INOVANCE



MD630 Series General-Purpose AC Drive Quick Start Guide















Data code 19012572A00

Preface

Introduction

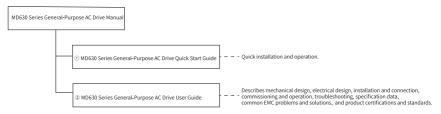
This product is a new generation of general-purpose AC drives from Inovance. The bus-type models come standard with a three-in-one high-speed bus communication interface. It is mainly used in silicon crystals, lithium batteries, 3C, semiconductor, ceramic, glass, rubber and plastics, cables, textile and other industries. The AC drives are designed to efficiently drive various types of loads, such as fans, water pump, roller and belt.

The AC drives range from 0.37 kW to 22 kW, with a total of five different frame sizes.

This guide is specifically designed for EU terminal commissioning engineers. It provides step-by-step instructions to quickly install and commission the AC drive.

More Information

The following figure and table describe document codes and document introduction of the drive.



Data Name	Data Code	Description
MD630 Series Compact AC Drive Quick Start Guide (this guide)	19012572	This guide describes the installation and operation, common faults and troubleshooting, and parameter settings of the AC drive.

Revision History

Date	Version	Description
January 2025	A00	Initial release.

Access to the Guide

This guide is not in the scope of delivery. If necessary, you can download the PDF file in three ways:

- 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 My Inovance app, where you can search for and download manuals



Warranty Disclaimer

If your product becomes defective under normal use conditions, we will offer guaranteed repair services within the warranty period. Maintenance will be charged after the warranty expires.

The warranty does not cover any defect caused by:

- 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.

Table of Contents

Preface	. 1
Fundamental Safety Instructions	. 5
1 Shipment Check	11
2 Power Supply Compatibility Check	12
3 Unpacking and Handling	13
4 AC Drive Installation	15
4.1 Pre-installation Check	15
4.2 Dimensions	15
4.3 Installation Clearance	18
4.4 Screw-based Installation	22
4.5 Through-hole Installation	23
4.6 Installing AC Drive to DIN Rail	26
4.7 Post-installation Check	27
5 AC Drive Wiring	28
5.1 Inspection Before Wiring	28
5.2 Cable Preparation	28
5.3 Power Cable Connection	30
5.4 Connecting Control Cable	30
5.5 Inspection After Wiring	33
6 Quick Operation	35
6.1 Operating Panel	35
6.1.1 Overview	
6.1.2 Components	
6.1.3 Display on the Operating Panel	
6.2 Commissioning preparation	
6.2.1 Motor Type	
6.2.2 Select Motor Parameter Group 1 on Nameplate	
6.2.3 Collect Data of AC Drive and Motor	
6.2.4 Check Cables Connecting AC drive Motor	
6.2.6 AC Drive Model Check	
6.2.7 Software Version Check	
6.3 Quick Commissioning	
6.3.1 Quick Commissioning Flowchart	44

6.3.2 Restore Factory Settings	44
6.3.3 Setting Motor Parameters	
6.3.4 Setting the Motor Control Method	
6.3.5 Setting Motor Control Mode	
6.3.6 Motor Auto-tuning	
6.3.7 Start/stop or set the speed and torque	
6.3.7.1 Start/Stop or Set Speed and Torque Through Application N (Applicable for MD630S)	53
6.3.7.2 Start/Stop or Set Speed and Torque Through Operating Pa	
6.3.7.3 Start/Stop or Set Speed and Torque Through DI Terminal .	
6.3.7.4 Start/Stop AC Drive Through DI Terminal and Set Speed an Through Analog Setting	61
6.3.7.5 Start/Stop or Set Speed and Torque Through EtherCAT Cor (Applicable for MD630N)	64
6.3.7.6 Start/Stop or Set Speed Through iFA	72
7 Troubleshooting	82
8 Commissioning Parameters	112
8.1 Control Method and Control Mode	112
8.2 Parameters Related to Frequency Settings	112
8.3 Parameters Related to Multi-reference	114
8.4 Parameters Related to V/f Curve	114
8.5 Parameters Related to SVC Curve	115
8.6 Motor Phase Sequence Switchover	116
8.7 Acceleration/Deceleration time	117
8.8 Frequency Limits	117
8.9 Common Protection Parameter	119
8.10 Startup Parameters	119
8.11 Stop Mode	120
8.12 Carrier Frequency Parameters	120
8.13 I/O Parameters	121
8.14 Communication Parameters	126

Fundamental Safety Instructions

Safety Disclaimer

- This section describes the safety precautions that help you use this product correctly.
 Before using this product, read the user guide thoroughly and correctly understand the related safety precautions. 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 equipment 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 use.

Safety Levels and Definitions

DANGER Indicates that failure to comply with the notice will result in severe personal injuries or even death.

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

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

Safety Precautions

- Product illustrations in the user 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.
- Product illustrations in this guide are for reference only. Actual products may vary.
- Personnel must take mechanical precautions to protect personal safety. Wear necessary
 protective safety gear, such as anti-smashing shoes, clothing, glasses, gloves, and
 sleeves.

Unpacking



- 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.



- Check whether the packing is intact and whether there is damage, water seepage, damp, and deformation.
- Unpack the package by following the unpacking sequence. Do not hit the package with force.
- Check whether there is damage, rust, or injuries on the surface of the equipment or equipment accessories.
- Check the materials and ensure all items are included.

Storage and transportation



- Large-scale or heavy equipment must be transported by qualified professionals using specialized hoisting equipment. Failure to comply may result in personal injury or equipment damage.
- Before hoisting the equipment, ensure the equipment components such as the front cover and terminal blocks are secured firmly with screws. Loosely-connected components may fall off and result in personal injuries 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.



- 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 can result in equipment damage.
- Store and transport the product in environments free from water splashes, rain exposure, direct sunlight, strong electric and magnetic fields, and excessive vibration.
- Avoid storing the product for more than 3 months. When the product needs to be stored for an extended period, take more strict protection and necessary inspection.
- Before transportation, ensure the product is packed securely. For long-distance shipping, use airtight packaging.
- Always transport the product separately from any items or substances that could potentially damage or negatively affect its performance.

Installation



 The equipment must be operated only by professionals with electrical knowledge. Nonprofessionals are not allowed.



- Read through the guide and safety instructions before installation.
- Do not install the product in places with strong electric or magnetic fields.
- Before installation, ensure that the installation position has sufficient mechanical strength to support the weight of the device. Failure to comply will result in a mechanical danger.
- 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 equipment onto flame retardant materials, such as metal. Keep the equipment away from combustible objects. Failure to comply will result in a fire.



- Cover the top of the equipment with a piece of cloth or paper during installation. This is to prevent unwanted objects such as metal chippings, oil, and water from falling into the equipment and causing faults. After the installation is completed, remove the protective guard. Failure to comply will block the vent and affect heat dissipation, causing overheat of the product.
- 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



- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Before wiring, disconnect all the power supplies of the equipment, 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 direct voltage of the main circuit
 and ensure that the voltage is within the safety range. Failure to comply will 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.
- Make sure that the equipment is reliably grounded. Failure to comply will result in an electric shock.



- Do not connect the input power supply to the output end of the equipment. Failure to comply will 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.
- The cables used for wiring must have the appropriate size and shielding type. The cable shield needs to be grounded reliably at both ends.
- 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.



- During wiring, follow the proper electrostatic discharge (ESD) procedures, and wear an antistatic wrist strap. Failure to comply will result in damage to internal equipment circuits.
- Use shielded twisted pairs for the control circuit. Connect the shield to the grounding terminal of the equipment for grounding purpose. Failure to comply will result in equipment malfunction.

Power-on



- 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, contact any wiring terminal of the product, or remove any part of the product at power-on. Failure to comply will result in an electric shock.



- 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 other mechanical parts. Failure to comply may result in personal injuries or even death.

Operation



DANGER

- 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.



- 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



DANGER

- 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, cut off all equipment power supplies and wait as specified on the product warning sign.
- When a PM motor rotates, its terminals will produce induced voltage even if the motor is powered off. Failure to comply can result in an electric shock.



 Perform daily and periodic inspection and maintenance for the equipment according to maintenance requirements and keep a maintenance record.

Repair



- 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 electric shock.
- Before inspection and repair, cut off all equipment power supplies and wait as specified on the product warning sign.



- Require for repair services in accordance with the product warranty agreement.
- When the fuse is blown or the circuit breaker or earth leakage circuit breaker (ELCB) trips, adhere strictly to the waiting period indicated on the product warning label before restoring power or conducting any subsequent actions. Failure to comply may result in personal injuries, equipment damage or even death.
- 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 in according with the replacement instructions.
- Do not operate damaged equipment. Failure to comply may result in worse damage.
- After the equipment is replaced, perform wiring inspection and parameter settings again.

Disposal



- 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

To ensure safe operations, comply with safety signs on the device, and do not damage or remove the safety labels. The following table describes the safety signs.

Safety Sign	Description
▲ ② 10min	 Before using the product, read the user guide and safety precautions carefully. Failure to comply will result in personnel injuries or death or product 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 Shipment Check

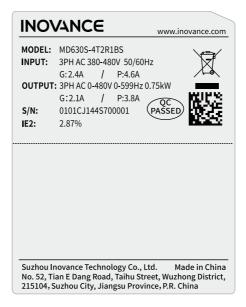
Procedure

1. Open the package and check whether the AC drive is intact.



If the AC drive or other accessories are damaged, do not operate or install the damaged device.

2. Check whether the AC drive model is consistent with that on the delivery order.



3. Record the model and serial No.

2 Power Supply Compatibility Check

Check and ensure that the voltage of the mains power is compatible with the voltage of the AC drive power supply.

The following table describes the AC drive models and power supply voltage.

Table 2–1 AC drive models and power supply voltage

Struc	Туре	AC Drive Model (Three-Phase 380 V to	Product No.
ture		480 V)	
T1	Standard	MD630S-4T1R5BS	0101CQ45
	Bus type	MD630N-4T1R5BS	0101CQ43
	Standard	MD630S-4T2R1BS	0101CJ14
	Bus type	MD630N-4T2R1BS	0101CJ26
	Standard	MD630S-4T3R8BS	0101CJ15
	Bus type	MD630N-4T3R8BS	0101CJ27
T2	Standard	MD630S-4T5R1BS	0101CJ16
	Bus type	MD630N-4T5R1BS	0101CJ28
	Standard	MD630S-4T7R2BS	0101CJ17
	Bus type	MD630N-4T7R2BS	0101CJ29
	Standard	MD630S-4T9R0BS	0101CJ18
	Bus type	MD630N-4T9R0BS	0101CJ30
T3	Standard	MD630S-4T013BS	0101CJ19
	Bus type	MD630N-4T013BS	0101CJ31
	Standard	MD630S-4T017BS	0101CJ20
	Bus type	MD630N-4T017BS	0101CJ32
T4	Standard	MD630S-4T025BS	0101CJ21
	Bus type	MD630N-4T025BS	0101CJ33
	Standard	MD630S-4T032BS	0101CJ22
	Bus type	MD630N-4T032BS	0101CJ34
T5	Standard	MD630S-4T037BS	0101CJ23
	Bus type	MD630N-4T037BS	0101CJ35
	Standard	MD630S-4T045BS	0101CJ24
	Bus type	MD630N-4T045BS	0101CJ36

Note

MD630S indicates the standard model, and MD630N indicates the bus model.

3 Unpacking and Handling

Unpacking

- 1. Open the external box to take out the inner box, as shown in pictures **1**, **2**, **3**.
- 2. Open the inner box, as shown in pictures **4** and **5**.
- 3. Take out the expanded polyethylene foam and the AC drive, as shown in picture ${\bf 6}$.

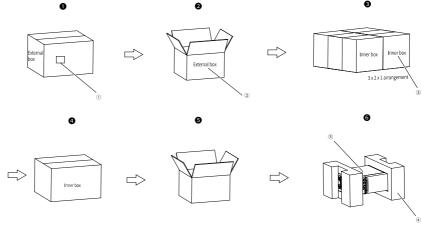


Figure 3-1 AC drive unpacking Table 3-1 Unpacking list

No.	Name
1)	Label
2	External box
3	Inner box
4	Expanded polyethylene foam
(S)	AC drive

Storage



Store and transport the equipment as required to prevent damage.

• The AC drive must be stored in a clean and dry room, where the temperature ranges from -40°C and +60°C and temperature change rate is smaller than 1°C/min.

- Avoid transporting the equipment in environments such as water splashing, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Do not expose the drive to the environment with moisture, high temperature, or strong sunlight for a long time.
- If the AC drive needs to be stored for a long period of time, cover it or take other appropriate measures to keep it from contamination and environmental influences.
- Try to store the product with the original packing carton of Inovance.
- Avoid storing the product for more than 3 months. When the product needs to be stored for an extended period, take more strict protection and necessary inspection.
- The electrolytic capacitor will deteriorate after long-term storage. Therefore, switch on
 the AC drive once for at least 5 hours every 6 months. Increase the input voltage slowly
 to the rated value by using a voltage regulator. Contact Inovance for technical support if
 necessary.
- Pack the drive 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.

Transportation



- 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 block are secured firmly with screws. Loosely-connected components may fall off and result in personal injuries 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.
- 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.
- Handle the equipment with care during transportation and mind your steps to prevent personal injuries or equipment damage.

4 AC Drive Installation

4.1 Pre-installation Check

Check the following items before installation:

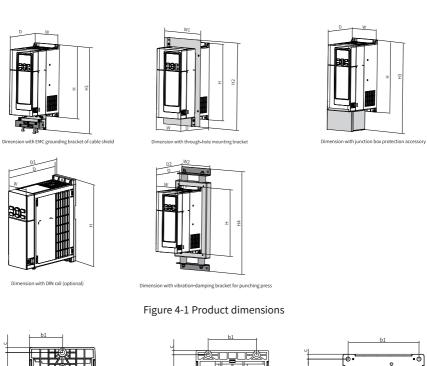
- Check the installation environment, installation clearance, and Installation orientation.
- Prepare the installation tools and accessories.
- Packaging confirmation, unpacking inspection and handling to meet the installation requirements.
- Check the following items before installation.

Table 4-1 Checklist before installation

No.	Item	Checked
1	The installation position is mechanically strong enough to bear the weight of the AC drive.	
2	The load-bearing capacity of the ground and the environment meet the installation requirements.	
3	Sufficient clearance is reserved for heat dissipation, including for heat dissipation of other devices in the cabinet.	
4	The mounting bracket (if needed) is made of flame-retardant material.	
5	If the application site is exposed to metal powder, install the AC drive in a completely enclosed cabinet that has enough space to isolate the AC drive from metal powder.	
6	Before installing the AC drive, install the bottom mounting bracket in the cabinet and guide rails (optional), and prepare mounting beams with holes reserved to fix the AC drive.	
7	Keep flammables or explosives away from the drive.	

4.2 Dimensions

This section describes the size specifications of different models with different options (the following illustrations are based on the T4 model).



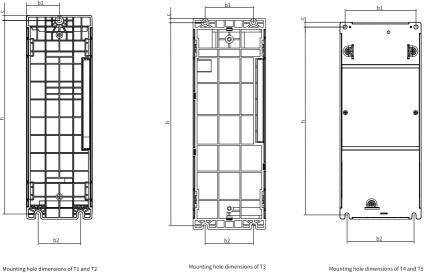


Figure 4-2 Mounting hole position

Table 4–2 Product dimensions

	Dimensi	on		Product dime	rive Structure	(kW)	
			T1 (0.37 to 1.5)	T2 (2.2 to 4)	T3 (5.5 to 7.5)	T4 (11 to 15)	T5 (18.5 to 22)
Outline dimen	Width	W (for only AC drive)	70 (2.76)	75 (2.95)	90 (3.54)	125 (4.92)	165 (6.50)
sions mm (in.)		W1 (with through-hole mounting bracket)	/	/	/	174.7 (6.88)	214.7 (8.45)
		W2 (with vibration- damping bracket for punching press)	110 (4.33)	110 (4.33)	110 (4.33)	175 (6.89)	175 (6.89)
	Depth	D (for only AC drive)	169.5 (6.67)	169.5 (6.67)	190 (7.48)	186 (7.32)	200 (7.87)
		D (with DIN rail (optional))	177.5 (6.99)	177.5 (6.99)	/	/	/
		D2 (with vibration- damping bracket for punching press)	207.5 (8.17)	207.5 (8.17)	228 (8.98)	226 (8.90)	240 (9.45)
	Height	H (for only AC drive)	217 (8.54)	217 (8.54)	262 (10.31)	303 (11.93)	330 (12.99)
		H1 (with EMC grounding bracket of cable shield)	248 (9.76)	248 (9.76)	303.5 (11.95)	370 (14.57)	415 (16.34)
		H2 (with through-hole mounting bracket)	/	/	/	332 (13.07)	370 (14.57)
		H3 (with junction box protection accessory)	272.3 (10.72)	272.3 (10.72)	323 (12.72)	403 (15.87)	420 (16.54)
		H4 (with vibration- damping bracket for punching press)	415 (16.34)	415 (16.34)	415 (16.34)	466 (18.35)	466 (18.35)

Dimension		Drive Structure (kW)				
			T2 (2.2 to 4)	T3 (5.5 to	T4 (11 to 15)	T5 (18.5 to 22)
				7.5)		
Mounting	b1	35 (1.38)	37.5 (1.48)	60 (2.36)	109 (4.29)	140 (5.51)
hole	b2	45 (1.77)	45 (1.77)	60 (2.36)	103 (4.06)	140 (5.51)
dimension	С	5.5 (0.22)	5.5 (0.22)	5.5 (0.22)	7.5 (0.30)	8 (0.31)
mm (in.)	h	206 (8.15)	206 (8.15)	252 (9.92)	289 (11.38)	314 (12.36)
Hole diame	Hole diameter		ф5 (0.20)	ф5 (0.20)	ф6 (0.24)	ф6 (0.24)
mm (in.)						
Tightening t	torque	1.2	1.2	1.2	2.8	2.8
N·m						
Weight		1.25 (2.76)	1.36 (3.00)	2.08 (4.59)	4.01 (8.84)	5.94 (13.10)
kg (lb)						

4.3 Installation Clearance

Note

- Before installing the AC drive in the cabinet, design the cabinet to ensure sufficient clearances for installation and heat dissipation. Take the following factors into consideration:
- When multiple AC drives are required to work together, install them side by side. Keep their tops level with each other, especially for those of different sizes.
- In applications requiring AC drives to be installed side by side, install an air guide
 plate to prevent overtemperature/overload fault that may occur due to heat
 dissipated from the lower row to the upper row.
- Reserve sufficient clearance according to the power rating of the AC drive. The
 recommended installation methods of the MD600 include single-layer installation
 and multi-layer installation.

Installation Clearance for A Single Device

When only a single device is installed, reserve sufficient clearance around the device. The following figure shows the minimum clearance.

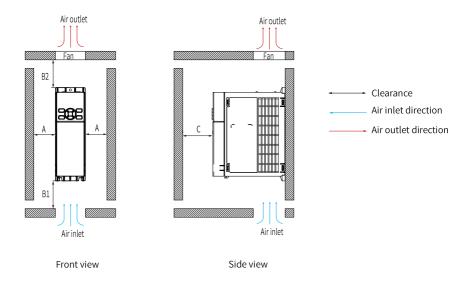


Figure 4-3 Clearance for installation of a single device

Table 4–3 Clearance for installation of a single device

Power Rating	Clearance (mm)				
(kW)	A	B1	B2	С	
0.37 to 2.2	20	100	100	40	
3 to 7.5	30	100	100	40	
11 to 15	30	150	150	40	
18.5 to 22	30	200	150	40	

Installation Clearance for Multiple Devices

When multiple devices are installed side by side, reserve sufficient clearance around the devices. The following figure shows the minimum clearance.

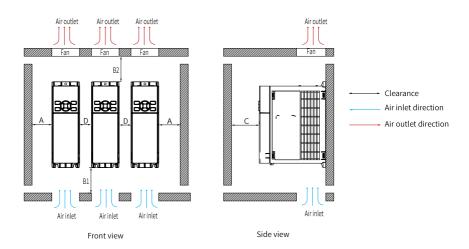


Table 4-4 Clearance for installation of multiple devices

Power	Clearance (mm)					
Rating	А	B1	B2	С	D	
(kW)						
0.37 to 2.2	20	100	100	40	30 (ambient temp. 50°C)	
					0 (ambient temp. 40°C)	
3 to 7.5	30	100	100	40	30 (ambient temp. 50°C)	
					0 (ambient temp. 40°C)	
11 to 15	30	150	150	40	30 (ambient temp. 50°C)	
					0 (ambient temp. 40°C)	
18.5 to 22	30	200	150	40	30 (ambient temp. 50°C)	
					0 (ambient temp. 40°C)	

When multiple devices are installed at multiple layers, reserve sufficient clearance around the device. The following figure shows the minimum clearance.

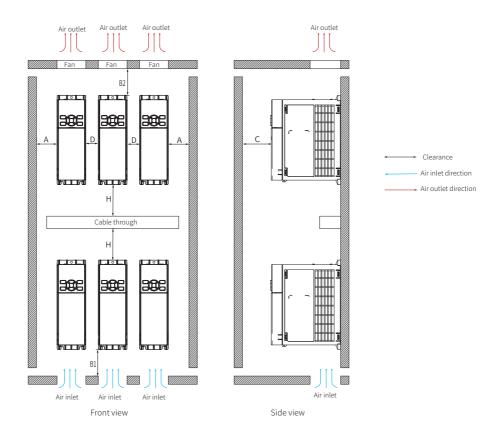


Figure 4-4 Clearance for installation of multiple devices at different layers

Table 4–5 Clearance for installation of multiple devices at different layers

Power	Clearance (mm)					
Rating	А	B1	B2	С	D	Н
(kW)						
0.37 to 2.2	20	100	100	40	30 (ambient temp. 50°C)	125
					0 (ambient temp. 40°C)	
3 to 7.5	30	100	100	40	30 (ambient temp. 50°C)	125
					0 (ambient temp. 40°C)	

Power	Clearance (mm)					
Rating (kW)	А	B1	B2	С	D	Н
11 to 15	30	150	150	40	30 (ambient temp. 50°C)	150
					0 (ambient temp. 40°C)	
18.5 to 22	30	200	150	40	30 (ambient temp. 50°C)	150
					0 (ambient temp. 40°C)	

4.4 Screw-based Installation

- 1. For T1 to T2 models, install the AC drive as the following measures:
 - a. Use a Phillips screwdriver to secure the M4 cross recessed pan head SEMS screw on the upper side of the AC drive, as shown in figure ①
 - b. Repeat the previous step to fix the M4 cross recessed pan head SEMS screws on the lower left and lower right side of the AC drive, as shown in ② and ③.

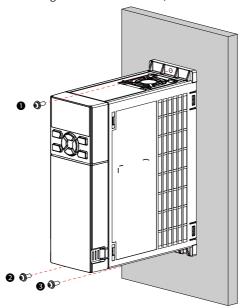
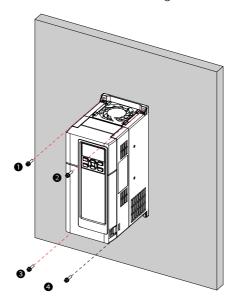


Figure 4-5 Installing through screws

2. For T3 to T5 models, install the AC drive as the following measures:

- a. Use a Phillips screwdriver to secure the screws on the upper right and upper left side of the AC drive, as shown in ① and ②. T3 screw: M4 cross recessed pan head SEMS screw; T4/T5 screw: M5 cross recessed hexagon head SEMS screw.
- b. Repeat the previous step to fix the screws on the lower left and lower right side of the AC drive, as shown in ③ and ④. T3 screw: M4 cross recessed pan head SEMS screw; T4/T5 screw: M5 cross recessed hexagon head SEMS screw.



Note

For torque details, refer to MD630 Series General Purpose AC Drive User Guide.

4.5 Through-hole Installation

For T4 to T5 models, install the through-hole mounting bracket as the following measures:

Procedure

- 1. Remove the M4 screws provided with the bracket to divide the bracket into two parts, and install the left bracket into the AC drive, as shown figure 1 in Figure 1.
- 2. Tighten the two M4×16 cross recessed pan head SEMS screws (M5×20 cross outer hexagon screws for T5 model) on the left side of the machine with a Phillips screw-driver, as shown in Figure 2 in Figure 1.
- 3. Insert the right bracket into the AC drive, ensuring it is correctly aligned with the left side bracket using locating pegs. Tighten the two M4×16 cross recessed pan head SEMS screws (M5×20 cross outer hexagon screws for T5 model) on the left side of the machine with a Phillips screwdriver. Fasten the left and right brackets with two M4×10 cross recessed pan head SEMS screws. See Figure ②.
- 4. Insert the AC drive with the bracket tilted into the fixed hole of the control cabinet, as shown in the figure **3**.
- 5. Push the AC drive up so that the bracket is flat against the mounting surface of the control cabinet. Tighten the four M5×20 cross recessed hexagon head SEMS screws around the bracket with a Phillips screwdriver, as shown in figure 4.

Note

- Discard the removed M4 \times 10 screws and replace them with the supplied M4 \times 10 screws.
- Screw torque: M4: 1.2 N⋅m, M5: 2.8 N⋅m.

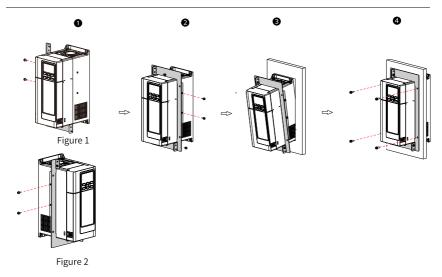


Figure 4-6 Through-hole mounting (T4 to T5 models)

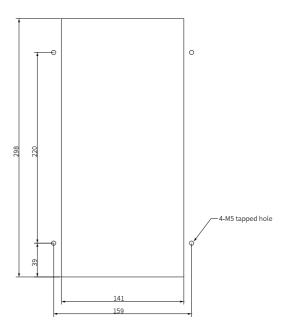


Figure 4-7 Recommended mounting hole dimensions for T4 model cabinet (mm)

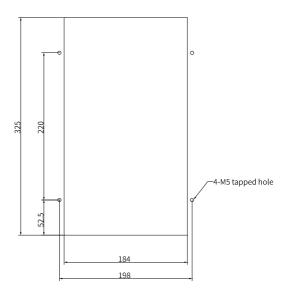


Figure 4-8 Recommended mounting hole dimensions for T5 model cabinet (mm)

4.6 Installing AC Drive to DIN Rail

For T1 to T1 models, install the DIN rail as the following measures:

Procedure

- 1. Install the optional plastic base plate of the DIN rail into the bottom of the product with PA4×12 self-tapping screws, as shown in Figure ①.
- 2. Snap the upper snap-fit joint of the plastic base plate into the guide rail, and then tap the bottom of the product with your hand in the direction of the arrow. Then, snap the lower snap-fit joint of the plastic base plate into the guide rail, as shown in Figure 2.

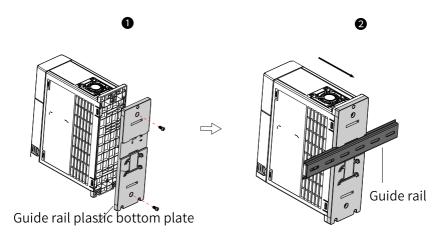


Figure 4-9 Guide rail mounting

Note

- Self-tapping screws are shipped with the rail brackets.
- Screw torques: 1.2 N·m

4.7 Post-installation Check

After the installation is done, check the following items.

Table 4–6 Post-installation checklist

No.	ltem	Checked
1	The ceiling height meets the minimum requirements for smooth ventilation. The air inlet and air outlet are free of obstruction and have sufficient space. Sufficient space is reserved for safe passing when the cabinet door is opened.	
2	All contact protection devices (such as the guard plate) inside and outside the cabinet are installed.	

5 AC Drive Wiring

5.1 Inspection Before Wiring

Check the following items before wiring.

Table 5-1 Pre-wiring inspection checklist

No.	ltem	Passed
1	Cables used during wiring comply with the requirements on the cross sectional area and the shield.	
2	The device and the drive are grounded properly.	
3	Proper electrostatic discharge (ESD) procedures are followed and antistatic wrist straps are worn.	

5.2 Cable Preparation

Cables for T1 to T3 series

• Input/Output cable

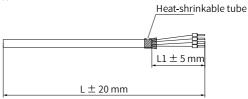


Figure 5-1 T1 to T3 input and output cables

• DC bus input cables

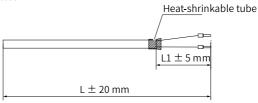


Figure 5-2 DC bus input cables

• Braking cable

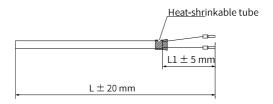


Figure 5-3 Braking cable

Cables for T4 to T5 series

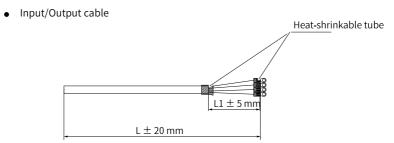


Figure 5-4 T4 to T5 input and output cables

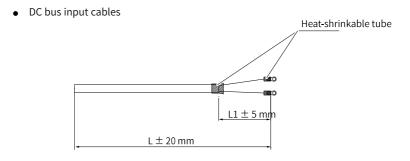


Figure 5-5 DC bus input cables

• Braking cable

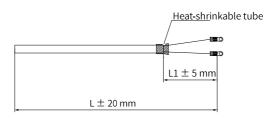


Figure 5-6 Braking cable

Note

- The total power cable length (L) and stripping length (L1) are adjusted according to the actual working conditions on site.
- The power ring tongue terminals are heat-shrink tubing with suitable heat-shrink sleeves.
- The control cables can be customized according to actual demand.

5.3 Power Cable Connection

Before connecting power cables, disable the power supply input. Take the following steps.

- Remove upper access cover of the AC drive in the direction indicated by the arrow, as shown in figure 1.
- 2. Remove the power terminal protection board in the direction indicated by the arrow, as shown in figure 2.
- Connect the cables to the the input terminals (R, S, T) and output terminals (U, V, W) of AC drive. If an external braking resistor is required, connect the cables to the BR and + terminals of the AC drive. Secure the cables with the recommended torque.

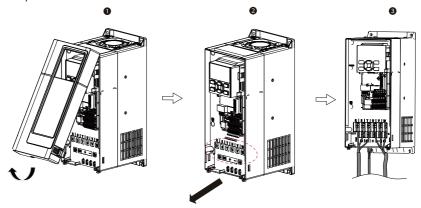


Figure 5-7 Connecting the power cables

5.4 Connecting Control Cable

Before connecting the control cables, disable the power supply input. Take the following steps.

1. Connecting control cable

- a. Remove the front cover in the direction indicated by the arrow, as shown in figure \P .
- b. Locate the terminals that need to access. Insert the cables into the terminals and confirm whether the connection is secure, as shown in Figure 2.
 It is recommended to use cable crimping terminals for secure connections.
 However, if wire cables are used instead, an additional step is required: pressing the terminal button as shown in the figure 3.

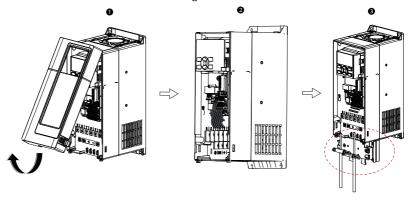


Figure 5-8 Connecting the control cable

2. I/O connection

This section takes MD630S standard model and MD630N bus model as examples to illustrate the IO connection.

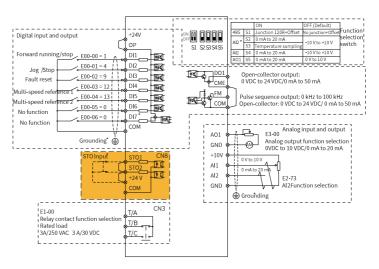


Figure 5-9 IO connection (MD630S)

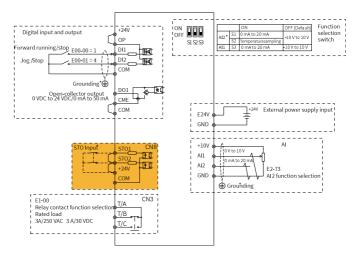


Figure 5-10 IO connection (MD630N)

3. Bus connection

This section takes EtherCAT as examples.

EtherCAT cables are connected to the network ports (IN and OUT) equipped with the metal shield. The procedures are as follows.

- a. Disable system power supply.
- b. Connect the EtherCAT master and EtherCAT slave with shielded network cables.

- c. Ensure the connection other than communication, such as the main circuit connection and control circuit connection are correct, and then power on the system.
- d. The next section takes EtherCAT linear connection and redundancy ring typology as examples.

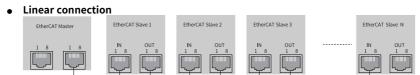


Figure 5-11 Linear connection

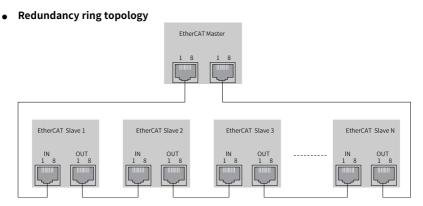


Figure 5-12 Redundant ring topology

The EtherCAT communication cable must be Ethernet Category 5 (100BASE-T \times) network cable or high-strength shielded network cable. The cables used for the AC drive must also be shielded network cable, with length no longer than 100 m. The shielded network cable enhances the anti-interference capacity of the system.

5.5 Inspection After Wiring

After wiring is completed, check the following items and tick compliant items.

	No.	ltem	Passed
1		The power supply input cables are connected to the R, S, and T terminals.	
2		The motor input cables are connected to the U, V, and W terminals.	
3		The dimensions of the main circuit cables meet the requirements.	

No.	ltem	Passed
4	Check that the heat-shrinkable tubes have been applied to the cable lug copper tubes and fully cover the cable conductor of the main circuit.	
5	The motor output cable does not exceed 50 m. Otherwise, the carrier frequency needs to be reduced through F2-50.	
6	The ground cables are connected correctly.	
7	The output terminals and control signal terminals are securely fastened.	
8	The braking resistor and braking unit are wired properly. The power of braking resistor and resistance are in the proper range.	
9	The control circuit signal cables are shielded twisted pair cables.	
10	The control circuit cables are routed separately from the main circuit power cables (the control circuit cables should not be wound together with the main circuit power cables). If it is not possible to route separately, choose the cross-wire routing.	
11	There are no screws, gaskets, or exposed cables left inside the product.	

6 Quick Operation

6.1 Operating Panel

6.1.1 Overview

The operating panel of the MD630 includes LED and keys, with the following functions:

- Parameter display: The LED displays parameters, various monitoring data, and fault codes. The indicators indicate the current status and the unit of parameters.
- Parameter setting: In each level of menu, the data bit you are operating on will flash.
 You can use the up and down keys to increase or decrease numerical values, and the left and right keys to switch between the bits you are operating on.
- Status monitoring: When the AC drive is stopped or running, the operating panel displays the different status of the AC drive according to the parameter settings (A6-03 to A6-05).

6.1.2 Components

The operating panel is shown in the following figure, including the status display area, parameter display area, and key area.



Figure 6-1 Operating panel

Table 6–1 Description of the operating panel

No.	Name	Description
1)	Status display area	It displays the running state of the AC drive. For details, see "Table 6–2 Status description" on page 36.
2	Parameter display area	It displays the parameters of the AC drive. For details, see "6.1.3 Display on the Operating Panel" on page 37.
3	Units display area	It displays the unit of the current data.
4	Key area	For details, see "Table 6–3 Key descriptions" on page 37.
(5)	Connector model	Steady ON: Displays the connector parameters.
6	Minus sign	Steady ON: Indicates that the current parameter is a negative value or indicates the opposite direction of the content displayed.

Table 6–2 Status description

Sign	Name	Function	Status
		Description	
FWD	FWD	Forward run	Steady on: The AC drive is running forwardly or the forward running mode is set.
REV	REV	Reverse run	Steady on: The AC drive is running reversely or the reverse running mode is set.
	Local/remote	Local/remote connection mode	Off: local control (operating panel) Steady on: Terminal control Flashing: Communication control Flashing quickly: User-defined control mode
Т	Torque control	Torque control mode	Off: Speed control mode Steady on: Torque control mode
1	Alarm	Alarm or fault	Steady on: A fault or an alarm occurs.
\Diamond	Run	Running status	Off: The AC drive does not run. Steady on: The AC drive is running.
	Minus sign	Value sign	Steady ON: Indicates that the current parameter is a negative value or indicates the opposite direction of the content displayed.
Ф	Connector	Connector model	Steady ON: Displays connector parameters.

Table 6–3 Key descriptions

Key	Name	Function
(5)	Menu/Back key	Return to the last interface or undo the operation. Switch the menu. Long press the key to enter the multi-function menu.
	OK key	Press the key to enter the settings interface or confirm settings.
	Up key	• Increase the current parameter value.
	Down key	Decrease the current parameter value.
<u>•</u>	SHIFT key	 In the monitoring interface, press the key to switch among monitoring objects. In the parameter interface, press the key to switch the data bit. In the multi-function menu interface, press the key to switch among the basic menu, user menu, calibration menu, and error record menu. In the error record menu, press the key to switch among historical fault records.
•	Operation key	• In the operating panel control mode, press the key to operate the drive.
	Stop key	When the drive is running, press the key to stop the drive. When the drive is in the faulty state, press the key to perform a reset operation.

6.1.3 Display on the Operating Panel

The main display area of the operating panel consists of five 8-segment LEDs, which display various monitoring data such as the set frequency and output frequency, as well as the current operating state of the AC drive.

Table 6–4 Panel display

Category	Operating Panel Display	Meaning
Status display	8888	AC drive initialized
	88888	The AC drive is in the auto-tuning state.
	8888	AC drive busy
	88888	The AC drive is in the auto- inspection state.
Parameter display	8888	Parameter group F0
	88888	A0-10
Display of connectors	88888	Connector L2202
Parameter value display	88888	Parameter value 321.5 (Decimal)
	8.8888	Parameter value 0x000E (Hexadecimal)

Category	Operating Panel Display	Meaning
Fault display	88888	Fault code E027.1
	88888	Warning code A028.1
	88888	Minor fault code L028.3
	88888	Prompt code N028.2

6.1.4 Parameter View and Setting

The LED operating panel adopts a three-level menu to perform operations such as parameter setting. It consists of the following menus:

- Level I: Parameter group
- Level II: Parameter
- Level III: Parameter value

After entering each level of the menu, when the display bit flashes, you can press to modify the value of the bit. You can also switch to other display bits by



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

- The parameter is an unmodifiable parameter, such as the product type, actual measurement value, and operation log.
- The parameter is unmodifiable when the servo drive is running. In this case, you can modify the parameter after stopping the servo drive.

You can return to Level II menu from Level III menu by pressing difference between pressing the two keys is:

, the system saves the parameter setting first, and then goes After you press back to Level II menu and shifts to the next parameter.

 Pressing returns to level-2 menu corresponding to the current parameter without saving the current parameter setting.

Here is the example of setting b5-01 (Digital setting of main frequency) to 30.00 Hz. The basic setting process through the operating panel is as follows.

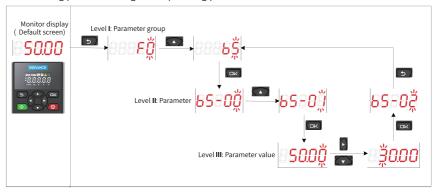


Figure 6-2 Parameter setting

6.2 Commissioning preparation

6.2.1 Motor Type

Check the motor type through motor nameplate. In some cases, the motor type is not indicated on the nameplate. You can confirm the motor type by using the following two methods:

- The asynchronous motor has slip, and the synchronous motor has no slip. The rated slip
 of the motor = rated frequency x 60 ÷ rated pole pairs rated speed. If the calculation
 result is not zero, the motor is asynchronous motor.
- Short the UVW cable of the motor. The motor with obvious resistance when it is
 wobbled manually is synchronous motor. Otherwise, the motor type is asynchronous
 motor. This method can be used to determine whether the reluctance motor is magnet
 assisted synchronous reluctance motor. The resistance of the reluctance motor without
 assisted magnet will not increase.

6.2.2 Select Motor Parameter Group 1 on Nameplate

Some motors may have multiple groups of parameters on the nameplates. As shown in the following figure, it is recommended to select the motor parameter group 1 input to the AC drive as the rated parameters. The analysis is as follows:

duty type	n (/min)	P (kW)	U (V)	I (A)	f (Hz)	cos/phi
S1	650	200	414	342	22.3	0.89
S1	765	200	480	296	26	0.88
S1	1950	200	480	300	66.5	0.87
S1	3000	130	480	192	101.5	0.87

V/f is directly proportional to the flux. The U/f of motor parameter group 1 and motor parameter group 2 is about 18.5, which is the rated flux coefficient. The V/f of motor parameter group 3 = 7.2, which is the field-weakening parameter. The V/f of motor parameter group 4 = 4.7, which is the field-weakening parameter. The rated motor parameters in the AC drive cannot be used to set the field-weakening parameters. Selecting motor parameter group 3 or 4 will result in insufficient motor output. Therefore, only group 1/2 can be selected. If the motor parameter group 2 is selected, the maximum output force at low frequency cannot meet the design requirements; therefore the motor parameter group 1 shall be selected. For the AC drive, the maximum output voltage is related to the bus voltage and is not related to the rated motor voltage. Setting the motor group 1 parameters will not result in insufficient output voltage.

6.2.3 Collect Data of AC Drive and Motor

Confirm the following information before commissioning.

Collect motor data

See the information on the motor nameplate: rated power, rated voltage, rated current, rated frequency, and rated speed, as well as motor type.

The motor parameters listed on the nameplate are crucial for successful parameter auto-tuning. Note that the settings for asynchronous and synchronous motors differ. Before setting the motor parameters, confirm the motor type, as shown in "6.2.1 Motor Type" on page 40.

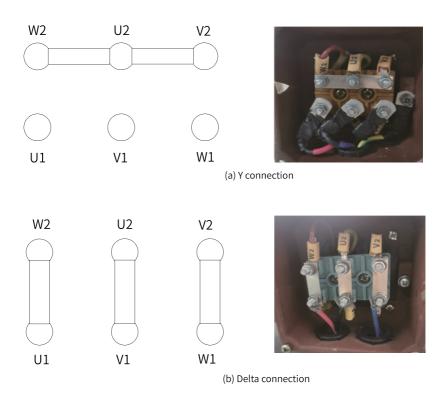
Collect AC drive data

See the information on the AC drive nameplate: product name, model, power, voltage class, and output current to ensure the IO range and power rating of AC drive match those of the motor.

Check motor connection mode

Check whether the motor connection method (Y-type or delta type) is consistent with the motor nameplate. The wrong motor connection method will result in poor motor output force and high output current without carrying the load.

Figure 6-3 Motor connection mode



6.2.4 Check Cables Connecting AC drive Motor

Connect the cables between the AC drive and the motor. Before powering on and commissioning the system, ensure that the preparation for power-on has been completed, and check each item in the table.

Table 6-5 Steps

Items	Operation	Passed	Completed
1	The power input of the main circuit is correctly connected based on terminal labels (R, S, and T).		
2	The main circuit output terminals (U, V, and W) and motor cables (U, V, and W) are connected in the same phase sequence.		
3	The power input terminals (R, S, and T) and output terminals (U, V, and W) of the main circuit are correctly connected. For example, the power input cable is not connected to the output end.		
4	The AC drive and motor are reliably grounded.		

Items	Operation	Passed	Completed
5	The encoder is correctly connected, and the shield is properly processed.		
6	Connect the power supply of the auxiliary circuit properly.		
7	Communication cables are correctly connected.		
8	External interfaces such as I/O interfaces are correctly connected.		

6.2.5 Powering on the AC Drive

After the wiring inspection, connect the main circuit R, S, T to the three-phase AC power supply. Before checking the parameters of the AC drive, ensure it is normally powered.

6.2.6 AC Drive Model Check

Check the equipment information according to the product nameplate. See the following table for inspection parameters.

Parameter	Parameter Name	Description
A2-21	Device type	1: MD630S (485 standard type + STO) 4: MD630N (Bus type + STO)
A3-02	Rated AC drive power	This parameter displays the rated AC drive power.
A3-03	AC drive rated current	This parameter displays the rated AC drive current.
A3-04	Rated AC drive voltage	This parameter displays the rated AC drive voltage.
A3-05	Maximum AC drive current	Sets the maximum current of the AC drive. The base value is the rated current of the AC drive

Table 6-6 Related Parameters

If the product information such as the rated power, rated voltage, and rated current is inconsistent with that on the nameplate, contact the service personnel for technical support.

6.2.7 Software Version Check

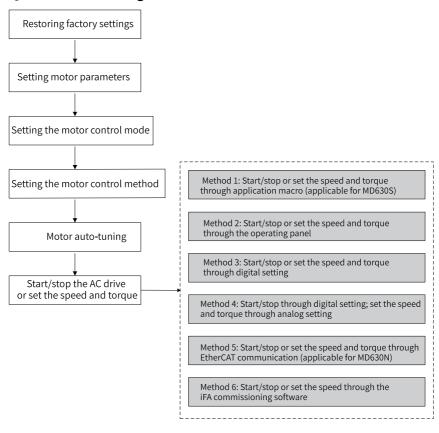
If you need to use a specific software version for commissioning, check the software version by consulting the following parameters after software update.

Item	Parameter Name	Display Range
A2-22	Performance software version	0.0 to 655.35
A2-23	Function software version	0.0 to 655.35

Item	Parameter Name	Display Range	
A2-24	Performance software sub-version	0.0 to 655.35	
A2-25	Function software sub-version	0.0 to 655.35	

6.3 Quick Commissioning

6.3.1 Quick Commissioning Flowchart



6.3.2 Restore Factory Settings

Restoring factory settings refers to resetting the parameters to the factory default values. Conduct this operation before the first-time commissioning of the AC drive.

1. Start restoring factory settings: Set parameter initialization through A0-00.

If the motor parameters have not been set or if the motor parameters need to be reset as well, set A0-00 to 3 [Restore parameters (including motor parameters) to default settings].

If the motor parameters have been set or if the motor parameters do not need to be reset, set A0-00 to 1 [Restore parameters (excluding motor parameters) to default settings].

2. Restoring factory settings completed: Wait for the value of A0-00 to become 0. In this case, the settings are restored to default. Other commissioning procedures can continue.

Table 6–7 Restoring factory parameters

Param.	Parameter	Default	Value Range	Descriptions
i urum.	Name	Delaate	value nange	Descriptions
A0-00	Parameter	0: No	0: No operation	0: No operation
710 00	initialization	operation	1: Restore parameters	1: Restore parameters (excluding motor
	iiiidati2atioii	орегасіон	(excluding motor	parameters) to factory settings. AC drive
			parameters) to default	parameters except factory parameters, motor
			settings	parameters, and records are restored to default
			2: Clear records	settings.
			3: Restore parameters	2: Clear records. Fault records, cumulative
			(including motor	running time, cumulative power-on time, and
			parameters) to default	cumulative power consumption are cleared.
			settings	3: Restore parameters (including motor
			4: Back up current user	parameters) to factory settings. Except the
			parameters	factory parameters and records, all other
			5: Clear fault information	parameters of the AC drive are restored to
			501: Restore user backed-	factory settings. This differs from mode 1 in that
			up parameters	the motor parameters are also restored.
			503: Restore parameters	4: Back up current user parameters. The current
			including motor	parameter settings are backed up, which is the
			parameters to default	same as the function when A0-39 is set to 400.
			settings and clear records	5: Clear fault information. The fault information
			g	recorded in group H6 to Hb is cleared.
				501: Restore user parameters from backup.
				Parameters backed up by setting A0-00 to 4 are
				stored, which is the same as the function when
				A0-38 is set to 500.
				503: Restore parameters (including motor
				parameters) to factory settings and clear
				records. Except the factory parameters, all
				other parameters of the AC drive are reset to
				the factory settings. This differs from mode 3 in
				that the records are cleared. The factory
				parameters include model parameters and
				factory AI/AO correction parameters. The
				records include fault records, cumulative
				running time, and cumulative power-on time.
			1	, ,

6.3.3 Setting Motor Parameters

When the motor type is asynchronous motor, the following table lists the motor parameters that need to be set according to the motor nameplate.

Table 6–8 Parameter setting for asynchronous motor

Param.	Name	Value	Mandatory or not
F1-00 (C4-00)	Motor type	Set F1-00 to 0 (asynchronous motor) 0: Asynchronous motor 2: Permanent magnet synchronous motor 3: Synchronous reluctance motor without permanent magnet 4: Permanent magnet synchronous reluctance motor	Yes
F1-01 (C4-01)	Rated motor power	For applications where multiple motors are driven by one AC drive (multiple motors must be the same), set the rated power of a motor and set the number of parallel motors in C4-13 (Number of parallel motors).	Yes
F1-03 (C4-03)	Rated motor voltage	Set the rated motor voltage.	Yes
F1-04 (C4-04)	Rated motor current	Set the rated motor current. For applications where multiple motors are driven by one AC drive, set the rated current of a single motor and set the number of parallel motors in C4-13 (Number of parallel motors).	Yes
F1-06 (C4-06)	Rated motor frequency	Set the rated motor frequency which corresponds to the rated motor voltage.	Yes
F1-07 (C4-07)	Rated motor speed	The parameter indicates the rated rotor speed of the motor. For synchronous motors, synchronous speed is (rated frequency x 60 \div number of pole pairs), and for asynchronous motors, slip must be considered. Some motor nameplates do not include a rated speed or only list the synchronous speed, so the rated speed can be set according to the following base value.	Yes
F1-10 (C4-10)	Maximum motor frequency	The maximum motor frequency is the base value of the set frequency and acceleration/deceleration time. Scenarios: When the maximum set frequency is lower than the rated motor frequency, the effective maximum frequency is the rated motor frequency. If you want to set the speed limit, set it in F2-22 to F2-27.	Optional
F1-11 (C4-11)	Minimum motor frequency	Minimum motor frequency Scenarios: In applications when the motors is not allowed to run at low speed, the minimum motor frequency needs to be set.	Optional
F1-14 (C4-14)	Number of motor pole pairs	The number of pole pairs can be found on the motor nameplate. It can also be calculated. Number of pole pairs \approx (rated frequency x 60) / rated speed (rated frequency unit: Hz, rated speed unit: rpm) For example, if the rated frequency is 50 Hz and the rated speed is 1450 rpm, the calculation would be: Number of pole pairs \approx (50 Hz x 60) \div 1450 rpm = 2.07 In this case, the decimal part (0.07) represents the slip, which can be ignored. Therefore, the number of pole pairs is rounded down to 2. Scenarios: If the number of pole pairs does not exceed 12, the software automatically calculates the correct number of pole pairs.	Optional

Note

The motor parameters in group F1 in the table are the mapping of motor parameters in group C4. The settings of the two groups are equivalent.

When the motor type is synchronous motor, the following table lists the motor parameters that need to be set according to the motor nameplate.

Table 6–9 Parameter setting for synchronous motor

Param.	Name	Value	Mandatory or not
F1-00 (C4-00)	Motor type	Set F1-00 to 2 (Permanent magnet synchronous motor) 0: Asynchronous motor 2: Permanent magnet synchronous motor 3: Synchronous reluctance motor without permanent magnet 4: Permanent magnet synchronous reluctance motor	Yes
F1-01 (C4-00)	Rated motor power	Sets the rated motor power. For the synchronous motor, multi-motor drive is not allowed. So synchronous motors with amortisseur winding are recommended to be set as asynchronous motor V/f operation.	Yes
F1-03 (C4-03)	Rated motor voltage	Set the rated motor voltage.	Yes
F1-04 (C4-04)	Rated motor current	Sets rated motor current	Yes
F1-06 (C4-06)	Rated motor frequency	Sets rated motor frequency	Yes
F1-07 (C4-07)	Rated motor speed	Motor rated rotor speed. Check whether rated speed equals to synchronous speed (rated frequency \times 60 \div Number of pole pairs); otherwise the motor parameters may be incorrect. This can lead to abnormal auto-tuning and operation.	Yes
F1-10 (C4-10)	Maximum motor frequency	The maximum motor frequency is the base value of the set frequency and acceleration/deceleration time. Scenarios: When the maximum set frequency is lower than the rated motor frequency, the effective maximum frequency is the rated motor frequency. If you want to set the speed limit, set it in F2-22 to F2-27.	Optional
F1-11 (C4-11)	Minimum motor frequency	Minimum motor frequency Scenarios: This parameter is not required for the motors that do not support low-speed operation.	Optional

Param.	Name	Value	Mandatory or not
F1-12 (C4-12)	Synchronous motor back EMF	The rated back EMF is the back EMF (effective value of the line voltage) when the motor rotates at rated speed without load. It has a significant effect on low-speed performance. Scenarios: If the synchronous motor cannot be auto-tuned for no-load rotation, it is recommended to check the motor nameplate or ask the motor manufacturer to set the motor back EMF accurately. F1-12 is the back EMF at rated speed. If the effective value of the back EMF marked on the nameplate is 120 V/krpm, the rated back EMF = F1-07 \div 1000 x 120 V. If the back EMF is not known, the motor shaft must be disconnected for no-load dynamic auto-tuning. The above procedures only need to be performed once for motors with the same specification. After that, you can manually input the back EMF value.	Optional
F1-14 (C4-14)	Number of motor pole pairs	The number of pole pairs can be found on the motor nameplate. It can also be calculated. Number of pole pairs \approx (rated frequency x 60) / rated speed (rated frequency unit: Hz, rated speed unit: rpm) For example, if the rated frequency is 50 Hz and the rated speed is 1450 rpm, the calculation would be: Number of pole pairs \approx (50 Hz x 60) \div 1450 rpm = 2.07 In this case, the decimal part (0.07) represents the slip, which can be ignored. Therefore, the number of pole pairs is rounded down to 2. Scenarios: If the number of pole pairs does not exceed 12, the software automatically calculates the correct number of pole pairs. Note: The difference between the number of poles and the number of pole pairs is that the number of pole pairs = the number of poles \div 2.	Optional

Note

The motor parameters in group F1 in the table are the mapping of motor parameters in group C4. The settings of the two groups are equivalent.

6.3.4 Setting the Motor Control Method

When F1-00 (Motor type) is set to 0 (Common asynchronous motor), F0-01 (Motor control method) can be set according to the application requirements. When F1-00 (Motor type) is set to 2 (Permanent magnet synchronous motor), the SVC mode is recommended.

Item	Parameter Name	Default	Value Range
F0-01 (d0-00)	Motor control method	2	0: SVC 2: V/f

6.3.5 Setting Motor Control Mode

If F0-01 is set to the V/f control method, only the speed control mode is supported.

If the torque control mode is applied under normal operating conditions, switch to the speed control mode during initial commissioning for motor auto-tuning. After the auto-tuning is completed and running direction is adjusted, switch to the torque control mode again.

Parameter	Parameter Name	Default	Value Range
F0-02	Motor control mode	0	0: Speed control
(d0-01)			1: Torque control
			3: DI1
			4: DI2
			5: DI3 (active only for MD630S)
			6: DI4 (active only for MD630S)
			7: DI5 (active only for MD630S)
			8: DI6 (active only for MD630S)
			9: DI7 (active only for MD630S)
			Others: B connector

6.3.6 Motor Auto-tuning

Unlike servo systems which use preset parameters, the AC drives need to be matched with different motors and require the motor parameter auto-tuning before operation

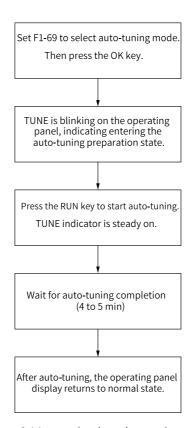


Figure 6-4 Auto-tuning through operating panel

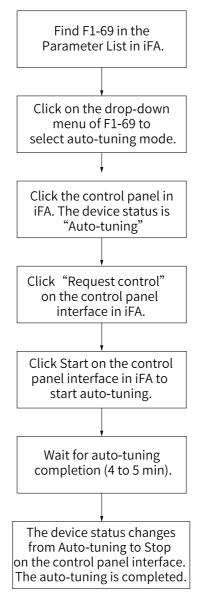


Figure 6-5 Auto-tuning through iFA

Table 6–10 Parameters related to motor auto-tuning

0	Range	
U		LO. No. and another a
	0 to 22	1: Static partial auto-tuning of asynchronous motor. It applies to scenarios where the motor cannot be disconnected from the load and dynamic auto-tuning is not allowed. Some motor parameters are auto-tuned. Other parameters use default values. 2: No-load dynamic auto-tuning of the asynchronous motor. It applies to scenarios where the motor can rotate at high speed without the load. It supports auto-tuning of all motor parameters under no-load and pure inertia load states. 3: Static complete auto-tuning of asynchronous motor. It applies to scenarios where the motor cannot be disconnected from the load and dynamic auto-tuning is not allowed. Some motor parameters are auto-tuned. The auto-tuning precision is better than that when C2-00 is set to 1. 4: Inertia auto-tuning. This mode is applicable to scenarios requiring high-speed operation. Auto-tuning can be performed without load or with light load (below 80% of the rated load) or pure inertia load. Auto-tuning inertia ratio parameters. 5: Dead zone auto-tuning. This mode is used to tune the non-linear characteristics of the drive, thus improving the voltage output precision and operation efficiency. 12: No-load dynamic auto-tuning of permanent magnet motor. It applies to scenarios where the motor can rotate at high speed without the load. All motor parameters can be tuned. 13: Static partial auto-tuning of permanent magnet motor. It applies to scenarios where the motor cannot be disconnected from the load and dynamic complete auto-tuning. The sampling deviation between output phase currents is auto-tuning. The sampling deviation between output phase currents is auto-tuning. The sampling deviation between output phase currents is auto-tuning is not allowed. Part motor parameters also depends on the setting of C2-01. 15: Reserved 21: Static auto-tuning of synchronous reluctance motor. It applies to scenarios where the motor cannot be disconnected from the load and dynamic complete auto-tuning is not allowed. Part motor parameters are tuned. 22: Complete

6.3.7 Start/stop or set the speed and torque

6.3.7.1 Start/Stop or Set Speed and Torque Through Application Macro (Applicable for MD630S)

The MD630S provides application macro function. The application macro is multiple sets of default parameters. Depending on the purpose, it can be divided into interface macros and industry macros. The interface macro is mainly for setting control parameters, and provides 18 sets of default parameters that cover various control methods, including control via the operation panel, terminal control, and communication control. These parameters can be written into the AC drive by selecting the desired interface macro using function code A0-48. After the parameters are written, the motor can be started and debugged directly, significantly reducing the complexity of the debugging process.

Select the interface macros according to the control mode.

- For the initial commissioning of starting/stopping the AC drive through the operating panel, 101 (Quick commissioning macro) is recommended to select.
- For the initial commissioning of digital control for start/stop, it is recommended to choose from the following interface macros: 102 (Two fixed speeds in single-wire mode), 104 (Four fixed speeds in two-wire mode 2), and 108 (Four fixed speeds in three-wire mode 2).
- For the initial commissioning of speed regulation using analog signals, it is
 recommended to choose from the following interface macros: 103 (Analog speed
 regulation in single-wire mode), 105 (Analog speed regulation in two-wire mode 1), 106
 (Analog speed regulation in two-wire mode 2), and 107 (Analog speed regulation in twowire mode 3).
- For the initial commissioning of start/stop and speed regulation using communication (Modbus), it is recommended to use 113 (Modbus communication control macro).

The optional interface macros are listed in the table below. Users can select according to the specific needs.

Table 6–11 Interface macro description

Param.	Parameter Name	Optional Macro	Function Description				
A0-48	Interface	0	No operation				
	macro selection	101: Quick commissioning macro	Scenario: Start/stop the AC drive and set the frequency through the local operating panel. • After pressing the RUN key on the operating panel, the AC drive operates.				
		102: Two fixed speeds in single- wire mode	Scenario: Start/stop the AC drive through the terminal in single-wire mode, and set frequency through multireference. • When DI1 is closed, the AC drive runs at the first fixed frequency. • When DI1 and DI2 are closed, the AC drive runs at the second fixed frequency. • When DI3 is open, the AC drive stops.				
		103: Analog speed regulation in single-wire mode	Scenario: Start/stop the AC drive through the terminal in single-wire mode, and set frequency through analog inputs. • When DI1 is closed, the AC drive runs. • Set the frequency through AI1.				
						104: Four fixed speeds in two-wire mode 2	Scenario: Start/stop the AC drive through the terminals in two-wire mode 2, and set frequency through multi-reference. • When DI1 is closed and DI2 is open, the AC drive runs at the forward direction. When DI1 is open and DI2 is closed, the AC drive runs at the reverse direction. • Four fixed frequencies (Multi-speed) can be set through the combination use of DI4 and DI5.
		105: Analog speed regulation in two-wire mode 1	Scenario: Start/stop the AC drive through the terminals in two-wire mode 1, and set frequency through analog inputs. • When DI1 is closed, the AC drive runs at the forward direction. Remain DI1 is closed and close DI2, then the AC drive runs at the reverse direction. • Set the frequency through AI1.				
		106: Analog speed regulation in two-wire mode 2 (To be continued)	Scenario: Start/stop the AC drive through the terminals in two-wire mode 2, and set frequency through analog inputs. • When DI1 is closed and DI2 is open, the AC drive runs at the forward direction. When DI1 is open and DI2 is closed, the AC drive runs at the reverse direction. • Set the frequency through AI1.				

Param.	Parameter Name	Optional Macro	Function Description
A0-48	Interface macro selection	(Continued) 107: Analog speed regulation in two-wire mode 3	Scenario: Start/stop the AC drive through the terminals in two-wire mode 3, and set frequency through analog inputs. • When DI1 signal is in the rising edge and DI2 is closed, the AC drive runs. • When DI2 is open, the AC drive stops. • Set the frequency through AI1.
		108: Four fixed speeds in three-wire mode 2	Scenario: Start/stop the AC drive through the terminals in three-wire mode 2, and set frequency through multi-reference. • When DI1 signal is in the rising edge and DI4 is closed, the AC drive runs at the forward direction. When DI2 signal is in the rising edge and DI4 is closed, the AC drive runs at the diverse direction. When DI4 is open, the AC drive stops. • Four fixed frequencies (Multi-speed) can be set through the combination use of DI5 and DI6.
		109: Analog speed regulation in three-wire mode 1	Scenario: Start/stop the AC drive through the terminals in three-wire mode 1, and set frequency through analog inputs. • When DI2 is closed and DI1 changes from open to closed (0->1 triggered), the AC drive starts in the forward direction. When DI4 is closed, the AC drive rotates in the reverse direction. When DI2 is open, the AC drive stops
		110: Analog speed regulation in three-wire mode 2	 Set the frequency through AI1. Scenario: Start/stop the AC drive through the terminals in three-wire mode 2, and set frequency through analog inputs. When DI1 signal is in the rising edge and DI4 is closed, the AC drive runs at the forward direction. When DI2 signal is in the rising edge and DI4 is closed, the AC drive runs at the diverse direction. When DI4 is open, the AC drive stops. Set the frequency through AI1.
		111: Analog PID controller	Scenario: Start/stop the AC drive through the terminal in single-wire mode and set frequency through PID regulation. • When DI1 is closed, the AC drive runs. • Al1 is used as the PID reference. • Al2 is used as the PID feedback.
		112: PID controller with fixed reference value (To be continued)	Scenario: Start/stop the AC drive through the terminal in single-wire mode and set frequency through PID regulation. • When DI1 is closed, the AC drive runs. • Local PID is used as PID reference. • AI1 is used as the PID feedback.

Param.	Parameter Name	Optional Macro	Function Description
A0-48	Interface macro selection	(Continued) 113: Modbus communication control macro	Scenario: Start/stop the AC drive and set the frequency through Modbus communication.
		114: Modbus communication control macro with DI terminal start/stop control	Scenario: Start/stop the AC drive through the terminal in single-wire mode and set frequency through Modbus communication. • When DI1 is closed, the AC drive runs. • Set the frequency through Modbus.
		115: Multi-channel switchover 1	Scenario: Switch between the set channel (frequency reference) and terminal start/stop module (terminal control mode). • Terminal start/stop module A, set channel 1: Start the AC drive through DI1; make the AC drive run at reverse direction through DI2; set the frequency reference through AI1. • Terminal start/stop module B, set channel 2: Make AC drive start in the forward direction through DI6 and AC drive start in the reverse direction through DI7; set the frequency reference through AI2. • When DI4 is closed, the user can switch between set channel 1 and set channel 2. • When DI5 is closed, the user can switch between terminal start/stop module A and terminal start/stop module B.
		116: Multi-channel switchover 2	Scenario: Switch between the two control channels and between the two set channels. Control channel 1, set channel 1: Terminal control start/stop, frequency set by Al1 Control channel 2, set channel 2: Communication controls start/stop and frequency reference. When Dl4 is closed, the user can switch between control channel 1 and control channel 2. When Dl5 is closed, the user can switch between set channel 1 and set channel 2.
		117: Jog control through DI terminal	Scenario: Jog control through terminals. When DI1 is closed, the AC drive starts by jogging 1 mode. When DI2 is closed, the AC drive starts by jogging 2 mode.

Operation steps

- 1. Restore factory settings of the AC drive.

 Set A0-00 (Parameter initialization) to 1 to restore parameters (excluding motor parameters) to default settings.
- 2. Set interface macro parameters.

Select a macro from 101 to 118 to write to A0-48 (Interface macro selection). For example, to select analog speed regulation in two-wire mode 2, set A0-48 to 106.

3. Check whether the application macro is active.

Check whether the value of A0-49 is the macro number written in step 2. For example, if the macro number written step 2 is 106, the value of A0-49 shall be 106, which indicates the parameters are successfully set.

4. Wiring

The control interfaces such as DI and AI terminals need to be wired.

5. Function verification

Verify the macro function based on the macro number selected. For example, if 106 (Analog speed regulation in two-wire mode 2) is selected, when DI1 is closed and DI2 is disconnected, the motor runs in the forward direction at the speed provided by AI1. When DI1 is disconnected and DI2 is closed, the motor runs in the reverse direction at the speed provided by AI1.

After the above settings, the user can control the AC drive start/stop by DI terminal in two-wire mode, and the motor speed by AI1 input.

- In the stop state, closing DI1 and disconnecting DI2 give the AC drive start command in the forward direction and the motor runs in the forward direction at the speed corresponding to the Al1 input;
- In the stop state, closing DI2 and disconnecting DI1 give the AC drive start command in the reverse direction and the motor runs in the reverse direction at the speed corresponding to the Al1 input;
- In the running state, disconnect DI1 or DI2 to set the stop command of the AC drive;
- In the fault state, close DI3 to set the fault reset command of the AC drive.

6.3.7.2 Start/Stop or Set Speed and Torque Through Operating Panel

Operating procedure

Note

The first two steps can be configured by setting A0-48 (Interface macro selection) to 101 (Quick commissioning macro). For details, see "6.3.7.1 Start/Stop or Set Speed and Torque Through Application Macro (Applicable for MD630S)" on page 53 (Available only for MD630S).

Step 1: Start or stop the AC drive through the operating panel

Set F0-03 (Main command source of control channel 1) to 0 to select the operating panel as the AC drive command source. You can control the AC drive start/stop through the operating panel.

Step 2: Set frequency or torque

Setting frequency through parameter settings

- 1. Set F0-02 (Motor control mode) = 0 (Speed control).
- 2. Set F0-29 (Main frequency source) to 0 [Set by the parameter (F0-30)].
- 3. Set the frequency in Hz through F0-30 (Main frequency digital setting). When the main frequency source is set by parameters, in addition to directly modifying the value of the parameters to set the frequency, you can also set the frequency by using the UPDOWN keys.

When the AC drive is stopped or running, You can increase the set frequency by pressing the key on the operating panel. Using key to decrease the frequency setting. The two keys help to set the frequency to the target value in real time.

Then the motor can operate in speed control mode by setting the operating panel.

- In the stop state, press to set the start command of the AC drive. The AC drive starts at the frequency set by F0-30.
- In the running state, press to set the stop command of the AC drive.
- In the fault state, press

 to set the fault reset command.

Setting torque through operating panel

- 1. Set F0-02 (Motor control mode) = 1 (Torque control).
- 2. Set b5-13 (Torque reference source) to 0 [Set by the parameter (b5-14)].
- 3. Set the target torque in percentage, which is the percentage of motor rated torque through b5-14 (Torque reference digital setting).

Then the motor can operate in torque control mode by setting the operating panel.

- In the stop state, press to set the start command of the AC drive. The AC drive outputs torque set by b5-14.
- In the running state, press to set the stop command of the AC drive.
- In the fault state, press to set the fault reset command

6.3.7.3 Start/Stop or Set Speed and Torque Through DI Terminal

Start/stop the AC drive through DI terminal, and control the motor speed through multireference.

Wiring

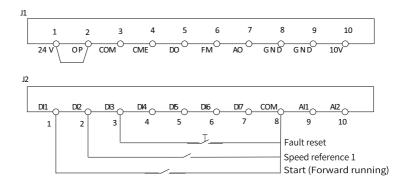


Figure 6-6 Wiring diagram

Operation steps

Note

The first two steps can be configured by setting A0-48 (Interface macro selection) to 102, 104, or 108. For details, see "6.3.7.1 Start/Stop or Set Speed and Torque Through Application Macro (Applicable for MD630S)" on page 53 (Available only for MD630S).

Step 1: Start or stop the AC drive through the DI terminal

- Set the terminals as the active command source (F0-03 (Main command source of control channel 1) = 1)
- 2. Set the terminal mode.

Set the terminal command of terminal module A/B through F4-01 (Mode of terminal start/stop module A) / F4-02 (Mode of terminal start/stop module B). Six terminal control modes (corresponding to value 1 to 6) are available, including one-wire mode, two-wire mode 1, two-wire mode 2, two-wire mode 3, three-wire mode 1, and three-wire mode 2.

Terminal module A and B can be switched freely from terminal module A (two-wire mode 2) to terminal module B (three-wire mode 1).

3. Configure the terminal function. (F4-03: DI1 function selection to F4-09: DI7 function selection) After the terminal mode and each DI terminal function are configured, start/ stop and fault reset can be performed on the AC drive through the DI terminal. MD630N includes only DI1 and DI2.

In default setting, the AC drive terminal command is one-wire mode, and the default value of F4-03 (DI1 function selection) is 1 (Terminal start/stop module A IN1). In other words,

after setting F0-03 (Main command source of control channel 1) = 1 [Terminal] in the default condition, the start/stop command can be given to the terminal by closing the DI1 terminal.

Step 2: Set frequency or torque through multi-reference

Set frequency as follows:

Set F0-29 (Main frequency source) = 6 (Multi-reference) to select multi-reference as the frequency source.

- 1. Set F0-02 (Motor control mode) = 0 (Speed control).
- 2. Set the multi-reference as follows:
 - Set F0-39 (Multi-reference 0) to 50%
 - Set F0-40 (Multi-reference 1) to 100%
- 3. Assign DI terminal function with multi-reference terminal 1 (select one of F4-03 to F4-09 = 12). Choose any terminal from DI1 to DI7.
- 4. After the above settings, the value of F0-39 (Multi-reference 0) is 50%, and the AC drive running frequency is 50% of the value of C4-06 (Rated motor frequency).

After the above settings, the user can control the AC drive start/stop by DI terminal, and the motor speed by multi-reference.

For example, if the default one-wire mode is configured (DI1 function: Terminal start/stop module A_IN1) and the DI2 function is multi-reference terminal 1 (F4-04=12),

- in the stop state, closing DI1 gives the AC drive start command and the motor runs at the frequency corresponding to the value of F0-39.
- in the running state, after closing DI2, the motor runs at the frequency corresponding to the value of F0-40.
- in the running state, disconnect DI1 to set the stop command of the AC drive;
- in the fault state, close DI3 to set the fault reset command of the AC drive.

Note

This example illustrates only two speed references of the multi-references. This product supports up to 16 references of speed adjustment via the DI terminal.

Set torque as follows:

Set b5-13 (Torque reference source) to 6 (multi-reference) to select the multi-reference output as the torque reference.

- 1. Set F0-02 (Motor control mode) = 1 (Torque control).
- 2. Set the multi-reference as follows:
 - Set F0-39 (Multi-reference 0) to 50%
 - Set F0-40 (Multi-reference 1) to 100%
- 3. Assign DI terminal function with multi-reference terminal 1 (select one of F4-03 to F4-09 = 12). Choose any terminal from DI1 to DI7.

4. After the above settings, the value of F0-39 (Multi-reference 0) is 50%, and the torque reference is 50%

After the above settings, the user can control the AC drive start/stop by DI terminal, and the motor output torque by multi-reference.

For example, if the default one-wire mode is configured (DI1 function: Terminal start/stop module A_IN1) and the DI2 function is multi-reference terminal 1 (F4-04=12).

- in the stop state, closing DI1 gives the AC drive start command and the motor outputs the torque based on the F0-39.
- in the running state, after closing DI2, the motor outputs the torque based on the value of F0-40.
- in the running state, disconnect DI1 to set the stop command of the AC drive;
- in the fault state, close DI3 to set the fault reset command of the AC drive.

Note

This example illustrates only two torque references of the multi-references. This product supports up to 16 references of torque adjustment via the DI terminal.

6.3.7.4 Start/Stop AC Drive Through DI Terminal and Set Speed and Torque Through

Analog Setting

MD630 supports two analog signal inputs, Al1 and Al2, which can be configured for either voltage or current signals.

Wiring

If there is no stable analog signal on site, PLC or sensor can be used as the source of analog signal. In this case, connect the positive and negative terminals of the DC power supply directly to the AI and GND terminals of MD630. The wiring diagram is shown below (using the MD630S as an example).

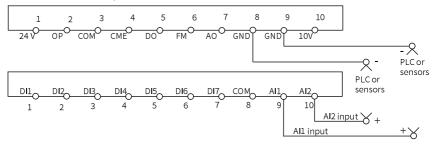


Figure 6-7 Wiring diagram (1)

If a potentiometer is used on site as a source of analog signals, use the 10V voltage output provided by the MD630 and connect a variable resistor. This method allows to change AI input through voltage by adjusting the variable resistor. However, this method is only applicable to voltage signals as analog inputs, not to current signal inputs.

The wiring diagram is shown below (using the MD630S as an example).

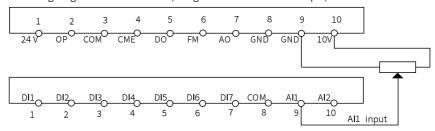


Figure 6-8 Wiring diagram (2)

Operation steps

Note

The first two steps can be configured by setting A0-48 to 103, 105, 106, or 107. For details, see "6.3.7.1 Start/Stop or Set Speed and Torque Through Application Macro (Applicable for MD630S)" on page 53 (Available only for MD630S).

Step 1: Start or stop the AC drive through the DI terminal

- Set the terminals as the active command source (F0-03 (Main command source of control channel 1) = 1)
- 2. Set the terminal mode.

Set the terminal command of terminal module A/B through F4-01 (Mode of terminal start/stop module A) / F4-02 (Mode of terminal start/stop module B). Six terminal control modes (corresponding to value 1 to 6) are available, including one-wire mode, two-wire mode 1, two-wire mode 2, two-wire mode 3, three-wire mode 1, and three-wire mode 2.

Terminal module A and B can be switched freely from terminal module A (two-wire mode 2) to terminal module B (three-wire mode 1).

3. Configure the terminal function. (F4-03: DI1 function selection to F4-09: DI7 function selection) After the terminal mode and each DI terminal function are configured, start/ stop and fault reset can be performed on the AC drive through the DI terminal. MD630N includes only DI1 and DI2.

In default setting, the AC drive terminal command is one-wire mode, and the default value of F4-03 (DI1 function selection) is 1 (Terminal start/stop module A_IN1). In other words, after setting F0-03 (Main command source of control channel 1) = 1 [Terminal] in the default condition, the start/stop command can be given to the terminal by closing the DI1 terminal.

Step 2: Set frequency or torque through AI

Set frequency as follows:

When F0-29 (Main frequency source) = 2 (AI1)/3 (AI2) is set, the AI terminal is selected as the source of the frequency reference. The AI input is converted to the input ratio through the AI curve. 100.0% of the input ratio corresponds to rated motor frequency (F1-06).

- 1. Set F0-02 (Motor control mode) = 0 (Speed control).
- 2. Set Al1 curve to "0 V to 10 V corresponds to 0% to 100%":
 - Set F4-28 (minimum input of AI curve 1) to 0.00 V.
 - Set F4-29 (Percentage corresponding to minimum input of Al curve 1) to 0.0%.
 - Set F4-30 (maximum input of Al curve 1) to 10.00 V.
 - Set F4-31 (Percentage corresponding to maximum input of AI curve 1) to 100.0%.
- 3. Set AI filter time through F4-21 (AI1 filter time).
- 4. Set F0-29 (Main frequency source) = 2 (AI1) to select AI as the frequency source.

 The AI terminal defaults to voltage input mode, and if you need to switch to current input mode, use the DIP switch. For the current-type AI input, 1 mA current corresponds to 0.5 V voltage. That is, 20 mA corresponds to 10 V.

After setting the preceding steps, when Al1 input 5 V power, the AC drive obtains the Al1 curve conversion of 50%, and the AC drive runs at 50% of C4-06 [Rated motor frequency]. When Al1 input voltage is changed, the running frequency changes according to the Al1 curve.

After the above settings, the user can control the AC drive start/stop by DI terminal, and the motor speed by Al1 input.

For example, if the default one-wire mode is configured,

- in the stop state, closing DI1 gives the AC drive start command and the motor runs at the frequency corresponding to the Al1 input;
- in the running state, disconnect DI1 to set the stop command of the AC drive;
- in the fault state, close DI3 to set the fault reset command of the AC drive.

Set torque as follows:

Take IS620N as an example:

- 1. Set F0-02 (Motor control mode) = 1 (Torque control).
- 2. Set AI1 curve to "0 V to 10 V (or 0 mA to 20 mA) corresponds to 0% to 100%":
 - Set F4-28 (minimum input of AI curve 1) to 0.00 V.
 - Set F4-29 (Percentage corresponding to minimum input of Al curve 1) to 0.0%.
 - Set F4-30 (maximum input of Al curve 1) to 10.00 V.
 - Set F4-31 (Percentage corresponding to maximum input of Al curve 1) to 100.0%.
- 3. Set AI filter time through F4-21 (AI1 filter time).
- 4. Set b5-13 (Torque reference source) = 2 (Al1) to select Al1 as the torque source.

After setting the preceding steps, when AI1 input 5 V power, the AC drive obtains the AI1 curve conversion of 50%, and the torque setting is 50%. When AI1 input voltage is changed, the torque setting changes according to the AI1 curve.

After the above settings, the user can control the AC drive start/stop by DI terminal, and the motor output torque by Al1 input.

For example, if the default one-wire mode is configured,

- in the stop state, closing DI1 gives the AC drive start command and the motor runs and outputs the torque based on the Al1 input;
- in the running state, disconnect DI1 to set the stop command of the AC drive;
- in the fault state, close DI3 to set the fault reset command of the AC drive.

6.3.7.5 Start/Stop or Set Speed and Torque Through EtherCAT Communication (Applica-

ble for MD630N)

Prerequisite

Ensure the controller and AC drive is connected properly.

For example, AC801 serves as the EtherCAT master and MD630N as the EtherCAT slave. The communication network topology is as follows.

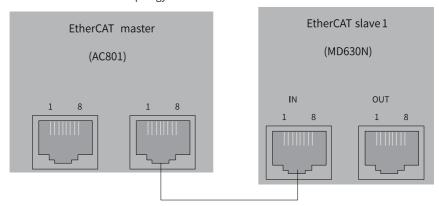


Figure 6-9 Network topology

The EtherCAT bus uses standard RJ45 network ports with standard registered jacks, and uses 100BASETX Category 5 cable, allowing a maximum cable length of 100 meters between two devices and supporting a maximum number of stations of 65535.

Connecting steps:

- 1. Disable system power supply of the AC drive.
- 2. Connect the EtherCAT master and EtherCAT slave with shielded network cables.
- 3. Power on the AC drive after ensuring that connections other than communication connection are correct.

Operation steps

Step 1: Start or stop the AC drive through remote communication

1. Set F0-03 (Main command source of control channel 1) to 2 to select the communication as the active command source.

When the command source is set to communication, you need to configure basic communication parameters to enable the AC drive to communicate with the host controller. The host controller needs to follow the communication address and format specified by the AC drive to write communication commands to the AC drive.

Step 2: Set the frequency or torque through communication

Set frequency as follows:

- 1. Set b0-03 to 0 and b5-00 to 9 to select communication as the main frequency reference source of set channel 1.
- Set n0-14 (7310H speed setting) to the following values according to on-site requirements.

0: Frequency (unsigned 16-bit) 1: Frequency (signed 16-bit) 2: Speed (signed 16-bit) 3: Percentage (corresponds to the rated frequency/signed 16-bit/two decimal places) 4: Percentage (corresponds to the maximum frequency/signed 16-bit/two decimal places)

Set torque as follows:

- 1. Set b0-03 to 0 and b5-13 to 9 to select communication as the torque reference source of set channel 1.
- 2. It is recommended to set n0-14 to 1.

Step 3: Establish EtherCAT communication connection

- 1. Set the value of n0-10 to 1 (through operating panel or the software tool). Set the communication mode to EtherCAT.
- Wait for a few seconds until LED0 to become green and LED1 to become steady yellow.This indicates that the slave and master are connected successfully and there is data exchange.
- 3. Import the device description file (XML) of the MD630N to the host controller software (otherwise, the slave cannot be added later) and add the MD630N device.
- 4. Open the host controller software InoProShop and select "New Project". Select the PLC model in the pop-up interface, and click "OK". Save the project to the specified path (path can be modified).

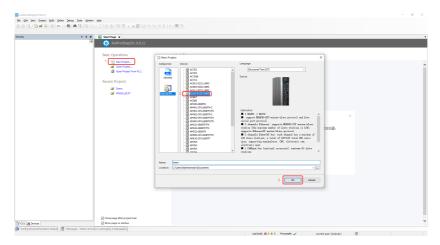


Figure 6-10 Create a project

Import the device description file (XML) of the AC drive; otherwise, the AC drive cannot be identified.

Click "Tools"-> "Device Repository". Then after the pop-up interface appears, click Install.

C:\Users\Administrator\Documents\Demo\Demo.project - InoProShop(V1.9.0.1) <u>File Edit View Project Build Online Debug Tools Window Help</u> Package Manager... - 📑 🔛 👑 I 😘 🤫 🐧 🕞 🖳 l 管 🔛 l 🗐 l 🙊 🖔 InoPkgManager Library Repository... Devices CAT D InoMD630N Device Repository... □ Demo Scan r tion Settings InoProShop Tool Device (AC81X-0122-U0R0) Fault Diagnose Scripting Network Configuration Customize... EtherCAT Config Restore Options... PLC Logic **PLC** settings Application DifferentialMonitor Users and Groups Library Manager PLC PRG (PRG) Files Task Configuration PLC shell ETHERCAT_D ETHERCAT_D.EtherCAT_Task OPC UA □ S MainTask PLC_PRG Log Resources List

Figure 6-11 Add a device description file

6. After clicking **Install**, the "**Install Device Description**" interface appears. Select the file in "*.xml" format. Otherwise, the XML file of the device cannot be displayed. Click "**Open**" and wait for a few seconds. Then the installation is completed.

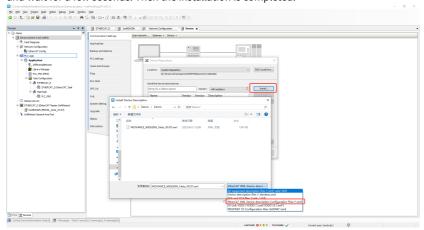


Figure 6-12 Install the device description file

7. After entering the interface, double-click "Device" and the blank area on the right displays detailed information. Then, click "Scan network" to pop up the "Select Device" window, and then scan the network to identify the PLC device.



The IP address of the computer connected to the PLC should be set in the same segment as the PLC's IP which can be viewed through the panel.

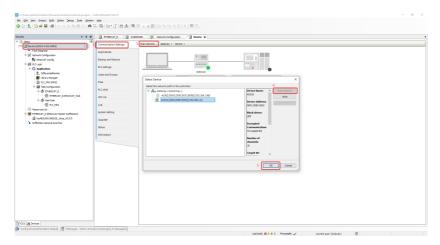


Figure 6-13 Scan and identify the master device

8. After identifying the correct PLC, click "**Network Configuration**" to select the supported communication interface. Check the "**EtherCATMaster**" box.

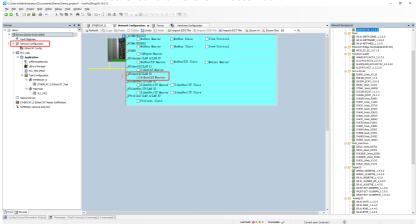


Figure 6-14 Configure master communication interface

9. Locate "ETHERCAT_D (EtherCAT Master SoftMotion)" in the device bar on the left. Right-click on the pop-up bar and select "Scan Device". The Scan Devices window will pop up. Click "Scan Device" below to scan the MD630N. Click "Copy Scan Device" to complete adding the AC drive.

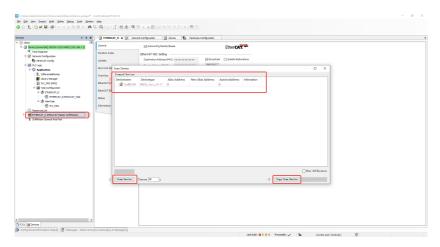
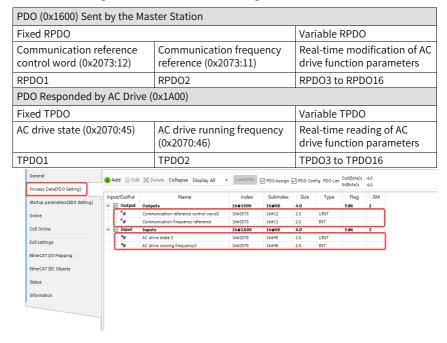


Figure 6-15 Scan the slave device

10. After adding the AC drive, the user can configure PDO on the slave device.
The default fixed PDO mapping in the XML file meets basic motor control requirements.
The PDO exchange data is detailed in the following table.



11. Click "Compile". Wait until the compilation is complete, and then click "Login" to wait for the program to be downloaded to the PLC.



Figure 6-16 Login and download to PLC

12. After login and download are complete, click the start button. The green mark appears on the right side of the MD630N device in the left column to indicate that the device is started and communication is established properly. In this case, the user can monitor the I/O variables of the configuration mapping, as well as online COE and state machine operations.

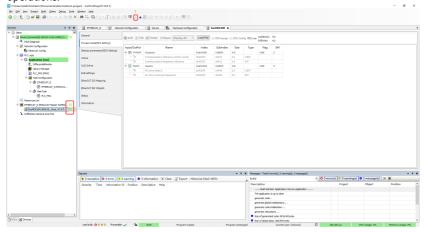
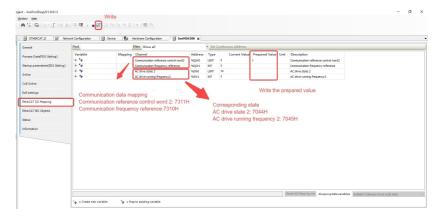


Figure 6-17 Establish communication successfully between the master and slave

Step 4: Control the AC drive through communication

1. To control the motor, set the corresponding I/O mapping variable value according to the mapping address of the communication data.



2. For start/stop control and setting frequency or torque using EtherCAT communication, read and write specific communication addresses of the AC drive. In other words, the specific addresses are mapped to the PDO data of EtherCAT.
For start/stop control and setting frequency or torque, 7311H and 7310H need to be need to be mapped to the PDO data.

The 7311H is one of the communication addresses of control command supported by the AC drive. It is defined as follows:

Communication Address		Description
Communication setting control word 2	7311H	The setpoint of 7311H is in decimal format. 0: Stop according to the stop mode set by F2-17 1: Forward run 2: Reverse run 3: Jog 1 4: Jog 2 5: Coast to stop 6: Stop according to the stop mode specified by F2-17 7: Reset upon fault 8: Emergency stop

For example, write 1 to 7311H to control the forward running of the AC drive. Write 0 to 7311H to stop the AC drive according to the mode set in F2-17 (ON_OFF1 (start/stop) stop mode).

The 7310H is one of the communication addresses of frequency reference supported by the AC drive. It is defined as follows:

Communicat	ion Address	Description
Communication speed setting value 2	7310Н	The target frequency can be set through the communication address. The attributes of values written by this address is defined by n0-14 [7310H speed setting]. 0: Frequency (UInt16) 1: Frequency (Int16) 2: Speed (Int16) 3: Percentage (corresponds to rated frequency/ Int16/2 decimal places) 4: Percentage (corresponds to maximum frequency/ Int16/2 decimal places)

In default settings, when n014 = 1 is set, write 1000 to 7310H to set the main frequency to $10.00 \, \text{Hz}$. Write -1000 to set the main frequency to -10.00 Hz.

The corresponding state is as follows.

Communicat	Communication Address Description	
AC drive state 2	7044H	The value format of 7044H is hexadecimal. The AC drive states corresponding to bit values are as follows: Bit00: Running status. 0: Stopped; 1: Running Bit01: Running direction. 0: Forward; 1: Reverse Bit02: Fault state. 0: No fault; 1: Fault Bit03: Frequency reached. 0: Not reached; 1: Reached Bit04: Reserved Bit05: Reserved Bit06: Reserved Bit07: Reserved Bit07: Reserved Bit08: Fault master code. For details, see specific fault descriptions.
AC drive running frequency 2	7045H	2 decimal places, signed number, unit Hz by default. The decimal places is switchable via A0-71.

6.3.7.6 Start/Stop or Set Speed Through iFA

Preparation

- 1. Prepare a PC.
- 2. Visit the official website of Inovance (http://www.inovance.com) to download and install the iFA commissioning software.
- 3. Select optional relay module (SOP20 is recommended.)
- 4. Prepare the network cable, USB cable, and type-C cable.

Operation steps

Step 1: Install the iFA software on the PC.

Step 2: Wiring

A relay connection is required between the PC and the AC drive. SOP-20 is recommended as the relay. The PC is connected to the relay via a USB cable, and the relay is connected to the AC drive using a network cable, as shown in the following figure.



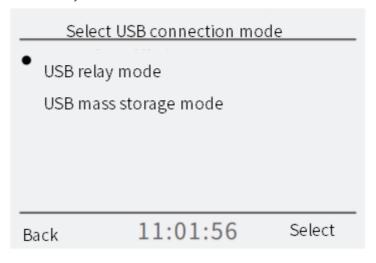
For wiring procedures using SOP-20, see the following section. For more details, see SOP-20 User Guide.

Wiring of relay (SOP-20)

1. Open the USB cover and locate the USB port. The cover is located in the middle of the SOP-20, as shown in the following figure.



- 2. Insert one end of the USB cable to the USB port of SOP-20, and the other end to the USB port of the PC.
- 3. Select the "USB relay mode".



4. Use a network cable to connect one end to the network cable interface on the back of SOP-20 and the other end to the J12 external keyboard interface on the MD630 control board

Step 3: Create a project and connect to the device

Note

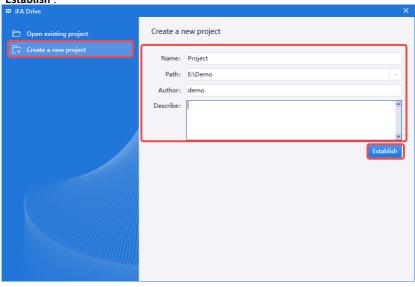
Take the following measures:

Set the motor parameters correctly according to the motor nameplate. See "6.3.3 Setting Motor Parameters" on page 46.

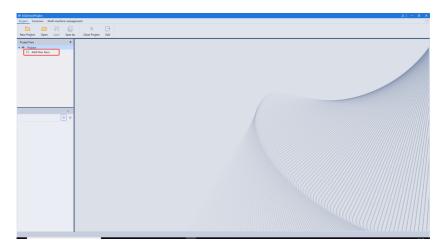
Defines the motor control mode. See "6.3.4 Setting the Motor Control Method" on page 48 and "6.3.5 Setting Motor Control Mode" on page 48.

Perform motor auto-tuning. See "6.3.6 Motor Auto-tuning" on page 49.

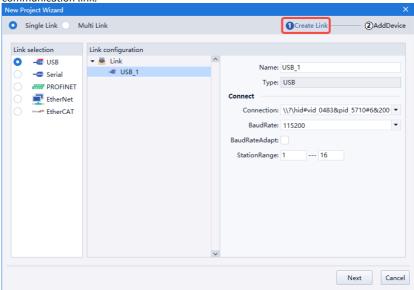
 Click "Create a new project", fill in the corresponding information, and then click "Establish".



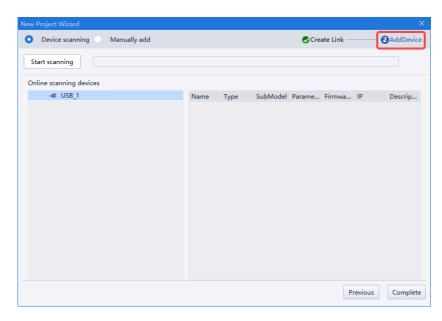
2. After the creation is complete, enter the iFA man interface. Double-click "Add New Item" under the project name to start adding AC drive device information.



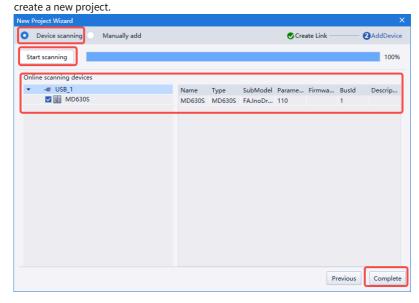
3. Go to "Create Link" on the first page of the New Project wizard to create a communication link.



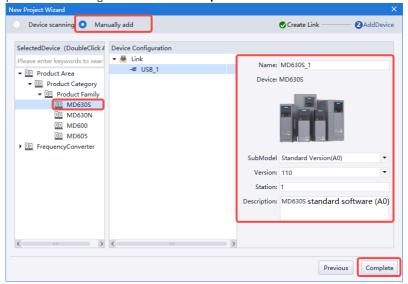
4. After creating the link, go to "Add Device" on the second page of the New Project wizard.



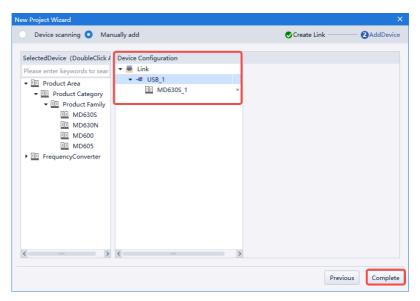
- 5. There are two ways to add devices: Device scanning and manually add.
 - For scanning the device select "Device Scanning" and click "Start scanning". The
 progress bar on the right side starts to display the scan progress. 100% indicates that
 the scan is complete. The scanned device information is displayed below. After the
 device is scanned online, click the Complete button in the lower right corner to



To add the device manually, the user needs to know the type of devices to connect.
 Check "Manually add" and click the device type to be added in the "Selected Device" tab on the left, such as "MD630S". Set the name, station number and other parameters in the right tab. Then click "Complete".



After the addition is successful, the **Device Configuration** bar displays the name of the added device as shown in the following figure. Click "**Complete**" to create a project.



6. After adding a new project, automatically return to the iFA main interface. The device name you added is displayed under the project tree. The main display area displays the configured communication link information.

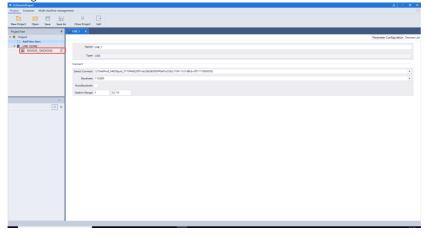


Figure 6-18 Main interface after adding a device

Right-click the device name and select "Connect" in the pop-up box to connect the device.

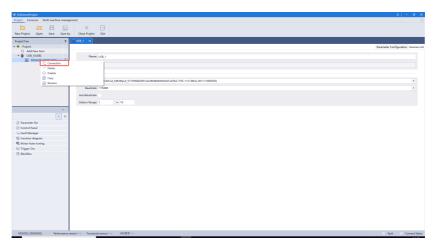
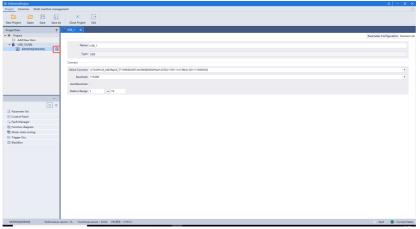
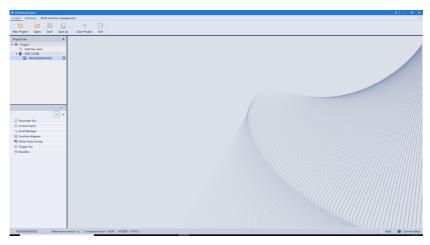


Figure 6-19 Connecting the device

8. When the green flag shown in the following figure is displayed after the device name, the device is connected and the new project is created.

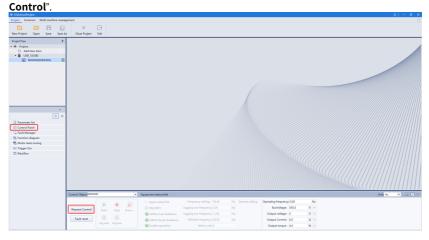


9. After creating a project and connecting the device, enter the following interface.



Step 4: Start/stop or set the speed through the iFA commissioning software

 $1. \ \, \text{Double-click ``Control Panel''} \ \, \text{on the left to open the control panel, and click ``Request'}$



2. In the frequency setting window, adjust the frequency setting.



3. In the stop state, click the "**Start**" button to rotate the motor according to the frequency set in the above step.



4. In the running state, click the "**Stop**" button to decelerate the motor to stop.



7 Troubleshooting

The following table lists the solutions for common fault codes.

Note

After troubleshooting, perform fault reset to make the AC drive exit the faulty state. The fault reset includes manual reset (available for all fault codes) and automatic reset.

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E002.1 Hardware over-current	over-	Output grounded	Method 1: Measure the resistance of the output side to ground with a tramegger. If it is not at the $M\Omega$ level, the resistance is abnormal. Method 2: Enable manual self-test (C2-04 = 1) and enable the drive to run. If a fault is reported, an exception occurs Note: When the grid is an IT system, short circuit to ground cannot be detected during self-check. To enable this function, install an insulation monitor to the IT system.	Check the short circuit to ground part. Replace the UVW output cables or motor.	Manual reset
		Output inter-phase short circuit	Method 1: Measure the resistance between UV, VW, and WU with a multimeter to check whether the resistances are symmetrical. If resistances are not symmetric, an exception occurs. Method 2: Enable manual self-test (C2-04 = 1) and enable the drive to run. If a fault is reported, an exception occurs	Check the short- circuited output phases. Replace the UVW output cables or motor.	
		Speed loop parameter setpoints too high (SVC) (To be continued)		1. Reduce the speed loop Kp (F2-02) to half the current value and set the speed loop Ti (F2-03) to 2s. Start operating and observe whether the drive can run smoothly. If the fault persists, halve the speed loop Kp again. 2. If the fault persists, the fault is not caused by excessively high parameter setpoints.	

Fault	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E002.1	Hardware over-current (Continued) Synchronous motor demagnetization (SVC)	Synchronous motor demagnetization (SVC)	1. Check whether the carrier frequency A5-01 is set to an excessively low value. 2. Check whether the speed control oscillates. Check whether the actual speed jitters excessively through the continuous oscilloscope function of the iFA drive commissioning software. 3. Check whether the motor back EMF harmonics and output current harmonics are excessively high. 4. Check whether the motor EMF is too low. Record the current back EMF (F1-12). Disconnect the motor coupling and perform dynamic autotuning of the synchronous motor again (F1-69 = 12). Compare whether the auto-tuned back EMF (F1-12) is lower than the original back EMF. If yes, an exception occurs. Note: When the motor temperature increases, the back EMF decreases by less than 10%. If back EMF recovers after cooling, it is normal.	Analyze the specific demagnetization causes. Common causes include low carrier frequency, oscillation in speed control mode, and excessive motor back EMF and output current harmonic. If the preceding exceptions are not rectified, demagnetization may occur again even after the motor is replaced.	Mode Manual reset
		Synchronous/ Asynchronous motor parameters are not auto-tuned in the vector control mode (SVC).	In the SVC control mode (F0-01 = 0), perform parameter auto-tuning. Compare the parameters in group F1 to the default values to check whether auto-tuning has been performed.	Perform accurate parameter auto-tuning or download all auto-tuning parameters.	
		Low carrier frequency during high-speed operation (To be continued)	Check whether the carrier frequency (A5-01) set for the motor during high-speed operation is higher than the output frequency x 12. If not, overcurrent may occur due to dissipated control.	Increase the carrier frequency during high-speed motor control. Calculate the derating rate based on the required carrier frequency (12 x output frequency) during model selection.	

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E002.1	Hardware over- current	(Continued) The motor is started during rotation (synchronous motor in SVC).	Before start, check whether the motor is rotating, especially check whether the load is heavy with large inertia. The time for the motor with such a load to coast to stop is long.	Set the start mode to flying start (d0-02 = 1), and then start the drive again.	Manual reset
		Oscillation caused by overcurrent (asynchronous motors in V/f control mode)	Use the continuous oscilloscope function of the iFA software tool to check whether the actual excitation current (U6-25/L3224), actual torque current (U6-25/L3226), and operating frequency (U0-00) of the motor are oscillating. Under normal conditions, the fluctuation range does not exceed 10%.	1. Increase or decrease the V/f oscillation suppression gain (d2-23) properly and observe whether overcurrent is suppressed. 2. Change the motor control method to SVC (F0-01 = 0) and perform parameter auto-tuning.	
		Overcurrent suppression parameters are improperly (asynchronous motor in V/f control mode). (To be continued)	Ensure that overcurrent suppression is enabled (d2-26 = 1). Check whether the overcurrent suppression point (d2-27) and overcurrent suppression Kp/Ki (d2-28/d2-29) are too large or small.	Decrease the overcurrent suppression setpoints Kp/Ki setting first. If the fault persists, increase the setpoint. (For high-power motors, reduce the overcurrent suppression Kp/Ki properly.)	
E002.1	Hardware over- current	(Continued) Overvoltage suppression or undervoltage suppression parameters are set improperly (asynchronous motor in V/f mode).	Check whether overvoltage suppression (d1-54) or undervoltage suppression (d1-63) is enabled and observe whether overcurrent occurs in the overvoltage or undervoltage stage.	Adjust undervoltage suppression Kp/Ki (d1-66/d1-67) under undervoltage suppression. Adjust overvoltage suppression Kp/Ki (d1-57/d1-58) under overvoltage suppression. Decrease the setpoint first. If the fault persists, increase the setpoint again.	Manual reset
		The value of the torque boost parameters (asynchronous motor in V/f control mode) are excessively high. (To be continued)	When the torque boost mode is manual or manual+automatic, check whether the manual torque boost (d2-14) is set to an excessively high value and whether the stator resistance (F1-20) is auto-tuned. When the torque boost mode is automatic, check whether the stator resistance (F1-20) is auto-tuned.	If the manual torque boost (d2-14) is set to an excessively high value, decrease the manual torque boost (d2-14) and perform static partial auto-tuning of the asynchronous motor again (F1-69 = 1).	

Fault	Name	Fault Cause	Confirmation Method	Solution	Reset
Code					Mode
E002.1	Hardware over-	(Continued)	Check whether the deceleration time is too short. If the deceleration time is	Determine whether the	Manual
	current	V/f acceleration/ deceleration time is	too short, increase the deceleration	acceleration/ deceleration time is a	reset
	current	too short	·	value that must be set.	
		(asynchronous	time gradually (by 5s every time). Repeat the test to check whether the	Otherwise, the	
		motor in V/f control	fault persists. If the fault does not	acceleration/	
		mode).	occur, the fault cause is excessively	deceleration time (F0-48	
		mode).	low acceleration/deceleration time.	to F0-49) can be	
			tow deceleration, deceleration time.	extended properly.	
				Enable the overcurrent	
				suppression function	
				(d2-26=1). If the fault	
				persists, decrease the	
				setpoint first. If it is	
				inactive, increase the	
				setpoint again.	
				Increase the manual	
				torque boost value (d2-	
				14) appropriately.	
				When multiple motors	
				are started	
				simultaneously, all	
				motors can be braked	
				with DC braking (d0-25)	
				for the same duration to	
				significantly reduce	
				startup current shock.	
				In operation conditions	
				where the start/stop	
				speed is fast, enable	
				shutdown DC injection	
				braking (d0-29 is not 0)	
				to ensure that the shutdown DC injection	
				braking active time (d0-	
				29) is active before the	
				next start.	
		Model-related	Check the nameplate of the drive to	Set the drive model	
		parameters are set	ensure the rated power/current/	parameters (A3-02 to A3-	
		incorrectly.	voltage of the drive (A3-02 to A3-04)	04) according to the	
		meorrectly.	are consistent with those on the	nameplate label of the	
			nameplate.	drive.	
		Motor parameters	'		
		Motor parameters	Check the nameplate of the motor to	Set the motor rated	
		are set improperly.	ensure the basic parameters of the motor (F1-00 to F1-12) are consistent	parameters (F1-00 to F1-	
			with those on the nameplate.	12) according to the motor nameplate.	
<u> </u>			with those on the nameptate.	motor nameptate.	

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E002.1	Hardware over- current	The V/f curve voltage is excessively high (asynchronous motor V/f).	When the V/f curve is multi-point V/f (d2-00 = 1), reduce the voltage at the point where the voltage/frequency is too large in the multi-point curve (d2-02 to d2-10) and observe whether the fault disappears. When the separated V/f curve is used (d2-00 = 10), set the frequency first. Then slowly try to increase the voltage. If the output voltage is lower than the voltage set upon fault when the output current reaches the rated value, the voltage set in the separated V/f mode is improper.	Reduce the voltage/ frequency ratio on the multi-point V/f curve to prevent it from being larger than the ratio on the linear V/f, resulting in the motor overexcitation. For V/f separation, set the voltage acceleration/ deceleration time (d2- 50/ d2 -51) that matches the frequency to avoid excessive voltage acceleration time or output voltage.	Manual reset
		Braking resistor overcurrent	Braking resistor overcurrent occurs when the bus voltage increases to the actual operating voltage of the braking unit (A4-01) due to motor deceleration or speed fluctuation. Remove the braking resistor and enable the drive to run again. Check whether overcurrent occurs again after the bus voltage increases. If not, the braking resistor is faulty. In this case, check the following: 1. Check whether the braking output is short-circuited. 2. Check whether the braking resistor is wired correctly. 3. Check whether the resistance of the braking resistor is too small.	Re-connect the braking resistor. Replace with a braking resistor of higher resistance.	
		The SVC control system cannot track or adjust the reactive power stably at extremely low frequencies (about 0 Hz), leading to unstable system operation (synchronous motor SVC).	When the synchronous motor is in the SVC mode and the set speed (U0-01) is near 0, check whether violent feedback speed fluctuation, unusual motor noise, motor stall, or slightly continuous reverse rotation occurs. If yes, an exception occurs.	Avoid the long-term operation in SVC mode at speeds close to 0. Perform auto-tuning again (F1-69=12). Enable IF control and set the tens of the low-speed processing mode (d0–85) to 1. Ask for technical	
		nardware fault	/	support.	

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E002.3	Phase-W over- current	Synchronous motor demagnetization (SVC)	Record the current back EMF (F1-12), disassemble the motor coupling, and perform dynamic auto-tuning for the synchronous motor (F1-69 = 12) again. Check whether the newly auto-tuned back EMF is lower than the initial auto-tuned value. If yes, an exception occurs. Note: When the motor temperature increases, the back EMF decreases by less than 10%. If the back EMF recovers after cooling, it is normal.	Analyze the specific demagnetization causes. Common causes include low carrier frequency, oscillation in speed control mode, and excessive motor back EMF and output current harmonic. Note: If the preceding exceptions are not rectified, demagnetization may occur again even after the motor is replaced.	Manual reset
		Synchronous/ Asynchronous motor parameters are not auto-tuned in the vector control mode (SVC).	In the SVC control mode (F0-01 = 0), perform parameter auto-tuning. Compare the parameters in group F1 to the default values to check whether auto-tuning has been performed.	Perform accurate parameter auto-tuning or download all auto-tuning parameters.	
		Low carrier frequency during high-speed operation	Check whether the carrier frequency set for the motor during high-speed operation is higher than the result of output frequency x 12. If no, control dissipation may result in overcurrent.	The carrier frequency of high-power machines is low by default. In this case, increase the carrier frequency during high-speed motor operation. Calculate derating according to the carrier frequency and select the model according to the derating coefficient.	
		The motor is started during rotation (synchronous motor in SVC).	Before start, check whether the motor is rotating, especially check whether the load is heavy with large inertia. The time for the motor with such a load to coast to stop is long.	Set the start mode to flying start (d0-02 = 1).	
	Oscillation caused by overcurrent (asynchronous motors in V/f control mode) (To be continued)	Use the continuous oscilloscope function in the commissioning software to check whether the actual excitation (U6-24/L3224), torque current (U6–25/L3226) and operating frequency (U0-00) of the motor are oscillating. The fluctuation range of the actual excitation/torque current of the motor does not exceed 10% under normal conditions.	Increase or decrease the V/f oscillation suppression gain (d2-23) properly. Change the motor control method to SVC (F0-01 = 0). After parameter auto-tuning, the SVC mode applied.		

Fault	Name	Fault Cause	Confirmation Method	Solution	Reset
Code					Mode
E002.3	Phase-W	(Continued)	Check whether overvoltage	Adjust undervoltage	Manual
	over-	Overvoltage	suppression (d1-54) or undervoltage	suppression Kp/Ki (d1-	reset
	current	suppression or	suppression (d1-63) is enabled and	66/d1-67) under	
		undervoltage	observe whether overcurrent occurs	undervoltage	
		suppression	in the overvoltage or undervoltage	suppression. Adjust	
		parameters are set	stage.	overvoltage suppression	
		improperly		Kp/Ki (d1-57/d1-58)	
		(asynchronous		under overvoltage	
		motor in V/f mode).		suppression. Decrease	
				the setpoint first. If the	
				fault persists, increase	
				the setpoint again.	
		The value of the	When the torque boost mode is	If the manual torque	
		torque boost	manual or manual+automatic, check	boost (d2-14) is set to an	
		parameters	whether the manual torque boost (d2-	excessively high value,	
		(asynchronous	14) is set to an excessively high value	decrease the manual	
		motor in V/f control	and whether the stator resistance (F1-	torque boost (d2-14).	
		mode) are	20) is auto-tuned. When the torque	Perform static partial	
		excessively high.	boost mode is automatic, check	auto-tuning of the	
		(To be continued)	whether the stator resistance (F1-20)	asynchronous motor	
			is auto-tuned.	again (F1-69 = 1).	

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E002.3	Phase-W over- current	V/f acceleration/ deceleration time is too short (asynchronous motor in V/f control mode).	Check whether the deceleration time is too short. If the deceleration time is too short, increase the deceleration time gradually (by 5s every time). Repeat the test to check whether the fault persists. If the fault does not occur, the fault cause is excessively low acceleration/deceleration time.	Determine whether the acceleration/ deceleration time is a value that must be set. Otherwise, the acceleration/ deceleration time (F0-48 to F0-49) can be extended properly. Enable the overcurrent suppression function (d2-26=1). If the fault persists, decrease the setpoint first. If it is inactive, increase the setpoint again. Increase the manual torque boost value (d2-14) appropriately. In operation conditions where the start/stop speed is fast, enable shutdown DC injection braking (d0-29 is not 0) to ensure that the shutdown DC injection braking active time (d0-29) is active before the next start. When multiple motors are started simultaneously, all motors can be braked with DC braking (d0-25) for the same duration to significantly reduce startup current shock.	Manual reset
		Model-related parameters are set incorrectly.	Check the nameplate of the drive to ensure the rated power/current/ voltage of the drive (A3-02/A3-03/A3-04) are consistent with those on the nameplate.	Set model-related parameters correctly.	
		Motor parameters are set incorrectly. (To be continued)	Check the nameplate of the motor to ensure the basic parameters of the motor (F1-00 to F1-12) are consistent with those on the nameplate.	Set the motor rated parameters (F1-00 to F1-12) according to the motor nameplate.	

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E002.3	Phase-W over- current	The V/f curve voltage is excessively high (asynchronous motor V/f).	When the V/f curve is multi-point V/f (d2-00 = 1), reduce the voltage at the point where the voltage/frequency is too large in the multi-point curve (d2-02 to d2-10) and observe whether the fault disappears. When the separated V/f curve is used (d2-00 = 10), set the frequency first. Then slowly try to increase the voltage. If the output voltage is lower than the voltage set upon fault when the output current reaches the rated value, the voltage set in the separated V/f mode is improper.	1. Reduce the voltage/ frequency ratio on the multi-point V/f curve to prevent it from being larger than the ratio on the linear V/f, resulting in the motor overexcitation. 2. For separated V/f, set the voltage acceleration/ deceleration time (d2- 50/d2-51) that matches the frequency to avoid excessive voltage acceleration time or output voltage.	Manual reset
		Braking resistor overcurrent	Braking resistor overcurrent occurs when the bus voltage increases to the actual operating voltage of the braking unit (A4-01) due to motor deceleration or speed fluctuation. Remove the braking resistor and enable the drive to run again. Check whether overcurrent occurs again after the bus voltage increases. If not, check the following: 1. Check whether the braking output is short-circuited. 2. Check whether the braking resistor is wired correctly. 3. The resistance of the braking resistor is too small.	Re-connect the braking resistor. Select a higher resistance braking resistor.	
		The SVC control system cannot track or adjust the reactive power stably at extremely low frequencies (about 0 Hz), leading to unstable system operation (synchronous motor SVC).	When the synchronous motor is in the SVC mode and the set speed (U0-01) is near 0, the feedback speed fluctuates greatly and abnormal noise, motor stall, or slightly continuous reverse rotation occurs.	1. Avoid the long-term operation in the SVC at speeds closed to 0. 2. Perform parameter auto-tuning again (F1-69 = 12). 3. Enable IF control and set the tens of the low-speed processing mode (d0-85) to 1.	
		Hardware fault	Ask for technical support.	Ask for technical support.	

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E005.1	Bus over- voltage	In the power generation state, the braking recovery power is insufficient (synchronous motor/asynchronous motor in SVC mode).	Method 1: Measure the resistance of the output side to ground with a tramegger. If it is not at the M Ω level, the resistance is abnormal. Method 2: Enable manual self-test (C2-04 = 1) and enable the drive to run. If a fault is reported, an exception occurs Note: When the grid is an IT system, short circuit to ground cannot be detected during self-test. To enable this function, install an insulation monitor to the IT system. 1. Check whether the motor is in the generating state. 2. Use a multimeter to check whether the braking resistor power is too low. 3. Check whether the braking resistor is connected securely.	1. Increase the deceleration time (F0-49) to reduce the generating power. 2. Replace with a braking resistor of higher power. 3. Re-connect the braking resistor. 4. Enable overvoltage suppression when the load allows (d1-54 = 2). Note: Active loads such as cranes does not support overvoltage	Manual reset
		Sudden removal of the load causes speed overshoot and generation (synchronous motor/ asynchronous motor in SVC mode).	Check whether the actual motor speed increases significantly after the load is suddenly removed. If yes, an exception occurs.	suppression. 1. Increase the speed loop Kp (F2-02). 2. Add the speed loop Ti (F2-03). The recommended value is 2s.	

Fault	Name	Fault Cause	Confirmation Method	Solution	Reset
Code					Mode
E005.1	Bus over- voltage	(Continued) The value of the speed loop gain is too low, resulting in feedback power generation after feedback speed overshoot when the speed reference reaches the target value (synchronous motor/asynchronous motor in SVC mode).	Observe whether overvoltage occurs after the speed reaches the target value during acceleration.	1. Increase the speed loop Kp (F2-02) and increase the speed loop Ti (F2-03) to 2s. 2. Enable S-curve (b7-00 = 1) to set the ramp acceleration end arc (F0-51).	Manual reset
		Speed loop parameter setpoints too high (SVC)	Reduce the speed loop Kp (F2-02) to half the current value and set the speed loop Ti (F2-03) to 2s. Start running and observe whether the drive can run smoothly. If the fault persists, reduce the Kp to half the current value several times. If the fault still occurs, the fault is not caused by the cause.	Reduce the speed loop Kp (F2-02) to half the current value and set the speed loop Ti (F2-03) to 2s.	
		The motor is started during rotation (synchronous/ asynchronous motor in SVC).	Before start, check whether the motor is rotating, especially check whether the load is heavy with large inertia. The time for the motor with such a load to coast to stop is long.	Set the start mode to flying start (d0-02 = 1).	

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E005.1	005.1 Bus over- voltage	(Continued) Oscillation caused by overvoltage (asynchronous motors in V/f control mode)	Use the continuous oscilloscope function in the commissioning software to check whether the actual excitation (U6-24/L3224), torque current (U6-25/L3226) and operating frequency (U0-00) of the motor are oscillating. Under normal conditions, the actual excitation/torque current fluctuation range of the motor does not exceed 10%.	1. Increase or decrease the V/f oscillation suppression gain (d2-23) properly and observe whether overcurrent is suppressed. 2. Change the motor control method to SVC (F0-01 = 0). After parameter auto-tuning, the SVC mode applied.	Manual reset
		The deceleration time is too short.	Check whether the deceleration time is too short. If the deceleration time is too short, increase the deceleration time gradually (by 5s every time). Repeat the test to check whether the fault persists. If the fault does not occur, the fault cause is excessively low acceleration/deceleration time.	1. Determine whether the acceleration/ deceleration time is a value that must be set. Otherwise, the acceleration/ deceleration time can be extended properly. 2. Enable overvoltage suppression (F2-39 = 1) for applications with low speed following requirements. For applications with low speed following requirements, install a braking resistor. 3. For applications where the braking resistor cannot be installed, increase the overexcitation current (SVC: d0-40, V/f: d0-41) properly. Enable vector overexcitation (d0-39 = 1) first during SVC control.	
		Model-related parameters are set incorrectly.	Check the nameplate of the drive to ensure the rated power/current/ voltage of the drive (A3-02/A3-03/A3-04) are consistent with those on the nameplate.	Set model-related parameters correctly.	

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E005.1	Bus over- voltage	(Continued) The starting voltage of the braking unit is too high.	Check whether the effective action voltage of the braking unit (A4-01) reaches the overvoltage threshold (A3-57).	The effective action voltage of the braking unit varies with the voltage level of the machine. Manual modification is not required under normal conditions. In extreme cases, reduce the action voltage of the braking unit (A4-00).	Manual reset
		The input voltage is too high.	Check whether the input voltage is within the normal range (380 V to 480 V).	1. Reduce the input voltage to a value within the normal range (380 V to 480 V). 2. Decrease the overvoltage suppression action voltage (F2-40) and the braking unit action voltage (A4-00).	
		The overvoltage suppression parameters are set improperly.	Enable overvoltage suppression (d1-54 = 1) and check whether the overvoltage suppression Kp/Ki (d1-57/d1-58) is set to excessively low or high values (based on actual operating conditions).	Decrease the setpoint of kp or ki first. If the fault persists, increase the setpoint again. In addition, for large inertia models, reduce the setpoint further. Adjust the overvoltage suppression Kp/Ki (d1- 57/58).	
	The synchronous motor reports a fault after overspeed or the synchronous motor coasts to stop after manual settings. Synchronous motor overspeed The synchronous motor coasts to stop manually or to coasts to stop upon fault.	Check whether the output voltage (F1- $12 \times U0-00 \times 1.414$) of the synchronous motor exceeds the overvoltage threshold A3-57. If yes, interruption of the operation may result in overvoltage, leading to explosion of the drive. Note: When the synchronous motor overspeed occurs, the output voltage (F1- $12 \times U0-00 \times 1.414$) can be much higher than the bus voltage. After the motor is interrupted, the field weakening current disappears and the U/V/W phase voltage increases dramatically in a short time, leading to back EMF short circuit in the output diode during switch-on in the reverse direction.	1. Limit the speed upper limit by setting d1-03 (Digital setting of positive frequency upper limit) to a value lower than or equal to A3-57/(1.414 x F1-12). 2. Replace with a motor with a higher back EMF. Note: A motor with high back EMF can effectively reduce the output current. However, operating at a speed above the limit may result in damage caused by overvoltage.		

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E009.1	Bus under- voltage	Input phase loss	Measure whether the line voltages between RS, ST, and RT are symmetrical at the mains input side.	Check whether the input switches, contactors, and wiring terminals are abnormal and re- connect them.	Auto matic reset by default.
		Power dip occurs and the grid voltage is unstable.	Check whether undervoltage occurs in other devices in the same cabinet at the same time. Note: Undervoltage is mostly caused by power dip.	In load scenarios such as wind turbines, water pumps, air compressors, and electric drums, enable undervoltage suppression (d1-63 = 1). Note: When undervoltage suppression is enabled (d1-63 = 1), a brief speed drop occurs during undervoltage suppression and the drive converts the motor kinetic energy into electrical energy to stabilize the bus voltage, preventing the undervoltage fault.	Switch to manual reset throug h A3- 67.
		The input voltage is too low. The undervoltage suppression parameters are set improperly. (To be continued)	1. Check whether the input voltage is within the normal range (380 V to 480 V). 2. Check whether the upstream circuit breaker or contactor trips or cannot be closed. 1. Check whether undervoltage suppression (d1-63 = 1) is enabled and whether the undervoltage suppression Kp/Ki (d1-66/-67) are set to excessively high or low values. 2. During undervoltage suppression, undervoltage fault is triggered when	1. Increase the input voltage to a value within the normal range. 2. Ensure that the upstream circuit breaker or contactor is normal. 1. Adjust the undervoltage suppression Kp/Ki (d1-66/67). Decrease the value. If it is invalid, increase the value. 2. If you need to run	
			the actual speed is lower than the minimum operating frequency (d1-72) of undervoltage suppression. In this case, the drive stops.	with a low speed, modify the minimum operating frequency (d1- 72) for undervoltage suppression.	

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E009.1	Bus under- voltage	Undervoltage occurs during motor oscillation The pre-charge contactor is abnormal and the pre-charge resistor cannot be disconnected	Check whether the output torque (U0-06) and bus voltage (U0-02) are subject to large oscillation (fluctuation above 10%) in the same frequency as that of bus fluctuation. Check whether the undervoltage fault occurs after power-on, whether the bus recovers after stop, and whether the undervoltage fault disappears after stop.	Rectify the motor oscillation. Contact technical support to replace the relay.	Auto matic reset by default. Switch to manual reset throug h A3-67.
		Properly. Hardware error (circuit board)		Ask for technical support.	-
E009.3	Pre-drive timeout	The input circuit is not connected properly.	Check whether cables are connected properly.	Re-connect the AC drive according to the wiring diagram.	Manual reset
		The input voltage is excessively low.	Check whether the input voltage is within the normal range (380 V to 480 V).	Increase the input voltage to a value within the normal range (380 V to 480 V).	
		Hardware error (circuit board)	If the input fault persists, the hardware may be damaged.	Ask for technical support.	

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E010.1	Drive overload	The load is too heavy, or locked rotor occurs on the motor	Scenario 1: When the asynchronous motor is overloaded, switch to V/f control (F0-01 = 2) and observe whether the output current is excessively high. If motor parameters are set properly, but overload still occurs during slow acceleration when starting with load in the V/f mode, then the load is too heavy. Scenario 2: In high-speed operation in vector control, if the product of output torque (U0-06) and operating frequency (U0-00) is close to the output power (U0-05), but the output torque is large, then the load is too heavy. Scenario 3: Check whether the brake releases normally.	In scenario 1, when the motor runs at low speed, increase the noload current (F1-30) properly and reduce the mutual inductance (F1-28). Ensure that the product of both is unchanged. For scenario 2, during low-speed overload of the synchronous motor, if a cam-pole motor is used, increase the MTPA tuning coefficient of the synchronous motor (d5-29) and observe whether the overall output current decreases. If overload occurs because the load in the high-speed field weakening zone is too heavy, increase the overmodulation coefficient (A5-06) to a value not exceeding 108%. For scenario 3, release the brake. If the fault persists are preceding measures are taken, use a drive with higher power rating.	Manual reset
		The SVC control system cannot track or adjust the reactive power stably at extremely low frequencies (about 0 Hz), leading to unstable system operation (synchronous motor SVC). (To be continued)	When the synchronous motor is in the SVC mode and the set frequency (U0-01) is near 0, violent speed feedback fluctuation, unusual motor noise, motor stall, or slight reverse rotation occurs.	Avoid the long-term operation in the SVC at speeds closed to 0. Enable IF control and set the tens of the low-speed processing mode (d0-85) to 1.	

Fault	Name	Fault Cause	Confirmation Method	Solution	Reset
Code					Mode
	Drive overload	Synchronous frequency of the asynchronous motor is close to 0 Hz during operation (asynchronous motor SVC).	The synchronous motor is connected to a generating load. The synchronous frequency (L3212) is close to 0 (within 0.5% fluctuation) and operation lasts for more than 10s.	Avoid the long-term operation in the SVC mode at speeds near 0.	Manual reset
		Synchronous motor demagnetization (SVC)	Record the current back EMF (F1-12), disassemble the motor coupling, and perform dynamic auto-tuning for the synchronous motor (F1-69 = 12) again. Check whether the newly auto-tuned back EMF is lower than the initial auto-tuned value. If yes, an exception occurs. Note: When the motor temperature increases, the back EMF decreases by less than 10%. If the back EMF recovers after cooling, it is normal.	Analyze the specific demagnetization causes. Common causes include low carrier frequency, oscillation in speed control mode, and excessive motor back EMF and output current harmonic. If the preceding exceptions are not rectified, demagnetization may occur again even after the motor is replaced.	
	Synchronous/ Asynchronous motor parameters are not auto-tuned in the vector control mode (SVC). (To be continued)	In the SVC control mode (F0-01 = 0), perform parameter auto-tuning. Compare the parameters in group F1 to the default values to check whether auto-tuning has been performed.	Perform accurate parameter auto-tuning or download all auto-tuning parameters.		

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E010.1	Drive	(C +i)	Check whether the deceleration time	Determine whether the	
E010.1	overload	(Continued) V/f acceleration/	is too short. If the deceleration time is		Manual
	overtoau	deceleration time is	too short, increase the deceleration	acceleration/ deceleration time is a	reset
		too short	· ·	value that must be set.	
			time gradually (by 5s every time).		
		(asynchronous motor in V/f control	Repeat the test to check whether the fault persists. If the fault does not	Otherwise, the	
		'	· '	acceleration/	
		mode).	occur, the fault cause is excessively	deceleration time (F0-48	
		(To be continued)	low acceleration/deceleration time.	to F0-49) can be	
				extended properly.	
				Enable the overcurrent	
				suppression function	
				(d2-26=1). If the fault	
				persists, decrease the	
				setpoint first. If it is	
				inactive, increase the	
				setpoint again.	
				Increase the manual	
				torque boost value (d2-	
			14) appropriately.		
				In operation conditions	
				where the start/stop	
				speed is fast, enable	
				shutdown DC injection	
				braking (d0-29 is not 0)	
				to ensure that the	
				shutdown DC injection	
				braking active time (d0-	
				29) is active before the	
				next start.	
				When multiple motors	
				are started	
				simultaneously, all	
				motors can be braked	
				with DC braking (d0-25)	
				for the same duration to	
				significantly reduce	
				,	
				startup current shock.	

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E010.1	Drive overload	The V/f curve voltage is excessively high (asynchronous motor V/f).	When the V/f curve is multi-point V/f (d2-00 = 1), reduce the voltage at the point where the voltage/frequency is too large in the multi-point curve (d2-02 to d2-10) and observe whether the fault disappears. When the separated V/f curve is used (d2-00 = 10), set the frequency first. Then slowly try to increase the voltage. If the output voltage is lower than the voltage set upon fault when the output current reaches the rated value, the voltage set in the separated V/f mode is improper.	Reduce the voltage/ frequency ratio on the multi-point V/f curve to prevent it from being larger than the ratio on the linear V/f, resulting in the motor overexcitation. For V/f separation, set the voltage acceleration/ deceleration time (d2- 50/ d2-51) that matches the frequency to avoid excessive voltage acceleration time or output voltage.	Manual reset
		The value of the torque boost parameters (asynchronous motor in V/f control mode) are excessively high.	When the torque boost mode is manual or manual+automatic, check whether the manual torque boost (d2-14) is set to an excessively high value and whether the stator resistance (F1-20) is auto-tuned. When the torque boost mode is automatic, check whether the stator resistance (F1-20) is auto-tuned.	If the manual torque boost (d2-14) is set to an excessively high value, decrease the manual torque boost (d2-14). Perform static partial auto-tuning of the asynchronous motor again (F1-69 = 1).	
		The motor is started during rotation (synchronous/ asynchronous motor in SVC).	Before start, check whether the motor is rotating, especially check whether the load is heavy with large inertia. The time for the motor with such a load to coast to stop is long.	Set the start mode to flying start (d0-02 = 1).	
		V/f oscillation overload (asynchronous motor V/f) (To be continued)	Use the continuous oscilloscope function in the commissioning software to check whether the actual excitation (U6-24/L3224), torque current (U6-25/L3226) and operating frequency (U0-00) of the motor are oscillating. Under normal conditions, the actual excitation/torque current fluctuation range of the motor does not exceed 10%.	Increase or decrease the V/f oscillation suppression gain (d2-23) properly. Change the motor control method to SVC (F0-01 = 0). After parameter auto-tuning, the SVC mode applied.	

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E010.1	Drive overload	(Continued) Synchronous motor magnetic pole angle auto-tuning error (synchronous motor SVC)	When the motor rotates freely, select "Pre-positioning start" (d0-71 = 3) to check whether the motor starts normally. When the motor does not rotate freely, check whether the motor Lq/Ld (F1-34/F1-32) is lower than 1.5. Check whether the motor used is a synchronous motor with squirrel cage. Check the nameplate of the motor to	When the motor rotates freely, the motor rotates slightly at the start of pre-positioning. It is recommended to use this start mode if the process will not be affected by this mode. When the motor cannot rotate freely and Lq/Ld (F1-34/F1-32) of the motor is lower than 1.5, select voltage pulse start mode (d0-71 = 0) and increase the synchronous motor initial position detection current (d0-75). Otherwise, select high-frequency injection start mode (d0-71 = 1), and set the initial position compensation angle (d0-76) to 180 and operate for several times. For synchronous motors with squirrel cage, reverse rotation may occur under inaccurate auto-tuned pole position. It is recommended to apply the V/f mode for asynchronous motors. Set the motor rated	Manual reset
		parameters properly.	ensure the basic parameters of the motor (F1-00 to F1-12) are consistent with those on the nameplate.	parameters (F1-00 to F1- 12) according to the motor nameplate.	
		The power rating of the AC drive is too low. (To be continued)	Check whether a low-overload model is used for high-overload applications or a low-power drive is used to drive a high-power motor.	Use a drive with higher power rating.	

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E010.1	Drive overload	The synchronous motor reports a fault after overspeed or the synchronous motor coasts to stop after manual settings. Derated operation applies due to long-term operation at low frequencies.	When the synchronous motor overspeed occurs, the value of back EMF (F1-12) x operating frequency (U0-00) x 1.414 is much higher than the bus voltage. After the motor is interrupted, the field weakening current disappears and the U/V/W phase voltage increases dramatically in a short time. This causes the output diode to energize in the reverse direction and back EMF short circuit. If the value of back EMF (F1-12) x operating frequency (U0-00) x 1.414 is higher than the overvoltage threshold, operation interruption may cause overvoltage of the AC drive and may damage the drive. Check whether the current operating frequency is 0 Hz to 5 Hz at low frequency. If yes, the system is in the low-frequency derating range. (In this	Set the positive frequency upper limit (d1-03) to the result of overvoltage threshold (A3-57)/(1.414 x back EMF of synchronous motor). Keep the maximum operating speed below this limit. Select the motor type properly. A motor with high back EMF can effectively reduce the output current. However, running at a speed above the limit may result in overvoltage or damage. Replace with a drive of higher power.	Manual reset
			range, the AC drive power is lower than its rated power.) Note 1: During low-frequency operation, large fluctuation in IGBT temperature may easily occur, resulting in thermal stress and damage the IGBT. Note 2: When the frequency is in the low frequency range from 0 Hz to 5 Hz, the derating is reduced from 20% to 0%. Check the nameplate of the drive to	Set model-related	
	parameters are set incorrectly.	ensure the rated power/current/ voltage of the drive (A3-02/A3-03/A3- 04) are consistent with those on the nameplate.	parameters correctly.		
		Derating due to excessively high carrier frequency	Setting the carrier frequency (A5-01) to a value higher than the default can result in derating of the output with load.	Set a proper carrier frequency. If the high carrier frequency output capability is insufficient, it is recommended to use a drive with higher power.	

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E011.1	Motor overload	The load is too heavy.	Scenario 1: When the asynchronous motor is overloaded, switch to V/f control (F0-01 = 2) and observe whether the output current is excessively high. If motor parameters are set properly, but overload still occurs during slow acceleration when starting with load in the V/f mode, then the load is too heavy. Scenario 2: In high-speed operation in vector control, if the product of output torque (U0-06) and operating frequency (U0-00) is close to the output power (U0-05), but the output torque is large, then the load is too heavy. Scenario 3: Check whether the brake releases normally.	In scenario 1, when the motor runs at low speed, increase the noload current (F1-30) properly and reduce the mutual inductance (F1-28). Ensure that the product of both is unchanged. For scenario 2, during low-speed overload of the synchronous motor, if a cam-pole motor is used, increase the MTPA tuning coefficient of the synchronous motor (d5-29) and observe whether the overall output current decreases. If overload occurs because the load in the high-speed field weakening zone is too heavy, increase the overmodulation coefficient (A5-06) to a value not exceeding 108%. For scenario 3, release the brake. If the fault persists are preceding measures are taken, use a drive with higher power rating.	Manual reset
		Synchronous motor demagnetization (SVC) (To be continued)	Record the current back EMF (F1-12), disassemble the motor coupling, and perform dynamic auto-tuning for the synchronous motor (F1-69 = 12) again. Check whether the newly auto-tuned back EMF is lower than the initial auto-tuned value. If yes, an exception occurs. Note: When the motor temperature increases, the back EMF decreases by less than 10%. If the back EMF recovers after cooling, it is normal.	Analyze the specific demagnetization causes. Common causes include low carrier frequency, oscillation in speed control mode, and excessive motor back EMF and output current harmonic. If the preceding exceptions are not rectified, demagnetization may occur again even after the motor is replaced.	

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E011.1	Motor overload	Set motor parameters properly.	Check the nameplate of the motor to ensure the basic parameters of the motor (F1-00 to F1-12) are consistent with those on the nameplate.	Set the motor rated parameters (F1-00 to F1-12) according to the motor nameplate.	Manual reset
		The input voltage is too low.	Check whether the input voltage meets the design requirements (380 V models: 380 V to 480 V). Check whether the upstream circuit breaker or contactor trips or cannot be closed.	Increase the input voltage to a value within the normal range. Ensure that the inlet switch is normal.	
		The motor overload protection coefficient (d1-46) is set to an excessively low value.	/	Increase the motor overload protection coefficient (d1-46). If the fault persists after long-term operation, switch off the motor overload protection (d1-45 = 0).	
E013.1	U phase loss	The output cables of the drive are connected improperly.	Check whether the output cables of the drive are connected properly.	Re-connect the output circuit of the AC drive.	Manual reset
		The output contactor is faulty or trips.	Check whether the output contactor is disconnected and whether the circuit trips.	Close the output contactor or brake.	
		Short circuit (ground)	Method 1: Measure the resistance of the output side to ground with a tramegger. If it is not at the M Ω level, the resistance is abnormal. Method 2: Enable manual self-test (C2-04 = 1) and enable the drive to run. If a fault is reported, an exception occurs Note: When the grid is an IT system, short circuit to ground cannot be detected during self-test. To enable this function, install an insulation monitor to the IT system.	Check the short circuit to ground part. Replace the UVW output cables or motor.	
		The motor winding is unbalanced.	Measure the phase-to-phase resistance between UV, UW, and VW phases of the motor with a multimeter to check whether they are equal.	Repair or replace the three-phase winding of the motor.	

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E013.2	V phase loss	The output cables of the drive are connected improperly.	Check whether the output cables of the drive are connected properly.	Re-connect the output circuit of the AC drive.	Manual
		The output contactor is faulty or trips.	Check whether the output contactor is disconnected and whether the circuit trips	Close the output contactor or brake.	
		Short circuit (ground)	Method 1: Measure the resistance of the output side to ground with a tramegger. If it is not at the $M\Omega$ level, the resistance is abnormal. Method 2: Enable manual self-test (C2-04 = 1) and enable the drive to run. If a fault is reported, an exception occurs Note: When the grid is an IT system, short circuit to ground cannot be detected during self-test. To enable this function, install an insulation monitor to the IT system.	Check the short circuit to ground part. Replace the UVW output cables or motor.	
		The motor winding is unbalanced.	Measure the phase-to-phase resistance between UV, UW, and VW phases of the motor with a multimeter to check whether they are equal.	Repair or replace the three-phase winding of the motor.	

Fault	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
Code					
E013.3	W phase loss	The output cables of the drive are connected improperly.	Check whether the output cables of the drive are connected properly.	Re-connect the output circuit of the AC drive.	Manual reset
		The output contactor is faulty or trips.	Check whether the output contactor is disconnected and whether the circuit trips.	Close the output contactor or brake.	
		Short circuit (ground)	Method 1: Measure the resistance of the output side to ground with a tramegger. If it is not at the $M\Omega$ level, the resistance is abnormal. Method 2: Enable manual self-test (C2-04 = 1) and enable the drive to run. If a fault is reported, an exception occurs Note: When the grid is an IT system, short circuit to ground cannot be detected during self-test. To enable this function, install an insulation monitor to the IT system.	Check the short circuit to ground part. Replace the UVW output cables or motor.	
		The motor winding is unbalanced.	Measure the phase-to-phase resistance between UV, UW, and VW phases of the motor with a multimeter to check whether they are equal.	Repair or replace the three-phase winding of the motor.	
E014.1	Drive overtem	Over-high ambient temperature	Measure the ambient temperature to check whether it is higher than 50°C.	Lower the ambient temperature.	Manual reset
	perature	Air filter blocked	Check whether the air filter of the fan is blocked.	Clean the air filter.	
		The fan is damaged.	After cooling down, start the AC drive and observe whether the fan rotates.	Replace the fan.	
		The thermistor is damaged	Contact the agent or Inovance for technical support.	Ask for technical support.	
		The module is damaged.	The fault persists after the preceding measures are taken.	Ask for technical support.	

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E160.1 L160.1 N160.1 A160.1	Modbus- RTU communi cation timeout	Ambient interference exists. The baud rate and data format of the master and slave are inconsistent.	Check whether the RS485 communication cable is correctly connected. Check whether communication parameters such as Modbus local address (n2-02), Modbus baud rate (n2-00), and Modbus data format (n2-01) are set correctly. The baud rate and data format set by the host controller and the AC drive must be	Connect the 485 communication cable. Ensure that the baud rate, data format, and station number set by the host controller and those set in the AC drive are consistent.	Auto
		The master does not send request data to the slave within the	consistent. The station number must be unique. Otherwise, communication can fail. 1. Check whether the master configures data request commands for the slave that reports errors.	Ensure that the master configures data request command for	
		timeout period.	Check whether the values of the Modbus communication timeout (n2-04) and the PLC communication cycle are proper. The Modbus communication timeout (n2-04) must be greater than the PLC communication cycle.	the slave that reports errors. 2. Ensure that the value of the Modbus communication timeout (n2-04) is higher than the PLC communication cycle.	

Fault Code	Name	Fault Cause	Confirmation Method	Solution	Reset Mode
E165.1 L165.1 N165.1 A165.1	EtherNet/ IP Ethernet communi cation timeout	The power supply of the device is unstable or the network topology is disturbed.	1. Check whether the power supply of the equipment is stable. Measure whether the bus voltage is within the operating voltage range. If not, check whether a high-power device is using the same power supply. The same power supply is used for high-power devices. This may cause voltage instability. In this case, an independent power supply is required. 2. Check whether the communication cable and power cable are routed through different routes. If the communication cable is routed together with the power cable, interference may occur. It is recommended to route the cables through different routes according to the cable routing specifications.	Ensure that no high-power devices share the same power supply. Use an independent power supply. Route the communication cables and power cables through different routes. If the voltage is still unstable after preceding measures are taken, replace the power supply.	Autoreset
		A fault occurs on the network device.	1. Ping the device continuously, check whether the device responds and whether the response delay is greater than the set communication service cycle. If no response or response delay is greater than the communication service cycle, the network equipment may be faulty. Use the step-by-step ping method to locate the faulty device and replace it. If the response delay is lower than the communication service cycle, check whether the delay fluctuation is stable or too large. If it is unstable or too large, the network equipment may be faulty or the network bandwidth may be insufficient. 2. Check whether the network bandwidth is sufficient with the command ifconfig.	1. Replace the network device that is faulty in the network topology. 2. If the network bandwidth is insufficient, reduce the number of nodes in the network topology or upgrade the network bandwidth.	
		The controller is faulty.	Check whether the controller works properly and whether there is any data sent. If not, the controller is abnormal and needs to be replaced.	Replace the controller.	

Fault	Name	Fault Cause	Confirmation Method	Solution	Reset
Code					Mode
E165.4 L165.4 N165.4 A165.4	Ethernet/ IP IP conflict	IP address conflict exists in the communication network.	Disconnect the device from the network and check whether the fault disappears. If there is no fault when the device is not connected to the network, the fault is reported after connection. The IP address of this	Modify the IP address of the conflict device.	Auto reset
			device conflicts with other devices in the network.		
E166.1 L166.1 N166.1 A166.1	PROFINET communi cation times out.	The master or slave is disconnected during communication. The mapping	The keypad displays the fault code. The operating panel displays the fault	Check the communication lines between the master and slave. Modify the illegal	Auto reset
L166.3 N166.3 A166.3	mapping address error	configured during configuration is illegal.	code and the master cannot establish data interaction with the slave.	mapping address.	reset
E167.1 L167.1 N167.1 A167.1	EtherCAT Sync is lost.	The slave hardware (for example, the ESC register) causes the synchronization signal to be lost and the drive runs improperly.	Observe whether the indicator (difference between SYNC and IRQ phases) is larger than the synchronization cycle set by the master through the continuous oscilloscope function of Inovance software, If yes, it indicates an error.	Replace the AC drive or contact technical support.	Auto reset
E167.2 L167.2 N167.2 A167.2	EtherCAT link lost	The physical connection of the data link is unstable or the process data is lost due to plug-in/plug-out of the network cable.	When the device is not powered on again, view the value of the link loss register through the software tool of the master. If it is not zero or the value increases continuously, the process data is lost.	Check whether the network cable of the drive is connected reliably. Check whether the network cable is loose due to strong vibration in the field. Ensure that the network cable is connected securely.	Auto reset
E167.7 L167.7 N167.7 A167.7	The number or length of EtherCAT PDO mapping exceeds the limit.	The master configuration information is incorrect.	Check whether the PDO is configured correctly.	Configure the number of mapped PDOs and bytes correctly. You can configure a maximum of 16 PDOs per group, and a maximum of 32 bytes per group of PDOs.	Auto reset

Fault	Name	Fault Cause	Confirmation Method	Solution	Reset
Code					Mode
E167.8	EtherCAT	The data frame is	If master communication is not	Check whether link loss	Auto
L167.8	process	lost at the upstream	recovered, view the synchronous loss	occurs on the upstream	reset
N167.8	data	station and the	counter value (n4-30) of the drive.	station. Check that the	
A167.8	reception	upstream station is	When a fault occurs, the value is not 0.	wiring is correct.	
	timeout	faulty.			
		The performance of	Observe the SYNC and Irq phases	Check whether the CPU	
		the master is poor,	through the online oscilloscope	operation load of the	
		the jitter of the IRQ	function in the software tool of the	master is too large. You	
		exceeds the set	drive. When a fault occurs, the phase	can optimize load	
		value x	is greater than or equal to the	reduction of the master	
		communication	synchronization loss threshold x	by reducing the	
		cycle.	communication cycle.	communication time	
				and setting a high	
				synchronization loss	
				threshold.	
N194.1	STO1 and	Both STO1 and	Check whether the 24 V power supply	1. Check whether the	Auto
	STO2 are	STO2 are	of the STO is normal.	wiring is correct.	reset
	disconnect	disconnected.		2. Contact the agent or	
	ed.			Inovance for technical	
				support.	

8 Commissioning Parameters

8.1 Control Method and Control Mode

Parame	Name	Default	Value Range
ter			
F0-01 (d0-00)	Motor control method	2	0: SVC 2: V/f
F0-02 (d0-01)	Motor control mode	0	0: Speed control 1: Torque control 3: DI1 4: DI2 5: DI3 (active only for MD630S) 6: DI4 (active only for MD630S) 7: DI5 (active only for MD630S) 8: DI6 (active only for MD630S) 9: DI7 (active only for MD630S) Others: B connector

8.2 Parameters Related to Frequency Settings

Parameter	Parameter Name	Default	Value Range
F0-25 (A0-70)	Frequency decimal place	2	1: 1 decimal places 2: 2 decimal places
F0-29 (b5-00)	Main frequency source	0	0: Set by the parameter (F0-30) 2: Al1 3: Al2 5: HDI pulse reference (active only for MD630S) 6: Multi-reference 7: Simple PLC 8: PID 9: Communication reference Others: F connector
F0-30 (b5-01)	Digital setting of main frequency	50.00 Hz	0.00 to A2-17

Parameter	Parameter Name	Default	Value Range
F0-31 (b5-02)	Auxiliary frequency source	0	0: Disabled 2: Al1 3: Al2 5: HDI pulse reference (active only for MD630S) 6: Multi-reference 7: Simple PLC 8: PID 9: Communication reference Others: F connector
F0-32 (b5-03)	Main and auxiliary frequency operation	0	0: Main frequency + auxiliary frequency 1: Main frequency - auxiliary frequency 2: Max (Main , Auxiliary) 3: Min(Main , Auxiliary) 4: Main frequency x auxiliary frequency
F0-33 (b5-04)	Auxiliary frequency source	0	0: Disabled 2: Al1 3: Al2 5: HDI pulse reference (active only for MD630S) 6: Multi-reference 7: Simple PLC 8: PID 9: Communication reference Others: F connector
F0-34 (b5-05)	Main frequency gain factor source	0	0: 100% 2: Al1 3: Al2 5: HDI pulse reference (active only for MD630S) 6: Multi-reference 7: Simple PLC 8: PID 9: Communication reference Others: F connector

8.3 Parameters Related to Multi-reference

Param.	Parameter Name	Default	Value Range
F0-38 (b8-08)	Multi-reference 0 setting mode	0	0: Set by the parameter (F0-39) 1: Al1 2: Al2 4: HDI pulse (valid only for MD630S) 5: PID 6: Digital setting of main frequency (b5-01/b6-01) for the current valid channel Others: F connector
F0-39 (b8-09)	Multi-reference 0	0.0	b8-43 to b8-42
F0-40 (b8-10)	Multi-reference 1	0.0	b8-43 to b8-42
F0-41 (b8-11)	Multi-reference 2	0.0	b8-43 to b8-42
F0-42 (b8-12)	Multi-reference 3	0.0	b8-43 to b8-42

8.4 Parameters Related to V/f Curve

When F0-01 (Motor control mode) = 2 (V/f), V/f-related parameters need to be set. V/f control is divided into V/f curve and V/f separation modes, and V/f curve includes multiple selections, such as linear V/f and multi-point V/f curve.

Item	Parameter Name	Default	Value Range
d2-00	V/f curve type	0	0: Linear V/f curve 1: Multi-point V/f curve 10: Separated V/f
d2-02	Frequency point 1 on a multi-point V/f curve	0.0 Hz	0-d2-03
d2-03	Frequency point 2 on a multi-point V/f curve	0.0 Hz	d2-02 to d2-04
d2-04	Frequency point 3 on a multi-point V/f curve	0.0 Hz	d2-03 to 600.0 Hz
d2-08	Voltage point 1 on a multi-point V/f curve.	0.0V	0.0 V to 1000.0 V

Item	Parameter Name	Default	Value Range
d2-09	Voltage point 2 on a multi-point V/f curve.	0.0V	0.0 V to 1000.0 V
d2-10	Voltage point 3 on a multi-point V/f curve.	0.0V	0.0 V to 1000.0 V
d2-47	Upper limit of V/f separation voltage	100.0%	50.0%–200.0%
d2-48	Voltage source of V/f separation	0	O: Set by the parameter (d2-49) 2: Al1 3: Al2 5: HDI pulse reference (active only for MD630S) 6: Multi-reference 7: Simple PLC 8: PID 9: Communication Others: F connector
d2-49	Digital setting of V/f separation voltage	OV	0-C4-03
d2-50	Voltage acceleration time of V/f separation	0.0s	0.0s to 1000.0s
d2-51	Voltage deceleration time of V/f separation	0.0s	0.0s to 1000.0s
d2-52	Frequency RFG time of V/f separation	0	0: 0 1: Preset RFG time
d2-53	Stop mode selection of V/f separation	0	0: Frequency and voltage declined to 0 separately 1: Frequency declined after voltage declined to 0 2: Coast to stop (newly added)

8.5 Parameters Related to SVC Curve

When F0-01 (Motor control mode) = 0 (SVC), SVC-related parameters need to be set. The following table shows the related parameters. F2-02 to F2-03 set the control parameters, and F2-04 to F2-12 adjust the effective speed loop parameters according to the actual operating conditions.

Parameter	Parameter Name	Default	Value Range
F2-02 (d3-02)	SVC speed loop Kp	5.0	0.0 to 6000.0
F2-03 (d3-03)	Speed loop Ti in SVC mode	0.127s	0.000s to 20.000s
F2-04 (d3-06)	Zero speed switchover frequency	1.0%	0 to d3.09
F2-05 (d3-07)	Zero speed Kp correction factor	100.0%	0.0% to 1000.0%
F2-06 (d3-08)	Zero speed Ti correction factor	100.0%	0.0% to 1000.0%
F2-07 (d3-09)	Low speed switchover frequency	10.0%	0.0% to d312
F2-08 (d3-10)	Low speed Kp correction factor	100.0%	0.0% to 1000.0%
F2-09 (d3-11)	Low speed Ti correction factor	100.0%	0.0% to 1000.0%
F2-10 (d3-12)	High speed switchover frequency	100.0%	d3-09 to 400.0%
F2-11 (d3-13)	High speed Kp correction factor	100.0%	0.0% to 1000.0%
F2-12 (d3-14)	High speed Ti correction factor	100.0%	0.0% to 1000.0%

8.6 Motor Phase Sequence Switchover

Unlike the speed reverse function, the direction of the speed is not changed when the motor phase sequence is switched, but the actual running direction of the motor changes to the reverse direction.

Parameter	Parameter Name	Default	Value Range
F2-14 (d0-14)	Motor running direction selection	0	0: Run in the default direction 1: Running direction reversed

8.7 Acceleration/Deceleration time

Item	Parameter Name	Default	Value Range
F0-45 (b7-00)	Ramp acceleration/ deceleration mode	0	0: Linear acceleration/deceleration 1: S Curve
F0-46 (b7-01)	Base for ramp acceleration/ deceleration time	1	0: Rated frequency 1: Maximum frequency 2: 100 Hz 3: Frequency reference
F0-48 (b7-04)	Ramp 1 acceleration time	20.0s	0.0s to 6500.0s
F0-49 (b7-05)	Ramp 1 deceleration time	20.0s	0.0s to 6500.0s
F0-50 (b7-06)	Ramp 1 acceleration start arc	0.00s	0.00s to 650.00s
F0-51 (b7-07)	Ramp 1 acceleration end arc	0.00s	0.00s to 650.00s
F0-52 (b7-08)	Ramp 1 deceleration start arc	0.00s	0.00s to 650.00s
F0-53 (b7-09)	Ramp 1 deceleration end arc	0.00s	0.00s to 650.00s

8.8 Frequency Limits

Parameter	Parameter Name	Default	Value Range
F2-22 (d1-03)	Digital setting of positive frequency upper limit 1	800.0%	F2-26 to 800.0%
F2-23 (d1-04)	Digital setting of reverse frequency upper limit 1	-800.0%	-800.00% to F2-27
F2-24 (d1-05)	Source of forward frequency upper limit 2	0 [800.0%]	0: 800% 2: Al1 3: Al2 5: HDI pulse reference (active only for MD630S) 6: Multi-reference 7: Simple PLC 8: PID 9: Communication reference Others: F connector

Parameter	Parameter Name	Default	Value Range
F2-25 (d1-06)	Source of reverse frequency upper limit 2	1: [Opposite to the forward frequency upper limit 2}	0: -800% 1: Opposite to the forward frequency upper limit 2 2: Al1 3: Al2 5: HDI pulse reference (active only for MD630S) 6: Multi-reference 7: Simple PLC 8: PID 9: Communication reference Others: F connector
F2-26 (d1-07)	Digital setting of forward frequency lower limit 1	0.0%	0.0% to F2-22
F2-27 (d1-08)	Digital setting of reverse frequency lower limit 1	0.0%	F2-23 to 0.0%
F2-30 (d1-09)	Digital setting of torque upper limit 1	150.0%	0.0%–800.0%
F2-31 (d1-10)	Digital setting of torque lower limit 1	-150.0%	-800.0%-0.0%
F2-32 (d1-11)	Source of torque upper limit 2	0	0: 800% 2: Al1 3: Al2 5: HDI pulse reference (active only for MD630S) 6: Multi-reference 7: Simple PLC 8: PID 9: Communication reference Others: F connector
F2-33 (d1-12)	Source of torque lower limit 2	1	0: -800% 1: Opposite to the source of torque upper limit 2 2: Al1 3: Al2 5: HDI pulse reference (active only for MD630S) 6: Multi-reference 7: Simple PLC 8: PID 9: Communication reference Others: F connector

8.9 Common Protection Parameter

Parameter	Parameter Name	Default	Value Range
F2-36 (d0-41)	Overexcitation gain (V/f)	90%	0%–200%
F2-37 (d2-26)	Overcurrent suppression	1	0: Disable 1: Enable
F2-38 (d2-27)	Overcurrent suppression threshold	200%	80% to 300%
F2-39 (d1-54)	Overvoltage suppression	0x0001	bit 0: V/f overvoltage suppression 0: Disable 1: Enable bit 1: vector overvoltage suppression 0: Disable 1: Enable
F2-40 (d1-55)	Overvoltage suppression action voltage	770.0V	600.0 V to A3-57
F2-43 (d1-63)	Undervoltage action selection	0	0: No action. 1: Undervoltage suppression 2: Decelerate to stop
F2-44 (d1-64)	Undervoltage suppression action voltage	430.0V	A3-55 to 500.0 V

8.10 Startup Parameters

Parameter	Parameter Name	Default	Value Range
F2-15 (d0-02)	Start mode	0	0: Direct start 1: Flying start
F2-16 (d0-03)	Flying start mode	4	0: From frequency at stop 1: From the mains frequency 2: From the maximum frequency 4: Magnetic field oriented flying start
d0-23	Startup frequency	0.00 Hz	0.00 Hz to 10.00 Hz
d0-24	(Startup frequency holding time)	0.0s	0.0s to 1000.0s
d0-25	DC braking time at startup	0.0s	0.0s to 100.0s
d0-26	DC braking current at startup	50%	0%–800%

8.11 Stop Mode

Item	Parameter Name	Default	Value Range
d0-04	OFF1 stop mode	0	0: Decelerate to stop 1: Coast to stop 2: Stop at maximum capability
d0-05	OFF2 (coast to stop) stop mode	0	0: Coast to stop
d0-06	OFF3 (quick stop) stop mode	0	0: Quick stop 1: Stop at maximum capability
d0-27	Starting frequency for DC braking at stop	0.0 Hz	0.0 Hz to 600.0 Hz
d0-28	DC braking waiting time for stop	0.0s	0.0s to 100.0s
d0-29	DC braking time at stop	0.0s	0.0s to 100.0s
d0-30	DC braking current at stop	50%	0%-800%

8.12 Carrier Frequency Parameters

Parameter	Parameter Name	Default	Value Range
F2-48 (A5-06)	Overmodulation coefficient	103.0%	0.0%–110.0%
F2-50 (A5-01)	Set carrier frequency	4.0 kHz	0.8 kHz to 20.0 kHz

8.13 I/O Parameters

Item	Parameter Name	Default	Value Range
F4-00 (b9-00)	Start/stop module A/ B selection by terminal	0	0: Module A 1: Module B Others: B connector
F4-01 (b9-01)	Mode of terminal start/stop module A	3	0: Disable 1: IN1 start 2: IN1 start, IN2 direction 3: IN1 start in forward direction, IN2 start in reverse direction 4: IN1P (rising edge) start, IN2 stop 5: IN1P (rising edge) start, IN2 stop, IN3 direction 6: IN1P(rising edge) start, IN2P(rising edge) start in reverse direction, IN3 stop
F4-02 (b9-09)	Mode of terminal start/stop module B	3	0: Disable 1: IN1 start 2: IN1 start, IN2 direction 3: IN1 start in forward direction, IN2 start in reverse direction 4: IN1P (rising edge) start, IN2 stop 5: IN1P (rising edge) start, IN2 stop, IN3 direction 6: IN1P(rising edge) start, IN2P(rising edge) start in reverse direction, IN3 stop
F4-03 (E0-00)	DI1 function selection	1	/
F4-04 (E0-01)	DI2 function selection	4	
F4-05 (E0-02)	DI3 function selection (for MD630S)	9	
F4-06 (E0-03)	DI4 function selection (for MD630S)	12	
F4-07 (E0-04)	DI5 function selection (for MD630S)	13	
F4-08 (E0-05)	DI6 function selection (for MD630S)	0	
F4-09 (E0-06)	DI7 function selection (for MD630S)	0	

Item	Parameter Name	Default	Value Range
F4-14 (E1-00)	RO output function selection	2	/
F4-15 (E1-04)	DO output function selection	0	
F4-16 (E1-08)	FMR (HDO) function selection	0	
F4-21 (E2-10)	AI2 filter time	0.10s	0.00s to 10.00s
F4-22 (E2-19)	AI2 fitter time	0.10s	0.00s to 10.00s
F4-27 (E2-38)	Al curve	0x0021	0x0001 to 0x0055
F4-28 (E2-40)	Minimum input of Al curve 1	0.00V	-10.00 V to F4-30
F4-29 (E2-41)	Percentage corresponding to minimum input of Al curve 1	0.0%	-800.0% to 800.0%
F4-30 (E2-42)	Maximum input of Al curve 1	10.00V	F4-28 to 10.00 V
F4-31 (E2-43)	Percentage corresponding to the maximum input of Al curve 1	100.0%	-800.0% to 800.0%
F4-32 (E2-44)	Minimum input of Al curve 2	0.00V	-10.00 V to F4-34
F4-33 (E2-45)	Percentage corresponding to minimum input of Al curve 2	0.0%	-800.0% to 800.0%
F4-34 (E2-46)	Maximum input of Al curve 2	10.00V	F4-32 to 10.00 V
F4-35 (E2-47)	Percentage corresponding to the maximum input of Al curve 2	100.0%	-800.0% to 800.0%
F4-36 (E2-48)	Minimum input of Al curve 3	0.00V	-10.00 V to F4-38
F4-37 (E2-49)	Percentage corresponding to minimum input of AI curve 3	0.0%	-800.0% to 800.0%
F4-38 (E2-50)	Maximum input of Al curve 3	10.00V	F4-36 to 10.00 V

Item	Parameter Name	Default	Value Range
F4-39 (E2-51)	Percentage corresponding to the maximum input of Al curve 3	100.0%	-800.0% to 800.0%
F4-40 (E2-52)	Minimum input of Al curve 4	0.00V	-10.00 V to F4-42
F4-41 (E2-53)	Percentage corresponding to minimum input of Al curve 4	0.0%	-800.0% to 800.0%
F4-42 (E2-54)	Inflection point 1 input of AI curve 4	3.00V	F4-40 to F4-44
F4-43 (E2-55)	Percentage corresponding to inflection point 1 input of Al curve 4	30.0%	-800.0% to 800.0%
F4-44 (E2-56)	Inflection point 2 input of AI curve 4	6.00V	F4-42 to F4-46
F4-45 (E2-57)	Percentage corresponding to inflection point 2 input of AI curve 4	60.0%	-800.0% to 800.0%
F4-46 (E2-58)	Maximum input of Al curve 4	10.00V	F4-44 to 10.00 V
F4-47 (E2-59)	Percentage corresponding to the maximum input of Al curve 4	100.0%	-800.0% to 800.0%
F4-48 (E2-60)	Minimum input of Al curve 5	-10.00V	-10.00 V to F4-50
F4-49 (E2-61)	Percentage corresponding to minimum input of Al curve 5	-100.0%	-800.0% to 800.0%
F4-50 (E2-62)	Inflection point 1 input of AI curve 5	-3.00V	F4-48 to F4-52
F4-51 (E2-63)	Percentage corresponding to inflection point 1 input of Al curve 5	-30.0%	-800.0% to 800.0%
F4-52 (E2-64)	Inflection point 2 input of AI curve 5	3.00V	F4-50 to F4-54
F4-53 (E2-65)	Percentage corresponding to inflection point 2 input of Al curve 5	30.0%	-800.0% to 800.0%

Item	Parameter Name	Default	Value Range
F4-54 (E2-66)	Maximum input of Al curve 5	10.00V	F4-52 to 10.00 V
F4-55 (E2-67)	Percentage corresponding to the maximum input of Al curve 5	100.0%	-800.0% to 800.0%
F4-59 (E3-00)	AO output function selection	0	/
F4-60 (E3-05)	Minimum input of AO curve	0.0%	-800.00% to F4-62
F4-61 (E3-06)	Percentage corresponding to minimum input of AO curve	0.00V	0.00 V to 10.00 V
F4-62 (E3-07)	Maximum input of AO curve	100.0%	F4-60 to 800.0%
F4-63 (E3-08)	Percentage corresponding to the maximum input of AO curve	10.00V	0.00 V to 10.00 V
F4-68 (E4-00)	HDI terminal type selection	1: Used as DI	0: Used as HDI 1: Used as DI
F4-69 (E4-01)	HDI input	0 [Disable]	0: Disabled 1: Enabled Other: B connector
F4-70 (E4-07)	HDI curve setting	0: Two-point curve	Ones position: Selects the HDI curve. 0: Two-point curve 1: Four-point curve Tens position: Reserved Hundreds position: Reserved Thousands position: Reserved Ten thousands position: Reserved
F4-71 (E4-08)	Minimum input of two-point HDI curve	0.00 kHz	0.00 to F4-73
F4-72 (E4-09)	Percentage corresponding to minimum input of two-point HDI curve	0.0%	-800.0% to 800.0%
F4-73 (E4-10)	Maximum input of two-point HDI curve	20.00 kHz	F4-71 to 20.00 kHz
F4-74 (E4-11)	Percentage corresponding to maximum input of two-point HDI curve	100.0%	-800.0% to 800.0%

Item	Parameter Name	Default	Value Range
F4-75 (E4-12)	Minimum input of four-point HDI curve	0.00 kHz	0.00 to F4-77
F4-76 (E4-13)	Percentage corresponding to minimum input of four-point HDI curve	-100.0%	-800.0% to 800.0%
F4-77 (E4-14)	Inflection 1 input of HDI four-point curve	5.00 kHz	F4-75 to F4-79
F4-78 (E4-15)	Percentage corresponding to inflection point 1 input of four-point HDI curve	-30.0%	-800.0% to 800.0%
F4-79 (E4-16)	Inflection 2 input of HDI four-point curve	10.00 kHz	F4-77 to F4-81
F4-80 (E4-17)	Percentage corresponding to inflection point 2 input of four-point HDI curve	30.0%	-800.0% to 800.0%
F4-81 (E4-18)	Maximum input of four-point HDI curve	20.00 kHz	F4-79 to 20.00
F4-82 (E4-19)	Percentage corresponding to maximum input of four-point HDI curve	100.0%	-800.0% to 800.0%
F4-83 (E4-32)	HDI filter time	0.10s	0.00s to 10.00s
F4-88 (E5-00)	FM multi-functional terminal output selection	0 [HDO pulse output (FMP)]	0: HDO pulse output (FMP) 1: Digital output (FMR)
F4-89 (E5-01)	HDO output function selection	0: Running frequency	/
F4-90 (E5-03)	Minimum input of HDO curve	0.0	-100.0% to F4-92
F4-91 (E5-04)	Percentage corresponding to minimum input of HDO curve	0.00	0.00% to 100.00%
F4-92 (E5-05)	Maximum input of HDO curve	100.0	F4-90 to 100.0%

Item	Parameter Name	Default	Value Range
F4-93 (E5-06)	Percentage corresponding to the maximum input of HDO curve	100.00	0.00% to 100.00%
F4-97 (E5-15)	Maximum frequency of HDO output	50.00 kHz	0.01 kHz to 100.00 kHz

8.14 Communication Parameters

The following table shows the common communication parameters of MD630S.

Table 8–1 Common communication parameters of MD630S

Item	Parameter Name	Default	Value Range
Fd-00 (n1-02)	Commissioning address (for commissioning software/operating panel)	1	1 to 127
Fd-04 (n2-20)	Modbus communication enable	0	0: Not supported by the current device 1: Enabled
Fd-05 (n2-00)	Modbus baud rate	5	0: 300 bps 1: 600 bps 2: 1200bps 3: 2400 bps 4: 4800 bps 5: 9600 bps 6: 19200 bps 7: 38400 bps 8: 57600 bps 9: 115200 bps
Fd-06 (n2-01)	Modbus data format	0	0: 8-N-2 (No check) 1: 8-E-1 (Even parity check) 2: 8-O-1 (Odd parity check) 3: No check (8-N-1)
Fd-07 (n2-02)	Modbus local address	1	1 to 247
Fd-08 (n2-03)	Modbus response delay	2 ms	0 ms to 20 ms
Fd-09 (n2-04)	Modbus communication timeout time	0.0s	0.0s to 6000.0s

Item	Parameter Name	Default	Value Range
Fd-13 (n3-00)	CAN communication enable	0	0: Not supported by the current device 1: Enabled
Fd-14 (n3-01)	CAN communication protocol selection	2	1: CANopen 2: CANlink
Fd-15 (n3-02)	CANopen baud rate	5	0: 20 kbps 1: 50 kbps 2: 100kbps 3: 125 kbps 4: 250 kbps 5: 500 kbps 6: 1 Mbps
Fd-16 (n3-03)	CANopen station number	1	1 to 127
Fd-20 (n3-06)	CANlink baud rate	5	0: 20 kbps 1: 50 kbps 2: 100 kbps 3: 125 kbps 4: 250 kbps 5: 500 kbps 6: 1 Mbps
Fd-21 (n3-07)	CANlink station number	1	1 to 63
Fd-32 (n3-14)	CAN communication disconnection coefficient	3	1 to 15

The following table shows the common communication parameters of MD630N.

Table 8–2 Common communication parameters of MD630N

Item	Parameter Name	Default	Value Range
Fd-00 (n1-02)	Commissioning address (for commissioning software/operating panel)	1	1 to 127
Fd-01 (n0-10)	Communication type	1	1: EtherCAT 2: EtherNet/IP 3: PROFINET
Fd-39 (n4-16)	EtherCAT station name	0	0 to 65535
Fd-40 (n4-17)	EtherCAT station alias	0	0 to 65535
Fd-41 (n4-18)	EtherCAT station alias backup	0	0 to 65535

Item	Parameter Name	Default	Value Range
Fd-47 (n0-60)	MAC1 (EtherNet/IP, PROFINET)	0x0070	0x0000 to 0xFFFF
Fd-48 (n0-61)	MAC2 (EtherNet/IP, PROFINET)	0x00CA	0x0000 to 0xFFFF
Fd-49 (n0-62)	MAC3 (EtherNet/IP, PROFINET)	0x004D	0x0000 to 0xFFFF
Fd-50 (n0-63)	MAC4 (EtherNet/IP, PROFINET)	0x00AA	0x0000 to 0xFFFF
Fd-51 (n0-64)	MAC5 (EtherNet/IP, PROFINET)	0x00AA	0x0000 to 0xFFFF
Fd-52 (n0-65)	MAC6 (EtherNet/IP, PROFINET)	0x00AA	0x0000 to 0xFFFF
Fd-58 (n5-00)	EtherNet/IP-DHCP	0	0: Disable 1: Enable
Fd-59 (n5-01)	Most significant byte of EtherNet/IP-IP address	0	0 to 255
Fd-60 (n5-02)	Second most significant byte of EtherNet/IP-IP address	0	0 to 255
Fd-61 (n5-03)	Third byte of EtherNet/IP-IP address	0	0 to 255
Fd-62 (n5-04)	Least significant byte of EtherNet/IP-IP address	0	0 to 255
Fd-63 (n5-05)	EtherNet/IP-Most significant byte of subnet mask	0	0 to 255
Fd-64 (n5-06)	EtherNet/IP-Second most significant byte of subnet mask	0	0 to 255
Fd-65 (n5-07)	EtherNet/IP-Third byte of subnet mask	0	0 to 255
Fd-66 (n5-08)	EtherNet/IP-Least significant byte of subnet mask	0	0 to 255
Fd-67 (n5-09)	EtherNet/IP-Most significant byte of gateway	0	0 to 255
Fd-68 (n5-10)	EtherNet/IP-Second most significant byte of gateway	0	0 to 255

Item	Parameter Name	Default	Value Range
Fd-69 (n5-11)	EtherNet/IP-Third byte of gateway	0	0 to 255
Fd-70 (n5-12)	EtherNet/IP-Least significant byte of gateway	0	0 to 255
Fd-76 (n6-01)	PROFINET-Most significant byte of the IP address	0	0 to 255
Fd-77 (n6-02)	PROFINET-Least significant byte of the IP address	0	0 to 255
Fd-78 (n6-03)	PROFINET-Third byte of the IP address	0	0 to 255
Fd-79 (n6-04)	PROFINET-Least significant byte of the IP address	0	0 to 255
Fd-80 (n6-05)	PROFINET-Most significant byte of the subnet mask	0	0 to 255
Fd-81 (n6-06)	PROFINET-Second most significant byte of the subnet mask	0	0 to 255
Fd-82 (n6-07)	PROFINET-Third byte of subnet mask	0	0 to 255
Fd-83 (n6-08)	PROFINET-Least significant byte of subnet mask	0	0 to 255
Fd-84 (n6-09)	PROFINET-Most significant byte of gateway	0	0 to 255
Fd-85 (n6-10)	PROFINET-Second most significant byte of gateway	0	0 to 255
Fd-86 (n6-11)	PROFINET-Third byte of gateway	0	0 to 255
Fd-87 (n6-12)	PROFINET-Least significant byte of gateway	0	0 to 255





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