



MD310-KEY1 Series Smart Operating Panel User Guide



Industrial
Automation



Intelligent
Elevator



New Energy
Vehicle



Industrial
Robot



Rail
Transit



Data code PS00014357A00

Preface

Introduction

Thank you for purchasing MDD310-KEY1 external operating panel.

The MD310-KEY1 operating panel is a new-generation commissioning assistant designed for the MD310 series AC drive (single-drive system).

This operating panel supports LED display, parameter setting, status monitoring, fault analysis and locating.

This user guide presents safety instructions, product information, installation and wiring, function and application, and maintenance and inspection. Read through the user guide before use. Contact Inovance if you have any question during use.

Revision History

Date	Version	Description
Dec 2023	A00	First release.

Access to the Guide

This guide is not delivered with the product. You can obtain the PDF version by the following methods:

- Do keyword search under Service and Support at <http://www.inovance.com>.
- Scan the QR code on the product with your smart phone.
- Scan the QR code below to install the app, where you can search for and download user guides.



Warranty Disclaimer

Inovance provides warranty service within the warranty period (as specified in your order) for faults or damage that occur during normal operation. Maintenance will be charged after the warranty expires.

Within the warranty period, maintenance will be charged for the following damage:

- Damage caused by operations not following the instructions in the user guide
- Damage caused by fire, flood, or unusual voltage
- Damage caused by unintended use of the product
- Damage caused by use beyond the specified scope of application of the product

- Damage or secondary damage caused by force majeure (natural disaster, earthquake, and lightning strike)

The maintenance is charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

For details, see Product Warranty Card.

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Fundamental Safety Instructions

Safety disclaimer

- This chapter provides essential safety instructions for proper use of the equipment. Before operating the equipment, read through the guide and comprehend all the safety instructions. Failure to observe the safety precautions may result in serious injuries or death of personnel or device damage.
- "Danger", "Warning", and "Caution" items in this guide do not indicate all safety precautions that need to be followed; instead, they just supplement the safety precautions.
- Use this product according to the designated environment requirements. Damage caused by improper use is not covered by warranty.
- Inovance shall take no responsibility for any personal injuries or property damage caused by improper usage.

Safety Levels and Definitions



危险

Indicates that failure to comply with the notice can result in death or severe personal injury.



警告

Indicates that failure to comply with the notice may result in death or severe personal injury.



注意

Indicates that failure to comply with the notice may result in minor or moderate personal injury or equipment damage.

Safety Precautions

- Drawings in the guide 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 guide are shown for illustration only and may be different from the product you purchased.
- Operators must take mechanical precautions to protect personal safety and wear protective equipment, such as anti-smashing shoes, safety clothing, safety glasses, protective gloves, and protective sleeves.

Unpacking**警告**

- Do not install the equipment if you find damage, rust, or signs of use on the equipment or accessories upon unpacking.
- Do not install the equipment if you find water seepage or missing or damaged components upon unpacking.
- Do not install the equipment if you find the packing list does not conform to the equipment you received.

**注意**

- Check whether the packing is intact and whether there is damage, water seepage, dampness, and deformation before unpacking.
- Unpack the package by following the unpacking sequence. Do not strike the package violently.
- Check whether there is damage, rust, or signs of bumping on the surface of the equipment and equipment accessories before unpacking.
- Check whether the package contents are consistent with the packing list before unpacking.

Storage and Transportation**警告**

- Large-scale or heavy equipment must be transported by qualified professionals using specialized hoisting equipment. Failure to comply may result in personal injuries or equipment damage.
- Before hoisting the equipment, ensure the components such as the front cover and terminal blocks are secured firmly with screws. Loosely-connected components may fall off and result in personal injury or equipment damage.
- Never stand or stay below the equipment when the equipment is being hoisted by the hoisting equipment.
- When hoisting the equipment with a steel rope, ensure the equipment is hoisted at a constant speed without suffering from vibration or shock. Do not turn the equipment over or let the equipment stay hanging in the air. Failure to comply may result in personal injuries or equipment damage.

 注意

- Handle the equipment with care during transportation and mind your steps to prevent personal injuries or equipment damage.
- When carrying the equipment with bare hands, hold the equipment casing firmly with care to prevent parts from falling. Failure to comply may result in personal injuries.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply will result in equipment damage.
- Avoid storing or transporting the equipment in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing the product for more than 3 months. When the product needs to be stored for an extended period, take strict protection and necessary inspection measures.
- Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
- Never transport the drive with other equipment or materials that may harm or have negative impacts on the drive.

Installation

 危险

- The equipment can only be operated by professionals with electrical knowledge. Non-professionals are not allowed to operate on the equipment.

 警告

- Read through the guide and safety instructions before installation.
- Do not install this equipment in places with strong electric or magnetic fields.
- Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply will result in mechanical hazards.
- Do not wear loose clothes or accessories during installation. Failure to comply may result in an electric shock.
- When installing the equipment in a closed environment (such as a cabinet or casing), use a cooling device (such as a fan or air conditioner) to cool the environment down to the required temperature. Failure to comply may result in equipment over-temperature or a fire.
- Do not retrofit the equipment.
- Do not fiddle with the bolts used to fix equipment components or the bolts marked in red.
- When the equipment is installed in a cabinet or final assembly, a fireproof enclosure providing both electrical and mechanical protections must be provided. The IP rating must meet IEC standards and local laws and regulations.
- Before installing devices with strong electromagnetic interference, such as a transformer, install a shielding device for the equipment to prevent malfunction.
- Install the product on an incombustible object such as metal and do not touch or attach the product to combustibles. Failure to comply can result in fire accident.

注意

- Cover the top of the equipment with a piece of cloth or paper during installation. This is to prevent unwanted objects such as metal shavings, oil, and water from falling into the equipment and causing faults. After installation, remove the cloth or paper on top of the equipment to prevent over-temperature caused by poor ventilation due to blocked ventilation holes.
- Resonance may occur when the equipment operating at a constant speed executes variable speed operations. In this case, install the vibration-proof rubber under the motor frame or use the vibration suppression function to reduce resonance.

Wiring

危険

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Before wiring, disconnect all the power supplies of the equipment, and wait for at least the time designated on the equipment warning label before further operations because residual voltage still exists after power-off. Measure the DC voltage of the main circuit and ensure that the voltage is within the safety range. Failure to comply can result in an electric shock.
- Do not perform wiring, remove the equipment cover, or touch the circuit board with power ON. Failure to comply will result in an electric shock.
- Check that the equipment is grounded properly. Failure to comply can result in an electric shock.

警告

- Do not connect the input power supply to the output end of the equipment. Failure to comply can result in equipment damage or even a fire.
- When connecting a drive to the motor, check that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Cables used for wiring must meet cross sectional area and shielding requirements. The shield of the cable must be reliably grounded at one end.
- Fix the terminal screws with the tightening torque specified in the user guide. Improper tightening torque may overheat or damage the connecting part, resulting in a fire.
- After wiring is done, check that all cables are connected properly and no screws, washers or exposed cables are left inside the equipment. Failure to comply may result in electric shock or equipment damage.

注意

- Follow the proper electrostatic discharge (ESD) procedure and wear an anti-static wrist strap to perform wiring. Failure to comply may result in damage to the equipment or to the internal circuit of the product.
- Use shielded twisted pairs for the control circuit. Connect the shield to the grounding terminal of the equipment for grounding purpose. Failure to comply can result in equipment malfunction.

Power-on

 危险

- Before power-on, check that the equipment is installed properly with reliable wiring and the motor can be restarted.
- Check that the power supply meets equipment requirements before power-on to prevent equipment damage or a fire.
- Do not open the cabinet door or protective cover of the product, touch any wiring terminal of the product, or remove any part of the product with power on. Failure to comply can result in an electric shock.

 警告

- Perform a trial run after wiring and parameter setting to ensure the equipment operates safely. Failure to comply may result in personal injuries or equipment damage.
- Before power-on, check that the rated voltage of the equipment is consistent with that of the power supply. Failure to comply may result in a fire.
- Before power-on, check that no one is near the equipment, motor, or machine. Failure to comply may result in death or personal injury.

Operation state

 危险

- The equipment must be operated only by professionals. Failure to comply can result in death or personal injury.
- Do not touch any connecting terminals or disassemble any unit or component of the equipment during operation. Failure to comply can result in an electric shock.

 警告

- Do not touch the equipment casing, fan, or resistor with bare hands to feel the temperature. Failure to comply may result in personal injuries.
- Prevent metal or other objects from falling into the equipment during operation. Failure to comply may result in a fire or equipment damage.

Maintenance

 危险

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not maintain the equipment with power ON. Failure to comply can result in an electric shock.
- Before maintenance, disconnect all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
- When a permanent magnet motor is used, do not touch the motor terminals immediately after power-off because the motor terminals can generate induced voltage during rotation even after the equipment power supply is off. Failure to comply can result in an electric shock.

 警告

- Perform routine and periodic inspection and maintenance on the equipment according to maintenance requirements and keep a maintenance record.

Repair	
 危险	• Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals. • Do not repair the equipment with power ON. Failure to comply can result in an electric shock. • Before inspection and repair, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
 警告	• Submit the repair request according to the warranty agreement. • When the fuse is blown or the circuit breaker or earth leakage current breaker (ELCB) trips, wait for at least the time designated on the equipment warning label before power-on or further operations. Failure to comply may result in death, personal injury or equipment damage. • When the equipment is faulty or damaged, the troubleshooting and repair work must be performed by professionals that follow the repair instructions, with repair records kept properly. • Replace quick-wear parts of the equipment according to the replacement instructions. • Do not operate on damaged equipment. Failure to comply may result in death, personal injury, or severe equipment damage. • After the equipment is replaced, check the wiring and set parameters again.
Disposal	
 警告	• Dispose of retired equipment in accordance with local regulations and standards. Failure to comply may result in property damage, personal injuries, or even death. • Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

Safety Labels

For safe operation and maintenance, comply with the safety labels on the equipment. Do not damage or remove the safety labels. See the following table for descriptions of the safety labels.

Safety Label	Description
	• Read through the safety instructions before operating the equipment. Failure to comply may result in death, personal injuries, or equipment damage. • Do not touch the terminals or remove the cover with power ON or within 10 min after power-off. Failure to comply will result in an electric shock.

1 Product Information

1.1 Applicable AC Drives

The MD310-KEY1 operating panel is only applicable to the MD310 series AC drives.

1.2 Dimensions

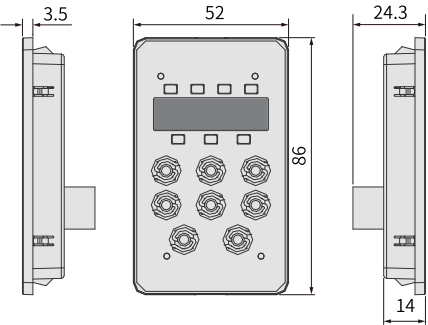


Figure 1-1 Overall dimensions of the MD310-KEY operating panel (unit: mm)

1.3 Components

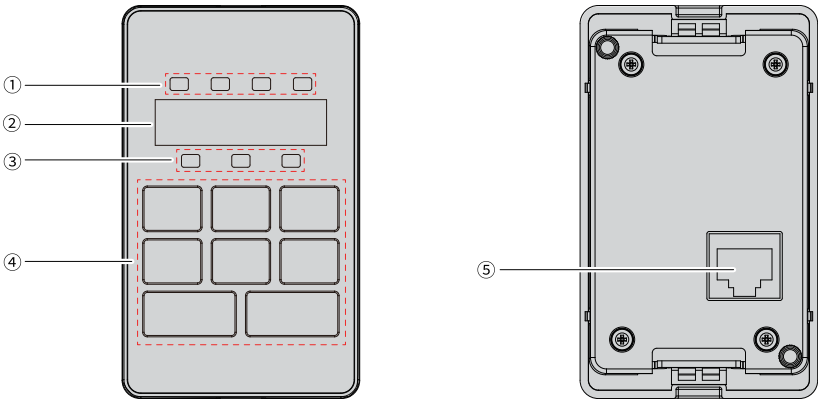


Table 1-1 Component description

No.	Name
①	Status indicator
②	Display
③	Unit indicator

No.	Name
④	Key
⑤	Network port

1.4 Technical Specifications

Item	Specification
Operating location	Indoors without direct sunlight, dust, corrosive gas, combustible gas, oil mist, water vapor, drip, or salty elements
Altitude	3000 m max.
Ambient temperature	-10°C to +40°C
Humidity	Less than 95% RH (without condensation)
Vibration	Lower than 0.6 g
Storage temperature	-20°C to +60°C
IP rating	IP20
Pollution degree	PD2
Material	Disposal: The operating panel is recyclable to protect the environment. See related international and local laws and regulations for disposal and recycling.

2 Installation and Wiring

2.1 Connecting MD310-KEY1 to the Drive

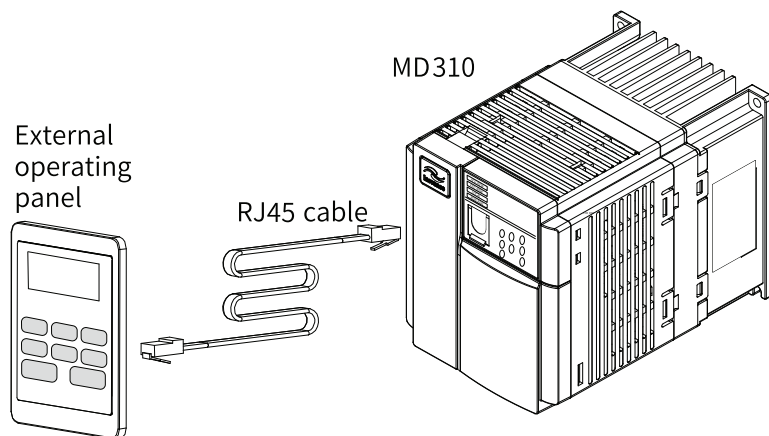


Figure 2-1 Connecting MD310-KEY1 to the drive

2.2 Installing MD310-KEY1 To the Cabinet Door

1. The MD310-KEY operating panel can be installed to the cabinet door. Drill mounting holes on the cabinet door. The cut-out dimensions are shown in Figure ①.
2. Insert the operating panel into the cabinet door in the arrow direction, as shown in Figure ②.
3. The Figure ③ shows what it looks like after installation is done.

Insert the operating panel to the cabinet door in the arrow direction

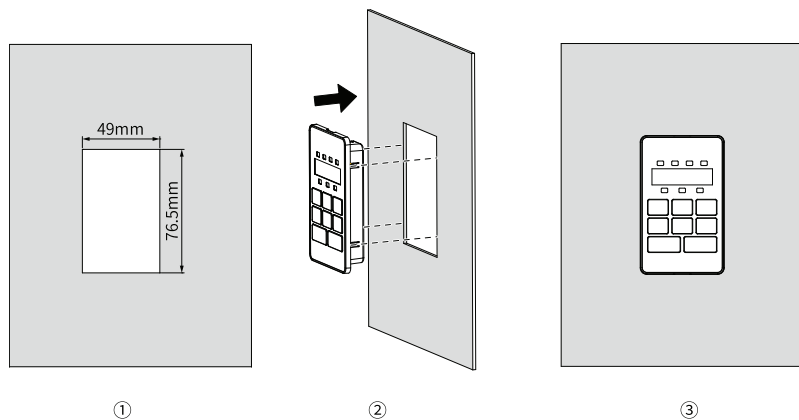


Figure 2-2 Installing MD310-KEY1 to the cabinet door

3 Function and Application

3.1 Overview

The MD310-KEY1 operating panel can be used to execute the following functions.

- Function parameter modification
- Operating status monitoring
- Operation process control

Note: When the external operating panel is connected properly, the built-in operating panel is not available. The external operating panel functions in the same way as the built-in operating panel.

Homepage

The 5-digit LED on the operating panel can display the frequency reference, output frequency, and various monitoring data.

Basic operations

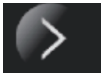
There are eight keys on the MD310-KEY1 external operating panel. Their functions are the same as those on the built-in operating panel. The following describes the functions of the keys.



Figure 3-1 MD310-KEY1 operating panel

Table 3-1 Functions of Keys

External operating panel keys	Name	Function
	Programming key	Used to enter or exit level I menus.
	Confirm key	Used to enter the menu interfaces level by level and confirm parameter setting.

External operating panel keys	Name	Function
	UP key	Used to increase the data or parameter.
	DOWN key	Used to decrease the data or parameter.
	SHIFT key	Used to select parameters to be displayed in turn in the stop or operation state, and select the digit to be modified during parameter modification.
	RUN key	Used to run the drive in the operating panel control mode.
	Stop/Reset	Used to stop the drive or reset faults. The function of this key is restricted by F7-02.
	Multi-function key	Used as the command source or used to switch direction quickly or display parameters as defined by F7-01.

Device switchover

The built-in operating panel is used by default. When the external operating panel is connected properly, the operating panel control mode applies. In this case, the built-in operating panel is not available.

3.2 Parameter Setting

Viewing/Editing parameters

The method for viewing/editing parameters through MD310-KEY1 is the same as that through the built-in operating panel. The operating panel adopts three-level menus for parameter setting. The three-level menus consist of function parameter group (level 1), parameter (level 2), and parameter setpoint (level 3), as shown in the following figure.

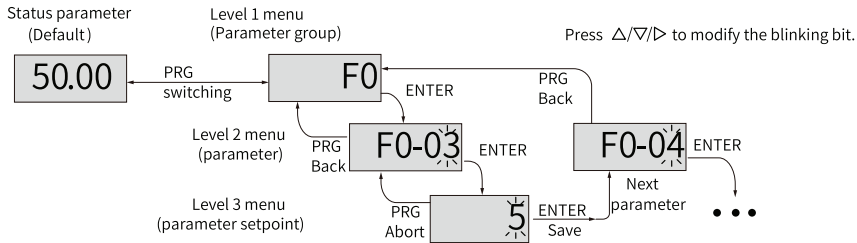


Figure 3-2 Operation flowchart of three-level menus

You can return to level 2 menus from level 3 menus by pressing the PRG or ENTER key. The difference between the two keys is as follows:

- Pressing the ENTER key saves the setpoint, returns to level 2 menus, and shifts to the next parameter automatically.
- Pressing the PRG key aborts current setpoint and returns to the level 2 menu of current parameter directly.

Example

Here is an example of changing the value of F3-02 from 10.00 Hz to 15.00 Hz.

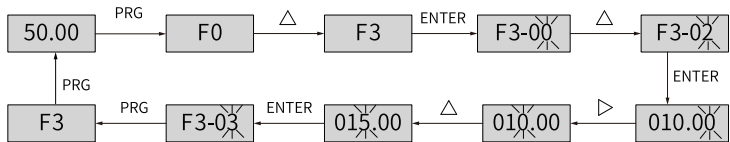


Figure 3-3 Operation example for level-3 menus

In the level-3 menu state, if the parameter is displayed without any blinking digit, this parameter cannot be modified. This may be caused by the following:

- The parameter is read-only. Such parameters include AC drive type, measured parameters, operation record parameters, and so on.
- The parameter can be modified only at stop.

3.3 Status Monitoring

Fault status

When a fault occurs, the fault code is displayed on the operating panel.

The MD310-KEY1 operating panel only displays fault codes. The fault time and fault description cannot be recorded. For troubleshooting instructions for each fault code, see the following table.

Table 3-2 List of fault codes

Fault code	Fault name	Cause	Solution
Err02	Overcurrent during acceleration	The output circuit of the drive is grounded or short-circuited.	Rectify peripheral faults.
		The control mode is FVC or SVC but parameter auto-tuning is not performed.	Set motor parameters according to the motor nameplate and perform motor auto-tuning.
		The acceleration time is too short.	Increase the acceleration time.
		The manual torque boost value or V/f curve is improper.	Adjust the manual torque boost value or V/f curve.
		The voltage is too low.	Adjust the voltage until it is within the normal range.
		A spinning motor is being rotates.	Enable the flying start function or start the motor after it stops.
		A sudden load is applied during acceleration.	Remove the load added suddenly.
		The braking unit or braking resistor is not installed.	Install the braking unit and braking resistor.
		The resistance of the braking resistor is too low or the braking resistor is short-circuited.	Replace the braking resistor.
		The motor is short-circuited to ground.	Replace the cable or motor.
Err03	Overcurrent during deceleration	The output circuit of the AC drive is grounded or short-circuited.	Rectify peripheral faults.
		The control mode is FVC or SVC but parameter auto-tuning is not performed.	Set motor parameters according to the motor nameplate and perform motor auto-tuning.
		The deceleration time is too short.	Increase the deceleration time.
		The voltage is too low.	Adjust the voltage until it is within the normal range.
		A sudden load is added during deceleration.	Remove the load added suddenly.
		The braking unit or braking resistor is not installed.	Install the braking unit and braking resistor.
		The resistance of the braking resistor is too low or the braking resistor is short-circuited.	Replace the braking resistor.
		The motor is short-circuited to ground.	Replace the cable or motor.

Fault code	Fault name	Cause	Solution
Err04	Overcurrent during operation at constant speed	The output circuit of the drive is grounded or short-circuited.	Check whether the motor is short-circuited or disconnected.
		The control mode is FVC or SVC but parameter auto-tuning is not performed.	Set motor parameters according to the motor nameplate and perform motor auto-tuning.
		The voltage is too low.	Adjust the voltage until it is within the normal range.
		A sudden load is applied during running.	Remove the load added suddenly.
		The power rating of the AC drive is too low.	Select an AC drive of higher power rating.
		The resistance of the braking resistor is too low or the braking resistor is short-circuited.	Replace the braking resistor.
		The motor is short-circuited to ground.	Replace the cable or motor.
Err05	Overvoltage during acceleration	The input voltage is too high.	Adjust the voltage to a value within the normal range.
		External force drives the motor during acceleration.	Remove the external force or install a braking resistor.
		The acceleration time is too short.	Increase the acceleration time.
		The braking unit or braking resistor is not installed.	Install the braking unit and braking resistor.
Err06	Overvoltage during deceleration	The input voltage is too high.	Adjust the voltage to a value within the normal range.
		An external force drives the motor during deceleration.	Remove the external force or install a braking resistor.
		The deceleration time is too short.	Increase the deceleration time.
		The braking unit or braking resistor is not installed.	Install the braking unit and braking resistor.
Err07	Overvoltage during operation at constant speed	The input voltage is too high.	Adjust the voltage to a value within the normal range.
		An external force drives the motor during operation.	Remove the external force or install a braking resistor.
Err08	Pre-charge resistor overload	The input voltage is beyond the specified range.	Adjust the input voltage to the specified range.

Fault code	Fault name	Cause	Solution
Err09	Undervoltage	Instantaneous power failure occurs.	Reset encoder fault.
		The input voltage of the AC drive is beyond the specified range.	Adjust the voltage to a value within the normal range.
		The bus voltage is abnormal.	Contact the agent or Inovance for technical support.
		The rectifier bridge and pre-charge resistor are faulty.	Contact Inovance for technical support.
		The driver board is abnormal.	Contact Inovance for technical support.
		The control board is abnormal.	Contact Inovance for technical support.
Err10	Drive overload	The load is too heavy or the motor is stalled.	Reduce the load and check the motor and mechanical conditions.
		The power rating of the AC drive is too low.	Select an AC drive of higher power rating.
Err11	Motor overload	F9-01 is set incorrectly.	Set this parameter properly.
		The load is too heavy or the motor is stalled.	Reduce the load and check the motor and mechanical conditions.
		The power rating of the AC drive is too low.	Select an AC drive of higher power rating.
Err12	Input phase loss	The three-phase input power supply is abnormal.	Check and eliminate faults in peripheral circuits.
		The driver board is abnormal.	Contact Inovance for technical support.
		The lightning protection board is abnormal.	Contact Inovance for technical support.
		The main control board is abnormal.	Contact Inovance for technical support.
Err13	Output phase loss	The cable connecting the drive and the motor is faulty.	Rectify peripheral faults.
		The three-phase outputs of the AC drive are unbalanced during operation of the motor.	Check whether the motor three-phase winding is normal and rectify the fault.
		The lightning protection board is abnormal.	Contact Inovance for technical support.
		The module is faulty.	Contact Inovance for technical support.
Err14	Drive overtemperature	The ambient temperature is too high.	Lower down the ambient temperature.
		The air duct is blocked.	Clean the air duct.
		The fan is damaged.	Replace the damaged fan.
		The thermistor is damaged.	Contact Inovance for technical support.
		The module is damaged.	Contact Inovance for technical support.

Fault code	Fault name	Cause	Solution
Err15	Peripheral device fault	External fault signals are inputted through the multi-function DI.	Reset the operation.
		An external fault signal is inputted through the virtual I/O.	Reset the operation.
Err16	Communication fault	Modbus communication timeout	Check that RS485 communication cable is connected properly. Check that Fd-04 and PLC communication cycle are set properly.
		CANopen communication times out.	Check and ensure that the CAN communication cable is connected properly. View Fd-15...Fd-17 to check for interference.
		PDO mapping configured by CANopen inconsistent with the actual communication mapping	Check the PDO mapping in group FE/AF.
		CANlink heartbeat timeout	Check and ensure that the CAN communication cable is connected properly. View Fd-15...Fd-17 to check for interference.
		CANlink station number conflict	Modify the repeated CAN station numbers through Fd-13.
		DP communication times out.	Check whether the DP communication cable is correctly connected.
Err17	Contactor fault	The driver board and power supply are abnormal.	Replace the driver board or power supply board.
		The contactor is faulty.	Replace the contactor.
		The lightning protection board is abnormal.	Replace the lightning protection board.
Err18	Current detection fault	The driver board is abnormal.	Replace the drive board.
Err19	Motor auto-tuning fault	Motor parameters are not set according to the nameplate.	Set the motor parameters correctly according to the motor nameplate.
		Parameter auto-tuning timeout	Check the cables connecting the AC drive and the motor.
Err21	EEPROM read/write fault	The EEPROM chip is damaged.	Replace the main control board.
Err23	Output short-circuited to ground	The motor is short-circuited to ground.	Replace the cable or motor.
Err26	Cumulative operating time reached	The accumulative operating time reaches the set value.	Clear the record by parameter initialization.

Fault code	Fault name	Cause	Solution
Err27	User-defined fault 1	The signal of user-defined fault 1 is inputted through the multi-functional DI terminal.	Reset the operation.
		The signal of user-defined fault 1 is inputted through virtual I/O.	Reset the operation.
Err28	User-defined fault 2	The signal of user-defined fault 2 is inputted through the multi-functional DI terminal.	Reset the operation.
		The signal of user-defined fault 2 is inputted through virtual I/O.	Reset the operation.
Err29	Cumulative power-on time reach	The accumulative power-on time reaches the set value.	Clear the record by parameter initialization.
Err30	Load loss	The load is disconnected during AC drive running.	Check whether the load is disconnected.
Err31	PID feedback loss during operation	The PID feedback is lower than the setpoint of FA-26.	Check the PID feedback signal or set FA-26 properly.
Err40	Pulse-by-pulse current limit fault	The load is too heavy or the motor is stalled.	Reduce the load and check the motor and mechanical conditions.
		The power rating of the AC drive is too low.	Select an AC drive of higher power rating.
Err41	Motor switchover fault during operation	The motor is switched through the terminal during operation of the drive.	Perform motor switchover after the AC drive stops.
Err42	Excessive speed deviation	Motor stall	Check the mechanical conditions. Check whether motor parameter auto-tuning is performed and whether F2-10 is set to an excessively low value.
		Speed deviation detection parameters F9-69 and F9-70 are set improperly.	Speed deviation detection parameters F9-69 and F9-70 are set improperly.
		The cable connecting the output side (UVW) of the AC drive and the motor is faulty.	Check whether the cables connecting the AC drive and the motor are disconnected.
Err45	Motor temperature fault	The cable of the temperature sensor becomes loose.	Check whether the temperature sensor is connected loosely. If yes, tighten the cables.
		Motor temperature is too high.	Increase the carrier frequency or take other measures to cool down the motor.
		The value of F9-57 (Motor overtemperature protection threshold) is too small.	Increase the motor overheat protection threshold (90°C to 100°C for normal motors).

Fault code	Fault name	Cause	Solution
Err55	Master-slave control fault	The slave is faulty.	Troubleshoot the fault according to the slave fault code.
Err61	Braking transistor overload	The resistance of the braking resistor is too low.	Use a braking resistor of higher resistance.
Err62	Braking transistor short-circuited	The braking unit is short-through.	Check whether the braking transistor is normal. Check whether an external braking resistor is used.
Err96	Control board internal communication timeout	The internal cables are connected loosely.	Connect all cables properly.
		The driver board is abnormal.	Contact Inovance for technical support.
		The control board is abnormal.	Contact Inovance for technical support.

3.4 Tuning

The process for tuning with MD310-KEY1 is the same as that with built-in operating panel of the drive.

Motor Parameter Setting

When the drive runs in vector control mode ($F0-01 = 0$), accurate motor parameters are required to ensure satisfactory drive performance and operation efficiency. This is major difference between the vector control mode and V/f control mode ($F0-01 = 2$).

The motor parameters (motor 1 by default) that need to be set are listed in the following table.

Motor 1 parameters	Param.	Description
F1-00	Motor type	Asynchronous or variable-frequency asynchronous type
F1-01 to F1-05	Rated motor power/voltage/ current/ frequency/speed	Model parameters, which need to be inputted manually
F1-06 to F1-10	Internal equivalent stator resistance, inductance, and rotor inductance	Auto-tuned parameters

For complicated application system with multiple motors, the parameters of motors 2 are listed in the following table.

Motor 2 parameters	Description
A2-00	Asynchronous or variable-frequency asynchronous type
A2-01 to A2-05	Model parameters, which need to be inputted manually
A2-06 to A2-10	Auto-tuned parameters

Motor parameter tuning/auto-tuning

The internal electrical parameters of the controlled motor can be obtained through dynamic auto-tuning, static auto-tuning, and manual input. See details in the following table.

Auto-tuning mode	Applicable occasion	Auto-tuning effect
No-load dynamic auto-tuning	Applies when the motor can be easily disconnected from the application system.	Optimal
With-load dynamic auto-tuning	Applies when the asynchronous motor cannot be disconnected from the application system.	Acceptable
Static auto-tuning	Applies when the motor cannot be disconnected from the load and dynamic auto-tuning is not allowed.	Not recommended
Manual parameter input	Applies to asynchronous motors that cannot be disconnected from the application system. Copy the auto-tuned motor parameters to F1-00...F1-10.	Acceptable

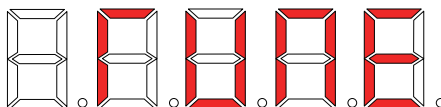
The following shows the motor parameter auto-tuning procedure.

Note: The following takes motor 1 as an example to describe motor parameter auto-tuning. The auto-tuning methods of motors 2, 3, and 4 are the same, with parameters changed accordingly only.

1. If the motor can be disconnected from the load, cut off the power, and disconnect the load from the motor to let the motor rotate without load.
2. After power-on, set the operating panel as the drive command source (F0-02).
3. Input the motor nameplate parameters (such as F1-00 to F1-05) correctly and input the following parameters based on the motor selected.

Motor Selection	Param.
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	A2-00 to A2-05: Same as above

4. If the motor is an asynchronous motor, set F1-37 (A2-37 in case of motor 2) to 2 and press the ENTER key. The operating panel will display "TUNE", as shown below.



5. Press the RUN key on the operating panel, then the drive drives the motor to accelerate/decelerate and run in the forward/reverse direction. In this case, the RUN indicator turns on. The auto-tuning process lasts for about 2 minutes. When the preceding display disappears and the operation panel returns to the normal parameter display state, it indicates that auto-tuning is done.
6. After auto-tuning is done, the following motor parameters are calculated automatically.

Motor Selection	Param.
Motor 1	F1-06: Asynchronous motor stator resistance F1-07: Asynchronous motor rotor resistance F1-08: Leakage inductive reactance of asynchronous motor F1-09: Mutual inductive reactance of asynchronous motor F1-10: No-load current of asynchronous motor
Motor 2	A2-06 to A2-10: Same as above

Note: If the motor cannot be completely disconnected from the load, set F1-37 (Auto-tuning selection) or A2-37 in the case of motor 2 to 3 (Asynchronous motor static auto-tuning 2), and then press RUN on the operating panel to start motor parameter auto-tuning.

4 Maintenance

Type	Period	Item
Routine inspection	Routine	Check the ambient temperature, humidity, dust, and foreign objects.
		Check whether unusual noise is generated.
		Check whether the LED display is normal.
		Check whether the operation through the operating panel is normal.
		Check whether unusual smell is generated.
Regular inspection	1 year	Check whether the fastening parts are loosened.
		Check whether overtemperature occurs on the equipment.
		Check whether the fastening parts of the RJ45 interface are loosened.



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