retentive at power down.

An automatic stop system can be implemented if the signal output by the DO terminal with function 8 or 9 (Set/Designated count value reached) is fed back to the AC drive input DI terminal with the stop function.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

6.7 Motor Parameters and Auto-tuning

6.7.1 Motor Parameter Setting

When the AC drive runs in the vector control mode (that is, when F0-01 = 0), accurate motor parameters are necessary to ensure the desired drive performance and running efficiency. This is significantly different from the V/F control mode (when F0-01 = 2). The following table lists the parameters that must be set for a default single-motor installation.

Value of FP-02	Group A	Group U
F1-00	Motor type	Asynchronous motor Variable-frequency asynchronous motor
F1-01 to F1-05	• Rated motor power • Rated motor voltage • Rated motor current • Rated motor frequency • Rated motor speed	Model parameters, manual input
F1-06 to F1-20	Motor internal equivalent stator resistance, inductive reactance and rotor inductance	Auto-tuning parameters

For complex applications that use multiple motors, the parameters that must be set for motors 2, 3 and 4 are listed in the following table.

Motor 2 Parameters	Motor 3Parameters	Motor 4 Parameters	Description
A2-00	A3-00	A4-00	0: Common asynchronous motor 1: Variable frequency asynchronous motor
A2-01 to A2-05	A3-01 to A3-05	A4-01 to A4-05	Model parameters, manual input
A2-06 to A2-10	A3-06 to A3-10	A4-06 to A4-10	Auto-tuning parameters

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

6.7.2 Motor Auto-tuning

The MD310 supports the following motor auto-tuning methods:

- No-load dynamic auto-tuning
- With-load dynamic auto-tuning
- Static auto-tuning
- Manual input

Auto-tuning Method	Application	Result
No-load dynamic auto-tuning	It is applied to applications where the asynchronous motor can be disconnected from the load.	Best
With-load dynamic auto-tuning	It is applied to applications where the asynchronous motor cannot be disconnected from the load.	OK
Static auto-tuning	It is applied to applications where the asynchronous motor cannot be disconnected from the load and dynamic auto-tuning is not allowed.	Poor
Manual input	It is applied to applications where the asynchronous motor cannot be disconnected from the load. Input the motor parameters of the same model with successful auto-tuning into function codes F1-00 to F1-10.	OK

Here takes motor 1 as an example to describe the motor auto-tuning procedure. The auto-tuning procedure of motors 2, 3 and 4 is the same and only the function parameters are changed accordingly.

- You can disconnect the motor from the load.

  To perform motor auto-tuning, do as follows:

  1. Power off the MD310
  2. Disconnect the mechanical linkage between the motor and the load so that the motor can run without a load.
  3. Power on the MD310.
  4. Set F0-02 (Command source selection) to 0 (Operation panel control).
  5. Input the parameters taken from the motor nameplate as listed in the following table.

Auto-tuning Method	Application
Motor 1	F1-00: Motor type selection F1-01: Rated motor power F1-02: Rated motor voltage F1-03: Rated motor current F1-04: Rated motor frequency F1-05: Rated motor speed
Motor 2	A2-06 to A2-10, defined the same as F1-00 to F1-05
Motor 3	A3-00 to A3-05, defined the same as F1-00 to F1-05
Motor 4	A4-00 to A4-05, defined the same as F1-00 to F1-05

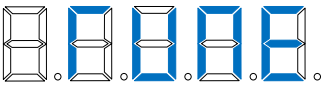
www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

6. Set F1-37 (Auto-tuning selection) to 2 (Dynamic auto-tuning).

For motors 2, 3 and 4, the corresponding function parameters are A2-37, A3-37 and A4-37, respectively.

7. Press ENTER on the operating panel.

The operating panel displays:



8. Press RUN on the operating panel.

The MD310 starts the auto-tuning process and drives the motor to accelerate and decelerate, and to run in the forward and reverse directions automatically. This process continues for two minutes.

The display indicates that the auto-tuning process is complete by returning to the normal parameter status display. The MD310 automatically calculates the following motor parameters and configures the function codes with their correct values.

Auto-tuning Method	Application
Motor 1	F1-06: Stator resistance F1-07: Rotor resistance F1-08: Leakage inductive reactance F1-09: Mutual inductive reactance F1-10: No-load current
Motor 2	A2-06 to A2-10, defined the same as F1-00 to F1-05
Motor 3	A3-06 to A3-10, defined the same as F1-00 to F1-05
Motor 4	A4-06 to A4-10, defined the same as F1-00 to F1-05

- You cannot disconnect the motor from the load.

To perform motor auto-tuning, do as follows:

1. Power on the MD310, set F0-02 to 0, and input the motor nameplate parameters.
2. Set F1-37 (Auto-tuning selection) to 1(Static auto-tuning).
3. Press ENTER on the operating panel.
4. Press RUN on the operating panel.

The MD310 starts the auto-tuning process.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

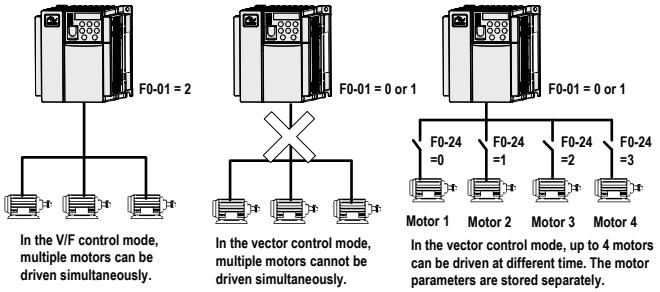
6.7.3 Using Multiple Groups of Motor Parameters

You can switch the MD310 to use any of four groups of motor parameters.

- Groups F1 and F2 (motor 1 parameters)
- Group A2 (motor 2 parameters)
- Group A3 (motor 3 parameters)
- Group A4 (motor 4 parameters)

The relevant parameter group is set either by function code F0-24 or by using function 41 and 42 on a digital input. If a DI uses function 41 or 42, this overrides the setting of function code F0-24.

Figure 6-24 Switchover amongst four motors



6.8 Interfaces

6.8.1 Use of DI Terminals

There are five digital terminals on the control board, DI1 to DI5. There are five additional digital terminals on the optional I/O extension board, DI6 to DI10.

The internal hardware of DI terminals is configured with 24 VDC power supply for detection. You can input a signal to a DI terminal of the AC drive only by shorting the DI terminal and COM.

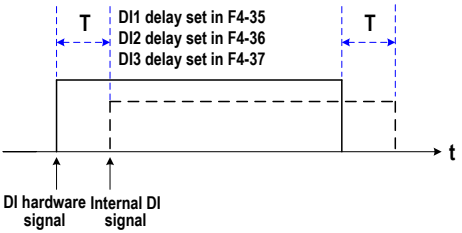
By default, F4-38 = 0000 and F4-39 = 0000. A DI terminal is active (logic 1) when shorted to COM, and inactive (logic 0) when not shorted.

You can change the DI terminal active mode. That is, a DI terminal is inactive (logic 0) when shorted to COM, and active (logic 1) when not shorted to COM. In this case, it is necessary to change the corresponding bit in F4-38 and F4-39 (these two parameters respectively specify the active mode setting of DI1 to DI5 and DI16 to DI10) to 1.

The AC drive also provides F4-10 (DI filter time) for the DI signal to improve the anti-interference level. For DI1 to DI3, the AC drive provides the DI signal delay function, convenient for some applications requiring delay.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Figure 6-25 Setting of the DI delay function



The ten DI terminals can be defined in function codes F4-00 to F4-09. Each DI can be allocated with a function among the 50 functions. For details, see descriptions of F4-00 to F4-09.

The hardware design allows only DI5 to receive high-speed pulse signal. If high-speed pulse count is required, use DI5.

6.8.2 Use of DO Terminals

There are three digital terminals on the control board, FM, DO1 and TA/TB/TC.

- FM and DO1 are transistor outputs and can drive 24 VDC low-voltage circuit.
- TA/TB/TC is relay output and can drive 250 VAC control circuit.

There are five additional digital terminals on the optional I/O extension board, DO2 (transistor output) and PA/PB/PC (relay output).

The DO terminals are set for the functions by setting F5-01 and F5-05 to indicate the running state and alarm information of the AC drive. There are a total of 40 functions. For details, see the descriptions of group F5.

Terminal	Corresponding Function Code	Output Feature Description
FM-CME	F5-06 when F5-00 = 0	Transistor, able to output high-speed pulses 10 Hz–50 KHz; drive capacity: 24 VDC, 50 mA
	F5-01 when F5-00 = 1	Transistor; drive capacity: 24 VDC, 50 mA
TA-TB-TC	F5-02	Relay; drive capacity: 50 VAC, 0.2 A/30 VDC, 1 A
PA-PB-PC	F5-03	Extension card, relay; drive capacity: 50 VAC, 0.2 A/30 VDC, 1 A
DO1-CME	F5-04	Transistor; drive capacity: 24 VDC, 50 mA
DO2-CME	F5-05	Extension card, transistor; drive capacity: 24 VDC, 50 mA

When F5-00 = 0, the FM terminal is high-speed pulse output. The frequency of output pulses indicates the value of the internal running parameter. The greater the value is, the higher the output pulse frequency is. 100% of the value corresponds to 50 kHz. The indicated internal parameter is defined by F5-06.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

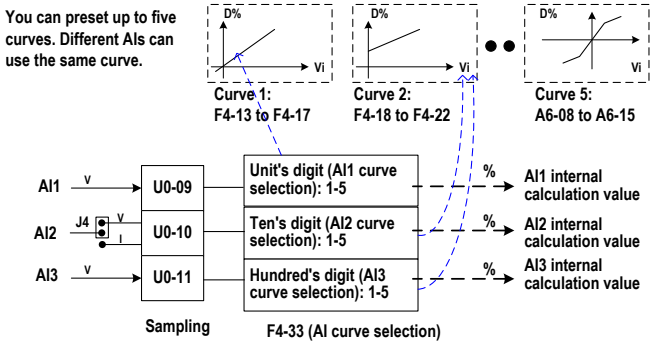
6.8.3 Use of AI Terminals

The MD310 provides two analog input terminals, AI1 and AI2, on the control board and an extra AI terminal AI3 on the optional I/O extension board.

Terminal	Input Signal Characteristic
AI1-GND	It receives the signal of 0–10 VDC.
AI2-GND	If J4 jumps to the "V" position, the AI receives the voltage signal of 0–10 VDC. If J8 jumps to the "I" position, the AI receives the current signal of 0–20 mA.
AI3-GND	It receives the signal of -10 to 10 VDC.

AI can be used as the setting channel of the frequency reference, torque reference, voltage reference at V/F separation, and PID reference or feedback. The correspondence between the voltage/current and the actual reference or feedback is defined by F4-13 to F4-27.

Figure 6-26 Correspondence between the voltage/current and the actual reference or feedback



The sampling of AI terminals can be viewed in U0-09 to U0-11. The calculation value is for internal subsequent calculation and cannot be directly read by the user.

- AI Correction

  To improve AI accuracy and ensure that voltage setting is the same as the sampling value, AI correction is required. For the correction method, see the descriptions of group AC.

  Group AC parameters have been auto-corrected by delivery. You can perform correction again on site if necessary.

  Here is an example of performing AI correction.

  1. Input 2.000 V voltage to AI1-GND, and record the value of U0-21.
  2. Change AC-00 to 2.000, and change AC-01 to the value of U0-21 recorded in the first step.
  3. Input 8.000 V voltage to AI1-GND, and record the value of U0-21.
  4. Change AC-00 to 8.000, and change AC-03 to the value of U0-21 recorded in the third step.

  The AI correction is completed.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

6.8.4 Use of AO Terminals

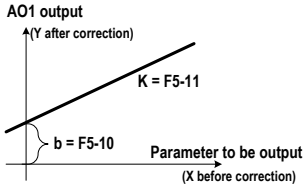
The MD310 provides two analog output terminals, AO1 on the control board and AO2 on the optional I/O extension board.

Terminal	Output Signal Characteristic
AO1-GND	If J5 jumps to the "V" position, the AO outputs the voltage signal of 0–10 VDC. If J5 jumps to the "I" position, the AO outputs the current signal of 0–20 mA.
AO2-GND	It outputs the voltage signal of 0–10 VDC.

AO1 and AO2 can be used to indicate the internal running parameters. The indicated parameters can be defined by F5-07 and F5-08.

The designated running parameters can be rectified before output. The rectification feature is Y = kX + b, among which "X" indicates the running parameters to be output, and "k" and "b" of AO1 can be set by F5-10 and F5-11.

Figure 6-27 Setting of "k" and "b" of AO1



- AO Correction

  To improve AO accuracy and ensure that the output voltage of the drive is the same as the target voltage, AO correction is required. For the correction method, see the descriptions of group AC.

  Group AC parameters have been auto-corrected by delivery. You can perform correction again on site if necessary.

  Here is an example of performing AI correction.

  5. Set F5-07 to 1.
  6. Set F0-08 to 10.00 and AC-12 to 2.0000 (the result of F0-08 x 10.000/F0-10). Measure the voltage of AO1-GND with a precision instrument.
  7. Set F0-08 to 40.00 and AC-12 to 8.0000 (the result of F0-08 x 10.000/F0-10). Measure the voltage of AO1-GND with a precision instrument.
  8. Write the voltage values measured in the second and third steps to AC-13 and AC-15 respectively.

  The AO correction is completed.

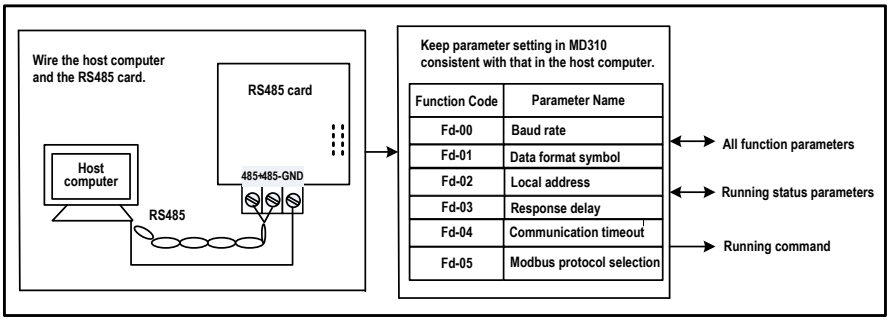
www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

6.9 Serial Communication

The MD310 supports the Modbus-RTU slave communication protocol, thus enabling you to view and modify the function parameters, view the running status parameters and send running command and frequency reference to the AC drive on the host computer.

Keep communication parameter setting on the AC drive consistent with that on the host computer. For details of the communication parameters, see descriptions of group Fd.

Figure 6-28 Use of the serial communication



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

7

Function Code Table

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Chapter 7 Function Code Table

7.1 Introduction

Note

Password protection is available for use with the MD310 AC Drive. If this protection has been enabled, you will need to know the user-defined password before you can edit the function codes described in this chapter. See section 5.7 "Password security" for instructions to set and remove password protection.

Groups F and A include standard function parameters. Group U includes the monitoring function parameters and extension card communication parameters.

The parameter description tables in this chapter use the following symbols:

The symbols in the function code table are described as follows:

Symbol	Meaning
☆	It is possible to modify the parameter with the MD310 in the stop or in the Run state.
★	It is not possible to modify the parameter with the MD310 in the Run state.
●	The parameter is the actual measured value and cannot be modified.
*	The parameter is a factory parameter and can be set only by the manufacturer.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

7.2 Standard Parameters

Function Code	Parameter Name	Setting Range	Default	Property
Group F0: Standard Parameters				
F0-01	Motor 1 control mode	0 and 2	2	*
F0-02	Command source selection	0 to 2	0	☆
F0-03	Main frequency setting channel selection	0 to 9	0	★
F0-04	Auxiliary frequency setting channel selection	0 to 9	0	★
F0-05	Base value of range of auxiliary frequency Y for Main and auxiliary superposition	0, 1	0	☆
F0-06	Range of auxiliary frequency Y for Main and auxiliary superposition	0% to 150%	100%	☆
F0-07	Frequency source superposition selection	00 to 34	00	☆
F0-08	Preset frequency	0.00 to max. frequency (F0-10)	50.00 Hz	☆
F0-09	Rotation direction	0 to 1	0	☆
F0-10	Max. frequency	50.00 to 500.00 Hz	50.00 Hz	★
F0-11	Source of frequency upper limit	0 to 5	0	★
F0-12	Frequency upper limit	0.00 Hz to maximum frequency (F0-10)	50.00 Hz	☆
F0-13	Frequency upper limit offset	0.00 Hz to max. frequency (F0-10)	0.00 Hz	☆
F0-14	Frequency lower limit	0.00 Hz to frequency upper limit (F0-12)	0.00 Hz	☆
F0-15	Carrier frequency	0.5 to 16.0 kHz	Model dependent	☆
F0-16	Carrier frequency adjusted with temperature	0, 1	1	☆
F0-17	Acceleration time 1	0.00 to 650.00s (F0-19 = 2) 0.0 to 6500.0s (F0-19 = 1) 0 to 65000s (F0-19 = 0)	Model dependent	☆
F0-18	Deceleration time 1	0.00 to 650.00s (F0-19 = 2) 0.0 to 6500.0s (F0-19 = 1) 0 to 65000s (F0-19 = 0)	Model dependent	☆
F0-19	Acceleration/Deceleration time unit	0:1s 1: 0.1s 2: 0.01s	1	★
F0-21	Frequency offset of Auxiliary frequency setting channel for Main and auxiliary superposition	0.00 Hz to max. frequency (F0-10)	0.00 Hz	☆
F0-22	Reserved	-	-	-

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
F0-23	Retentive of digital setting frequency upon stop	0, 1	0	☆
F0-24	Motor parameter group selection	0: Motor parameter group 1 1: Motor parameter group 2 2: Motor parameter group 3 3: Motor parameter group 4	0	★
F0-25	Acceleration/Deceleration time base frequency	0 to 2	0	★
F0-26	Base frequency for UP/DOWN modification during running	0, 1	0	★
F0-27	Binding command source to frequency source	000 to 9999	0000	☆
Group F1: Motor 1 Parameters				
F1-00	Motor type selection	0, 1	0	★
F1-01	Rated motor power	0.1 to 30.0 kW	Model dependent	★
F1-02	Rated motor voltage	1 to 1000 V	Model dependent	★
F1-03	Rated motor current	0.01 to 655.35 A	Model dependent	★
F1-04	Rated motor frequency	0.01 Hz to max. frequency	Model dependent	★
F1-05	Rated motor speed	1 to 65535 rpm	Model dependent	★
F1-06	Stator resistance	0.001 to 65.535 Ω	Model dependent	★
F1-07	Rotor resistance	0.001 to 65.535 Ω	Model dependent	★
F1-08	Leakage inductive reactance	0.01 to 655.35 mH	Model dependent	★
F1-09	Mutual inductive reactance	0.1 to 6553.5 mH	Model dependent	★
F1-10	No-load current	0.01 to F1-03	Model dependent	★
F1-37	Auto-tuning selection	0 to 2	0	★
Group F2: Vector Control Parameters				
F2-00	Speed loop proportional gain 1	1 to 100	30	☆

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
F2-01	Speed loop integral time 1	0.01 to 10.00s	0.50s	☆
F2-02	Switchover frequency 1	0.00 to F2-05	5.00 Hz	☆
F2-03	Speed loop proportional gain 2	0 to 100	20	☆
F2-04	Speed loop integral time 2	0.01 to 10.00s	1.00s	☆
F2-05	Switchover frequency 2	F2-02 to max. frequency	10.00 Hz	☆
F2-06	Vector control slip gain	50% to 200%	100%	☆
F2-07	Speed loop filter time constant	0.000s to 0.100s	0.000s	☆
F2-08	Over-excitation gain in vector control	0 to 200	64	☆
F2-09	Torque upper limit source in speed control mode	0 to 7	0	★
F2-10	Digital setting of torque upper limit in speed control mode	0.0% to 200.0%	150.0%	★
F2-13	Excitation adjustment proportional gain	0 to 60000	2000	☆
F2-14	Excitation adjustment integral gain	0 to 60000	1300	☆
F2-15	Torque adjustment proportional gain	0 to 60000	2000	☆
F2-16	Torque adjustment integral gain	0 to 60000	1300	☆
Group F3: V/F Control Parameters				
F3-00	V/F curve setting	0 to 11	0	★
F3-01	Torque boost	0.0% to 30%	Model dependent	☆
F3-02	Cut-off frequency of torque boost	0.00 Hz to max. frequency	50.00 Hz	★
F3-03	Multi-point V/F frequency 1 (F1)	0.00 Hz to F3-05	0.00 Hz	★
F3-04	Multi-point V/F voltage 1 (V1)	0.0% to 100.0%	0.0%	★
F3-05	Multi-point V/F frequency 2 (F2)	F3-03 to F3-07	0.00 Hz	★
F3-06	Multi-point V/F voltage 2 (V2)	0.0% to 100.0%	0.0%	★
F3-07	Multi-point V/F frequency 3 (F3)	F3-05 to rated motor frequency (F1-04)	0.00 Hz	★
F3-08	Multi-point V/F voltage 3 (V3)	0.0% to 100.0%	0.0%	★
F3-09	V/F slip compensation gain	0% to 200.0%	0.0%	☆
F3-10	V/F over-excitation gain	0 to 200	64	☆
F3-11	V/F oscillation suppression gain	0 to 100	Model dependent	☆
F3-12	Oscillation suppression mode	0 to 4	3	★

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
F3-13	Voltage source for V/F separation	0 to 8	0	☆
F3-14	Digital setting of voltage for V/F separation	0 V to rated motor voltage	0 V	☆
F3-15	Voltage rise time of V/F separation	0.0s to 1000.0s	0.0s	☆
F3-18	Overcurrent stall prevention level	50% to 200%	150%	★
F3-19	Overcurrent stall prevention selection	0, 1	1	★
F3-20	Overcurrent stall prevention gain	0 to 100	20	☆
F3-21	Speed multiplying overcurrent stall prevention level compensation factor	0% to 200%	0	★
F3-22	Overvoltage stall prevention level	120% to 150%	150%	★
F3-23	Overvoltage stall prevention selection	0, 1	1	★
F3-24	Overvoltage stall prevention frequency gain	0 to 100	30	☆
F3-25	Overvoltage stall prevention voltage gain	0 to 100	30	☆
F3-26	Overvoltage stall prevention max. frequency limit	0 to 50 Hz	5 Hz	★
F3-27	Slip compensation time constant	0.1s to 10.0s	0.5s	☆

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
Group F4: Input Terminals				
F4-00	DI1 function selection	0 to 50	1	★
F4-01	DI2 function selection	0 to 50	4	★
F4-02	DI3 function selection	0 to 50	9	★
F4-03	DI4 function selection	0 to 50	12	★
F4-04	DI5 function selection	0 to 50	13	★
F4-05	DI6 function selection	0 to 50	0	★
F4-06	DI7 function selection	0 to 50	0	★
F4-07	DI8 function selection	0 to 50	0	★
F4-08	DI9 function selection	0 to 50	0	★
F4-09	DI10 function selection	0 to 50	0	★
F4-10	DI filter time	0.000s to 1.000s	0.010s	☆
F4-11	Terminal command mode	0 to 3	0	★
F4-12	Terminal UP/DOWN rate	0.001 to 65.535 Hz/s	1.000 Hz/s	☆
F4-13	AI1 curve min. input	0.00 V to F4-15	0.00 V	☆
F4-14	Corresponding percentage of AI1 curve min. input	-100.00% to 100.0%	0.0%	☆
F4-15	AI1 curve max. input	F4-13 to 10.00 V	10.00 V	☆
F4-16	Corresponding percentage of AI1 curve max. input	-100.00% to 100.0%	100.0%	☆
F4-17	AI1 filter time	0.00s to 10.00s	0.10s	☆
F4-18	AI2 curve min. input	0.00 V to F4-20	0.00 V	☆
F4-19	Corresponding percentage of AI2 curve min. input	-100.00% to 100.0%	0.0%	☆
F4-20	AI2 curve max. input	F4-18 to 10.00 V	10.00 V	☆
F4-21	Corresponding percentage of AI2 curve max. input	-100.00% to 100.0%	100.0%	☆
F4-22	AI2 filter time	0.00s to 10.00s	0.10s	☆
F4-23	AI3 curve min. input	0.00 V to F4-25	-10.00 V	☆
F4-24	Corresponding percentage of AI3 curve min. input	-100.00% to 100.0%	-100.0%	☆
F4-25	AI3 curve max. input	F4-23 to 10.00 V	10.00 V	☆
F4-26	Corresponding percentage of AI3 curve max. input	-100.00% to 100.0%	100.0%	☆
F4-27	AI3 filter time	0.00s to 10.00s	0.10s	☆
F4-28	Pulse min. input	0.00 kHz to F4-30	0.00 kHz	☆
F4-29	Corresponding percentage of pulse min. input	-100.00% to 100.0%	0.0%	☆
F4-30	Pulse max. input	F4-28 to 20.00 kHz	20.00 kHz	☆

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
F4-31	Corresponding percentage of pulse max. input	-100.00% to 100.0%	100.0%	☆
F4-32	Pulse filter time	0.00s to 10.00s	0.10s	☆
F4-33	AI curve selection	111 to 555	321	☆
F4-34	AI curve selection	000 to 111	000	☆
F4-35	DI1 delay	0.0s to 3600.0s	0.0s	☆
F4-36	DI2 delay	0.0s to 3600.0s	0.0s	★
F4-37	DI3 delay	0.0s to 3600.0s	0.0s	★
F4-38	DI active mode selection 1	00000 to 11111	00000	★
F4-39	DI active mode selection 2	00000 to 11111	00000	★
Group F5: Output Terminals				
F5-00	FM terminal output mode	0,1	0	☆
F5-01	FMR function selection	0 to 41	0	☆
F5-02	Relay (T/A-T/B-T/C) function selection	0 to 41	2	☆
F5-03	Extension card relay (P/A-P/B-P/C) function selection	0 to 41	0	☆
F5-04	DO1 function selection	0 to 41	1	☆
F5-05	Extension card DO2 function selection	0 to 41	4	☆
F5-06	FMP function selection	0 to 16	0	☆
F5-07	AO1 function selection	0 to 16	0	☆
F5-08	AO2 function selection	0 to 16	1	☆
F5-09	Max. FMP output frequency	0.01 to 50.00 kHz	50.00 kHz	☆
F5-10	AO1 zero offset coefficient	-100.0% to 100.0%	0.0%	☆
F5-11	AO1 gain	-10.00 to 10.00	1.00	☆
F5-12	AO2 zero offset coefficient	-100.0% to 100.0%	0.00%	☆
F5-13	AO2 gain	-10.00 to 10.00	1.00	☆
F5-17	FMR output delay	0.0s to 3600.0s	0.0s	☆
F5-18	Relay 1 output delay	0.0s to 3600.0s	0.0s	☆
F5-19	Relay 2 output delay	0.0s to 3600.0s	0.0s	☆
F5-20	DO1 output delay	0.0s to 3600.0s	0.0s	☆
F5-21	DO2 output delay	0.0s to 3600.0s	0.0s	☆
F5-22	DI active mode selection 1	00000 to 11111	00000	☆

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
Group F6: Start/Stop Control				
F6-00	Startup mode	0 to 2	0	☆
F6-01	Mode of catching a spinning motor	0 to 2	0	★
F6-02	Speed of catching a spinning motor	1 to 100	20	☆
F6-03	Startup frequency	0.00 to 10.00 Hz	0.00 Hz	☆
F6-04	Startup frequency holding time	0.0s to 100.0s	0.0s	★
F6-05	DC injection braking 1 level/Pre-excitation level	0% to 100%	0%	★
F6-06	DC injection braking 1 active time /Pre-excitation active time	0.0s to 100.0s	0.0s	★
F6-07	Acceleration/Deceleration mode	0 to 2	0	★
F6-08	Time proportion of S-curve start segment	0.0% to (100.0% – F6-09)	30.0%	★
F6-09	Time proportion of S-curve end segment	0.0% to (100.0% – F6-08)	30.0%	★
F6-10	Stop mode	0, 1	0	☆
F6-11	DC injection braking 2 frequency threshold	0.00 Hz to maximum frequency	0.00 Hz	☆
F6-12	DC injection braking 2 delay time	0.0 to 100.0s	0.0s	☆
F6-13	DC injection braking 2 level	0% to 100%	0%	☆
F6-14	DC injection braking 2 active time	0.0s to 100.0s	0.0s	☆
F6-15	Braking use ratio	0% to 100%	100%	☆
F6-18	Catching a spinning motor current limit	30% to 200%	100%	★
F6-21	Demagnetization time	0.0s to 5.0s	1.0s	★
F6-22	Minimum output frequency	0 to 10 Hz	0	★

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
Group F7: Keypad Operation and LED Display				
F7-01	MF.K Key function selection	0 to 5	0	★
F7-02	STOP/RESET key function	0, 1	1	☆
F7-03	LED display running parameters 1	0000 to FFFF	1F	☆
F7-04	LED display running parameters 2	0000 to FFFF	0	☆
F7-05	LED display stop parameters	0000 to 1FFF	33	☆
F7-06	Load speed display coefficient	0.0001 to 6.5000	1.0000	☆
F7-07	Heatsink temperature of inverter module	0.0°C to 100.0°C	-	●
F7-09	Accumulative running time	0 to 65535 h	-	●
F7-10	Product SN	-	-	●
F7-11	Software version	-	-	●
F7-12	Number of decimal places for load speed display	0 to 3	1	☆
F7-13	Accumulative power-on time	0 to 65535 h	-	●
F7-14	Accumulative power consumption	0 to 65535 kWh	-	●
Group F8: Auxiliary Functions				
F8-00	Jog running frequency reference	0.00 Hz to maximum frequency	2.00 Hz	☆
F8-01	Jog acceleration time	0.0s to 6500.0s	20.0s	☆
F8-02	Jog deceleration time	0.0s to 6500.0s	20.0s	☆
F8-03	Acceleration time 2	0.0s to 6500.0s	Model dependent	☆
F8-04	Deceleration time 2	0.0s to 6500.0s	Model dependent	☆
F8-05	Acceleration time 3	0.0s to 6500.0s	Model dependent	☆
F8-06	Deceleration time 3	0.0s to 6500.0s	Model dependent	☆
F8-07	Acceleration time 4	0.0s to 6500.0s	Model dependent	☆
F8-08	Deceleration time 4	0.0s to 6500.0s	Model dependent	☆
F8-09	Frequency jump 1	0.00 Hz to max. frequency	0.00 Hz	☆
F8-10	Frequency jump 2	0.00 Hz to max. frequency	0.00 Hz	☆
F8-11	Frequency jump band	0.00 Hz to max. frequency	0.00 Hz	☆
F8-12	Forward/Reverse rotation dead-zone time	0.0s to 3000.0s	0.0s	☆
F8-13	Reverse RUN selection	0, 1	0	☆

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
F8-14	Running mode when frequency reference lower than frequency lower limit	0 to 2	0	☆
F8-15	Droop rate	0.00 to 10.00 Hz	0.00 Hz	☆
F8-16	Accumulative power-on time threshold	0 to 65000 h	0 h	☆
F8-17	Accumulative running time threshold	0 to 65000 h	0 h	☆
F8-18	Startup protection selection	0, 1	0	☆
F8-19	Frequency detection level 1	0.00 Hz to max. frequency	50.00 Hz	☆
F8-20	Frequency detection level 1 hysteresis	0.0% to 100.0%	5.0%	☆
F8-21	Detection width of frequency reference	0.00 to 100%	0.0%	☆
F8-22	Selection of frequency jump during acceleration/deceleration	0, 1	1	☆
F8-25	Frequency point of switchover of accel time 1 and accel time 2	0.00 Hz to max. frequency	0.00 Hz	☆
F8-26	Frequency point for switchover of decel time 1 and decel time 2	0.00 Hz to max. frequency	0.00 Hz	☆
F8-27	Selection of terminal jog preferred	0, 1	0	☆
F8-28	Frequency detection level 2	0.00 Hz to max. frequency	50.00 Hz	☆
F8-29	Frequency detection level 2 hysteresis	0.0% to 100.0%	5.0%	☆
F8-30	Detection of frequency 1	0.00 Hz to max. frequency	50.00 Hz	☆
F8-31	Detection width of frequency 1	0.0% to 100.0% (max. frequency)	0.0%	☆
F8-32	Detection of frequency 2	0.00 Hz to max. frequency	50.00 Hz	☆
F8-33	Detection width of frequency 2	0.0% to 100.0% (max. frequency)	0.0%	☆
F8-34	Zero current detection level	0.0% to 300.0% (rated motor current)	5.0%	☆
F8-35	Zero current detection delay	0.01s to 600.00s	0.10s	☆
F8-36	Output overcurrent threshold	0.0% (no detection) 0.1% to 300.0% (rated motor current)	200.0%	☆
F8-37	Output overcurrent detection delay	0.00s to 600.00s	0.00s	☆
F8-38	Detection of current 1	0.0% to 300.0% (rated motor current)	100.0%	☆
F8-39	Detection width of current 1	0.0% to 300.0% (rated motor current)	0.0%	☆

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
F8-40	Detection of current 2	0.0% to 300.0% (rated motor current)	100.0%	☆
F8-41	Detection width of current 2	0.0% to 300.0% (rated motor current)	0.0%	☆
F8-42	Timing function	0, 1	0	★
F8-43	Timing running time setting channel	0 to 3	0	★
F8-44	Timing running time	0.0 to 6500.0 min	0.0	★
F8-45	AI1 input voltage lower limit	0.00 V to F8-46	3.10 V	☆
F8-46	AI1 input voltage upper limit	F8-45 to 11.00 V	6.80 V	☆
F8-47	Module temperature threshold	0°C to 100°C	75°C	☆
F8-48	Cooling fan working mode	0, 1	0	☆
F8-49	Wakeup frequency	Hibernating frequency (F8-51) to max. frequency (F0-10)	0.00 Hz	☆
F8-50	Wakeup delay time	0.0s to 6500.0s	0.0s	☆
F8-51	Hibernating frequency	0.00 Hz to wakeup frequency (F8-49)	0.00 Hz	☆
F8-52	Hibernating delay time	0.0s to 6500.0s	0.0s	☆
F8-53	Current running time	0.0 to 6500.0 min	0.0 min	☆
Group F9: Fault and Protection				
F9-00	Motor overload protection selection	0, 1	1	☆
F9-01	Motor overload protection gain	0.20 to 10.00	1.00	☆
F9-02	Motor overload pending coefficient	50% to 100%	80%	☆
F9-07	Detection of short-circuit to ground upon power-on	0, 1	1	☆
F9-08	Braking unit action voltage	700 to 800 V	780 V	☆
F9-09	Auto reset times	0 to 20	0	☆
F9-10	Selection of DO action during auto reset	0, 1	0	☆
F9-11	Delay of auto reset	0.1s to 100.0s	1.0s	☆
F9-12	Selection of power input phase loss protection	0, 1	1	☆
F9-13	Power output phase loss protection	0, 1	1	☆
F9-14	1st fault type	0 to 51	-	●
F9-15	2nd fault type	0 to 51	-	●
F9-16	3rd (latest) fault type	0 to 51	-	●
F9-17	Frequency upon 3rd fault	-	-	●

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
F9-18	Current upon 3rd fault	-	-	●
F9-19	Bus voltage upon 3rd fault	-	-	●
F9-20	DI state upon 3rd fault	-	-	●
F9-21	Digital output terminal state upon 3rd fault	-	-	●
F9-22	AC drive state upon 3rd fault	-	-	●
F9-23	Current power-on time upon 3rd fault	-	-	●
F9-24	Current running time upon 3rd fault	-	-	●
F9-27	Frequency upon 2nd fault	-	-	●
F9-28	Current upon 2nd fault	-	-	●
F9-29	Bus voltage upon 2nd fault	-	-	●
F9-30	DI state upon 2nd fault	-	-	●
F9-31	Digital output terminal state upon 2nd fault	-	-	●
F9-32	AC drive state upon 2nd fault	-	-	●
F9-33	Current power-on time upon 2nd fault	-	-	●
F9-34	Current running time upon 2nd fault	-	-	●
F9-37	Frequency upon 1st fault	-	-	●
F9-38	Current upon 1st fault	-	-	●
F9-39	Bus voltage upon 1st fault	-	-	●
F9-40	DI state upon 1st fault	-	-	●
F9-41	Digital output terminal state upon 1st fault	-	-	●
F9-42	AC drive state upon 1st fault	-	-	●
F9-43	Current power-on time upon 1st fault	-	-	●
F9-44	Current running time upon 1st fault	-	-	●
F9-47	Fault protection action selection 1	00000 to 22222	00000	☆
F9-48	Fault protection action selection 2	00000 to 22210	00000	☆
F9-49	Fault protection action selection 3	00000 to 22222	00000	☆
F9-50	Fault protection action selection 4	00000 to 22222	00000	☆

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
F9-54	Frequency selection for continuing to run upon fault	0 to 4	0	☆
F9-55	Backup frequency upon abnormality	0.0% to 100.0% (max. frequency)	100.0%	☆
F9-59	Power dip ride-through function selection	0 to 2	0	★
F9-60	Voltage level of power dip ride-through function disabled	80% to 100%	85%	★
F9-61	Judging time of bus voltage recovering from power dip	0.0s to 100.0s	0.5s	★
F9-62	Voltage level of power dip ride-through function enabled	60% to F9-60	80.0%	★
F9-63	Selection of load lost protection	0, 1	0	☆
F9-71	Power dip ride-through gain Kp	0 to 100	40	☆
F9-72	Power dip ride-through integral coefficient	0 to 100	30	☆
F9-73	Power dip ride-through gain Kp	0.0s to 300.0s	20.0s	★
Group FA: Process Control and PID Function				
FA-00	PID reference source	0 to 6	0	☆
FA-01	PID digital setting	0.0% to 100.0%	50.0%	☆
FA-02	PID feedback source	0 to 8	0	☆
FA-03	PID operation direction	0, 1	0	☆
FA-04	PID reference and feedback range	0 to 65535	1000	☆
FA-05	Proportional gain Kp1	0.0 to 100.0	20.0	☆
FA-06	Integral time Ti1	0.01s to 10.00s	2.00s	☆
FA-07	Differential time Td1	0.00s to 10.000s	0.000s	☆
FA-08	Negative PID output limit	0.00 Hz to max. frequency	2.00 Hz	☆
FA-09	PID error limit	0.0% to 100.0%	0.0%	☆
FA-10	PID Derivative limit	0.00% to 100.00%	0.10%	☆
FA-11	PID reference change time	0.00s to 650.00s	0.00s	☆
FA-12	PID feedback filter time	0.00s to 60.00s	0.00s	☆
FA-13	PID output filter time	0.00s to 60.00s	0.00s	☆
FA-15	Proportional gain Kp2	0.0 to 100.0	20.0	☆
FA-16	Integral time Ti2	0.01s to 10.00s	2.00s	☆
FA-17	Differential time Td2	0.000s to 10.000s	0.000s	☆
FA-18	PID parameter switchover condition	0 to 2	0	☆
FA-19	PID error 1 for auto switchover	0.0% to FA-20	20.0%	☆
FA-20	PID error 2 for auto switchover	FA-19 to 100.0%	80.0%	☆

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
FA-21	PID initial value	0.0% to 100.0%	0.0%	☆
FA-22	PID initial value active time	0.00s to 650.00s	0.00s	☆
FA-23	Max. deviation between two PID outputs in forward direction	0.00% to 100.00%	1.00%	☆
FA-24	Max. deviation between two PID outputs in reverse direction	0.00% to 100.00%	1.00%	☆
FA-25	PID integral property	00 to 11	00	☆
FA-26	Detection level of PID feedback loss	0.0%: No detection 0.1% to 100.0%	0.0%	☆
FA-27	Detection time of PID feedback loss	0.0s to 20.0s	0.0s	☆
FA-28	Selection of PID operation at stop	0, 1	0	☆
Group Fb: Wobble Function, Fixed Length and Count				
Fb-00	Wobble setting mode	0, 1	0	☆
Fb-01	Wobble amplitude	0.0% to 100.0%	0.0%	☆
Fb-02	Wobble step	0.0% to 50.0%	0.0%	☆
Fb-03	Wobble cycle	0.1s to 3000.0s	10.0s	☆
Fb-04	Triangular wave rising time coefficient	0.1% to 100.0%	50.0%	☆
Fb-05	Set length	0 to 65535 m	1000 m	☆
Fb-06	Actual length	0 to 65535 m	0 m	☆
Fb-07	Number of pulses per meter	0.1 to 6553.5	100.0	☆
Fb-08	Set count value	1 to 65535	1000	☆
Fb-09	Designated count value	1 to 65535	1000	☆
Group FC: Multi-Reference and Simple PLC Function				
FC-00	Reference 0	-100.0% to 100.0%	0.0%	☆
FC-01	Reference 1	-100.0% to 100.0%	0.0%	☆
FC-02	Reference 2	-100.0% to 100.0%	0.0%	☆
FC-03	Reference 3	-100.0% to 100.0%	0.0%	☆
FC-04	Reference 4	-100.0% to 100.0%	0.0%	☆
FC-05	Reference 5	-100.0% to 100.0%	0.0%	☆
FC-06	Reference 6	-100.0% to 100.0%	0.0%	☆
FC-07	Reference 7	-100.0% to 100.0%	0.0%	☆
FC-08	Reference 8	-100.0% to 100.0%	0.0%	☆
FC-09	Reference 9	-100.0% to 100.0%	0.0%	☆
FC-10	Reference 10	-100.0% to 100.0%	0.0%	☆
FC-11	Reference 11	-100.0% to 100.0%	0.0%	☆
FC-12	Reference 12	-100.0% to 100.0%	0.0%	☆

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
FC-13	Reference 13	-100.0% to 100.0%	0.0%	☆
FC-14	Reference 14	-100.0% to 100.0%	0.0%	☆
FC-15	Reference 15	-100.0% to 100.0%	0.0%	☆
FC-16	Simple PLC running mode	0 to 2	0	☆
FC-17	Simple PLC retentive selection	00 to 11	00	☆
FC-18	Running time of simple PLC reference 0	0.0s (h) to 6500s (h)	0.0s (h)	☆
FC-19	Acceleration/deceleration time of simple PLC reference 0	0 to 3	0	☆
FC-20	Running time of simple PLC reference 1	0.0s (h) to 6500s (h)	0.0s (h)	☆
FC-21	Acceleration/deceleration time of simple PLC reference 1	0 to 3	0	☆
FC-22	Running time of simple PLC reference 2	0.0s (h) to 6500s (h)	0.0s (h)	☆
FC-23	Acceleration/deceleration time of simple PLC reference 2	0 to 3	0	☆
FC-24	Running time of simple PLC reference 3	0.0s (h) to 6500s (h)	0.0s (h)	☆
FC-25	Acceleration/deceleration time of simple PLC reference 3	0 to 3	0	☆
FC-26	Running time of simple PLC reference 4	0.0s (h) to 6500s (h)	0.0s (h)	☆
FC-27	Acceleration/deceleration time of simple PLC reference 4	0 to 3	0	☆
FC-28	Running time of simple PLC reference 5	0.0s (h) to 6500s (h)	0.0s (h)	☆
FC-29	Acceleration/deceleration time of simple PLC reference 5	0 to 3	0	☆
FC-30	Running time of simple PLC reference 6	0.0s (h) to 6500s (h)	0.0s (h)	☆
FC-31	Acceleration/deceleration time of simple PLC reference 6	0 to 3	0	☆
FC-32	Running time of simple PLC reference 7	0.0s (h) to 6500s (h)	0.0s (h)	☆
FC-33	Acceleration/deceleration time of simple PLC reference 7	0 to 3	0	☆
FC-34	Running time of simple PLC reference 8	0.0s (h) to 6500s (h)	0.0s (h)	☆
FC-35	Acceleration/deceleration time of simple PLC reference 8	0 to 3	0	☆
FC-36	Running time of simple PLC reference 9	0.0s (h) to 6500s (h)	0.0s (h)	☆

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
FC-37	Acceleration/deceleration time of simple PLC reference 9	0 to 3	0	☆
FC-38	Running time of simple PLC reference 10	0.0s (h) to 6500s (h)	0.0s (h)	☆
FC-39	Acceleration/deceleration time of simple PLC reference 10	0 to 3	0	☆
FC-40	Running time of simple PLC reference 11	0.0s (h) to 6500s (h)	0.0s (h)	☆
FC-41	Acceleration/deceleration time of simple PLC reference 11	0 to 3	0	☆
FC-42	Running time of simple PLC reference 12	0.0s (h) to 6500s (h)	0.0s (h)	☆
FC-43	Acceleration/deceleration time of simple PLC reference 12	0 to 3	0	☆
FC-44	Running time of simple PLC reference 13	0.0s (h) to 6500s (h)	0.0s (h)	☆
FC-45	Acceleration/deceleration time of simple PLC reference 13	0 to 3	0	☆
FC-46	Running time of simple PLC reference 14	0.0s (h) to 6500s (h)	0.0s (h)	☆
FC-47	Acceleration/deceleration time of simple PLC reference 14	0 to 3	0	☆
FC-48	Running time of simple PLC reference 15	0.0s (h) to 6500s (h)	0.0s (h)	☆
FC-49	Acceleration/deceleration time of simple PLC reference 15	0 to 3	0	☆
FC-50	Time unit of simple PLC running	0, 1	0	☆
FC-51	Reference 0 source	0 to 6	0	☆
Group Fd: Communication				
Fd-00	Baud rate	0000 to 6039	6005	☆
Fd-01	Data format symbol	0 to 3	0	☆
Fd-02	Local address	0: Broadcast address; 1 to 247	1	☆
Fd-03	Response delay	0 to 20	2	☆
Fd-04	Communication timeout	0.0 (invalid); 0.1 to 60.0	0.0	☆
Fd-05	Communication protocol	00 to 31	00	☆
Fd-06	Current resolution read by communication	0: 0.01 1: 0.1	0	☆

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
Group FE: User-Defined Parameters				
FE-00	User-defined parameter 0	F0-00 to FP-xx, A0-00 to Ax-xx, U0-xx	F0-00	☆
FE-01	User-defined parameter 1	Same as FE-00	F0-02	☆
FE-02	User-defined parameter 2	Same as FE-00	F0-03	☆
FE-03	User-defined parameter 3	Same as FE-00	F0-07	☆
FE-04	User-defined parameter 4	Same as FE-00	F0-08	☆
FE-05	User-defined parameter 5	Same as FE-00	F0-17	☆
FE-06	User-defined parameter 6	Same as FE-00	F0-18	☆
FE-07	User-defined parameter 7	Same as FE-00	F3-00	☆
FE-08	User-defined parameter 8	Same as FE-00	F3-01	☆
FE-09	User-defined parameter 9	Same as FE-00	F4-00	☆
FE-10	User-defined parameter 10	Same as FE-00	F4-01	☆
FE-11	User-defined parameter 11	Same as FE-00	F4-02	☆
FE-12	User-defined parameter 12	Same as FE-00	F5-04	☆
FE-13	User-defined parameter 13	Same as FE-00	F5-07	☆
FE-14	User-defined parameter 14	Same as FE-00	F6-00	☆
FE-15	User-defined parameter 15	Same as FE-00	F6-10	☆
FE-16	User-defined parameter 16	Same as FE-00	F0-00	☆
FE-17	User-defined parameter 17	Same as FE-00	F0-00	☆
FE-18	User-defined parameter 18	Same as FE-00	F0-00	☆
FE-19	User-defined parameter 19	Same as FE-00	F0-00	☆
FE-20	User-defined parameter 20	Same as FE-00	F0-00	☆
FE-21	User-defined parameter 21	Same as FE-00	F0-00	☆
FE-22	User-defined parameter 22	Same as FE-00	F0-00	☆
FE-23	User-defined parameter 23	Same as FE-00	F0-00	☆
FE-24	User-defined parameter 24	Same as FE-00	F0-00	☆
FE-25	User-defined parameter 25	Same as FE-00	F0-00	☆
FE-26	User-defined parameter 26	Same as FE-00	F0-00	☆
FE-27	User-defined parameter 27	Same as FE-00	F0-00	☆
FE-28	User-defined parameter 28	Same as FE-00	F0-00	☆
FE-29	User-defined parameter 29	Same as FE-00	F0-00	☆

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
Group FP: Function Parameter Management				
FP-00	User password	0 to 65535	0	☆
FP-01	Parameter initialization	0: No operation 1: Restore factory parameters except motor parameters 2: Clear records 4: Back up current user parameters 501: Restore user backup parameters	0	★
FP-02	Selection of general function parameter display	00 to 11	11	☆
FP-03	Selection of individualized parameter display	00 to 11	00	☆
FP-04	Selection of parameter modification	0, 1	0	☆
Group A0: Torque Control and Limit				
A0-00	Speed/Torque control selection	0, 1	0	★
A0-01	Torque reference source in torque control	0 to 7	0	★
A0-03	Torque digital setting in torque control	-200.0% to 200.0%	150.0%	☆
A0-05	Forward max. frequency in torque control	0.00 Hz to max. frequency (F0-10)	50.00 Hz	☆
A0-06	Reverse max. frequency in torque control	0.00 Hz to max. frequency (F0-10)	50.00 Hz	☆
A0-07	Acceleration time in torque control	0.00s to 650.00s	0.00s	☆
A0-08	Deceleration time in torque control	0.00s to 650.00s	0.00s	☆
Group A1: Virtual DI/DO				
A1-00	VDI1 function selection	0 to 50	0	★
A1-01	VDI2 function selection	0 to 50	0	★
A1-02	VDI3 function selection	0 to 50	0	★
A1-03	VDI4 function selection	0 to 50	0	★
A1-04	VDI5 function selection	0 to 50	0	★
A1-05	VDI active state setting mode	00000 to 22222	00000	☆
A1-06	Selection of VDI active state	00000 to 11111	00000	★
A1-07	Function selection for AI1 used as DI	0 to 50	0	★
A1-08	Function selection for AI2 used as DI	0 to 50	0	★

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
A1-09	Function selection for AI3 used as DI	0 to 50	0	★
A1-10	Active state selection for AI used as DI	000 to 111	000	☆
A1-11	VDO1 function selection	0 to 41	0	☆
A1-12	VDO2 function selection	0 to 41	0	☆
A1-13	VDO3 function selection	0 to 41	0	☆
A1-14	VDO4 function selection	0 to 41	0	☆
A1-15	VDO5 function selection	0 to 41	0	☆
A1-16	VDO1 output delay	0.0s to 3600.0s	0.0s	☆
A1-17	VDO2 output delay	0.0s to 3600.0s	0.0s	☆
A1-18	VDO3 output delay	0.0s to 3600.0s	0.0s	☆
A1-19	VDO4 output delay	0.0s to 3600.0s	0.0s	☆
A1-20	VDO5 output delay	0.0s to 3600.0s	0.0s	☆
A1-21	VDO active mode selection	00000 to 11111	00000	☆
Group A2: Motor 2 Parameters				
A2-00	Motor type selection	0 to 1	0	★
A2-01	Rated motor power	0.1 to 30.0 kW	Model dependent	★
A2-02	Rated motor voltage	1 to 1000 V	Model dependent	★
A2-03	Rated motor current	0.01 to 655.35 A	Model dependent	★
A2-04	Rated motor frequency	0.01 to max. frequency	Model dependent	★
A2-05	Rated motor speed	1 to 65535 rpm	Model dependent	★
A2-06	Stator resistance	0.001 to 65.535 Ω	Auto-tuning parameter	★
A2-07	Rotor resistance	0.001 to 65.535Ω	Auto-tuning parameter	★
A2-08	Leakage inductive reactance	0.01 to 655.35 mH	Auto-tuning parameter	★
A2-09	Mutual inductive reactance	0.1 to 6553.5 mH	Auto-tuning parameter	★
A2-10	No-load current	0.01 A to A2-03	Auto-tuning parameter	★
A2-37	Auto-tuning selection	0 to 2	0	★
A2-38	Speed loop proportional gain 1	1 to 100	30	☆
A2-39	Speed loop integral time 1	0.01s to 10.00s	0.50	☆
A2-40	Switchover frequency 1	0.00 to A2-43	5.00	☆

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
A2-41	Speed loop proportional gain 2	1 to 100	20	☆
A2-42	Speed loop integral time 2	0.01 to 10.00	1.00	☆
A2-43	Switchover frequency 2	A2-40 to max. frequency	10.00	☆
A2-44	Vector control slip gain	50% to 200%	100%	☆
A2-45	Speed loop filter time constant	0.000s to 0.100s	0.000s	☆
A2-46	Over-excitation gain in vector control	0 to 200	64	☆
A2-47	Torque upper limit source in speed control mode	0 to 7	0	☆
A2-48	Digital setting of torque upper limit in speed control mode	0.0% to 200.0%	150.0%	☆
A2-51	Excitation adjustment proportional gain	0 to 60000	2000	☆
A2-52	Excitation adjustment integral gain	0 to 60000	1300	☆
A2-53	Torque adjustment proportional gain	0 to 60000	2000	☆
A2-54	Torque adjustment integral gain	0 to 60000	1300	☆
A2-61	Motor 2 control mode	0 and 2	2	★
A2-62	Motor 2 acceleration/deceleration time selection	0 to 4	0	☆
A2-63	Motor 2 torque boost	0.0% (fixed torque boost) 0.1% to 30.0%	Model dependent	☆
A2-65	Motor 2 oscillation suppression gain	0 to 100	Model dependent	☆
Group A3: Motor 3 Parameters				
A3-00	Motor type selection	0 to 1	0	★
A3-01	Rated motor power	0.1 to 30.0 kW	Model dependent	★
A3-02	Rated motor voltage	1 to 1000 V	Model dependent	★
A3-03	Rated motor current	0.01 to 655.35 A	Model dependent	★
A3-04	Rated motor frequency	0.01 to max. frequency	Model dependent	★
A3-05	Rated motor speed	1 to 65535 rpm	Model dependent	★
A3-06	Stator resistance	0.001 to 65.535 Ω	Auto-tuning parameter	★
A3-07	Rotor resistance	0.001 to 65.535Ω	Auto-tuning parameter	★

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
A3-08	Leakage inductive reactance	0.01 to 655.35 mH	Auto-tuning parameter	★
A3-09	Mutual inductive reactance	0.1 to 6553.5 mH	Auto-tuning parameter	★
A3-10	No-load current	0.01 A to A2-03	Auto-tuning parameter	★
A3-37	Auto-tuning selection	0 to 2	0	★
A3-38	Speed loop proportional gain 1	1 to 100	30	☆
A3-39	Speed loop integral time 1	0.01s to 10.00s	0.50	☆
A3-40	Switchover frequency 1	0.00 to A2-43	5.00	☆
A3-41	Speed loop proportional gain 2	1 to 100	20	☆
A3-42	Speed loop integral time 2	0.01 to 10.00	1.00	☆
A3-43	Switchover frequency 2	A2-40 to max. frequency	10.00	☆
A3-44	Vector control slip gain	50% to 200%	100%	☆
A3-45	Speed loop filter time constant	0.000s to 0.100s	0.000s	☆
A3-46	Over-excitation gain in vector control	0 to 200	64	☆
A3-47	Torque upper limit source in speed control mode	0 to 7	0	☆
A3-48	Digital setting of torque upper limit in speed control mode	0.0% to 200.0%	150.0%	☆
A3-51	Excitation adjustment proportional gain	0 to 60000	2000	☆
A3-52	Excitation adjustment integral gain	0 to 60000	1300	☆
A3-53	Torque adjustment proportional gain	0 to 60000	2000	☆
A3-54	Torque adjustment integral gain	0 to 60000	1300	☆
A3-61	Motor 3 control mode	0 and 2	2	★
A3-62	Motor 3 acceleration/deceleration time selection	0 to 4	0	☆
A3-63	Motor 3 torque boost	0.0% (fixed torque boost) 0.1% to 30.0%	Model dependent	☆
A3-65	Motor 3 oscillation suppression gain	0 to 100	Model dependent	☆
Group A4: Motor 4 Parameters				
A4-00	Motor type selection	0 to 1	0	★
A4-01	Rated motor power	0.1 to 30.0 kW	Model dependent	★
A4-02	Rated motor voltage	1 to 1000 V	Model dependent	★

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
A4-03	Rated motor current	0.01 to 655.35 A	Model dependent	★
A4-04	Rated motor frequency	0.01 to max. frequency	Model dependent	★
A4-05	Rated motor speed	1 to 65535 rpm	Model dependent	★
A4-06	Stator resistance	0.001 to 65.535 Ω	Auto-tuning parameter	★
A4-07	Rotor resistance	0.001 to 65.535Ω	Auto-tuning parameter	★
A4-08	Leakage inductive reactance	0.01 to 655.35 mH	Auto-tuning parameter	★
A4-09	Mutual inductive reactance	0.1 to 6553.5 mH	Auto-tuning parameter	★
A4-10	No-load current	0.01 A to A2-03	Auto-tuning parameter	★
A4-37	Auto-tuning selection	0 to 2	0	★
A4-38	Speed loop proportional gain 1	1 to 100	30	☆
A4-39	Speed loop integral time 1	0.01s to 10.00s	0.50	☆
A4-40	Switchover frequency 1	0.00 to A2-43	5.00	☆
A4-41	Speed loop proportional gain 2	1 to 100	20	☆
A4-42	Speed loop integral time 2	0.01 to 10.00	1.00	☆
A4-43	Switchover frequency 2	A2-40 to max. frequency	10.00	☆
A4-44	Vector control slip gain	50% to 200%	100%	☆
A4-45	Speed loop filter time constant	0.000s to 0.100s	0.000s	☆
A4-46	Over-excitation gain in vector control	0 to 200	64	☆
A4-47	Torque upper limit source in speed control mode	0 to 7	0	☆
A4-48	Digital setting of torque upper limit in speed control mode	0.0% to 200.0%	150.0%	☆
A4-51	Excitation adjustment proportional gain	0 to 60000	2000	☆
A4-52	Excitation adjustment integral gain	0 to 60000	1300	☆
A4-53	Torque adjustment proportional gain	0 to 60000	2000	☆
A4-54	Torque adjustment integral gain	0 to 60000	1300	☆
A4-61	Motor 4 control mode	0 and 2	2	★
A4-62	Motor 4 acceleration/deceleration time selection	0 to 4	0	☆

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
A4-63	Motor 4 torque boost	0.0% (fixed torque boost) 0.1% to 30.0%	Model dependent	☆
A4-65	Motor 4 oscillation suppression gain	0 to 100	Model dependent	☆
Group A5: Control Optimization				
A5-00	DPWM switchover frequency upper limit	0.00 to 15.00 Hz	12.00 Hz	☆
A5-01	PWM modulation pattern	0, 1	0	☆
A5-02	Dead zone compensation mode selection	0, 1	1	☆
A5-03	Random PWM depth	0 to 10	0	☆
A5-04	Selection of fast current limit	0, 1	1	☆
A5-05	Current detection compensation	0 to 100	5	☆
A5-06	Undervoltage threshold	60.0% to 140.0%	100.0%	☆
A5-09	Narrow pulse control selection	0, 1	0	☆
Group A6: AI Curve Setting				
A6-00	AI curve 4 min. input	-10.00 V to A6-02	0.00 V	☆
A6-01	Corresponding percentage of AI curve 4 min. input	-100.0% to 100.0%	0.0%	☆
A6-02	AI curve 4 inflexion 1 input	A6-00 to A6-04	3.00 V	☆
A6-03	Corresponding percentage of AI curve 4 inflexion 1 input	-100.0% to 100.0%	30.0%	☆
A6-04	AI curve 4 inflexion 1 input	A6-02 to A6-06	6.00 V	☆
A6-05	Corresponding percentage of AI curve 4 inflexion 1 input	-100.0% to 100.0%	60.0%	☆
A6-06	AI curve 4 max. input	A6-06 to 10.00 V	10.00 V	☆
A6-07	Corresponding percentage of AI curve 4 max. input	-100.0% to 100.0%	100.0%	☆
A6-08	AI curve 5 min. input	-10.00 V to A6-10	-10.00 V	☆
A6-09	Corresponding percentage of AI curve 5 min. input	-100.0% to 100.0%	-100.0%	☆
A6-10	AI curve 5 inflexion 1 input	A6-08 to A6-12	-3.00 V	☆
A6-11	Corresponding percentage of AI curve 5 inflexion 1 input	-100.0% to 100.0%	-30.0%	☆
A6-12	AI curve 5 inflexion 1 input	A6-10 to A6-14	3.00 V	☆
A6-13	Corresponding percentage of AI curve 5 inflexion 1 input	-100.0% to 100.0%	30.0%	☆
A6-14	AI curve 5 max. input	A6-14 to 10.00 V	10.00 V	☆
A6-15	Corresponding percentage of AI curve 5 max. input	-100.0% to 100.0%	100.0%	☆

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
A6-16	Jump point of AI1 input corresponding setting	-100.0% to 100.0%	0.0%	☆
A6-17	Jump amplitude of AI1 input corresponding setting	0.0% to 100.0%	0.5%	☆
A6-18	Jump point of AI2 input corresponding setting	-100.0% to 100.0%	0.0%	☆
A6-19	Jump amplitude of AI2 input corresponding setting	0.0% to 100.0%	0.5%	☆
A6-20	Jump point of AI3 input corresponding setting	-100.0% to 100.0%	0.0%	☆
A6-21	Jump amplitude of AI3 input corresponding setting	0.0% to 100.0%	0.5%	☆
Group AC: AI/AO Correction				
AC-00	AI1 measured voltage 1	0.500 to 4.000 V	Factory-corrected	☆
AC-01	AI1 displayed voltage 1	0.500 to 4.000 V	Factory-corrected	☆
AC-02	AI1 measured voltage 2	6.000 to 9.999 V	Factory-corrected	☆
AC-03	AI1 displayed voltage 2	6.000 to 9.999 V	Factory-corrected	☆
AC-04	AI2 measured voltage 1	0.500 to 4.000 V	Factory-corrected	☆
AC-05	AI2 displayed voltage 1	0.500 to 4.000 V	Factory-corrected	☆
AC-06	AI2 measured voltage 2	6.000 to 9.999 V	Factory-corrected	☆
AC-07	AI2 displayed voltage 2	6.000 to 9.999 V	Factory-corrected	☆
AC-08	AI3 measured voltage 1	-9.999 to 10.000 V	Factory-corrected	☆
AC-09	AI3 displayed voltage 1	-9.999 to 10.000 V	Factory-corrected	☆
AC-10	AI3 measured voltage 2	-9.999 to 10.000 V	Factory-corrected	☆
AC-11	AI3 displayed voltage 2	-9.999 to 10.000 V	Factory-corrected	☆
AC-12	AO1 target voltage 1	0.500 to 4.000 V	Factory-corrected	☆
AC-13	AO1 measured voltage 1	0.500 to 4.000 V	Factory-corrected	☆
AC-14	AO1 target voltage 2	6.000 to .999 V	Factory-corrected	☆

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default	Property
AC-15	AO1 measured voltage 2	6.000 to 9.999 V	Factory-corrected	☆
AC-16	AO2 target voltage 1	0.500 to 4.000 V	Factory-corrected	☆
AC-17	AO2 measured voltage 1	0.500 to 4.000 V	Factory-corrected	☆
AC-18	AO2 target voltage 2	6.000 to 9.999 V	Factory-corrected	☆
AC-19	AO2 measured voltage 2	6.000 to 9.999 V	Factory-corrected	☆
AC-20	AI2 measured current 1	0.000 to 20.000 mA	Factory corrected	☆
AC-21	AI2 sampling current 1	0.000 to 20.000 mA	Factory corrected	☆
AC-22	AI2 measured current 2	0.000 to 20.000 mA	Factory corrected	☆
AC-23	AI2 sampling current 2	0.000 to 20.000 mA	Factory corrected	☆
AC-24	AO1 ideal current 1	0.000 to 20.000 mA	Factory corrected	☆
AC-25	AO1 sampling current 1	0.000 to 20.000 mA	Factory corrected	☆
AC-26	AO1 ideal current 2	0.000 to 20.000 mA	Factory corrected	☆
AC-27	AO1 sampling current 2	0.000 to 20.000 mA	Factory corrected	☆

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

7.3 Monitoring Function Codes

Function Code	Parameter Name	Display Range
Group U0: Monitoring Parameters		
U0-00	Running frequency	0.00 to 500.00 Hz
U0-01	Frequency reference	0.00 to 500.0 Hz
U0-02	Bus voltage	0.0 to 3000.0 V
U0-03	Output voltage	0 to 1140 V
U0-04	Output current	0.00 to 655.35 A
U0-05	Output power	0 to 32767
U0-06	Output torque	-200.0% to 200.0%
U0-07	DI state	0 to 32767
U0-08	DO state	0 to 1023
U0-09	AI1 voltage	-
U0-10	AI2 voltage	-
U0-11	AI3 voltage	-
U0-12	Count value	-
U0-13	length value	-
U0-14	Load speed display	0 to 65535
U0-15	PID reference	0 to 65535
U0-16	PID feedback	0 to 65535
U0-17	PLC stage	-
U0-18	Pulse reference	0.00 to 20.00 kHz
U0-19	Feedback speed	-500.0 to 500.0 Hz
U0-20	Remaining running time	0.0 to 6500.0 min
U0-21	AI1 voltage before correction	0.00 to 10.57 V
U0-22	AI2 voltage (V)/ current (mA) before correction	0.00 to 10.57 V
U0-23	AI3 voltage before correction	-10.57 to 10.57 V
U0-24	Linear speed	0 to 65535 m/min
U0-25	Accumulative power-on time	-
U0-26	Accumulative running time	-
U0-27	Pulse reference	0 to 65535 Hz
U0-28	Communication reference	-100.00% to 100.00%
U0-28	Reserved	-
U0-30	Main frequency reference	0.00 to 500.00 Hz
U0-31	Auxiliary frequency reference	0.00 to 500.00 Hz

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Display Range
U0-32	Viewing any register address value	-
U0-34	Motor temperature	-
U0-35	Target torque	-200.0% to 200.0%
U0-37	Power factor angle	-180° to 180°
U0-39	Target voltage upon V/F separation	0 V to rated motor voltage
U0-40	Output voltage upon V/F separation	0 V to rated motor voltage
U0-41	DI state display	-
U0-42	DO state display	-
U0-43	DI set for function state display 1	-
U0-44	DI set for function state display 2	-
U0-59	Frequency Reference	-100.00% to 100.00%
U0-60	Running frequency	-100.00% to 100.00%
U0-61	AC drive running state	0 to 65535

7.4 Extension Card Communication

Function Code	Parameter Name	Display Range
Group U3: Extension Card Communication		
U3-16	Frequency reference	0.00 Hz to max. frequency
U3-18	Control command	0001: Forward run 0002: Reverse run 0003: Forward jog 0004: Reverser jog 0005: Coast to stop 0006: Decelerate to stop 0007: Fault reset
U3-19	AO1 control	0 to 7FFF indicating 0% to 100%
U3-20	AO2 control	0 to 7FFF indicating 0% to 100%
U3-21	FMP control	0 to 7FFF indicating 0% to 100%
U3-23	AC drive speed	0 rpm to max. speed

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

8

Function Parameter Descriptions

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Chapter 8 Function Parameter Descriptions

Group F0: Standard Parameters

Function Code	Parameter Name	Setting Range	Default
F0-01	Motor 1 control mode	0: Sensorless vector control (SVC) 2: Voltage/Frequency (V/F) control	0

F0-01: This function parameter sets the control mode of motor 1.

0. Sensorless vector control (SVC)

   It indicates open-loop vector control and applies to high-performance control applications such as machine tools, centrifuges, wire-drawing machines and injection moulding machines. The AC drive can operate only one motor.

2. Voltage/Frequency (V/F) control

   It applies to applications that have low loading requirements or applications where one AC drive must operate multiple motors, such as fans and pumps.

Note

When using vector control, you must perform motor auto-tuning because the advantages of vector control can be obtained only after correct motor parameters are applied. Better performance is achieved by adjusting the speed regulator parameters in group F2 (or group A2 for motor 2, group A3 for motor 3 and group A4 for motor 4).

Function Code	Parameter Name	Setting Range	Default
F0-02	Command source selection	0: Operation panel control (LED off) 1: Terminal control (LED on) 2: Communication control (LED flashing)	0

F0-02: This function parameter defines the input channel of the MD310 control commands, for example, Run, Stop, Forward rotation, Reverse rotation and Jog operation.

0. Operation panel control (The REMOTE indicator is off.)

   Commands are given by pressing keys RUN and STOP/RES on the operation panel.

1. Terminal control (The REMOTE indicator is on.)

   Commands are given by using multi-functional input terminals with functions such as FWD, REV, JOGF and JOGR.

2. Communication control (The REMOTE indicator is flashing.)

   Commands are given from a host computer. For details, see descriptions of parameters in group Fd and brief descriptions of corresponding communication card, which are included in the appendix of this manual.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F0-03	Main frequency setting channel selection	0: Digital setting (non-retentive at power down) 1: Digital setting (retentive at power down) 2: AI1 3: AI2 4: AI3 5: Pulse reference 6: Multi-reference 7: Simple PLC 8: PID 9: Communication reference	0

F0-03: This function parameter selects the channel used to set the main frequency reference.

0. Digital setting (non-retentive at power down)

   The initial value of the frequency reference is F0-08 (Preset frequency). You can change the frequency reference by pressing ▲ and ▼ on the operation panel (or using the UP/DOWN function of the input terminals).

   When the M3D10 is powered on again after power down, the frequency reference continues from the value of F0-08.

1. Digital setting (retentive at power down)

   The initial value of the frequency reference is F0-08 (Preset frequency). You can change the frequency reference by pressing ▲ and ▼ on the operation panel (or using the UP/DOWN function of the input terminals).

   When the M310 is powered on again after power down, the frequency reference continues from where it last reached.

   Note that F0-23 decides whether the frequency modification is retained at stop.

2. AI1 (0 to 10 V voltage input)

3. AI2 (0 to 10 V voltage input or 4 to 20 mA current input, determined by the setting of jumper J4)

4. AI3 (-10 to 10 V voltage input)

   The frequency reference is entered from an analog input (AI) terminal. The MD310 provides two AI terminals (AI1, AI2). An extra AI terminal (AI3) is provided by the I/O extension card.

   The MD310 provides five curves to indicate the mapping relationship between the input voltage entered from AI1, AI2 or AI3 and the target frequency. Three of the curves have a linear (point-point) correspondence, and two have four-point correspondence. You can set the curves by using function codes F4-13 to F4-27 and function codes in group A6, and select curves for AI1, AI2 and AI3 in function code F4-33.

   When an analog input is used as the frequency source, 100% of the voltage/current input corresponds to the value of F0-10 (Max. frequency).

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

5. Pulse reference (DI5)

   The frequency reference is input by means of DI5 (high-speed pulse). The signal specification of pulse reference is 9 to 30 V (voltage range) and 0 to 20 kHz (frequency range).

   You can set the relationship between the pulse reference and the corresponding percentage by using function codes F4-28 to F4-31. The relationship is a two-point linear correspondence. The corresponding value 100% of the pulse reference corresponds to the value of F0-10 (Max. frequency).

6. Multi-reference

   In multi-reference mode, combinations of different DI terminal states correspond to different frequency references. The MD310 supports a maximum of 16 references implemented by 16 state combinations of four DI terminals (allocated with functions 12 to 15) in Group FC. The multiple references indicate percentages of the value of F0-10 (Max. frequency).

   If a DI terminal is used for the multi-reference function, you need to set related parameters in group F4.

7. Simple PLC

   When using the simple PLC mode as the frequency source, the MD310 running frequency can be switched among the 16 frequency references. You can set the holding time and acceleration/deceleration time of the 16 frequency references. For details, refer to the descriptions of Group FC.

8. PID

   PID control is generally used in on-site process closed-loop control, such as constant pressure closed-loop control and constant tension closed-loop control.

   When applying PID as the frequency source, you need to set parameters of PID function in group FA.

9. Communication reference

   The main frequency reference is given by the host computer. The MD310 supports the Modbus communication protocols.

Function Code	Parameter Name	Setting Range	Default
F0-04	Auxiliary frequency setting channel selection	The same as for F0-03 described above	0

F0-04: When used as an independent frequency input channel (frequency source switched over from main to auxiliary), F0-04 is used in the same way as F0-03. When used for superposition (frequency source is "main and auxiliary superposition"), pay attention to the following aspects:

- If the Auxiliary frequency setting channel is digital setting, the preset frequency (F0-08) does not take effect. You can directly adjust the auxiliary frequency reference by pressing keys ▲ and ▼ on the operation panel (or using the UP/DOWN function of the input terminals) based on the main frequency reference.
- If the auxiliary frequency setting channel is analog input (AI1, AI2 and AI3) or pulse reference, 100% of the input corresponds to the range of the auxiliary frequency (set in F0-05 and F0-06). This is valid only for the main and auxiliary superposition.
- If the auxiliary frequency setting channel is pulse reference, it is similar to analog input.

Note

Main and auxiliary must not use the same channel. That is, F0-03 and F0-04 cannot be set to the same value.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F0-05	Base value of range of auxiliary frequency Y for Main and auxiliary superposition	0: Relative to maximum frequency 1: Relative to main frequency X	0
F0-06	Range of auxiliary frequency Y for Main and auxiliary superposition	0% to 150%	100%

F0-05, F0-06: These two function parameters limit the auxiliary frequency Y for Main and auxiliary superposition.

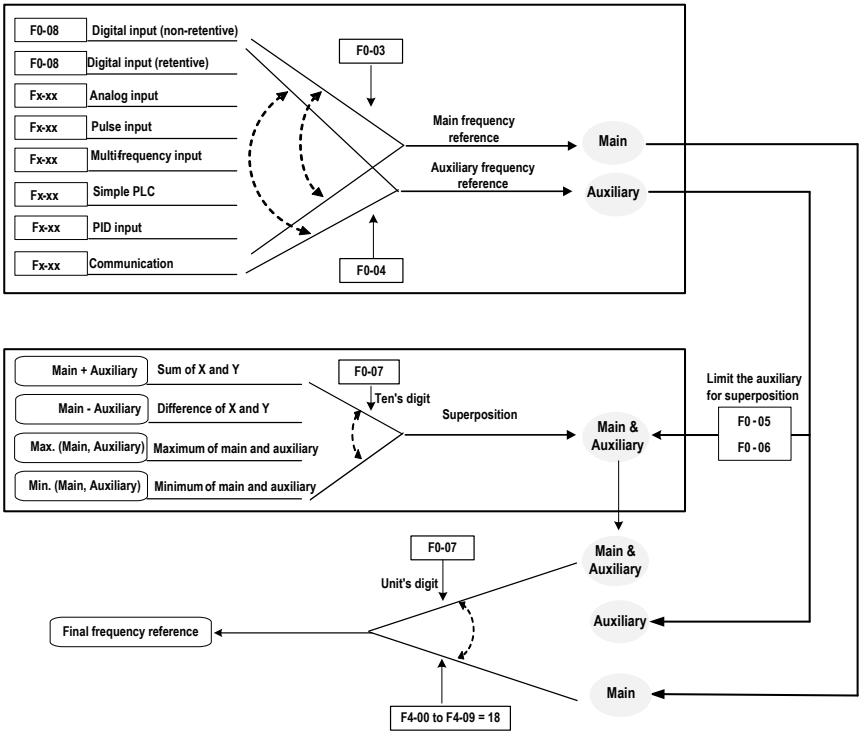
You can set the auxiliary frequency range to be relative to either maximum frequency or main frequency in F5-05. If relative to main frequency, the range of the auxiliary frequency varies with the main frequency.

Function Code	Parameter Name	Setting Range	Default
F0-07	Frequency source superposition selection	Unit's digit: Frequency source selection 0: Main frequency setting channel 1: Main and auxiliary superposition (superposition relationship determined by ten's digit) 2: Switchover between main and auxiliary 3: Switchover between main and "Main and auxiliary superposition" 4: Switchover between auxiliary and "Main and auxiliary superposition"	00
		Ten's digit: Main and auxiliary superposition relationship) 0: Main + Auxiliary 1: Main - Auxiliary 2: MAX (main, auxiliary) 3: MIN (main, auxiliary)	

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

F0-07: This function parameter tells how to set the final frequency reference when main and auxiliary superposition is involved.

If the frequency setting channel involves main and auxiliary superposition, you can directly add the value set in F0-21 to the main and auxiliary superposition result to flexibly satisfy various requirements.



Function Code	Parameter Name	Setting Range	Default
F0-08	Preset frequency	0.00 to max. frequency (F0-10)	50.00 Hz

F0-08: This function parameter is the initial value of frequency reference if the frequency source is digital setting.

Function Code	Parameter Name	Setting Range	Default
F0-09	Rotation direction	0 to 1	0

F0-09: To implement change of the rotation direction of motor, directly modify this function parameter, which is equivalent to exchanging any two of U, V, W cables of the motor.

Note

The original direction of motor will be resumed after parameter initialization. Never use this function in applications where changing the rotation direction of motor is prohibited after system commissioning is completed.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F0-10	Max. frequency	50.00 to 500.00 Hz	50.00 Hz

F0-10: This function parameter is the value which 100% of the input corresponds to, when the frequency source is AI, pulse reference (DI5), or multi-reference.

Function Code	Parameter Name	Setting Range	Default
F0-11	Source of frequency upper limit	0: Set by F0-12 1: AI1 2: AI2 3: AI3 4: Pulse reference (DI5) 5: Communication reference	0

F0-11: This function parameter sets the channel of frequency upper limit. If the channel is analog input, 100% of analog input corresponds to F0-12. If the source is AI1, AI2, AI3, pulse reference (DI5) or communication reference, the setting is similar to that of the Main frequency setting channel.

For example, to avoid runaway in torque control mode in winding application, you can set the frequency upper limit by means of analog input. When the AC drive reaches the upper limit, it will keep running at this speed.

Function Code	Parameter Name	Setting Range	Default
F0-12	Frequency upper limit	0.00 Hz to maximum frequency (F0-10)	50.00 Hz

F0-12: This function parameter sets the frequency upper limit.

Function Code	Parameter Name	Setting Range	Default
F0-13	Frequency upper limit offset	0.00 Hz to max. frequency (F0-10)	0.00 Hz

F0-13: When the source of the frequency upper limit is analog input or pulse reference, the final frequency upper limit is obtained by adding the value of F0-13 to the value of F0-12.

Function Code	Parameter Name	Setting Range	Default
F0-14	Frequency lower limit	0.00 Hz to frequency upper limit (F0-12)	0.00 Hz

F0-14: When the frequency reference is lower than the value of this function parameter, the AC drive can stop, run at the frequency lower limit, or run at zero speed, determined by F8-14 (Running mode when frequency reference lower than frequency lower limit).

Function Code	Parameter Name	Setting Range	Default
F0-15	Carrier frequency	0.5 to 16.0 kHz	Model dependent

F0-15: This function parameter adjusts the carrier frequency of the AC drive, helping to reduce the motor noise, avoiding the resonance of the mechanical system, and reducing the leakage current to the earth and interference generated by the AC drive.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

When the carrier frequency becomes lower, high harmonics of the output current, the power loss and temperature rise of the motor increase.

When the carrier frequency becomes higher, power loss and temperature rise of the motor decline. However, the AC drive has an increase in power loss, temperature rise and interference.

Adjusting the carrier frequency will exert influences on the following items.

Table 6-1 Influences of carrier frequency adjustment

Carrier frequency	Low → High
Motor noise	Large → Small
Output current waveform	Bad → Good
Motor temperature rise	High → Low
AC drive temperature rise	Low → High
Leakage current	Small → Large
External radiation interference	Small → Large

The factory setting of carrier frequency varies with the AC drive power. If you need to set F0-15 higher than the factory setting, remember to de-rate the AC drive because an increase in temperature rise of the heatsink will result. Otherwise, the AC drive may overheat and alarm.

Function Code	Parameter Name	Setting Range	Default
F0-16	Carrier frequency adjusted with temperature	0: No 1: Yes	1

F0-16: This function parameter sets whether the carrier frequency is adjusted based on the heatsink temperature.

If yes, The AC drive automatically reduces the carrier frequency when detecting that the heatsink temperature is high. The AC drive resumes the carrier frequency to the set value when the heatsink temperature becomes normal.

This function aims at reducing the opportunities of AC drive to alarm due to overheat.

Function Code	Parameter Name	Setting Range	Default
F0-17	Acceleration time 1	0.00 to 650.00s (F0-19 = 2) 0.0 to 6500.0s (F0-19 = 1) 0 to 65000s (F0-19 = 0)	Model dependent
F0-18	Deceleration time 1	0.00 to 650.00s (F0-19 = 2) 0.0 to 6500.0s (F0-19 = 1) 0 to 65000s (F0-19 = 0)	Model dependent

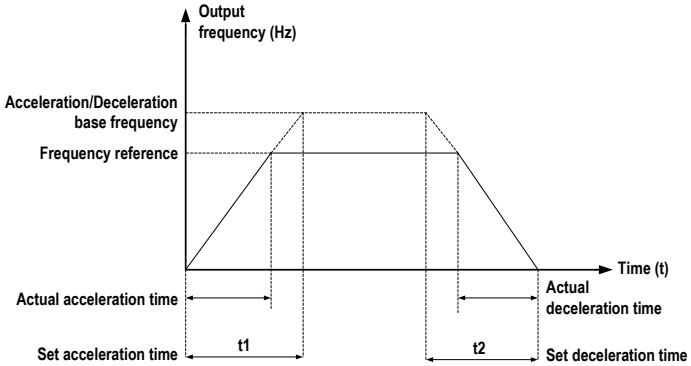
F0-17, F0-18: These two function parameters set the first group of acceleration/deceleration time.

Acceleration time indicates the time required by the AC drive to accelerate from 0 Hz to F0-25 (Acceleration/Deceleration base frequency), that is, t1 in Figure 6-1.

Deceleration time indicates the time required by the AC drive to decelerate from F0-25 (Acceleration/Deceleration base frequency) to 0 Hz, that is, t2 in Figure 6-1.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Figure 8-1 Acceleration/Deceleration time



The MD310 provides totally four groups of acceleration/deceleration time for selection. You can perform switchover by using a DI terminal.

- Group 1: F0-17, F0-18
- Group 2: F8-03, F8-04
- Group 3: F8-05, F8-06
- Group 4: F8-07, F8-08

Function Code	Parameter Name	Setting Range	Default
F0-19	Acceleration/Deceleration time unit	0:1s 1: 0.1s 2: 0.01s	1

F0-19: This function parameter sets the unit of acceleration/deceleration time.

Note

Modifying this parameter will make the displayed decimal places change and corresponding acceleration/deceleration time also change.

Function Code	Parameter Name	Setting Range	Default
F0-21	Frequency offset of Auxiliary frequency setting channel for Main and auxiliary superposition	0.00 Hz to max. frequency (F0-10)	0.00 Hz

F0-21: This function parameter is valid only when the frequency source is Main and auxiliary superposition. The final frequency reference is obtained by adding the value set in F0-21 to the Main and auxiliary superposition result.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F0-23	Retentive of digital setting frequency upon stop	0: Non-retentive 1: Retentive	0

F0-23: This function parameter is valid only when the frequency source is digital setting.

0. Non-retentive

   The AC drive resumes the frequency reference to the value set in F0-08 at stop. The frequency reference continues from the value of F0-08 at next power-on.

1. Retentive

   The AC drive retains the frequency reference that was last reached at stop. The frequency reference continues from the retained value at next power-on.

Function Code	Parameter Name	Setting Range	Default
F0-24	Motor parameter group selection	0: Motor parameter group 1 1: Motor parameter group 2 2: Motor parameter group 3 3: Motor parameter group 4	0

F0-24: This function parameter selects the current motor parameter group.

The MD310 supports driving four motors at different time. Motor parameter group 1 corresponds to groups F1 and F2. Motor parameter groups 2, 3 and 4 correspond to groups A2, A3 and A4 respectively. You can implement switchover amongst the four motor parameter groups via a DI terminal.

When motor selection via F0-24 and the selection via terminal are active simultaneously, terminal decides the motor selection.

Function Code	Parameter Name	Setting Range	Default
F0-25	Acceleration/Deceleration time base frequency	0: Maximum frequency (F0-10) 1: Frequency reference 2: 100 Hz	0

F0-25: The acceleration/deceleration time indicates the time it takes the drive to change between 0 Hz to the frequency set in this function parameter.

When F0-25 is set to 1, the acceleration/deceleration time is related to the frequency reference. If the frequency reference changes frequently, the acceleration/deceleration time will keep changing. Pay more attentions during applications.

Function Code	Parameter Name	Setting Range	Default
F0-26	Base frequency for UP/DOWN modification during running	0: Running frequency 1: Frequency reference	0

F0-26: This function parameter is valid only when the frequency source is digital setting. It sets the base frequency to be modified by using keys ▲ and ▼, or the terminal UP/DOWN function. If the running frequency and frequency reference are different, there will be a large difference between the AC drive's performance during the acceleration/deceleration process.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F0-27	Binding command source to frequency source	0: No binding 1: Digital setting frequency 2: AI1 3: AI2 4: AI3 5: Pulse reference (DI5) 6: Multi-reference 7: Simple PLC 8: PID 9: Communication reference Unit's digit: Binding operation panel control to frequency source Ten's digit: Binding terminal control to frequency source Hundred's digit: Binding communication control to frequency source Thousand's digit: Binding automatic running to frequency source	0000

F0-27: This function parameter defines the binding of three command sources and nine frequency sources. Different command sources can be bound to the same frequency source. If a command source is bound to a frequency source, the frequency source set in F0-03 to F0-07 no longer takes effect.

Group F1: Motor 1 Parameters

Function Code	Parameter Name	Setting Range	Default
F1-00	Motor type selection	0: Common asynchronous motor 1: Variable frequency asynchronous motor	0
F1-01	Rated motor power	0.1 to 30.0 kW	Model dependent
F1-02	Rated motor voltage	1 to 1000 V	Model dependent
F1-03	Rated motor current	0.01 to 655.35 A	Model dependent
F1-04	Rated motor frequency	0.01 Hz to max. frequency	Model dependent
F1-05	Rated motor speed	1 to 65535 rpm	Model dependent

F1-00 to F1-05: These function parameters are motor nameplate parameters. Set them correctly according to the motor nameplate to ensure accurate motor auto-tuning result. The advantages of V/F or vector control can be obtained only after correct motor parameters are applied.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F1-06	Stator resistance	0.001 to 65.535 Ω	Model dependent
F1-07	Rotor resistance	0.001 to 65.535 Ω	Model dependent
F1-08	Leakage inductive reactance	0.01 to 655.35 mH	Model dependent
F1-09	Mutual inductive reactance	0.1 to 6553.5 mH	Model dependent
F1-10	No-load current	0.01 to F1-03	Model dependent

F1-06 to F1-10: These function parameters are obtained by means of motor auto-tuning. For details on motor auto-tuning, see the descriptions of F1-37 (Auto-tuning selection).

Each time F1-01 (Rated motor power) or F1-02 (Rated motor voltage) is modified, the AC drive automatically restores F1-06 to F1-10 to common standard Y series motor parameters.

If motor auto-tuning cannot be performed on site, set these parameters according to the data provided by motor manufacturer.

Function Code	Parameter Name	Setting Range	Default
F1-37	Auto-tuning selection	0: No auto-tuning 1: Static auto-tuning 2: Dynamic auto-tuning	0

F1-37: This function code selects the auto-tuning mode.

No auto-tuning

Auto-tuning is prohibited.

Static auto-tuning

It is applicable to scenarios where dynamic auto-tuning cannot be performed because the asynchronous motor cannot be disconnected from the load.

To perform static auto-tuning, set F1-00 to F1-05 according to the motor nameplate, set F1-37 to 1 and press RUN . You can obtain the value of parameters F1-06 to F1-08 from the static auto-tuning.

Dynamic auto-tuning

It is applicable to scenarios where the asynchronous motor can be disconnected from the load. In the dynamic auto-tuning process, the AC drive performs static auto-tuning first and then accelerates to 80% of the rated motor frequency within the acceleration time set in F0-17. The AC drive keeps running for a certain period and then decelerates to stop within deceleration time set in F0-18.

To perform dynamic auto-tuning, set F1-00 to F1-05 according to the motor nameplate, set F1-37 to 2 and press RUN . You can obtain the value of parameters F1-06 to F1-10 and F2-13 t0 F2-16 from the dynamic auto-tuning.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Group F2: Vector Control Parameters

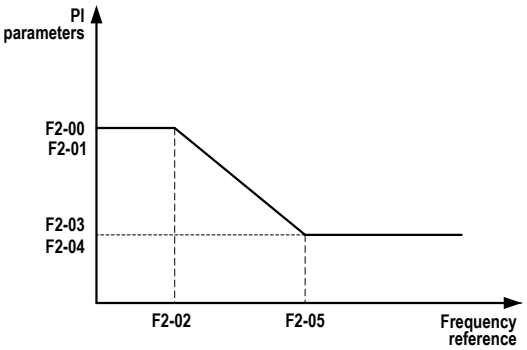
Group F2 is valid for vector control only. In V/F control applications, ignore it.

Function Code	Parameter Name	Setting Range	Default
F2-00	Speed loop proportional gain 1	1 to 100	30
F2-01	Speed loop integral time 1	0.01 to 10.00s	0.50s
F2-02	Switchover frequency 1	0.00 to F2-05	5.00 Hz
F2-03	Speed loop proportional gain 2	0 to 100	20
F2-04	Speed loop integral time 2	0.01 to 10.00s	1.00s
F2-05	Switchover frequency 2	F2-02 to max. frequency	10.00 Hz

F2-00 to F2-05: These function parameters are speed loop PI parameters.

- If the running frequency is less than or equal to F2-02 (Switchover frequency 1), the PI parameters are F2-00 and F2-01.
- If the running frequency is equal to or greater than F2-05 (Switchover frequency 2), PI parameters are F2-03 and F2-04.
- If the running frequency is between F2-02 and F2-05, the PI parameters are obtained from linear switchover between the two groups of PI parameters, as shown in Figure 6-2.

Figure 8-2 Speed loop PI parameters



You can improve the system response by either increasing the proportional gain or reducing the integral time. Be aware that this may lead to system oscillation.

You are suggested to Increase the proportional gain first to ensure that the system does not oscillate, and then reduce the integral time to ensure that the system has quick response and small overshoot.

Note

Improper PI setting may cause too large speed overshoot and even overvoltage during overshoot drop.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F2-06	Vector control slip gain	50% to 200%	100%

F2-06: This function parameter adjusts speed stability accuracy of the motor in SVC. When the motor with load runs at a very low speed, increase F2-06. When the motor with load runs at a very large speed, decrease F2-06.

Function Code	Parameter Name	Setting Range	Default
F2-07	Speed loop filter time constant	0.000s to 0.100s	0.000s

F2-07: This function parameter filters the torque current reference in SVC.

Increase it adequately when the speed fluctuation is very large. Decrease it when the motor oscillates. This parameter rarely needs to be modified.

Small speed loop filter time constant may result in larger output torque fluctuation but rapid speed response.

Function Code	Parameter Name	Setting Range	Default
F2-08	Over-excitation gain in vector control	0 to 200	64

F2-08: This function parameter can restrain rise of the bus voltage during deceleration of the AC drive, preventing occurrence of overvoltage.

Increase this parameter in applications where overvoltage is likely to occur during deceleration. The larger the over-excitation gain is, the better the restraining result will be achieved. But very large setting may lead to an increase in output current. Thus set a proper value according to the actual condition.

Set F2-08 to 0 in applications where the inertia is small and bus voltage will not rise during motor deceleration or where regen resistor is applied.

Function Code	Parameter Name	Setting Range	Default
F2-09	Torque upper limit source in speed control mode	0: F2-10 1: AI1 2: AI2 3: AI3 4: Pulse reference (DI5) 5: Communication reference 6: MIN (AI1, AI2) 7: MIN (AI1, AI2)	0
F2-10	Digital setting of torque upper limit in speed control mode	0.0% to 200.0%	150.0%

F2-09: This function parameter restricts the maximum output torque of the AC drive in the speed control mode. If the torque upper limit source is analog input, pulse or communication reference, 100% of the setting corresponds to F2-10, and 100% of F2-10 corresponds to the AC drive rated torque.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

For details on setting of AI1, AI2 and AI3, see the descriptions of the AI curves in group F4. For details on pulse reference, see the descriptions of F4-28 to F4-32.

If communication is selected, the host computer writes data -100.00% to 100.00% using the communication address 0x1000, where 100.0% corresponds to F2-10. The communication protocol is Modbus.

Function Code	Parameter Name	Setting Range	Default
F2-13	Excitation adjustment proportional gain	0 to 60000	2000
F2-14	Excitation adjustment integral gain	0 to 60000	1300
F2-15	Torque adjustment proportional gain	0 to 60000	2000
F2-16	Torque adjustment integral gain	0 to 60000	1300

F2-13 to F2-16: These function parameters are vector control current loop PI parameters. They are obtained from motor auto-tuning and need not be modified.

The dimension of the current loop integral regulator is integral gain rather than integral time. Very large current loop PI gain may lead to control loop oscillation. When current oscillation or torque fluctuation is great, decrease the proportional gain or integral gain.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Group F3: V/F Control Parameters

Group F3 is valid only for V/F control. In vector control applications, ignore it.

V/F control is applicable to low load applications (fan or pump) or applications where one AC drive operates multiple motors or there is a large difference between the AC drive power and the motor power.

Function Code	Parameter Name	Setting Range	Default
F3-00	V/F curve setting	0: Linear V/F	64
		1: Multi-point V/F	
		2: Square V/F	
		3: 1.2-power V/F	
		4: 1.4-power V/F	
		6: 1.6-power V/F	
		8: 1.8-power V/F	
		9: Reserved	
		10: V/F complete separation	
		11: V/F half separation	

0 Linear V/F

It is applicable to common constant torque load.

1. Multi-point V/F

It is applicable to special load such as dehydrator and centrifuge. Any such V/F curve can be obtained by setting F3-03 to F3-08.

2. Square V/F

It is applicable to centrifugal loads such as fan and pump.

3 to 8. V/F curve between linear V/F and square V/F

10. V/F complete separation

In this mode, the output frequency and output voltage of the AC drive are independent. The output frequency is determined by the frequency source, and the output voltage is determined by F3-13 (Voltage source for V/F separation).

It is applicable to induction heating, inverse power supply and torque motor control.

11. V/F half separation

In this mode, The V and F proportional relationship can be set in F3-13 and is also related to the rated motor voltage and rated motor frequency in group F1.

Assume that the voltage input is X (0% to 100%), the V and F relationship is: V/F=2 x X x (Rated motor voltage/Rated motor frequency)

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F3-01	Torque boost	0.0% to 30%	Model dependent
F3-02	Cut-off frequency of torque boost	0.00 Hz to max. frequency	50.00 Hz

F3-01 and F3-02: The torque compensation function compensates for insufficient torque production at low frequency.

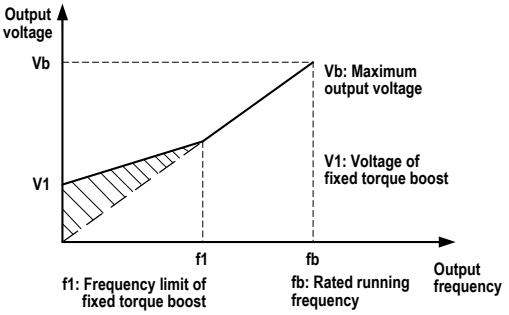
F3-01 compensates for insufficient torque production by boosting output voltage of the AC drive. But very large setting will result in motor overheat and AC drive overcurrent.

- Increase this parameter when a heavy load is applied but the startup torque of the motor is insufficient
- Decrease this parameter when a light load is applied.

If it is set to 0.0%, fixed torque boost is enabled. This moment the AC drive automatically calculates the torque boost value based on motor parameters including the stator resistance.

F3-02 sets the cutoff frequency under which torque boost is active. If the frequency reference exceeds the value set in F3-02, torque boost becomes inactive.

Figure 8-3 Customuzed torque boost



www.Farazcontrol.com (مهندس رمضان زاده)۰۹۱۲۹۲۷۵۱۵۹ واحد فروش:

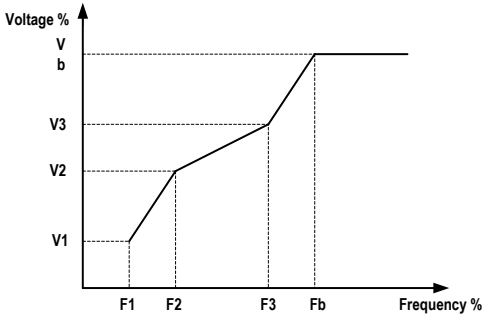
Function Code	Parameter Name	Setting Range	Default
F3-03	Multi-point V/F frequency 1 (F1)	0.00 Hz to F3-05	0.00 Hz
F3-04	Multi-point V/F voltage 1 (V1)	0.0% to 100.0%	0.0%
F3-05	Multi-point V/F frequency 2 (F2)	F3-03 to F3-07	0.00 Hz
F3-06	Multi-point V/F voltage 2 (V2)	0.0% to 100.0%	0.0%
F3-07	Multi-point V/F frequency 3 (F3)	F3-05 to rated motor frequency (F1-04) Note: The rated frequency of motor 2, motor 3 and motor 4 is set in A2-04, A3-04 and A4-04, respectively.	0.00 Hz
F3-08	Multi-point V/F voltage 3 (V3)	0.0% to 100.0%	0.0%

F3-03 to F3-08: These function parameters define multi-point V/F curve.

You must set the multi-point V/F curve based on the motor's load characteristic. The three voltage points and frequency points must satisfy: V1 < V2 < V3, F1 < F2 < F3.

Very large voltage setting at low frequency may result in motor overheat or burnt out, and AC drive overcurrent stall or overcurrent protection.

Figure 8-4 Multi-point V/F curve



Function Code	Parameter Name	Setting Range	Default
F3-09	V/F slip compensation gain	0% to 200.0%	0.0%

F3-09: This function parameter compensates for the motor speed slip when load increases.

Setting 100.0% indicates compensation for rated motor speed slip when rated load is applied. The rated motor speed slip is obtained from calculation of the rated motor frequency and rated motor speed in group F1.

Slightly adjust F3-09 to minimize the difference between the actual motor speed and target motor speed.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F3-10	V/F over-excitation gain	0–200	64

F3-10: This function parameter can restrain rise of the bus voltage during deceleration of the AC drive, preventing occurrence of overvoltage.

Increase this parameter in applications where overvoltage is likely to occur during deceleration. The larger the over-excitation gain is, the better the restraining result will be achieved. But very large setting may lead to an increase in output current. Thus set a proper value according to the actual condition.

Set F3-10 to 0 in applications where the inertia is small and bus voltage will not rise during motor deceleration or where regen resistor is applied.

Function Code	Parameter Name	Setting Range	Default
F3-11	V/F oscillation suppression gain	0 to 100	Model dependent

F3-11: Set this function parameter as small as possible in the prerequisite of ensuring good oscillation suppression result to avoid negative influence on V/F control.

- Set this parameter to 0 to disable oscillation suppression if there is no oscillation.
- Increase this parameter only when motor oscillation is obvious.

The larger the value is, the better the oscillation suppression result will be achieved. Ensure that F1-03 (Rated motor current) and F1-10 (No-load current) are correct before setting this parameter.

Function Code	Parameter Name	Setting Range	Default
F3-12	Oscillation suppression mode	0 to 4	3

Function Code	Parameter Name	Setting Range	Default
F3-13	Voltage source for V/F separation	0: Set by F3-14 1: AI1 2: AI2 3: AI3 4: Pulse reference (DI5) 5: Multi-reference 6: Simple PLC 7: PID 8: Communication reference 100.0% corresponds to the rated motor voltage (F1-02, A2-02, A3-02 and A4-02).	0
F3-14	Digital setting of voltage for V/F separation	0 V to rated motor voltage	0 V

F3-13 and F3-14: The V/F separation function is generally applicable to applications such as induction heating, inverter power supply and torque motor control.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

If this function is enabled, the output voltage can be set by F3-14, from analog input, pulse reference, multi-reference, simple PLC, PID or communication reference. The voltage sources for V/F separation are the same as the frequency sources. For details, see F0-03.

Except for digital setting (set by F3-14), 100% of the setting corresponds to the rated motor voltage. If the percentage is negative, take its absolute value.

0. Set by F3-14
1. AI1
2. AI2
3. AI3

   The output voltage is entered from an analog input.

4. Pulse reference (DI5)

   The output voltage is entered from pulse reference (DI5).

   Pulse input specification: voltage range 9 to 30 V, frequency range 0 to 20 kHz

5. Multi-reference

   Set parameters in groups F4 and FC to determine the correspondence between signal reference and voltage reference. Setting 100.0% of the multi-reference in group FC corresponds to the rated motor voltage.

6. Simple PLC

   Set parameters in group FC to determine the setting output voltage.

7. PID

   The output voltage is generated from PID closed loop. For details, see the description of the PID function in group FA.

8. Communication reference

   The output voltage is set by means of communication.

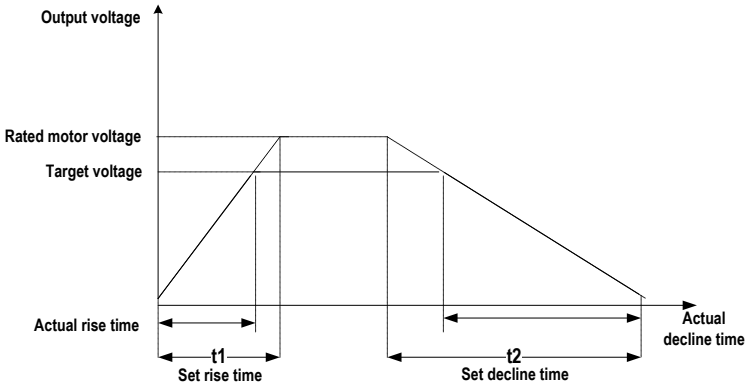
   The setting of voltage for V/F separation is similar to that of the Main frequency setting channel. For details, see the description of F0-03. Percentage 100.0% corresponds to the rated motor voltage. If the percentage is negative, take its absolute value.

Function Code	Parameter Name	Setting Range	Default
F3-15	Voltage rise time of V/F separation	0.0s to 1000.0s	0.0s

F3-15 and F3-16: This function parameter sets the time of the V/F separation voltage to rise from 0 V to the rated motor voltage.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Figure 8-5 V/F separation

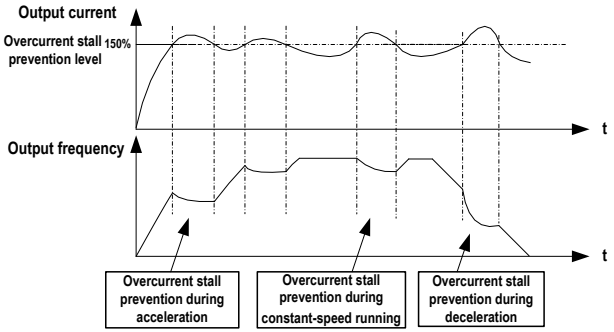


Function Code	Parameter Name	Setting Range	Default
F3-18	Overcurrent stall prevention level	50% to 200%	150%
F3-19	Overcurrent stall prevention selection	0: Disabled 1: Enabled	1
F3-20	Overcurrent stall prevention gain	0 to 100	20
F3-21	Speed multiplying overcurrent stall prevention level compensation factor	0% to 200%	0

When the output current exceeds the value set in F3-18 during acceleration, running at constant speed or deceleration, the overcurrent stall prevention function is enabled and the output frequency starts to drop. Until the output current recovers below the stall prevention level, the output frequency starts to accelerate to the target frequency agian.

Using this function will increase the acceleration time. If the actual acceleration time cannot satisfy the requirement, increase the value of F3-18 adequately.

Figure 8-6 Overcurrent stall prevention function



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

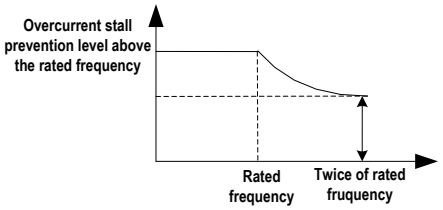
In the high frequency area, the motor drive current is small and bigger motor speed drop is caused by stall current compared with below the rated frequency. To improve the motor running characteristic, you can lower the overcurrent stall prevention level above the rated frequency.

The overcurrent stall prevention function above the rated frequency helps to improve the acceleration performance in the applications, such as centrifuge, where high running frequency and several times of field weakening are required, and the load inertia is large.

The overcurrent stall prevention level above the rated frequency = (fs/fn) x k x LimitCur.

- fs: running frequency
- fn: rated motor frequency
- k: speed multiplying overcurrent stall prevention level compensation factor (F3-21)
- LimitCur: Overcurrent stall prevention level (F3-18)

Figure 8-7 Overcurrent stall prevention level above the rated frequency



Note

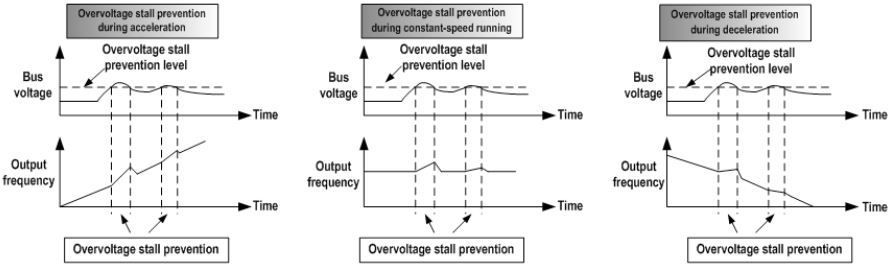
- The overcurrent stall prevention level 150% indicates 1.5 times of the rated current of the AC drive.
- For high-power motor with carrier frequency below 2 kHz, lower the overcurrent stall prevention level. This is because the fast current limit function is enabled in advance of the overcurrent stall prevention function due to increase of pulsating current, which will result in insufficient torque output.

Function Code	Parameter Name	Setting Range	Default
F3-22	Overvoltage stall prevention level	120% to 150%	150%
F3-23	Overvoltage stall prevention selection	0: Disabled 1: Enabled	1
F3-24	Overvoltage stall prevention frequency gain	0 to 100	30
F3-25	Overvoltage stall prevention voltage gain	0 to 100	30
F3-26	Overvoltage stall prevention max. frequency limit	0 to 50 Hz	5 Hz

When the bus voltage exceeds the value set F3-22, it indicates that the motor becomes an electric generator (motor speed larger than the drive output frequency). In this case, the overvoltage stall prevention function is enabled and adjusts the output frequency (dissipates the regenerative energy).

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Using this function will increase the deceleration time and avoid overvoltage trip. If the actual deceleration time cannot satisfy the requirement, increase the value of F3-10 (V/F over-excitation gain) adequately.



Note

When using regen resistor, braking unit or energy feedback unit, pay attention to the following aspects:

- Set F3-10 (V/F over-excitation gain) to 0. Otherwise, overcurrent may result during the drive running.
- Set F3-23 (overvoltage stall prevention selection) to 0 (disabled). Otherwise, the deceleration time may be increased.

Function Code	Parameter Name	Setting Range	Default
F3-27	Slip compensation time constant	0.1s to 10.0s	0.5s

The smaller the value of F3-27 is set, the faster response will be obtained. But too small setting may cause overvoltage fault Err07 to large-inertia load.

Group F4: Input Terminals

The MD310 provides five DI terminals (DI5 can be used for high-speed pulse input) and two analog input (AI terminals). The optional extension card provides another five DI terminals and an AI terminal (AI3).

Function Code	Parameter Name	Setting Range	Default
F4-00	DI1 function selection	0 to 50	1
F4-01	DI2 function selection	0 to 50	4
F4-02	DI3 function selection	0 to 50	9
F4-03	DI4 function selection	0 to 50	12
F4-04	DI5 function selection	0 to 50	13
F4-05	DI6 function selection	0 to 50	0
F4-06	DI7 function selection	0 to 50	0
F4-07	DI8 function selection	0 to 50	0
F4-08	DI9 function selection	0 to 50	0
F4-09	DI10 function selection	0 to 50	0

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

0. No function

   Set reserved terminals to 0 to avoid malfunction.

1. Forward RUN (FWD)

2. Reverse RUN (REV)

   The DI terminals selecting these two functions control forward and reverse running of the AC drive.

3. Three-wire control mode

   The DI terminal set for this function determines three-wire control mode of the AC drive. For details, see the description of F4-11.

4. Forward jog (FJOG)

5. Reverse jog (RJOG)

   FJOG indicates forward jog running, and RJOG indicates reverse jog running. The jog frequency, jog acceleration time and jog deceleration time are described respectively in F8-00, F8-01 and F8-02.

6. Terminal UP

7. Terminal DOWN

   The terminals selecting these two functions are used for increment and decrement when frequency reference is input via external DI terminal, or when the frequency source is digital setting.

8. Coast to stop

   When the terminal set for this function becomes on, the AC drive shuts off output and the stop process of the motor is not controlled by the AC drive. It means the same as coast to stop described in F6-10.

9. Fault reset (RESET)

   You can perform fault reset via DI terminal set for this function. It is the same as the function of RESET key on the operation panel. Remote fault reset is implemented by this function.

10. RUN disabled

    When the terminal set for this function becomes on, the AC drive decelerates to stop and retains all running parameters, such as PLC, wobble and PID parameters. Once the terminal becomes off, the AC drive resumes the running state before stop.

11. External fault NO input

    When the terminal set for this function becomes on, the AC drive reports ERR15 and performs the fault protection action. For details, see F9-47.

12. Multi-reference terminal 1

13. Multi-reference terminal 2

14. Multi-reference terminal 3

15. Multi-reference terminal 4

    The 16 speeds or 16 other references can be implemented through combinations of 16 states of these four terminals.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

16. Terminal 1 for acceleration/deceleration time selection

17. Terminal 2 for acceleration/deceleration time selection

    Totally four groups of acceleration/deceleration time can be selected through combinations of four states of these two terminals.

18. Frequency source switchover

    The terminal set for this function is used to perform switchover between two frequency sources according to the setting in F0-07.

19. UP and DOWN setting clear (terminal, operation panel)

    If the frequency source is digital setting, the terminal set for this function is used to clear the modification by using the UP/DOWN function or the increment/decrement key on the operation panel, restoring the frequency reference to the value of F0-08.

20. Command source switchover 1

    - If the command source is terminal control (F0-02 = 1), this terminal is used to perform switchover between terminal control and operation panel control.
    - If the command source is communication control (F0-02 = 2), this terminal is used to perform switchover between communication control and operation panel control.

21. Acceleration/Deceleration prohibited

    This function ensures the AC drive to maintain the current frequency output without being affected by external signals (except the STOP command).

22. PID disabled

    This function disables the PID function. The AC drive maintains the current frequency output without supporting PID adjustment of frequency source.

23. PLC state reset

    When the simple PLC function is enabled again after it was disabled in the execution process, this function restores the original state of simple PLC for the AC drive

24. Wobble disabled

    When the terminal set for this function becomes on, the wobble function becomes disabled and the AC drive outputs center frequency.

25. Counter input

    The terminal set for this function is used to count pulses.

26. Counter reset

    The terminal set for this function is used to clear the counter.

27. Length signal pulses count

    The terminal set for this function is used to count pulses of the length signal.

28. Length reset

    The terminal set for this function is used to clear the length.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

29. Torque control prohibited

    When the terminal set for this function becomes on, the torque control is disabled and the AC drive enters speed control.

30. Pulse input as frequency reference (valid only for DI5)

    DI5 is used for pulse input as frequency reference.

31. Reserved

32. Immediate DC injection braking

    Once the terminal set for this function becomes on, the AC drive directly switches over to the DC injection braking state.

33. External fault NC input

    Once the terminal set for this function becomes on, the AC drive reports ERR15 and stops.

34. Frequency modification enabled

    When the terminal set for this function becomes on, the AC drive responds to frequency modification.

35. PID operation direction reverse

    When the terminal set for this function becomes on, the PID operation direction is reversed to the direction set in FA-03.

36. External stop 1

    In the operation panel mode, the terminal set for this function can be used to stop the AC drive, equivalent to the function of the STOP key on the operation panel.

37. Command source switchover 2

    The terminal set for this function is used to perform switchover between terminal control and communication control. If the command source is terminal control, the AC drive switches over to communication control after the terminal becomes ON.

38. PID integral disabled

    When the terminal set for this function becomes on, the integral function becomes disabled. However, the proportional and differentiation functions are still effective.

39. Switchover between Main frequency setting channel and preset frequency

    When the terminal set for this function becomes on, the frequency source X is replaced by the preset frequency set in F0-08.

40. Switchover between Auxiliary frequency setting channel and preset frequency

    When the terminal set for this function becomes on, the frequency source Y is replaced by the preset frequency set in F0-08.

41. Motor selection 1

42. Motor selection 2

    Switchover between the four groups of motor parameters can be implemented through the four state combinations of two terminal set for these two function.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

43. PID parameter switchover

    If PID parameters switchover is done via DI terminal (FA-18 = 1), the PID parameters are FA-05 to FA-07 when the terminal set for this function becomes off; the PID parameters are FA-15 to FA-17 when the terminal set for this function becomes on.

44. User-defined fault 1

45. User-defined fault 2

    If the terminals selecting these two functions become on, the AC drive reports Err27 and Err28 respectively, and performs fault protection actions based on the setting in F9-49.

46. Speed control/Torque control

    This function enables the AC drive to switch over between speed control and torque control.

    When the terminal set for this function becomes off, the AC drive runs in the mode set in A0-00.

    When the terminal set for this function becomes on, the AC drive switches over to the other control mode.

47. Emergency stop

    When the terminal set for this function becomes on, the AC drive immediately stops as fast as possible. During the stop process, the current remains at the set upper limit. This function aims at satisfying the applications where emergency stop is required.

48. External stop 2

    This function enables the AC drive to decelerate to stop in any control mode (operation panel, terminal or communication). In this case, the deceleration time is deceleration time 4.

49. Deceleration DC injection braking

    When the terminal set for this function becomes on, the AC drive decelerates to the DC injection braking 2 frequency threshold and then switches over to DC injection braking state.

50. Clear the current running time

    When the terminal set for this function becomes on, the current running time of the AC drive is cleared. This function must be supported by F8-42 and F8-53.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

The four multi-reference terminals have 16 state combinations, corresponding to 16 references, as listed in the following table.

K4	K3	K2	K1	Reference Setting	Corresponding Pr.
OFF	OFF	OFF	OFF	Reference 0	FC-00
OFF	OFF	OFF	ON	Reference 1	FC-01
OFF	OFF	ON	OFF	Reference 2	FC-02
OFF	OFF	ON	ON	Reference 3	FC-03
OFF	ON	OFF	OFF	Reference 4	FC-04
OFF	ON	OFF	ON	Reference 5	FC-05
OFF	ON	ON	OFF	Reference 6	FC-06
OFF	ON	ON	ON	Reference 7	FC-07
ON	OFF	OFF	OFF	Reference 8	FC-08
ON	OFF	OFF	ON	Reference 9	FC-09
ON	OFF	ON	OFF	Reference 10	FC-10
ON	OFF	ON	ON	Reference 11	FC-11
ON	ON	OFF	OFF	Reference 12	FC-12
ON	ON	OFF	ON	Reference 13	FC-13
ON	ON	ON	OFF	Reference 14	FC-14
ON	ON	ON	ON	Reference 15	FC-15

If the frequency source is multi-reference, the value 100% of FC-00 to FC-15 corresponds to F0-10 (Max. frequency). Besides the multi-speed function, the multi-reference can be also used as the PID reference source or the voltage source for V/F separation.

Two terminals for acceleration/deceleration time selection have four state combinations, as listed in the following table.

Terminal 2	Terminal 1	Accel/Decel Time Selection	Corresponding Pr.
OFF	OFF	Accel/Decel time 1	F0-17, F0-18
OFF	ON	Accel/Decel time 2	F8-03, F8-04
ON	OFF	Accel/Decel time 3	F8-05, F8-06
ON	ON	Accel/Decel time 4	F8-07, F8-08

Two motor selection terminals have four state combinations, as listed in the following table.

Terminal 2	Terminal 1	Selected Motor	Corresponding Pr.
OFF	OFF	Motor 1	Groups F1, F2
OFF	ON	Motor 2	Group A2
ON	OFF	Motor 3	Group A3
ON	ON	Motor 4	Group A4

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F4-10	DI filter time	0.000s to 1.000s	0.010s

F4-10: This function parameter sets the software filter time of DI terminal. If DI terminals are liable to interference, which may cause malfunction, increase this parameter to enhance the anti-interference capability. However, increase of DI filter time will slow the response of DI terminals.

Function Code	Parameter Name	Setting Range	Default
F4-11	Terminal command mode	0: Two-wire control mode 1	0
		1: Two-wire control mode 2	
		2: Three-wire control mode 1	
		3: Three-wire control mode 2	

F4-11: This function parameter defines the four modes, in which the AC drive running is controlled via DI terminals.

The following example takes DI1, DI2 and DI3 to describe how to control the AC drive via DI terminals.

0. Two-wire control mode 1

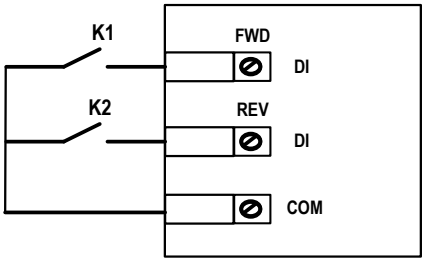
It is the most commonly used two-wire control mode, in which the forward/reverse rotation of the motor is decided by DI1 and DI2. The parameters are set as below:

Function Code	Parameter Name	Value	Function Description
F4-11	Terminal command mode	0	Two-wire control mode 1
F4-00	DI1 function selection	1	Forward RUN (FWD)
F4-01	DI2 function selection	2	Reverse RUN (REV)

As shown in the following figure, when only K1 is on, the AC drive instructs forward rotation. When only K2 is on, the AC drive instructs reverse rotation. When K1 and K2 are on or off simultaneously, the AC drive stops.

Figure 8-8 Two-wire control mode 1

K1	K2	Running Command
1	0	Forward
0	1	Reverse
1	1	Stop
0	0	Stop



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

1. Two-wire control mode 2

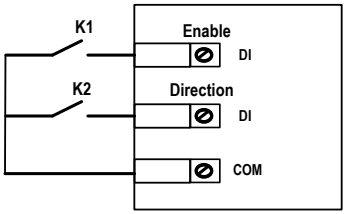
In this mode, DI1 is RUN enabled terminal, and DI2 determines the running direction. The parameters are set as below:

Function Code	Parameter Name	Value	Function Description
F4-11	Terminal command mode	1	Two-wire control mode 2
F4-00	DI1 function selection	1	RUN enabled
F4-01	DI2 function selection	2	Forward or reverse

As shown in the following figure, on the condition that K1 is on, the AC drive instructs forward rotation when K2 is off and instructs reverse rotation when K2 is on . When K1 is off, the AC drive stops running.

Figure 8-9 Two-wire control mode 2

K1	K2	Running Command
1	0	Forward
1	1	Reverse
0	0	Stop
0	1	Stop



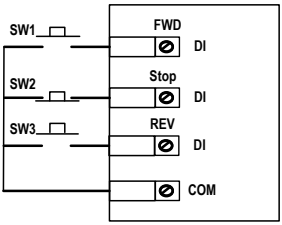
2. Three-wire control mode 1

In this mode, DI3 is RUN enabled terminal, and the direction is decided by DI1 and DI2. The parameters are set as below:

Function Code	Parameter Name	Value	Function Description
F4-11	Terminal command mode	2	Three-wire control mode 1
F4-00	DI1 function selection	1	Forward RUN (FWD)
F4-01	DI2 function selection	2	Reverse RUN (REV)
F4-02	DI3 function selection	3	Three-wire control

As shown in the following figure, on the condition that SW1 is on, the AC drive instructs forward rotation when SW2 is pressed to be on and instructs reverse rotation when SW3 is pressed to be on. The AC drive stops immediately after SW1 becomes off. During normal startup and running, SW1 must remain on. The AC drive's running state is determined by the final action on SW1, SW2 and SW3.

Figure 8-10 Three-wire control mode 1



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

3. Three-wire control mode 2

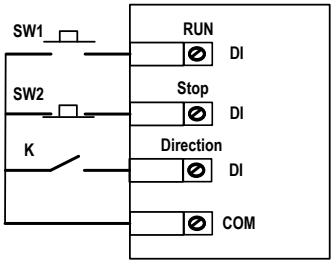
In this mode, DI3 is RUN enabled terminal. The RUN command is given by DI1 and the direction is decided by DI2. The parameters are set as below:

Function Code	Parameter Name	Value	Function Description
F4-11	Terminal command mode	3	Three-wire control mode 2
F4-00	DI1 function selection	1	RUN enabled
F4-01	DI2 function selection	2	Forward or reverse
F4-02	DI3 function selection	3	Three-wire control

As shown in the preceding figure, on the condition that SW1 is ON, the AC drive starts running when SW2 is pressed to be ON; the AC drive instructs forward rotation when K is OFF and instructs reverse rotation when K is ON. The AC drive stops immediately after SW1 becomes OFF. During normal startup and running, SW1 must remain ON. The AC drive's running state is determined by the final action of SW1, SW2 and K.

Figure 8-11 Three-wire control mode 2

K2	Direction
0	Forward
1	Reverse



Function Code	Parameter Name	Setting Range	Default
F4-12	Terminal UP/DOWN rate	0.001 to 65.535 Hz/s	1.000 Hz/s

F4-12: This function parameter sets the rate of frequency change every second when terminal UP/DOWN is used to adjust frequency reference.

Function Code	Parameter Name	Setting Range	Default
F4-13	AI1 curve min. input	0.00 V to F4-15	0.00 V
F4-14	Corresponding percentage of AI1 curve min. input	-100.00% to 100.0%	0.0%
F4-15	AI1 curve max. input	F4-13 to 10.00 V	10.00 V
F4-16	Corresponding percentage of AI1 curve max. input	-100.00% to 100.0%	100.0%
F4-17	AI1 filter time	0.00s to 10.00s	0.10s

F4-13 to F4-16: These five function parameters set the relationship between the analog input and the corresponding percentage.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

When the analog input voltage exceeds the value of F4-15, the AC drive uses the maximum value.

When the analog input voltage is below the value of F4-13, the AC drive uses the minimum value or 0.0%, determined by the setting of F4-34.

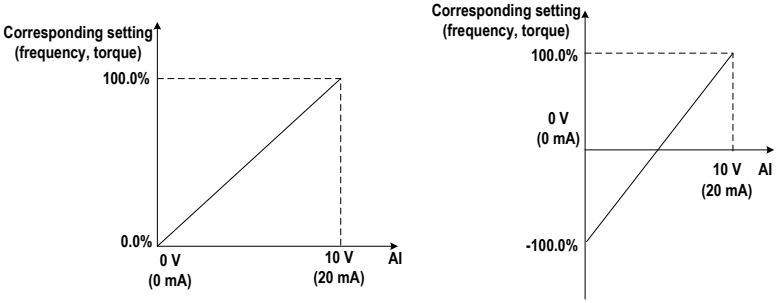
If the analog input is current, 1 mA current is equal to 0.5 V voltage.

F4-17 sets the AI1 software filter time of AI1. If the analog input is liable to interference, increase this parameter to stabilize the detected analog input. But too large setting slows the response of analog detection. Set it properly based on actual conditions.

In different applications, 100% of analog input corresponds to different nominal values.

Two typical relationships between analog input and the corresponding percentage are shown in the following figure.

Figure 8-12 Relationships between analog input and the corresponding percentage



Function Code	Parameter Name	Setting Range	Default
F4-18	AI2 curve min. input	0.00 V to F4-20	0.00 V
F4-19	Corresponding percentage of AI2 curve min. input	-100.00% to 100.0%	0.0%
F4-20	AI2 curve max. input	F4-18 to 10.00 V	10.00 V
F4-21	Corresponding percentage of AI2 curve max. input	-100.00% to 100.0%	100.0%
F4-22	AI2 filter time	0.00s to 10.00s	0.10s
F4-23	AI3 curve min. input	0.00 V to F4-25	-10.00 V
F4-24	Corresponding percentage of AI3 curve min. input	-100.00% to 100.0%	-100.0%
F4-25	AI3 curve max. input	F4-23 to 10.00 V	10.00 V
F4-26	Corresponding percentage of AI3 curve max. input	-100.00% to 100.0%	100.0%
F4-27	AI3 filter time	0.00s to 10.00s	0.10s

F4-18 to F4-22 and F4-23 to F4-27: These function parameters define the AI curve 2 and AI curve 3, respectively. The AI curve 2 and AI curve 3 have the same function and usage as the AI curve 1 does. Refer to the description of AI curve 1.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F4-28	Pulse min. input	0.00 kHz to F4-30	0.00 kHz
F4-29	Corresponding percentage of pulse min. input	-100.00% to 100.0%	0.0%
F4-30	Pulse max. input	F4-28 to 20.00 kHz	20.00 kHz
F4-31	Corresponding percentage of pulse max. input	-100.00% to 100.0%	100.0%
F4-32	Pulse filter time	0.00s to 10.00s	0.10s

F4-28 to F4-32: These five function parameters set the relationship between the pulse input (from DI5 only) and the corresponding percentage. It has the same function and usage as the AI curve 1 does. Refer to the description of AI curve 1.

Function Code	Parameter Name	Setting Range	Default
F4-33	AI curve selection	1: Curve 1 (2 points, see F4-13 to F4-16)	321
		2: Curve 2 (2 points, see F4-18 to F4-21)	
		3: Curve 3 (2 points, see F4-23 to F4-26)	
		4: Curve 4 (4 points, see A6-00 to A6-07)	
		5: Curve 5 (4 points, see A6-08 to A6-15)	
		Unit's digit: AI1 curve selection	
		Ten's digit: AI2 curve selection	
		Hundred's digit: AI3 curve selection	

F4-33: This function parameter selects the curve of AI1, AI2 and AI3 from the five curves, respectively. Curve 1, curve 2 and curve 3 are 2-point curves, set in group F4. Curve 4 and curve 5 are 4-point curves, set in group A6.

The MD310 provides two AI terminals (AI1, AI2). An extra AI terminal (AI3) is provided by the I/O extension card.

Function Code	Parameter Name	Setting Range	Default
F4-34	AI curve selection	0: Minimum value	000
		1: 0.0%	
		Unit's digit: Setting for AI1 less than minimum input	
		Ten's digit: Setting for AI2 less than minimum input	
		Hundred's digit: Setting for AI3 less than minimum input	

F4-33: This function parameter determines the corresponding setting when the analog input voltage is less than the minimum value.

If the a digit is set to 0. the corresponding setting of the minimum input (F4-14, F4-19, F4-24) is used when the AI voltage is less than the minimum input.

If the a digit is set to 0. the corresponding setting of the AI is 0.0% when the AI voltage is less than the minimum input.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F4-35	DI1 delay	0.0s to 3600.0s	0.0s
F4-36	DI2 delay	0.0s to 3600.0s	0.0s
F4-37	DI3 delay	0.0s to 3600.0s	0.0s

F4-35 to F4-37: When the state of DI terminals changes, these three function parameters set the delay time of the change. Now the MD310 supports the delay function on DI1, DI2 and DI3 only.

Function Code	Parameter Name	Setting Range	Default
F4-38	DI active mode selection 1	0: High level active	00000
		1: Low level active	
		Unit's digit: DI1 active mode	
		Ten's digit: DI2 active mode	
		Hundred's digit: DI3 active mode	
		Thousand's digit: DI4 active mode	
		Ten thousand's digit: DI5 active mode	
F4-39	DI active mode selection 2	0: High level active	00000
		1: Low level active	
		Unit's digit: DI6 active mode	
		Ten's digit: DI7 active mode	
		Hundred's digit: DI8 active mode	
		Thousand's digit: DI9 active mode	
		Ten thousand's digit: DI10 active mode	

F4-38 and F4-39: These two function parameters set the active mode of DI terminals.

- High level active

  If a high level voltage is applied to DI terminal, the DI signal will be seen as active. That is, the DI terminal becomes active when being connected with COM, and inactive when being disconnected from COM.

- Low level active

  If a low level voltage is applied to DI terminal, the DI signal will be seen as active. That is, the DI terminal becomes active when being disconnected from COM, and inactive when being connected with COM.

www.Farazcontrol.com (مهندس رمضان زاده)۰۹۱۲۹۲۷۵۱۵۹ واحد فروش:

Group F5: Output Terminals

The MD310 provides a digital output (DO) terminal, an analog output (AO) terminal, a relay terminal and an FM terminal (either high-speed pulse output or open-collector output).

Extra AO terminal (AO2), relay terminal (relay2) and DO terminal (DO2) are provided by the I/O extension card.

Function Code	Parameter Name	Setting Range	Default
F5-00	FM terminal output mode	0: Pulse output (FMP) 1: Digital output (FMR)	0

F5-00: This function parameter is a programmable multiplexing terminal and determines whether the FM terminal is high-speed pulse output (FMP) or open-collector output (FMR). When used for high-speed pulse output, the max. output frequency is 50 kHz. For details, see the description of F5-06.

Function Code	Parameter Name	Setting Range	Default
F5-01	FMR function selection	0 to 41	0
F5-02	Relay (T/A-T/B-T/C) function selection	0 to 41	2
F5-03	Extension card relay (P/A-P/B-P/C) function selection	0 to 41	0
F5-04	DO1 function selection	0 to 41	1
F5-05	Extension card DO2 function selection	0 to 41	4

F5-01 to F5-05: These five function parameters select the function of the five digital output terminals. T/A-T/B-T/C is the relay of the MD310 and P/A-P/B-P/C is the relay on the I/O extension card.

0. No output

   The terminal has no function.

1. AC drive running

   When the AC drive is running and has output frequency (can be zero), the terminal set for this function becomes on.

2. Fault output

   When a fault occurs and the AC drive stops due to the fault, the terminal set for this function becomes on.

3. Frequency level detection FDT1 output

   Refer to the descriptions of F8-19 and F8-20.

4. Frequency reached

   Refer to the description of F8-21.

5. Zero-speed running (no output at stop)

   When the output frequency is 0 during drive running, the terminal set for this function becomes on. When the drive stops, the terminal becomes off.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

6. Motor overload pending

   The AC drive judges the motor overload pending according to the pending threshold before performing overload protection. If the pending threshold is exceeded, the terminal set for this function becomes on. For motor overload parameters, see the descriptions of F9-00 to F9-02.

7. AC drive overload pending

   The terminal set for this function becomes on for 10s before the AC drive performs overload protection.

8. Set count value reached

   The terminal set for this function becomes on when the count value reaches the value set in Fb-08.

9. Designated count value reached

   The terminal set for this function becomes on when the count value reaches the value set in Fb-09.

10. Length reached

    The terminal set for this function becomes on when the detected actual length exceeds the value set in Fb-05.

11. PLC cycle completed

    The terminal set for this function outputs a pulse signal with width of 250 ms when simple PLC completes one cycle.

12. Accumulative running time reached

    The terminal set for this function becomes on when the accumulative running time of the AC drive exceeds the value set in F8-17.

13. Frequency limited

    The terminal set for this function becomes on when the frequency reference exceeds the frequency upper or lower limit, and the output frequency of the AC drive also reaches the upper or lower limit.

14. Torque limited

    The terminal set for this function becomes on when the AC drive enters stall protection because the output torque reaches the toque limit in the speed mode.

15. Ready for RUN

    The terminal set for this function becomes on when the AC drive ready to operate the motor (The power applied the main circuit and control circuit is normal, and no fault is detected).

16. AI1 > AI2

    When the AI1 input value is greater than the AI2 input value, the terminal set for this function becomes on.

17. Frequency upper limit reached

    When the running frequency reaches the frequency upper limit, the terminal set for this function becomes on.

18. Frequency lower limit reached (no output at stop)

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

The terminal set for this function outputs the ON signal when the running frequency reaches the frequency lower limit. The signal becomes OFF in the stop state

19. Undervoltage output

    The terminal set for this function outputs the ON signal when the AC drive is in the undervoltage state.

    The terminal set for this function is used to perform switchover between two frequency sources according to the setting in F0-07.

20. Communication setting

    See the communication protocol in this manual.

21. Reserved

22. Reserved

23. Zero-speed running 2 (having output at stop)

    When the output frequency is 0 during drive running, the terminal set for this function becomes on. When the drive stops, the terminal remains on.

24. Accumulative power-on time reached

    The terminal set for this function becomes on when the accumulative power-on time of the AC drive (F7-13) exceeds the value set in F8-16.

25. Frequency level detection FDT2

    Refer to the descriptions of F8-28 and F8-29.

26. Frequency 1 reached

    Refer to the descriptions of F8-30 and F8-31.

27. Frequency 2 reached

    Refer to the descriptions of F8-32 and F8-33.

28. Current 1 reached

    Refer to the descriptions of F8-38 and F8-39.

29. Current 2 reached

    Refer to the descriptions of F8-40 and F8-41.

30. Timing reached

    On the condition that the timing function is enabled (F8-42 = 1), the terminal set for this function becomes on when the current running time of the AC drive reaches the set timing time.

31. AI1 input exceeding limit

    The terminal set for this function becomes on when AI1 input is larger than the value set in F8-46 (AI1 input voltage upper limit) or smaller than the value set in F8-45 (AI1 input voltage lower limit).

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

32. Load lost

The terminal set for this function becomes on when the load gets lost.

33. Reverse running

The terminal set for this function becomes on when the AC drive runs in the reverse direction.

34. Zero current state

Refer to the descriptions of F8-34 and F8-35.

35. Module temperature reached

The terminal set for this function becomes on when the heatsink temperature of the inverter module (F7-07) reaches the module temperature threshold (F8-47).

36. Output current exceeding limit

Refer to the descriptions of F8-36 and F8-37.

37. Frequency lower limit reached (having output at stop)

The terminal set for this function becomes on when the running frequency reaches the frequency lower limit. When the drive stops, the terminal remains on.

38. Alarm output

If a fault occurs on the AC drive and the AC drive continues to run, the terminal outputs an alarm signal.

39. Motor overheat pending

The terminal set for this function becomes on when the motor temperature reaches the value set in F9-58 (Motor overheat pending threshold). You can view the motor temperature by using U0-34.

40. Current running time reached

The terminal set for this function becomes on when the current running time of the AC drive exceeds the value set in F8-53.

41. Fault output

When a fault occurs on the AC drive and the fault is not undervoltage, the terminal set for this function outputs the ON signal.

Function Code	Parameter Name	Setting Range	Default
F5-06	FMP function selection	0 to 16	0
F5-07	AO1 function selection	0 to 16	0
F5-08	AO2 function selection	0 to 16	1

F5-06 to F5-08: These three function parameters select the function of the pulse output terminal and the two analog output terminals.

The pulse output frequency range of the FMP terminal is 0.01 kHz to F5-09 (Max. FMP output frequency). F5-09 must be set in the range of 0.01 to 100.00 kHz.

The output range of AO1 and AO2 is 0 to 10 V or 0 to 20 mA.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

The functions of the three terminals are listed in the following table.

Value	Function	Range (Corresponding to 0.0% to 100.0% of Pulse or Analog Output Range)
0	Running frequency	0 to max. frequency
1	Frequency reference	0 to max. frequency
2	Output current	0 to 2 times of rated motor current
3	Output torque (absolute value)	0 to 2 times of rated motor torque
4	Output power	0 to 2 times of rated power
5	Output voltage	0 to 1.2 times of rated AC drive voltage
6	Pulse input	0.01 to 50.00 kHz
7	AI1	0 to 10 V
8	AI2	0 to 10 V (or 0 to 20 mA)
9	AI3	-10 to 10 V
10	Length	0 to max. set length
11	Count value	0 to max. count value
12	Communication reference	0.0% to 100.0%
13	Motor speed	0 to motor speed corresponding to max. output frequency
14	Output current	0.0 to 1000.0 A
15	Output voltage	0.0 to 1000.0 V
16	Output torque (actual value)	-2 times of rated motor torque to 2 times of rated motor torque

Function Code	Parameter Name	Setting Range	Default
F5-09	Max. FMP output frequency	0.01 to 50.00 kHz	50.00 kHz

F5-09: This function parameter sets the maximum pulse output frequency when the FM terminal is used for pulse output.

Function Code	Parameter Name	Setting Range	Default
F5-10	AO1 zero offset coefficient	-100.0% to 100.0%	0.0%
F5-11	AO1 gain	-10.00 to 10.00	1.00
F5-12	AO2 zero offset coefficient	-100.0% to 100.0%	0.00%
F5-13	AO2 gain	-10.00 to 10.00	1.00

F5-10 to F5-13: These four function parameters generally correct the zero offset of analog output and the output amplitude error. They can also define the required AO curve.

If "b" represents zero offset, "k" represents gain, "Y" represents actual output, and "X" represents standard output, the actual output is: Y = kX + b. The zero offset coefficient 100% of AO1 and AO2 corresponds to 10 V or 20 mA.

For example, the analog output is used for frequency reference. To implement output of 8 V at 0 Hz and output of 3 V at maximum frequency, set the gain to -0.50 and zero offset coefficient to 80%.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F5-17	FMR output delay	0.0s to 3600.0s	0.0s
F5-18	Relay 1 output delay	0.0s to 3600.0s	0.0s
F5-19	Relay 2 output delay	0.0s to 3600.0s	0.0s
F5-20	DO1 output delay	0.0s to 3600.0s	0.0s
F5-21	DO2 output delay	0.0s to 3600.0s	0.0s

F5-17 to F5-21: These function parameters set the output delay of terminals FMR, relay1, relay2, DO1 and DO2 from state change.

Function Code	Parameter Name	Setting Range	Default
F5-22	DI active mode selection 1	0: Positive logic active 1: Negative logic active Unit's digit: FMR active mode Ten's digit: Relay1 active mode Hundred's digit: Relay2 active mode Thousand's digit: DO1 active mode Ten thousand's digit: DO2 active mode	00000

F5-22: This function parameter sets the active mode of terminals FMR, relay1, relay2, DO1 and DO2.

- Positive logic active

  The digital output terminal becomes active when being connected with COM, and inactive when being disconnected from COM.

- Negative logic active

  The digital output terminal becomes active when being disconnected from COM, and inactive when being connected with COM.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Group F6: Start/Stop Control

Function Code	Parameter Name	Setting Range	Default
F6-00	Startup mode	0: Direct startup	0
		1: Catching a spinning motor	
		2: Pre-excited startup	

0. Direct startup

   If the DC injection braking active time is set to 0, the AC drive starts to run from the startup frequency.

   If the DC injection braking active time is not 0, the AC drive performs DC injection braking first and then starts to run from the startup frequency. It is applicable to small-inertia load application where the motor is likely to rotate at startup.

1. Catching a spinning motor

   To catch a spinning motor, the AC drive detects the speed and direction of the spinning motor, and then starts to run from the spinning motor frequency, minimizing impact of power supply to the motor.

   It is applicable to the restart upon instantaneous power down of large-inertia load. In this startup mode, ensure that the motor parameters in group F1 are set correctly.

2. Pre-excited startup

   It is valid only for asynchronous motor and used for building the magnetic field before the motor runs. For pre-excited current and pre-excited time, see parameters of F6-05 and F6-06.

   If the pre-excited time is 0, the AC drive cancels pre-excitation and starts to run from the startup frequency.

   If the pre-excited time is not 0, the AC drive pre-excites first and then starts to run, improving the motor dynamic response.

Function Code	Parameter Name	Setting Range	Default
F6-01	Mode of catching a spinning motor	0: From stop frequency	0
		1: From line frequency	
		2: From maximum frequency	

F6-01: This function parameter selects a proper catching mode to catch a spinning motor within the shortest time.

0. From stop frequency

   It is the commonly used mode.

1. From line frequency

   It is applicable to restart after long-time power down.

2. From maximum frequency

   It is applicable to power generating load.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F6-02	Speed of catching a spinning motor	1 to 100	20

F6-02: This function parameter sets the speed of catching a spinning motor. The larger the value is, the faster the catching is. However, too large value may cause unreliable catching.

Function Code	Parameter Name	Setting Range	Default
F6-03	Startup frequency	0.00 to 10.00 Hz	0.00 Hz
F6-04	Startup frequency holding time	0.0s to 100.0s	0.0s

F6-03: Set this function parameter properly to ensure the motor torque at startup. It is not restricted by the frequency lower limit. But if the frequency reference is lower than the startup frequency, the AC drive will not start and stay standby.

F6-04: This function parameter is required to fully build magnetic flux at startup of the motor. It is not included in the acceleration time but included in the simple PLC running time. It does not take effect during FWD/REV switchover.

Example 1:

Setting	Description
F0-03 = 0	The frequency setting channel is digital setting.
F0-08 = 2.00 Hz	The frequency reference via digital setting is 2.00 Hz.
F6-03 = 5.00 Hz	The startup frequency is 5.00 Hz.
F6-04 = 2.0s	The startup frequency holding time is 2.0s.

In this example, the AC drive stays standby and the output frequency is 0.0 Hz.

Example 2:

Setting	Description
F0-03 = 0	The frequency setting channel is digital setting.
F0-08 = 10.00 Hz	The frequency reference via digital setting is 10.00 Hz.
F6-03 = 5.00 Hz	The startup frequency is 5.00 Hz.
F6-04 = 2.0s	The startup frequency holding time is 2.0s.

In this example, the AC drive accelerates to 5.00 Hz first, and then accelerates to the frequency reference 10.00 Hz after 2s.

Function Code	Parameter Name	Setting Range	Default
F6-05	DC injection braking 1 level/ Pre-excitation level	0% to 100%	0%
F6-06	DC injection braking 1 active time /Pre-excitation active time	0.0s to 100.0s	0.0s

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

F6-05 and F6-06: The DC injection braking function is effective for direct startup (F6-00 = 0). It is generally applied to restart of the spinning motor after stop.

The AC drive performs DC injection braking based on the value set in F6-05 and starts to run after the time set in F6-06. The larger the DC injection braking 1 level is, the larger the braking force will be achieved. If F6-06 is set to 0, the AC drive directly starts without DC injection braking.

The pre-excitation function makes the AC drive build magnetic field for the asynchronous motor based on the value set in F6-05 and starts to run after the time set in F6-06. If F6-06 is set to 0, the AC drive directly starts without pre-excitation.

The DC injection braking 1 level or pre-excitation level is a percentage relative to the following two base values.

Function Code	Parameter Name	Setting Range	Default
F6-07	Acceleration/Deceleration mode	0: Linear acceleration/deceleration 1: Static S-curve acceleration/deceleration 2: Dynamic S-curve acceleration/deceleration	0

F6-07: This function parameter sets the acceleration/deceleration mode in the start and stop process of the AC drive.

0. Linear acceleration/deceleration

   The output frequency increases or decreases linearly.

3. Static S-curve acceleration/deceleration

   The output frequency increases or decreases along with the S curve on the condition that the target frequency is fixed. This mode is applied to the applications where soft start or stop is required, such as elevator and conveyor belt.

4. Dynamic S-curve acceleration/deceleration

   The output frequency increases or decreases along with the S curve on the condition that the target frequency is changing at real time. This mode is applicable to the applications requiring supreme riding comfort and fast response.

   The acceleration/deceleration time in this mode is obtained from the following formulas.

   Time for acceleration segment in dynamic S-curve Ta:

$$Ta = \text{Acceleration time} \times \left\{ \frac{\text{Frequency reference}}{\text{Acceleration/Deceleration time base frequency (F0-25)}} + \left(\text{Time proportion of S-curve start segment} + \text{Time proportion of S-curve end segment} \right) / 2 \right\}$$

   Time for acceleration segment in dynamic S-curve Td:

$$Td = \text{Deceleration time} \times \left\{ \frac{\text{Frequency reference}}{\text{Acceleration/Deceleration time base frequency (F0-25)}} + \left(\text{Time proportion of S-curve start segment} + \text{Time proportion of S-curve end segment} \right) / 2 \right\}$$

Note

The dynamic S-curve acceleration/deceleration time and the target frequency cannot be too large. If the S-curve acceleration/deceleration time is larger than 100s or the target frequency is larger than 6 times of rated motor frequency, the dynamic S-curve is ineffective and the AC drive switches over to linear acceleration/deceleration automatically.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F6-08	Time proportion of S-curve start segment	0.0% to (100.0% – F6-09)	30.0%
F6-09	Time proportion of S-curve end segment	0.0% to (100.0% – F6-08)	30.0%

F6-08 and F6-09: These two function parameters define the time proportion of the start segment and end segment of the S-curve acceleration/deceleration, respectively. They must satisfy F6-08 + F6-09 ≤ 100.0%.

In the following figure, t1 is set by F6-08, and t2 is set by F6-09. The output frequency slope increases gradually in t1 and decreases gradually to 0 in t2. The slope remains unchanged between t1 and t2, that is, linear acceleration/deceleration.

Figure 8-13 Static S-curve acceleration/deceleration

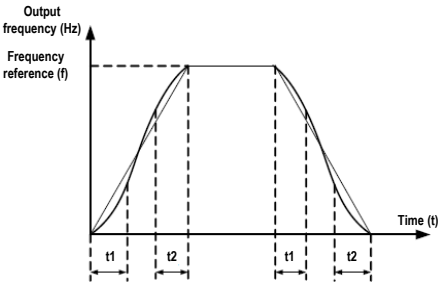
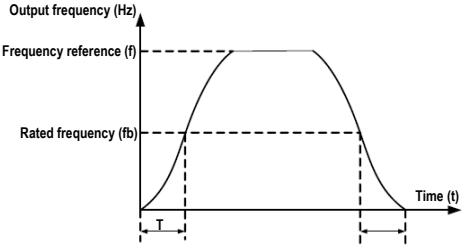


Figure 8-14 Dynamic S-curve acceleration/deceleration



Function Code	Parameter Name	Setting Range	Default
F6-10	Stop mode	0: Decelerate to stop 1: Coast to stop	0

F6-10: This function parameter defines the stop mode of the AC drive.

0. Decelerate to stop

   Once the stop command is input, the AC drive decreases the output frequency based on the deceleration time to 0.

1. Coast to stop

   Once the stop command is input, the AC drive immediately stops output. The motor then coasts to stop based on the mechanical inertia.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F6-11	DC injection braking 2 frequency threshold	0.00 Hz to maximum frequency	0.00 Hz
F6-12	DC injection braking 2 delay time	0.0 to 100.0s	0.0s
F6-13	DC injection braking 2 level	0% to 100%	0%
F6-14	DC injection braking 2 active time	0.0s to 100.0s	0.0s

F6-11 to and F6-14: These function parameters define the DC injection braking function at stop.

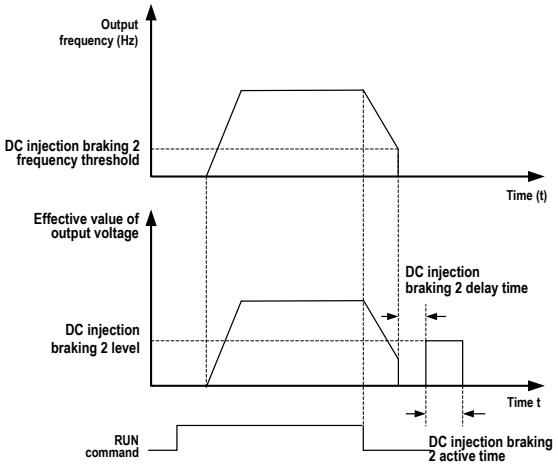
F6-11: The AC drive starts DC injection braking when the running frequency decreases to the value set in this parameter in the process of deceleration to stop.

F6-12: When the running frequency decreases to the value set in F6-11, the AC drive stops output for a time and then starts DC injection braking. This prevents the occurrence of fault such as overcurrent caused by direct DC injection braking at high speed.

F6-13: It indicates the output current at DC injection braking and is percentage of the rated motor current. The larger this setting value is, the better DC injection braking result is obtained, but the motor and AC drive overheat more.

F6-14: If it is set to 0, DC injection braking is disabled.

Figure 8-15 DC injection braking function diagram at stop



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F6-15	Braking use ratio	0% to 100%	100%

F6-15: It is effective for the AC drive with internal braking unit only. It adjusts the duty ratio of the braking unit. The larger the value is, the better the braking result will be achieved. But too large setting will cause big fluctuation of bus voltage.

Function Code	Parameter Name	Setting Range	Default
F6-18	Catching a spinning motor current limit	30% to 200%	100%

F6-18: It limits the current during the catching a spinning motor process.

When catching a spinning motor with light load or small inertia, the motor may be driven to accelerate to a speed higher than that before stop and then decelerate to the target frequency during the catching process

In this case, decrease the value of F6-18 adequately to reduce the output torque during catching

The catching a spinning motor function must be disabled in the pair-driving applications such as the kowtow machine. This is to prevent the other motor from accelerating or decelerating suddenly.

Function Code	Parameter Name	Setting Range	Default
F6-21	Demagnetization time	0.0s to 5.0s	1.0s

There is still residual magnetism on the rotor windings in a short period every time the motor coasts to stop or stops due to occurrence of a fault. The residual magnetism attenuates according to the rotor time constant.

If the motor is restarted within short time after stop, overcurrent may occur. The default value of this function parameter is updated automatically based on the motor power.

Function Code	Parameter Name	Setting Range	Default
F6-22	Minimum output frequency	0 to 10 Hz	0

The AC drive accelerates from the minimum output frequency at startup and decelerates to this value first then to 0 when stop.

If the frequency reference setting channel is PID reference, the minimum output frequency is ineffective. The FWD/REV switchover is not affected by this value.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Group F7: Keypad Operation and LED Display

Function Code	Parameter Name	Setting Range	Default
F7-01	MF.K Key function selection	0: MF.K key disabled	0
		1: Keypad control and remote control switchover (terminal or communication)	
		2: Forward RUN and reverse RUN switchover	
		3: Forward jog	
		4: Reverse jog	
		5. Individualized parameters display	

F7-01: This function parameter sets the function of the 

key.

0. MF.K key disabled

   The MF.K key has no function.

1. Keypad control and remote control switchover (terminal or communication)

   You can perform switchover from the command source to keypad control. If the command source is keypad, this key is inactive.

2. Forward RUN and reverse RUN switchover

   You can change the direction of the frequency reference via the MF.K key. It is active only when the command source is keypad.

3. Forward jog

   You can implement forward jog (FJOG) via the MF.K key.

4. Reverse jog

   You can implement reverse jog (RJOG) via the MF.K key.

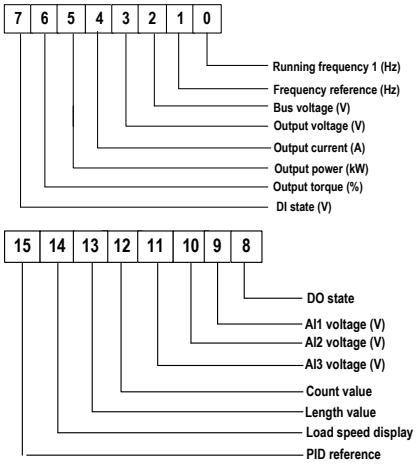
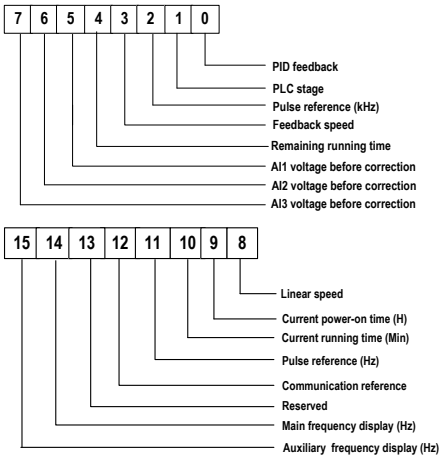
5. Individualized parameters display

   It implements display of individualized parameters (used together with FP-03).

Function Code	Parameter Name	Setting Range	Default
F7-02	STOP/RESET key function	0: Stop function enabled only in keypad control	1
		1: Stop function enabled in any operation mode	

F7-02: This function parameter sets the function of the STOP/RESET key.

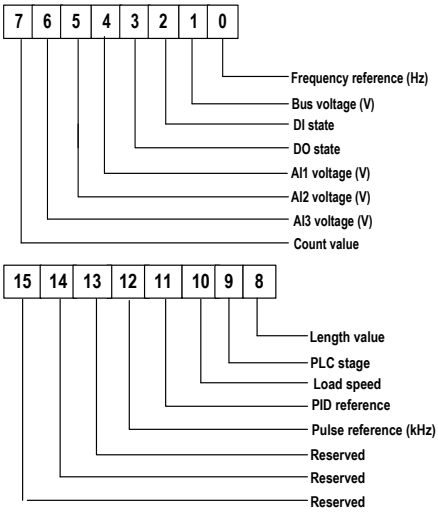
www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F7-03	LED display running parameters 1	0000 to FFFF  If a parameter needs to be displayed during the running, set the corresponding bit to 1, and set F7-03 to the hexadecimal equivalent.	1F
F7-04	LED display running parameters 2	0000 to FFFF  If a parameter needs to be displayed during the running, set the corresponding bit to 1, and set F7-04 to the hexadecimal equivalent.	0

F7-03 to and F7-04: You can set a maximum of 32 parameters that can be viewed during drive running according to the binary bits of these two parameters. The display starts from the lowest bit of F7-03.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F7-05	LED display stop parameters	0000 to 1FFF	33



If a parameter needs to be displayed during the running, set the corresponding bit to 1, and set F7-05 to the hexadecimal equivalent.

Function Code	Parameter Name	Setting Range	Default
F7-06	Load speed display coefficient	0.0001 to 6.5000	1.0000

F7-06: This function parameter adjusts the correspondence relationship between the output frequency of the AC drive and the load speed. For details, see the description of F7-12.

Function Code	Parameter Name	Setting Range	Default
F7-07	Heatsink temperature of inverter module	0.0°C to 100.0°C	-

F7-07: This function parameter displays the IGBT temperature of the inverter module. The IGBT overheat protection value of the inverter module varies with the drive model.

Function Code	Parameter Name	Setting Range	Default
F7-09	Accumulative running time	0 to 65535 h	-

F7-09: This function parameter displays the accumulative running time of the AC drive. After the accumulative running time reaches the value set in F8-17, the digital output terminal set for function 12 becomes on.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F7-10	Product SN	-	-
F7-11	Software version	-	-

Function Code	Parameter Name	Setting Range	Default
F7-12	Number of decimal places for load speed display	0: 0 decimal place 1: 1 decimal place 2: 2 decimal places 3: 3 decimal places	1

F7-12: This function parameter sets the number of decimal places for load speed display. The following gives an example to explain how to calculate the load speed.

Assume that F7-06 (Load speed display coefficient) is 2.000 and F7-12 is 2 (2 decimal places). When the running frequency of the AC drive is 40.00 GHz, the load speed is 40.00 40.00 x 2.000 = 80.00 (display of 2 decimal places).

If the AC drive is in the stop state, the load speed display is the speed corresponding to the frequency reference. If the frequency reference is 50.00 Hz, the load speed in the stop state is 50.00 x 2.000 = 100.00 (display of 2 decimal places).

Function Code	Parameter Name	Setting Range	Default
F7-13	Accumulative power-on time	0 to 65535 h	0 h

F7-13: This function parameter displays the accumulative power-on time of the AC drive since delivery. If the time reaches the value set in F8-17, the digital output terminal set for function 24 becomes on.

Function Code	Parameter Name	Setting Range	Default
F7-14	Accumulative power consumption	0 to 65535 kWh	-

F7-14: This function parameter displays the accumulative power consumption of the AC drive until now.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Group F8: Auxiliary Functions

Function Code	Parameter Name	Setting Range	Default
F8-00	Jog running frequency reference	0.00 Hz to maximum frequency	2.00 Hz
F8-01	Jog acceleration time	0.0s to 6500.0s	20.0s
F8-02	Jog deceleration time	0.0s to 6500.0s	20.0s

F8-00 to and F8-02: These three function parameters define the frequency reference, acceleration time and deceleration time for drive jog running.

In jog running mode, F6-00 must be set to 0 (direct startup) and F6-10 must be set to 0 (Decelerate to stop).

Function Code	Parameter Name	Setting Range	Default
F8-03	Acceleration time 2	0.0s to 6500.0s	Model dependent
F8-04	Deceleration time 2	0.0s to 6500.0s	Model dependent
F8-05	Acceleration time 3	0.0s to 6500.0s	Model dependent
F8-06	Deceleration time 3	0.0s to 6500.0s	Model dependent
F8-07	Acceleration time 4	0.0s to 6500.0s	Model dependent
F8-08	Deceleration time 4	0.0s to 6500.0s	Model dependent

F8-03 to F8-08: These function parameters define the other three groups of acceleration/deceleration time. They are the same as F0-17 and F0-18, which define the first group of acceleration/deceleration time.

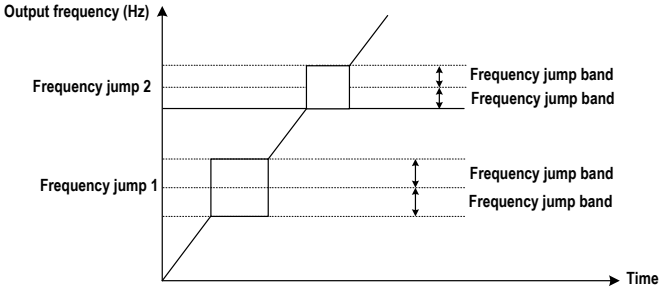
You can perform switchover amongst the four groups of acceleration/deceleration time through state combinations of DI terminals. For details, see the description of F4-01 to F4-05.

Function Code	Parameter Name	Setting Range	Default
F8-09	Frequency jump 1	0.00 Hz to max. frequency	0.00 Hz
F8-10	Frequency jump 2	0.00 Hz to max. frequency	0.00 Hz
F8-11	Frequency jump band	0.00 Hz to max. frequency	0.00 Hz

F8-09 to F8-11: The frequency jump function enables the AC drive to avoid the mechanical resonance point of the load. The MD310 can be set with two separate frequencies. If both are set to 0, the frequency jump function is disabled.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

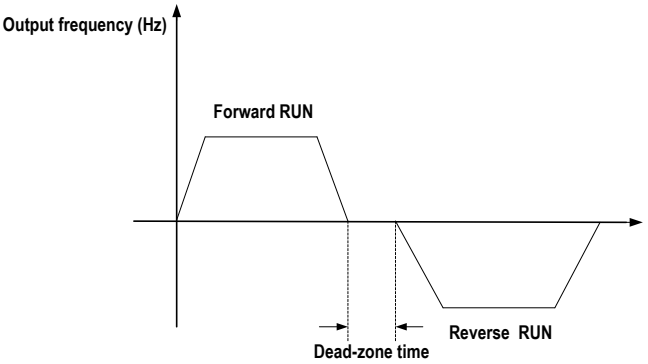
Figure 8-16 Jump frequency function



Function Code	Parameter Name	Setting Range	Default
F8-12	Forward/Reverse rotation dead-zone time	0.0s to 3000.0s	0.0s

F8-12: This function parameter sets the time of 0 Hz output at transition of forward RUN and reverse RUN of the AC drive.

Figure 8-17 Forward run and reverse run switchover dead-zone time



Function Code	Parameter Name	Setting Range	Default
F8-13	Reverse RUN selection	0: Enabled 1: Disabled	0

F8-13: This function parameter determines whether reverse RUN is allowed. In the applications where reverse RUN is prohibited, set this parameter to 1.

Function Code	Parameter Name	Setting Range	Default
F8-14	Running mode when frequency reference lower than frequency lower limit	0: Run at frequency lower limit 1: Stop 2: Run at zero speed	0

F8-14: This function parameter set the drive running mode when the frequency reference is lower than the frequency lower limit.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F8-15	Droop rate	0.00 to 10.00 Hz	0.00 Hz

F8-15: The droop control function aims at balancing the load level of multiple motors that drive the same load.

The output frequency of the AC drive decreases as the load increases. In this way, the load level of the motor is reduced by decreasing the output frequency for this motor, implementing load level balancing.

Function Code	Parameter Name	Setting Range	Default
F8-16	Accumulative power-on time threshold	0 to 65000 h	0 h

F8-16: If the accumulative power-on time (F7-13) reaches the value set in this parameter, the digital output terminal set for function 24 becomes ON.

For example, to enable the AC drive to output Err29 when the accumulative power-on time reaches 100 hours, perform the following settings:

Setting	Description
A1-00 = 44	Allocate VDI with the user-defined fault 1 function.
A1-05 = 0000	The active state of VDI1 is from VDO1.
A1-11 = 24	Allocate VDO1 with the power-on time reached function.
F8-16 = 100	Set the accumulative power-on time threshold to 100 hours.

Function Code	Parameter Name	Setting Range	Default
F8-17	Accumulative running time threshold	0 to 65000 h	0 h

F8-17: If the accumulative running time (F7-09) reaches the value set in this parameter, the digital output terminal set for function 12 becomes on.

Function Code	Parameter Name	Setting Range	Default
F8-18	Startup protection selection	0: Enabled 1: Disabled	0

F8-18: This function parameter determines whether to enable safety protection at drive startup. If such protection is enabled (F8-18 = 1), the AC drive will not respond to the RUN command that is input at power-on or fault reset. This helps to avoid unexpected motor running at power-on or fault reset.

The AC drive will get out of startup protection after you cancel the RUN command.

Function Code	Parameter Name	Setting Range	Default
F8-19	Frequency detection level 1	0.00 Hz to max. frequency	50.00 Hz
F8-20	Frequency detection level 1 hysteresis	0.0% to 100.0%	5.0%

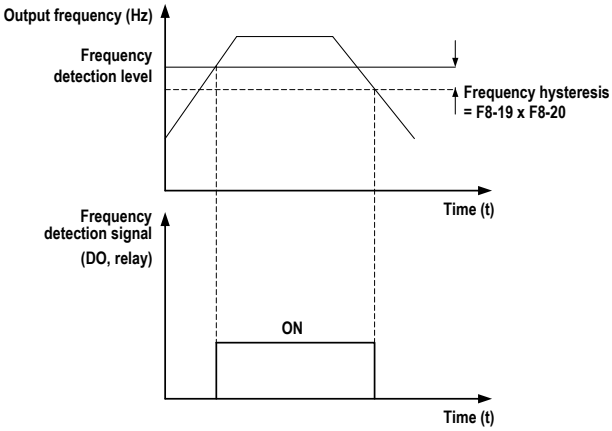
F8-19 and F8-20: These two function parameters set the frequency detection function that can be allocated to digital output terminals.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

F8-19: It sets the detection level for the digital output function 3. When the drive running frequency exceeds the detection level, the digital output terminal set for function 3 becomes on.

F8-20: It sets the hysteresis level for the frequency detection function. It is the percentage of frequency hysteresis relative to the frequency detection level (F8-19).

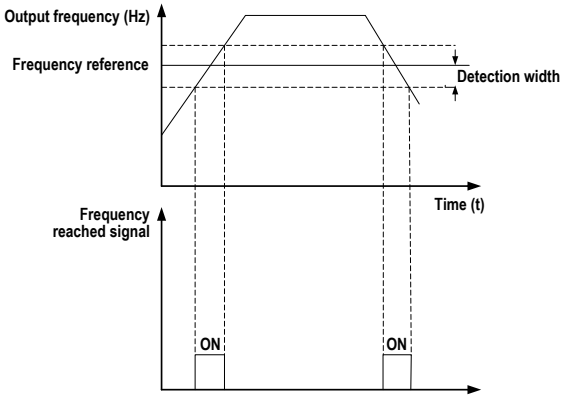
Figure 8-18 Frquency detection function



Function Code	Parameter Name	Setting Range	Default
F8-21	Detection width of frequency reference	0.00 to 100%	0.0%

F8-21: This function parameter sets the detection width of frequency reference. It is a percentage relative to the maximum frequency. When the drive's output frequency reaches the width, the digital output terminal set for function 4 becomes on.

Figure 8-19 Frequency reached detection width

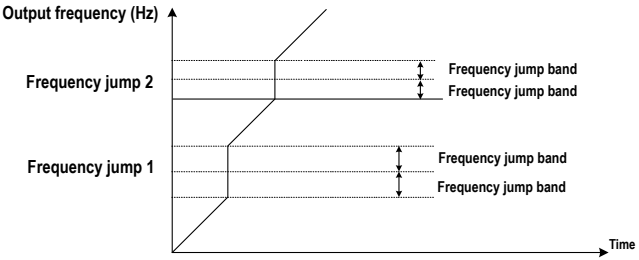


www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F8-22	Selection of frequency jump during acceleration/ deceleration	0: Disabled 1: Enabled	1

F8-22: This function parameter determines whether frequency jump is enabled during acceleration/ deceleration. If it is enabled, when the running frequency is within the jump band, the AC drive will jump over the jump band.

Figure 8-20 Frequency jump during acceleration/deceleration



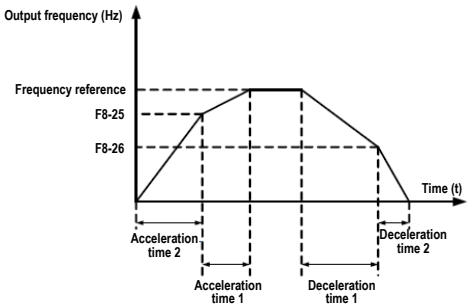
Function Code	Parameter Name	Setting Range	Default
F8-25	Frequency point of switchover of accel time 1 and accel time 2	0.00 Hz to max. frequency	0.00 Hz
F8-26	Frequency point for switchover of decel time 1 and decel time 2	0.00 Hz to max. frequency	0.00 Hz

F8-25 and F8-26: These two function parameters determine selection of acceleration /deceleration time. This function is active only when motor 1 is selected and acceleration/deceleration time is not switched over via external DI terminal.

During acceleration, if the running frequency is below F8-25, acceleration time 2 is selected. If it is above F8-25, acceleration time 1 is selected.

During deceleration, if the running frequency is above F8-26, deceleration time 1 is selected. If it is below F8-26, deceleration time 2 is selected.

Figure 8-21 Acceleration time and deceleration time switchover



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F8-27	Selection of terminal jog preferred	0: Disabled 1: Enabled	0

F8-27: This function parameter determines whether terminal jog is preferred. If this function is enabled, the AC drive will switch over to terminal jog running state when a terminal jog command is input during drive running.

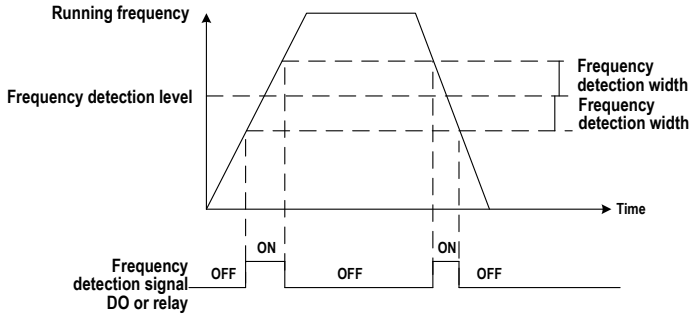
Function Code	Parameter Name	Setting Range	Default
F8-28	Frequency detection level 2	0.00 Hz to max. frequency	50.00 Hz
F8-29	Frequency detection level 2 hysteresis	0.0% to 100.0%	5.0%

F8-28 and F8-29: They are the same as F8-19 and F8-20. Refer to the description of the two parameters.

Function Code	Parameter Name	Setting Range	Default
F8-30	Detection of frequency 1	0.00 Hz to max. frequency	50.00 Hz
F8-31	Detection width of frequency 1	0.0% to 100.0% (max. frequency)	0.0%
F8-32	Detection of frequency 2	0.00 Hz to max. frequency	50.00 Hz
F8-33	Detection width of frequency 2	0.0% to 100.0% (max. frequency)	0.0%

F8-30 to F8-32: These function parameters set the detection level and width of two frequencies. The MD310 provides two groups of frequency detection parameters for the digital output functions 26 and 27.

Figure 8-22 Any frequency reached detection

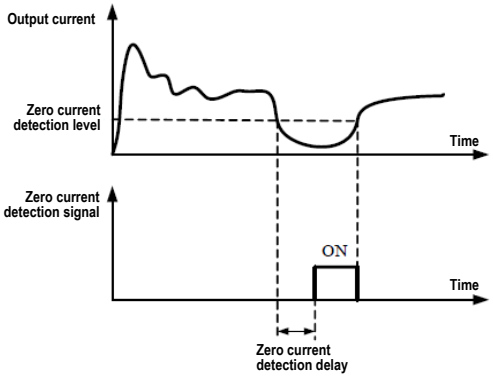


Function Code	Parameter Name	Setting Range	Default
F8-34	Zero current detection level	0.0% to 300.0% (rated motor current)	5.0%
F8-35	Zero current detection delay	0.01s to 600.00s	0.10s

F8-34 and F8-35: These two function parameters set the detection level and delay of zero current for the digital output function 34. If the drive's output current is equal to or smaller than the value set in F8-34 and the duration exceeds the value set in F8-35, the digital output terminal set for function 34 becomes on.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

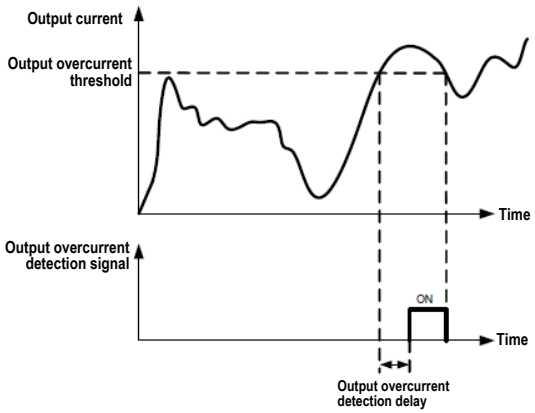
Figure 8-23 Zero current detection delay



Function Code	Parameter Name	Setting Range	Default
F8-36	Output overcurrent threshold	0.0% (no detection) 0.1% to 300.0% (rated motor current)	200.0%
F8-37	Output overcurrent detection delay	0.00s to 600.00s	0.00s

F8-36 and F8-37: These two function parameters set overcurrent protection for the digital output function 36. If the drive's output current is equal to or smaller than the value set in F8-36 and the duration exceeds the value set in F8-37, the digital output terminal set for function 34 becomes on.

Figure8-24 Detection of output current exceeding the limit

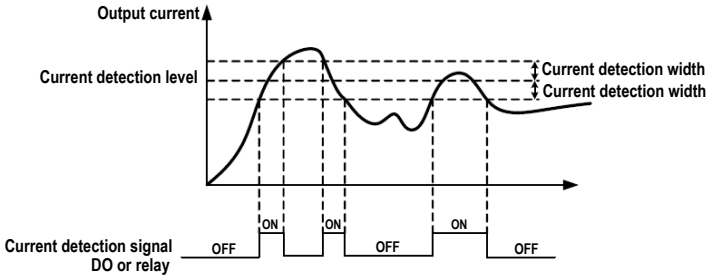


www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F8-38	Detection of current 1	0.0% to 300.0% (rated motor current)	100.0%
F8-39	Detection width of current 1	0.0% to 300.0% (rated motor current)	0.0%
F8-40	Detection of current 2	0.0% to 300.0% (rated motor current)	100.0%
F8-41	Detection width of current 2	0.0% to 300.0% (rated motor current)	0.0%

F8-38 and F8-41: These function parameters set the detection level and width of current 1 and current 2 for the digital output functions 28 and 29. If the drive's output current reaches the width, the digital output terminals set for functions 28 and 29 become on.

Figure 8-25 Any frequency reached detection



Function Code	Parameter Name	Setting Range	Default
F8-42	Timing function	0: Disabled 1: Enabled	0
F8-43	Timing running time setting channel	0: Set by F8-44 1: AI1 2: AI2 3: AI3 (100% of analog input corresponds to the value of F8-44)	0
F8-44	Timing running time	0.0 to 6500.0 min	0.0

F8-42 and F8-44: These function parameters define the timing function of the AC drive. Once it is enabled, the AC drive starts timing from startup. When the set timing running time is reached, the AC drive stops automatically and the digital output terminal set for the function 30 becomes on.

The AC drive starts timing from 0 again for each startup. You can view the remaining timing running time in U0-20.

Function Code	Parameter Name	Setting Range	Default
F8-45	AI1 input voltage lower limit	0.00 V to F8-46	3.10 V
F8-46	AI1 input voltage upper limit	F8-45 to 11.00 V	6.80 V

F8-45 and F8-46: These two function parameters indicate whether the AI1 input voltage is in the setting range. If the AI1 input is larger than F8-46 or smaller than F8-45, the digital output terminal set for the function 31 becomes on.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F8-47	Module temperature threshold	0°C to 100°C	75°C

F8-47: This function parameter sets the module temperature threshold. When the heatsink temperature reaches the value set in F8-47, the digital output terminal set for the function 35 becomes on.

Function Code	Parameter Name	Setting Range	Default
F8-48	Cooling fan working mode	0: Working during drive running 1: Working continuously	0

F8-48: This function parameter sets the working mode of the cooling fan.

0. Working during running

   The fan works during drive running. When the drive stops, the fan works if the heatsink temperature is above 40°C and stops if the heatsink temperature is below 40°C.

1. Working continuously

   The fan keeps working after power-on.

Function Code	Parameter Name	Setting Range	Default
F8-49	Wakeup frequency	Hibernating frequency (F8-51) to max. frequency (F0-10)	0.00 Hz
F8-50	Wakeup delay time	0.0s to 6500.0s	0.0s
F8-51	Hibernating frequency	0.00 Hz to wakeup frequency (F8-49)	0.00 Hz
F8-52	Hibernating delay time	0.0s to 6500.0s	0.0s

F8-49 to F8-52: These function parameters define the hibernating and wakeup function in the water supply application. Generally, set the wakeup frequency equal to or higher than the hibernating frequency. If they are set to 0, the function is disabled.

During drive running, when the frequency reference is equal to or smaller than F8-51, the AC drive enters the hibernating state after the delay set in F8-52.

In the hibernating state, when the frequency reference is equal to or larger than F8-49, the AC drive wakes up after the delay set in F8-50.

When the frequency source is PID, whether to perform PID operation in the hibernating state is determined by FA-28 (Selection of PID operation at stop).

Function Code	Parameter Name	Setting Range	Default
F8-53	Current running time	0.0 to 6500.0 min	0.0 min

F8-53: This function parameter sets the current running time. If the current running time reaches the value set in this parameter, the digital output terminal set for the function 40 becomes on, indicating that the current running time is reached.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Group F9: Fault and Protection

Function Code	Parameter Name	Setting Range	Default
F9-00	Motor overload protection selection	0: Disabled 1: Enabled	1
F9-01	Motor overload protection gain	0.20 to 10.00	1.00

F9-00 and F9-01: The motor overload protection function estimates the motor overload level based on the inverse time-lag curve.

If the motor overload protection is disabled, the motor may be damaged due to overheating. Therefore, it is suggested that a thermal relay be installed between the AC drive and the motor.

The inverse time-lag curve is:

- 220% x F9-01 x rated motor current

  If the load remains at this value for one minute, the AC drive reports the motor overload fault.

- 150% x F9-01 x rated motor current

  If the load remains at this value for 60 minutes, the AC drive reports the motor overload fault.

Set F9-01 properly based on the actual motor overload capacity. Too large setting may damage the motor because the motor overheats but the AC drive does not report the fault and perform corresponding protection.

Function Code	Parameter Name	Setting Range	Default
F9-02	Motor overload pending coefficient	50% to 100%	80%

F9-02: The AC drive has the motor overload pending function that reminds of motor overload in advance through the digital output function 6.

When the accumulative output current of the AC drive reaches above the inverse time-lag curve x F9-02, the DO terminal set for the function outputs the ON signal.

Function Code	Parameter Name	Setting Range	Default
F9-07	Detection of short-circuit to ground upon power-on	0: Disabled 1: Enabled	0

F9-07: This function parameter determines whether to detect motor short circuit to ground at power-on. If this function is enabled, the AC drive's UVW will have voltage output for a while after power-on.

Function Code	Parameter Name	Setting Range	Default
F9-08	Braking unit action voltage	700 to 800 V	780 V

F9-08: The braking unit action voltage Vbreak must satisfy 800 ≥ Vbreak ≥ (1.414 x Vs + 30). Vs represents the AC power voltage input to the AC drive.

Note that improper setting of this parameter may result in abnormal running of the built-in braking unit.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F9-09	Auto reset times	0 to 20	0

F9-09: This function parameter sets the allowable times of auto fault reset. If the reset times exceed the value set in this parameter, the AC drive will keep the fault state.

Function Code	Parameter Name	Setting Range	Default
F9-10	Selection of DO action during auto reset	0: Not act 1: Act	0

F9-10: This function parameter decides whether the digital output terminal set for the fault output acts during the fault reset.

Function Code	Parameter Name	Setting Range	Default
F9-11	Delay of auto reset	0.1s to 100.0s	1.0s

F9-11: This function parameter sets the delay of auto reset after the AC drive reports a fault.

Function Code	Parameter Name	Setting Range	Default
F9-12	Selection of power input phase loss protection	0: Disabled 1: Enabled	1

F9-12: This function parameter determines whether to perform power input phase loss protection.

Function Code	Parameter Name	Setting Range	Default
F9-13	Power output phase loss protection	0: Disabled 1: Enabled	1

F9-13: This function parameter determines whether to perform power output phase loss protection.

Function Code	Parameter Name	Setting Range
F9-14	1st fault type	0 to 51
F9-15	2nd fault type	
F9-16	3rd (latest) fault type	

F9-14 to F9-16: These function parameters record the types of the most recent three faults. 0 indicates no fault.

Function Code	Parameter Name	Description
F9-17	Frequency upon 3rd fault	It displays the frequency when the latest fault occurs.
F9-18	Current upon 3rd fault	It displays the current when the latest fault occurs.
F9-19	Bus voltage upon 3rd fault	It displays the bus voltage when the latest fault occurs.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Description
F9-20	DI state upon 3rd fault	It displays the state of all DI terminals when the latest fault occurs. Bit9 Bit8 Bit7 Bit6 Bit5 Bit4 Bit3 Bit2 Bit1 Bit0 DI10 DI9 DI8 DI7 DI6 DI5 DI4 DI3 DI2 DI1 If a DI is on, the setting is 1. If the DI is off, the setting is 0. The display is the equivalent decimal number converted from the binary settings.
F9-21	Digital output terminal state upon 3rd fault	It displays the state of all digital output terminals when the latest fault occurs. Bit4 Bit3 Bit2 Bit1 Bit0 DO2 DO1 REL2 REL1 FMP If an output terminal is on, the setting is 1. If the output terminal is off, the setting is 0. The display is the equivalent decimal number converted from the binary settings.
F9-22	AC drive state upon 3rd fault	Reserved
F9-23	Current power-on time upon 3rd fault	It displays the current power-on time when the latest fault occurs.
F9-24	Current running time upon 3rd fault	It displays the current running time when the latest fault occurs.
F9-27	Frequency upon 2nd fault	Same as F9-17 to F9-24.
F9-28	Current upon 2nd fault	
F9-29	Bus voltage upon 2nd fault	
F9-30	DI state upon 2nd fault	
F9-31	Digital output terminal state upon 2nd fault	
F9-32	AC drive state upon 2nd fault	
F9-33	Current power-on time upon 2nd fault	
F9-34	Current running time upon 2nd fault	
F9-37	Frequency upon 1st fault	Same as F9-17 to F9-24.
F9-38	Current upon 1st fault	
F9-39	Bus voltage upon 1st fault	
F9-40	DI state upon 1st fault	
F9-41	Digital output terminal state upon 1st fault	
F9-42	AC drive state upon 1st fault	
F9-43	Current power-on time upon 1st fault	
F9-44	Current running time upon 1st fault	

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

F9-17 to F9-44: These function parameters record the frequency, current, bus voltage, DI state, digital output terminal state, AC drive state, power-on time and running time at occurrence of the three faults.

Function Code	Parameter Name	Setting Range	Default
F9-47	Fault protection action selection 1	0: Coast to stop 1: Stop according to the stop mode 2: Continue to run	00000
		Unit's digit: Motor overload (Err11)	
		Ten's digit: Power input phase loss (Err12)	
		Hundred's digit: Power output phase loss (Err13)	
		Thousand's digit: External fault (Err15)	
		Ten thousand's digit: Communication fault (Err16)	
F9-48	Fault protection action selection 2	Unit's digit: Reserved	00000
		Ten's digit: EEPROM read-write fault (Err21) 0: Coast to stop 1: Stop according to the stop mode	
		Hundred's digit: Reserved	
		Thousand's digit: Reserved	
		Ten thousand's digit: Accumulative running time reached (Err26) 0: Coast to stop 1: Stop according to the stop mode 2: Continue to run	
F9-49	Fault protection action selection 3	Unit's digit: User-defined fault 1 (Err27) 0: Coast to stop 1: Stop according to the stop mode 2: Continue to run	00000
		Ten's digit: User-defined fault 2 (Err28) Same as unit's digit	
		Hundred's digit: Power-on time reached (Err29) Same as unit's digit	
		Thousand's digit: Load lost (Err30) 0: Coast to stop 1: Stop according to the stop mode 2: Continue to run at 7% of rated motor frequency and restore to the frequency reference if the load does not get lost	
		Ten thousand's digit: PID feedback lost during drive running (Err31) Same as unit's digit	

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
F9-50	Fault protection action selection 4	0: Coast to stop 1: Stop according to the stop mode 2: Continue to run	00000
		Unit's digit: Too large speed feedback error (Err42)	
		Ten's digit: Reserved	
		Hundred's digit: Reserved	
		Thousand's digit: Reserved	
		Ten thousand's digit: Reserved	

F9-47 to F9-50: These function parameters set the action mode of the AC drive at occurrence of fault.

0. Coast to stop

   The AC drive displays Err** and directly stops.

1. Stop according to the stop mode

   The AC drive displays A** and stops according to the stop mode. After stop, the AC drive displays Err**.

2. Continue to run

   The AC drive continues to run and displays A**. The running frequency is set in F9-54.

Function Code	Parameter Name	Setting Range	Default
F9-54	Frequency selection for continuing to run upon fault	0: Current running frequency 1: Frequency reference 2: Frequency upper limit 3: Frequency lower limit 4: Backup frequency upon abnormality	0
F9-55	Backup frequency upon abnormality	0.0% to 100.0% (max. frequency)	100.0%

F9-54 to F9-55: These function parameters define the running frequency of the AC drive when "Continue to run" is selected at occurrence of fault. The setting value of F9-55 is a percentage of maximum frequency.

Function Code	Parameter Name	Setting Range	Default
F9-59	Power dip ride-through function selection	0: Disabled 1: Bus voltage constant control 2: Decelerate to stop	0
F9-60	Voltage level of power dip ride-through function disabled	80% to 100%	85%
F9-61	Judging time of bus voltage recovering from power dip	0.0s to 100.0s	0.5s

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

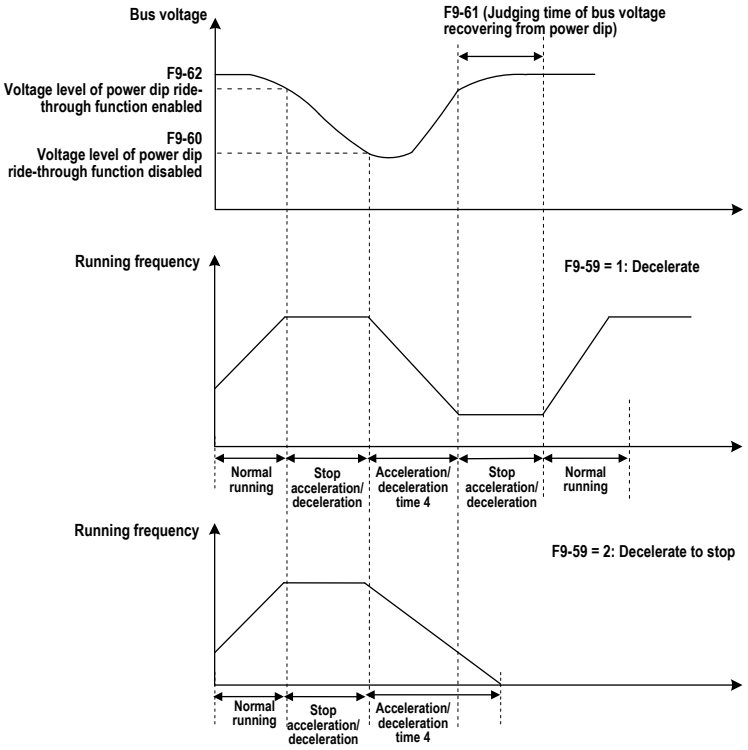
Function Code	Parameter Name	Setting Range	Default
F9-62	Voltage level of power dip ride-through function enabled	60% to 85% (standard bus voltage)	80.0%
F9-71	Power dip ride-through gain Kp	0 to 100	40
F9-72	Power dip ride-through integral coefficient	0 to 100	30
F9-73	Power dip ride-through gain Kp	0.0s to 300.0s	20.0s

F9-59 to F9-62: These function parameters define the power dip ride-through function. When an instantaneous power loss or a sudden power dip occurs, the AC drive compensates the DC bus voltage reduction with the real-time energy feedback by reducing the output frequency.

F9-59 = 1: When power dip occurs, the AC drive decelerates. When the bus voltage recovery ramp time is longer than the value set in F9-61, the AC drive accelerates to the frequency reference.

F9-59 = 2: When power dip occurs, the AC drive decelerates to stop.

Figure 8-26 Power dip ride-through function



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Note

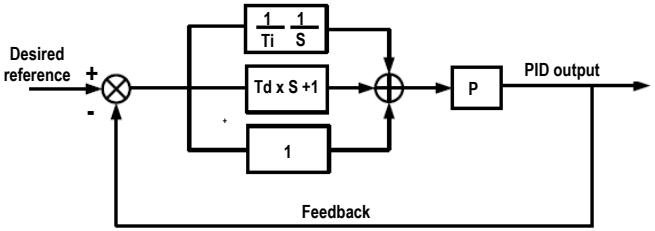
- In the bus voltage constant control mode, when the line voltage recovers, the AC drive continues to accelerate to the target frequency. In the deceleration to stop mode, when the line voltage recovers, the AC drive continues to decelerates to 0 Hz and stops.
- The power dip ride-through function is purposed to ensure the motor to decelerate to stop normally when the line voltage is abnormal, and to start immediately once the line voltage recovers to normal. This is to prevent the motor from coasting to stop suddenly due to the undervoltage fault when the line voltage is abnormal. It takes the motor very long time to coast to stop for large-inertia system. After the line voltage recovers to normal, restart of the motor spinning at high speed will result in the overload or overcurrent fault to the AC drive.

Function Code	Parameter Name	Setting Range	Default
F9-63	Selection of load lost protection	0: Disabled 1: Enabled	0

Group FA: PID Function

The PID (Proportional + Integral + Derivative) function uses system feedback for closed-loop control of variables such as flow, pressure, temperature, and so on. The purpose of the PID control is to keep the drive output frequency as close as possible to a desired reference via the PID adjustment.

Figure 8-27 PID function



Function Code	Parameter Name	Setting Range	Default
FA-00	PID reference source	0: Set by FA-01 1: AI1 2: AI2 3: AI3 4: Pulse reference (DI5) 5: Communication reference 6: Multi-reference	0
FA-01	PID digital setting	0.0% to 100.0%	50.0%

FA-00 and FA-01: These function parameters set the input channel of the PID reference. The PID reference is a relative value and ranges from 0.0% to 100.0%. The PID feedback is also a relative value. The PID function is aimed at making the PID reference and the PID feedback as close as possible.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
FA-02	PID feedback source	0: AI1 1: AI2 2: AI3 3: AI1 - AI2 4: Pulse reference (DI5) 5: Communication reference 6: AI1 + AI2 7: Max. (|AI1|, |AI2|) 8: Min. (|AI1|, |AI2|)	0

FA-02: This function parameter sets the PID feedback channel. The PID feedback is a relative value and ranges from 0.0% to 100.0%.

Function Code	Parameter Name	Setting Range	Default
FA-03	PID operation direction	0: Forward operation 1: Reverse operation	0

FA-03: This function parameter sets the direction of the PID operation. It is influenced by the DI function 35 "PID operation direction reverse".

- Forward operation

  When the PID feedback is smaller than the reference, the AC drive increases the output frequency. The winding tension control requires forward PID operation.

- Reverse operation

  When the PID feedback is smaller than the reference, the AC drive decreases the output frequency. The unwinding tension control requires reverse PID operation.

Function Code	Parameter Name	Setting Range	Default
FA-04	PID reference and feedback range	0 to 65535	80%

FA-04: It is a non-dimensional parameter and is used for calculate the display of PID reference (U0-15) and PID feedback (U0-16).

- U0-15 = PID reference (percentage) x FA-04
- U0-16 = PID feedback (percentage) x FA-04

For example, if FA-04 is set to 2000 and PID reference is 100.0%, the display of PID reference (U0-15) is 2000.

Function Code	Parameter Name	Setting Range	Default
FA-05	Proportional gain Kp1	0.0 to 100.0	20.0
FA-06	Integral time Ti1	0.01s to 10.00s	2.00s
FA-07	Differential time Td1	0.00s to 10.000s	0.000s

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

FA-05 to FA-07: These function parameters are the proportional gain (Kp1), integral time (Ti1) and derivative time (Td1) of PID control.

- Proportional gain (Kp1)

  A large value tends to reduce the present error, but too large setting will cause system oscillation.

- Integral time (Ti1)

  The shorter the integral time is, the faster the error will be predicted. But too short setting will cause overshoot or system oscillation.

- Derivative time (Td1)

  The longer the derivative time is, the faster the system will respond to the error. But too longer setting will cause vibration.

Function Code	Parameter Name	Setting Range	Default
FA-08	Negative PID output limit	0.00 Hz to max. frequency	2.00 Hz

FA-08: This function parameter sets the limit of the negative PID output (the AC drive runs in the reverse direction) because too high negative PID output is not allowed in some applications.

Function Code	Parameter Name	Setting Range	Default
FA-09	PID error limit	0.0% to 100.0%	0.0%

FA-09: This function parameter sets the error limit of the PID reference and PID feedback. When the PID error reaches this level, the PID function becomes disabled. This function helps to stabilize the output frequency of the AC drive, effective for some closed-loop control applications.

Function Code	Parameter Name	Setting Range	Default
FA-10	PID Derivative limit	0.00% to 100.00%	0.10%

FA-10: This function parameter applies a limit to the derivative output, which is sensitive in PID function and may cause system oscillation.

Function Code	Parameter Name	Setting Range	Default
FA-11	PID reference change time	0.00s to 650.00s	0.00s

FA-11: This function parameter sets the time it takes the PID reference to change from 0.0% to 100.0%. The PID reference changes linearly based on the time set in this parameter, reducing negative impact of sudden PID reference change.

Function Code	Parameter Name	Setting Range	Default
FA-12	PID feedback filter time	0.00s to 60.00s	0.00s
FA-13	PID output filter time	0.00s to 60.00s	0.00s

FA-12 and FA-13: These two function parameters provide filter function to the PID feedback and PID output, lowering interference on the PID feedback and weakening sudden change of the PID change but slowing the response of the process closed-loop system.

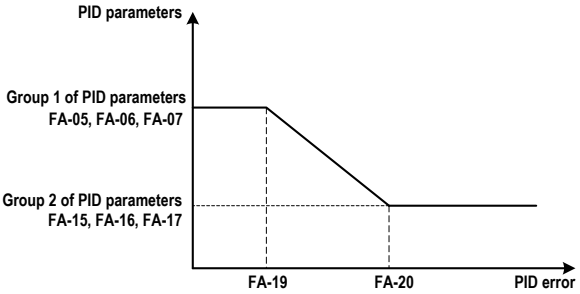
www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
FA-15	Proportional gain Kp2	0.0 to 100.0	20.0
FA-16	Integral time Ti2	0.01s to 10.00s	2.00s
FA-17	Differential time Td2	0.000s to 10.000s	0.000s
FA-18	PID parameter switchover condition	0: No switchover 1: Switchover via DI 2: Auto switchover based on PID error	0
FA-19	PID error 1 for auto switchover	0.0% to FA-20	20.0%
FA-20	PID error 2 for auto switchover	FA-19 to 100.0%	80.0%

FA-15 to FA-20: On some applications, switchover of PID parameters is required because one group of PID parameters cannot satisfy the requirement.

The switchover can be implemented either via a DI terminal or automatically implemented according to the PID error level.

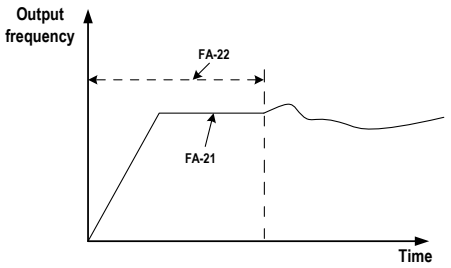
Figure 8-28 PID parameters switchover



Function Code	Parameter Name	Setting Range	Default
FA-21	PID initial value	0.0% to 100.0%	0.0%
FA-22	PID initial value active time	0.00s to 650.00s	0.00s

FA-21 and FA-22: When the AC drive starts up, the PID function acts only after the PID output is fixed at the PID initial value (FA-21) for the time set in FA-22.

Figure 8-29 The PID initial value



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
FA-23	Max. deviation between two PID outputs in forward direction	0.00% to 100.00%	1.00%
FA-24	Max. deviation between two PID outputs in reverse direction	0.00% to 100.00%	1.00%

FA-23 and FA-24: These function parameters limit the deviation between two PID outputs (2 ms per PID output) to suppress rapid change of PID output and stabilize the drive running.

They correspond to the absolute maximum value of the output deviation in forward direction and in reverse direction.

Function Code	Parameter Name	Setting Range	Default
FA-25	Max. deviation between two PID outputs in reverse direction	Unit's digit: Integral separation 0: Disabled 1: Enabled	00
		Ten's digit: Whether to stop integral operation when the PID output reaches the limit 0: Continue integral operation 1: Stop integral operation	

FA-25: This function parameter determines whether to enable integral separation and whether to stop integral operation when the PID output reaches the limit.

If integral separation is enabled, when the DI set for the function 38 "PID integral disabled" is on, the integral operation becomes disabled. This moment, only the P gain and derivative time take effect.

If integral separation is disabled, no matter whether the DI set for the function 38 "PID integral disabled" is on, integral separation is inactive.

Function Code	Parameter Name	Setting Range	Default
FA-26	Detection level of PID feedback loss	0.0%: No detection 0.1% to 100.0%	0.0%
FA-27	Detection time of PID feedback loss	0.0s to 20.0s	0.0s

FA-26 and FA-27: These function parameters define the PID feedback loss detection function. When the PID feedback is smaller than the value set in FA-26 for the time set in FA-27, the AC drive reports Err31 and acts as selected in ten's thousand's digit in F9-49.

Function Code	Parameter Name	Setting Range	Default
FA-28	Selection of PID operation at stop	0: Disabled 1: Enabled	0

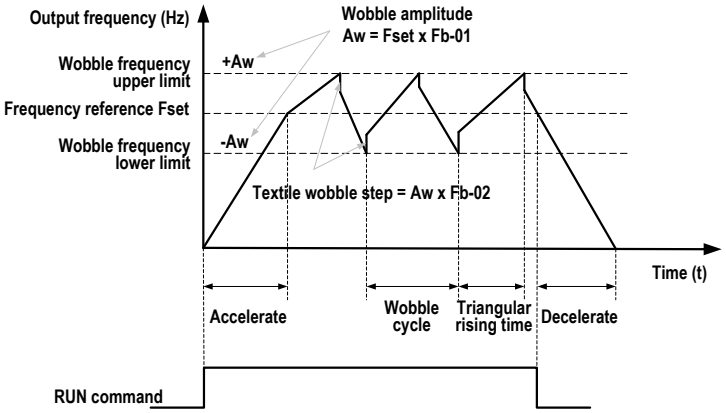
FA-28: This function parameter determines whether to continue PID operation when the AC drive stops. Generally, the PID operation is disabled in the stop state.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Group Fb: Wobble Function, Fixed Length and Count

The wobble function is applicable to the industries such as textile and chemical fiber and the winding and unwinding applications. It indicates the output frequency wobbles up and down with the frequency reference as the center. The trace of the running frequency at the time axis is shown in the following figure.

Figure 8-30 Wobble function



Function Code	Parameter Name	Setting Range	Default
Fb-00	Wobble setting mode	0: Relative to the frequency reference 1: Relative to the max. frequency	0

Fb-00: This function parameter selects the base value of the wobble amplitude.

Fb-00 = 0: It is a variable wobble amplitude system. The wobble amplitude varies with the central frequency (frequency reference).

Fb-00 = 1: It is a fixed wobble amplitude system. The wobble amplitude is fixed.

Function Code	Parameter Name	Setting Range	Default
Fb-01	Wobble amplitude	0.0% to 100.0%	0.0%
Fb-02	Wobble step	0.0% to 50.0%	0.0%

Fb-01 and Fb-02: These function parameters set the wobble amplitude and wobble step.

- When Fb-00 = 0, Aw (wobble amplitude) = F0-07 (Frequency source superposition selection) x Fb-01.
- When Fb-00 = 1, Aw (wobble amplitude) = F0-10 (Max. frequency) x Fb-01.

Wobble step frequency = Aw (wobble amplitude) x Fb-02 (Wobble step). The wobble running frequency must be within the frequency upper limit and frequency lower limit.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
Fb-03	Wobble cycle	0.1s to 3000.0s	10.0s
Fb-04	Triangular wave rising time coefficient	0.1% to 100.0%	50.0%

Fb-03: It specifies the time of a complete wobble cycle.

Fb-04: It is the percentage of triangular wave rising time to Fb-03 (Wobble cycle).

- Triangular wave rising time = Fb-03 (Wobble cycle) x FB-04 (Triangular wave rising time coefficient, unit: s)
- Triangular wave falling time = Fb-03 (Wobble cycle) x (1 - Fb-04 Triangular wave rising time coefficient, unit: s)

Function Code	Parameter Name	Setting Range	Default
Fb-05	Set length	0 to 65535 m	1000 m
Fb-06	Actual length	0 to 65535 m	0 m
Fb-07	Number of pulses per meter	0.1 to 6553.5	100.0

Fb-05 to Fb-07: These function parameters are used for fixed length control.

You can obtain the actual length (Fb-06) by dividing the number of pulses sampled by DI by Fb-07 (Number of pulses each meter). The sampling DI terminal must be set for the function 27 "Length signal pulses count". For high pulse frequency, use terminal DI5.

When the actual length reaches the value set in Fb-05, the digital output terminal set for the function 10 "Length reached" becomes on.

Length reset can be implemented via the DI terminal set for the function 28 "Length reset".

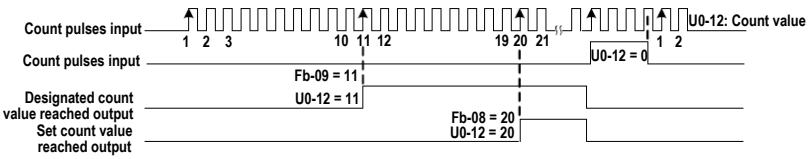
Function Code	Parameter Name	Setting Range	Default
Fb-08	Set count value	1 to 65535	1000
Fb-09	Designated count value	1 to 65535	1000

Fb-08 and Fb-09: These function parameters are the set count value and designated count value. The counting value is sampled by the DI terminal set for the function 25 "Counter input". For high pulse frequency, use terminal DI5.

When the counting value reaches the level set in Fb-08, the digital output terminal set for the function 8 "Set count value reached" becomes on.

When the counting value reaches the level set in Fb-09, the digital output terminal set for the function 9 "Designated count value reached" becomes on.

Fb-09 should be equal to or smaller than Fb-08.



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Group FC: Multi-Reference and Simple PLC Function

The multi-reference of the MD310 can be used as multi-speed, V/F separated voltage source and PID reference source.

The simple PLC function is completely different from the user programmable function. It can only complete simple combination of multiple references.

Function Code	Parameter Name	Setting Range	Default
FC-00	Reference 0	-100.0% to 100.0%	0.0%
FC-01	Reference 1	-100.0% to 100.0%	0.0%
FC-02	Reference 2	-100.0% to 100.0%	0.0%
FC-03	Reference 3	-100.0% to 100.0%	0.0%
FC-04	Reference 4	-100.0% to 100.0%	0.0%
FC-05	Reference 5	-100.0% to 100.0%	0.0%
FC-06	Reference 6	-100.0% to 100.0%	0.0%
FC-07	Reference 7	-100.0% to 100.0%	0.0%
FC-08	Reference 8	-100.0% to 100.0%	0.0%
FC-09	Reference 9	-100.0% to 100.0%	0.0%
FC-10	Reference 10	-100.0% to 100.0%	0.0%
FC-11	Reference 11	-100.0% to 100.0%	0.0%
FC-12	Reference 12	-100.0% to 100.0%	0.0%
FC-13	Reference 13	-100.0% to 100.0%	0.0%
FC-14	Reference 14	-100.0% to 100.0%	0.0%
FC-15	Reference 15	-100.0% to 100.0%	0.0%

FC-00 and FC-15: The multi-reference is relative value and ranges from -100.0% to 100.0%.

As frequency source, it is a percentage relative to the maximum frequency. As V/F separated voltage source, it is a percentage relative to the rated motor voltage. Multi-reference can be switched over based on different states of DI terminals. For details, see the descriptions of group F4.

Function Code	Parameter Name	Setting Range	Default
FC-16	Simple PLC running mode	0: Stop after running one cycle	0
		1: Keep final values after running one cycle	
		2: Repeat after running one cycle	

FC-16: It determines the simple PLC running mode.

0. Stop after running one cycle

   The AC drive stops after running one cycle, and will not start up until receiving new RUN command.

1. Keep final values after running one cycle

   The AC drive keeps the final running frequency and direction after running one cycle.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

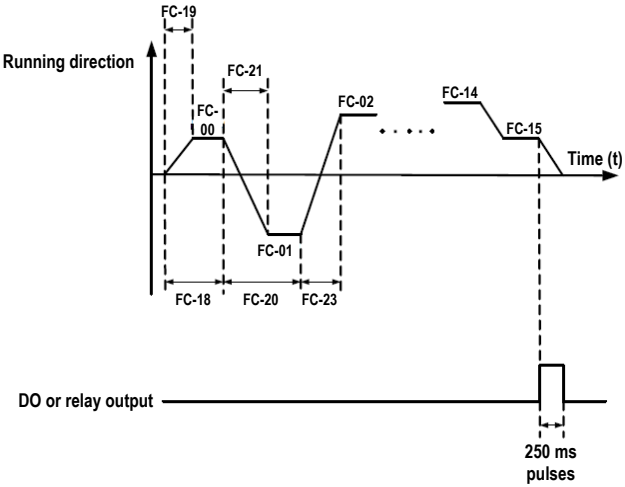
2. Repeat after running one cycle

   The AC drive automatically starts another cycle after running one cycle, and will not stop until receiving the stop command.

Simple PLC can be either the frequency source or V/F separated voltage source.

When used as the frequency source, the value of FC-00 to FC-15 (positive or negative) determines the drive running direction. If the value is negative, it indicates that the AC drive runs in the reverse direction.

Figure 8-31 The simple PLC function



Function Code	Parameter Name	Setting Range	Default
FC-17	Simple PLC retentive selection	Unit's digit: Retentive at power loss	00
		0: No	
		1: Yes	
		Ten's digit: Retentive at stop	
		0: No	
		1: Yes	

FC-17: It decides whether simple PLC is retentive at power loss or stop.

If yes, the AC drive memorizes the PLC running stage and running frequency before power loss or stop and will continue to run from the memorized stage at next power-on. If not, the AC drive restarts the PLC process at next power-on.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
FC-18	Running time of simple PLC reference 0	0.0s (h) to 6500s (h)	0.0s (h)
FC-19	Acceleration/deceleration time of simple PLC reference 0	0 to 3	0
FC-20	Running time of simple PLC reference 1	0.0s (h) to 6500s (h)	0.0s (h)
FC-21	Acceleration/deceleration time of simple PLC reference 1	0 to 3	0
FC-22	Running time of simple PLC reference 2	0.0s (h) to 6500s (h)	0.0s (h)
FC-23	Acceleration/deceleration time of simple PLC reference 2	0 to 3	0
FC-24	Running time of simple PLC reference 3	0.0s (h) to 6500s (h)	0.0s (h)
FC-25	Acceleration/deceleration time of simple PLC reference 3	0 to 3	0
FC-26	Running time of simple PLC reference 4	0.0s (h) to 6500s (h)	0.0s (h)
FC-27	Acceleration/deceleration time of simple PLC reference 4	0 to 3	0
FC-28	Running time of simple PLC reference 5	0.0s (h) to 6500s (h)	0.0s (h)
FC-29	Acceleration/deceleration time of simple PLC reference 5	0 to 3	0
FC-30	Running time of simple PLC reference 6	0.0s (h) to 6500s (h)	0.0s (h)
FC-31	Acceleration/deceleration time of simple PLC reference 6	0 to 3	0
FC-32	Running time of simple PLC reference 7	0.0s (h) to 6500s (h)	0.0s (h)
FC-33	Acceleration/deceleration time of simple PLC reference 7	0 to 3	0
FC-34	Running time of simple PLC reference 8	0.0s (h) to 6500s (h)	0.0s (h)
FC-35	Acceleration/deceleration time of simple PLC reference 8	0 to 3	0
FC-36	Running time of simple PLC reference 9	0.0s (h) to 6500s (h)	0.0s (h)
FC-37	Acceleration/deceleration time of simple PLC reference 9	0 to 3	0
FC-38	Running time of simple PLC reference 10	0.0s (h) to 6500s (h)	0.0s (h)
FC-39	Acceleration/deceleration time of simple PLC reference 10	0 to 3	0

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
FC-40	Running time of simple PLC reference 11	0.0s (h) to 6500s (h)	0.0s (h)
FC-41	Acceleration/deceleration time of simple PLC reference 11	0 to 3	0
FC-42	Running time of simple PLC reference 12	0.0s (h) to 6500s (h)	0.0s (h)
FC-43	Acceleration/deceleration time of simple PLC reference 12	0 to 3	0
FC-44	Running time of simple PLC reference 13	0.0s (h) to 6500s (h)	0.0s (h)
FC-45	Acceleration/deceleration time of simple PLC reference 13	0 to 3	0
FC-46	Running time of simple PLC reference 14	0.0s (h) to 6500s (h)	0.0s (h)
FC-47	Acceleration/deceleration time of simple PLC reference 14	0 to 3	0
FC-48	Running time of simple PLC reference 15	0.0s (h) to 6500s (h)	0.0s (h)
FC-49	Acceleration/deceleration time of simple PLC reference 15	0 to 3	0
FC-50	Time unit of simple PLC running	0: s (second) 1: h (hour)	0

FC-18 to FC-50: These function parameters set the running time and acceleration/deceleration time of 16 references of simple PLC.

Function Code	Parameter Name	Setting Range	Default
FC-51	Reference 0 source	0: Set by FC-00 1: AI1 2: AI2 3: AI3 4: Pulse reference 5: PID 6: Set by preset frequency (F0-08), modified via terminal UP/DOWN	0

FC-51: This function parameter determines the setting channel of reference 0.

Group Fd: Communication Parameters

For the details, refer to the MD310 Modbus Communication Protocol.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Group FE: User-Defined Parameters

The AC drive allows you to add a maximum of 30 MD310 function parameters to group FE, facilitating you to view and modify. If F0.00 is displayed on group FE, it indicates that group FE is null and ignore it.

Function Code	Parameter Name	Setting Range	Default
FE-00	User-defined parameter 0	F0-00 to FP-xx, A0-00 to Ax-xx, U0-xx	F0-00
FE-01	User-defined parameter 1	Same as FE-00	F0-02
FE-02	User-defined parameter 2	Same as FE-00	F0-03
FE-03	User-defined parameter 3	Same as FE-00	F0-07
FE-04	User-defined parameter 4	Same as FE-00	F0-08
FE-05	User-defined parameter 5	Same as FE-00	F0-17
FE-06	User-defined parameter 6	Same as FE-00	F0-18
FE-07	User-defined parameter 7	Same as FE-00	F3-00
FE-08	User-defined parameter 8	Same as FE-00	F3-01
FE-09	User-defined parameter 9	Same as FE-00	F4-00
FE-10	User-defined parameter 10	Same as FE-00	F4-01
FE-11	User-defined parameter 11	Same as FE-00	F4-02
FE-12	User-defined parameter 12	Same as FE-00	F5-04
FE-13	User-defined parameter 13	Same as FE-00	F5-07
FE-14	User-defined parameter 14	Same as FE-00	F6-00
FE-15	User-defined parameter 15	Same as FE-00	F6-10
FE-16	User-defined parameter 16	Same as FE-00	F0-00
FE-17	User-defined parameter 17	Same as FE-00	F0-00
FE-18	User-defined parameter 18	Same as FE-00	F0-00
FE-19	User-defined parameter 19	Same as FE-00	F0-00
FE-20	User-defined parameter 20	Same as FE-00	F0-00
FE-21	User-defined parameter 21	Same as FE-00	F0-00
FE-22	User-defined parameter 22	Same as FE-00	F0-00
FE-23	User-defined parameter 23	Same as FE-00	F0-00
FE-24	User-defined parameter 24	Same as FE-00	F0-00
FE-25	User-defined parameter 25	Same as FE-00	F0-00
FE-26	User-defined parameter 26	Same as FE-00	F0-00
FE-27	User-defined parameter 27	Same as FE-00	F0-00
FE-28	User-defined parameter 28	Same as FE-00	F0-00
FE-29	User-defined parameter 29	Same as FE-00	F0-00

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Group FP: Function Parameter Management

Function Code	Parameter Name	Setting Range	Default
FP-00	User password	0 to 65535	0

FP-00: This function parameter controls the security protection function that requires a user-defined password.

To enable password protection, set a non-zero value in this parameter. This value is the user-defined password. Then you can use the password to enter the function code editing mode. Make sure to remember the password you set.

To remove password protection, enter the function code editing mode using the current password and set FP-00 to 00000.

Function Code	Parameter Name	Setting Range	Default
FP-01	Parameter initialization	0: No operation	0
		1: Restore factory parameters except motor parameters	
		2: Clear records	
		4: Back up current user parameters	
		501: Restore user backup parameters	

FP-01: The MD310 has the parameter initialization function.

0. No operation

   Parameter initialization is disabled.

1. Restore factory parameters except motor parameters

   Most MD310 function parameters are restored to factory parameters. The parameters will not be restored include motor parameters, F0-22 (Frequency reference resolution), F7-09 (Accumulative running time), F7-13 (Accumulative power-on time), F7-14 (Accumulative power consumption) and recorded fault information.

2. Clear records

   F7-09 (Accumulative running time), F7-13 (Accumulative power-on time), F7-14 (Accumulative power consumption) and recorded fault information are cleared.

3. Back up current user parameters

   You can make a separate external backup of parameter settings. This feature allows you to load a set of parameter settings during commissioning, or to restore a set of settings after completing a maintenance or repair operation on the MD310.

501. Restore user backup parameters

You are allowed to restore previous backup user parameters.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
FP-02	Selection of general function parameter display	Unit's digit: Group U 0: Not display 1: Display Ten's digit: Group A 0: Not display 1: Display	11
FP-03	Selection of individualized parameter display	Unit's digit: User-defined group 0: Not display 1: Display Ten's digit: User-modified group 0: Not display 1: Display	00

FP-02 to FP-03: These function parameters determine whether to display the general function parameters and the individualized parameters

The MD310 classifies the parameters into three groups, general group, user-defined group and user-modified group. They are defined and displayed as follows:

Parameter Group	Description	Display
General group	Display function codes of the AC drive in sequence of F0 to FF, A0 to AF and U0 to UF.	
User-defined group	Display a maximum of 32 user-defined parameters in group FE.	
User-modified group	Display the parameters that are modified.	

For example, function parameter F0-00 is displayed as F0-00 in general group, as uF0-00 in user-defined group and cF0-00 in user-modified group.

Function Code	Parameter Name	Setting Range	Default
FP-04	Selection of parameter modification	0: Disabled 1: Enabled	0

FP-04: This function parameter controls modification of function parameters to avoid danger caused by unexpected parameter modification.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Group A0: Torque Control and Limit

Function Code	Parameter Name	Setting Range	Default
A0-00	Speed/Torque control selection	0: Speed control 1: Torque control	0

A0-00: This function parameter determines whether the AC drive is in speed control or torque control.

MD310 has two digital input functions related to torque control, function 29 "Torque control prohibited" and function 46 "Speed control/Torque control".

- When the DI terminal set for the function 46 is off, A0-00 determines the control mode.
- When the DI terminal set for the function 46 is on, the control mode is reverse to the value of A0-00.
- When the DI terminal set for the function 29 is on, the AC drive always run in speed control.

Function Code	Parameter Name	Setting Range	Default
A0-01	Torque reference source in torque control	0: Set by A0-03 1: AI1 2: AI2 3: AI3 4: Pulse reference (DI5) 5: Communication reference 6: MIN (AI1, AI2) 7: MAX (AI1, AI2)	0
A0-03	Torque digital setting in torque control	-200.0% to 200.0%	150.0%

A0-01 and A0-03: These function parameters select the channel used to set the torque reference in torque control. There are a total of eight torque setting channels.

The torque reference is a relative value. 100.0% corresponds to the rated AC drive torque. The setting range is -200.0% to 200.0%, indicating the maximum AC drive torque is twice of the rated AC drive torque.

If the torque reference is positive, the AC drive runs in forward direction. If the torque reference is negative, the AC drive runs in reverse direction.

0. Digital setting

   The torque reference is directly set by A0-03.

1. AI1 (0 to 10 V voltage input)
2. AI2 (0 to 10 V voltage input or 0 to 20 mA current input, determined by the setting of jumper J4)
3. AI3 (-10 to 10 V voltage input)

   The frequency reference is entered from an analog input (AI) terminal. The MD310 provides two AI terminals (AI1, AI2). An extra AI terminal (AI3) is provided by the I/O extension card.

   The MD310 provides five curves to indicate the mapping relationship between the input voltage entered from AI1, AI2 or AI3 and the target torque. Three of the curves have a linear (point-point)

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

correspondence, and two have four-point correspondence. You can set the curves by using function codes F4-13 to F4-27 and function codes in group A6, and select curves for AI1, AI2 and AI3 in function code F4-33.

When an analog input is used as the frequency source, 100% of the voltage/current input corresponds to the value of A0-03 (Torque digital setting in torque control).

4. Pulse reference (DI5)

The torque reference is input by means of DI5 (high-speed pulse). The signal specification of pulse reference is 9 to 30 V (voltage range) and 0 to 20 kHz (frequency range). The corresponding percentage 100% of the pulse reference corresponds to the value of A0-03 (Torque digital setting in torque control).

5. Communication reference

The torque reference is given by the host computer through the communication address 0x1000. The data format is -100.00% to 100.00%. 100.00% corresponds to the value of A0-03 (Torque digital setting in torque control).

Function Code	Parameter Name	Setting Range	Default
A0-05	Forward max. frequency in torque control	0.00 Hz to max. frequency (F0-10)	50.00 Hz
A0-06	Reverse max. frequency in torque control	0.00 Hz to max. frequency (F0-10)	50.00 Hz

A0-05 and A0-06: These function parameters set the maximum frequency of the AC drive in forward and reverse directions in torque control.

The motor speed will rise continuously if the load torque is smaller than the motor output torque. This function limits the motor speed in torque control to prevent runaway.

Function Code	Parameter Name	Setting Range	Default
A0-07	Acceleration time in torque control	0.00s to 650.00s	0.00s
A0-08	Deceleration time in torque control	0.00s to 650.00s	0.00s

A0-07 and A0-08: These function parameters set the acceleration/deceleration time in torque control to implement smooth change of motor speed. This helps to prevent problems such as big noise or too large mechanical stress caused by quick change of motor speed.

But in applications where rapid torque response is required, for example, two motors are used to drive the same load, you need to set these two parameters to 0.00s.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Group A1: Virtual DI/DO

Function Code	Parameter Name	Setting Range	Default
A1-00	VDI1 function selection	0 to 50	0
A1-01	VDI2 function selection	0 to 50	0
A1-02	VDI3 function selection	0 to 50	0
A1-03	VDI4 function selection	0 to 50	0
A1-04	VDI5 function selection	0 to 50	0

A1-00 and A1-04: These function parameters set function to the five virtual DI terminals VDI1 to VD15, which have the same digital input functions (0 to 50) as the ten DI terminals do. For more details, see the description of F4-00 to F4-09.

Function Code	Parameter Name	Setting Range	Default
A1-05	VDI active state setting mode	0: Decided by state of VDOx	00000
		1: Decided by A1-06	
		Unit's digit: VDI1	
		Ten's digit: VDI2	
		Hundred's digit: VDI3	
		Thousand's digit: VDI4	
		Ten thousand's digit: VDI5	
A1-06	Selection of VDI active state	0: Inactive	00000
		1: Active	
		Unit's digit: VDI1	
		Ten's digit: VDI2	
		Hundred's digit: VDI3	
		Thousand's digit: VDI4	
		Ten thousand's digit: VDI5	

A1-05 and A1-06: These function parameters determine the active mode of the VDI1 to VD15.

0. Decided by state of VDOx

   To enable the AC drive to report fault and stop when the input from AI1 reaches the limit, perform the following settings:

   1. Set A1-00 to 44 to allocate VDI1 to the function 44 "User-defined fault 1".
   2. Set A1-05 to xxx0 to decide the VDI1 active state by state of VDOx.
   3. Set A1-11 to 31 to allocate VDO1 with the function 31 "AI1 input exceeding limit".

   Then when the input from AI1 reaches the limit, VDO1 becomes on. Then, VDI1 becomes on and the AC drive receives the user-defined fault.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

1. Decided by A1-06

   To enable the AC drive to automatically enter the running state after power-on, perform the following settings:

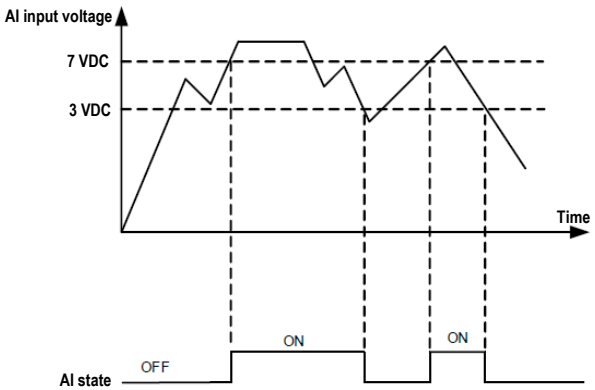
   1. Set A1-00 to 1 to allocate VDI1 to the function 1 "Forward RUN (FWD)".
   2. Set A1-05 to xxx1 to decide the VDI1 active state by state of A1-06.
   3. Set F0-02 to 1 to use terminal control as the command source.
   4. Set F8-18 to 0 to disable the startup protection.

   After completing initialization at power-on, the AC drive detects that VDI1 is set for the function FWD is active. This means the AC drive receives the FWD command from VDI1 and starts forward running.

Function Code	Parameter Name	Setting Range	Default
A1-07	Function selection for AI1 used as DI	0 to 50	0
A1-08	Function selection for AI2 used as DI	0 to 50	0
A1-09	Function selection for AI3 used as DI	0 to 50	0
A1-10	Active state selection for AI used as DI	0: High level active 1: Low level active	000
		Unit's digit: AI1	
		Ten's digit: AI2	
		Hundred's digit: AI3	

A1-07 and A1-10: These function parameters enable AI to be used as DI. When the AI input voltage is higher than 7 V, the AI is in the high level state. When the AI input voltage is lower than 3 V, the AI is in the low level state. The AI is in the hysteresis state between 3 V and 7 V.

Figure 8-32 AI terminal active state judgement



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
A1-11	VDO1 function selection	0: Short with physical DIx internally 1 to 41	0
A1-12	VDO2 function selection	0: Short with physical DIx internally 1 to 41	0
A1-13	VDO3 function selection	0: Short with physical DIx internally 1 to 41	0
A1-14	VDO4 function selection	0: Short with physical DIx internally 1 to 41	0
A1-15	VDO5 function selection	0: Short with physical DIx internally 1 to 41	0
A1-16	VDO1 output delay	0.0s to 3600.0s	0.0s
A1-17	VDO2 output delay	0.0s to 3600.0s	0.0s
A1-18	VDO3 output delay	0.0s to 3600.0s	0.0s
A1-19	VDO4 output delay	0.0s to 3600.0s	0.0s
A1-20	VDO5 output delay	0.0s to 3600.0s	0.0s
A1-21	VDO active mode selection	0: High level active 1: Low level active	00000
		Unit's digit: VDO1	
		Ten's digit: VDO2	
		Hundred's digit: VDO3	
		Thousand's digit: VDO4	
		Ten's thousand's digit: VDO5	

A1-11 and A1-21: These function parameters set functions to VDO terminals, which have the same digital output functions (1 to 40) as the DO terminals do. For more details, see the description in group F5. The VDO can be used together with VDIx to implement some simple logic control.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Group A2: Motor 2 Parameters

The MD310 can switch over running amongst four motors. For the four motors, you can:

- Set motor nameplate parameters respectively
- Perform motor auto-tuning respectively
- Select V/F control or vector control respectively
- Set parameters related to V/F control or vector control independently

Motor 2, motor 3 and motor 4 parameters are defined the same as motor 1 parameters. For details, see the descriptions of groups F1 and F2.

Function Code	Parameter Name	Setting Range	Default
A2-00	Motor type selection	0 to 1	0
A2-01	Rated motor power	0.1 to 30.0 kW	Model dependent
A2-02	Rated motor voltage	1 to 1000 V	Model dependent
A2-03	Rated motor current	0.01 to 655.35 A	Model dependent
A2-04	Rated motor frequency	0.01 to max. frequency	Model dependent
A2-05	Rated motor speed	1 to 65535 rpm	Model dependent
A2-06	Stator resistance	0.001 to 65.535 Ω	Auto-tuning parameter
A2-07	Rotor resistance	0.001 to 65.535Ω	Auto-tuning parameter
A2-08	Leakage inductive reactance	0.01 to 655.35 mH	Auto-tuning parameter
A2-09	Mutual inductive reactance	0.1 to 6553.5 mH	Auto-tuning parameter
A2-10	No-load current	0.01 A to A2-03	Auto-tuning parameter
A2-37	Auto-tuning selection	0 to 2	0
A2-38	Speed loop proportional gain 1	1 to 100	30
A2-39	Speed loop integral time 1	0.01s to 10.00s	0.50
A2-40	Switchover frequency 1	0.00 to A2-43	5.00
A2-41	Speed loop proportional gain 2	1 to 100	20
A2-42	Speed loop integral time 2	0.01 to 10.00	1.00
A2-43	Switchover frequency 2	A2-40 to max. frequency	10.00
A2-44	Vector control slip gain	50% to 200%	100%
A2-45	Speed loop filter time constant	0.000s to 0.100s	0.000s

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
A2-46	Over-excitation gain in vector control	0 to 200	64
A2-47	Torque upper limit source in speed control mode	0 to 7	0
A2-48	Digital setting of torque upper limit in speed control mode	0.0% to 200.0%	150.0%
A2-51	Excitation adjustment proportional gain	0 to 60000	2000
A2-52	Excitation adjustment integral gain	0 to 60000	1300
A2-53	Torque adjustment proportional gain	0 to 60000	2000
A2-54	Torque adjustment integral gain	0 to 60000	1300
A2-61	Motor 2 control mode	0 and 2	2
A2-62	Motor 2 acceleration/ deceleration time selection	0 to 4	0
A2-63	Motor 2 torque boost	0.0% (fixed torque boost) 0.1% to 30.0%	Model dependent
A2-65	Motor 2 oscillation suppression gain	0 to 100	Model dependent

Group A5: Control Optimization

Function Code	Parameter Name	Setting Range	Default
A5-00	DPWM switchover frequency upper limit	0.00 to 15.00 Hz	12.00 Hz

A5-00: This function parameter is effective only for V/F control and determines the digital pulse width modulation (DPWM) pattern in V/F control. This parameter rarely needs to be modified.

- If the output frequency is lower than the setting, the 7-segment continuous modulation pattern will be used, which may result in larger switching loss but smaller current ripple.
- If the output frequency is higher than the setting, the 5-segment intermittent modulation pattern will be used, which may result in smaller switching loss but larger current ripple.

Function Code	Parameter Name	Setting Range	Default
A5-01	PWM modulation pattern	0: Asynchronous modulation 1: Synchronous modulation	0

A5-01:This function parameter is effective only for V/F control.

Synchronous modulation is applied when the drive's output frequency reaches 85 Hz or above, improving the quality of output voltage. Asynchronous modulation is applied when the drive's output frequency is below 85 Hz.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
A5-02	Dead zone compensation mode selection	0: No compensation 1: Compensation mode 1	1

A5-02: This function parameter rarely needs to be modified. It can be modified only when there is special requirement on output voltage waveform quality or motor oscillation occurs.

Function Code	Parameter Name	Setting Range	Default
A5-03	Random PWM depth	0: Random PWM invalid 1 to 10	0

A5-03: This function parameter aims at lower the unpleasant motor noise and reducing the electromagnetic interference.

Function Code	Parameter Name	Setting Range	Default
A5-04	Selection of fast current limit	0: Disabled 1: Enabled	1

A5-04: The fast current limit function helps to minimize occurrence of AC drive overcurrent, ensuring continuous running of the drive. But the drive is not to stay in long-timing fast current limit because this may result in drive overheating. In this case, the drive reports Err40, indicating that the AC drive is overloaded and must stop.

Function Code	Parameter Name	Setting Range	Default
A5-05	Current detection compensation	0 to 100	5

A5-05: This function parameter sets the drive's current detection compensation and rarely needs to be modified. Too large setting may deteriorate the control performance.

Function Code	Parameter Name	Setting Range	Default
A5-06	Undervoltage threshold	60.0% to 140.0%	100.0%

A5-06: This function parameter sets the voltage threshold for Err09 (undervoltage).

100.0% of the AC drive of different voltage classes correspond to different undervoltage point, as shown below.

Parameter Name	Setting Range
Single-phase 220 V	200 V
Three-phase 220 V	200 V
Three-phase 380 V	350 V

Function Code	Parameter Name	Setting Range	Default
A5-09	Narrow pulse control selection	0: Disabled 1: Enabled	0

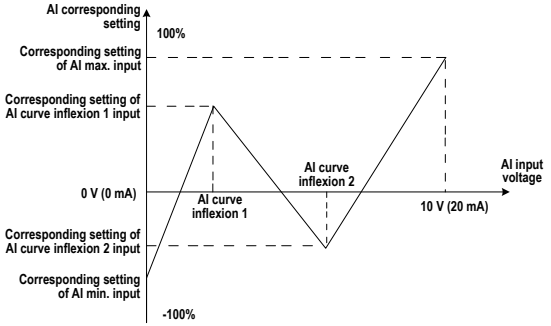
www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Group A6: AI Curve Setting

Function Code	Parameter Name	Setting Range	Default
A6-00	AI curve 4 min. input	-10.00 V to A6-02	0.00 V
A6-01	Corresponding percentage of AI curve 4 min. input	-100.0% to 100.0%	0.0%
A6-02	AI curve 4 inflexion 1 input	A6-00 to A6-04	3.00 V
A6-03	Corresponding percentage of AI curve 4 inflexion 1 input	-100.0% to 100.0%	30.0%
A6-04	AI curve 4 inflexion 1 input	A6-02 to A6-06	6.00 V
A6-05	Corresponding percentage of AI curve 4 inflexion 1 input	-100.0% to 100.0%	60.0%
A6-06	AI curve 4 max. input	A6-06 to 10.00 V	10.00 V
A6-07	Corresponding percentage of AI curve 4 max. input	-100.0% to 100.0%	100.0%
A6-08	AI curve 5 min. input	-10.00 V to A6-10	-10.00 V
A6-09	Corresponding percentage of AI curve 5 min. input	-100.0% to 100.0%	-100.0%
A6-10	AI curve 5 inflexion 1 input	A6-08 to A6-12	-3.00 V
A6-11	Corresponding percentage of AI curve 5 inflexion 1 input	-100.0% to 100.0%	-30.0%
A6-12	AI curve 5 inflexion 1 input	A6-10 to A6-14	3.00 V
A6-13	Corresponding percentage of AI curve 5 inflexion 1 input	-100.0% to 100.0%	30.0%
A6-14	AI curve 5 max. input	A6-14 to 10.00 V	10.00 V
A6-15	Corresponding percentage of AI curve 5 max. input	-100.0% to 100.0%	100.0%

A6-00 to A6-15: These function parameters define the AI curve 4 and AI curve 5, which have the similar function of AI curve 1 to AI curve 3. AI curve 1 to AI curve 3 are linear correspondence and AI curve 4 and AI curve 5 are four-point correspondence.

Figure 8-33 AI curve 4 and AI curve 5



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Setting Range	Default
A6-16	Jump point of AI1 input corresponding setting	-100.0% to 100.0%	0.0%
A6-17	Jump amplitude of AI1 input corresponding setting	0.0% to 100.0%	0.5%
A6-18	Jump point of AI2 input corresponding setting	-100.0% to 100.0%	0.0%
A6-19	Jump amplitude of AI2 input corresponding setting	0.0% to 100.0%	0.5%
A6-20	Jump point of AI3 input corresponding setting	-100.0% to 100.0%	0.0%
A6-21	Jump amplitude of AI3 input corresponding setting	0.0% to 100.0%	0.5%

A6-16 to A6-21: The MD310 has the jump function on the corresponding percentage of AI1 to AI3 input, stabilizing the input entered from AI.

The AI1 input jumps around 5.00 V and the jump range is 4.90 to 5.10 V. The AI1 min. input 0.00 V corresponds to 0.0% and the max. input 10.00 V corresponds to 100.0%. The corresponding percentage of the detected AI1 input fluctuates between 49.0% and 51.0%.

You can set A6-16 to 50.0% and A6-17 to 1.0% to fix the corresponding percentage of AI1 input at 50.0%.

Group AC: AI/AO Correction

Function Code	Parameter Name	Setting Range	Default
AC-00	AI1 measured voltage 1	0.500 to 4.000 V	Factory-corrected
AC-01	AI1 displayed voltage 1	0.500 to 4.000 V	Factory-corrected
AC-02	AI1 measured voltage 2	6.000 to 9.999 V	Factory-corrected
AC-03	AI1 displayed voltage 2	6.000 to 9.999 V	Factory-corrected
AC-04	AI2 measured voltage 1	0.500 to 4.000 V	Factory-corrected
AC-05	AI2 displayed voltage 1	0.500 to 4.000 V	Factory-corrected
AC-06	AI2 measured voltage 2	6.000 to 9.999 V	Factory-corrected
AC-07	AI2 displayed voltage 2	6.000 to 9.999 V	Factory-corrected
AC-08	AI3 measured voltage 1	-9.999 to 10.000 V	Factory-corrected
AC-09	AI3 displayed voltage 1	-9.999 to 10.000 V	Factory-corrected
AC-10	AI3 measured voltage 2	-9.999 to 10.000 V	Factory-corrected
AC-11	AI3 displayed voltage 2	-9.999 to 10.000 V	Factory-corrected

AC-00 to AC-11: The function of correcting the input entered from the AI terminal is to make the sampling voltage value the same as the voltage reference. These function parameters have been corrected by delivery and are restored to the factory-corrected value during parameter initialization, thus rarely requiring on-site correction.

Measured voltage indicates the actual output voltage measured by multimeter. Displayed voltage indicates the voltage sampled and displayed by the drive. For details, refer to U0-21, U0-22 and U0-23.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

During Correction, send two voltage values to each AI terminal and save the measured values and displayed values to AC-00 to AC-11. Then the AC drive will automatically perform AI zero offset and gain correction.

Function Code	Parameter Name	Setting Range	Default
AC-12	AO1 target voltage 1	0.500 to 4.000 V	Factory-corrected
AC-13	AO1 measured voltage 1	0.500 to 4.000 V	Factory-corrected
AC-14	AO1 target voltage 2	6.000 to .999 V	Factory-corrected
AC-15	AO1 measured voltage 2	6.000 to 9.999 V	Factory-corrected
AC-16	AO2 target voltage 1	0.500 to 4.000 V	Factory-corrected
AC-17	AO2 measured voltage 1	0.500 to 4.000 V	Factory-corrected
AC-18	AO2 target voltage 2	6.000 to 9.999 V	Factory-corrected
AC-19	AO2 measured voltage 2	6.000 to 9.999 V	Factory-corrected
AC-20	AI2 measured current 1	0.000 to 20.000 mA	Factory corrected
AC-21	AI2 sampling current 1	0.000 to 20.000 mA	Factory corrected
AC-22	AI2 measured current 2	0.000 to 20.000 mA	Factory corrected
AC-23	AI2 sampling current 2	0.000 to 20.000 mA	Factory corrected
AC-24	AO1 ideal current 1	0.000 to 20.000 mA	Factory corrected
AC-25	AO1 sampling current 1	0.000 to 20.000 mA	Factory corrected
AC-26	AO1 ideal current 2	0.000 to 20.000 mA	Factory corrected
AC-27	AO1 sampling current 2	0.000 to 20.000 mA	Factory corrected

AC-12 to AC-27: The function of correcting the AO output is to make the actual output voltage/current of AO the same as the target output voltage/current.

These function parameters have been corrected by delivery and are restored to the factory-corrected value during parameter initialization, thus rarely requiring on-site correction.

Target voltage indicates the theoretical output voltage of the drive. Measured voltage indicates the actual output voltage value measured by the multimeter.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Group U0: Monitoring Parameters

Group U0 is used to monitor the AC drive's running state. You can view the parameter values by using operation panel, convenient for on-site commissioning, or from the host computer by means of communication (address: 0x7000-0x7044).

U0-00 to U0-31 are the monitoring parameters in the running and stop state defined by F7-03 and F7-04.

Function Code	Parameter Name	Display Range
U0-00	Running frequency	0.00 to 500.00 Hz
U0-01	Frequency reference	0.00 to 500.0 Hz

U0-00 and U0-01: These two parameters display the absolute value of theoretical running frequency and frequency reference. The output frequency of the drive is displayed in U0-19.

Function Code	Parameter Name	Display Range
U0-02	Bus voltage	0.0 to 3000.0 V
U0-03	Output voltage	0 to 1140 V
U0-04	Output current	0.00 to 655.35 A
U0-05	Output power	0 to 32767
U0-06	Output torque	-200.0% to 200.0%

U0-02 and U0-06: They display the bus voltage and output voltage, output current, output power and output torque of the drive.

Function Code	Parameter Name	Display Range
U0-07	DI state	0 to 32767

U0-07: It displays the current state of DI terminals. After the value is converted into a binary number, each bit corresponds to a DI. "1" indicates high level signal, and "0" indicates low level signal. The corresponding relationship between bits and DIs is described in the following table:

Bit0	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Bit8	Bit9
DI1	DI2	DI3	DI4	DI5	DI6	DI7	DI8	DI9	DI10
Bit10	Bit11	Bit12	Bit13	Bit14	Bit15	-	-	-	-
VDI1	VDI2	VDI3	VDI4	VDI5	-	-	-	-	-

Function Code	Parameter Name	Display Range
U0-08	DO state	0 to 1023

U0-08: It displays the current state of DO terminals. After the value is converted into a binary number, each bit corresponds to a DO. "1" indicates high level signal, and "0" indicates low level signal. The corresponding relationship between bits and DOs is described in the following table.

Bit0	Bit1	Bit2	Bit3	Bit4	Bit5
DO3	Relay 1	Relay 2	DO1	DO2	VDO1
Bit6	Bit7	Bit8	Bit9	Bit10	Bit11
VDO2	VDO3	DO4	VDO5	-	-

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Display Range
U0-14	Load speed display	0 to 65535
U0-15	PID reference	0 to 65535
U0-16	PID feedback	0 to 65535
U0-18	Pulse reference	0.00 to 20.00 kHz

Function Code	Parameter Name	Display Range
U0-19	Feedback speed	-500.0 to 500.0 Hz

U0-19: It displays the actual output frequency of the AC drive.

When the value is between -99.99 to 300.00 Hz, two decimal places are displayed. If the value is out of this range, one decimal place is displayed.

Function Code	Parameter Name	Display Range
U0-20	Remaining running time	0.0 to 6500.0 min

U0-20: It displays the remaining running time during the drive timing running.

Function Code	Parameter Name	Display Range
U0-21	AI1 voltage before correction	0.00 to 10.57 V
U0-22	AI2 voltage (V)/ current (mA) before correction	0.00 to 10.57 V
U0-23	AI3 voltage before correction	-10.57 to 10.57 V

U0-21 to U0-23: They display the sampled AI input voltage (before correction). They actually used AI input voltage after correction are displayed in U0-09, U0-10 and U0-11.

A total of three decimal places are displayed. But when a negative number is displayed, only two decimal places are displayed together with negative sign " -".

Function Code	Parameter Name	Display Range
U0-24	Linear speed	0 to 65535 m/min

U0-24: It displays the linear speed of the DI5 used for high-speed pulse sampling. The unit is meter/minute. The linear speed is obtained according to the actual number of pulses sampled per minute and Fb-07 (Number of pulses per meter).

Function Code	Parameter Name	Display Range
U0-27	Pulse reference	0 to 65535 Hz

U0-27: It displays the DI5 high-speed pulse sampling frequency, in minimum unit of 1 Hz. It is the same as U0-18, except for the difference in units.

Function Code	Parameter Name	Display Range
U0-28	Communication reference	-100.00% to 100.00%

U0-28: It displays the data written by means of the communication address 0x1000.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Display Range
U0-30	Main frequency reference	0.00 to 500.00 Hz
U0-31	Auxiliary frequency reference	0.00 to 500.00 Hz

U0-30 and U0-31: They display the main frequency reference and auxiliary frequency reference. When the value is between 0.00 to 300.00 Hz, two decimal places are displayed. If the value is out of this range, one decimal place is displayed.

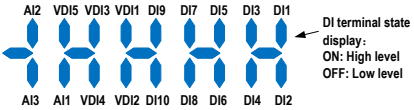
Function Code	Parameter Name	Display Range
U0-35	Target torque	-200.0% to 200.0%
U0-37	Power factor angle	-180° to 180°

Function Code	Parameter Name	Display Range
U0-39	Target voltage upon V/F separation	0 V to rated motor voltage
U0-40	Output voltage upon V/F separation	0 V to rated motor voltage

U0-39 and U0-40: They display the target output voltage and current actual output voltage in the V/F separation state. For details, see the description of parameters in group F3.

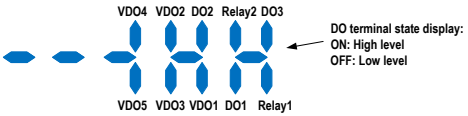
Function Code	Parameter Name	Display Range
U0-41	DI state display	-

U0-41: It displays the DI state and the display format is shown as below:



Function Code	Parameter Name	Display Range
U0-42	DO state display	-

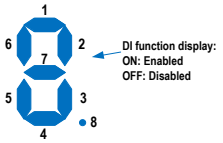
U0-42: It displays the DO state and the display format is shown as below:



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Function Code	Parameter Name	Display Range
U0-43	DI set for function state display 1	-

U0-43: It displays whether the DI terminals set for the functions 1 to 40 are active. The operation panel has five 7-segment LEDs and each 7-segment LED displays the selection of eight functions. The 7-segment LED is defined as below:



Function Code	Parameter Name	Display Range
U0-44	DI set for function state display 2	-

U0-44: It displays whether the DI terminals set for the functions 41 to 59 are active. The display format is similar to U0-43. The 7-segment LEDs display functions 41–48, 49–56 and 57–59, respectively from right to left.

Function Code	Parameter Name	Display Range
U0-59	Frequency Reference	-100.00% to 100.00%
U0-60	Running frequency	-100.00% to 100.00%

U0-59 and U0-60: 100.00% corresponds to the maximum frequency (F0-10).

Function Code	Parameter Name	Display Range
U0-61	AC drive running state	0 to 65535

U0-61: It displays the running state of the AC drive. The data format is listed in the following table:

Bit0	0: Stop 1: Run
Bit1	0: Constant 1: Accelerate
Bit2	2: Decelerate
Bit3	0: Bus voltage normal 1: Undervoltage

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Group U3: Extension Card Communication Parameters

The parameters in group U3 are used for communication with the extension card only.

Function Code	Parameter Name	Display Range
U3-16	Frequency reference	0.00 Hz to max. frequency

It is used to set the frequency reference of the AC drive when the drive communicates with the extension card.

Function Code	Parameter Name	Display Range
U3-18	Control command	0001: Forward run 0002: Reverse run 0003: Forward jog 0004: Reverser jog 0005: Coast to stop 0006: Decelerate to stop 0007: Fault reset

It is used to control the DO and VDO output of the AC drive when the drive communicates with the extension card.

Function Code	Parameter Name	Display Range
U3-19	AO1 control	0 to 7FFF indicating 0% to 100%

It is used to set the AO1 output of the AC drive when the drive communicates with the extension card.

Function Code	Parameter Name	Display Range
U3-20	AO2 control	0 to 7FFF indicating 0% to 100%

It is used to set the AO2 output of the AC drive when the drive communicates with the extension card.

Function Code	Parameter Name	Display Range
U3-21	FMP control	0 to 7FFF indicating 0% to 100%

It is used to set the FMP output of the AC drive when the drive communicates with the extension card.

Function Code	Parameter Name	Display Range
U3-23	AC drive speed	0 rpm to max. speed

It is used to set the AC drive speed in the unit of rpm when the drive communicates with the extension card.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹(مهندس رمضان زاده)

9

EMC

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Chapter 9 EMC

9.1 Definition of Terms

■ EMC

Electromagnetic compatibility (EMC) describes the ability of electronic and electrical devices or systems to work properly in the electromagnetic environment and not to generate electromagnetic interference that influences other local devices or systems.

In other words, EMC includes two aspects: The electromagnetic interference generated by a device or system must be restricted within a certain limit; the device or system must have sufficient immunity to the electromagnetic interference in the environment.

■ First environment

Environment that includes domestic premises, it also includes establishments directly connected without intermediate transformers to a low-voltage power supply network which supplies buildings used for domestic purposes

■ Second environment

Environment that includes all establishments other than those directly connected to a low-voltage power supply network which supplies buildings used for domestic purposes

■ Category C1 AC drive

Power Drive System (PDS) of rated voltage less than 1000 V, intended for use in the first environment

■ Category C2 AC drive

PDS of rated voltage less than 1000 V, which is neither a plug in device nor a movable device and, when used in the first environment, is intended to be installed and commissioned only by a professional

■ Category C3 AC drive

PDS of rated voltage less than 1000 V, intended for use in the second environment and not intended for use in the first environment

■ Category C4 AC drive

PDS of rated voltage equal to or above 1000 V, or rated current equal to or above 400 A, or intended for use in complex systems in the second environment

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

9.2 Introduction to EMC Standard

9.2.1 EMC Standard

The MD310 series AC drive satisfies the requirements of standard EN 61800-3. 2004 Category C2. The AC drives are applied to both the first environment and the second environment.

9.2.2 Installation Environment

The system manufacturer using the AC drive is responsible for compliance of the system with the European EMC directive. Based on the application of the system, the integrator must ensure that the system complies with standard EN 61800-3. 2004 Category C2, C3 or C4.

The system (machinery or appliance) installed with the AC drive must also have the CE mark. The system integrator is responsible for compliance of the system with the EMC directive and standard EN 61800-3. 2004 Category C2.

⚠WARNING
If applied in the first environment, the AC drive may generate radio interference. Besides the CE compliance described in this chapter, users must take measures to avoid such interference, if necessary.

9.3 Selection of Peripheral EMC Devices

9.3.1 Installation of EMC Input Filter on Power Input Side

An EMC filter installed between the AC drive and the power supply can not only restrict the interference of electromagnetic noise in the surrounding environment on the AC drive, but also prevents the interference from the AC drive on the surrounding equipment.

The MD310 series AC drive satisfies the requirements of category C2 only with an EMC filter installed on the power input side. The installation precautions are as follows:

- Strictly comply with the ratings when using the EMC filter. The EMC filter is category I electric apparatus, and therefore, the metal housing ground of the filter should be in good contact with the metal ground of the installation cabinet on a large area, and requires good conductive continuity. Otherwise, it will result in electric shock or poor EMC effect.
- The ground of the EMC filter and the PE conductor of the AC drive must be tied to the same common ground. Otherwise, the EMC effect will be affected seriously.
- The EMC filter should be installed as closely as possible to the power input side of the AC drive.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

The following table lists the recommended manufacturers and models of EMC filters for the MD310 series AC drive. Select a proper one based on actual requirements.

Table 9-1 Recommended manufacturers and models of EMC filters

AC Drive Model	Power Capacity (kVA)	Rated Input Current (A)	AC Input Filter Model (Changzhou Jianli)	AC Input Filter Model (Schaffner)
Three-phase 380 V, 50/60 Hz				
MD310T0.4B	1.2	1.9	DL-5EBK5	FN 3258-7-44
MD310T0.7B	1.5	3.4	DL-5EBK5	FN 3258-7-44
MD310T1.5B	3	5	DL-5EBK5	FN 3258-7-44
MD310T2.2B	4	5.8	DL-10EBK5	FN 3258-7-44
MD310T3.7B	5.9	10.5	DL-16EBK5	FN 3258-16-33
MD310T5.5B	8.9	14.6	DL-16EBK5	FN 3258-16-33
MD310T7.5B	11	20.5	DL-25EBK5	FN 3258-30-33
MD310T11B	17	26	DL-35EBK5	FN 3258-30-33
MD310T15B	21	35	DL-35EBK5	FN 3258-42-33
MD310T18.5B	24	38.5	DL-50EBK5	FN 3258-42-33

9.3.2 Installation of AC Reactor on Power Input Side

An AC input reactor is installed to eliminate the harmonics of the input current. As an optional device, the reactor can be installed externally to meet strict requirements of an application environment for harmonics. The following table lists the recommended manufacturers and models of input reactors.

Table 9-2 Recommended manufacturers and models of AC input reactors

AC Drive Model	Rated Input Current (A)	AC Input Reactor Model (Inovance)
Three-phase 380 V, 50/60 Hz		
MD310T0.4B	1.9	MD-ACL-7-4T-222-2%
MD310T0.7B	3.4	MD-ACL-7-4T-222-2%
MD310T1.5B	5	MD-ACL-7-4T-222-2%
MD310T2.2B	5.8	MD-ACL-7-4T-222-2%
MD310T3.7B	10.5	MD-ACL-10-4T-372-2%
MD310T5.5B	14.6	MD-ACL-15-4T-552-2%
MD310T7.5B	20.5	MD-ACL-30-4T-113-2%
MD310T11B	26	MD-ACL-30-4T-113-2%
MD310T15B	35	MD-ACL-40-4T-153-2%
MD310T18.5B	38.5	MD-ACL-40-4T-153-2%

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

9.3.3 Installation of AC Reactor on Power Output Side

Whether to install an AC output reactor on the power output side is dependent on the actual situation. The cable connecting the AC drive and the motor should not be too long; capacitance enlarges when an over-long cable is used and thus high-harmonics current may be easily generated.

If the length of the output cable is equal to or greater than the value in the following table, install an AC output reactor on the power output side of the AC drive.

Table 9-3 Cable length threshold when an AC output reactor is installed

MD500 Power (kW)	Rated Voltage (V)	Min. Cable Length When Selecting Output Reactor (m)
< 4	200 to 500	50
5.5	200 to 500	70
7.5	200 to 500	100
11	200 to 500	110
15	200 to 500	125
18.5	200 to 500	135

The following table lists the recommended manufacturer and models of AC output reactors.

Table 9-4 Recommended manufacturer and models of AC output reactors

AC Drive Model	Rated Output Current (A)	AC Output Reactor Model ((Shanghai Eagtop)
Three-phase 380 V, 50/60 Hz		
MD310T0.4B	1.5	OCL-0005-EISC-E1M4
MD310T0.7B	2.1	OCL-0005-EISC-E1M4
MD310T1.5B	3.8	OCL-0005-EISC-E1M4
MD310T2.2B	5.1	OCL-0007-EISC-E1M0
MD310T3.7B	9	OCL-0010-EISC-EM70
MD310T5.5B	13	OCL-0015-EISC-EM47
MD310T7.5B	17	OCL-0020-EISC-EM35
MD310T11B	25	OCL-0030-EISC-EM23
MD310T15B	32	OCL-0040-EISC-EM18
MD310T18.5B	37	OCL-0050-EISC-EM14

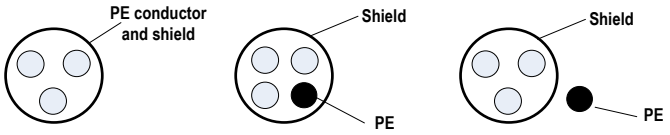
www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

9.4 Shielded Cable

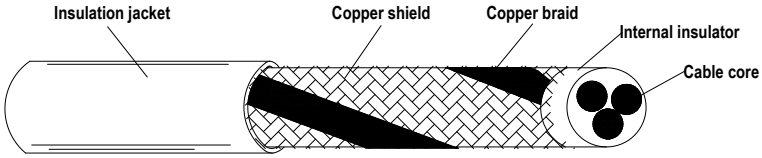
9.4.1 Requirements for Shielded Cable

The shielded cable must be used to satisfy the EMC requirements of CE marking. Shielded cables are classified into three-conductor cable and four-conductor cable. If conductivity of the cable shield is not sufficient, add an independent PE cable, or use a four-conductor cable, of which one phase conductor is PE cable.

The three-conductor cable and four-conductor cable are shown in the following figure.

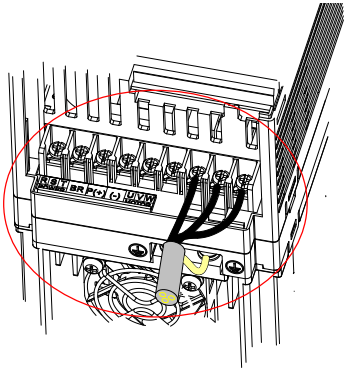


To suppress emission and conduction of the radio frequency interference effectively, the shield of the shielded cable is cooper braid. The braided density of the cooper braid should be greater than 90% to enhance the shielding efficiency and conductivity, as shown in the following figure.



The following figure shows the grounding method of the shielded cable.

Figure 9-1 Grounding of the shielded cable



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

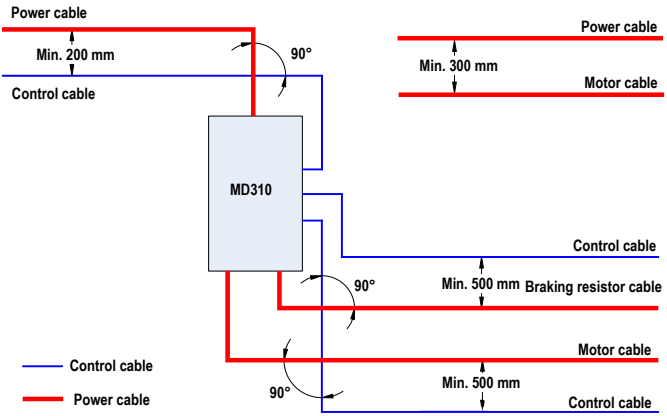
The installation precautions are as follows:

1. Symmetrical shielded cable is recommended. The four-conductor shielded cable can also be used as an input cable.
2. The motor cable and PE shielded conducting wire (twisted shielded) should be as short as possible to reduce electromagnetic radiation and external stray current and capacitive current of the cable. If the motor cable is over 100 meters long, an output filter or reactor is required.
3. It is recommended that all control cables be shielded.
4. It is recommended that shielded cables or shielded steel tube armored cables be used for the drive power output, and the shield must be well grounded. For devices suffering from interference, shielded twisted pair (STP) cable is recommended and the cable shield must be well grounded.

9.4.2 Cabling Requirements

1. The motor cables must be laid far away from other cables. The motor cables of several AC drives can be laid side by side.
2. It is recommended that the motor cables, power input cables and control cables be laid in different ducts. To avoid electromagnetic interference caused by rapid change of the output voltage of the AC drive, the motor cables and other cables must not be laid side by side for a long distance.
3. If the control cable must run across the power cable, make sure they are arranged at an angle of close to 90°. Other cables must not run across the AC drive.
4. The power input and output cables of the AC drive and weak-current signal cables (such as control cable) should be laid vertically (if possible) rather than in parallel.
5. The cable ducts must be in good connection and well grounded. Aluminium ducts can be used to improve electric potential.
6. The filter, AC drive and motor should be connected to the system (machinery or appliance) properly, with spraying protection at the installation part and conductive metal in full contact.

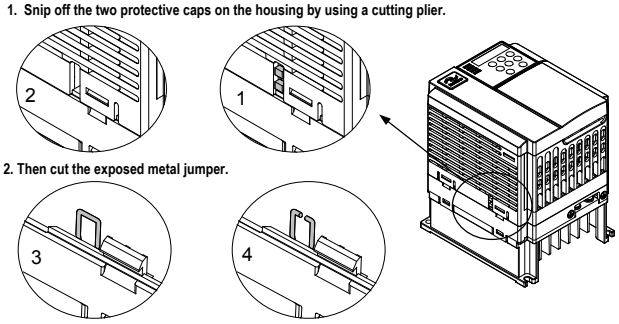
Figure 9-2 Cabling diagram



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

9.5 Solutions to Current Leakage

1. The AC drive outputs high-speed pulse voltage, producing high-frequency leakage current during running of the AC drive. To prevent electric shock and even a fire caused by current leakage, it is necessary to install a residual current circuit-breaker to the AC drive.
2. Each AC drive produces more than 100 mA leakage current. Therefore, the sensitivity current of the residual current circuit-breaker must be above 100 mA. High-frequency pulse interference may cause the circuit-breaker to malfunction, and thus the residual current circuit-breaker must have the high-frequency filtering function.
3. If multiple AC drives are required, each AC drive must be installed with a circuit-breaker. The factors that influence the leakage current are as follows:
   - AC drive capacity
   - Carrier frequency
   - Type and length of motor cable
   - EMI filter
4. When the leakage current causes the circuit-breaker to act, you should:
   - Increase the sensitivity current of the circuit-breaker.
   - Replace the circuit-breaker with a new one with high-frequency suppression function.
   - Reduce the carrier frequency.
   - Shorten the length of the output cable.
   - Install a current leakage suppression device.
5. Cut the safety capacitor jumper.
   - The AC drive has built-in safety capacitor. If the leakage current of the entire system is too large at power-on and the current leakage protection switch acts, you can cut the safety capacitor jumper to reduce the leakage current to ground.
   - The position and cutting method of the safety capacitor jumper are shown in the following figure.



Note

The jumper cannot be re-connected once it is cut. This will result in an increase in leakage current to ground during drive running. Take full consideration before cutting the jumper.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

9.6 Solutions to Common EMC Interference Problems

The AC drive generates very strong interference. Although EMC measures are taken, the interference may still exist due to improper cabling or grounding during use. When the AC drive interferes with other devices, adopt the following solutions.

Interference Type	Solution
Leakage protection switch tripping	Connect the motor housing to the PE of the AC drive. Connect the PE of the AC drive to the PE of the line voltage. Add a safety capacitor to the power input cable. Add magnetic rings to the input drive cable.
AC drive interference during running	Connect the motor housing to the PE of the AC drive. Connect the PE of the AC drive to the PE of the line voltage. Add a safety capacitor to the power input cable and wind the cable with magnetic rings. Add a safety capacitor to the interfered signal port or wind the signal cable with magnetic rings. Connect the equipment to the common ground.
Communication interference	Connect the motor housing to the PE of the AC drive. Connect the PE of the AC drive to the PE of the mains voltage. Add a safety capacitor to the power input cable and wind the cable with magnetic rings. Add a matching resistor between the communication cable source and the load side. Add a common grounding cable besides the communication cable. Use a shielded cable as the communication cable and connect the cable shield to the common grounding point.
I/O interference	Enlarge the capacitance at the low-speed DI. A maximum of 0.11 uF capacitance is suggested. Enlarge the capacitance at the AI. A maximum of 0.22 uF is suggested.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹(مهندس رمضان زاده)

10

Trouble-shooting

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

10 Trouble-shooting

10.1 Faults and Solutions

When a fault occurs during running, the AC drive stops output immediately, the contact of the fault relay acts, and the operation panel displays the fault code.

Troubleshoot the fault according to the following table. If the fault cannot be eliminated, contact the agent or Inovance.

Fault Name	Display	Possible Causes	Solutions
Inverter unit protection	Err01	1. The output circuit is short circuited. 2. The cable between the motor and the AC drive is too long. 3. The module overheats. 4. The internal connections become loose. 5. The main control board is faulty. 6. The drive board is faulty. 7. The inverter module is faulty.	1. Eliminate external faults. 2. Install a reactor or an output filter. 3. Check that the air filter and the cooling fan work properly. 4. Connect all cables properly. 5. Contact the agent or Inovance for technical support.
Overcurrent during acceleration	Err02	1. The output circuit is grounded or short circuited. 2. Reserved 3. The acceleration time is too short. 4. Customized torque boost or V/F curve is not appropriate. 5. The voltage is too low. 6. The spinning motor is started. 7. A sudden load is added during acceleration. 8. The AC drive size is small.	1. Eliminate external faults. 2. Perform the motor auto-tuning. 3. Increase the acceleration time. 4. Adjust the manual torque boost or V/F curve. 5. Adjust the voltage to normal range. 6. Enable the catching a spinning motor function or start the motor after it stops. 7. Remove the added load. 8. Replace a large drive.
Overcurrent during deceleration	Err03	1. The output circuit is grounded or short circuited. 2. Reserved 3. The deceleration time is too short. 4. The voltage is too low. 5. A sudden load is added during deceleration. 6. The braking unit and regenerative braking resistor are not installed.	1. Eliminate external faults. 2. Perform the motor auto-tuning. 3. Increase the deceleration time. 4. Adjust the voltage to normal range. 5. Remove the added load. 6. Install the braking unit and regen resistor.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Fault Name	Display	Possible Causes	Solutions
Overcurrent at constant speed	Err04	1. The output circuit is grounded or short circuited. 2. Motor auto-tuning is not performed. 3. The voltage is too low. 4. A sudden load is added during operation. 5. The AC drive size is small.	1. Eliminate external faults. 2. Perform the motor auto-tuning. 3. Adjust the voltage to normal range. 4. Remove the added load. 5. Replace a large drive.
Overvoltage during acceleration	Err05	1. The input voltage is too high. 2. An external force drives the motor during acceleration. 3. The acceleration time is too short. 4. The braking unit and regenerative braking resistor are not installed.	1. Adjust the voltage to normal range. 2. Cancel the external force or install a regenerative braking resistor. 3. Increase the acceleration time. 4. Install the braking unit and regenerative braking resistor.
Overvoltage during deceleration	Err06	1. The input voltage is too high. 2. An external force drives the motor during deceleration. 3. The deceleration time is too short. 4. The braking unit and regenerative braking resistor are not installed.	1. Adjust the voltage to normal range. 2. Cancel the external force or install the regenerative braking resistor. 3. Increase the deceleration time. 4. Install the braking unit and regenerative braking resistor.
Overvoltage at constant speed	Err07	1. The input voltage is too high. 2. An external force drives the motor during deceleration.	1. Adjust the voltage to normal range. 2. Cancel the external force or install the regenerative braking resistor.
Control power supply fault	Err08	The input voltage is not within the allowable range.	Adjust the input voltage to the allowable range.
Undervoltage	Err09	1. Instantaneous power failure occurs. 2. The AC drive's input voltage is not within the allowable range. 3. The bus voltage is abnormal. 4. The rectifier bridge and buffer resistor are faulty. 5. The drive board is faulty 6. The main control board is faulty.	1. Reset the fault. 2. Adjust the voltage to normal range. 3. Contact the agent or Inovance.
AC drive overload	Err10	1. The load is too heavy or locked-rotor occurs on the motor. 2. The AC drive size is small.	1. Reduce the load and check the motor and mechanical conditions. 2. Replace a large drive.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Fault Name	Display	Possible Causes	Solutions
Motor overload	Err11	1. F9-01 is set improperly. 2. The load is too heavy or motor standstill occurs. 3. The AC drive size is small.	1. Set F9-01 correctly. 2. Reduce the load and check the motor and mechanical conditions. 3. Replace a large drive.
Power input phase loss	Err12	1. The three-phase power input is abnormal. 2. The drive board is faulty. 3. The lightening protection board is faulty. 4. The main control board is faulty.	1. Eliminate external faults. 2. Contact the agent or Inovance for technical support.
Power output phase loss	Err13	1. The cable connecting the AC drive and the motor is faulty. 2. The AC drive's three-phase outputs are unbalanced when the motor is running. 3. The drive board is faulty 4. The module is faulty.	1. Eliminate external faults. 2. Check whether the motor three-phase winding is normal. 3. Contact the agent or Inovance.
Module overheat	Err14	1. The ambient temperature is too high. 2. The air filter is blocked. 3. The fan is damaged. 4. The thermally sensitive resistor of the module is damaged. 5. The inverter module is damaged.	1. Lower the ambient temperature. 2. Clean the air filter. 3. Replace the damaged fan. 4. Replace the damaged thermally sensitive resistor. 5. Replace the inverter module.
External equipment fault	Err15	1. External fault signal is input via DI. 2. External fault signal is input via virtual I/O.	Reset the operation.
Communication fault	Err16	1. The host computer is in abnormal state. 2. The communication cable is faulty. 3. F0-28 is set improperly. 4. The communication parameters in group FD are set improperly.	1. Check the cabling of host computer. 2. Check the communication cabling. 3. Set F0-28 correctly. 4. Set the communication parameters properly.
Contactor fault	Err17	1. The drive board and power supply are faulty. 2. The contactor is faulty.	1. Replace the faulty drive board or power supply board. 2. Replace the faulty contactor.
Current detection fault	Err18	The drive board is faulty.	Replace the faulty drive board.
EEPROM read-write fault	Err21	The EEPROM chip is damaged.	Replace the main control board.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Fault Name	Display	Possible Causes	Solutions
AC drive hardware fault	Err22	1. Overvoltage exists. 2. Overcurrent exists.	1. Handle based on overvoltage. 2. Handle based on overcurrent. Err22 is caused by hardware overvoltage fault on most conditions.
Short circuit to ground	Err23	The motor is short circuited to the ground.	Replace the cable or motor.
Accumulative running time reached	Err26	The accumulative running time reaches the setting value.	Clear the record through the parameter initialization function.
User-defined fault 1	Err27	1. The user-defined fault 1 signal is input via DI. 2. User-defined fault 1 signal is input via virtual I/O.	Reset the operation.
User-defined fault 2	Err28	1. The user-defined fault 2 signal is input via DI. 2. The user-defined fault 2 signal is input via virtual I/O.	Reset the operation.
Accumulative power-on time reached	Err29	The accumulative power-on time reaches the setting value.	Clear the record through the parameter initialization function.
Load lost	Err30	The load gets disconnected during the drive running.	Check that the load is disconnected.
PID feedback lost during running	Err31	The PID feedback is lower than the setting of FA-26.	Check the PID feedback signal or set FA-26 to a proper value.
Pulse-by-pulse current limit fault	Err40	1. The load is too heavy or motor standstill occurs. 2. The AC drive size is small.	1. Reduce the load and check the motor and the machine. 2. Replace a large drive.

ARCO CONTROL
:051-37133855-6
:09014284236
WWW.ARCOKALA.COM

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

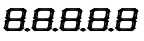
Fault Name	Display	Possible Causes	Solutions
Motor switchover fault during running	Err41	Change the selection of the motor via terminal during running of the AC drive.	Perform motor switchover after the AC drive stops.

10.2 Symptoms and Diagnostics

The following symptoms may occur during use of the AC drive. When these symptoms occur, perform simple analysis based on the following table.

No.	Symptom	Possible Causes	Solutions
1	There is no display at power-on.There is no display at power-on.	1. There is no power supply to the AC drive or the power input to the AC drive is too low. 2. The switching mode power supply on the drive board of the AC drive is faulty. 3. The rectifier bridge is damaged. 4. The control board or the operation panel is faulty. 5. The cable connecting the control board and the drive board and the operation panel breaks.	1. Check the power supply. 2. Check the bus voltage. 3. Re-connect the 4-core and 28-core cables. 4. Contact the agent or Inovance for technical support.
2	“HC” is displayed at power-on.	1. The cable between the drive board and the control board is in poor contact. 2. Related components on the control board are damaged. 3. The motor or the motor cable is short circuited to the ground. 4. The power input to the AC drive is too low.	1. Re-connect the 4-core and 28-core cables. 2. Contact the agent or Inovance for technical support.
3	“Err23” is displayed at power-on.	1. The motor or the motor output cable is short-circuited to the ground. 2. The AC drive is damaged.	1. Check insulation of the motor and the output cable with a megger. 2. Contact the agent or Inovance for technical support.
4	The AC drive display is normal upon power-on. But after running the AC drive displays “HC” and stops immediately.	1. The cooling fan is damaged or locked-rotor occurs. 2. The external control terminal cable is short circuited.	1. Replace the damaged fan. 2. Eliminate external fault.
5	Err14 (module overheat) is reported frequently.	1. The setting of carrier frequency is too high. 2. The cooling fan is damaged, or the air filter is blocked. 3. Components inside the AC drive are damaged (thermal coupler or others).	1. Reduce the carrier frequency (F0-15). 2. Replace the fan and clean the air filter. 3. Contact the agent or Inovance for technical support.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

No.	Symptom	Possible Causes	Solutions
6	The motor does not rotate after the AC drive runs.	1. Check the motor and the motor cables. 2. The motor parameters are set improperly. 3. The cable between the drive board and the control board is in poor contact. 4. The drive board is faulty.	1. Check that cabling between the AC drive and the motor is normal. 2. Replace the motor or rectify mechanical faults. 3. Check and set the motor parameters again.
7	The DI terminals are disabled.	1. The related parameters are set incorrectly. 2. The external signal is incorrect. 3 The jumper across OP and +24 V becomes loose. 4. The control board is faulty.	1. Check and set the parameters in group F4 again. 2. Re-connect the external signal cables. 3. Re-confirm the jumper bar across OP and +24 V. 4. Contact the agent or Inovance for technical support.
9	The AC drive reports overcurrent and overvoltage frequently.	1. The motor parameters are set improperly. 2. The acceleration/deceleration time is improper. 3. The load fluctuates.	1. Set the motor parameters or perform motor auto-tuning again. 2. Set proper acceleration/deceleration time. 3. Contact the agent or Inovance for technical support.
10	Err17 is reported upon power-on or running.	The soft startup contactor is not closed.	1. Check whether the contactor cable is loose. 2. Check whether the contactor is faulty. 3. Check whether 24 V power supply of the contactor is faulty. 4. Contact the agent or Inovance for technical support.
11	 is displayed upon power-on.	Related component on the control board is damaged.	Replace the control board.

ARCO CONTROL
:051-37133855-6
:09014284236
WWW.ARCOKALA.COM

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹(مهندس رمضان زاده)

11

Selection

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Chapter 11 Selection

11.1 Selection Guidance of Peripheral Devices

The following table is the selection guidance of peripheral devices.

Table 11-1 Selection guidance of peripheral devices of the MD310

AC Drive Model	MCCB (A)	Contactor (A)	Cable of Input Side Main Circuit (mm^2)	Cable of Output Side Main Circuit (mm^2)	Cable of Control Circuit (mm^2)
Single-phase 220 V					
MD310S0.4B	6	9	1.5	1.5	0.5
MD310S0.7B	10	12	1.5	1.5	0.5
MD310S1.5B	16	18	2.5	2.5	0.75
MD310S2.2B	-				
Three-phase 220 V					
MD310-2T0.4B	4	9	1.5	1.5	0.5
MD310-2T0.7B	6	9	1.5	1.5	0.75
MD310-2T1.1B	10	12	1.5	1.5	0.75
MD310-2T2.2B	16	18	1.5	1.5	0.75
MD310-2T3.7B	20	25	2.5	2.5	0.75
MD310-2T5.5B	32	32	6.0	6.0	0.75
MD310-2T7.5B	40	40	10	10	1.0
Three-phase 380 V					
MD310T0.4B	4	9	1	1	0.75
MD310T0.7B	4	9	1	1	0.75
MD310T1.5B	6	9	1.5	1.5	0.75
MD310T2.2B	10	12	1.5	1.5	0.75
MD310T3.7B	16	18	1.5	1.5	0.75
MD310T5.5B	20	25	2.5	2.5	0.75
MD310T7.5B	25	25	4.0	4.0	0.75
MD310T11B	32	32	6.0	6.0	0.75
MD310T15B	40	40	10	10	0.75
MD310T18.5B	50	50	10	10	0.75

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

11.2 Braking Unit and Regenerative Braking Resistor

■ Selection of Resistance of Regenerative Braking Resistor

The AC drive transfers the regenerative energy generated during the braking of the motor to the externally mounted regenerative braking resistor.

According to the formula U x U/R = Pb:

- U refers to the braking voltage at system stable braking.

  The U value varies with the system. The 380 VAC system usually selects 700 V braking voltage.

- Pb refers to the braking power.

■ Selection of Power of Regenerative Braking Resistor

In theory, the power of the regenerative braking resistor is the same as the braking power. But in consideration of de-rating 70%, the power of the regenerative braking resistor is calculated from the following formula:

0.7 × Pr = Pb × D

Pr refers to the power of the regenerative braking resistor.

D refers to the braking frequency (percentage of the regenerative process to the whole deceleration).

Application	Elevator	Winding & unwinding	Centrifuge	Occasional braking load	General Application
Braking Frequency	20% to 30%	20% to 30%	50% to 60%	5%	10%

Note

The preceding table is for reference only. You can select the resistance and power of the regenerative braking resistor based on actual needs. However, the resistance must not be lower than the reference value. The power may be higher than the reference value. Selection of the regenerative braking resistor model is determined by the generation power of the motor and is also related to the system inertia, deceleration time and potential energy load. For systems with high inertia, and/or short deceleration time, and/or frequent braking, select a regenerative braking resistor with higher power and lower resistance value.

www.Farazcontrol.com (مهندس رمضان زاده)۰۹۱۲۹۲۷۵۱۵۹ واحد فروش:

■ Selection Guidance of Regenerative Braking Resistor

AC Drive Model	Power	Resistance	Braking Unit	Remark
Single-phase 220 V				
MD310S0.4B	80 W	≥ 200 Ω	Built-in	-
MD310S0.7B	80 W	≥ 150 Ω		
MD310S1.5B	100 W	≥ 100 Ω		
MD310T2.2B	100 W	≥ 70 Ω		
Three-phase 220 V				
MD310-2T0.4B	150 W	≥ 150 Ω	Built-in	-
MD310-2T0.7B	150 W	≥ 110 Ω		
MD310-2T1.1B	250 W	≥ 100 Ω		
MD310-2T2.2B	300 W	≥ 65 Ω		
MD310-2T3.7B	400 W	≥ 45 Ω		
MD310-2T5.5B	800 W	≥ 110 Ω		
MD310-2T7.5B	1000 W	≥ 100 Ω		
Three-phase 380 V				
MD310T0.4B	150 W	≥ 300 Ω	Built-in	-
MD310T0.7B	150 W	≥ 300 Ω		
MD310T1.5B	150 W	≥ 220 Ω		
MD310T2.2B	250 W	≥ 200 Ω		
MD310T3.7B	300 W	≥ 130 Ω		
MD310T5.5B	400 W	≥ 90 Ω		
MD310T7.5B	500 W	≥ 65 Ω		
MD310T11B	800 W	≥ 43 Ω		
MD310T15B	1000 W	≥ 32 Ω		
MD310T18.5B	1300 W	≥ 25 Ω		

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

12

Appendix

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Appendix 1 Modbus Communication Protocol

The MD310 provides the RS232/RS485 communication interface and supports the Modbus communication protocol so that the user can implement centralized control, such as setting running commands and function codes, and reading working status and fault information of the AC drive, by using a PC or PLC.

■ About the Protocol

This protocol defines the content and format of transmitted messages during serial communication, including master polling (or broadcasting) format and master coding method (function code for the action, transmission data, and error check). The slave uses the same structure in the response, including action confirmation, data returning and error check. If an error occurs when the slave receives a message, or the slave cannot complete the action required by the master, the slave returns a fault message as a response to the master.

■ Application

The AC drive is connected to a "single-master multi-slave" PC/PLC control network with the RS232/RS485 bus.

Bus Structure

1. Interface mode

   The RS232/RS485 hardware interface is used.

2. Transmission mode

   The asynchronous serial and half-duplex transmission mode is used. At the same moment, either the master or the slave transmits data and the other can only receives data. During asynchronous serial communication, data is sent frame by frame in the form of packet.

3. Topological structure

   The system consists of a single master and multiple slaves. The address range of the slaves is 1 to 249, and 0 is the broadcast address. A slave must have a unique address in the network.

4. Protocol description

   The Modbus communication protocol used by the MD310 is a serial master-slave communication protocol. In the network, only one device (master) can set up the protocol (that is, "query/command"), and other devices (slaves) can only provide data to respond to the "query/command" from the master or execute the action according to the "query/command" from the master. The master here is a PC, an industrial device, or a PLC, and a slave is an MD310 AC drive. The master can communicate with a single slave or broadcast messages to all slaves. When the master communicates with a single slave, the slave needs to return a message (response) to the "query/command" from the master. For a broadcast message sent by the master, the slaves need not return a response.

5. Data format

   The data format of the Modbus protocol used by the AC drive is as follows:

   In RTU mode, messages are sent with an interval of at least 3.5-character time. The first field transmitted is the device address. The allowable transmitted characters are hexadecimal 0 ... 9, A ... F. The network devices keep detecting the network bus, even during the silent interval. After receiving the first field (the address field), each device decodes the field to determined whether itself is the

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

destination device. Following the last transmitted character, an interval of at least 3.5-character time marks the end of the message. A new message starts to be sent after this interval.

The entire message frame must be transmitted as a continuous stream. If a silent interval of longer than 1.5-character time occurs before completion of the frame, the receiving device refreshes the incomplete message and assumes that the next byte is the address field of a new message. Similarly, if a new message begins earlier than 3.5-character time following a previous message, the receiving device considers the new message as a continuation of the previous message. This results in an error, as the value in the final cyclical redundancy check (CRC) field is incorrect for the combined messages. A typical message frame is described as below.

- RTU frame format

Frame header: START	At least 3.5-character time
Slave address: ADR	Communication address : 1 to 249
Command code: CMD	03: Read slave parameters 06: Write slave parameters
Data content: DATA (N-1)	Data: Function code parameter address, number of function code parameters, and values of function code parameters
Data content: DATA (N-2)	
……	
Data content: DATA0	
CRC CHK low order	Detection value: CRC value
CRC CHK high order	
END	At least 3.5-character time

- CMD and DATA

  Command code: 03H, read N words (a maximum of 12 words can be read)

  For example, the AC drive start address F002 of the slave 01 reads two consecutive values.

  Master command information

ADR	01H
CMD	03H
High order of the start address	F0H
Low order of the start address	02H
High order of the number of registers	00H
Low order of the number of registers	02H
CRC CHK low order	56H
CRC CHK high order	CBH

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Slave response information

When FD-05 is set to 0:

ADR	01H
CMD	03H
High order of bytes	00H
Low order of bytes	04H
Data F002H high order	00H
Data F002H low order	00H
Data F003H high order	00H
Data F003H low order	01H
CRC CHK low order	82H
CRC CHK high order	C7H

When FD-05 is set to 1:

ADR	01H
CMD	03H
Number of bytes	04H
Data F002H high order	00H
Data F002H low order	00H
Data F003H high order	00H
Data F003H low order	01H
CRC CHK low order	3BH
CRC CHK high order	F3H

Command Code: 06H, write a word

For example, write 5000 (1388H) into F00AH of the AC drive whose slave address is 02H.

Master command information

ADR	02H
CMD	06H
Data address high order	F0H
Data address low order	0AH
Data content high order	13H
Data content low order	88H
CRC CHK low order	97H
CRC CHK high order	ADH

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Slave response information

ADR	02H
CMD	06H
Data address high order	F0H
Data address low order	0AH
Data content high order	13H
Data content low order	88H
CRC CHK low order	97H
CRC CHK high order	ADH

- CRC check

In RTU mode, a message includes a CRC-based error-check field. The CRC field checks the content of the entire message. The CRC field is two bytes, containing a 16-bit binary value. The CRC field is calculated by the transmitting device, and then added to the message. The receiving device recalculates a CRC value after receiving the message, and compares the calculated value with the CRC value in the received CRC field. The CRC is first stored to 0xFFFF. Then a procedure is invoked to process the successive 8-bit byte in the message and the value in the register. Only the eight bits in each character are used for the CRC. The start bit, stop bit and the parity bit do not apply to the CRC. During generation of the CRC, each eight-bit character is in exclusive-OR (XOR) with the content in the register. Then the result is shifted in the direction of the least significant bit (LSB), with a zero filled into the most significant bit (MSB) position. The LSB is extracted and examined. If the LSB was a 1, the register then performs XOR with a preset value. If the LSB was a 0, no XOR is performed. This process is repeated until eight shifts have been performed. After the last (eighth) shift, the next eight-bit byte is in XOR with the register's current value, and the process repeats for eight more shifts as described above. The final value of the register, after all the bytes of the message have been applied, is the CRC value. The CRC is added to the message from the low-order byte followed by the high-order byte. The CRC simple function is as follows:

```
unsigned int crc_chk_value（unsigned char *data_value,unsigned char length）
{
    unsigned int crc_value=0xFFFF;
    int i;
    while（length--）
    {
        crc_value^=*data_value++;
        for（i=0;i<8;i++）
        {
            if（crc_value&0x0001）
            {
                crc_value=（crc_value>>1）^0xa001;
```


www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

```
                }
                        else
                {
                        crc_value=crc_value>>1;
                 }
            }
        }
            return（crc_value）;
    }
```

■ Address definition of communication parameters

1. This part describes the communication content used to control the running, status, and parameter setting of the AC drive.
2. Function code parameters are read and written (certain functional codes cannot be changed, and can only be used by the manufacturer or for monitoring).
3. The group numbers and identifiers of function codes are used for expressing the parameter addresses.
4. High-order bytes: F0 to FF (groups F), A0 to AF (groups A), 70 to 7F (group U)
5. Low-order bytes: 00 to FF
6. For example, F3-11, the address is expressed as F30B.

Note

- Group FF: factory parameters. The parameters cannot be read or changed.
- Group U: These parameters can only be read.

Certain parameters cannot be modified when the AC drive is running. Certain parameter cannot be modified regardless of the state of the AC drive. Users need to meet the requirements for the range, unit, and related description when modifying function code parameters.

Function Code Group	Communication Address	Function Code Address in RAM
Groups F0 to FE	0xF000 to 0xFEFF	0x0000 to 0x0EFF
Groups A0 to AC	0xA000 to 0xACFF	0x4000 to 0x4CFF
Group U0	0x7000 to 0x70FF	-

Frequent storage to the EEPROM reduces its service life. Therefore, in the communication mode, users can change the values of certain function code parameters in the RAM rather than storing the setting.

For groups F parameters, users only need to change high order F of the function code address to 0.

For groups A parameters, users only need to change high order A of the function code address to 4.

The function code addresses are expressed as follows:

High-order bytes: 00 to 0F (groups F), 40 to 4F (groups A)

Low-order bytes: 00 to FF

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

For example, if function code F3-11 is not stored into EEPROM, the address is expressed as 030B; if function code A1-05 is not stored into EEPROM, the address is expressed as 41-05.

It is an invalid address when being read.

Users can also use the command code 07H to implement this function.

■ Stop/RUN parameters:

Parameter Address	Parameter Description
1000H	Communication setup value (-10000 to 10000) (Decimal)
1001H	Running frequency
1002H	Bus voltage
1003H	Output voltage
1004H	Output current
1005H	Output power
1006H	Output torque
1007H	Running speed
1008H	DI tag
1009H	DO tag
100AH	AI1 voltage
100BH	AI2 voltage
100CH	AI3 voltage
100DH	Count value input
100EH	Length value input
100FH	Load speed
1010H	PID setting
1011H	PID feedback
1012H	PLC stage
1013H	Pulse setting frequency (unit: 0.01 kHz)
1014H	Feedback speed (unit: 0.1 Hz)
1015H	Remaining running time
1016H	AI1 voltage before correction
1007H	Running speed
1008H	DI tag
1019H	Linear speed
101AH	Current power-on time
101BH	Current running time
101CH	Pulse setting frequency (unit: 1 Hz)
101DH	Communication setting value
101EH	Actual feedback speed
101FH	Main frequency X
1020H	Auxiliary frequency Y

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Note

- The communication setting value indicates the percentage: 10000 corresponds to 100.00%, and -10000 corresponds to -100.00%.
- With regard to frequency, the communication setting frequency is a percentage of F0-10 (maximum frequency), and this parameter can be read and written via communication. With regard to torque, the communication setting toruqe is a percentage of F2-10, A2-48, A3-48, A4-48 (respectively corresponding to motors 1, 2, 3, and 4).

■ Control command input to AC drive (write-only):

Command Word Address	Command Word Function
2000H	0001: Forward RUN
	0002: Reverse RUN
	0003: Forward jog
	0004: Reverse jog
	0005: Coast to stop
	0006: Stop according to the stop mode in F4-10
	0007: Fault reset

■ Read AC drive state (read-only):

Command Word Address	Command Word Function
3000H	0001: Forward RUN
	0002: Reverse RUN
	0003: Stop

■ Parameter lock password check

If "8888H" is returned, it indicates that the password check is passed.

Password Address	Password Content
1F00H	*****

■ DO terminal control (write-only)

Command Address	Command Content
2001H	BIT0: DO1 control
	BIT1: DO2 control
	BIT2: RELAY1 control
	BIT3: RELAY2 control
	BIT4: FMR control
	BIT5: VDO1
	BIT6: VDO2
	BIT7: VDO3
	BIT8: VDO4
	BIT9: VDO5

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

■ AO1 control (write-only)

Command Address	Command Content
2002H	0 to 7FFF indicates 0% to 100%.

■ AO2 control (write-only)

Command Address	Command Content
2003H	0 to 7FFF indicates 0% to 100%.

■ Pulse output control (write-only)

Command Address	Command Content
2004H	0 to 7FFF indicates 0% to 100%.

■ AC drive fault description

AC Drive Fault Address	AC Drive Fault Information
8000	0000: No fault 0001: Reserved 0002: Overcurrent during acceleration 0003: Overcurrent during deceleration 0004: Overcurrent at constant speed 0005: Overvoltage during acceleration 0006: Overvoltage during deceleration 0007: Overvoltage at constant speed 0008: Snubber resistor overload 0009: Undervoltage 000A: AC drive overload 000B: Motor overload 000C: Input phase loss 000D: Output phase loss 000E: Module overheat 000F: External device fault 0010: Communication abnormal 0011: Contactor abnormal 0012: Current detection fault 0013: Motor auto-tuning fault 0014: Reserved 0015: Parameter read/write abnormal 0016: AC drive hardware fault 0017: Motor short-circuit to ground 0018: Reserved

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

AC Drive Fault Address	AC Drive Fault Information
8000	0019: Reserved 001A: Running time reached 001B: User-defined fault 1 001C: User-defined fault 2 001D: Power-on time reached 001E: Load becoming 0 001F: PID feedback lost during running 0028: Fast current limit timeout 0029: Motor switchover fault during running 002A: Speed deviation too large 002B: Motor overspeed 002D: Motor overheat 005A: Reserved 005B: Reserved 005C: Reserved 005E: Speed feedback incorrect

■ Communication fault information description data (fault code)

Communication Fault Address	Fault Description
8001H	0000: No fault 0001: Password incorrect 0002: Command code incorrect 0003: CRC check error 0004: Invalid address 0005: Invalid parameter 0006: Parameter modification invalid 0007: System locked 0008: EEPROM operation

When Fd-05 is set to 1 (Standard Modbus protocol), the corresponding relationship between the standard protocol exception codes and the current exception codes are as follows:

Communication Fault Address	Fault Description
8001H	0000: No fault 0001: Password incorrect 0002: Command code incorrect 0003: CRC check error 0004: Invalid address 0005: Invalid parameter 0006: Parameter modification invalid 0007: System locked 0008: EEPROM operation

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

When Fd-05 is set to 1 (Standard Modbus protocol), the corresponding relationship between the standard protocol exception codes and the current exception codes are as follows:

Standard Protocol Exception Code	Current Exception Code
Standard Protocol Exception Code	Current Exception Code
01: Command code incorrect	0002: Command code incorrect
02: Address incorrect	0004: Invalid address
03: Data incorrect	0005: : Invalid parameter, 0001: Password incorrect
04: Command cannot be processed	0006: Parameter modification invalid, 0007: System locked

■ Group Fd communication parameter description

Function Code	Parameter Name	Setting Range	Default
Fd-00	Baud rate	Unit's digit (Modubs)	6005
		0: 300 bps	
		1: 600 bps	
		2: 1200 bps	
		3: 2400 bps	
		4: 4800 bps	
		5: 9600 bps	
		6: 19200 bps	
		7: 38400 bps	
		8: 57600 bps	
		9: 115200 bps	

This parameter is used to set the data transmission speed between the host computer and the AC drive.

Note that the baud rate of the host computer must be the same as that of the AC drive. Otherwise, communication shall fail. The higher the baud rate is, faster the communication will be.

Function Code	Parameter Name	Setting Range	Default
Fd-01	Data format	0: No check <8,N,2>	0
		1: Even parity check <8,E,1>	
		2: Odd parity check <8,O,1>	
		3: No check, data format <8,N,1>	

Note that the data format of the host computer must be the same as that of the AC drive. Otherwise, communication shall fail.

Function Code	Parameter Name	Setting Range	Default
Fd-02	Local address	1–249	1
		0: Broadcast address	

This parameter is used to set the address of the AC drive. This address is unique (except the broadcast address), which is the basis for point-to-point communication between the host computer and the AC drive.

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

When the local address is set to 0 (that is, the broadcast address), the AC drive can only receive and execute broadcast commands of the host computer, but will not respond to the host computer.

Function Code	Parameter Name	Setting Range	Default
Fd-03	Response delay	0–20 ms	2 ms

This parameter is used to set the delay from the time when AC drive receives the frame matching the local address to the time when it AC drive starts returning a response frame. Too short response delay may make the host computer fail to receive the frame in time. If the response delay is shorter than the system processing time, the system processing time shall prevail. If the response delay is longer than the system processing time, the system sends data to the host computer only after the response delay is up.

Function Code	Parameter Name	Setting Range	Default
Fd-04	Communication timeout	0.0–60.0s	0.0s

When the AC drive does not receive the communication signal within the time set in this parameter, it will report the communication timeout fault (Err16).

When this parameter is set to 0.0s, the system does not detect communication timeout.

Generally, this parameter is set to 0.0s. In applications with continuous communication, you can use this parameter to monitor the communication status.

Function Code	Parameter Name	Setting Range	Default
Fd-05	Communication protocol	Unit's digit: Modbus 0: Non-standard Modbus protocol 1: Standard Modbus protocol Ten's digit: Reserved	31

FD-05 = 1: Standard Modbus protocol

FD-05 = 0: For the read command, the slave returns an additional byte. For details, see "Data Format" in this appendix.

Function Code	Parameter Name	Setting Range	Default
Fd-06	Current resolution read by communication	0: 0.01 A 1: 0.1 A	0

This parameter is used to set the unit of the output current read by communication.

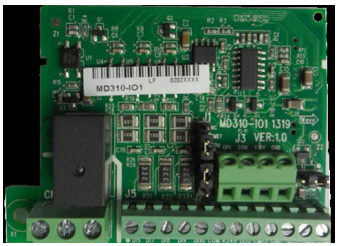
www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Appendix 2 Extension I/O Card (MD310-IO1)

■ Overview

MD310-IO1 is developed by Inovance and is designed for extension of input and output terminals of the MD5310 drive. It provides five digital inputs, one analog voltage input, one digital output, one analog output and one relay output.

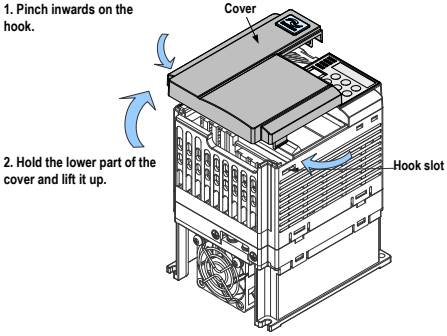
■ Physical Appearance

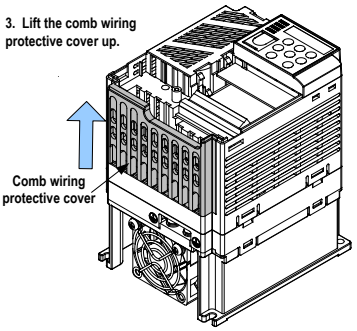


■ Mounting Method

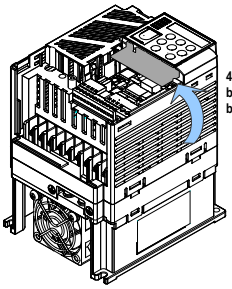
Power off the drive and wait until the capacitor discharges completely. Then insert the MD310-IO1 card into the drive and fix it with the prepared screws.

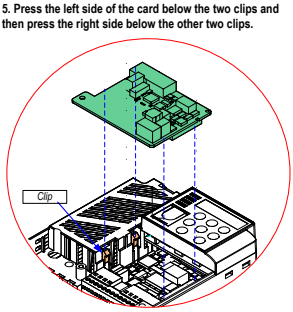
The mounting process is shown in the following figure.

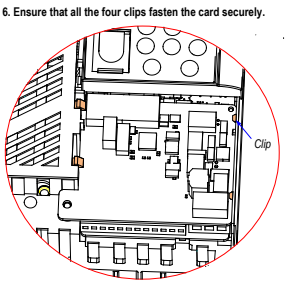




www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)







■ Description of Terminals and Jumpers

The following table describes the terminals of the MD310-IO1.

Type	Terminal	Terminal Name	Function Description
Power supply	+24V-COM	External +24V power supply	Provide a +24 V power supply to an external unit. Generally used to supply DI/DO terminals and external sensors. Max. output current: 200 mA
	OP1	Digital input power terminal	Connect to +24V by the jumper J2 by default. When applying an external power supply, remove the jumper J2 to disconnect the OP1 from +24V and connect the OP1 to the external power supply.
Analog input	AI3-PGND	Analog input 3	Input voltage range: -10 to 10 VDC
Digital inputs	DI6-OP1	Digital input 6	Optically-coupled isolation compatible with dual-polarity inputs Input resistance: 4.4 kΩ Voltage range for inputs: 9 to 30 V
	DI7-OP1	Digital input 7	
	DI8-OP1	Digital input 8	
	DI9-OP1	Digital input 9	
	DI10-OP1	Digital input 10	
Analog output	AO2-GND	Analog output 2	Output voltage range: 0 to 10 V Output current range: 0 to 20 mA Output current with resistance range: 0 to 500 Ω Signal selection (voltage or current) by J4
Digital output	DO2-CME	Digital output 2	Optically-coupled isolation, dual-polarity open-collector output Output voltage range: 0 to 24 V Output current range: 0 to 50 mA Note that CME1 and COM are internally insulated, but are shorted by the jumper J1 internally. Remove the jumper J1 if you need to apply external power to DO2.
Relay outputs (RELAY2)	PA- PB	Normally-closed (NC) terminal	Contact driving capacity: 250 VAC, 3 A, Cos φ = 0.4 30 VDC, 1 A
	PA- PC	Normally-closed (NC) terminal	

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

■ CANlink Transmission Distance

The transmission distance of the CANlink bus is directly related to the baud rate, the communication cable length and the number of nodes. The relationship of them is described in the following table.

Baud Rate	Cable Length	Min. Cable Diameter	Max. Number of Nodes
1 M	20	0.3	18
500 K	80	0.3	32
250 K	150	0.3	63
125 K	300	0.5	63
100 K	500	0.5	63
50 K	1000	0.7	63

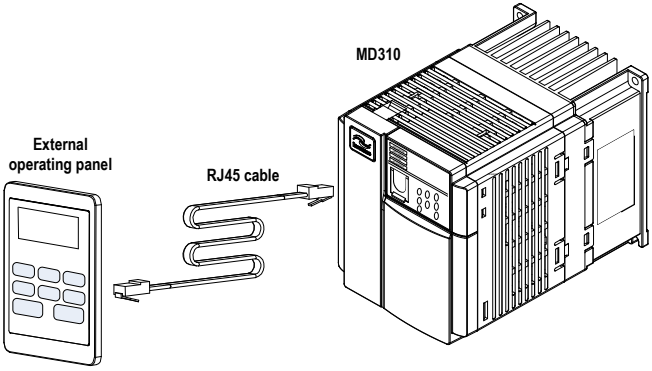
www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Appendix 3 External Operation Panel

The operating panel, shown in the following figure, allows you to monitor system operation, modify parameters and start or stop the MD310.



The operating panel is connected to the MD310, as shown in the following figure.



www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

■ Key Functions

Key	Name	Function
	Programming	Enter or exit the Level I menu. Return to the previous menu
	Enter	Enter each level of the menu interface. Confirm the displayed parameter setting.
	Up	When navigating a menu, it moves the selection up through the screens available. When editing a parameter value, it increases the displayed value. When the AC drive is in RUN mode, it increases the speed.
	Down	When navigating a menu, it moves the selection down through the screens available. When editing a parameter value, it decreases the displayed value. When the AC drive is in RUN mode, it decreases the speed.
	Shift	Select the displayed parameter in the stop or running state. Select the digit to be modified when modifying a parameter value
	Run	Start the AC drive when using the operating panel control mode.
	Stop/Reset	Stop the AC drive when it is in the RUN state. Perform a reset operation when the AC drive is in the FAULT state. Note: The functions of this key can be restricted by using function F7-02.
	Multifunction	Perform a function switchover as defined by the setting of F7-01, for example to quickly switch command source or direction.

ARCO CONTROL
:051-37133855-6
:09014284236
WWW.ARCOKALA.COM

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Warranty Agreement

1. The warranty period of the product is 18 months from date of manufacturing. During the warranty period, if the product fails or is damaged under the condition of normal use by following the instructions, Inova will be responsible for free maintenance.
2. Within the warranty period, maintenance will be charged for the damages caused by the following reasons:

   a. Improper use or repair/modification without prior permission

   b. Fire, flood, abnormal voltage, other disasters and secondary disaster

   c. Hardware damage caused by dropping or transportation after procurement

   d. Improper operation

   e. Trouble out of the equipment (for example, external device)
3. If there is any failure or damage to the product, please correctly fill out the Product Warranty Card in detail.
4. The maintenance fee is charged according to the latest Maintenance Price List of Inova.
5. The Product Warranty Card is not re-issued. Please keep the card and present it to the maintenance personnel when asking for maintenance.
6. If there is any problem during the service, contact Inova's agent or Inova directly.
7. This agreement shall be interpreted by Inova Automation Co., Limited.

Inova Automation Co., Limited

Unit B01, 17/F

MG Tower, 133 Hoi Bun Road, Kwun Tong

Hong Kong

Tel: (852) 2751 6080

Fax: (852)2751 6933

Email: info@inova-automation.com

ARCO CONTROL

:051-37133855-6

:09014284236

WWW.ARCOKALA.COM

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Product Warranty Card

<table>
<tr><td rowspan="3">Customer information</td><td colspan="2">Address:</td></tr>
<tr><td rowspan="2">Company name:
Postcode:</td><td>Contact person:</td></tr>
<tr><td>Tel or Email:</td></tr>
<tr><td rowspan="3">Product information</td><td colspan="2">Product model:</td></tr>
<tr><td colspan="2">Serial No (Attach here):</td></tr>
<tr><td colspan="2">Name Supplier who supplied you the unit</td></tr>
<tr><td>Failure Description
(eg. Fault code)</td><td colspan="2">Maintenance personnel:</td></tr>
</table>

www.Farazcontrol.com واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)

Inovance

MD310 Series

General-purpose AC Drive

ARCO CONTROL

:051-37133855-6

:09014284236

WWW.ARCOKALA.COM

Inova Automation Co., Limited
Address:Unit B01, 17/F,MG Tower, 133 Hoi Bun Road, Kwun Tong,Hong Kong
Tel: (852) 2751 6080
Fax: (852)2751 6933
Email: info@inova-automation.com
http://www.inovance.cn

www.Farazcontrol.com

واحد فروش: ۰۹۱۲۹۲۷۵۱۵۹ (مهندس رمضان زاده)