

Foreword

Thank you for choosing SINE Electric's EM650C series all-in-one air compressor.

Document No.: 31010236

Release date: February 2025

Version: 5.0

The EM650C series machine is a highly reliable and highly integrated dedicated air compressor launched by Sinee Electric. The EM650C is mainly designed for permanent magnet synchronous motors and adopts sensorless vector control technology (SVC).

The EM650C series all-in-one machine has the following features:

- High system integration: The machine is equipped with a built-in 220V transformer for solenoid valve power supply and a built-in start-stop control switch for power frequency cooling fan; it is also equipped with a dedicated touch screen for air compressor systems; it integrates temperature and pressure acquisition and protection circuits, requiring no expansion card;
- The control line adopts pluggable terminals and is designed to prevent incorrect terminal insertion;
- The all-in-one product integrates special software for the air compressor industry;
- The touch screen integrates the working process of the air compressor system;
- At 50°C ambient temperature, no derating is required;
- Comprehensive protection functions: Fan phase sequence protection, fan overload and overcurrent protection, fan short-circuit protection; multiple protections for the main motor drive such as short circuit, overcurrent, overvoltage, overload, and overheating.

Before using the EM650C series products, please read this manual carefully and keep it properly.

When the all-in-one air compressor is connected to the motor for the first time, please correctly set the motor nameplate parameters: rated power, rated voltage, rated current, rated frequency, rated speed, motor connection method, and rated power factor, etc.

As we are always committed to improving our products and product materials, the information provided by our company is subject to change without prior notice.

For the latest changes and more content, please visit www.sinee.cn

Safety Precautions

Safety definition: In this manual, safety precautions are divided into the following two categories:



Danger: Hazards caused by failure to operate as required, which may result in serious injury or even death.



Caution: Hazards caused by failure to operate as required, which may result in moderate or minor injury, as well as equipment damage. Users must read this chapter carefully during installation, commissioning, and maintenance of the system, and must operate in accordance with the safety precautions specified in this chapter. The company shall not be liable for any injuries or losses caused by improper operation.

Safety Precautions

Before installation:



Danger

1. Do not install the machine if water enters the package, parts are missing, or parts are damaged when unpacking!
2. Do not install the machine if the outer packaging label does not match the actual product name!



Caution

1. Handle with care during transportation; otherwise, there is a risk of damaging the equipment!
2. Do not use damaged or incomplete all-in-one machines, as there is a risk of injury!
3. Do not touch the components of the control system with your hands, otherwise there is a risk of electrostatic damage!

During installation:



Danger

1. Please install it on flame-retardant objects such as metal and keep it away from combustibles; otherwise, it may cause a fire!
2. Do not arbitrarily loosen the fixing bolts of the equipment components, especially those with red marks!



Caution

1. Do not let wire ends or screws fall into the all-in-one machine; otherwise, it may cause damage to the machine!
2. Please install the all-in-one machine in a place with little vibration and away from direct sunlight.
3. When the all-in-one machine is placed in a relatively closed cabinet or space, pay attention to the installation gap to ensure heat dissipation.

During wiring:



Danger

1. Construction must be carried out by professional electrical engineers in accordance with the instructions in this manual; otherwise, unexpected dangers may occur!
2. A circuit breaker must be installed between the all-in-one machine and the power supply (it is recommended to use a specification greater than or equal to and closest to twice the rated current); otherwise, a fire may occur!
3. Before wiring, please confirm that the power supply is in a zero-energy state; otherwise, there is a risk of electric shock!!
4. Never connect the input power to the output terminals (U1/U2, V1/V2, W1/W2) of the all-in-one machine. Pay attention to the marks on the terminals and do not connect to the wrong wires! Otherwise, it will cause damage to the all-in-one machine!
5. Please properly, standardly, and reliably ground the all-in-one machine in accordance with standards; otherwise, there may be risks of electric shock and fire!



Caution

1. Ensure that the configured lines meet EMC requirements and the safety standards of the region. Please refer to the preferred recommendations for the wire diameter of the wires used. Otherwise, accidents may occur!
2. Please use a screwdriver with the specified torque to fasten the terminals; otherwise, there is a risk of fire.
3. Do not connect phase-shifting capacitors and LC/RC noise filters to the output circuit.
4. Do not connect electromagnetic switches or contactors to the output circuit. Otherwise, the overcurrent protection circuit of the all-in-one machine will act, and in severe cases, it may cause internal damage to the all-in-one machine.
5. Do not disassemble the internal connecting cables of the all-in-one machine; otherwise, it may cause internal damage to the all-in-one machine.

Before power-on:



Danger

1. Please confirm whether the voltage level of the input power supply is consistent with the rated voltage level of the all-in-one machine; check whether the wiring positions of the power input terminals (R, S, T) and output terminals (U1/U2, V1/V2, W1/W2) are correct; and pay attention to checking whether there is a short circuit in the peripheral circuits connected to the all-in-one machine and whether the connected lines are fastened. Otherwise, the all-in-one machine may be damaged!
2. No part of the all-in-one machine needs to undergo a withstand voltage test, as the product has passed this test before leaving the factory. Otherwise, an accident may occur!



Caution

1. The all-in-one machine can only be powered on after the cover plate is properly closed; otherwise, there may be a risk of electric shock!
2. The wiring of all peripheral accessories must comply with the instructions in this manual and be connected correctly according to the circuit connection methods provided in this manual. Otherwise, an accident may occur!

After power-on:



Danger

1. Do not touch the all-in-one machine and surrounding circuits with wet hands; otherwise, there is a risk of electric shock!

2. If the panel stop indicator does not turn on after powering on, please immediately turn off the power switch. Do not touch any terminals on the R, S, T, or other connection terminals of the all-in-one machine with hands or a screwdriver; otherwise, there is a risk of electric shock. After turning off the power switch, please contact our customer service personnel immediately.
3. At the initial stage of power-on, the all-in-one machine automatically conducts a safety test on the external high-voltage circuit. During this period, never touch the U1, V1, W1 terminals of the all-in-one machine or the motor terminals; otherwise, there is a risk of electric shock!
4. Do not disassemble any parts of the all-in-one machine when it is powered on.



Caution

1. If parameter identification is required, be aware of the risk of injury from the rotating motor; otherwise, an accident may occur!
2. Do not arbitrarily modify the manufacturer's parameters of the all-in-one machine; otherwise, equipment damage may occur!

During operation:



Danger

1. Do not touch the cooling fan, radiator, or discharge resistor to test the temperature; otherwise, burns may occur!
2. Non-professional technicians are not allowed to detect signals during operation; otherwise, personal injury or equipment damage may occur!



Caution

1. During the operation of the all-in-one machine, avoid objects falling into the equipment; otherwise, the equipment may be damaged!
2. Do not use contactors to control the start and stop of the all-in-one machine by switching on and off; otherwise, the equipment may be damaged!

During maintenance:



Danger

1. Do not perform maintenance or servicing on the equipment while it is powered on; otherwise, there is a risk of electric shock!
2. Cut off the main circuit power supply, and confirm that the keyboard display interface has been off for at least 10 minutes before performing maintenance or servicing on the all-in-one machine. Otherwise, residual charges on the capacitors may cause harm to people!
3. Personnel without professional training are not allowed to perform maintenance or servicing on the all-in-one machine; otherwise, personal injury or equipment damage may occur!
4. After replacing the all-in-one machine, parameters must be set, and all pluggable interfaces must be plugged or unplugged when the power is off!
5. The synchronous motor will generate electricity when rotating. In the power-off state, wait for the motor to stop for 10 minutes before performing maintenance or servicing on the all-in-one machine; otherwise, there is a risk of electric shock!

Precautions

Motor insulation check

When a motor is used for the first time, reused after long-term storage, or during regular inspections, a motor insulation check should be performed to prevent damage to the all-in-one machine due to insulation failure of the motor windings. During the insulation check, the motor connection must be disconnected from the all-in-one machine. It is recommended to use a 500V voltage-type megohmmeter, and the measured insulation resistance must be at least 5MΩ.

Motor thermal protection

If the selected motor does not match the rated capacity of the all-in-one machine—especially when the rated power of the all-in-one machine is greater than that of the motor—be sure to adjust the motor protection-related parameters in the all-in-one machine or install a thermal relay in front of the motor to protect the motor.

Operation above power frequency

This all-in-one machine can provide an output frequency range of 0.00Hz~600.00Hz/0.0Hz~3000.0Hz. If the customer needs to operate the motor above its rated frequency, the load capacity of the mechanical device must be considered.

Motor heating and noise

Since the output voltage of the all-in-one machine is a PWM wave, which contains certain harmonics, the motor's temperature rise, noise, and vibration will increase slightly compared to operation at power frequency.

Presence of varistors or power factor correction capacitors on the output side

The output of the all-in-one machine is a PWM wave. If power factor correction capacitors, lightning protection varistors, or similar devices are installed on the output side, they may easily cause an instantaneous overcurrent in the all-in-one machine or even damage it. Do not use such devices.

Use beyond rated voltage value

The EM650C series open-loop vector all-in-one machine is not suitable for use outside the allowable operating voltage range specified in this manual, as this may damage internal components. If such use is necessary, use a corresponding step-up or step-down device for voltage conversion.

Lightning surge protection

This series of all-in-one machines is equipped with a lightning overcurrent protection device, which provides a certain degree of self-protection against induced lightning. For areas with frequent lightning strikes, customers should install additional protection at the front end of the all-in-one machine.

Altitude and derating

In areas where the altitude exceeds 1000m, the heat dissipation efficiency of the all-in-one machine decreases due to thin air, so derating is necessary: for every 100m increase in altitude, derate by 1% (maximum operating altitude: 3000m); when the temperature exceeds 50°C, derate by 1.5% for every 1°C increase (maximum operating temperature: 60°C). In such cases, please consult our company for technical support.

Notes on disposal of the all-in-one machine

Electrolytic capacitors in the main circuit and on the printed circuit board may explode if incinerated, and plastic components may produce toxic gases when burned. Dispose of the machine as industrial waste.

Contents

Chapter 1 Overview	8
1.1 Model and Specifications of EM650C Series All-in-One Machine	8
Chapter 2 Installation	10
2.1 Product Confirmation	10
2.2 Outline Dimensions and Installation Dimensions	11
2.3 Requirements and Management for Installation Site	15
2.4 Installation Direction and Space	16
Chapter 3 Wiring	17
3.1 Connection of Peripheral Devices	17
3.2 System Wiring Diagram	18
3.3 Main Circuit Wiring Terminals	18
3.4 Wiring of Control Circuit Terminals	21
Chapter 4 Touch Screen Operation	23
4.1 Home	23
4.2 Menu	24
4.3 Operating Parameters	24
4.4 User Parameters	24
4.5 Maintenance Parameters	26
4.6 Manufacturer Parameters	28
4.7 Inverter Parameters	32
4.8 Protection Records	33
4.9 Timed Operation	35
4.10 Pop-up Interfaces	35
Chapter 5 Trial Operation	38
5.1 Commissioning Process of the All-in-One Machine	38
5.2 Confirmation Items Before Power-on	39
5.3 Confirmation of the All-in-One Machine Status After Power-on	39

Chapter 6 Protection/Fault Solution 40

6.1 Protection/Fault Content 40

6.2 Protection Analysis 43

Chapter 7 Maintenance and Care 45

7.1 Daily Maintenance and Care of the All-in-One Machine45

7.2 Warranty Instructions for the All-in-One Machine 45

Chapter 8 Function Code Table 46

8.1 Description of the Function Code Table46

8.2 Functional Parameter Table 46

Chapter 1 Overview

1.1 Model and Specifications of EM650C Series All-in-One Machine

- Rated power supply voltage: Three-phase AC 340~460V;
- Applicable motor: Three-phase permanent magnet synchronous motor.

The model and rated output current of the EM650C series all-in-one machine are shown in Table 1-1.

Table 1-1 Models of EM650C series all-in-one machine

Rated Supply Voltage	Model	Main Motor		Power Frequency Fan	
		Applicable Motor Power (kW)	Rated Output Current (A)	Applicable Motor Power (kW)	Output Current (A)
Three-phase AC 340~440V	EM650C-7R5-3	7.5	17	0.4	1.5
	EM650C-011-3	11	25	0.4	1.5
	EM650C-015-3	15	32	0.4	1.5
	EM650C-022-3	22	45	0.75	2.1
	EM650C-030-3	30	60	1.5	3.8
	EM650C-037-3	37	75	1.5	3.8
	EM650C-045-3	45	90	4	10
	EM650C-055-3	55	110	4	10
	EM650C-075-3	75	150	4	10

- ★ The correct method for selecting the all-in-one machine is: The rated output current of the all-in-one machine $\geq$ the rated current of the motor, and the overload capacity should be considered.
- ★ It is generally recommended that the difference between the rated power of the all-in-one machine and the motor should not exceed two power levels.
- ★ The cooling fan is a power frequency motor with a three-phase 380V voltage level.

The technical specifications of the EM650C series all-in-one machine are shown in Table 1-2.

Table 1-2 Technical specifications of EM650C series all-in-one machine

Item		Specification
Power supply	Rated supply voltage	Three-phase 340V-10%~460V+10% 50~60Hz $\pm$ 5%, voltage unbalance rate < 3%
Output	Maximum output voltage	Maximum output voltage: Same as input supply voltage
	Output current rating	100% rated current continuous output
Basic control functions	Drive mode	Sensorless vector control (SVC)
	Input mode	Frequency (speed) input, torque input
	Start-stop control mode	Control terminal (two-wire control, three-wire control), communication
	Frequency control range	0.00~600.00Hz
	Input frequency resolution	Digital input: 0.01Hz/0.1Hz; analog input: 0.1% of maximum frequency

	Speed regulation range	1:200 (SVC)
	Speed control accuracy	$\pm 0.2\%$ of rated synchronous speed
	Acceleration and deceleration time	0.01s $\sim$ 600.00s / 0.1s $\sim$ 6000.0s / 1s $\sim$ 60000s
	Voltage/frequency characteristics	Rated output voltage: 20% $\sim$ 100% adjustable; base frequency: 1Hz $\sim$ 600Hz/3000Hz adjustable
	Torque boost	Fixed torque boost curve; arbitrary V/F curve optional
	Starting torque	150%/0.25Hz (SVC)
	Torque control accuracy	$\pm 5\%$ of rated torque (SVC)
	Output voltage self-adjustment	Output voltage remains basically unchanged when input voltage changes
	Automatic current limiting	Automatically limits output current to avoid frequent overcurrent tripping
	DC braking	Braking frequency: 0.01 $\sim$ maximum frequency; braking time: 0 $\sim$ 30s; Braking current: 0% $\sim$ 150% of rated current
Control port	Digital input terminals	3 channels of digital multi-functional digital input
	Analog input terminals	2 channels of temperature detection: PT100 temperature sensor detection 1 channel of pressure detection: 4 $\sim$ 20mA current input
	Digital output terminals	2 channels of relay output: 1 channel of solenoid valve power control circuit (220V AC), and 1 channel of weak current relay NO contact output
Display	LED display	3 LED digital tubes display the current status of the all-in-one machine (running, stopping, and fault status)
	Touch screen	System control, running status, and display interface
Protection	Protection function	Main unit has short circuit, overcurrent, overvoltage, undervoltage, phase loss, overload, overheat, load loss protection, etc.; fan has phase sequence protection, overcurrent, overload protection, etc.
Ambient conditions for operation	Mounting place	Indoor, altitude below 1000 meters, dust-free, no corrosive gas, and no direct sunlight. When the altitude exceeds 1000 meters, derate by 1% for every 100 meters increase; maximum operating altitude is 3000 meters
	Applicable environment	-10°C $\sim$ +50°C, 5% $\sim$ 95%RH (no condensation). When the ambient temperature exceeds 50°C, derating is required: derate by 3% for every 1°C increase; maximum operating ambient temperature is 60°C
	Vibration	Less than 0.5g
	Storage environment	-40°C $\sim$ +70°C
	Installation method	Wall-mounted, cabinet installation
Protection level		IP20
Cooling method		Forced air cooling

Chapter 2 Installation

2.1 Product Confirmation



Danger

- **Do not install a damaged all-in-one machine or one with missing components.**

There is a risk of injury

Upon receiving the product, please confirm the following items according to Table 2-1:

Table 2-1 Confirmation items

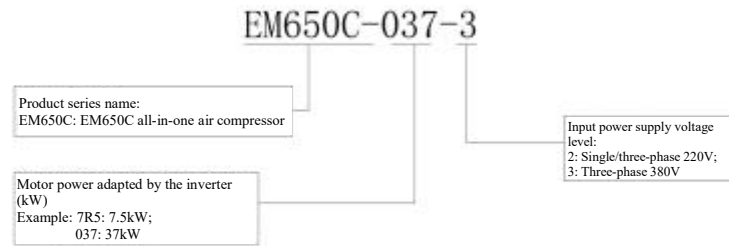
Confirmation Item	Confirmation Method
Whether the product matches the order.	Check the nameplate on the side of the all-in-one machine.
Whether there is any damage.	Check the overall appearance for damage during transportation.
Whether fasteners such as screws are loose.	If necessary, check with a screwdriver.

If any defects are found, please contact the agent or the marketing department of our company.

- **Nameplate**

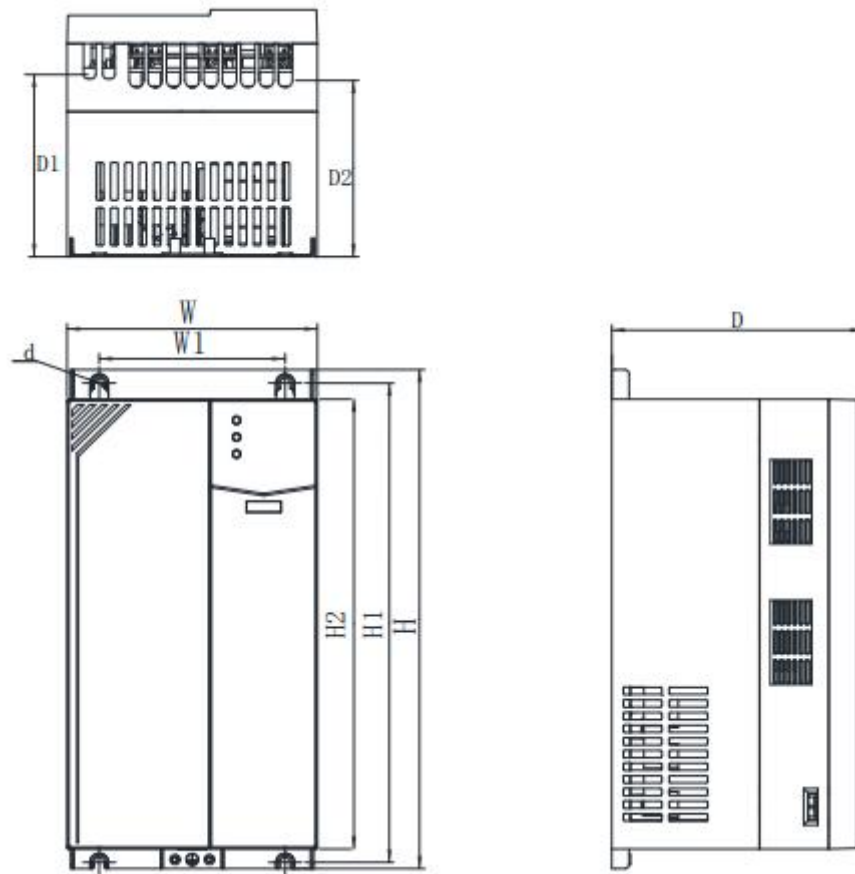


- **Model description of all-in-one machine**

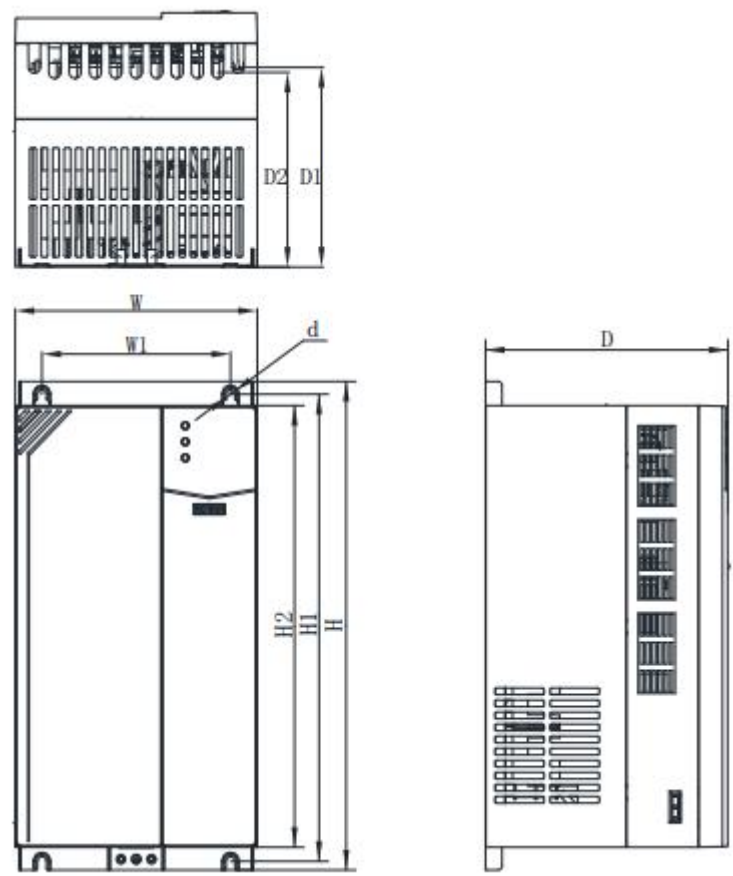


2.2 Outline Dimensions and Installation Dimensions

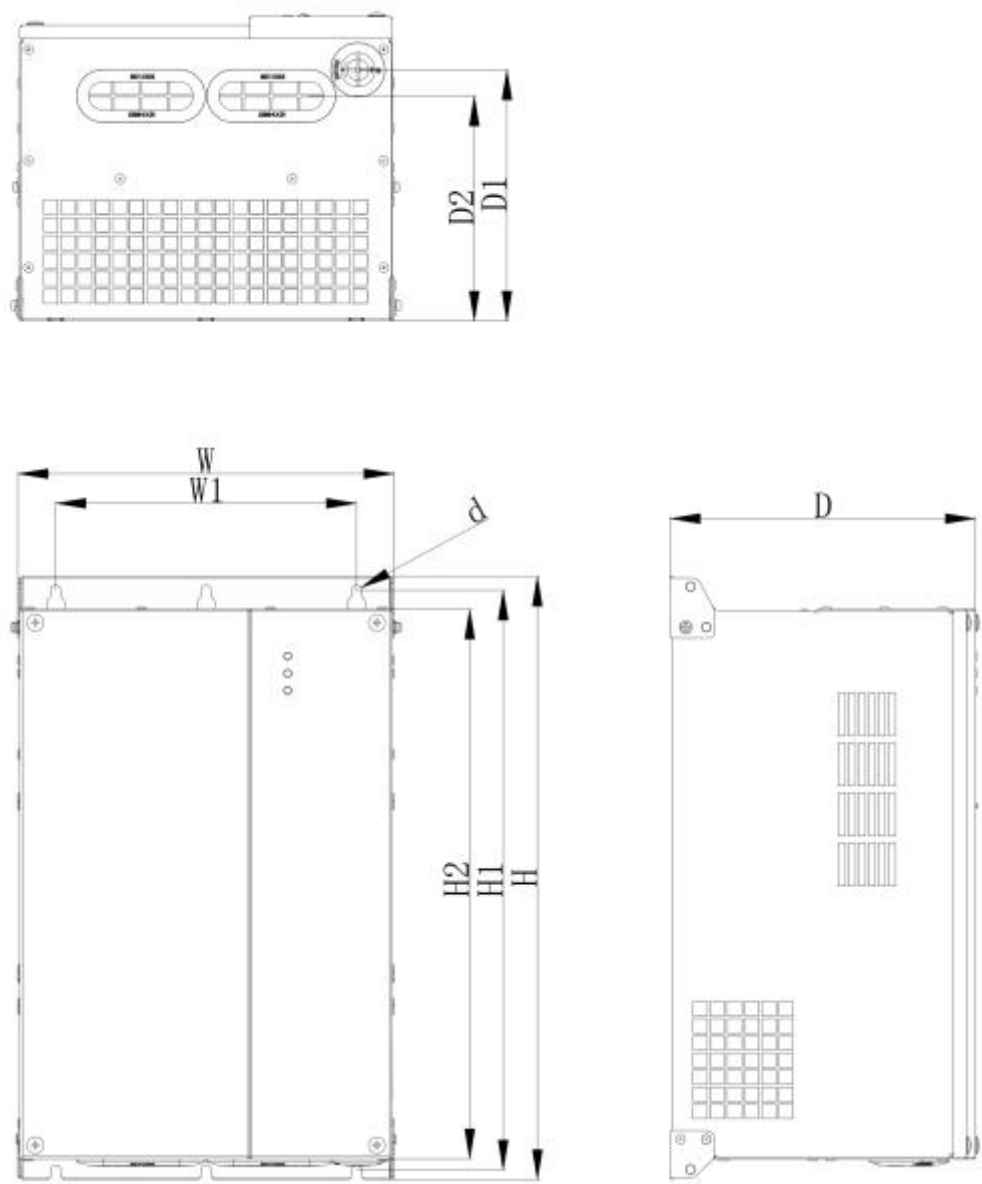
The EM650C series all-in-one machine has 4 specifications, including 3 types of outlines and 4 types of installation dimensions, as shown in Figure 2-1 and Table 2-2.



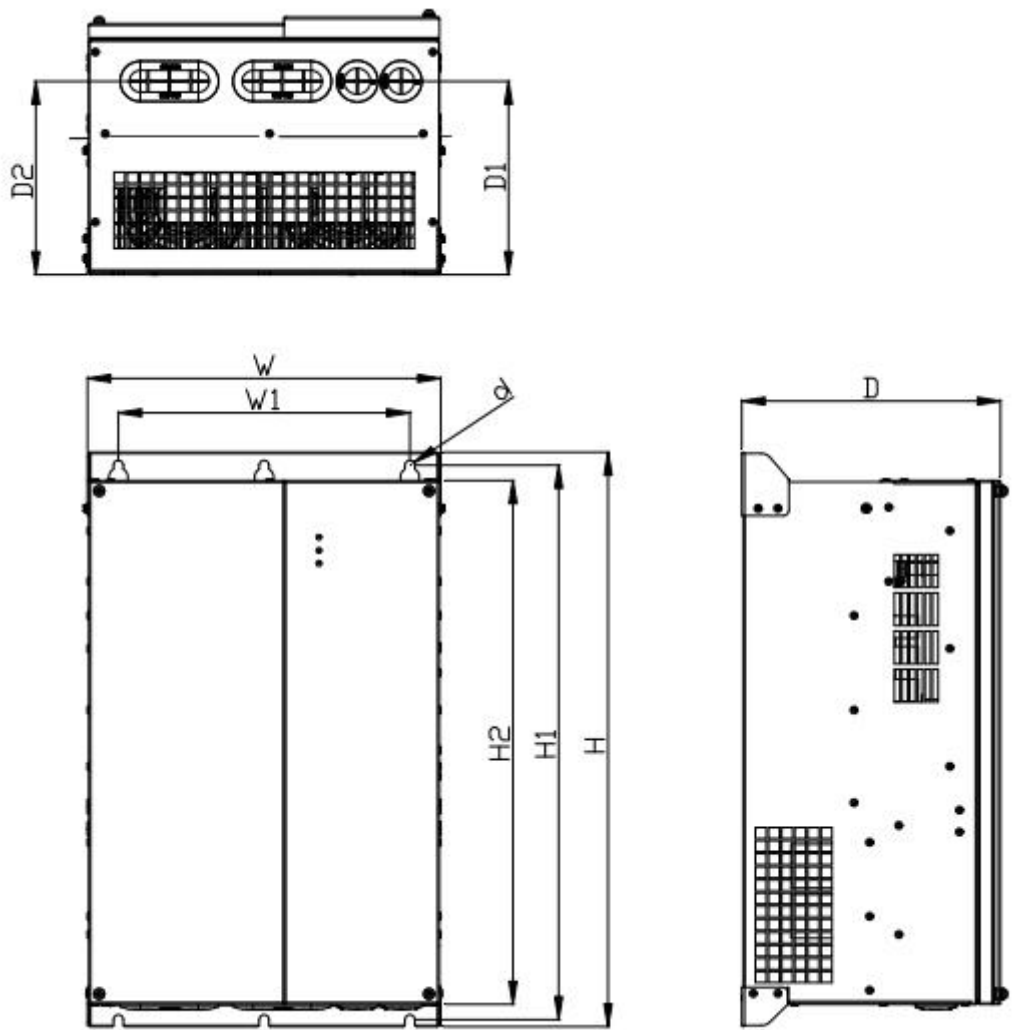
Outline dimension drawing of 7R5~015kW all-in-one machine



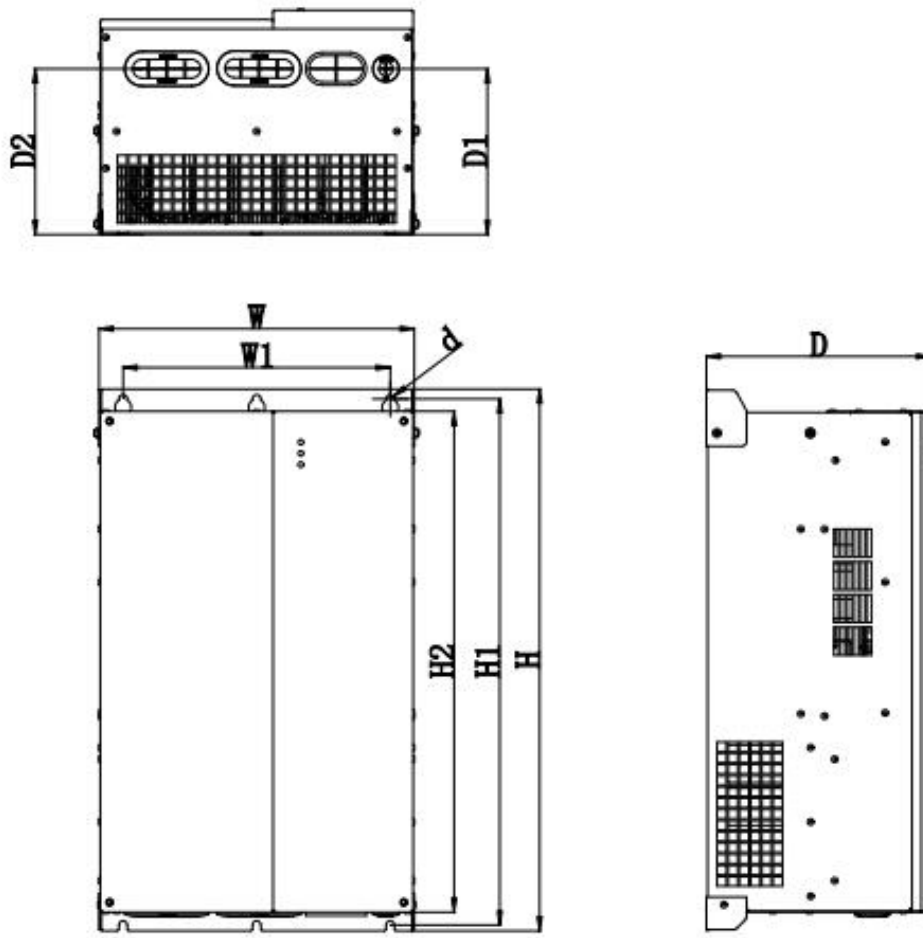
Outline dimension drawing of 22kW all-in-one machine



Outline dimension drawing of 37kW all-in-one machine



Outline dimension drawing of 45kW~55kW all-in-one machine



Outline dimension drawing of 75KW all-in-one machine

Figure 2-1 Outline Dimension Drawing of EM650C Series All-in-one Machine

Table 2-2 Outline dimensions and installation dimensions of EM650C series all-in-one machine

Specifications	W	W1	H	H1	H2	D	D1	D2	d
EM650C-7R5-3	140	105	305	292	276	161	133	116	6
EM650C-011-3	175	130	355	341	320	176	12	120.3	7
EM650C-015-3									
EM650C-022-3	190	148	365	349	330	190	150	146	7
EM650C-030-3	263	210	423	406	385	213	176	158	7
EM650C-037-3									
EM650C-045-3	323	266	527	508	480	237	178	178	9
EM650C-055-3									
EM650C-075-3	335	286	580	563	536	240	176	176	9

2.3 Requirements and Management for Installation Site

2.3.1 Installation Site

The installation site shall meet the following conditions:

1. Good indoor ventilation.
2. Temperature range of $-10^{\circ}\text{C} \sim 50^{\circ}\text{C}$. For plastic enclosures, if the ambient temperature exceeds 40°C , the top baffle must be removed.

3. Avoid high temperature and humidity; humidity should be less than 90%RH, with no rain or other liquid dripping.
4. Install on flame-retardant objects such as metal; do not install on flammable objects such as wood.
5. Avoid direct sunlight.
6. No flammable or corrosive gases and liquids.
7. No dust, oily dust, floating fibers, or metal particles.
8. The installation foundation is solid and free of vibration.

2.3.2 Preventive Measures

During installation, take protective measures for the all-in-one machine to prevent metal fragments or dust generated from drilling, etc., from falling into the interior of the machine. After installation, remove the protective materials.

2.4 Installation Direction and Space

The EM650C-7R5-3 and higher models are equipped with cooling fans for forced air cooling. To ensure good cooling circulation, the all-in-one machine must be installed vertically, and sufficient space must be maintained between its top, bottom, left, and right sides and adjacent objects or baffles (walls). Please refer to Figure 2-2.

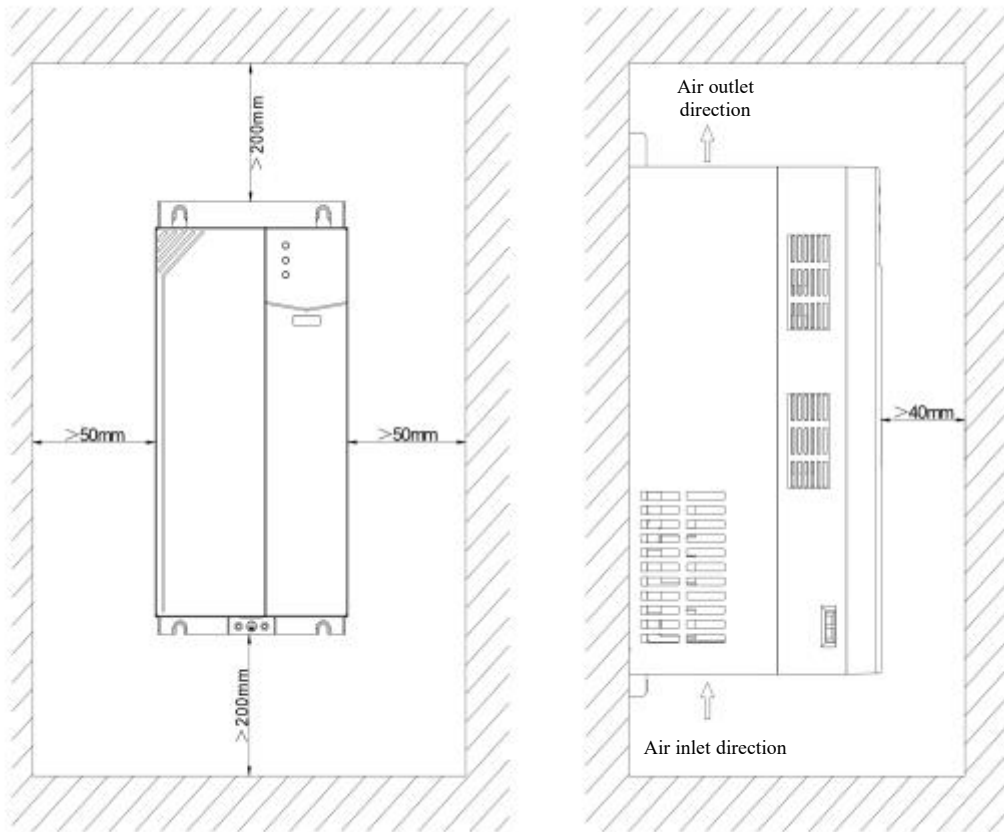


Figure 2-2 Installation Direction and Space of the All-in-one Machine

Chapter 3 Wiring

3.1 Connection of Peripheral Devices

The standard connection diagram of the EM650C series all-in-one machine with peripheral devices is shown in Figure 3-1.

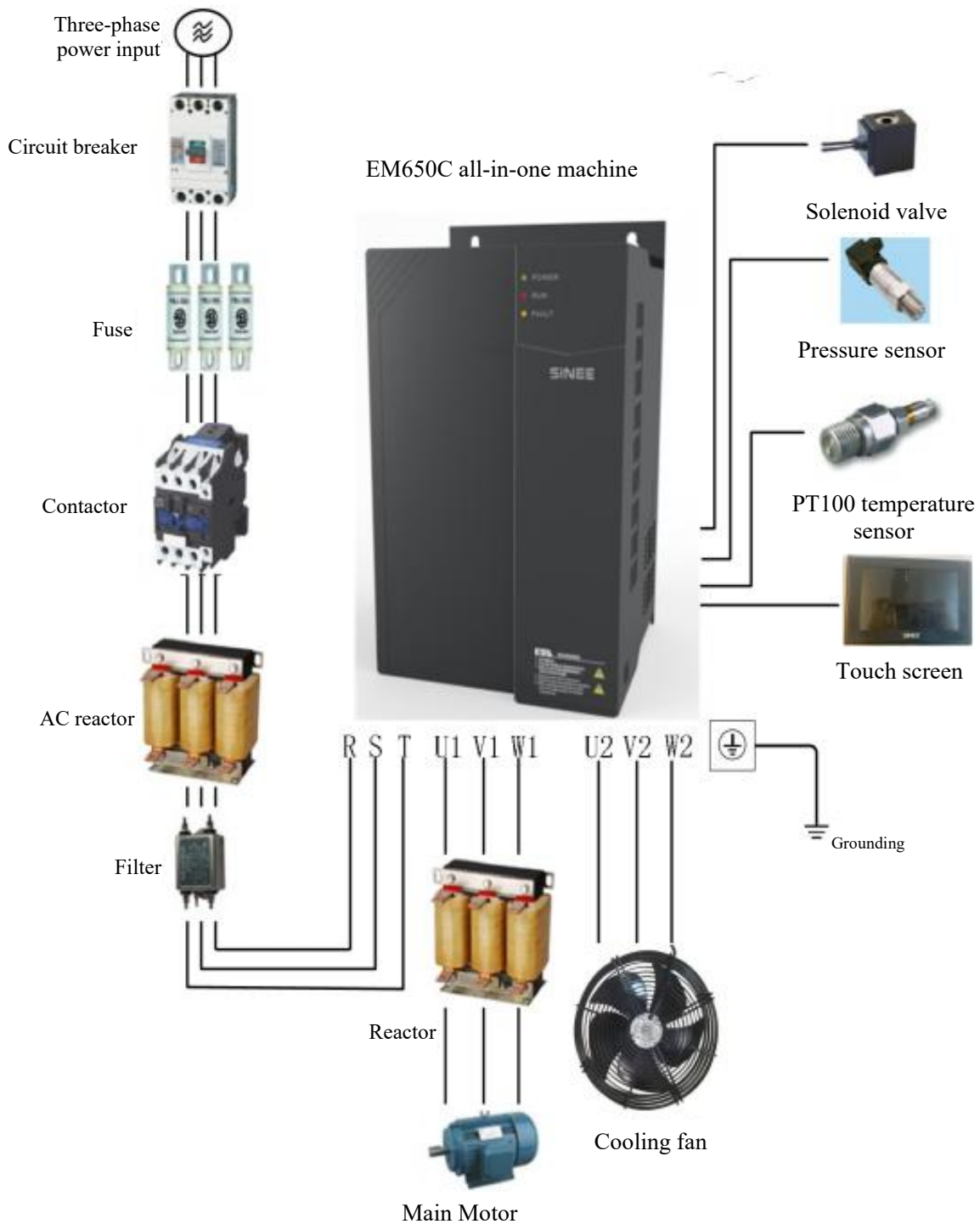


Figure 3-1 Connection Diagram of the All-in-one Machine and Peripheral Devices

3.2 System Wiring Diagram

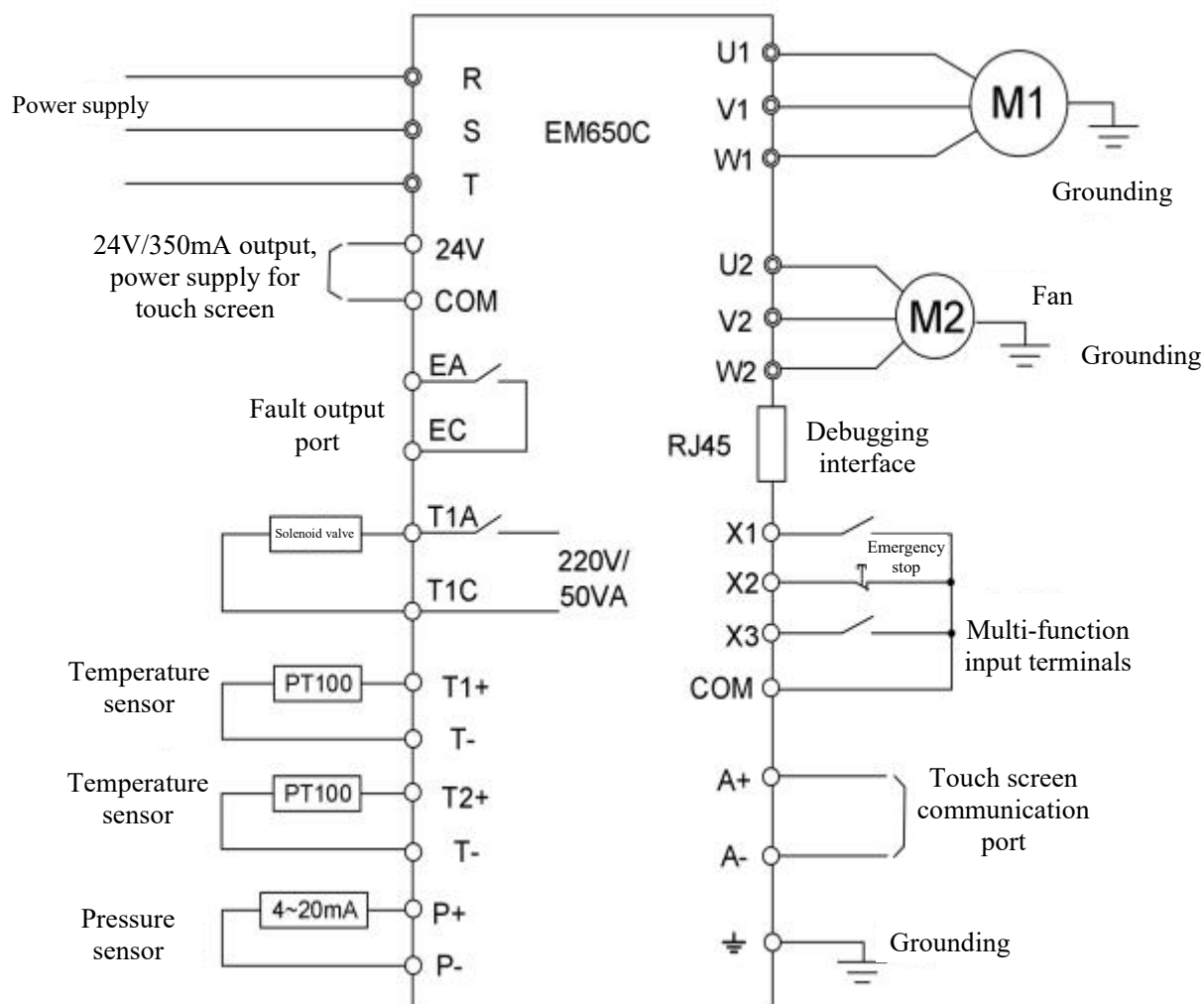
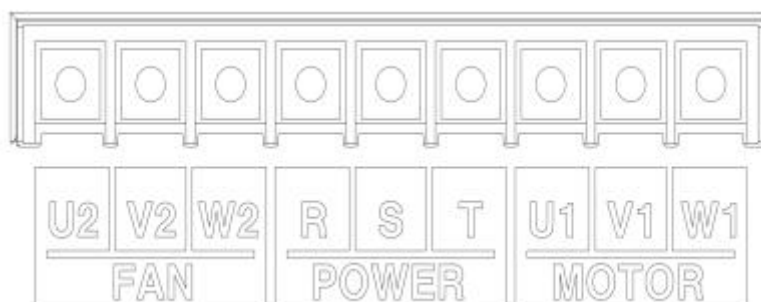


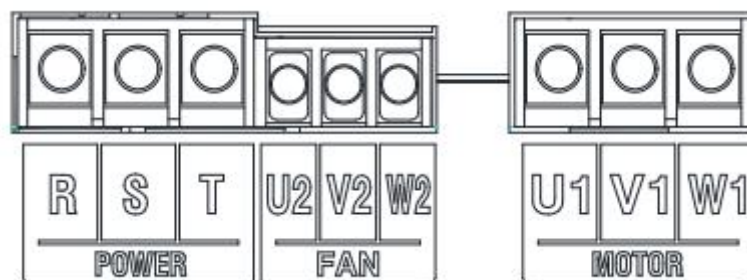
Figure 3-2 System Connection Diagram of the All-in-one Machine

3.3 Main Circuit Wiring Terminals

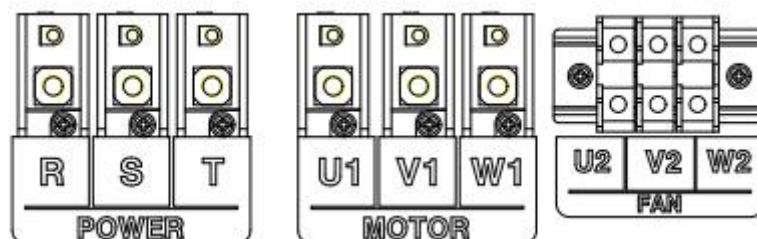
3.3.1 Composition of Main Circuit Terminals



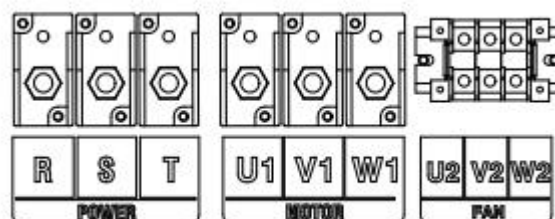
a) Schematic diagram of EM650C-7R5~022-3 terminals



b) Schematic diagram of EM650C-30~037-3 terminals



c) Schematic diagram of EM650C-45~55-3 terminals



d) Schematic diagram of EM650C-075-3 terminals

Figure 3-3 Schematic Diagram of Main Circuit Terminal Arrangement

3.3.2 Functions of Main Circuit Terminals

The functions of the main circuit terminals of the EM650C series all-in-one machine are as shown in the following table. Please connect the wires correctly according to the corresponding functions.

Terminal Label	Function Description
R, S, T	AC power input terminals, connected to three-phase AC power supply
U1, V1, W1	AC output terminals of the all-in-one machine, connected to three-phase AC motor
U2, V2, W2	Wiring terminals for the cooling fan
	Grounding terminal. For safety, be sure to connect to protective earth

3.3.3 Standard Wiring Diagram of Main Circuit

The standard wiring diagram of the main circuit of the EM650C series all-in-one machine is shown in Figure 3-4.

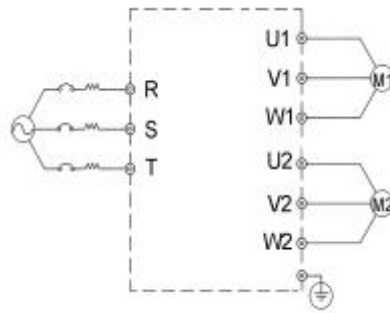


Figure 3-4 Standard Wiring of Main Circuit

3.3.4 Wiring on the Input Side of Main Circuit

3.3.4.1 Interference Countermeasures

The working principle of the all-in-one machine determines that it will generate external interference. Please configure the peripheral devices of the all-in-one machine according to Figure 3-1. Install the filter and the all-in-one machine on the same iron plate, and shield the all-in-one machine and peripheral devices with an iron box to reduce external interference, as shown in the following figure. For more detailed measures to reduce external interference, please refer to the user manual.

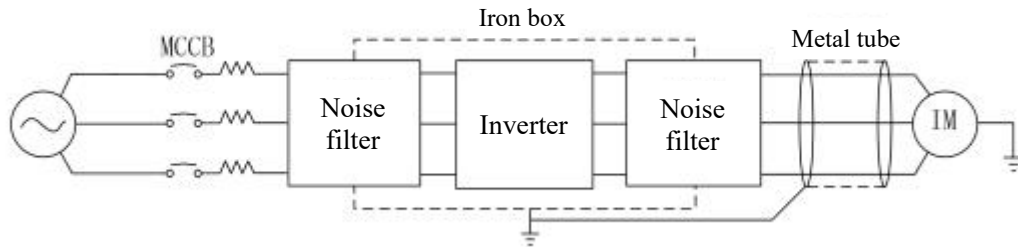


Figure 3-5 Countermeasures to Reduce External Interference

3.3.5 Specifications of Main Circuit Cables and Screws

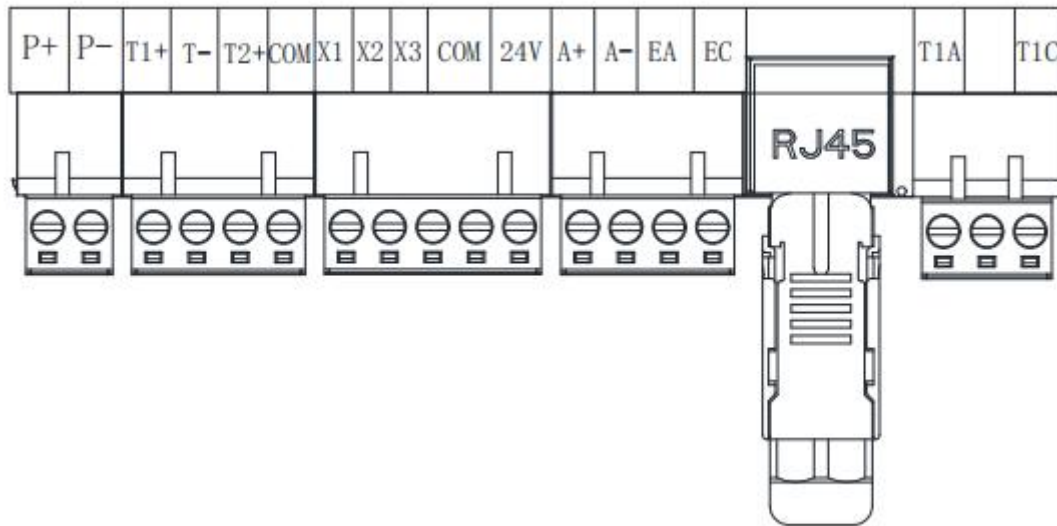
The specifications of main circuit cables and screws are as shown in the following table.

VFD Model	Terminal Symbol	Terminal Screw	Tightening Torque (N.m)	Wire Diameter (mm ²)	Wire Type
EM650C-7R5-3	R, S, T, U1, V1, W1	M4	1.5~2.0	6	750V wire
	U2, V2, W2			4	
EM650C-011-3	R, S, T, U1, V1, W1	M5	3.0~4.0	10	
	U2, V2, W2			4	
EM650C-015-3	R, S, T, U1, V1, W1			10	
	U2, V2, W2			4	
EM650C-022-3	R, S, T, U1, V1, W1			16	
	U2, V2, W2			4	
EM650C-030-3	R, S, T, U1, V1, W1	M6	4.0~5.0	25	
	U2, V2, W2	M5	3.0~4.0	4	
EM650C-037-3	R, S, T, U1, V1, W1	M6	4.0~5.0	25	
	U2, V2, W2	M5	3.0~4.0	4	
EM650C-045-3	R, S, T, U1, V1, W1	M8	10.0~14.0	35	
	U2, V2, W2	M5	3.0~4.0	4	

EM650C-055-3	R, S, T, U1, V1, W1	M8	10.0~14.0	35	
	U2, V2, W2	M5	3.0~4.0	4	
EM650C-075-3	R, S, T, U1, V1, W1	M10	20.0~28.0	50	
	U2, V2, W2	M5	3.0~4.0	4	

3.4 Wiring of Control Circuit Terminals

3.4.1 Composition of Control Circuit Terminals



3.4.2 Functions and Wiring of Control Circuit Terminals

Category	Terminal Label	Terminal Name	Function Description
Touch screen	24V	External power supply	Provide 24V power to the outside, with a maximum output current of 350mA; Power the touch screen
	COM	Power ground	
	A+	RS485 communication interface	Positive terminal of RS485 differential signal
	A-		Negative terminal of RS485 differential signal
Pressure detection	P+	Pressure sensor power output	24Vdc, 4-20mA current input
	P-	Pressure sensor signal input	
Temperature detection	T1+	1 channel of temperature detection	Support PT100 temperature sensor, with the detection range of -60°C-220°C
	T-		
	T2+	2 channels of temperature detection	Support PT100 temperature sensor, with the detection range of -60°C-220°C
	T-		
Digital input	X1	Multi-function input terminals	"Run" by default The corresponding terminal can be programmed through function code setting to realize input control of the set function
	X2	Multi-function input terminals	"Emergency stop" by default The corresponding terminal can be programmed through

			function code setting to realize input control of the set function
	X3	Multi-function input terminals	"External fault input" by default The corresponding terminal can be programmed through function code setting to realize input control of the set function
	COM	Digital reference ground	Internal COM and GND share the same ground
Relay output	T1A	Relay NO output terminal	It is internally a solenoid valve control port by default, powered by 220V/50VA isolation transformer
	T1C		
	EA	Relay NO output terminal	Weak current control port, can be used as fault output signal
	EC		
External keyboard port	RJ45	External keyboard terminal	Used for internal debugging port of the all-in-one machine manufacturer

Chapter 4 Touch Screen Operation

4.1 Home

The operation and display of the EM650C all-in-one machine are completed on the touch screen. After power-on, the touch screen enters the "Home" interface.

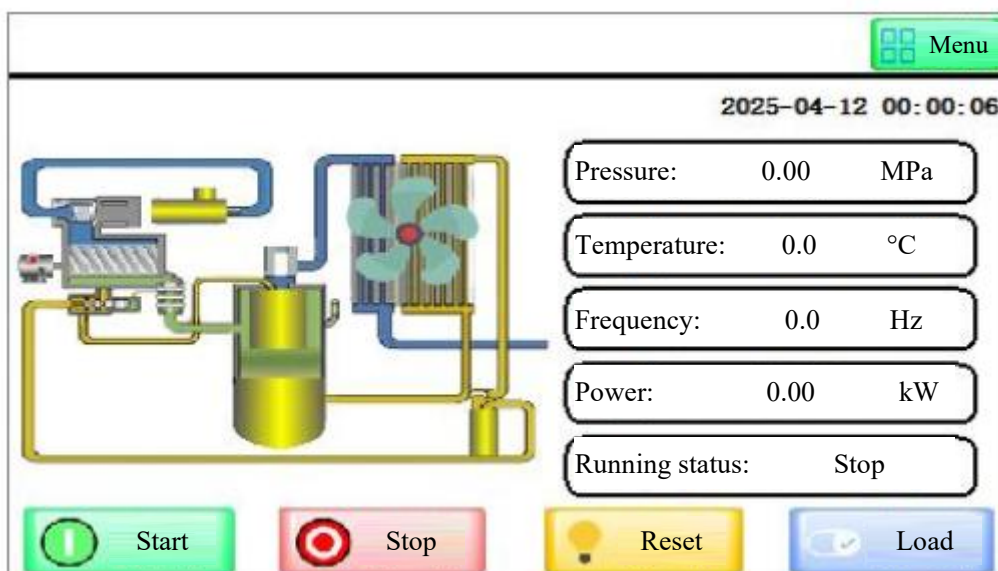


Figure 4-1 Home

The left side shows the status diagram of the air compressor, displaying the current running status; the right side shows the monitoring parameters, displaying the current pressure, temperature, frequency, power, and running status of the air compressor.

Button	Function
	Click this button to directly enter the "Menu" interface
	When a fault causes shutdown, click this button to reset the fault
	When the air compressor is running, this button functions as a manual unloading/loading button to control the air compressor to run in unloading or loading mode. It displays "Load" when the machine is stopped and "Unload" when it is running The "Load" button is invalid in the following states: stopped, loading delay during startup, exhaust pressure higher than load pressure during dormancy, and exhaust pressure higher than unload pressure during no-load operation. The "Unload" button is invalid when the exhaust pressure is lower than the load pressure
	When the air compressor is in standby mode, click this button to start its operation
	When the air compressor is running, click this button to stop its operation

4.2 Menu



Figure 4- 2 Menu

Click the menu icon and enter the corresponding password. After successful verification, you can enter the corresponding parameter viewing or setting interface. Click the " **Home** " button to directly return to the "Home" page.

4.3 Operating Parameters

The "Running Parameters" interface is used to display detailed operating information of the main unit and the fan.

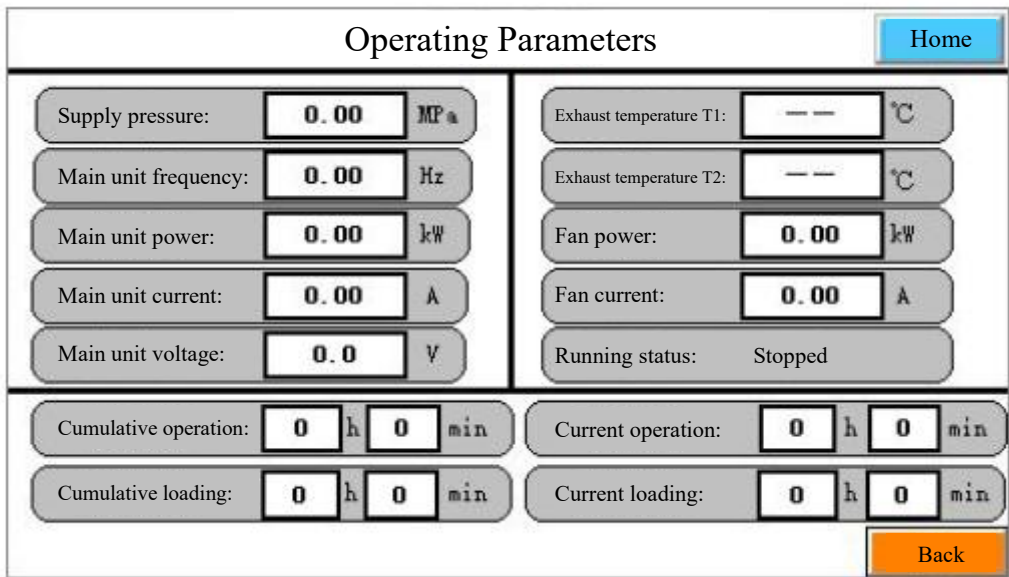


Figure 4-3 Running Parameters

4.4 User Parameters

This interface is used to set parameters related to the air compressor process.

Figure 4-4 User Parameters

To set a parameter, directly click the corresponding parameter item. A password input window will pop up. Enter the user password and click the "OK" button. After the system verifies the password correctly, you can proceed with the setting. After setting, click "OK" to save automatically; click "Cancel" during setting to cancel the operation. Click the "Password" button to modify the user password. You only need to enter the password once to set all user parameters. When re-entering the interface after exiting, you need to enter the password again.

Parameter	Function
Loading pressure	When the air compressor is in automatic unloading mode, if the pressure is lower than this value, it controls the air compressor to automatically load. When the air compressor is in no-load shutdown (dormant) mode, if the pressure is lower than this value and operating conditions are met, it automatically starts the air compressor
Unloading pressure	If the pressure is higher than this value and the air compressor is in loading mode, it controls the air compressor to unload
Inverter pressure	Set the supply pressure when the inverter air compressor runs stably. When the pressure fluctuates around this value, the controller adjusts the inverter's operating frequency to make the supply pressure close to the set value
Restart delay	After shutdown (including normal shutdown, shutdown due to long no-load, fault shutdown, emergency shutdown, etc.), the machine can only be restarted after this delay
Shutdown delay	Deceleration stop: When stopping, the machine unloads (loading valve loses power) and the main unit starts to decelerate to the lower limit frequency. If the shutdown delay timer has not expired at this time, it continues to run at the lower limit frequency until the timer ends, then stops freely; if the timer has expired, it stops directly Free stop: When stopping, the machine unloads (loading valve loses power) and the main unit maintains the current frequency. It stops freely after the stop delay timer ends
No-load time	The maximum continuous no-load running time allowed for the air compressor. Exceeding this time will automatically stop the machine, entering the long no-load shutdown (dormant) state
Pre-operation frequency	After the air compressor starts, it accelerates to this frequency, stops accelerating, and runs at this frequency for the pre-operation time before accelerating again
Pre-operation time	The time to run at the pre-operation frequency
Stopping method	Deceleration stop: The system decelerates according to the set time Free stop: The system stops output.
No-load frequency	The frequency maintained before the system enters the dormant state, defaulting to the lower limit frequency
Loading method	Manual: Manually control the loading/unloading of the system; automatic: The system automatically loads/unloads

User Parameters

Home

Fan settings

Fan start temperature: 0.0 °C

Fan start delay: 0.0 °C

Fan stop temperature: 0.0 S

Fan stop delay: 0.0 S

Password

Previous

Back

Figure 4-5 Second Page of User Parameters

Parameter	Function
Fan start temperature	When the air compressor is running, if the exhaust temperature is higher than this set value, the fan starts running
Fan stop temperature	When the air compressor is running, if the exhaust temperature is lower than this set value, the fan stops running
Fan start delay	Time filtering for the fan start temperature to avoid false starts of the fan
Fan stop delay	Time filtering for the fan stop temperature to avoid false stops of the fan

4.5 Maintenance Parameters

Maintenance Parameters

Home

Air filter usage time: 0 h

Air filter maintenance cycle: 0 h

Oil filter usage time: 0 h

Oil filter maintenance cycle: 0 h

Oil separator usage time: 0 h

Oil separator maintenance cycle: 0 h

Lubricating oil usage time: 0 h

Lubricating oil maintenance cycle: 0 h

Grease usage time: 0 h

Grease maintenance cycle: 0 h

Overdue warning: 0 h

Reset

Back

Figure 4-6 Maintenance Parameters

The "Maintenance Parameters" interface allows you to check the usage status of consumables and set the maintenance time for consumables. To set a parameter, directly click the corresponding parameter item. A password input window will pop up; enter the maintenance password and click the "Confirm" button. After the system verifies the password correctly, you can proceed with the setting. Once the parameter setting is completed, click "Confirm" to save automatically; click "Cancel" during the setting process to abort the operation. Click the "Password" button to modify the maintenance password. You only need to enter the password once to set all maintenance parameters. When re-entering the interface after exiting, you will need to enter the password again.

Parameter	Function
Oil filter usage time	Cumulative usage time of the oil filter. After replacing the oil filter with a new one, click here and enter the correct password to reset the time.
Oil separator usage time	Cumulative usage time of the oil separator. After replacing the oil separator with a new one, click here and enter the correct password to reset the time.
Air filter usage time	Cumulative usage time of the air filter. After replacing the air filter with a new one, click here and enter the correct password to reset the time.
Lubricating oil usage time	Cumulative usage time of the lubricating oil. After replacing the lubricating oil, click here and enter the correct password to reset the time.
Grease usage time	Cumulative usage time of the grease. After replacing the grease, click here and enter the correct password to reset the time.
Oil filter maintenance cycle	If the cumulative usage time of the oil filter exceeds the value set here, a warning will be issued with a beep, and the message "Maintenance due. Continued use may damage the equipment. Please perform maintenance promptly!" will be displayed. Setting it to "0" disables the oil filter usage time warning.
Oil separator maintenance cycle	If the cumulative usage time of the oil separator exceeds the value set here, a warning will be issued with a beep, and the message "Maintenance due. Continued use may damage the equipment. Please perform maintenance promptly!" will be displayed. Setting it to "0" disables the oil separator usage time warning.
Air filter maintenance cycle	If the cumulative usage time of the air filter exceeds the value set here, a warning will be issued with a beep, and the message "Maintenance due. Continued use may damage the equipment. Please perform maintenance promptly!" will be displayed. Setting it to "0" disables the air filter usage time warning.
Lubricating oil maintenance cycle	If the cumulative usage time of the lubricating oil exceeds the value set here, a warning will be issued with a beep, and the message "Maintenance due. Continued use may damage the equipment. Please perform maintenance promptly!" will be displayed. Setting it to "0" disables the lubricating oil usage time warning.
Grease maintenance cycle	If the cumulative usage time of the grease exceeds the value set here, a warning will be issued with a beep, and the message "Maintenance due. Continued use may damage the equipment. Please perform maintenance promptly!" will be displayed. Setting it to "0" disables the grease usage time warning.
Overdue warning	If the warning time for air compressor consumables exceeds the set value and the air compressor is in a stopped state, a fault alarm will be triggered with a beep, and the message "Mechanical maintenance due" will be displayed. Setting it to "0" disables this function.

4.6 Manufacturer Parameters

Manufacturer Parameters			Home	
Protection parameters	Shutdown pressure:	0.00 MPa	Unload pressure upper limit:	0.00 MPa
	Warning temperature:	0.0 °C	Shutdown temperature:	0.0 °C
	Maximum time:	0 h	Maximum time warning:	0 h
	Low temperature alarm:	0.0 °C	Low temperature protection:	Off
	Pressure range:	0.00 MPa	Motor temperature sensor:	None
	Motor overheat pre-alarm:	0 °C	Motor overheat protection value:	0 °C
Adjustment		Password	Next	Back

Figure 4-7 Manufacturer Parameters 1

After clicking "Manufacturer Parameters" in the "Menu" interface, a password input window will pop up. Enter the manufacturer password and click the "Confirm" button. After the system verifies the password correctly, you can enter the "Manufacturer Parameters" interface. This interface allows you to view and set manufacturer parameters. To set a parameter, directly click the corresponding parameter item. After setting, click "Confirm" to save automatically; click "Cancel" during setting to abort the operation. When re-entering the interface after exiting, you need to enter the password again. Click the "Password" button to modify the manufacturer password.

Parameter	Function
Warning temperature	If the exhaust temperature is higher than this set temperature, a warning will be issued with a beep, and the message "Oil temperature is high. Please handle it promptly. Continued use may damage the equipment!" will be displayed
Shutdown temperature	If the exhaust temperature is higher than this set temperature, the machine will shut down due to a fault with a beep, and the message "Oil temperature excessive fault" will be displayed
Shutdown pressure	If the supply pressure is higher than this set pressure, the machine will shut down due to a fault with a beep, and the message "Pressure excessive fault" will be displayed
Maximum time	The maximum operating time of the air compressor. The machine will stop running when this time is exceeded
Low temperature alarm	Pre-alarm for low-temperature protection of the air compressor's exhaust temperature. If the exhaust temperature is lower than this temperature, an oil temperature out-of-limit fault will be reported
Pressure range	The range of exhaust pressure
Motor overheat pre-alarm	A warning will be issued when the motor temperature exceeds this value
Unload pressure upper limit	When the pressure reaches this value, an alarm will be issued (without shutdown) to remind the user that the pressure is too high
Maximum time warning	A warning will be issued (without shutdown) when the operating time of the air compressor reaches this value
Low temperature protection	Low temperature protection switch of the air compressor's exhaust temperature
Motor temperature sensor	Select the motor temperature sensor: "None", "PT100", "PTC"
Motor overheat protection value	If the motor temperature exceeds this value, a "Motor overheat" fault will be reported, and the machine will shut down

Manufacturer Parameters

Home

Manufacturer information

Manufacturer name:

Delivery No.:

Service hotline:

Equipment model:

Date of manufacture:

Main unit model:

Adjustment

Password

Previous

Next

Back

Figure 4-8 Manufacturer Parameters 2

Parameter	Function
Manufacturer	Each character can be set to 0-9, A, B, C, D, E, F
Device model	Up to 16 characters can be displayed. Each character can be set to 0-9, A, B, C, D, E, F (total 16 digits)
Ex-factory No.	Up to 16 characters can be displayed. Each character can be set to 0-9, A, B, C, D, E, F (total 16 digits)
Date of production	The manufacturer enters the date of manufacture of the equipment
Service telephone	Each character can be set to 0-9, A, B, C, D, E, F
Main unit model	Up to 16 characters can be displayed. Each character can be set to 0-9, A, B, C, D, E, F (total 16 digits)

Manufacturer Parameters

Home

Linkage function

Linkage function: Off

Delay time: 0 S

Dormancy shutdown delay time: 0 S

Controlled equipment selection: Refrigeration dryer

Dual-head mode

Dual-head operation: Off

Temperature difference: 0 °C

Motor type: Asynchronous motor

Drive mode: Voltage vector

1# Temperature detection: Off

2# Temperature detection: Off

Adjustment

Password

Previous

Back

Figure 4-9 Manufacturer Parameters 3

Parameter	Function
Linkage function	Off: Disable linkage On: Enable linkage
Delay time	The effective delay time for starting/stopping the controlled equipment
Dormancy shutdown delay time	After the air compressor enters dormancy, the controlled equipment will shut down after this delay time
Controlled equipment selection	Refrigeration dryer, dry machine
Dual-head operation	Enable or disable the dual-head mode
Temperature difference	When dual-head mode is enabled, an alarm will be issued if the temperature difference between the two temperature sensors exceeds this value
Motor type	Synchronous motor, asynchronous motor
Drive mode	V/F, SVC
1# Temperature detection	Off, exhaust temperature, motor temperature
2# Temperature detection	Off, exhaust temperature, motor temperature

[Home](#)

Manufacturer Parameters

Adjust parameters

Pressure calibration 1:	0.0	%	Pressure calibration:	0.0	%
Temperature calibration 1:	0.0	%	Temperature calibration:	0.0	%
Running time setting:	0	H	Loading time setting:	0	H
Main unit power calibration:	0.00	%	Main unit current calibration:	0.00	%
Main unit voltage calibration:	0.00	%	Fan current calibration:	0.00	%
Pressure P1:	0.00		Pressure T1:	0.000	S

[Password](#)
[Next](#)
[Back](#)

Figure 4-10 Manufacturer Parameters - Adjustment 1

Parameter	Function
Pressure calibration 1	Percentage corresponding to 0.00MPa
Pressure calibration 2	Percentage corresponding to the full pressure range
Temperature calibration 1	Percentage corresponding to 20°C
Temperature calibration 2	Percentage corresponding to 80°C
Running time setting	Modify the total running time
Loading time setting	Modify the total loading time
Main unit power calibration	This function is used to calibrate the displayed parameters of the main unit's power
Main unit current calibration	This function is used to calibrate the displayed parameters of the main unit's current
Main unit voltage calibration	This function is used to calibrate the displayed parameters of the main unit's voltage
Fan current calibration	This function is used to calibrate the displayed parameters of the fan's current

Figure 4-11 Manufacturer Parameters - Adjustment 2

Parameter	Function
Stator resistance of synchronous motor	This parameter is obtained after successful motor self-learning
Synchronous motor d-axis inductance	This parameter is obtained after successful motor self-learning
Synchronous motor q-axis inductance	This parameter is obtained after successful motor self-learning
Pressure Kp1, pressure Ti1, pressure Td1	The first set of PID parameters for air compressor pressure PID adjustment
Pressure Kp2, pressure Ti2	The second set of PID parameters for air compressor pressure PID adjustment
Pressure switching point 1	Effective error percentage for PID1
Pressure switching point 2	Effective error percentage for PID2

On the third page of the "Manufacturer Parameters - Adjustment" interface, all user passwords can be modified

Figure 4-12 Manufacturer Parameters - Adjustment 3

4.7 Inverter Parameters

Accessing the "Inverter Parameters" interface also requires entering the correct password.

This interface is used to set inverter parameters, motor parameters, and fan parameters. After completing the parameter settings, click "Main Unit Jog" and "Fan Jog" respectively to check the rotation direction of the motors (including the main unit and power frequency fan). If the motor rotation direction is incorrect, be sure to power off and change the RS phase sequence of the motor. After the change, select jog again until the motor rotation direction is correct.

Figure 4-13 Inverter Parameters

Menu	Function
Maximum frequency	Maximum allowable operating frequency of the main unit
Upper limit frequency	Maximum output frequency allowed when the main unit is loading
Lower limit frequency	Minimum output frequency allowed when the main unit is loading
Loading frequency	After the air compressor starts, the inverter runs to this frequency, and the solenoid valve acts to start loading
Acceleration time	The time required for the main unit to go from zero speed to maximum speed
Deceleration time	The time required for the main unit to go from maximum speed to zero speed
Rated power	Rated power of the motor
Rated voltage	Rated voltage of the motor
Rated current	Rated current of the motor
Rated frequency	Rated frequency of the motor
Rated speed	Rated speed of the motor
Back EMF	Back electromotive force of the permanent magnet synchronous motor

Figure 4-14 Inverter Parameters - Fan Parameters

Parameter	Function
Rated fan power	Rated fan power
Rated fan current	Rated fan current, used to judge fan overcurrent
Motor self-learning	Only static self-learning can be performed without disconnecting the machine head
Loading valve jog	Press and hold to energize the loading valve; release to de-energize it
Fan jog	Press and hold to run the fan (to check its rotation direction); release to power off the fan
Main unit jogging	Press and hold to run the main unit at 5Hz (to check the machine head direction). Note: Ensure the motor has completed self-learning before jogging.

4.8 Protection Records

This function is used to display historical fault records related to the air compressor, including fault time, to facilitate technicians in analyzing faults.

Figure 4-15 Protection Records

In the "Fault Parameters" interface, click the "Fault Cause and Solution" button to enter the interface for viewing the causes and solutions of faults; in the "Fault Cause and Solution" interface, click "Fault Parameters" to return to the "Fault Parameters" interface; click the "Next" button to view the next set of fault parameters; and click the "Return" button to return to the "Menu" interface.

Figure 4-16 Fault Parameters

	Menu	Function
Current fault information (10 groups stored)	Fault SN (e.g.: Fault 01)	Records the fault sequence; the latest fault is numbered 01
	Fault type	The fault type when the equipment is protected by fault
	Output frequency	The output frequency of the inverter when the fault protection is triggered
	Output Current	The output current of the inverter when the fault protection is triggered
	Bus voltage	The bus voltage of the inverter when the fault protection is triggered
	Operating time	The running time of the equipment when the fault protection is triggered
	Supply pressure	The supply pressure of the equipment when the fault protection is triggered
	Exhaust temperature	The exhaust temperature of the equipment when the fault protection is triggered
	Running status	Indicates whether the equipment is in loading/unloading/dormant status when the fault occurred
	Fan status	Indicates whether the fan is in running/stop status when the fault occurred
Current fault		Click the "Current Fault" button to display detailed information of the current fault
Clear		Click the "Clear" button, enter the fault clearing password and confirm to clear all faults

4.9 Timed Operation

Timed Operation					Home
Date	Startup time	Shutdown time	Start action	Stop action	
Sunday ①	00 : 00	00 : 00	Disabled	Disabled	
Sunday ②	00 : 00	00 : 00	Disabled	Disabled	
Sunday ③	00 : 00	00 : 00	Disabled	Disabled	
Monday ①	00 : 00	00 : 00	Disabled	Disabled	
Monday ②	00 : 00	00 : 00	Disabled	Disabled	
Monday ③	00 : 00	00 : 00	Disabled	Disabled	

Note: The stop time cannot be earlier than the start time, and the start time of the latter time period cannot be earlier than the stop time of the previous time period! Otherwise, the timed start and stop cannot work normally

Next Back

Figure 4-17 Timed operation

In the timed operation interface, you can set three timed operation periods per day for a week. For each period, the stop time cannot be earlier than the start time; the start time of the latter period cannot be earlier than the stop time of the previous period. If the start action of a period is set to "Disabled", the stop action cannot be set to "Start".

4.10 Pop-up Interfaces

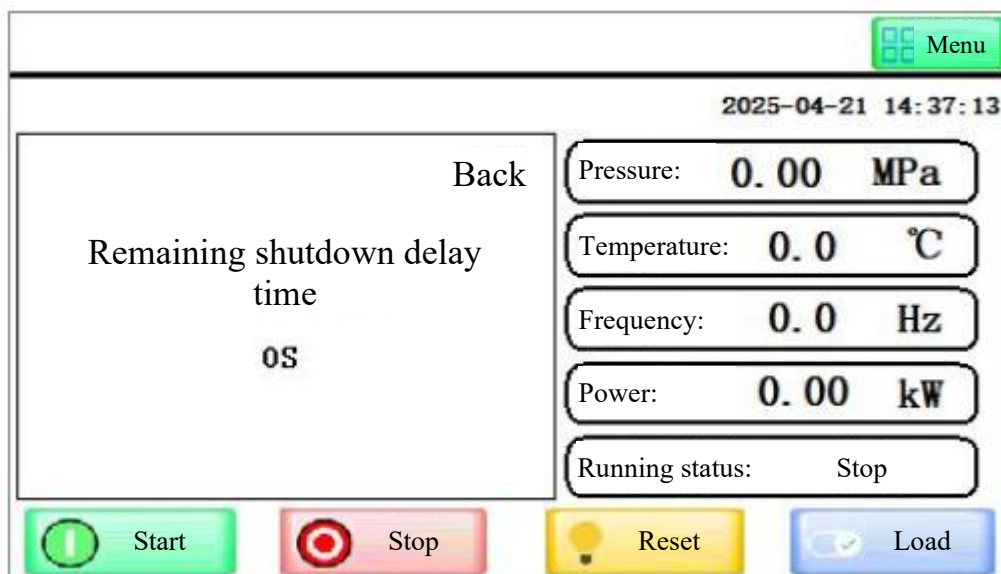
4.10.1 Remaining Time for Restart After Shutdown Window

		Menu	
		2025-04-21 14:35:30	
Back Remaining time for restart after shutdown 05	Pressure:	0.00 MPa	
	Temperature:	0.0 °C	
	Frequency:	0.0 Hz	
	Power:	0.00 kW	
	Running status:	Stop	
Start	Stop	Reset	Load

When the air compressor is running, press the "Stop" button and wait for it to stop. Then press the "Start" button. If the remaining time for restart after shutdown is not zero, the remaining time window will pop up, and the air compressor cannot be started at this time. You can press the "Return" button to close the window to view

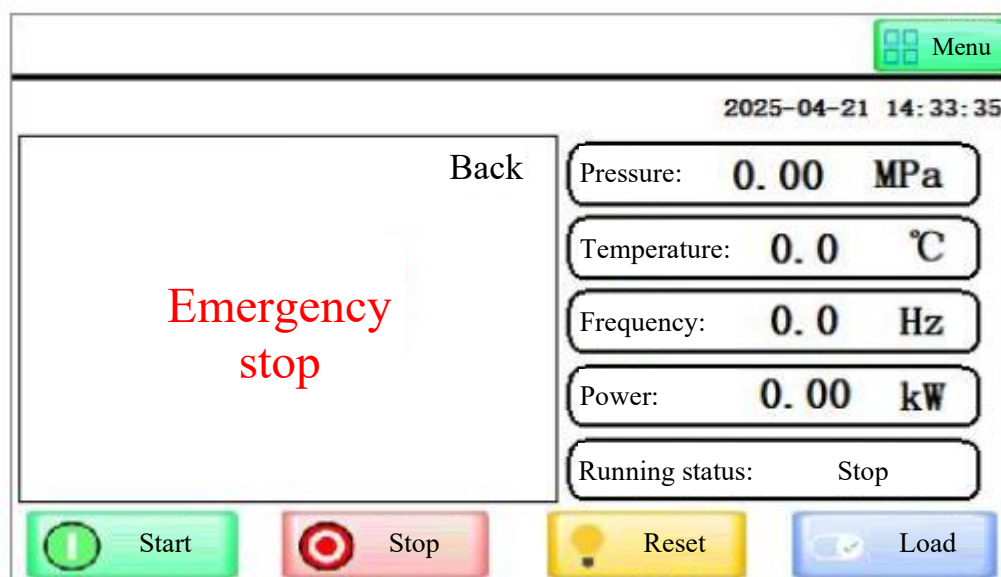
or set parameters. The window will close automatically when the remaining time for restart after shutdown reaches zero, and then you can press the "Start" button to start the air compressor.

4.10.2 Remaining Shutdown Delay Time Window



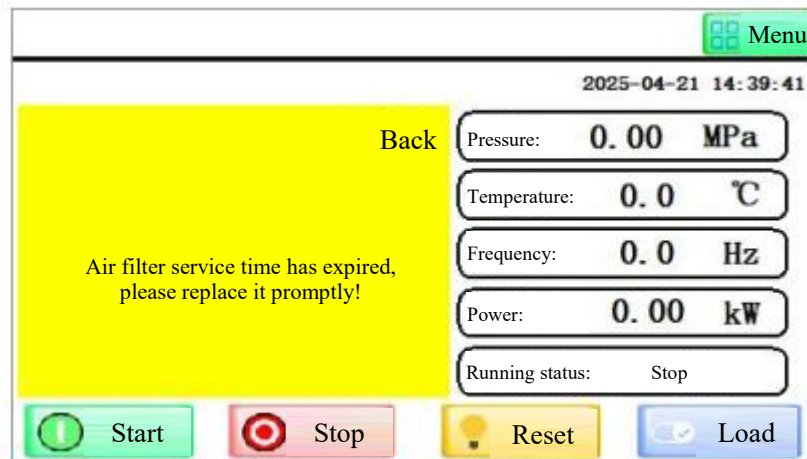
When the air compressor is running, press the "Stop" button. If the remaining shutdown delay time is not zero, the remaining shutdown delay time window will pop up. The window will close automatically when the remaining shutdown delay time reaches zero, and the air compressor will shut down completely. You can press the "Return" button to close the window to view or set parameters.

4.10.3 Emergency Stop Window



After pressing the "Emergency Stop" button, there is a pop-up window function of emergency stop display. The window can be canceled by clicking the "Back" button to view and set parameters, but it cannot be started. If the "Start" button is pressed, the emergency stop pop window will pop up again; when there is no operation interface, an emergency stop window will automatically pop up after a delay of 60s.

4.10.4 Warning Information Window



When the service time of consumables reaches their maintenance time, a pop-up window with warning information will appear. You can click the "Return" key to close the window to view or set parameters, and the air compressor can be started. If there is no operation on the interface, the warning information window will pop up automatically after a 60-second delay.

Chapter 5 Trial Operation

5.1 Commissioning Process of the All-in-One Machine

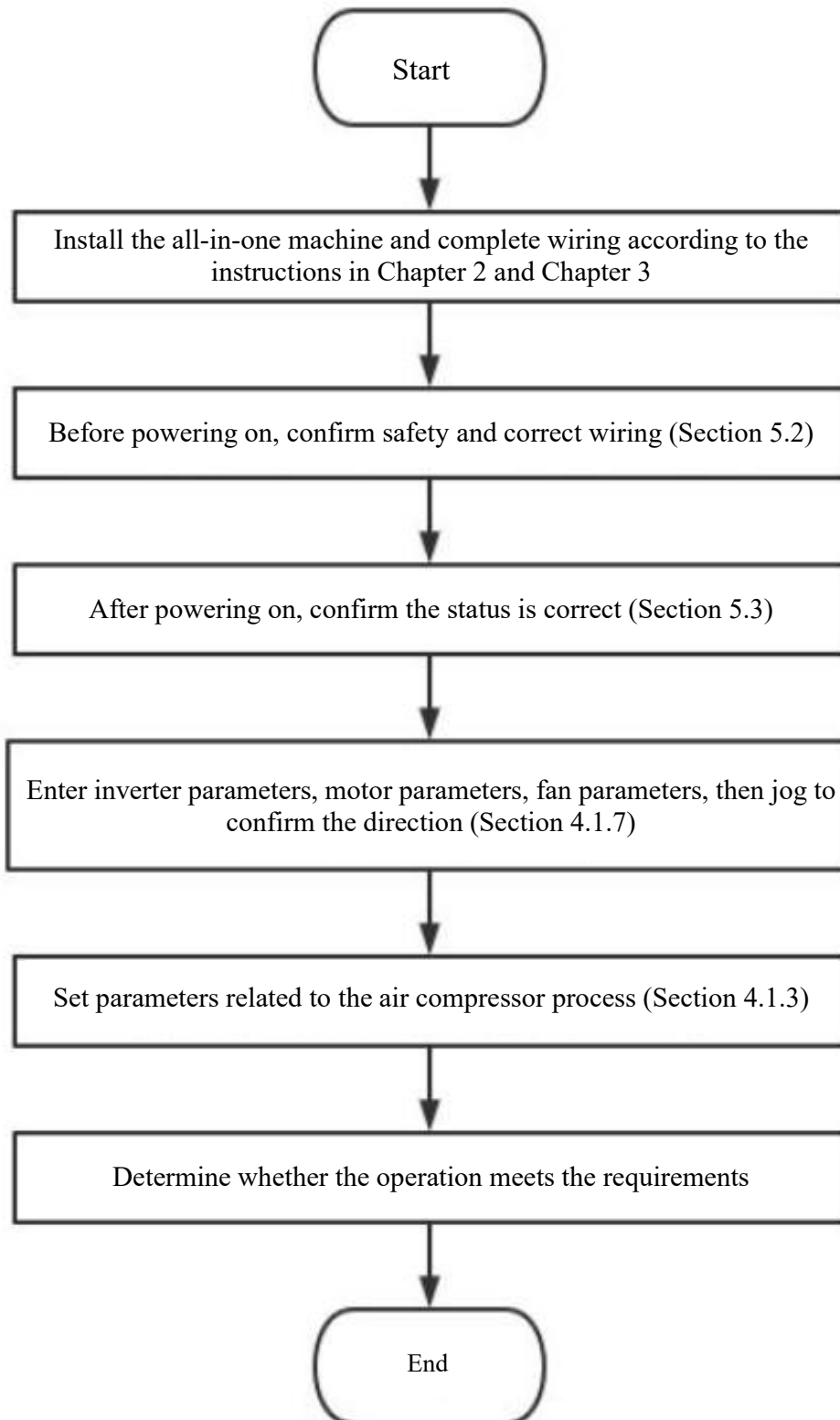


Figure 5-1 Commissioning Flowchart of the All-in-One Machine

5.2 Confirmation Items Before Power-on

Please be sure to confirm the following items before powering on:

Confirmation Item	Confirmation Content
Power wiring confirmation	Confirm that the input supply voltage is consistent with the requirements of the all-in-one machine
	Confirm that the power supply circuit is connected to a circuit breaker, and the power cord is correctly connected to the R, S, T input terminals of the all-in-one machine
	Confirm that the all-in-one machine and the motor are properly grounded
Motor wiring confirmation	Confirm that the motor is correctly connected to the U1, V1, W1 output terminals of the all-in-one machine, and that the wiring of U2, V2, W2 for the system cooling fan is correct and firmly connected
Communication terminal wiring confirmation	Confirm that the connection between the communication terminal of the all-in-one machine and the HMI is correct and reliable
Mechanical load confirmation	Confirm that the mechanical load is in a no-load state and that no danger will occur after operation

5.3 Confirmation of the All-in-One Machine Status After Power-on

After powering on, the HMI of the all-in-one machine displays the following under normal conditions:

Status	Display	Description
Normal	Home	When normal, it jumps to the home page after power-on initialization
Protected	Jumps from the home page to protection records, buzzer sounds	When protected, you can check the solution in Protection Records - Fault Parameters - Causes and Solutions

Chapter 6 Protection/Fault Solution

6.1 Protection/Fault Content

When an abnormality occurs in the all-in-one machine, the HMI will display the corresponding protection/fault code, parameters, causes, and solutions.

The protection relay and protection output terminals will act, and the all-in-one machine will stop output. In case of protection, if the motor is rotating, it will stop freely or decelerate to a stop. The protection details and solutions for the EM650C series all-in-one machine are as shown in the following table:

Protection Code	Protection Type	Cause	Solution
E01	Output short-circuit protection	1. Phase-to-phase short circuit. 2. External braking resistor short circuit. 3. Too short acceleration/deceleration time. 4. Inverter module damage. 5. Excessive on-site interference.	1. Check for short circuits in the wiring. 2. Appropriately extend the acceleration/deceleration time. 3. Investigate the cause, implement corresponding solutions, and then reset. 4. Seek technical support.
E02	Instantaneous overcurrent	1. Too short acceleration/deceleration time. 2. Unreasonable V/F curve setting in V/F drive mode. 3. The motor is rotating during startup. 4. Using a motor exceeding the all-in-one machine's capacity or overload. 5. Inappropriate motor parameters, requiring parameter identification. 6. Phase-to-phase short circuit on the output side of the all-in-one machine. 7. Damage to the all-in-one machine.	1. Extend the acceleration/deceleration time. 2. Set the V/F curve reasonably. 3. Enable speed tracking startup or start DC braking. 4. Replace with a motor or all-in-one machine that matches the load. 5. Perform motor parameter identification. 6. Check for short circuits in the wiring. 7. Seek technical support.
E04	Steady-state overcurrent	Same as E02	Same as E02
E05	Over-voltage protection	1. Too short deceleration time, resulting in excessive motor regenerative energy. 2. Open circuit of the braking unit or braking resistor. 3. Mismatch of the braking unit or braking resistor. 4. Too high power supply voltage. 5. Energy-consuming braking function not enabled.	1. Extend the deceleration time. 2. Check the wiring of the braking unit and braking resistor. 3. Equip with a suitable braking unit/resistor. 4. Reduce the supply voltage to the specified range. 5. For models with a built-in braking unit, set F15.30 to 1 to enable the energy-consuming braking function.
E06	Undervoltage protection	1. Phase loss of the input power supply. 2. Loose terminals of the input power supply wiring. 3. Excessive drop in input supply voltage. 4. Aging contacts of the switch on the input power supply.	1. Check the input power supply and wiring. 2. Tighten the screws of the input terminals. 3. Check the air switch and contactor.
E07	Input phase loss	1. Phase loss of the input power supply. 2. Large fluctuation of the input power supply.	1. Check the input power supply. 2. Check the input power supply wiring. 3. Check if the terminals are loose. 4. Add a voltage stabilizer on the input side.
E08	Output phase loss	1. Phase loss of output U, V, W.	1. Check the connection between the all-in-one machine and the motor. 2. Check if the output terminals are loose. 3. Check if the motor windings are broken.
E09	All-in-one machine overload	1. Too short acceleration/deceleration time. 2. Inappropriate V/F curve setting in V/F drive mode. 3. Overload. 4. Excessively long braking time, excessive braking intensity, repeated DC braking.	1. Extend the acceleration/deceleration time. 2. Set the V/F curve reasonably. 3. Replace with an all-in-one machine that matches the load. 4. Reduce the braking time and intensity; do not perform repeated DC braking.
E10	All-in-one machine overheating	1. Too high ambient temperature. 2. Poor ventilation of the all-in-one machine.	1. Ensure the operating environment meets the specifications. 2. Improve ventilation and check for blocked

		3. Failure of the cooling fan.	3. air ducts. Replace the cooling fan.
E11	Parameter setting conflict	1. Logical conflict in parameter settings.	1. Check if there are logically unreasonable parameters set before protection.
E13	Motor overload	1. Too short acceleration/deceleration time. 2. Inappropriate V/F curve setting in V/F drive mode. 3. Overload.	1. Extend the acceleration/deceleration time. 2. Set the V/F curve reasonably. 3. Replace with a motor that matches the load.
E14	External fault input	1. Action of the protection terminal of external equipment.	1. Check the external equipment.
E15	All-in-one machine memory protection	1. Interference causing memory read/write errors. 2. Controller repeatedly writing to internal memory, leading to memory damage.	1. Press the STOP/RESET button to reset and retry. 2. For parameters that need frequent modification (such as frequency setting), set F10.56 to 11 after debugging.
E16	Communication error	1. Communication timeout enabled in a non-continuous communication system. 2. Communication disconnection.	1. In a non-continuous communication system, set F10.03 to 0.0. 2. Adjust the F10.03 communication timeout time. 3. Check if the communication cable is disconnected.
E17	Abnormal temperature sensor of all-in-one machine	Temperature sensor disconnected or short-circuited of the all-in-one machine.	1. Check if the wiring of the all-in-one machine temperature sensor is properly connected. 2. Seek technical support.
E18	Soft start relay not pulling in	1. Power failure during operation. 2. Phase loss of the input power supply. 3. Loose terminals of the input power supply wiring. 4. Excessive drop in input power supply voltage. 5. Aging contacts of the switch on the input power supply.	1. Power off after the all-in-one machine stops, or directly reset the protection. 2. Check the input power supply and wiring. 3. Tighten the screws of the input terminals. 4. Check the air switch and contactor.
E19	Current detection circuit exception	Damage to the detection circuit of the drive board or control board.	1. Seek technical support.
E20	Stall protection	1. Too short deceleration time setting. 2. Abnormal energy-consuming braking during deceleration stop. 3. Overload.	1. Extend the deceleration time. 2. Check the energy-consuming braking situation. 3. Check if the motor is driven by other loads and cannot stop.
E21	PID feedback disconnection	1. PID feedback is greater than the upper limit value F09.24 or less than the lower limit value F09.25, depending on the type of feedback sensor.	1. Check if the feedback line is disconnected. 2. Check if the sensor is working abnormally. 3. Adjust the feedback disconnection detection value to a reasonable level.
E24	Self-identification exception	1. The STOP/RESET button is pressed during parameter identification. 2. The external terminal free stop action (FRS=ON) occurs during parameter identification. 3. No motor is connected. 4. The motor is not disconnected from the load during rotational self-learning. 5. Motor failure.	1. Press the STOP/RESET button to reset. 2. Do not operate external terminals during parameter identification. 3. Check the connection between the all-in-one machine and the motor. 4. Disconnect the motor from the load during rotational self-learning. 5. Check the motor.
E26	Load loss protection	1. No motor is connected, or the motor is mismatched. 2. A load loss situation occurs. 3. The load loss protection parameters are set unreasonably.	1. Check the wiring and replace with a matched motor. 2. Check the equipment. 3. Modify the load loss detection level (F07.22) and detection time (F07.23).
E27	Cumulative power-on time reached	1. The maintenance time of the all-in-one machine is reached.	1. Please contact the distributor to arrange technical support.
E28	Cumulative operation time reached	1. The maintenance time of the all-in-one machine is reached.	1. Please contact the distributor to arrange technical support.
E43	Material break protection	1. Material break occurs in tension control.	1. Check the processed cable/material.

E44	Wire arrangement protection	1. The valid time of the wire arrangement detection terminal is too long. 2. The invalid time of the wire arrangement detection terminal is too long.	1. Check if the sensor can operate normally. 2. Check if the terminal can correctly determine opening and closing.
E45	Excessive pressure fault	1. Incorrect connection to a temperature sensor wire. 2. The pressure range setting does not match the nominal value of the pressure sensor. 3. Sensor exception.	1. Correctly connect the pressure sensor wire. 2. Set the pressure range to match the nominal value of the pressure sensor. 3. Set an appropriate pressure value according to the actual application. 4. Replace the sensor.
E46	Pressure feedback disconnection	1. Sensor wiring exception. 2. Pressure sensor exception.	1. Check the wiring. 2. Replace the pressure sensor.
E47	Oil temperature overlimit fault	1. Incorrect connection to a pressure sensor wire. 2. Excessive temperature due to heat dissipation issues. 3. Excessively low ambient temperature.	1. Correctly connect the temperature sensor wire. 2. Check if the air duct is blocked and if the fan is reversing.
E48	Oil temperature feedback disconnection	1. Sensor wiring exception. 2. Temperature sensor exception	1. Check the wiring. 2. Replace the temperature sensor.
E49	Motor temperature overlimit	1. Loose wiring of the temperature sensor. 2. Excessively high motor temperature.	1. Check the temperature sensor wiring and eliminate faults. 2. Increase the carrier frequency or take other heat dissipation measures for the motor.
E50	Motor PTC disconnection	1. Sensor wiring exception. 2. Temperature sensor exception	1. Check the wiring. 2. Replace the temperature sensor.
E51	Maintenance time reached	Actual usage time of consumables $\geq$ preset consumable usage time + warning delay time	1. Maintain the machine and clear the relevant operation time. 2. Seek technical support.
E52	Air filter external fault	1. Air filter clogged. 2. Incorrect DI terminal setting or wiring.	1. Clean the air filter. 2. Check the DI terminal function setting and wiring.
E53	Oil filter external fault	1. Oil filter clogged. 2. Incorrect DI terminal setting or wiring.	1. Clean the oil filter. 2. Check the DI terminal function setting and wiring.
E54	Oil separator external fault	1. Oil separator clogged. 2. Incorrect DI terminal setting or wiring.	1. Clean the oil separator. 2. Check the DI terminal function setting and wiring.
E55	Fan overload	1. Oversized fan selection. 2. Fan locked-rotor or jammed by foreign objects.	1. Select a suitable fan. 2. Remove foreign objects.
E57	Pipeline overpressure	1. Excessively high feedback pressure in water supply applications.	1. Check if the sensor is abnormal. 2. Check if the analog terminal can normally detect analog input. 3. Check external equipment.
E58	Pipeline underpressure	1. Excessively low feedback pressure in water supply applications.	1. Check if the sensor is abnormal. 2. Check if the analog terminal can normally detect analog input. 3. Check external equipment.
E60	Fan overcurrent	1. Oversized fan selection. 2. Fan locked-rotor or jammed by foreign objects. 3. Fan output phase loss or fuse damaged.	1. Select a suitable fan. 2. Remove foreign objects. 3. Check the wiring and fuses for damage.
E63	Phase sequence error	Abnormal phase sequence of RST three-phase input.	1. Swap the phase sequence of any two phases among RST.
E64	Fan input phase loss	1. Abnormal three-phase input power supply. 2. Abnormal drive board, lightning protection board, main control board, or rectifier bridge.	1. Check and eliminate problems in the peripheral lines. 2. Seek technical support.
E65	Time limit expired	Operation time reaches the set time-limited operation time.	1. Clear the operation time or disable the time-limited operation function.
E76	Short circuit to ground	1. Output short circuit to ground. 2. Inverter module damage.	1. Check if the output cable is damaged or if the motor is short-circuited to the housing. 2. Investigate the cause, implement corresponding solutions, and then reset.

			3. Seek technical support.
E77	Refrigeration dryer or dry machine not engaged	Power contactor of the refrigeration dryer or dry machine not connected.	1. Check the DI terminal function setting and wiring. 2. Check if the contactor is normal.
E78	Refrigeration dryer fault	A fault occurs in the refrigeration dryer.	Troubleshoot the fault in the refrigeration dryer.
E79	Dry machine fault	A fault occurs in the dry machine.	Troubleshoot the fault in the dry machine.

6.2 Protection Analysis

6.2.1 Abnormal Motor Rotation

- Motor does not rotate when "Start" is pressed
 - Start/stop is controlled by terminals: Check the setting of function code F00.02.
 - Free stop terminal FRS is closed with COM: Disconnect the free stop terminal FRS from COM.
 - The operation command is switched to terminal-valid, and the operation command can only be controlled by terminals at this time: Modify to make it invalid.
 - The status combination of the operation command channel is terminal control: Modify to communication control.
 - The reference input frequency is set to 0: Increase the reference input frequency.
 - Abnormal input power supply or control circuit fault.
- Motor rotates in the reverse direction

The output phase sequence of the all-in-one machine is inconsistent with the motor input end: In the power-off state, swap any two motor connecting wires to change the motor's rotation direction.

6.2.2 Excessively Long Motor Acceleration Time

- The current limiting level parameter is set too low. Check if the current limiting level of the all-in-one machine is set too low.
- The set acceleration time is too long. Confirm the acceleration time code parameters.
- The motor is rotating before operation. Use start DC braking or speed tracking start.

6.2.3 Excessively Long Motor Deceleration Time

- When stall protection is active:
 - Overvoltage stall protection is triggered. When the DC bus voltage exceeds the overvoltage stall voltage (F07.07), the output frequency remains unchanged; when the DC bus voltage is lower than F07.07, the output frequency continues to decrease, thus extending the deceleration time.
 - The set deceleration time is too long. Please confirm the deceleration time code parameters.

6.2.4 Electromagnetic Interference and RF Interference

- When the all-in-one machine is running, due to its high-frequency switching operation, it may cause electromagnetic interference and RF interference to control equipment. The following measures can be taken:
 - Reduce the carrier frequency of the all-in-one machine (F00.23).
 - Install a noise filter on the input side of the all-in-one machine.
 - Install a noise filter on the output side of the all-in-one machine.
 - Cover the cable with a metal tube. Install the all-in-one machine in a metal chassis.
 - Ensure the all-in-one machine and motor are reliably grounded.
 - Separate the main circuit wires and control circuit wires for independent routing. Use shielded wires for the control circuit and connect the shielded wires as shown in Chapter 3.

6.2.5 Leakage Circuit Breaker Action

- **Leakage protector trips when the all-in-one machine is powered on**
 - A) Loosen the internal EMC screws of the all-in-one machine to disconnect the internal Y capacitor.
 - B) Use a dedicated leakage circuit breaker for the all-in-one machine with a current sensitivity of 30mA or higher.
- **Leakage circuit breaker trips when the all-in-one machine is running**
 - A) Ensure both the all-in-one machine and the motor are reliably grounded.
 - B) Use a dedicated leakage circuit breaker for the all-in-one machine with a current sensitivity of 30mA or higher.

6.2.6 Mechanical Vibration

- Resonance between the natural frequency of the mechanical system and the carrier frequency of the all-in-one machine

If the motor is normal but the mechanical system produces a sharp resonant sound, it is because the natural frequency of the mechanical system resonates with the carrier frequency of the all-in-one machine. Adjust F00.23 (carrier frequency) to avoid the resonance frequency.
- Resonance between the natural frequency of the mechanical system and the output frequency of the all-in-one machine

Resonance between the natural frequency of the mechanical system and the output frequency of the all-in-one machine will generate mechanical noise. Use the oscillation suppression function (F05.13) or install anti-vibration rubber on the motor base and other anti-vibration measures.
- PID control oscillation

The adjustment parameters P, Ti, and Td of the PID controller are mismatched. Reset the PID parameters.

6.2.7 Motor Continues to Rotate After the All-in-One Machine Stops Output

- Insufficient stop DC braking:
 - The stop DC braking torque is too small. Increase the set value of the stop DC braking current (F04.21).
 - The stop DC braking time is too short. Increase the set value of the stop DC braking time (F04.22). In general, prioritize increasing the stop DC braking current.

6.2.8 Output Frequency Not Match the Set Frequency

- The set frequency exceeds the upper limit frequency

When the set frequency exceeds the upper limit frequency setting, the output frequency is limited to the upper limit frequency. Reset the set frequency to be within the upper limit frequency range; or check if F00.16, F00.17, and F00.18 are set appropriately.

Chapter 7 Maintenance and Care

7.1 Daily Maintenance and Care of the All-in-One Machine

Depending on usage conditions, customers should conduct regular inspections of the all-in-one machine to eliminate faults and potential safety hazards. During inspections, be sure to cut off the power supply and wait for the keyboard LEDs to turn off for 10 minutes before proceeding. The inspection items are as shown below.

Inspection Item	Inspection Content	Solution
Screws of main circuit terminal and control circuit terminal	Whether the screws are loose	Tighten with a screwdriver
Heat sink	Whether there is dust or foreign matter	Blow off with dry compressed air at a pressure of 4~6kg/cm ²
PCB		
Cooling fan	Whether there is abnormal noise or vibration; whether the cumulative operating time has reached 20,000 hours	Replace the cooling fan
Electrolytic capacitor	Whether there is discoloration, peculiar smell, or bulging	Replace electrolytic capacitor

To ensure the all-in-one machine works normally for a long time, regular maintenance and replacement of internal components must be carried out according to their service life.

Part Name	Standard Replacement Interval (Years)
Cooling fan	2-3 years
Electrolytic capacitor	4-5 years
Printed circuit board	5-8 years

The service conditions for the replacement intervals of the all-in-one machine components listed above are: ambient temperature: annual average 30°C; load factor: below 80%; operating time: below 12 hours per day.

7.2 Warranty Instructions for the All-in-One Machine

The company will provide warranty services for the all-in-one machine under the following circumstances:

The warranty scope only covers the all-in-one machine itself; if the machine malfunctions or is damaged within 12 months under normal use, the company will be responsible for repairs; for issues beyond 12 months, reasonable maintenance fees will be charged.

Within one year, certain maintenance fees will also be charged for the following situations:

- Damage to the all-in-one machine caused by incorrect operation not in accordance with the instructions in this manual;
- Damage caused by floods, fires, abnormal voltage, etc.;
- Damage caused by incorrect wiring;
- Damage caused by self-modification, etc.

Service fees are calculated based on actual costs; if there is an additional agreement, the agreement shall take precedence.

Chapter 8 Function Code Table

8.1 Description of the Function Code Table

The function codes of the EM650C series all-in-one machine are as shown in the following table, with several function codes in each group. Among them, Group F18 is a monitoring parameter group used to check the status of the all-in-one machine; Group F19 is a protection record group used to view details of the last 3 protections; other groups are parameter setting groups used to meet different functional requirements.

F00	Basic function parameter group	F01	Motor 1 parameter group
F02	Input terminal function group	F03	Output terminal function group
F06	Vector control parameter group	F07	Protection function setting group
F10	Communication function group	F12	Keyboard and display function group
F16	Custom function group	F18	Monitoring parameter group
F19	Protection record group	F28	Air compressor application macro parameter group 1
F31	Air compressor application macro parameter group 2	F32	Air compressor application macro parameter group 3

- ★ Some invisible parameters are reserved parameters; modifying them may cause the all-in-one machine to operate abnormally. Please avoid operating such parameters.
- ★ Parameter attributes: ● Parameters that can be modified in any state; ○ Parameters that cannot be modified in running state; × Read-only parameters;

8.2 Functional Parameter Table

Function Code	Function Code Name	Parameter Description	Unit	Factory Value	Attribute
F00	Basic function parameter group				
F00.01	Motor 1 drive control mode	0: V/F control (VVF) 1: Sensorless vector control (SVC)		1	○
F00.02	Command source selection	0: Keyboard control 1: Terminal control 2: Communication control		2	○
F00.03	Terminal control mode selection	0: Terminal RUN - run, F/R - forward/reverse 1: Terminal RUN - forward, F/R - reverse 2: Terminal RUN - forward, Xi - stop, F/R - reverse 3: Terminal RUN - run, Xi - stop, F/R - forward/reverse		0	○
F00.04	Main frequency source A selection	0: Digital frequency setting F00.07 1: AI1 2: AI2 5: High-frequency pulse input (X5) 6: Main frequency communication setting (percentage) 7: Main frequency communication setting (direct frequency) 8: Digital potentiometer setting		8	○
F00.05	Auxiliary frequency source B selection	0: Digital frequency setting F00.07 1: AI1 2: AI2 5: High-frequency pulse input (X5) 6: Auxiliary frequency communication setting (percentage) 7: Auxiliary frequency communication setting (direct frequency) 8: Digital potentiometer setting 10: Process PID 11: Simple PLC		10	○

F00.06	Frequency source selection	0: Main frequency source A 1: Auxiliary frequency source B 2: Result of main and auxiliary calculation 3: Switch between main frequency source A and auxiliary frequency source B 4: Switch between main frequency source A and result of main and auxiliary calculation 5: Switch between auxiliary frequency source B and result of main and auxiliary calculation 6: Auxiliary frequency source B + feedforward calculation (winding application)		0	○
F00.07	Digital frequency setting	0.00~Maximum frequency F00.16	Hz	0.00	●
F00.08	Main and auxiliary calculation selection	0: Main frequency source A + Auxiliary frequency source B 1: Main frequency source A - Auxiliary frequency source B 2: Take the maximum value of main and auxiliary frequency sources 3: Take the minimum value of main and auxiliary frequency sources 4: Result of main frequency source A - Auxiliary frequency source B ≥ 0 5: Result of main frequency source A + Auxiliary frequency source B ≥ 0		0	○
F00.09	Reference selection for auxiliary frequency source B in main and auxiliary calculation	0: Relative to maximum frequency 1: Relative to main frequency source A		0	○
F00.10	Main frequency source gain	0.0~300.0	%	100.0	●
F00.11	Auxiliary frequency source gain	0.0~300.0	%	100.0	●
F00.12	Combined gain of main and auxiliary frequency sources	0.0~300.0	%	100.0	●
F00.13	Analog adjustment of combined frequency	0: Combined frequency of main and auxiliary channels 1: AI1 * Combined frequency of main and auxiliary channels 2: AI2 * Combined frequency of main and auxiliary channels 5: High-frequency pulse (PULSE) * Combined frequency of main and auxiliary channels		0	○
F00.14	Acceleration time 1	0.00~650.00 (F15.13=0) 0.0~6500.0 (F15.13=1) 0~65000 (F15.13=2)	s	15.00	●
F00.15	Deceleration time 1	Same as above	s	15.00	●
F00.16	Maximum frequency	1.00~600.00/1.0~3000.0	Hz	50.00	○
F00.17	Upper limit frequency control selection	0: Set by F00.18 1: AI1 2: AI2 5: High-frequency pulse input (X5) 6: Communication setting (percentage) 7: Communication setting (direct frequency)		0	○
F00.18	Upper limit frequency	Lower limit frequency F00.19~Maximum frequency F00.16	Hz	50.00	●
F00.19	Lower limit frequency	0.00~Upper limit frequency F00.18	Hz	0.00	●
F00.20	Rotation direction	0: Same direction 1: Opposite direction		0	●
F00.21	Reverse rotation control	0: Enable forward/reverse rotation 1: Disable reverse rotation		0	○
F00.22	Forward/reverse dead time	0.00~650.00	s	0.00	●
F00.23	Carrier frequency	1.0~16.0 (rated power 0.75~4.00kW) 1.0~10.0 (rated power 5.50~7.50kW)	kHz	4.0	●

		1.0~8.0 (rated power 11.00~45.00kW) 1.0~4.0 (rated power 55.00~90.00kW) 1.0~3.0 (rated power 110.00kW and above)			
F00.24	Automatic adjustment of carrier frequency	0: Invalid 1: Valid 1 2: Valid 2		1	○
F00.25	Carrier frequency noise suppression	0: Invalid 1: Carrier frequency noise suppression mode 1 2: Carrier frequency noise suppression mode 2		0	○
F00.26	Noise suppression width	1~20		1	●
F00.27	Noise suppression intensity	0~10: Carrier frequency noise suppression mode 1 0~4: Carrier frequency noise suppression mode 2 0: Invalid carrier frequency noise suppression	%	2	●
F00.28	Motor parameter group selection	0: Motor 1 parameter group 1: Motor 2 parameter group		0	○
F00.29	User password	0~65535		0	○
F00.31	Frequency resolution	0:0.01Hz 1:0.1Hz (with rotation speed of 10rpm)		0	○
F00.35	Supply voltage selection	0: 380V 1: 440V		0	○
F01	Motor 1 parameter group				
F01.00	Motor type selection	0: Ordinary asynchronous motor 1: Inverter asynchronous motor 2: Permanent magnet synchronous motor		2	○
F01.01	Rated motor power	0.10~650.00	kW	Model determination	○
F01.02	Rated motor voltage	50~2000	V	Model determination	○
F01.03	Rated motor current	0.01~600.00 (rated motor power ≤ 75kW) 0.1~6000.0 (rated motor power >75kW)	A	Model determination	○
F01.04	Rated motor frequency	0.01~600.00	Hz	Model determination	○
F01.05	Rated motor speed	1~60000	rpm	Model determination	○
F01.06	Motor winding connection	0: Y 1: Δ		Model determination	○
F01.07	Rated motor power factor	0.600~1.000		Model determination	○
F01.08	Motor efficiency	30.0~100.0	%	Model determination	○
F01.09	Stator resistance of asynchronous motor	1~60000 (rated motor power ≤ 75kW) 0.1~6000.0 (rated motor power >75kW)	mΩ	Model determination	○
F01.10	Rotor resistance of asynchronous motor	Same as above	mΩ	Model determination	○
F01.11	Asynchronous motor leakage inductance	0.01~600.00 (rated motor power ≤ 75kW) 0.001~60.000 (rated motor power >75kW)	mH	Model determination	○
F01.12	Asynchronous motor mutual inductance	Same as above	mH	Model determination	○
F01.13	Asynchronous motor no-load excitation current	0.01~600.00 (rated motor power ≤ 75kW) 0.1~6000.0 (rated motor power >75kW)	A	Model determination	○
F01.14	Asynchronous motor field weakening coefficient 1	10.00~100.00	%	87.00	○
F01.15	Asynchronous motor field weakening coefficient 2	10.00~100.00	%	80.00	○
F01.16	Asynchronous motor field weakening coefficient 3	10.00~100.00	%	75.00	○
F01.17	Asynchronous motor field weakening coefficient 4	10.00~100.00	%	72.00	○
F01.18	Asynchronous motor field weakening	10.00~100.00	%	70.00	○

	coefficient 5										
F01.19	Stator resistance of synchronous motor	1~60000 (rated motor power ≤ 75kW) 0.1~6000.0 (rated motor power >75kW)							mΩ	Model determination	○
F01.20	Synchronous motor d-axis inductance	0.01~600.00 (rated motor power ≤ 75kW) 0.001~60.000 (rated motor power >75kW)							mH	Model determination	○
F01.21	Synchronous motor q-axis inductance	Same as above							mH	Model determination	○
F01.22	Back EMF of synchronous motor	10.0~2000.0 (back EMF at rated speed)							V	Model determination	○
F01.23	Synchronous motor initial electrical angle	0.0~359.9 (valid for synchronous motors)									○
F01.34	Self-learning of motor parameters	00: No operation 01: Asynchronous motor static self-learning 02: Asynchronous motor rotating self-learning 11: Synchronous motor static self-learning 12: Synchronous motor rotating self-learning								00	○
F02	Input terminal function group										
F02.00	X1 digital input function selection	0: No function 1: Run terminal RUN 9: Free stop 23: External fault input								1	○
F02.01	X2 digital input function selection									9	○
F02.02	X3 digital input function selection									23	○
F02.15	Digital input terminal positive/negative logic 1	D7	D6	D5	D4	D3	D2	D1	D0	00010	○
		*	*	*	*	*	X3	X2	X1		
		0: Positive logic (Closed=Valid/Open=Invalid) 1: Negative logic (Closed=Invalid/Open=Valid)									
F02.17	Digital input terminal filtering frequency	0~100, 0=No filtering, n=Sampling once every n ms								2	○
F02.18	X1 valid delay time	0.000~30.000							s	0.000	●
F02.19	X1 invalid delay time	0.000~30.000							s	0.000	●
F02.20	X2 valid delay time	0.000~30.000							s	0.000	●
F02.21	X2 invalid delay time	0.000~30.000							s	0.000	●
F02.22	X3 valid delay time	0.000~30.000							s	0.000	●
F02.23	X3 invalid delay time	0.000~30.000							s	0.000	●
F03	Output terminal function group										
F03.00	Reserved	0: No output 1: All-in-one machine running 7: Inverter fault 49: Load valve output								49	○
F03.02	R1 output function selection									7	○
F03.05	Output signal type selection	D7	D6	D5	D4	D3	D2	D1	D0	0*0	○
		*	*	*	*	*	R1	*	Y1		
		0: Level 1: Single pulse									
F03.06	Digital output positive/negative logic	D7	D6	D5	D4	D3	D2	D1	D0	0*0	○
		*	*	*	*	*	R1	*	Y1		
		0: Positive logic (Closed=Valid/Open=Invalid) 1: Negative logic (Closed=Invalid/Open=Valid)									
F06	Vector control parameter group										
F06.00	Speed proportional gain ASR_P1	0.00~100.00								12.00	●
F06.01	Speed integral time constant ASR_T1	0.000~30.000 0.000: No integral							s	0.200	●
F06.02	Speed proportional gain ASR_P2	0.00~100.00								8.00	●
F06.03	Speed integral time constant ASR_T2	0.000~30.000 0.000: No integral							s	0.300	●
F06.04	Switching frequency 1	0.00~switching frequency 2							Hz	5.00	●
F06.05	Switching frequency 2	Switching frequency 1~Maximum frequency F00.16							Hz	10.00	●
F06.06	No-load current gain	50.0~300.0							%	100.0	●

F06.07	Speed loop output filter time constant	0.000~0.100	s	0.001	●
F06.08	Vector control slip gain	50.00~200.00	%	100.00	●
F06.09	Speed control torque upper limit source selection	0: Set by F06.10 and F06.11 1: AI1 2: AI2 5: Communication setting (percentage) 6: Take maximum value of AI1 and AI2 7: Take minimum value of AI1 and AI2		0	○
F06.10	Speed control motoring torque upper limit	0.0~250.0	%	165.0	●
F06.11	Speed control braking torque upper limit	0.0~250.0	%	165.0	●
F06.12	Excitation current proportional gain ACR-P1	0.00~100.00		0.50	●
F06.13	Excitation current integral time constant ACR-T1	0.00~600.00 0.00: No integral	ms	10.00	●
F06.14	Torque current proportional gain ACR-P2	0.00~100.00		0.50	●
F06.15	Torque current integral time constant ACR-T2	0.00~600.00 0.00: No integral	ms	10.00	●
F06.17	SVC zero frequency handling mode	0: Brake 1: No processing 2: Pipe blocking		2	○
F06.18	SVC zero frequency brake current	50.0~400.0 (100.0 is motor no-load current)	%	100.0	○
F06.20	Voltage feedforward gain	0~100	%	0	●
F06.21	Field weakening control selection	0: Invalid 1: Direct calculation 2: Automatic adjustment		2	○
F06.22	Field weakening voltage	70.00~100.00	%	95.00	●
F06.23	Maximum field weakening current of synchronous motor	0.0~150.0 (100.0 is the rated motor current)	%	100.0	●
F06.24	Field weakening regulator proportional gain	0.00~10.00		0.50	●
F06.25	Field weakening regulator integral time	0.01~60.00	s	2.00	●
F06.26	Synchronous motor MTPA control selection	0: Invalid 1: Valid		1	○
F06.27	Initial position self-learning gain	0~200	%	100	●
F06.28	Injection current low-frequency band	0.00~100.00 (100.00 is the rated motor frequency)	%	10.00	●
F06.29	Low-frequency band injection current	0.0~60.0 (100.0 is the rated motor current)	%	20.0	●
F06.30	Low-frequency band regulator gain of injection current	0.00~10.00		0.50	●
F06.31	Low-frequency band regulator integral time of injection current	0.00~300.00	ms	10.00	●
F06.32	High-frequency band of injection current	0.00~100.00 (100.00 is the rated motor frequency)	%	20.00	●
F06.33	High-frequency band injection current	0.0~30.0 (100.0 is the rated motor current)	%	8.0	●
F06.34	High-frequency band regulator gain of injection current	0.00~10.00		0.50	●
F06.35	High-frequency band	0.00~300.00	ms	10.00	●

	regulator integral time of injection current				
F06.36	Synchronous excitation saturation coefficient	0.00~1.00		0.6	○
F06.37	Speed loop rigidity coefficient	0~20		12	●
F06.38	Synchronous motor sliding mode gain coefficient	1.00~3.70		3.50	○
F06.39	Synchronous motor sliding mode error width	0.005~0.100		0.100	○
F06.40	Injected reactive current amplitude for synchronous motor	0.0~20.0	%	-10.0	○
F06.41	Synchronous motor open-loop low frequency handling range	0:VF 1:IF 2: IF during startup, VF during stop		0	○
F06.42	Synchronous motor open-loop low frequency handling range	0.0~50.0	%	8.0	○
F06.43	IF injection current	0.0~600.0	%	80.0	○
F06.44	Pole pull-in current time constant	0.0~6000.0	ms	1.0	○
F06.45	Initial pole leading angle	0.0~359.9	°	0.0	○
F06.46	Synchronous motor speed tracking proportional gain	0.00~10.00		1.00	○
F06.47	Synchronous motor speed tracking integral gain	0.00~10.00		1.00	○
F06.48	Synchronous motor speed tracking filter time constant	0.00~10.00	ms	0.40	○
F06.49	Synchronous motor speed tracking control intensity	1.0~100.0		5.0	○
F06.50	Synchronous motor speed tracking control threshold	0.00~10.00		0.20	○
F06.51	Rise time of injected active current for synchronous motor	0.010~1.000	s	5.0	○
F06.76	Low speed correction coefficient of stator resistance for asynchronous motor	10.0~500.0	%	100.0	●
F06.77	Low speed correction coefficient of rotor resistance for asynchronous motor	10.0~500.0	%	100.0	●
F06.78	Slip gain switching frequency point for asynchronous motor	0.10~Fmax	Hz	5.00	○
F07	Protection function setting group				
F07.00	Protection shielding	E20 * E13 E06 * E04 E07 E08 0: Protection active 1: Protection shielded		0*0 0*000	○
F07.01	Motor overload protection gain	0.20~10.00	1.00	●	
F07.02	Motor overload pre-alarm coefficient	50~100	%	80	●
F07.06	Bus voltage control selection	Units digit: Instantaneous power failure non-stop function selection 0: Invalid 1: Deceleration		10	○

		2: Decelerate to stop Tens digit: Overvoltage stall function selection 0: Invalid 1: Valid			
F07.07	Overvoltage stall control voltage	110.0~150.0 (380V, 100.0=537V)	%	134.0	○
F07.08	Instantaneous power failure non-stop action voltage	60.0~Instantaneous power failure non-stop recovery voltage (100.0 = standard bus voltage)	%	76.0	○
F07.09	Instantaneous power failure non-stop recovery voltage	Instantaneous power failure non-stop action voltage~100.0	%	86.0	●
F07.10	Instantaneous power failure non-stop voltage recovery judgment time	0.00~100.00	s	0.50	●
F07.11	Current limiting control	0: Invalid 1: Limiting mode 1 2: Limiting mode 2		2	○
F07.12	Current limiting level	20.0~180.0 (100.0 = rated current of the all-in-one machine)	%	150.0	●
F07.13	Fast current limiting selection	0: Invalid 1: Valid		0	○
F07.14	Protection retry times	0~20, 0: Disable protection retry		0	○
F07.15	Digital output action selection during protection retry	0: No action 1: Action		0	○
F07.16	Protection retry interval	0.01~30.00	s	0.50	●
F07.17	Protection retry times recovery time	0.01~30.00	s	10.00	●
F07.18	Protection retry selection	E08 * E07 * E02 E06 E05 E04 0: Enable protection retry 1: Disable protection retry		0 *0 *0000	○
F07.19	Action selection 1 during protection	E21 E16 E15 E14 E13 * E08 E07 0: Free stop 1: Stop according to stopping mode		000 00*00	○
F07.20	Action selection 2 during protection	E28 E27 * E23 0: Free stop 1: Stop according to stopping mode		00*0	○
F07.21	Load loss protection selection	0: Invalid 1: Valid		0	●
F07.22	Load loss detection level	0.0~100.0	%	20.0	●
F07.23	Load loss detection time	0.0~60.0	s	1.0	●
F07.24	Load loss protection action selection	0: Trip protection, free stop 1: Trip protection, stop according to stopping mode 2: Continue operation, DO status output		1	○
F07.25	Motor overspeed detection level	0.0~50.0 (reference is maximum frequency F00.16)	%	20.0	●
F07.26	Motor overspeed detection time	0.0~60.0, 0.0: Cancel motor overspeed protection	s	1.0	●
F07.27	AVR function	0: Invalid 1: Valid 2: Automatic		1	○
F07.28	Stall protection detection time	0.0~6000.0 (0.0: Do not detect stall protection)	s	0.0	○
F07.29	Stall control intensity	0~100	%	20	○
F07.30	Instantaneous power failure non-stop action deceleration time	0.00~300.00	s	20.00	○
F07.32	Protection retry selection 2	E10 E13 E15 E16 * E19 E20 * 0: Enable protection retry 1: Disable protection retry		000 00000	○
F07.36	Protection retry selection 3	* * * * * E09 E17 0: Enable protection retry 1: Disable protection retry		***** 00	○
F10	Communication function group				
F10.00	Local Modbus communication address	1~247, 0: Broadcast address		1	○
F10.01	Modbus communication baud rate	0: 4800 1: 9600		1	○

		2: 19200 3: 38400 4: 57600 5: 115200			
F10.02	Modbus data format	0: 1-8-N-1 (1 start bit + 8 data bits + 1 stop bit) 1: 1-8-E-1 (1 start bit + 8 data bits + 1 even parity + 1 stop bit) 2: 1-8-O-1 (1 start bit + 8 data bits + 1 odd parity + 1 stop bit) 3: 1-8-N-2 (1 start bit + 8 data bits + 2 stop bits) 4: 1-8-E-2 (1 start bit + 8 data bits + 1 even parity + 2 stop bits) 5: 1-8-O-2 (1 start bit + 8 data bits + 1 odd parity + 2 stop bits)		0	○
F10.03	485 communication timeout	0.0s~60.0s, 0.0: Invalid (Also valid for master-slave mode)	s	0.0	●
F10.04	Modbus response delay	1~20	ms	2	●
F10.05	Master-slave communication function selection	0: Invalid 1: Valid		0	○
F10.06	Master-slave selection	0: Slave 1: Master (Modbus protocol broadcast transmission)		0	○
F10.07	Master transmit data	0: Output frequency 1: Set frequency 2: Output torque 3: Set torque 4: PID setting 5: Output current		1	○
F10.08	Slave receive proportional coefficient	0.00~10.00 (multiple)		1.00	●
F10.09	Master transmit interval time	0.000~30.000	s	0.200	●
F10.10	Communication protocol selection	0: Modbus-RTU protocol		0	×
F12	Keyboard and display function group				
F12.01	STOP button stop function selection	0: Valid only in keyboard control 1: Valid in all command channels		1	○
F12.02	Parameter lock	0: Not locked 1: Reference input not locked 2: All locked except this function code		0	●
F12.03	Parameter copy (optional)	0: No operation 1: Upload parameters to keyboard 2: Download parameters to all-in-one machine (Groups F01 and F14 not downloaded) 3: Download parameters to all-in-one machine		0	○
F12.09	Load speed display coefficient	0.01~600.00		30.00	●
F12.13	Reset electricity meter	0: Not reset 1: Reset		0	●
F12.14	Restore default values	0: No operation 1: Restore factory settings (Excluding motor parameters, all-in-one machine parameters, manufacturer parameters, operation and power-on time records)		0	○
F12.15	Cumulative power-on time (h)	0~65535	h	XXX	×
F12.16	Cumulative power-on time (min)	0~59	min	XXX	×
F12.17	Cumulative operation time (h)	0~65535	h	XXX	×
F12.18	Cumulative operation time (min)	0~59	min	XXX	×
F12.19	Rated power	0.40~650.00	kW	Model OK	×
F12.20	Rated voltage	60~690	V	Model OK	×
F12.21	Rated current	0.1~1500.0	A	Model OK	×
F12.22	Performance software SN 1	XXX.XX		XXX.XX	×

F12.23	Performance software SN 2	XX.XXX						XX.XXX	×
F12.24	Function Software SN 1	XXX.XX						XXX.XX	×
F12.25	Function Software SN 2	XX.XXX						XX.XXX	×
F16	Custom function group								
F16.00	Application	0: General model 1: Water supply application 2: Air compressor application 3: Winding and unwinding application 4: Fan 5: Machine tool spindle 6: Polishing machine 7: High-speed motor application 8: Extruder 9: EM100 communication macro 10: EM303B communication macro						2	○
F16.01	Set length	1~65535 (F16.13=0) 0.1~6553.5 (F16.13=1) 0.01~655.35 (F16.13=2) 0.001~65.535 (F16.13=3)					m	1000	●
F16.02	Pulses per meter	0.1~6553.5						100.0	●
F16.03	Set count value	F16.04~65535						1000	●
F16.04	Specified count value	1~F16.03						1000	●
F16.05	Timed operation set time	0.0~6500.0, 0.0: Invalid					min	0.0	●
F16.06	Agent password	0~65535						0	●
F16.07	Set accumulated power-on target time	0~65535, 0: Disable power-on time reach protection					h	0	●
F16.08	Set accumulated operating target time	0~65535, 0: Disable operation time reach protection					h	0	●
F16.09	Factory password	0~65535						XXXX	●
F18	Monitoring parameter group								
F18.00	Output frequency	0.00~Upper limit frequency					Hz	XXX	×
F18.01	Set frequency	0.00~Maximum frequency F00.16					Hz	XXX	×
F18.03	Estimated feedback frequency	0.00~Upper limit frequency					Hz	XXX	×
F18.04	Output torque	-200.0~200.0					%	XXX	×
F18.05	Torque setting	-200.0~200.0					%	XXX	×
F18.06	Output Current	0.00~650.00 (rated motor power ≤ 75kW) 0.0~6500.0 (rated motor power >75kW)					A	XXX	×
F18.07	Output current percentage	0.0~300.0 (100.0 = rated current of the all-in-one machine)					%	0	×
F18.08	Output voltage	0.0~690.0					V	XXX	×
F18.09	DC bus voltage	0~1200					V	XXX	×
F18.10	Simple PLC operation count	0~10000						XXX	×
F18.11	Simple PLC operation stage	1~15						XXX	×
F18.12	Current stage PLC operation time	0.0~6000.0						XXX	×
F18.14	Load speed	0~65535					rpm	XXX	×
F18.15	UP/DOWN offset frequency	0.00~2*Maximum frequency F00.16					Hz	XXX	×
F18.16	PID setting	0.0~Maximum PID range						XXX	×
F18.17	PID feedback	0.0~Maximum PID range						XXX	×
F18.18	Electricity meter: MWh	0~65535					MWh	XXX	×
F18.19	Electricity meter: kWh	0.0~999.9					kWh	XXX	×
F18.20	Output power	-650.00~650.00					kW	XXX	×
F18.21	Output power factor	-1.000~1.000						XXX	×
F18.22	Digital input terminal status 1	X5	X4	X3	X2	X1		XXX	×
		0/1	0/1	0/1	0/1	0/1			
F18.23	Digital input terminal status 2	*	AI2	AI1	*	*		XXX	×
		*	0/1	0/1	*	0/1			
F18.25	Output terminal status	*	*	R1	*	Y1		XXX	×
		*	*	0/1	*	0/1			

F18.26	AI1	0.0~100.0	%	XXX	×
F18.27	AI2	0.0~100.0	%	XXX	×
F18.31	High-frequency pulse input frequency: kHz	0.00~100.00	kHz	XXX	×
F18.32	High-frequency pulse input frequency: Hz	0~65535	Hz	XXX	×
F18.33	Count value	0~65535		XXX	×
F18.34	Actual length	0~65535	m	XXX	×
F18.35	Timed operation remaining time	0.0~6500.0	min	XXX	×
F18.36	Synchronous motor rotor position	0.0~359.9°		XXX	×
F18.39	VF separation target voltage	0~690	V	XXX	×
F18.40	VF separation output voltage	0~690	V	XXX	×
F18.45	Set speed	0~65535	rpm	XXX	×
F18.46	Output frequency symbol	0~65535		XXX	×
F18.51	PID output	-100.0~100.0		%	×
F18.60	All-in-one machine temperature	-40~200	°C	0	×
F19	Protection record group				
F19.00	Latest protection category	0: No protection (For fault protection codes, refer to Chapter 6)		0	×
F19.01	Output frequency at protection	0.00~Upper limit frequency	Hz	0.00	×
F19.02	Output current at protection	0.00~650.00 (rated motor power ≤ 75kW) 0.0~6500.0 (rated motor power >75kW)	A	0.00	×
F19.03	Bus voltage at protection	0~1200	V	0	×
F19.04	Operation status at protection	0: Not running 1: Forward acceleration 2: Reverse acceleration 3: Forward deceleration 4: Reverse deceleration 5: Forward constant speed 6: Reverse constant speed		0	×
F19.05	Working time at protection	h		0	×
F19.06	Previous protection category	For fault protection codes, refer to Chapter 6		0	×
F19.07	Output frequency at protection	Hz		0.00	×
F19.08	Output current at protection	A		0.00	×
F19.09	Bus voltage at protection	V		0	×
F19.10	Operation status at protection	Same as parameter F19.04 description		0	×
F19.11	Working time at protection	h		0	×
F19.12	First two protection category	For fault protection codes, refer to Chapter 6		0	×
F19.13	Output frequency at protection	Hz		0.00	×
F19.14	Output current at protection	A		0.00	×
F19.15	Bus voltage at protection	V		0	×
F19.16	Operation status at protection	Same as parameter F19.04 description		0	×
F19.17	Working time at protection	h		0	×
F28	Air compressor application macro parameter group 1				
F28.00	Application macro	0: Air compressor macro 1: EM650C 2: EM730-HA		1	○

F28.01	Air compressor start/stop mode	0: Local (HMI) 1: (HMI)/Remote control		0	○
F28.02	Loading method	0: Automatic 1: Manual		0	○
F28.03	Loading frequency	0.00~Fup	Hz	25.00	●
F28.04	Manual loading control command	0: Clear and unload 1: Set to 1 for loading		0	●
F28.05	Sleep judgment time	10~7200	S	600	●
F28.07	Restart delay time	1~300	S	60	●
F28.08	Stop delay time	0~60000S	S	5	●
F28.09	Pressure range	0.50~25.00	MPa	1.60	○
F28.11	Inverter pressure	Loading pressure ~ Unloading pressure	MPa	0.70	●
F28.12	Unload pressure upper limit	Inverter pressure ~ Shutdown pressure	MPa	0.85	●
F28.13	Shutdown pressure	Unloading pressure upper limit ~ Pressure range	MPa	0.90	●
F28.14	Pressure proportional gain (GP)	0.00~100.00		3.50	●
F28.15	Pressure integral time (GTi)	0.000~60.000 0.000: No integral	S	3.000	●
F28.16	Pressure differential time (GTd)	0.000~60.000	mS	0.000	●
F28.17	Pressure integral action range	0.00~100.00	%	100.0 0	●
F28.18	Pressure regulation upper limit	0.00~100.00	%	100.0 0	●
F28.19	Pressure regulation lower limit	0.00~100.00	%	35.00	●
F28.20	Loading pressure	0.00~Inverter pressure	MPa	0.60	●
F28.21	Unloading pressure	Inverter pressure ~ Unloading pressure upper limit	MPa	0.80	●
F28.22	Pressure limit deviation	0.00~100.00	%	0.21	●
F28.23	Pressure disconnection detection threshold	0.00~100.00	%	0.10	○
F28.24	Pressure disconnection detection time	0.0~6000.0 (0.0: This function is invalid)	s	0.1	●
F28.26	Temperature range	60.0~250.0	°C	220.0	○
F28.28	Fan start temperature	Fan stop temperature ~ Warning temperature	°C	80.0	●
F28.29	Warning temperature	Fan start temperature ~ Alarm temperature	°C	105.0	●
F28.30	Shutdown temperature	Warning temperature ~ Temperature range	°C	110.0	●
F28.37	Fan stop temperature	0.0~Fan start temperature	°C	70.0	●
F28.38	Fan stop delay time	1~300	S	0.1	●
F28.39	Fan start delay time	1~300	S	1.0	●
F28.41	Temperature disconnection detection threshold	0.0~100.0	%	99.0	○
F28.42	Temperature disconnection detection time	0.0~6000.0 (0.0: This function is invalid)	s	0.1	●
F28.44	Motor overheat threshold	25.0~200.0	°C	110.0	○
F28.45	Motor PTC disconnection detection threshold	0.0~100.0	%	99.0	○
F28.46	Motor PTC disconnection detection time	0.0~6000.0 (0.0: This function is invalid)	s	0.1	●
F28.47	Oil filter service time preset	0~9000	H	2000	●
F28.48	Oil separator service time preset	0~9000	H	2000	●
F28.49	Air filter service time preset	0~9000	H	2000	●
F28.50	Lubricating oil service time preset	0~9000	H	2000	●
F28.51	Grease service time	0~9000	H	2000	●

	preset				
F28.52	Warning delay time	0~2000	H	0	●
F28.53	Reserved				
F28.54	Jog loading delay	0~60	S	3	○
F28.64	Maximum time	0~60000 (0: Invalid)	h	0	●
F28.70	Loading/unloading status	0: Unloading status 1: Loading status 2: Sleep status		0	×
F28.71	Time fault query	From right to left: 1st digit: Oil filter time 2nd digit: Oil separator time 3rd digit: Air filter time 4th digit: Lubricating oil time 5th digit: Grease time 6th digit: Reserved 7th digit: Reserved 8th digit: Reserved		0	×
F28.72	Remaining shutdown delay time	0~60000	S	XXX	×
F28.73	Current loading time	0~60000	S	XXX	×
F28.74	Remaining time for restart after shutdown	0~60000	S	XXX	×
F28.77	Current running time	0~60000	H	XXX	×
F28.78	Supply pressure feedback	0.00~600.00	MPa	0	×
F28.79	Exhaust temperature feedback	-50.0~220.0	°C	0	×
F28.80	Motor temperature feedback	-50.0~220.0	°C	0	×
F28.81	Actual oil filter service time	0~9500	H	XXX	●
F28.82	Actual oil separator service time	0~9500	H	XXX	●
F28.83	Actual air filter service time	0~9500	H	XXX	●
F28.84	Actual lubricating oil service time	0~9500	H	XXX	●
F28.85	Actual grease service time	0~9500	H	XXX	●
F28.86	Total loading time	0~65535	H	XXX	●
F28.90	Total operation time	0~60000	H	XXX	●
F28.91	Terminal function query	D0 0 0: Disabled, 1: Enabled D0: Display emergency stop status D1: Display loading valve action status D2: Display fan operation status D3: Display alarm D4: Display mechanical maintenance time warning		XXX	×
F28.92	Supply pressure input monitoring	-10000-10000		0	×
F28.93	Exhaust temperature input monitoring	-10000-10000		0	×
F28.94	Motor temperature input monitoring	-10000-10000		0	×
F28.95	Pressure PI parameter switching mode	0: Use the first group of PID parameters 1: Reserved 2: Automatically switch according to error		0	○
F28.96	Pressure parameter switching point 1	0.00~F28.97	%	1.00	●
F28.97	Pressure parameter switching point 2	F28.96~100.00	%	2.50	●
F28.98	Pressure proportional gain (GP2)	0.00~100.00		10.00	●

F28.99	Pressure integral time (GTi2)	0.000~60.000 0.000: No integral	S	10.00 0	●
F31	Air compressor application macro parameter group 2				
F31.01	Air compressor fan handling	0: Fan does not stop during sleep 1: Fan stops during sleep		0	●
F31.04	Rated fan current	0.1~600.0	A	2.0	○
F31.05	Fan display current	0.0~15.6A	A	XXX	○
F31.13	Fan communication start command	0: Fan jog stop 1: Fan jog start		0	●
F31.17	Reset air compressor fault record	0: None 1: Reset (Automatically return to zero after reset)		0	●
F31.18	Rated fan power	0.40~650.00	kW	0.40	○
F31.19	Rated fan voltage	60~690	V	380	○
F32	Air compressor application macro parameter group 3				
F32.00	Current operation time (min)	0.000~59.999	min	XXX	●
F32.01	Total operation time (min)	0.000~59.999	min	XXX	●
F32.02	Total loading time (min)	0.000~59.999	min	XXX	●
F32.03	Current loading time (min)	0.000~59.999	min	XXX	●
F32.04	Actual oil filter service time (min)	0.000~59.999	min	XXX	●
F32.05	Actual oil separator service time (min)	0.000~59.999	min	XXX	●
F32.06	Actual air filter service time (min)	0.000~59.999	min	XXX	●
F32.07	Actual lubricating oil service time (min)	0.000~59.999	min	XXX	●
F32.08	Actual grease service time (min)	0.000~59.999	min	XXX	●
F32.19	Pre-operation frequency	0.00~Fup	Hz	70.00	●
F32.20	Pre-operation time	0~120	S	60	●
F32.23	Low temperature alarm temperature	-50.0~10.0		-15	○
F32.24	User macro parameters	0: Default parameters 1: 160Hz lower limit frequency		0	○
F32.25	Fan overload protection gain	0.20~10.00		1.00	●