ACDRIVE

S5300 CE Series

Contruction elevator control integrated inverter

User manual

Contents

Safety Information and Precautions

■ Warnings, Cautions and Notes

WARNING

A Warning contains information, which is essential for avoiding a safety hazard.

CAUTION

A Caution contains information, which is necessary for avoiding a risk of damage to the product or other machine.

Note

A Note contains information which helps to ensure correct operation.

■ Electrical Safety

Extreme care must be taken at all times when working with the AC Drive or within the area of the AC Drive. The voltages used in the AC Drive can cause severe electrical shock or burns and is potentially lethal. Only authorized and qualified personnel should be allowed to work on AC Drives

■ Machine/System Design and Safety of Personnel

Machine/system design, installation, commissioning startups and maintenance must be carried out by personnel who have the necessary training and experience. They must read this safety information and the contents of this manual. If incorrectly installed, the AC Drive may present a safety hazard.

The AC Drive uses high voltages and currents (including DC), carries a high level of stored electrical energy in the DC bus capacitors even after power OFF. These high voltages are potentially lethal.

The AC Drive is NOT intended to be used for safety related applications/functions. The electronic “STOP & START” control circuits within the AC Drive must not be relied upon for the safety of personnel. Such control circuits do not isolate mains power voltages from the output of the AC Drive. The mains power supply must be disconnected by a electrical safety isolation device before accessing the internal parts of the AC Drive.

Safety risk assessments of the machine or process system which uses an AC Drive must be undertaken by the user and or by their systems integrator/designer. In particular the safety assessment/design must take into consideration the consequences of the AC Drive failing or tripping out during normal operation and whether this leads to a safe stop position without damaging machine, adjacent equipment and machine operators/users. This responsibility lies with the user or their machine/process system integrator.

The system integrator/designer must ensure the complete system is safe and designed according to the relevant safety standards. Inovance Technology and Authorized Distributors can provide recommendations related to the AC drive to ensure long term safe operation.

■ Working Environment and Handling

Matters related to transport, storage, installation, IP rating, working environment and AC Drive tolerance limits (temperature, ambient, voltage, pollution, vibration etc) can be found within this manual. The guidelines and recommendations should be followed in order to gain long term trouble free operation as the lifetime of the AC Drive is dependent on the working environment and correct handling of the product in the initial installation stage.

■ Electrical Installation - Safety

Electrical shock risk is always present within an AC Drive including the output cable leading to the motor terminals. Where dynamic brake resistors are fitted external to the AC Drive, care must be taken with regards to live contact with the brake resistors, terminals which are at high DC voltage and potentially lethal. Cables from the AC Drive to the dynamic brake resistors should be double insulated as DC voltages are typically 600 to 700 VDC.

Mains power supply isolation switch should be fitted to the AC Drive. The mains power supply must be disconnected via the isolation switch before any cover of the AC Drive can be removed or before any servicing work is undertaken

Stored charge in the DC bus capacitors of the PWM inverter is potentially lethal after the AC supply has been disconnected. The AC supply must be isolated at least 10 minutes before any work can be undertaken as the stored charge will have been discharged through the internal bleed resistor fitted across the DC bus capacitors.

Whenever possible, it is good practice to check the DC bus voltage with a VDC meter before accessing the inverter bridge. Where the AC Drive input is connected to the mains supply with a plug and socket, then upon disconnecting the plug and socket, be aware that the plug pins may be exposed and internally connected to the DC bus capacitors (via the internal bridge rectifier in reversed bias). Wait 10 minutes to allow stored charge in the DC bus capacitors to be dissipated by the bleed resistors before commencing work on the AC Drive.

When using an earth leakage circuit breaker, use a residual current operated protective device (RCD) of type B (breaker which can detect both AC and DC). Leakage current can cause unprotected components to operate incorrectly. If this is a problem, lower the carrier frequency, replace the components in question with parts protected against harmonic current, or increase the sensitivity amperage of the leakage breaker to at least 200 mA per drive.

Factors in determining leakage current:

• Size of the AC drive

• AC drive carrier frequency

• Motor cable type and length

• EMI/RFI filter

For more information, contact Inovance.

■ Complying with Local Regulations

The installer of the AC Drive is responsible for complying with all relevant regulations for wiring, circuit fuse protection, earthing, accident prevention and electromagnetic (EMC regulations). In particular fault discrimination for preventing fire risk and solid earthing practices must be adhered to for electrical safety (also for good EMC practice). Within the European Union, all machinery in which this product is used must comply with the following directives;

2014/35/EU: Low Voltage Directive

2014/30/EU: Electromagnetic compatibility

■ AC Motor (Induction/Asynchronous)

AC induction motors are designed to run at fixed speed at the 50 or 60 Hz supply frequency and therefore it's cooling capability is dependent on the axial driven fan mounted at the non drive end.

When the motor is operated at variable speed with the AC Drive, it is necessary to consider the reduced cooling rate especially when running at low speed for considerable period of time. Please consult with the motor manufacturer who can provide cooling solutions such as a electric force ventilated fan or an "inverter" rated AC motor designed to handle reduced speed running with AC Drives.

It is also necessary to consult with the motor manufacturer when above base speed (> 50/60 Hz) running is required and or when high speed operations are required. Motor suppliers also provide solutions for encoder feedback devices for close loop operation with an AC Drive.

■ Adjusting AC Drive Parameters

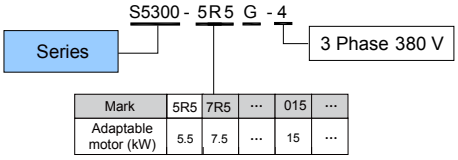
The AC Drive when it leaves the factory with default settings should enable the user to get started quickly to check on the basic mechanical running conditions. At a later time, fine tuning to optimize the operation/performance can be undertaken.

Such parameter tuning should be done by qualified personnel who have prior training on AC Drives. Some parameter settings if manipulated incorrectly can have adverse reactions and care should be taken especially during the commissioning startup stages to prevent personnel from engaging the machine.

This manual provides a complete list of the parameters with functional description and care should always be taken whenever parameters are adjusted during a live running startup. Inovance Technology and Authorized Distributors can provide product training and if in doubt seek advice.

Chapter 1 Product Information

1.1 Product Type Identification



1.2 S5300 Models and Technical Data

S5300 Model	Power Capacity (kVA)	Input Current (A)	Output Current (A)	Applicable Motor (kW)
S5300-5R5G-4	8.9	14.6	13.0	5.5
S5300-7R5G-4	11.0	20.5	17.0	7.5
S5300-011G-4	17.0	26.0	25.0	11
S5300-015G-4	21.0	35.0	32.0	15
S5300-018G-4	24.0	38.5	37.0	18.5
S5300-022G-4	30.0	46.5	45.0	22
S5300-030G-4	40.0	62.0	60.0	30
S5300-037G-4	57.0	76.0	75.0	37
S5300-045G-4	69.0	92.0	91.0	45
S5300-055G-4	85.0	113.0	112.0	55
S5300-075G-4	114.0	157.0	150.0	75

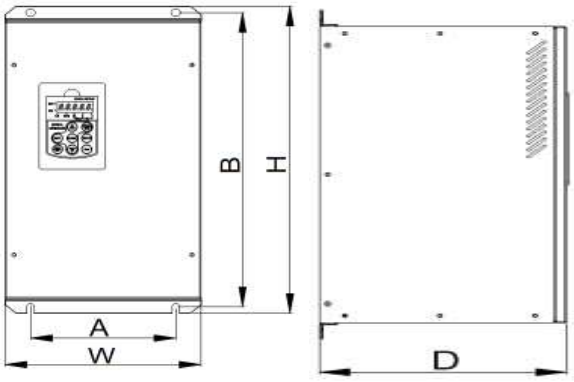
1.3 Technical Specifications

Item		Specifications
Basic functions	Maximum frequency	150 Hz
	Carrier frequency	0.5–16 kHz, adjusted automatically based on the load features
	Resolution of input frequency	• Digital setting: 0.01 Hz • Analog setting: maximum frequency x 0.025%
	Motor control mode	Sensorless vector control (SVC) Voltage/Frequency (V/F) control
	Startup torque	• V/F: 0.5 Hz, 150%; SVC:0.5 Hz, 200%
	Speed range	1:100 (SVC)
	Speed stability accuracy	±0.5% (SVC)
	Overload capacity	60s for 150% of the rated current, 3s for 180% of the rated current
	Torque boost	• Fixed boost • Customized boost 0.1%–30.0%
	Ramp mode	• Straight-line ramp • S-curve ramp
	DC braking	DC braking frequency: minimum frequency to rated frequency DC braking current: 0.0% to 120.0% of rated current
	Auto voltage regulation (AVR)	It can keep constant output voltage automatically when the mains voltage changes.
	Overvoltage/Overcurrent stall control	The current and voltage are limited automatically during the running to avoid frequent overvoltage/overcurrent tripping.
	Rapid current limit	It decreases the overcurrent faults to the minimum and ensures normal running of the AC drive.
	Torque limit and control	It automatically limits torque during running, preventing frequent overcurrent tripping.

Item		Specifications
Individualized functions	Excellent performance	It implements control on the asynchronous motor and synchronous motor with the high-performance current vector control technology.
	Power dip ride-through	It reduces set frequency for load to maintain normal output of the AC drive when the bus voltage remains low, preventing the undervoltage fault during running.
	Low voltage protection	In the case of sudden bus voltage reduction or power failure, the AC drive stops quickly and restricts the running to prevent hook gliding.
	Overload protection	It automatically identifies the load condition, and restricts the hoist running after overload, but allows only the descending running.
	Three-level function codes	The function codes are classified into three levels, respectively for junior, senior, and advanced users.
	Display of gearbox use ratio	With the internal calculation mode of the gearbox use ratio, the current gearbox use ratio is displayed to users.
	Brake time sequence control	The time sequence control of a specialized brake for the crane is provided.
	Light-load high-speed	It detects the output torque of the AC drive and automatically calculates the highest output frequency.
	Load overspeed judgment	Two alarms indicating frequency direction abnormality and frequency following abnormality based on the encoder feedback frequency are available.
	Integrated control	Built-in logic for construction hoist simplifies design of control cabinet.
	Multiple fault alarms	Probable faults are listed and corresponding solutions are provided.
	Advanced background software	It supports the AC drive parameter operation and virtual oscilloscope function. By means of the virtual oscilloscope, the state inside the AC drive is monitored.
	Static auto-tuning of motor parameters	The S5300 supports static auto-tuning of all motor parameters .
	Weighing function	The S5300 can calculate current load weight according to analog input signal of weighing sensor and supports operation limited due to overload.
Running	Command source	• Operation panel control • Terminal control
	Frequency source	Multi-speed
	Input terminal	• 5 digital input (DI) terminals, including one that supports up to 100 kHz high-speed pulse input • 2 analog input (AI) terminals, one supporting only 0–10 V voltage input and the other supporting 0–10 V voltage input or 4–20 mA current input
	Output terminal	• 1 high-speed pulse output terminal (open-collector) that supports 0–100 kHz square wave signal output • 1 digital output (DO) terminal • 1 relay output terminal • 1 analog output (AO) terminal that supports 0-10 V voltage output or 4–20 mA current output
Display and operation	LED display	It can display the parameters.
Environment	Installation location	Indoor, free from direct sunlight, dust, corrosive gas, combustible gas, oil smoke, vapor, drip or salt
	Altitude	Lower than 1000 m (derated 1%/100 m if the altitude is higher than 1000 m)
	Ambient temperature	–10°C to +40°C (derated 2%/degree when between 40°C and 50°C)
	Humidity	Less than 95% RH, without condensing
	Vibration	9.8 m/s^2 for below 20 Hz, and 5.9 m/s^2 for above 20 Hz
	Storage temperature	–20°C to +70°C
	Pollution level	PD2
	IP level	IP20
	Power system	IN, TT

1.4 Mounting Dimensions

Product Appearance and Mounting Dimensions of the AC Drive



Descriptions of the physical dimensions and mounting dimension

S5300 Model	Mounting Hole (mm)		Physical Dimensions (mm)			Mounting Hole Diameter (mm)
	A	B	H	W	D	
S5300-5R5G-4	148	236	248	160	183	Ø 5.0
S5300-7R5G-4	190	305	322	208	192	Ø6
S5300-011G-4						
S5300-015G-4						
S5300-018G-4	235	447	432	285	228	Ø6.5
S5300-022G-4						
S5300-030G-4						
S5300-037G-4	260	580	549	385	265	Ø10
S5300-045G-4						
S5300-055G-4						
S5300-075G-4	343	678	660	473	307	Ø10

1.5 Repair and Maintenance

1.5.1 Routine Maintenance

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

Routine maintenance involves checking:

- Whether the installation environment of the AC drive changes
- Whether the cooling fan works properly
- Whether the motor vibrates excessively
- Whether the AC drive overheats

Routine cleaning involves:

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

1.5.2 Periodic Inspection

Perform periodic inspection on the items that are difficult to check during running. Periodic inspection involves:

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

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

1.5.3 Replacement of Vulnerable Components

Vulnerable components of the AC drive include the cooling fan and filter electrolytic capacitor. Their service life is related to the operating environment and maintenance.

The service life of the two components is listed in the following table.

Table 1-6 Service life of cooling fan and filter electrolytic capacitor

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

1.5.4 Storage of AC Drive

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

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

1.6 Warranty Agreement

1. The warranty agreement applies only to the AC drive itself.
2. The warranty period of the product is 18 months (refer to the barcode on the product). After 18 months, proper maintenance fee is charged.
3. Within the warranty period, maintenance will be charged for the damages due to the following causes:
   - a. Improper operation without following the instructions
   - b. Fire, flood, and abnormal voltage
   - c. Using the AC drive for non-recommended functions
4. Maintenance fee is charged according to Inovance's uniform standard. If there is an agreement, the agreement prevails.

1.7 Braking Component Selection Guideline

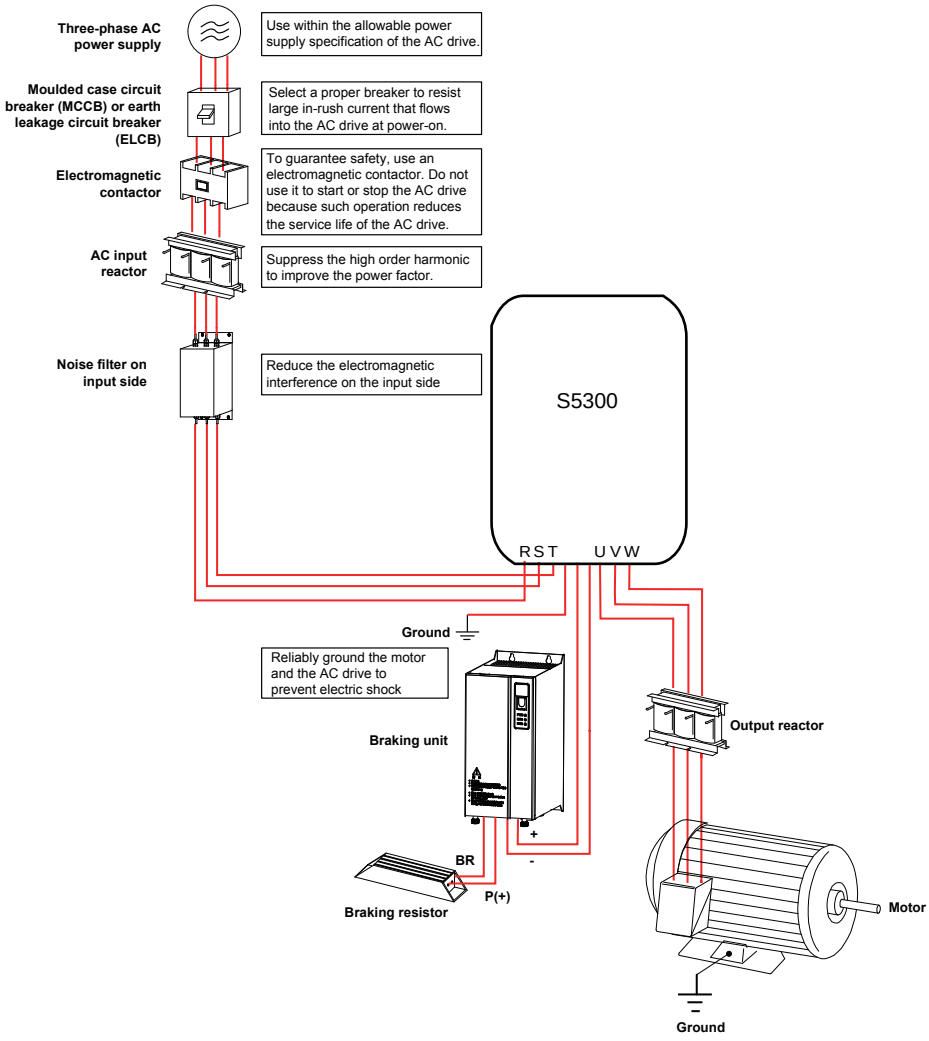
The braking resistor model is dependent on the generation power of the motor in the actual system and is also related to the system inertia, deceleration time and potential energy load. Select the braking resistor based on the actual conditions. The larger the system inertia, the shorter the deceleration time, and the more frequent the braking is. In this case, you need to select a braking resistor of larger power and smaller resistance.

Different braking resistor models are required for different crane conditions. The following tables list the braking components for different S5300 models .

Braking components for the hoisting mechanism

AC Drive Model	In-wire Reactor		Braking Unit	Braking Resistor		
	Current (A)	Inductance (mH)		Power (kW)	Resistance (Ω)	Quantity
S5300-5R5G-4	15	1.42	Built-in	≥ 3	≥ 108	1
S5300-7R5G-4	20	1.06	Built-in	≥ 4	≥ 78	1
S5300-011G-4	30	0.7	Built-in	≥ 5.5	≥ 52	1
S5300-015G-4	40	0.53	Built-in	≥ 7.5	≥ 39	1
S5300-018G-4	50	0.42	Built-in	≥ 10	≥ 30	1
S5300-022G-4	60	0.36	Built-in	≥ 11	≥ 27	1
S5300-030G-4	80	0.26	Built-in	≥ 15	≥ 22	1
S5300-037G-4	90	0.24	MDBUN-45-T	≥ 18.5	≥ 17	1
S5300-045G-4	120	0.18	MDBUN-60-T	≥ 22.5	≥ 13	1
S5300-055G-4	150	0.15	MDBUN-90-T	≥ 28	≥10	1
S5300-075G-4	200	0.11	MDBUN-90-T	≥ 38	≥ 9	1

1.8 Braking Component Selection Guideline



Description of Peripheral Electrical Devices

Part	Mounting Location	Function Description
MCCB	Power receiving side	Interrupt power supply when overcurrent occurs on downstream devices
Contactor	Between MCCB and AC drive input side	Start and stop the AC drive. Do not start and stop the AC drive frequently by switching the contactor on and off (less than twice per minute) nor use it to directly start the AC drive.
AC input reactor	AC drive input side	Improve the power factor of the input side. Eliminate the higher harmonics of the input side effectively and prevent other devices from being damaged due to distortion of the voltage waveform. Eliminate the input current unbalance due to unbalance between the power phases.
EMC Input filter	AC drive input side	Reduce the external conduction and radiation interference of the AC drive. Decrease the conduction interference flowing from the power supply to the AC drive and improve the anti-interference capacity of the AC drive.
DC reactor	MD series AC drive of 7.5G and above configured with DC reactor as standard	Improve the power factor of the input side. Improve the efficiency and thermal stability of the AC drive. Eliminate the impact of higher harmonics of the AC drive input side and reduce the external conduction and radiation interference.
AC output reactor	Between AC drive output side and the motor, close to the AC drive	The output side of the AC drive generally has much higher harmonics. When the motor is far from the AC drive, there is much distributed capacitance in the circuit and certain harmonics may cause resonance in the circuit, bringing about the following two impacts: Degrade the motor insulation performance and damage the motor in the long run. Generate large leakage current and cause frequent AC drive protection trips. If the distance between the AC drive and the motor is greater than 50 m, install an AC output reactor.

- Do not install the capacitor or surge suppressor on the output side of the AC drive. Otherwise, it may cause faults to the AC drive or damage to the capacitor and surge suppressor.
- Inputs/Outputs (main circuit) of the AC drive contain harmonics, which may interfere with the communication device connected to the AC drive. Therefore, install an anti-interference filter to minimize the interference.
- For more details on peripheral devices, refer to related selection in section 3.2.1.

Chapter 2 Mechanical and Electrical Installation

2.1 Mechanical Installation

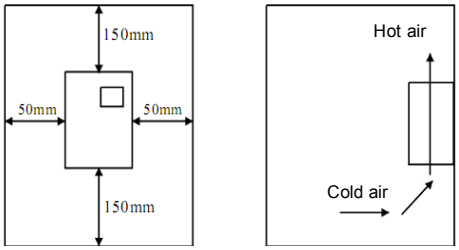
2.1.1 Installation Environment

Installation environment of the S5300

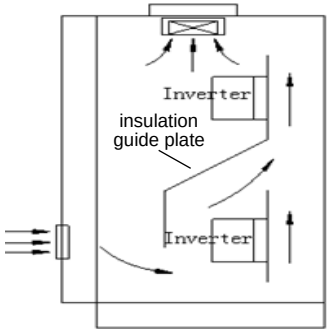
Item	Requirement
Ambient temperature	–10°C to +50°C
Heat dissipation	Install the AC drive on the surface of an incombustible object, and ensure that there is sufficient space around for heat dissipation. Install the AC drive vertically on the support using screws.
Mounting location	Free from direct sunlight, high humidity and condensation
	Free from corrosive, explosive and combustible gas
	Free from oil dirt, dust and metal powder
Vibration	Less than 0.6 g, far away from the punching machine

2.1.2 Installation Clearance Requirements

The clearance that needs to be reserved varies with the power rating of the S5300, as shown in the following fgure.



The S5300 series AC drive dissipates heat from the bottom to the top. When multiple AC drives are required to work together, install them side by side.



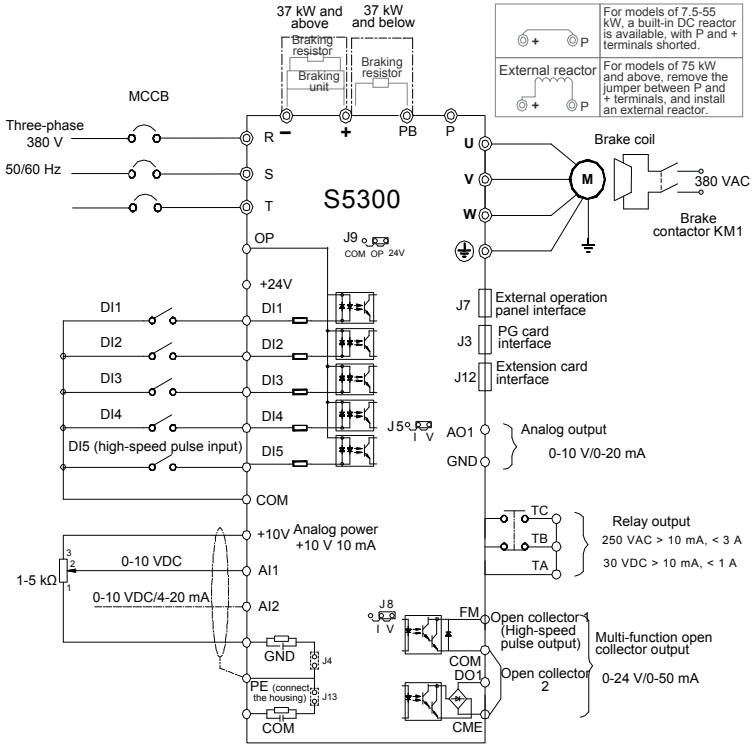
2.2 Electrical Installation

2.2.1 Selection of Peripheral Electrical Devices

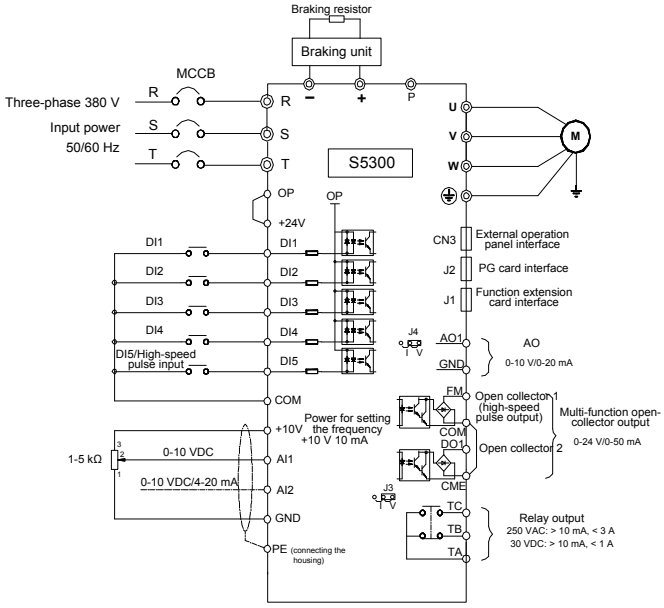
S5300 Model	MCCB (A)	Contactor (A)	Cable of Input Side Main Circuit (mm^2)	Cable of Output Side Main Circuit (mm^2)	Cable of Control Circuit (mm^2)
S5300-5R5G-4	32	25	4.0	4.0	1.0
S5300-7R5G-4	40	32	4.0	4.0	1.0
S5300-011G-4	63	40	4.0	4.0	1.0
S5300-015G-4	63	40	6.0	6.0	1.0
S5300-018G-4	100	63	6	6	1.5
S5300-022G-4	100	63	10	10	1.5
S5300-030G-4	125	100	16	10	1.5
S5300-037G-4	160	100	16	16	1.5
S5300-045G-4	200	125	25	25	1.5
S5300-055G-4	200	125	35	25	1.5
S5300-075G-4	250	160	50	35	1.5

2.2.2 Application of Wiring Terminals and Typical Wiring Example

The following figure shows the application of the power wiring terminals and control circuit wiring terminals.

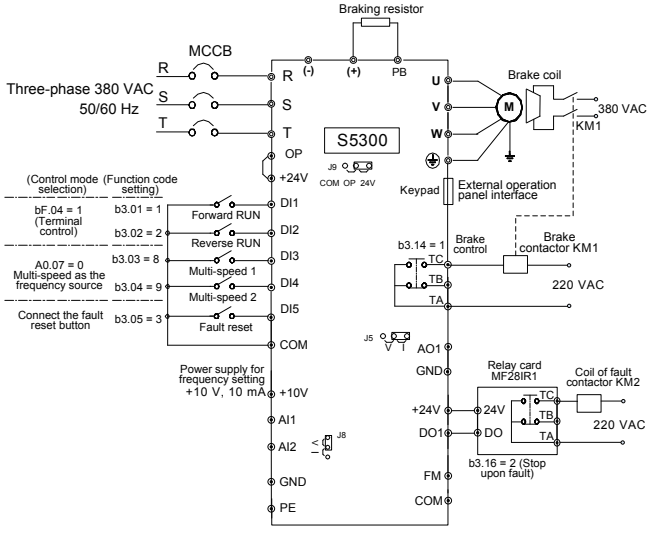


Three-phase wiring for the S5300 of 37 kW to 55 kW



Note	• ◎ indicates the main circuit terminal, and ○ indicates the control circuit terminal. • The models of 37 kW or below have a built-in braking unit, and no external braking unit is required. • The models of 7.5 kW to 55 kW have a built-in DC reactor as standard. • Select a proper braking resistor based on actual requirements. For details, see the preceding braking resistor selection guideline.

The following fgure takes S5300 of 37 kW as an example to show a common wiring method for crane application.



2.2.4 Main Circuit Terminals and Wiring

■ Safety Information

DANGER
• Ensure that the power supply is cut off before wiring. Failure to comply may result in electric shock. • Wiring must be performed only by qualified personnel under instructions described in this manual. Failure to comply may result in equipment damage or personal injury. • Ground the equipment reliably. Failure to comply may result in electric shock or a fire.

CAUTION
• Ensure that input power is consistent with rated value of the AC drive. Otherwise, the AC drive may be damaged. • Ensure that motor is applicable to the AC drive. Failure to comply may result in motor damage or AC drive protection. • Do not connect power supply to the U, V, W terminals. Otherwise, the AC drive may be damaged. • Do not connect braking resistor directly to the (+), (-) terminals of the DC bus. Failure to comply may result in a fire.

■ Terminal Description

The following table describes the terminals of the AC drive main circuit.

Terminal Symbol	Terminal Name	Description
R, S, T	Three-phase power input terminals	Connect the three-phase power supply.
(+), (-)	Positive and negative terminals of DC bus	Input the common DC bus (connect the external braking unit for models of 37 kW or above).
(+), PR	Terminals for connecting the braking resistor	Connect the braking resistor for models of 37 kW or below.
P, (+)	Terminals for connecting the external reactor	Connect the external reactor.
U, V, W	AC drive output terminals	Connect the three-phase motor.
	Grounding terminal	Must be grounded.

■ Wiring Description

1. Power input terminals:

   The cable connection on the input side of the AC drive has no phase sequence requirement.

2. (+), (-) terminals of the DC bus:

   Terminals (+) and (-) of DC bus have residual voltage after power-off. Start wiring only after the CHARGE indicator becomes off and ensure that voltage is less than 36 V. Otherwise, failure to comply may result in electric shock.

   When connecting the external braking unit for the AC drive of 37 kW or above, do not reverse poles (+) and (-). Otherwise, it may damage the AC drive and even cause a fire.

   The cable length of braking unit cannot be longer than 10 m. Use twisted pair wire or pair wires for parallel connection.

   Do not connect the braking resistor directly to the DC bus. Otherwise, it may damage the AC drive and even cause fire.

3. Terminals (+), PR for connecting the braking resistor:

   Connecting terminals of braking resistor are effective only for the drive of 37 kW or below with a built-in braking unit.

   The cable length of the braking resistor must be less than 5 m. Otherwise, it may damage the AC drive.

4. Terminals P, (+) for connecting the external reactor:

   For the AC drive of 75 kW or above, remove the jumper across terminals P and (+) and install the reactor between the two terminals.

5. Output terminals U, V, W of the AC drive:

   The output side of the AC drive must not be connected with a capacitor or surge absorber. Otherwise, it may cause frequent AC drive protection or even damage the AC drive.

   If the motor cable is too long, electrical resonance is generated due to the impact of distributed capacitance. This damages motor insulation or generates large leakage current that causes AC drive to trip in overcurrent protection. If the motor cable is greater than 50 m long, an AC output reactor must be installed close to the AC drive.

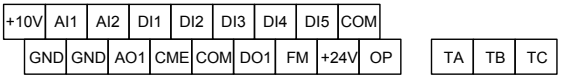
6. Grounding terminal ⏚ PE:

   This terminal must be grounded reliably. The resistance of the grounding cable must be less than 0.1 Ω. Otherwise, it may cause fault or damage to the AC drive.

   Do not share the earth terminal and the N terminal of the power supply zero line.

2.2.5 Control Circuit Terminals and Wiring

■ Terminal Arrangement



■ Function Description

The following table describes the terminals of the control circuit.

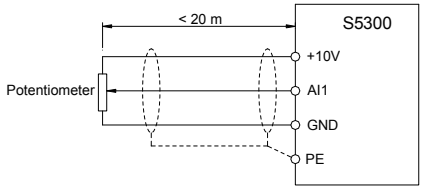
Type	Terminal Symbol	Terminal Name	Function Description
Power supply	+10V-GND	External +10V power supply	Provide +10 V power supply externally. Generally, it provides power supply to external potentiometer with resistance range of 1–5 kΩ. Maximum output current: 10 mA
	+24V-COM	External +24V power supply	Provide +24 V power supply externally. Generally, it provides power supply to DI/DO terminals and external sensors. Maximum output current: 200 mA
	OP	Input terminal of external power supply	It is connected to +24V by default (decided by jumper J9). When DI1 to DI5 need to be driven by external power, OP needs to be connected to external power supply and be disconnected from +24V.
AI	AI1-GND	AI1	1. Input voltage range: 0–10 VDC 2. Input impedance: 22 kΩ
	AI2-GND	AI2	1. Input range: 0–10 VDC/4–20 mA, decided by jumper J8 on the control board 2. Input impedance: 22 kΩ (voltage input), 500 Ω (current input)
DI	DI1-COM	DI1	1. Optical coupling isolation, compatible with dual polarity input 2. Input impedance: 2.4 kΩ 3. Voltage range for level input: 9–30 V
	DI2-COM	DI2	
	DI3-COM	DI3	
	DI4-COM	DI4	
	DI5-COM	High-speed pulse input	Having features of DI1 to DI4, it can be also used as the channel for high-speed pulse input. Maximum input frequency: 100 kHz
AO	AO1-GND	AO1	1. Voltage output or current output determined by jumper J5. 2. Output voltage range: 0–10 V 3. Output current range: 0–20 mA

Type	Terminal Symbol	Terminal Name	Function Description
DO	DO1-CME	DO1	1. Optical coupling isolation, dual polarity open-collector output 2. Output voltage range: 0–24 V 3. Output current range: 0–50 mA Note that CME and COM are internally isolated, but they are short-circuited externally by using a jumper at factory delivery (DO1 is driven by +24V by default in this case). If DO1 needs to be driven by external power supply, remove the jumper.
	FM-COM	High-speed pulse output	It is restricted by b3.18 (FM function selection). As high-speed pulse output, maximum frequency reaches 100 kHz. As open-collector output, its specification is the same as DO1.
Relay output	TA/TB	Normally closed (NC) terminal	Contact driving capacity: 250 VAC: 3 A, COSø = 0.4 30 VDC: 1 A
	TA/TC	Normally open (NO) terminal	
Auxiliary interface	J12	Extension card interface	Used as the Interface of 28-pin terminal and optional card (I/O extension card, PLC card and various bus cards).
	J3	PG card interface	Used as the interface for connecting open-collector encoder, differential encoder, UVW encoder, and resolver.
	J7	External operation panel interface	Connect the external operation panel.
Auxiliary interface	J9	Reserved	Reserved.

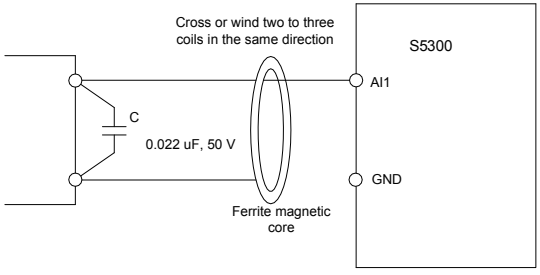
■ Wiring Description

1. Wiring of AI terminals

Weak analog voltage signals easily suffer from external interference, and therefore use shieldeds not longer than 20 m, as shown in following figure.



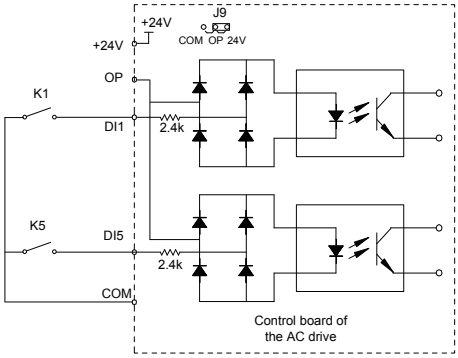
In certain scenarios where analog signals suffer serious interference, a filter capacitor or ferrite magenetic core needs to be installed on the analog signal source, as shown in the following figure.



2. Wiring of DI terminals

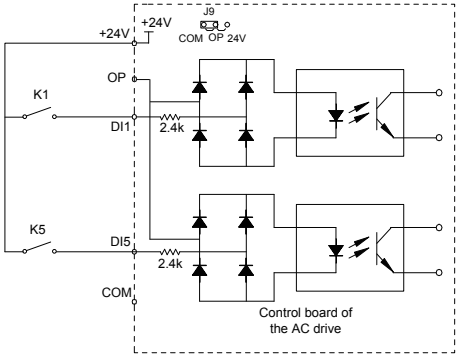
Generally, use shielded cables not longer than 20 m. When active driving is adopted, filtering measures must be necessarily taken to reduce interference to the power supply. It is recommended to use the contact control mode.

1) Wiring of dry contact common cathode



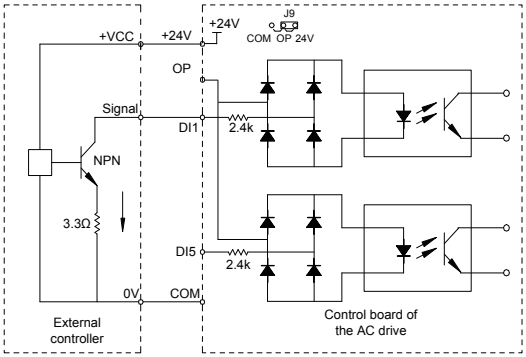
This is the most commonly used wiring mode, in which J9 is connected to 24V, by default. If external power supply is applied, remove jumper bar (J9) between +24V and OP, and connect the positive pole of external power supply to OP and the negative pole to COM.

2) Wiring of dry contact common anode



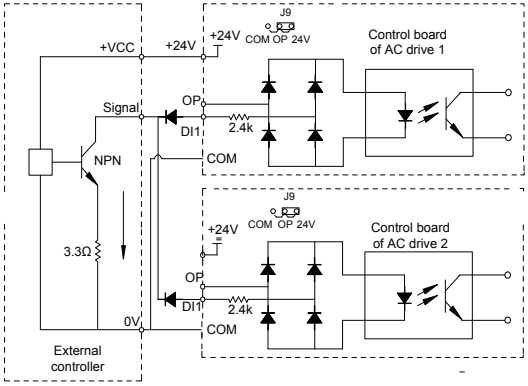
In such wiring mode, the jumper bar J9 is connected to COM. If external power supply is used, remove J9, and connect OP to COM for external power supply; external power supply 24 V is used as the COM for DI terminals.

3) SINK wiring

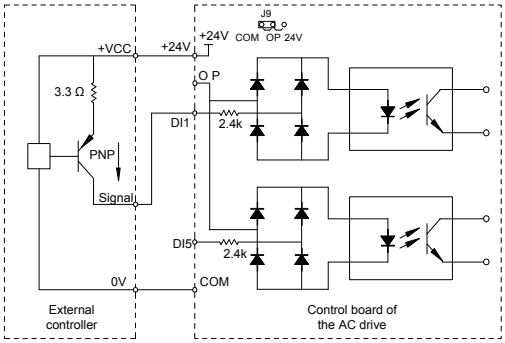


This is the most commonly used wiring mode, in which J9 is connected to 24V. If external power supply is used, remove jumper bar J9 between +24V and OP, and connect the positive pole and negative pole of external power supply respectively to the positive and negative of the controller.

In such wiring mode, the DI terminals of different AC drives cannot be connected in parallel. Otherwise, it causes DI mal-operation. If parallel connection between DI terminals of different AC drives is required, connect a diode (anode) in series to the DI terminals. The diode must meet the requirements: IF > 10 mA, UF < 1 V.



4) SOURCE wiring



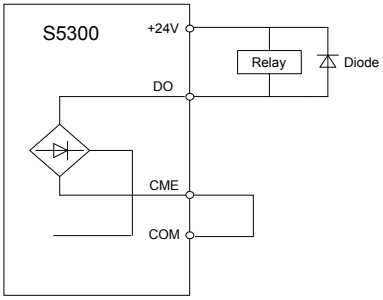
In such wiring mode, J9 is connected to COM. If external power supply is used, remove the J9 between COM and OP, and connect the positive pole and negative pole of external power supply respectively to the positive and negative of the controller. Then, signals are sent to the DI terminals.

3. Wiring of DO terminals

When the DO terminal needs to drive the relay, an absorption diode must be installed on two sides of the relay coil. Otherwise, the 24 VDC power supply may be damaged. The driving capacity is not larger than 50 mA.

Do not reverse the polarity of the absorption diode during installation, as shown in the following figure. Otherwise, the 24 VDC power supply is damaged immediately if there is digital output.

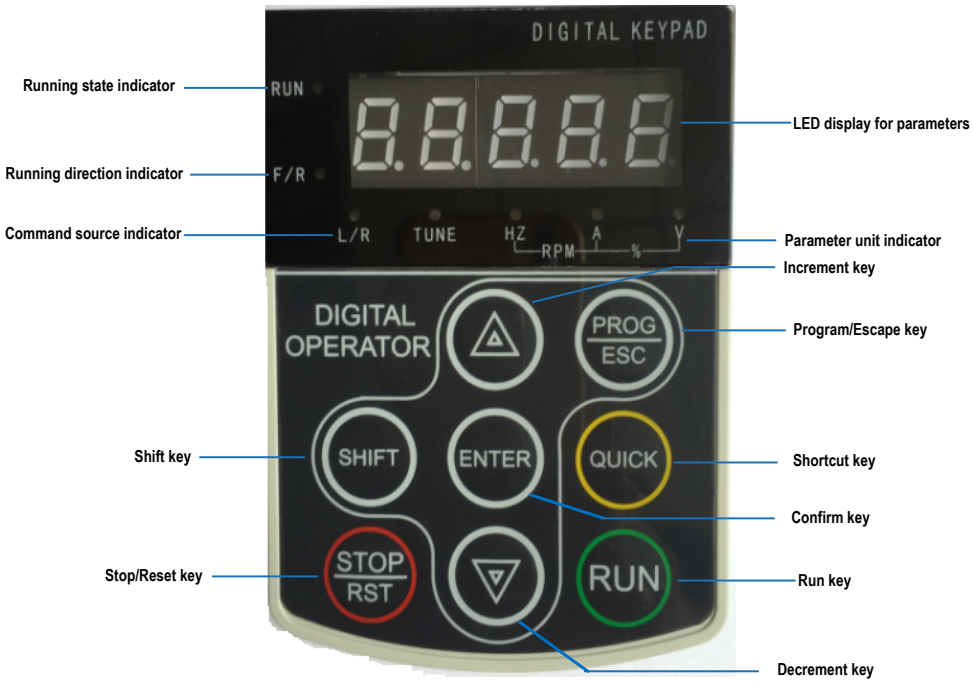
Figure 2-22 Wiring of DO terminals



Chapter 3 Operations and Application Examples

3.1 Introduction to the Operation Panel

The operation panel, shown in , allows you to monitor the running state , modify the parameters and start/stop S5300 .



■ Status Indicators

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

Indicator	Indication
○ RUN	OFF indicates the S5300 is in the stop state .
	ON indicates the S5300 is in the running state .
○ LOCAL/REMOT	OFF indicates the S5300 is under the operating panel control .
	ON indicates the S5300 is under the terminal control .
	FLASHING indicates the S5300 is under the communication control .
○ FWD/REV	OFF indicates reverse motor rotation.
	ON indicates forward motor rotation.
○ TUNE/TC	ON indicates the auto-tuning state.

■ Unit Indicators

There are three red unit indicators below the data display. These indicators operate individually or in pairs to show the units used to display data .

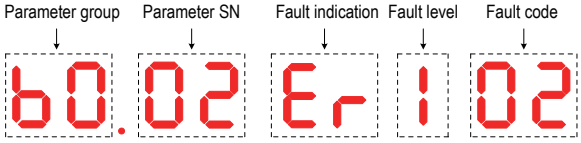
Indicator appearance	Meaning
Hz RPM A % V	Hz for frequency
Hz RPM A % V	A for current
Hz RPM A % V	V for voltage
Hz RPM A % V	RPM for rotational speed
Hz RPM A % V	% for anything relevant

■ LED Display

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

- Function parameters
- Monitoring information
- Fault code

For example,

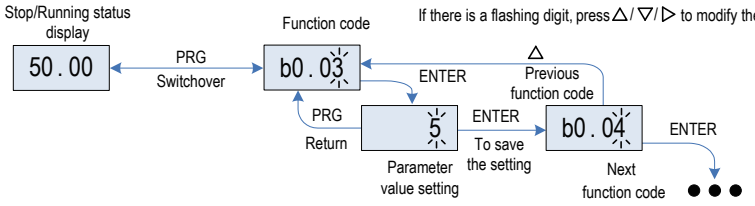


■ Keys on Operation Panel

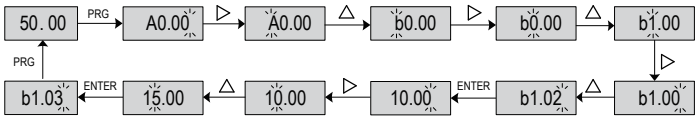
Key	Key Name	Function
PRG	Programming	Enter or exit the Level I menu.
ENTER	Confirm	Enter each level of the menu interface. Confirm the displayed parameter setting.
△	Increment	When editing a parameter value, it increases the displayed value.
▽	Decrement	When editing a parameter value, it decreases the displayed value.
▷	Shift	Select the displayed parameter in the stop or running state. Select the digit to be modified when modifying a parameter value
RUN	RUN	Start the AC drive when using the operating panel control mode.
STOP RST	Stop/Reset	Stop the AC drive when it is in the RUN state. Perform a reset operation when the AC drive is in the FAULT state.
QUICK	Shortcut key	Press this key to quickly enter the password input interface.
MF.K	No function	Reserved

3.2 Viewing and Modifying Function Codes

The operation panel of the S5300 adopts three-level interfaces, that is status display, function code and function code setting value, as shown in the following figure.



Here is an example of modifying the value of b1.02 from 10.00 Hz to 15.00 Hz.



In the parameter value setting interface, if the parameter has no blinking digit, it means that the parameter cannot be modified. This may be because:

- Such a function parameter is readable, such as monitoring parameters and running record parameters.
- Such a function parameter cannot be modified in the running state and can only be modified at stop.

3.3 Status Parameters and Limit Abnormal Code of the S5300

3.3.1 Display of Status Parameters of the S5300

In the stop or running state, you can press  on the operation panel to display status parameters.

In the running state, you can view five parameters, such as frequency reference, the output synchronous frequency, output current, output voltage and bus voltage. In the stop state, you can only view the frequency reference and the bus voltage

3.3.2 Limit Abnormal Display Code of the S5300

Limit Abnormal	Display Code
Up limit abnormal	STOP1
Down limit abnormal	STOP2
Forbid running abnormal	STOP3
Door limit abnormal	STOP4
Car top window limit abnormal	STOP5
Overload limit abnormal	STOP6
Remote lock abnormal	STOP9

3.4 Starting/Stopping the AC Drive

3.4.1 Selecting the Start/Stop Command Source

There are three start/stop command sources, namely, operation panel control, terminal control and communication control, selected in bF.04.

bF.04	Command source selection		Default: 0	Description
	Setting Range	0	Operation panel control (indicator OFF)	Press the RUN or STOP key to start/stop the AC drive.
		1	Terminal control (indicator ON)	Set a DI terminal for the corresponding function.
		2	Communication control (indicator flashing)	For factory test

- Operation panel control

  Set bF.04 = 0 on the operation panel to enable the operation panel control. Press 

on the operation panel. The AC drive runs immediately (the RUN indicator is ON). After you press 

while the AC drive is running, the AC drive stops immediately (the RUN indicator is OFF).

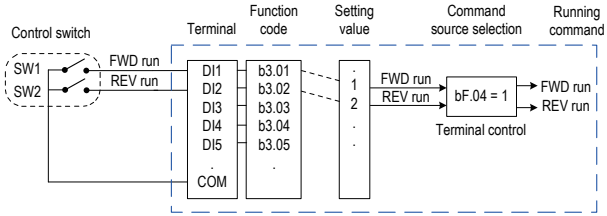
- Terminal control

  This control mode is applicable to scenarios where the DIP switch or electromagnetic button is used to start or stop the application system or scenarios where the dry contact signal is used to start or stop the AC drive.

  The S5300 provides the terminal control function . Parameters b3.01 to b3.12 determine the DI terminal through which the start/stop signal is input. For detailed setting, see the descriptions of b3.02 to b3.12.

For example:

To use the DIP switch as the start/stop source, and set DI1 for the forward run function and DI2 for the reverse run function, perform the setting as shown in the following figure.



In the preceding figure, when SW1 is ON, the AC drive instructs forward run. When SW1 is OFF, the AC drive stops. When SW2 is ON, thr AC drive instructs reverse run. When SW2 is OFF, the AC drive stops. When SW1 and SW2 are ON simultaneously, the AC drive reports the 44# fault.

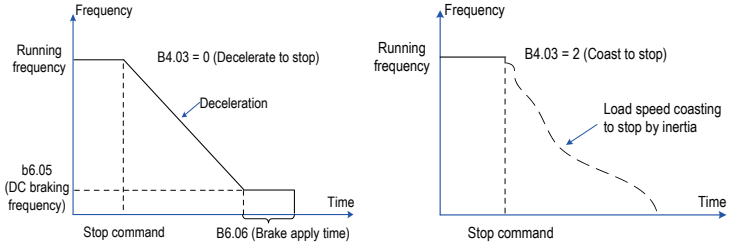
After you press RUN on the operation panel, the direction in which the AC drive drives the motor to run is regarded the forward direction. If the rotating direction is reverse to the required by the equipment, power off the AC drive and exchange any two of the output UVW cables (wait until the main capacitor of the AC drive discharges completely).

3.4.2 Start Mode

The S5300 supports the direct start mode . It has the built-in specialized crane brake control time sequence (see description of parameters in the group b6).

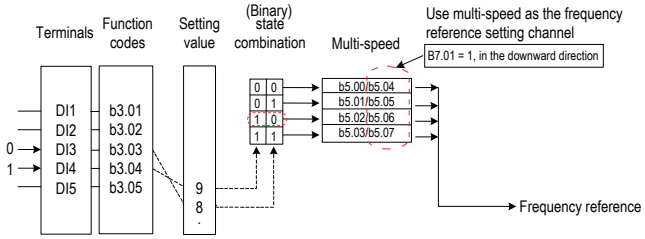
3.4.3 Stop mode

The S5300 supports two stop modes, decelerate to stop and coast to stop, selected in b4.03. Decelerate to stop is adopted by default (b4.03 = 0).



■ Frequency Reference Set in Multi-Speed Mode

The multi-speed mode can be used in the applications where only several frequency references are required but the frequency reference need not be adjusted continuously. The S5300 supports setting of a maximum of four frequency references, which can be set through state combinations of two DI terminals. Set the two DI terminals for function 8 and 9 to use them for multi-speed input. The multiple speeds can be set in group b5. Meanwhile, set multi-speed as the frequency reference setting channel, as shown in the following figure.



In the preceding figure, DI3 and DI4 are selected for input of multi-speed signals. Set the empty bit to 0. Based on state combination of the two binary values, multi-speed is selected.

When (DI3, DI4) = (0, 1), binary values (0, 1) are combined into value 2, indicating that speed set in b5.02/b5.06 is used.

When b7.01 = 0, the value of b5.02 is used as the frequency reference no matter whether the S5300 runs in the upward or downward direction.

When b7.01 = 1, the value of b5.02 is used as the frequency reference if the S5300 runs in the upward direction . The value of b5.06 is used as the frequency reference if the S5300 runs in the downward direction .

The S5300 supports a maximum of two DI terminals used for input of multi-speed signals . You can also use less than one DI terminal for input of the multi-speed signal. The state value of the empty bit is considered as 0.

3.5 Use of DI Terminals

The S5300 provdes fve DI terminals (DI1 to DI5). Extra fve DI terminals (DI6 to DI10) are provided by the I/O extension card.

The internal hardware of the DI terminals has the 24 VDC power supply for detection. The DI signal can be input to the AC drive after you short the DI terminal and the COM port.

The AC drive also provides the DI filter time (b3.21) to the DI signal tom improve the anti-interference level.

The preceding ten DI terminals can be defined in function parameters b3.01 to b3.10. For details, see the descriptions of b3.01 and b3.10.

3.6 Use of DO Terminals

The S5300 provides three DO terminals (FM, DO1 and T/A-T/B-T/C), amongst which FM and DO1 are transistor output and can drive 24 VDC low-voltage circuit, and TA/TB/TC is relay output and can drive 250 VAC control circuit.

Extral digital outputs (DO2 and P/A-P/B-PC) are provided by the I/O extension card. The DO2 is transistor output and the P/A-P/B-P/C is relay output.

The functions of DO terminals can be defined in b3.14 to b3.18. For details, see the descriptions of the parameters in group b3.

Terminal	Corresponding Function Code	Output Feature Description
FM-CME	When the thousand's digit of b3.18 = 1, the digital output is used	Transistor output, drive capacity: 24 VDC, 50 mA
T/A-T/B-T/C	b3.14	Relay output, drive capacity: 250 VAC, 3 A
P/A-P/B-P/C	b3.15	Relay output on the extension card, drive capacity: 250 VAC, 3 A
DO1-CME	b3.16	Transistor output, drive capacity: 24 VDC, 50 mA
DO2-CME	b3.17	Transistor output on extension card, drive capacity: 24 VDC, 50 mA

3.7 Use of AI Terminals

The S5300 provides two AI terminals (AI1 and AI2) .

Terminal	Input Signal Characteristic
AI1-GND	It receives the signal of 0 to 10 VDC.
AI2-GND	If J8 jumps to the "V" position, the AI receives the voltage signal of 0 to 10 VDC. If J8 jumps to the "I" position, the AI receives the current signal of 4 to 20 mA.

AI allows the AC drive to use external voltage or current signal as the frequency reference setting channel or the torque reference. The relationship between the voltage or current and the reference or feedback is defined in b3.22 to b3.31.

The sampling value of AI can be read in U0.12 and U0.13. The calculation value is for internal computation and you cannot read it.

3.8 Use of AO Terminals

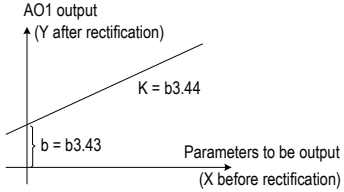
The S5300 provides one AO terminal (AO1) . An extra of AO2 is provided by the extension card.

Terminal	Output Signal Characteristic
AO1-GND	If J5 jumps to the "V" position, it outputs the signal of 0 to 10 VDC.
	If J5 jumps to the "I" position, it outputs the signal of 0 to 20 mA.
AO2-GND	It is provided by the extension card and outputs the signal of 0 to 10 VDC.

AO1 and AO2 can be used to indicate internal running parameters. The indicated parameters can be defined by b3.19 and b3.20.

The designated running parameters can be rectified before output. The rectification feature is Y = kX + b, among which "X" indicates the running parameters to be output, and "k" and "b" of AO1 can be set by b3.44 and b3.43.

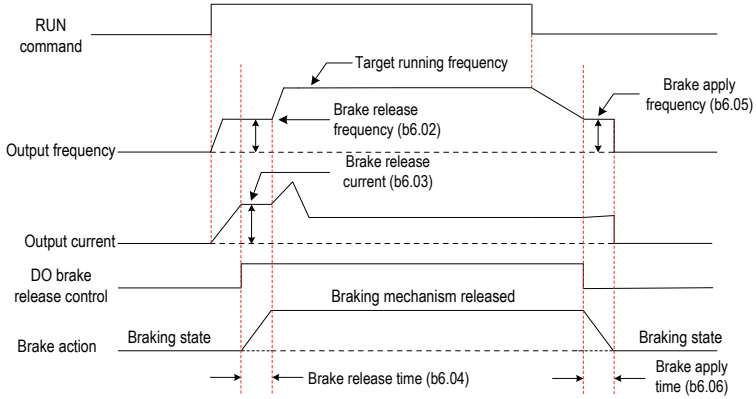
Figure 3-7 Setting of "k" and "b" of AO1



3.9 Brake Time Sequence of the Crane System

The S5300 has the built-in brake time sequence control function . This function requires that an output terminal is set for the function 1 (brake control). The following figure shows the brake control time sequence.

Figure 3-8 Brake control time sequence of the crane system



The braking mechanism keeps applied when de-energized and is released when energized. Because the brake needs to act mechanically, there is a mechanical delay between the brake output signal of the AC drive and the braking state. The brake release time (b6.04) and the brake apply time (b6.06) must be set according to the actual mechanical delay of the brake. Theoretically, these two parameters must be a little longer than the mechanical delay to prevent hook gliding.

Note: The S5300 can implement separate control of upward and downward brake time sequence in the application of construction elevator. For details, refer to the descriptions of b7.01 to b7.06.

3.10 Setting and Auto-tuning of Motor Parameters

3.10.1 Motor Parameters to Be Set

When the AC drive runs in the vector control mode, accurate motor parameters are required to ensure desired drive performance and running efficiency. This is extremely different from the V/F control (b1.00 = 2).

3.10.2 Motor Auto-tuning

The motor parameters can be obtained through dynamic auto-tuning or static auto-tuning. You can also input the motor parameters manually.

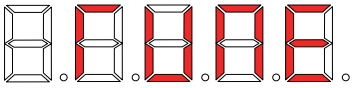
Auto-tuning Mode	Application	Result	Parameter Setting
Static auto-tuning (complete)	It is applied to all applications.	Good	b0.04 = 3
No-load dynamic auto-tuning (complete)	It is applied to applications where the motor can be easily disconnected from the load.	Good	b0.04 = 2
Static auto-tuning (incomplete)	It is applied to applications where the motor cannot be disconnected from the load and dynamic auto-tuning is not allowed.	OK	b0.04 = 1

The process of motor auto-tuning is as follows:

1. If the motor can be disconnected from the load, disconnect the motor from the load mechanically after power-off so that the motor can run without load.
2. After power-on, set bF.04 (command source selection) to 0 (operation panel control).
3. Input the motor nameplate parameters (such as A0.01 to A0.05) correctly and input the following parameters according to the motor you select.

Manual Input Parameters
A0.00: Motor type selection
A0.01: Rated motor power
A0.02: Rated motor voltage
A0.03: Rated motor current
A0.04: Rated motor frequency
A0.05: Rated motor speed

4. If the motor can be disconnected from the load completely, set b0.04 to 2 (dynamic auto-tuning for asynchronous motor). Press the ENTER key. The operation panel displays:



5. Then press the RUN key on the operation panel. The AC drive will drive the motor to accelerate/decelerate (based on the acceleration time and deceleration time set in b4.06 and b4.07), and the RUN indicator is ON. When the preceding display information disappears and the operation panel returns to the normal parameter display status, it indicates that the auto-tuning is completed.

   The following motor parameters will be obtained from the auto-tuning.

Motor Parameters Obtained From Auto-tuning
F0-00: Stator resistance (asynchronous motor) F0-01: Rotor resistance (asynchronous motor)
F0-02: Leakage inductive reactance (asynchronous motor)
F0-03: Mutual inductive reactance (asynchronous motor)
F0.04: No-load current (asynchronous motor)

If the motor cannot be disconnected from the load, set b0.04 (auto-tuning selection) to 1 or 3 (recommended). When b0.04 = 3, all required motor parameters can be obtained but the auto-tuning process is a little longer.

3.11 Password Security

The S5300 provides the user password protection function .

Function Code	Function Description	Function Code Group to Be Protected
AF.00	Password for all function parameters	Groups A, b, E, U and F
bF.00	Level-II menu password	Groups b, E, U and F
FF.00	Level-III menu password	Group F

When AF.00, bF.00 and FF.00 are set to a non-zero value, the password function is enabled. This moment when you press the QUICK key on the operation panel, "-----" is displayed, and you must input the correct user password to enter the menu. If the password is wrongly input for three consecutive times, the system will be locked.

3.12 Restoring Default Setting

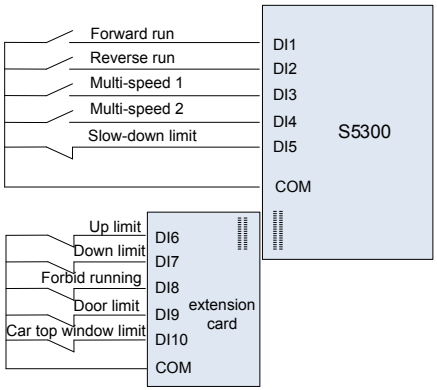
The S5300 categorizes all parameters into three levels . The menu of each level has the functions of restoring the default setting and displaying the user-modified parameters.

Menu Level	Function Code	Function Description	Remark
Level-I menu	AF.01	Restore default setting of parameters in the level-I menu	Certain parameters cannot be restored. For details, see the description of AF.01.
	AF.02	Level-I menu parameters display setting	Only display the parameters in the level- I menu that are modified
Level-II menu	bF.01	Restore default setting of parameters in the level-II menu	Restore the level-II menu parameters or all parameters, except certain parameters. For details, see the description of FF.01.
	bF.02	Level-II menu parameters display setting	Only display the parameters in the level-II menu that are modified
	bF.03	Clear historical data	Clear the parameters that are stored at power down, mainly the group U1 parameters and fault recording parameters. For details, see the description of bF.03.
Level-III menu	FF.10	Restore default setting of parameters in the level-III menu	Restore the level-III menu parameters or all parameters, except certain parameters. For details, see the description of FF.10.
	FF.11	Level-III menu parameters display setting	Only display the parameters in the level-II menu that are modified

3.13 Application Example of the S5300 for Construction Hoist

The S5300 can implement integrated control of the construction hoist, that is, all external limit logics of the construction hoist can be connected to the AC drive. The S5300 controls external limit logics . This helps to minimize external wiring of the whole construction hoist control system and save contactors or PLC.

Various limit signals can be connected to the S5300, such as up limit signal, down limit signal, forbid running signal, door limit signal, car top window limit signal, overload limit signal and slow-down limit signal.

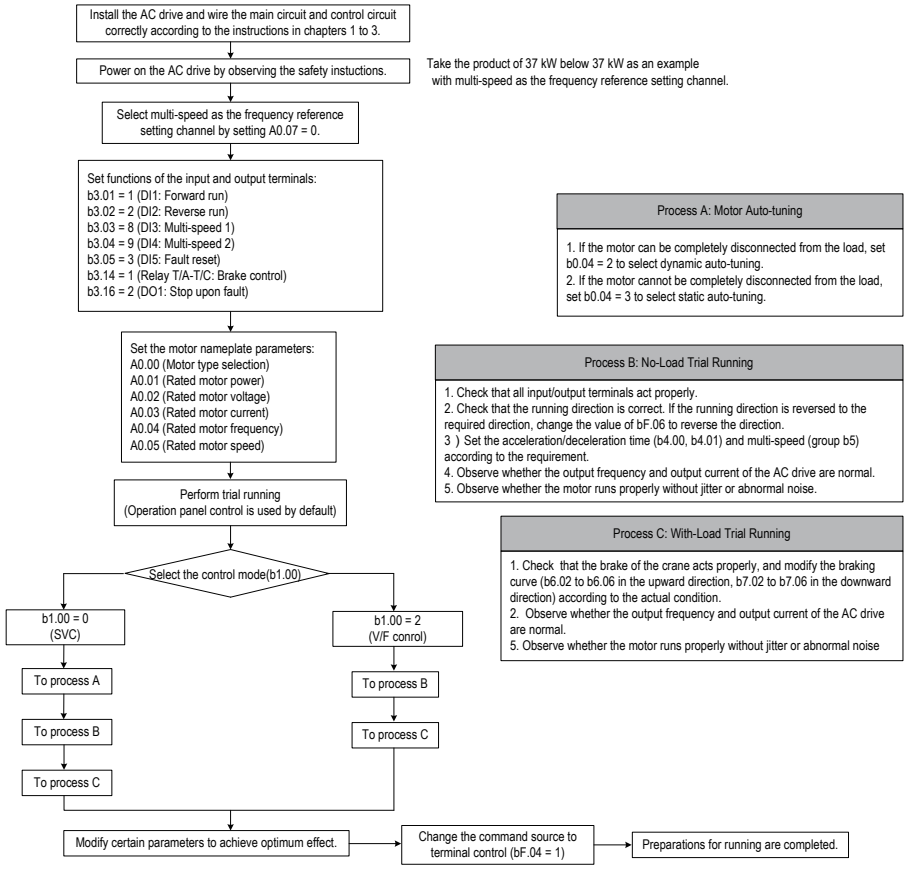


When the S5300 detects up limit signal, upward running is forbidden. When it detect down limit signal, downward running is forbidden.

When it detects slow-down limit signal, the hoist switches over from running frequency to min. frequency (b5.00/b5.04). When it detects other limit signals, the elevator running is forbidden. When it receives the limit signal during running, it stops running automatically. For the stop mode, refer to the descriptions of b7.07 to b7.09.

Note	If a limit signal is connected to the S5300, set the corresponding terminal for the related function in b3.01 to b3.10. For details, see the descriptions of parameters in group b3.

3.14 Commissioning Process of First Use



Chapter 4 Function Code Table

In the S5300 drive, certain parameters are factory reserved and are not listed in the following table. As a result, certain function code numbers in the table are nonconsecutive. Never modify these parameters to prevent malfunction.

The parameters can be modified only when the AC drive is in the stop state. The monitored parameters are displayed on the operation panel for viewing only and cannot be modified.

4.1 Parameters of Level-I Menu (Group A)

The level-I menu includes the crane standard parameters and the fine-tuning parameters of the braking time sequence.

Function Code	Parameter Name	Function Description	Setting Range	Default
Group A0: Standard Parameters				
A0.01	Rated motor power	It indicates the rated motor power displayed on the motor nameplate.	0.4 to 1000.0 kW	Model dependent
A0.02	Rated motor voltage	It indicates the rated motor voltage displayed on the motor nameplate.	0 to 2000 V	380 V
A0.03	Rated motor current	It indicates the rated motor current displayed on the motor nameplate.	(≤ 55 kW): 0.01 to 655.35 A (> 55 kW): 0.1 to 6553.5 A	Model dependent
A0.04	Rated motor frequency	It indicates the rated motor frequency displayed on the motor nameplate.	0.01Hz to b1.02 (max. frequency)	50.00 Hz
A0.05	Rated motor speed	It indicates the rated motor speed displayed on the motor nameplate.	0 to 3000 rpm	1400 rpm
A0.06	Rated speed of the construction elevator	It is used to calculate the current height (U0.09) of the construction elevator. When the down limit (input function 24) is active, the current height is cleared and calibrated.	25 to 99 m/min	33 m/min
Group AF: Auxiliary Parameters in Level-I Menu				
AF.00	User password	It is used to set the password for viewing and modifying all parameters. If it is set a non-zero value, you need to input the password to enter any menu. If the password is input incorrectly for three consecutive times, the menu is locked. In this case, you need to re-power on the AC drive to view or modify the parameters.	0 to 65535	0
AF.01	Restore default setting of parameters in the level-I menu	0: No operation 1: Restore default setting of parameters in the level-I menu (not including A0.00 to A0.06, A0.08 and AF.00)	0, 1	0
AF.02	Level-I menu parameters display setting	0: Display all parameters in the level-I menu 1: Only display the parameters that are modified	0, 1	0

4.2 Parameters in the Level-II Menu (Group b, Group E*, Group U)

The level-II menu mainly includes standard function parameters, monitoring parameters and the fault recording parameters. After you set the parameters in the level-II menu properly, all function of the S5300 can be implemented . If it is necessary to improve the S5300 output performance, enter the level-III menu to perform related setting.

To enter the level-II menu, input the password set in bF0.00 correctly.

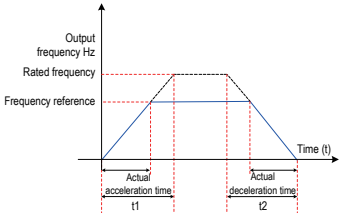
Function Code	Parameter Name	Function Description	Setting Range	Default
Group b0: Basic Motor Parameters				
b0.02	Gearbox theoretical running time	It indicates the rated service life of the gearbox (hour) and is used for calculation of the monitoring parameters U1.07 (Gearbox use ratio). If b0.02 = 0, the function of U1.07 is disabled.	0 to 65535	0
b0.03	Gearbox nameplate load value	It indicates the output torque (percentage) of the AC drive when the gearbox bears the rated load. It is used for calculation of the monitoring parameters U1.07 (Gearbox use ratio). If b0.03 = 0, the function of U1.07 is disabled.	0.0% to 200.0%	0.0%
b0.04	Auto-tuning selection	0: No auto-tuning 1: Static auto-tuning for asynchronous motor (certain motor parameters obtained) 2: Dynamic auto-tuning for asynchronous motor (all motor parameters obtained) 3: Static auto-tuning for asynchronous motor (all motor parameters obtained)	0 to 3	0
b0.05	Power-on auto-tuning selection	The S5300 provides the power-on auto-tuning function of the stator resistance. Once this function is enabled, the AC drive will perform static auto-tuning for 2 to 3 seconds automatically after power-on each time to ensure the best control performance. 0: Disabled 1: Enabled	0, 1	1
Group b1: Motor Control Parameters				
b1.00	Control mode	0: Sensorless vector control (SVC) 2: Voltage/Frequency (V/F) control	0 to 2	0
b1.01	Slip compensation	For SVC, it is used to adjust the speed stability accuracy of the motor. When the motor with heavy load runs at too low speed, increase the value of this parameter. When the motor with heavy load runs at too high speed, decrease the value of this parameter.	50.0% to 200.0%	100.0%
b1.02	Max. frequency	When the frequency source is AI or high-speed pulse, this parameter is the base value for calculating the target frequency. It is used to set the upper limit of the frequency output by the AC drive at any time.	50.00 to 150.00 Hz	50.00 Hz
b1.03	Min. frequency	It is used to set the lower limit of the frequency output by the AC drive at any time.	0.00 to 15.00 Hz	0.00 Hz
b1.04	Forward torque upper limit	These two parameters are used to set the output torque upper limit when the DI function 1 (forward run) and DI function 2 (reverse run 1) are enabled. They are the percentage of the rated motor torque. In SVC, even if b1.04 and b1.05 are set to lower than 50.0%, the AC drive will regard the output torque upper limit as 50.0%.	0.0% to 500.0%	180.0%
b1.05	Reverse torque upper limit		0.0% to 500.0%	180.0%

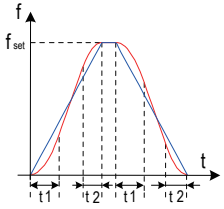
Function Code	Parameter Name	Function Description	Setting Range	Default
Group b3: Input/output Parameters				
b3.01	DI1 function selection	1. Forward run 2. Reverse run The terminal is used to control forward or reverse run of the AC drive. 3. Fault reset The terminal is used for the fault reset function, which is the same as the function of RESET key on the operation panel. Remote fault reset is implemented through this function. 4. Quick stop If the terminal set for this function becomes ON, the AC drive immediately outputs the brake apply frequency (b6.05) and executes the brake apply time sequence. 5. Coast to stop If the terminal set for this function becomes ON, the AC drive stops the output, the motor coasts to stop without control by the AC drive. It is the same as coast to stop described in b4.03. 6. Decelerate to stop If the terminal set for this function becomes ON, the AC drive stops according to normal deceleration logic. It is the same as canceling the running command. 7. External fault input When the terminal set for this function becomes ON, the AC drive reports fault 50#. 8. Multi-speed 1 9. Multi-speed 2 11. Brake release feedback 12. Brake apply feedback These are the feedback input signals of faults 41# and 42#. For details, see the description of the two faults. 22: Manual/Automatic mode switchover The terminal set for this function is used to switch over the S5300 running mode . If the input is inactive, the S5300 runs in the manual mode and the attendant operates the construction elevator. If the input is active, the elevator controller is connected for intelligent control to implement automatic leveling, call and running. 23. Up limit input It is the connecting point of the up limit switch of the construction elevator. If the input is inactive, running in the up direction is forbidden. 24. Down limit input It is the connecting point of the down limit switch of the construction elevator. If the input is inactive, running in the down direction is forbidden. 25. Forbid running input It is the input point of forbidding running of the construction elevator. If the input is inactive, the running is forbidden.	If the hundred's digit = 1, it indicates that the function logic is reversed. Unit's digit and ten's digit: function selection If they are set to 0 and 100, it indicates that they are invalid.	1
b3.02	DI2 function selection			2
b3.03	DI3 function selection			8
b3.04	DI4 function selection			9
b3.05	DI5 function selection			3
b3.06	DI6 function selection			5
b3.07	DI7 function selection			0

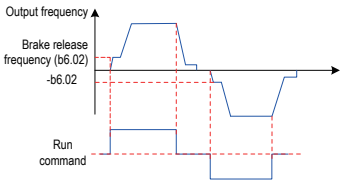
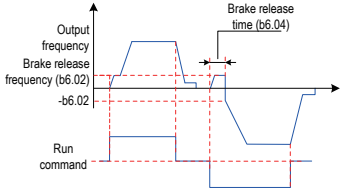
Function Code	Parameter Name	Function Description	Setting Range	Default
b3.08	DI8 function selection	26. Door limit input It is the input point of the door limit of the construction elevator. If the input is inactive, the running is forbidden. 27. Car top window limit input It is the input point of the car top window limit of the construction elevator. If the input is inactive, the running is forbidden. 28. Overload limit input It is the input point of the overload limit of the construction elevator. If the input is inactive, the running is forbidden. 29. Full-load limit input It is the input point of the full-load limit of the construction elevator. If the input point is inactive, the elevator does not respond to the hall calls during running. It is effective only in the automatic running mode. 30: Slow-down limit input The slow-down limit input point of the construction elevator. On the condition that the intelligent elevator controller is not connected, if the input point is inactive, the running frequency is restricted as the value of b7.18. On the condition that the intelligent elevator controller is connected, if the input point is active, the running frequency is restricted as the value of b7.18 in the manual mode. The running frequency is controlled by the controller in the automatic running mode. 31. Check point input It is the input point of the leveling encoder check of the construction elevator. When the state changes, the leveling encoder re-load the pulses. This function is valid only when the intelligent elevator controller is connected. 32. Shielding the 48# fault If the terminal set for this function becomes ON, the S5300 does not detect the 48# fault. This function is used to shield the 48# fault caused by asynchronous power-on of external communication device and the S5300 .	If the hundred's digit = 1, it indicates that the function logic is reversed. Unit's digit and ten's digit: function selection If they are set to 0 and 100, it indicates that they are invalid.	0
b3.09	DI9 function selection			0
b3.10	DI10 function selection			0
b3.14	Relay 1 function selection (T/A-T/B-T/C)	1. Brake control The terminal set for this function becomes ON when the brake release requirement in the braking time sequence is satisfied. For details, see the description of parameters in group b6. 2. Stop due to occurrence of fault The terminal set for this function becomes ON after a level-1 fault occurs on the AC drive. 3. Alarm due to occurrence of fault The terminal set for this function becomes ON after a level-2 or a level-3 fault occurs on the AC drive. 4. Fault prompt The terminal set for this function becomes ON after a level-4 fault occurs on the AC drive.	If the hundred's digit = 1, it indicates that the function logic is reversed. Unit's digit and ten's digit: function selection If they are set to 0 and 100, it indicates that they are invalid.	1
b3.15	Relay 2 function selection (P/A-P/B-P/C)			0

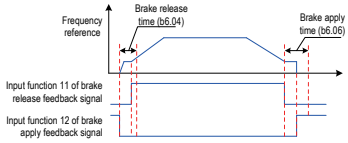
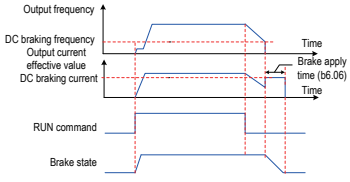
Function Code	Parameter Name	Function Description	Setting Range	Default
b3.16	DO1 connecting to relay function selection	8. AC drive overload pending The terminal set for this function becomes ON 10s before the AC drive performs the overload protection. 9. Motor overload pending The AC drive judges whether the motor is overloaded according to the overload pending threshold before performing the protection. If the pending threshold is exceeded, the terminal set for this function becomes ON. For the motor overload parameters, see descriptions of bE.00 to bE.02. 10. Undervoltage protection When the AC drive enters the undervoltage protection state, the terminal set for this function becomes ON and the AC drive keeps output for at least 5s. For details, see the descriptions of bE.11 and bE.12. 11. Overload protection When the AC drive enters the overload protection state, the terminal set for this function becomes ON. For details, see the description of bE.13. 12. Over-torque output When the output torque of the AC drive exceeds the setting of bF.17, the terminal set for this function becomes ON. If the output torque is below 90% of the setting of bF.17, the terminal set for this function becomes OFF. For details, see the description of bF.17. 13. Motor fan control The output of the terminal set for this function is active when the AC drive is running. Once the AC drive stops, the output becomes inactive after the time set in bF.21. 14. Frequency reached output For details, see the description of bF.07 and bF.08. 15. AC drive running The output of the terminal set for this function is active when the AC drive is in the running state. The output becomes inactive once the AC drive stops.	If the hundred's digit = 1, it indicates that the function logic is reversed. Unit's digit and ten's digit: function selection If they are set to 0 and 100, it indicates that they are invalid.	2
b3.17	DO2 function selection			0

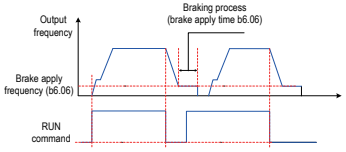
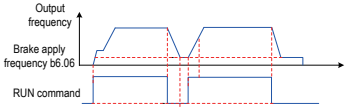
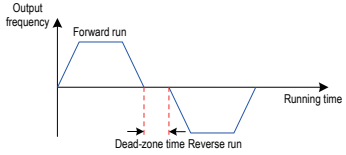
Function Code	Parameter Name	Function Description	Setting Range	Default
b3.18	FM function selection	If the thousand's digit of this parameter is set to 1, it indicates that the FM is used for digital output. In this case, the output function is the same as b3.12 to b3.17	Thousand's digit: output type selection If the hundred's digit = 1, it indicates that the function logic is reversed. Unit's digit and ten's digit: function selection If they are set to 0 and 100, it indicates that they are invalid.	0
b3.19	AO1 function selection	If the thousand's digit of these two parameters are set to 1, it indicates that they are used for digital output. In this case, the output function is the same as b3.14 to b3.17. The active output is 10.00 V, and the inactive output is 0.00 V. If the thousand's digit is set to 0, it indicates that they are used for analog output. The output range corresponds to the high-speed pulse or analog output 0.0% to 100.0%. 0: Frequency reference, 0 to max. frequency 1: Output current, 0 to 2 times of rated motor current		0
b3.20	AO2 function selection	2: Output torque, 0 to 2 times of rated motor torque 3: Output power, 0 to 2 times of rated motor power 4: Output voltage, 0 to 1.2 times of rated AC drive voltage		0
b3.21	DI filter time	It is used to set the software filter time of DI terminal status. If DI terminals are liable to interference and may cause malfunction, increase the value of this parameter to enhance the anti-interference capacity. However, increase of DI filter time will reduce the response of DI terminals.	0.000s to 1.000s	0.010s
b3.22	AI1 min. input	b3.22 to b3.26 are used to define the relationship between the analog input voltage and the corresponding setting. When the analog input voltage exceeds the max. value, the max. value is used. When the analog input voltage is below the min. value, the min. value or 0.0% is used. When the analog input is current, 1 mA current corresponds to 0.5 V voltage. The AI1 filter time is used to set the software filter time of AI1. If the analog input is liable to interference, increase the value of this parameter to stabilize the detected analog input. However, increase of the AI filter time will slow the response of analog detection. Set this parameter properly based on actual conditions. In different applications, 100% of analog input corresponds to different nominal values. For details, refer to the description of different applications.	0.00 V to b3.24	0.00 V
b3.23	Corresponding setting of AI1 min. input		0.0% to 100.0%	0.0%
b3.24	AI1 max. input		b3.22 to 10.00 V	10.00 V
b3.25	Corresponding setting of AI1 max. input		0.0% to 100%	100.0%
b3.26	AI1 filter time		0.00s to 10.00s	0.10s
b3.27	AI2 min. input	For the function and use, see the descriptions of b3.22 to b3.26.	0.00 V to b3.29	0.00 V
b3.28	Corresponding setting of AI2 min. input		0.0% to 100.0%	0.0%
b3.29	AI2 max. input		b3.27 to 10.00 V	10.00 V
b3.30	Corresponding setting of AI2 max. input		0.0% to 100%	100.0%
b3.31	AI2 filter time		0.00s to 10.00s	0.10s

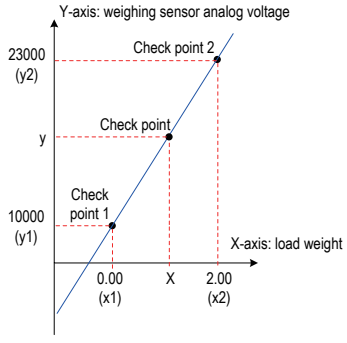
Function Code	Parameter Name	Function Description	Setting Range	Default
b3.43	AO1 zero offset coefficient	These two parameters are used to correct the zero offset of analog output and the output amplitude deviation. They can also be used to define the desired AO curve. If "b" represents zero offset, "k" represents gain, "Y" represents actual output, and "X" represents standard output, actual output is: Y = kX + b. The zero offset coefficient 100% of AO1 and AO2 corresponds to 10 V (or 20 mA). The standard output refers to the value corresponding to the analog output of 0 to 10 V (or 0 to 20 mA) with no zero offset or gain adjustment. For example, if the analog output is used as the frequency reference, it is expected that the output is 8 V when the frequency is 0 V, and the output is 3 V at the max. frequency. You need to set the gain to -0.50 and the zero offset to 80%.	-100.0% to 100.0%	0.0%
b3.44	AO1 gain		-10.00 to 10.00	1.00
b3.45	AO2 zero offset coefficient		-100.0% to 100.0%	0.0%
b3.46	AO2 gain		-10.00 to 10.00	1.00
Group b4: Ramp Parameters				
b4.00	Acceleration time	Acceleration time indicates the time required for the AC drive to accelerate from 0 to the rated frequency (A0.04), shown as t1 in the following figure. Deceleration time indicates the time required for the AC drive to decelerate from the rated frequency (A0.04) to 0, shown as t2 in the following figure.  	0.1s to 600.0s	3.0s
b4.01	Deceleration time			
b4.02	Acceleration mode	0: Linear acceleration/deceleration The output frequency increases or decreases linearly. 1: S-curve acceleration/deceleration The output frequency increases or decreases according to the S curve. S curve is applied in the applications where smooth start or stop is required. 2: Coast to stop (only for b4.03) Once the output of stop command is active, the AC drive stops output immediately. Then the motor coasts to stop due to mechanical inertia.	0, 1	0
b4.03	Deceleration mode		0 to 2	0

<table>
<tr><th>Function Code</th><th>Parameter Name</th><th>Function Description</th><th>Setting Range</th><th>Default</th></tr>
<tr><td>b4.04</td><td>Time proportion of S-curve start segment</td><td rowspan="2">These two parameters respectively define the time proportions of the start segment and the end segment of S-curve acceleration/ deceleration.
In the following figure, t1 is the time defined in b4.04, within which the slope of the output frequency change increases gradually. t2 is the time defined in b4.05, within which the slope of the output frequency change gradually decreases to 0. Within the time between t1 and t2, the slope of the output frequency change is fixed, that is, linear acceleration/deceleration.
 
</td><td rowspan="2">0.0% to 40.0%</td><td rowspan="2">30.0%</td></tr>
<tr><td>b4.05</td><td>Time proportion of S-curve end segment</td></tr>
<tr><td>b4.06</td><td>Dynamic auto-tuning acceleration time</td><td rowspan="2">These two parameters are used to set the acceleration time and deceleration time when the AC drive performs dynamic auto-tuning (b0.04 = 2). The calculation and definition are the same.</td><td rowspan="2">0.1s to 600.0s</td><td rowspan="2">20.0s</td></tr>
<tr><td>b4.07</td><td>Dynamic auto-tuning deceleration time</td></tr>
<tr><td colspan="5">Group b5: Multi-speed Parameters</td></tr>
<tr><td>b5.00</td><td>Upward multi-speed 1</td><td rowspan="8">The multi-speed function is implemented by state combinations of DI terminals that are set for functions 8 and 9. The combinations are shown as follows:
<table><tr><th>Input Function 9</th><th>Input Function 8</th><th>Target Speed</th></tr><tr><td>OFF</td><td>OFF</td><td>b5.00</td></tr><tr><td>OFF</td><td>ON</td><td>b5.01</td></tr><tr><td>ON</td><td>OFF</td><td>b5.02</td></tr><tr><td>ON</td><td>ON</td><td>b5.03</td></tr></table>
When b7.01 = 1, the following four speeds are used. The corresponding relationship is as follows:
<table><tr><th>Input Function 9</th><th>Input Function 8</th><th>Target Speed</th></tr><tr><td>OFF</td><td>OFF</td><td>b5.04</td></tr><tr><td>OFF</td><td>ON</td><td>b5.05</td></tr><tr><td>ON</td><td>OFF</td><td>b5.06</td></tr><tr><td>ON</td><td>ON</td><td>b5.07</td></tr></table></td><td rowspan="8">Min. frequency (b1.03) to max. frequency (b1.02)</td><td>20.00 Hz</td></tr>
<tr><td>b5.01</td><td>Upward multi-speed 2</td><td>50.00 Hz</td></tr>
<tr><td>b5.02</td><td>Upward multi-speed 3</td><td>50.00 Hz</td></tr>
<tr><td>b5.03</td><td>Upward multi-speed 4</td><td>50.00 Hz</td></tr>
<tr><td>b5.04</td><td>Downward multi-speed 1</td><td>20.00 Hz</td></tr>
<tr><td>b5.05</td><td>Downward multi-speed 2</td><td>50.00 Hz</td></tr>
<tr><td>b5.06</td><td>Downward multi-speed 3</td><td>50.00 Hz</td></tr>
<tr><td>b5.07</td><td>Downward multi-speed 4</td><td>50.00 Hz</td></tr>
</table>

Function Code	Parameter Name	Function Description	Setting Range	Default
Group b6: Brake Logic Control Parameters				
b6.01	Start direction	It is used to set the direction of the AC drive output torque within the brake release time. 0: Brake release torque the same as the running direction  1: Brake release torque always in the forward direction 	0, 1	0
b6.02	Brake release frequency in the upward direction	It is used to set the AC drive output frequency before the brake releases completely, namely, the minimum frequency, at which the motor can output full torque.	Min. frequency (b1.03) to 20.00 Hz	2.00 Hz
b6.03	Brake release current in the upward direction	It is used to set the percentage of the AC drive output current to the rated motor current (A0.03). When the percentage of the AC drive output current to the rated motor current reaches this value, the brake release command is output immediately (output function 1 enabled). For details, see the description of section 4.10.	0.0% to 150.0%	30.0%
b6.04	Brake release time in the upward direction	It is used to set the time it takes the mechanical brake from starting to release to releasing completely. Within the time, the AC drive keeps the brake release frequency output. For details, see the description of section 4.10.	0.00s to 5.00s	0.20s
b6.05	Brake apply frequency in the upward direction	When the output frequency during deceleration (after the RUN command is cancelled) falls below this value, the brake apply command is immediately output (output function 1 disabled). For details, see the description of section 4.10.	Min. frequency (b1.03) to 20.00 Hz	2.00 Hz
b6.06	Brake apply time in the upward direction	It is used to set the time it takes the mechanical brake from starting to apply to applying completely. Within the time, the AC drive keeps the brake apply frequency output. For details, see the description of section 4.10.	0.00s to 5.00s	0.20s

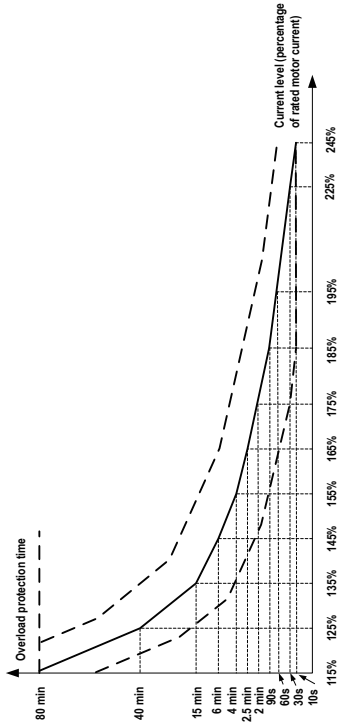
Function Code	Parameter Name	Function Description	Setting Range	Default
b6.08	Brake feedback purpose	It involves the use of faults 41# and 42#. For details, see the description of these two faults. 0: Braking feedback not used There is no braking feedback contact input to the AC drive or the braking feedback function is not required. 1: Used for direction at brake action Only one brake feedback contact is required and is connected to the input function 11 for this application. The brake feedback signal is monitored in the whole process. When the actual feedback action is reversed to the brake output logic (output function 1), the fault is reported. 2: Used for whole process monitoring The brake release time and brake apply time are determined by the brake feedback contact signal. Once the AC drive is powered on, the brake feedback signal is detected. In such application, one brake release contact and one brake apply contact need be connected to the AC drive. The correct application logic diagram is shown as below: 	0 to 2	0
b6.10	DC braking current	The DC braking current indicates the percentage of the AC output current to the rated motor current at DC braking. The larger the value is, the better DC braking result will be obtained but the motor and the AC drive will get hotter. In the process of decelerating to stop, when the frequency reference falls to the value of this parameter, the AC drive starts DC braking. After entering the DC braking state, the AC drive outputs the brake apply command.	0% to 120%	0%
b6.11	DC braking frequency		Min. frequency (b1.03) to 50.00 Hz	0.00 Hz

Function Code	Parameter Name	Function Description	Setting Range	Default
b6.12	Restart during braking	0: Restart not allowed during braking The restart command is inactive if the brake starts to apply in the process of stop. The AC drive can receive the RUN command only after the brake applies completely and the AC drive stops output.  1: Restart allowed during braking The AC drive can receive the RUN command even if the brake starts to apply.  	0, 1	0
b6.13	Restart delay time	Every time the AC drive stops, the AC drive can restart after the delay set in this parameter. For details, see the description of b6.09.	0.0s to 15.0s	0.3s
Group b7: Construction Elevator Logic Parameters				
b7.00	Forward/Reverse run dead-zone time	It is used to set the waiting time of compulsory stop at transition of forward RUN and reverse RUN of the AC drive.  	0.0s to 5.0s	3.0s
b7.01	Upward and downward logic separation selection	It is used to select the multi-speed and brake time sequence parameters for the upward and downward running. 0: Use the same multi-speed parameters (b5.00 to b5.03) and brake time sequence parameters (b6.02 to b6.06) for both upward and downward running. 1: Use the multi-speed parameters (b5.00 to b5.03) and brake time sequence parameters (b6.02 to b6.06) for upward running; use the multi-speed parameters (b5.04 to b5.07) and brake time sequence parameters (b7.02 to b7.06) for downward running.	0, 1	1

Function Code	Parameter Name	Function Description	Setting Range	Default
b7.02	Brake release frequency in the downward direction	For the use, refer to the descriptions of b6.02 to b6.06. The function is active only when b7.01 = 1 and the elevator runs in the downward direction.	Min. frequency (b1.03) to 20.00 Hz	0.00 Hz
b7.03	Brake release current in the downward direction		0.0% to 150.0%	0.0%
b7.04	Brake release time in the downward direction		0.00s to 5.00s	0.00s
b7.05	Brake apply frequency in the downward direction		Min. frequency (b1.03) to 20.00 Hz	2.00 Hz
b7.06	Brake apply time in the downward direction		0.00s to 5.00s	0.20s
b7.07	Up limit stop mode	They are used to select the stop mode when the limit switch acts. 0: Quick stop 1: Coast to stop 2: Decelerate to stop	0 to 2	0
b7.08	Down limit stop mode			0
b7.09	Forbid running stop mode			0
b7.10	Selection of weighing sensor input channel	It is used to select the AI for input of the weighing sensor signal. 0: Weighing function disabled 1: AI1 2: AI2	0 to 2	0
b7.11	Overload threshold	If the current load weight (U0.08) obtained by the AC drive after calculation is larger than the value of this parameter, the drive running is forbidden.	0.00 to 9.99 tons	2.20 tons
b7.12	Weighing check weight 1	If the weighing function is enabled (b7.10 is set to a non-zero value), perform weighing check as follows: 1: In the empty car state, input the current load weight into b7.12. The AC drive will store the load weight and the corresponding analog data of the weighing sensor (b7.14) in the empty state. 2. Put a load into the car and input the load weight to b7.13 and complete the weighing check. 3. After you complete the preceding two steps, the AC drive automatically generate the following "load weight-analog voltage" curve. Note: The load weight is calculated only when the AC drive stops.  	0.00 to 9.99 tons	0.00 tons
b7.13	Weighing check weight 2		0.00 to 9.99 tons	0.00 tons
b7.14	Weighing check analog voltage 1		0 to 32767	0
b7.15	Weighing check analog voltage 2		0 to 32767	0

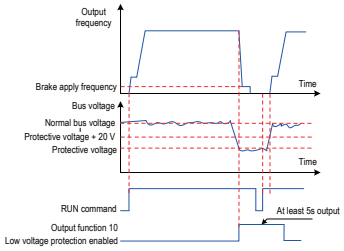
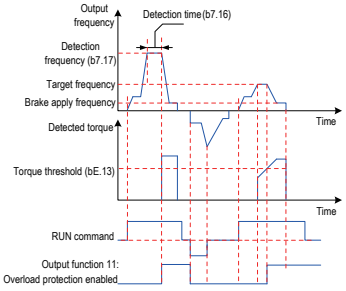
Function Code	Parameter Name	Function Description	Setting Range	Default
b7.16	Torque detection time for overload limit	These two parameters are used to detect the output torque in the overload limit function. When the output frequency of the AC drive reaches the setting of b7.17, the AC drive will keep output of the frequency for the time set in b7.16. In the constant-speed running state, the AC drive detects the output torque for the overload limit function (use of bE.13).	0.0 to 5.0s	0.5s
b7.17	Torque detection frequency for overload limit		Brake release frequency (b6.02) to rated frequency (A0.04)	40.00 Hz
b7.18	Frequency limit	When the S5300 is not connected to the elevator controller and the input function 30# is inactive, the running frequency is restricted by the value of this parameter. When the S5300 is connected to the elevator controller, the elevator is the manual mode and the input function 30# is inactive, the running frequency is restricted by the value of this parameter.	Min. frequency (b1.03) to upward multi-speed 1 (b5.00)	20.00 Hz
Group bC: Overspeed Protection Parameters				
bC.02	Frequency abnormal detection time	It is used to set the detection time of the fault 37#. If the motor feedback frequency is in the reverse direction to the frequency reference for the time set in this parameter, the AC drive reports the 37# fault. If it is set to 0, fault 37# is shielded.	0.00s to 1.00s	0.50s
bC.03	Frequency following error threshold	It is used to set the frequency following error threshold for detecting the fault 38#. For details, see the description of bC.04 or the fault 38#.	0% to 30%	20%
bC.04	Frequency following detection time	It is used to set the detection time of the fault 38#. If the difference between the motor feedback frequency and the frequency reference remains larger than bC.03 x rated motor frequency for the time set in this parameter, the AC drive reports the fault 38#. If it is set to 0, fault 38# is shielded. If both frequency reference and the output frequency are larger than the rated frequency, the fault is invalid.	0.00s to 1.00s	0.50s

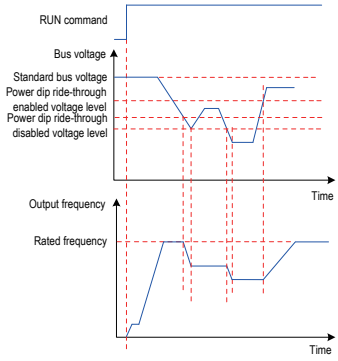
Function Code	Parameter Name	Function Description	Setting Range	Default
Group bd: Communication Parameters				
bd.00	Baud rate	It is used to set data transmission speed between host computer and the AC drive. Note that the baud rate of host computer must be the same as that of the AC drive. Otherwise, communication will fail. The larger the baud rate is, faster the communication will be. Unit's digit: Set baud rate of RS485 communication 5: 9600 bps 6: 19200 bps 7: 38400 bps 8: 57600 bps 9: 115200 bps Ten's digit: Reserved Hundred's digit: Reserved Thousand's digit: Set baud rate of CANlink communication 0: 20 Kbps 1: 50 Kbps 2: 100 Kbps 3: 125 Kbps 4: 250 Kbps 5: 500 Kbps 6: 1 Mbps	0005 to 6009	5005
bd.01	Data format	It is used to select data format of the AC drive. Note that the data format of the host computer must be the same as that of the AC drive. Otherwise, communication will fail. 0: No check <8, N, 2> 1: Even check <8, E, 1> 2: Odd check <8, O, 1> 3: No check <8, N, 1>	0 to 3	0
bd.02	Local address	When it is set to 0 (broadcast address), the broadcasting function of the host computer is implemented. This address is unique (except the broadcast address), which is the basis for point-to-point communication between the host computer and the AC drive.	0 to 247	1
bd.03	Response delay	It is used to set time interval from the AC drive completing data receiving to AC drive sending data to host computer. If response delay is shorter than system processing time, system processing time shall prevail. If the response delay is longer than the system processing time, after the system processing is completed, the AC drive will not send data to the host computer until the response delay is reached. It is only valid for the RS485 communication.	0 to 20ms	2 ms
bd.04	Communication timeout	If the time interval between two communications is longer than the setting of bd.04, the AC drive reports the 48# fault. Generally, it is set to 0.0s. Set this parameter in the continuous communication system to monitor the communication state. If it is set to 0, fault 48# is shielded.	0.0s to 60.0s	0.0s

Function Code	Parameter Name	Function Description	Setting Range	Default
Group bE: Fault and Protection				
bE.00	Motor overload protection selection	To protect the motors of different loads, set these two parameters according to the motor overload capacity. The motor overload protection is inverse time-lag curve as shown in the following figure.  When the motor keeps running at 175% of the rated motor current for two minutes, the 11# fault (motor overload) is reported. When the motor keeps running at 175% of the rated motor current for two minutes, the 11# fault (motor overload) is reported.	0, 1	1

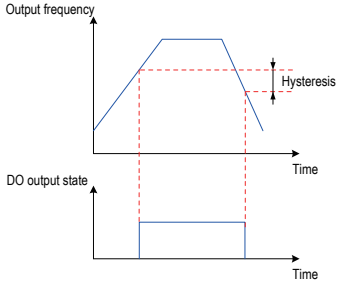
Function Code	Parameter Name	Function Description	Setting Range	Default
bE.01	Motor overload protection gain	When the motor keeps running at 115% of the rated motor current for 80 minutes, the 11# fault (motor overload) is reported. For example, the rated motor current is 100 A, If bE.01 = 1.00, when the motor running current reaches 125 A (125% of 100 A) and the motor runs at 125 A for 40 minutes, the 11# fault is reported. If bE.01 = 1.20, when the motor running current reaches 125 A (125% of 100 A) and the motor runs at 125 A for 40 x 1.2 = 48 minutes, the 11# fault is reported. The motor overload protection supports protection of the longest 80 minutes and the shortest 10 seconds. For example, the application requires report of the 11# fault when the motor runs at 150% of the rated motor current for two minutes. According to the preceding motor overload curve, 150% (I) is in the range of 145% (I1) and 155% (I2). 145% corresponds to the overload protection time 6 minutes (T1) and 145% corresponds to the overload protection time 4 minutes (T2). You can calculate the overload protection time T corresponding to 150% from the following formula: T = T1 + (T2 - T1) x (I - I1) / (I2-I1) = 4 + (6 - 4) x (150% - 145%) / (155%-145%) = 5 minutes Then you can calculate the motor overload protection gain from formula: F9-01 = Desired overload protection time / Corresponding overload protection time = 2/5 = 0.4. bE.01= 2 ÷ 5 = 0.4 Set bE.01 properly according to the actual overload capacity of the motor. If the setting is too large, the AC drive may not report the 11# fault timely when the motor is damaged due to overheating. The motor overload pending coefficient indicates when the motor overload detection level reaches the setting of this parameter, the output function 9 (motor overload pending) is active. In this case, the AC drive continues to run but does not report the motor overload fault. For example, when the motor overload protection gain is set to 1.00 and the motor overload pending coefficient is set to 80%, if the motor current reaches 145% of the rated motor current and the motor runs at the level for 4.8 minutes (80% x 6 minutes), the output function 9 is active.	0.20 to 10.00	1.00

Function Code	Parameter Name	Function Description	Setting Range	Default
bE.02	Motor overload pending coefficient	This function is used to input a pending signal to the control system via DO before the motor overload protection is performed. The parameter determines the percentage at which pending is performed before the motor overload protection. The larger the value is, the less advanced the pending will be. When the accumulative output current of the AC drive is larger than the value of the overload inverse time-lag curve multiplied by bE.02, the DO set for the function 9 becomes active.	50% to 100%	80%
bE.05	Overcurrent stall gain	When the output current exceeds the overcurrent stall protective current during acceleration/deceleration of the AC drive, the AC drive stops acceleration/deceleration and keeps running at the current frequency reference. After the output current decreases, the AC drive continues acceleration/deceleration. The overcurrent stall gain is used to adjust the overcurrent suppression capacity of the AC drive during acceleration/deceleration. The larger the value is, the greater the overcurrent suppression capacity will be. In the prerequisite of no overcurrent occurrence, set this gain as small as possible. For small-inertia load, the gain should be small. Otherwise, the system dynamic response will be slow. For large-inertia load, the gain should be large. Otherwise, the suppression result will be dissatisfactory and the overcurrent fault may occur. If the gain is set to 0, the overcurrent stall protection is disabled. bE.05 and bE.06 are valid only in V/F control.	0 to 100	20
bE.06	Overcurrent stall protective current		100% to 200%	150%
bE.07	Short-circuit to ground at power-on	It is used to check whether the motor is short-circuited to ground at power-on of the AC drive. If this function is enabled, the drive's U, V, W have voltage output a while after power-on.	0, 1	1
bE.08	Selection of power input phase loss protection	It is used to select whether to enable the power input phase loss protection. 0: Disabled 1: Power input phase loss protection on hardware enabled The models of 18.5 kW and below does not support this function. 2: Power input phase loss protection on both hardware and software enabled	0 to 2	1
bE.09	Selection of power output phase loss protection	1: Enabled 0: Disabled	0, 1	1

Function Code	Parameter Name	Function Description	Setting Range	Default
bE.11	Selection of low voltage protection	These two parameters are used to set the low voltage protection function. When the bus voltage suffers reduction peak, the AC drive performs protection automatically to prevent hook gliding. bE.11 = 1: Low voltage protection enabled bE.11 = 0: Low voltage protection disabled bE.12 is used to set the bus voltage, at which the low voltage protection is enabled. When the bus voltage is smaller than (bE.12 x rated motor voltage), this function is enabled. This moment the output function 10 becomes active, the AC drive directly outputs the brake apply frequency and performs the brake apply time sequence to forbid restart. When the bus voltage recovers to (bE.12 x rated motor voltage + 20 V), the low voltage protection is disabled. 	0, 1	0
bE.12	Low voltage protection threshold		1.00 to 1.30	1.05
bE.13	Torque threshold of overload protection	It is used to set the torque threshold at which the overload protection is enabled. If it is set to 0, the function is disabled. When the AC drive runs in the forward direction, if the output frequency reaches the value of b7.17 or reaches the constant-speed running frequency, the output torque is detected. For details, see the descriptions of b7.16 and b7.17. If the output torque is larger than the setting of bE.13, the AC drive stops automatically and restricts forward running. After the AC drive runs in the reverse direction, the restriction is cancelled. 	0.0% to 150.0%	0

Function Code	Parameter Name	Function Description	Setting Range	Default
bE.14	Selection of power dip ride-through	These two parameters are used to set the power dip ride-through function. With this function, the AC drive can automatically reduce the max. output frequency to maintain the full-torque output when a sudden bus voltage dip occurs. bE.14 =1: Power dip ride-through enabled bE.14 = 0: Power dip ride-through disabled bE.15 is used to set the voltage level of power dip ride-through enabled. It is a percentage of standard bus voltage.  	0, 1	0
bE.15	Voltage level of power dip ride-through enabled		70% to 95%	85%
bE.16	Built-in braking unit action voltage	The initial voltage of the built-in braking unit action Vbreak must satisfy: 800 ≥ Vbreak ≥ (1.414 Vs + 30). Vs is the AC power voltage to the AC drive. Note that improper setting of this parameter may result in abnormal running of the built-in braking unit.	620.0 to 800.0 V	700.0 V
bE.17	Selection of contactor fault detection	1: Enabled 0: Disabled Note that the models of 18.5 kW below does not support this function.	0, 1	1
Group bF: Auxiliary Parameters in Level-II Menu				
bF.00	Level-II menu password	It is used to set the password for viewing and modifying the level-II menu parameters. If it is set to a non-zero value, input this password when entering the level-II menu. If the password is input incorrectly for three consecutive times, the menu is locked. In this case, you need to re-power on the AC drive to view or modify the parameters.	0 to 65535	0
bF.01	Restore default setting of parameters in the level-II menu	0: No operation 1: Restore default setting of parameters in the level-II menu (not including b0.02, b0.03, b7.11, b7.12 and bF.00) 2: Restore the parameters in the level-I menu and level-II menu.	0 to 2	0
bF.02	Level-II menu parameters display setting	0: Display all parameters in the level-II menu 1: Only display the parameters in the level-II menu that are modified	0, 1	0

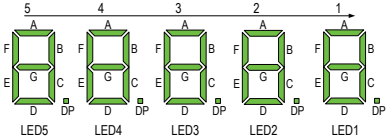
Function Code	Parameter Name	Function Description	Setting Range	Default
bF.03	Clear historical data	0: No 1: Yes Clear all parameters stored at power down and fault recording parameters, that is, the parameters in groups E* and U1.	0, 1	0
bF.04	Command source selection	It is used to select the input channel of the AC drive control commands (start, stop, forward run, reverse run and jog). 0: Operation panel control (indicator OFF) The running commands are controlled by using the RUN and STOP/RES keys on the operation panel. In this control mode, the logic time sequences of terminal input/output and brake control are invalid. After the AC drive receives the RUN command, the digital output function 1 (brake control) is valid. After receiving the STOP command, the AC drive decelerates to the brake apply frequency (b6.05) and then stops output. In this case, the digital output function 1 is invalid. 1: Terminal control (indicator ON) The running commands are controlled by digital input functions 1 (forward run) and 2 (reverse run). 2: Communication control (indicator flashing)	0 to 2	0
bF.05	Running frequency in operation panel control	When bF.04 = 0, it is used to set the target frequency of the AC drive.	Min. frequency (b1.03) to max. frequency (b1.02)	50.00 Hz
bF.06	Selection of running direction	You can change the motor running direction just by modifying this parameter without changing the motor wiring, which is equivalent to exchange any two of the motor's U, V, W cables. Note: The running direction restores to the default setting after parameter initialization. Do not modify this parameter in scenarios where it is forbidden to change the motor running direction after system commissioning. 0: Same direction 1: Reverse direction	0, 1	0

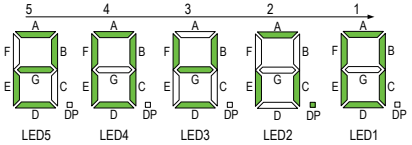
<table>
<tr><th>Function Code</th><th>Parameter Name</th><th>Function Description</th><th>Setting Range</th><th>Default</th></tr>
<tr><td>bF.07</td><td>Frequency detection value</td><td rowspan="2">When the frequency reference is higher than the value of bF.07, the digital output function 7 (frequency reached output) becomes active.
When the frequency reference is lower than the value of bF.07, the digital output function 7 is inactive.
These two parameters are used to set the detection value of the output frequency and the hysteresis value after the output is disabled.
bF.07 is the detection frequency, and bF.08 is a percentage of bF.07.
 
</td><td>Min. frequency (b1.03) to max. frequency (b1.02)</td><td>50.00 Hz</td></tr>
<tr><td>bF.08</td><td>Frequency detection hysteresis value</td><td>0.0% to 100.0%</td><td>5.0%</td></tr>
<tr><td>bF.09</td><td>Cooling fan control</td><td>It is used to select the working mode of the cooling fan.
0: Fan working during motor running
The fan works when the AC drive is in the running state. When the AC drive stops, the cooling fan works if the heatsink temperature is higher than 40°C and stops working if the heatsink temperature is lower than 40°C.
1: Fan working all along after power-on</td><td>0, 1</td><td>0</td></tr>
<tr><td>bF.10</td><td>Fault protection action 1</td><td rowspan="6">These parameters are used to set the fault levels of faults 41# to 65#. Each parameter value is a 5-digit number, indicating the fault level of five faults. The corresponding relationship is described in the following table.
<table>
<tr><th>Function Code</th><th>Digit</th><th>Meaning</th></tr>
<tr><td>bF.10</td><td>Ten thousand's digit</td><td>Fault 41# level</td></tr>
<tr><td>bF.10</td><td>Thousand's digit</td><td>Fault 42# level</td></tr>
<tr><td>…</td><td>…</td><td>…</td></tr>
<tr><td>bF.10</td><td>Unit's digit</td><td>Fault 45# level</td></tr>
<tr><td>bF.11</td><td>Ten thousand's digit</td><td>Fault 46# level</td></tr>
<tr><td>…</td><td>…</td><td>…</td></tr>
<tr><td>bF.11</td><td>Unit's digit</td><td>Fault 49# level</td></tr>
<tr><td>…</td><td>…</td><td>…</td></tr>
<tr><td>bF.14</td><td>Ten thousand's digit</td><td>Fault 61# level</td></tr>
<tr><td>…</td><td>…</td><td>…</td></tr>
<tr><td>bF.14</td><td>Unit's digit</td><td>Fault 65# level</td></tr>
</table></td><td rowspan="6">11111 to 55555</td><td>11115</td></tr>
<tr><td>bF.11</td><td>Fault protection action 2</td><td>11111</td></tr>
<tr><td>bF.12</td><td>Fault protection action 3</td><td>11111</td></tr>
<tr><td>bF.13</td><td>Fault protection action 4</td><td>11111</td></tr>
<tr><td>bF.14</td><td>Fault protection action 5</td><td>11111</td></tr>
</table>

Function Code	Parameter Name	Function Description	Setting Range	Default
bF.19	Selection of running mode	0: Application mode This mode is used on normal conditions. 1: Commissioning mode This mode is used at factory detection of the AC drive or cabinet. In this mode, functions such as the brake release time sequence and power output phase loss are disabled, and the AC drive must be in V/F control. Note that this parameter is non-retentive at power down and is cleared after re-power-on.	0, 1	0
bF.21	Motor fan control delay	This parameter is used together with the output function 13. For details, see the description of the output function 13.	0s to 3000s	30s
bF.22	Lockout indication	It is used to indicate the lockout state. 0: Remote lockout disabled 1: Remote lockout enabled, normal state 2: Remote lockout enabled, lockout state	0 to 2	0
bF.23	Random cipher	It is the unlock password and cannot be modified. After remote lockout is enabled, if the remote control module is faulty, use this random cipher to calculate the unlock password to unlock the system.	0 to 65535	0

Groups E0 and EF display the fault information. Each group of parameters indicate the information of a fault. Group E0 displays the information about the latest fault, and group EF displays the information of the earliest fault. The display in each group is the same. Parameters in groups E0 to EF cannot be modified and are retentive at power down.

Function Code	Parameter Name	Description
E*.00	Fault code	The five-digit LED data display is numbered 5, 4, 3, 2, 1 from left to the right. For example, the display is 104.01. 5#, 4# and 3# constitute the fault code, amongst which 5# indicates the fault level, 4# and 3# indicate the fault code. 2# and 1# indicate the fault sub-code and are reserved.
E*.01	Frequency reference at fault occurrence	It monitors the display value of U0.00 at fault occurrence.
E*.02	Feedback frequency at fault occurrence	It monitors the display value of U0.01 at fault occurrence (U0.00 in V/F control).
E*.03	Output current at fault occurrence	It monitors the display value of U0.03 at fault occurrence.
E*.04	Output voltage at fault occurrence	It monitors the display value of U0.04 at fault occurrence.
E*.05	Output power at fault occurrence	It monitors the display value of U0.05 at fault occurrence.
E*.06	Output torque at fault occurrence	It monitors the display value of U0.06 at fault occurrence.
E*.07	Bus voltage at fault occurrence	It monitors the display value of U0.07 at fault occurrence.

<table>
<tr><th>Function Code</th><th>Parameter Name</th><th>Description</th></tr>
<tr><td>E*.08</td><td>State of input functions 1 to 16 at fault occurrence</td><td rowspan="3">These four parameters display the state of input/output functions. Each function code indicates the state of 16 input/output functions by bits. After you enter the function code menu, the function code displays the decimal value. Press the UP key to enter the user viewing mode.
The five-digit LED data display is numbered 5, 4, 3, 2, 1 from left to the right.
 

After entering the user viewing mode, LEDs 5 and 4 indicate the No. of the currently viewed input/output function. LED1 indicates whether the currently viewed function is active (0: inactive; 1: active). You can press the UP or DOWN key to increase or decrease the function No.
LEDs 2 and 3 display the state of all 16 functions by segment. To be specific, the first eight functions correspond to segments A to DP of LED2, and the last eight functions correspond to segments A to DP of LED3.
 

In this figure, LEDs 5 and 4 indicate the state of input function 20. This function is inactive (LED1 is 0). Amongst the input functions 17 to 32, functions 17, 19, 21, 24, 26, 28, 30 and 31 are active and the other functions are inactive (LEDs 2 and 3).</td></tr>
<tr><td>E*.09</td><td>State of input functions 17 to 32 at fault occurrence</td></tr>
<tr><td>E*.10</td><td>State of input functions 33 to 48 at fault occurrence</td></tr>
<tr><td>E*.11</td><td>State of output functions 1 to 16 at fault occurrence</td></tr>
<tr><td>E*.12</td><td>Running step at fault occurrence</td><td>It records the running step of the AC drive at fault occurrence. For the display, see U0.26.</td></tr>
<tr><td>E*.13</td><td>Control mode at fault occurrence</td><td>It records the setting value of command source, frequency reference setting channel and control mode at fault occurrence.
<table>
<tr><th>Digit</th><th>Meaning</th><th>Description</th></tr>
<tr><td>Ten thousand's digit</td><td>Reserved</td><td></td></tr>
<tr><td>Thousand's digit</td><td>Reserved</td><td></td></tr>
<tr><td>Hundred's digit</td><td>Command source</td><td>For the data meaning, refer to bF.04.</td></tr>
<tr><td>Ten's digit</td><td>Frequency reference setting channel</td><td>For the data meaning, refer to A0.07.</td></tr>
<tr><td>Unit's digit</td><td>Drive control mode</td><td>For the data meaning, refer to b1.00.</td></tr>
</table></td></tr>
<tr><td>E*.14</td><td>Internal variable at fault occurrence</td><td>Reserved</td></tr>
<tr><td>E*.15</td><td>Synchronous frequency at fault occurrence</td><td>It records the instantaneous value of synchronous frequency at fault occurrence.</td></tr>
<tr><td>E*.16</td><td>Brake pipe current at fault occurrence</td><td>It records the instantaneous current of the brake pipe at occurrence of brake pipe overload (15#).</td></tr>
</table>

Groups U0 and U1 display the real-time monitor information of the AC drive. Group U0 parameters are refreshed in real time and non-retentive at power down. Group U1 parameters display the accumulative calculation information and are retentive at power down

Function Code	Parameter Name	Description
U0.00	Frequency reference	It displays the current frequency reference of the AC drive.
U0.01	Feedback frequency	It displays the the feedback value of the actual motor running frequency. It is the feedback frequency calculated by the AC drive if the drive runs without an encoder. It is the actual motor running frequency fed back by the encoder if the drive runs with an encoder. If you cannot judge whether the encoder works properly during onsite commissioning, check whether the value of this parameter is normal in V/F mode. If yes, the encoder fault is eliminated.
U0.02	Target frequency	It displays the frequency the AC drive will reach finally.
U0.03	Output current	It displays the output current of the AC drive during running.
U0.04	Output voltage	It displays the output voltage of the AC drive during running.
U0.05	Output power	It displays the output power of the AC drive during running.
U0.06	Output torque	It displays the output torque of the AC drive during running.
U0.07	Bus voltage	It displays the bus voltage of the AC drive.
U0.08	Current load weight	It displays the actual load weight of the current elevator detected by the weighing sensor.
U0.10	DI state	It displays the state of DI terminals. The display method is the same as that described in E*.08 to E*.11.
U0.11	DO state	It displays the state of DO terminals. The display method is the same as that described in E*.08 to E*.11.
U0.12	AI1 voltage	It displays the input voltage of the AI1 terminal.
U0.13	AI2 voltage	It displays the input voltage of the AI2 terminal.
U0.15	AO1 output voltage	It displays the output voltage of the AO1 terminal.
U0.16	AO2 output voltage	It displays the output voltage of the AO2 terminal.
U0.23	Heatsink temperature of the inverter module	It displays the temperature of the inverter module IGBT.
U0.24	Function software version	It displays the function software version of the AC drive.
U0.25	Performance software version	It displays the performance software version of the AC drive.

<table>
<tr><th>Function Code</th><th>Parameter Name</th><th>Description</th></tr>
<tr><td>U0.26</td><td>AC drive internal state</td><td>It displays the internal running step of the AC drive, facilitating onsite commissioning and troubleshooting. The 5-digit LED data display is numbered 5, 4, 3, 2, 1 from left to the right. The meaning of the display is defined as follows:
<table>
<tr><th>LED No.</th><th>Meaning</th><th>Display</th><th>Description</th></tr>
<tr><td>5</td><td>Reserved</td><td>-</td><td>-</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Jog procedure</td><td>0</td><td>Jog acceleration, constant-speed running state</td></tr>
<tr><td>1</td><td>Jog deceleration, stop state</td></tr>
<tr><td>2</td><td>Jog brake apply delay state</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Brake apply procedure</td><td>0</td><td>Brake apply command not sent</td></tr>
<tr><td>1</td><td>Brake apply command sent</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Brake release procedure</td><td>0</td><td>Brake release command not sent</td></tr>
<tr><td>1</td><td>Brake release command sent</td></tr>
<tr><td rowspan="8">1</td><td rowspan="8">Running procedure</td><td>0</td><td>Standby state</td></tr>
<tr><td>1</td><td>Brake release process</td></tr>
<tr><td>2</td><td>Normal running state</td></tr>
<tr><td>3</td><td>Process of cancelling the RUN command and apply the brake</td></tr>
<tr><td>4</td><td>Operation panel control state</td></tr>
<tr><td>5</td><td>Jog state</td></tr>
<tr><td>6</td><td>Motor auto-tuning state</td></tr>
<tr><td>7</td><td>AC drive stop process</td></tr>
</table></td></tr>
<tr><td>U0.27</td><td>AC drive internal data</td><td>Reserved</td></tr>
<tr><td>U0.28</td><td>Current fault code</td><td>It displays the current fault code of the AC drive.</td></tr>
<tr><td>U0.29</td><td>Rated slip frequency</td><td>It displays the rated slip of the current motor. The value of this parameter is calculated from rated motor speed.</td></tr>
<tr><td>U1.00</td><td>Emergency stop times</td><td>It displays the accumulative times of level-1 faults.</td></tr>
<tr><td>U1.01</td><td>Quick stop times</td><td>It displays the accumulative times of level-2 and level-3 faults.</td></tr>
<tr><td>U1.02</td><td>High bits of brake use times</td><td rowspan="2">It displays the accumulative use times of brakes of the AC drive. When the times displayed in the low bits exceed 65535, the high bits are added with 1, and the low bits are cleared to zero.</td></tr>
<tr><td>U1.03</td><td>Low bits of brake use times</td></tr>
<tr><td>U1.04</td><td>Accumulative time of torque limit reached</td><td>It displays the accumulative time when the output torque of the AC drive reaches or exceeds the torque upper limit (b1.04 and b1.05).</td></tr>
<tr><td>U1.05</td><td>Accumulative running time</td><td>It displays the accumulative running time of the AC drive.</td></tr>
<tr><td>U1.06</td><td>Accumulative power-on time</td><td>It displays the accumulative power-on time of the AC drive.</td></tr>
<tr><td>U1.07</td><td>Gearbox use ratio</td><td>It displays the use ratio of the gearbox. This function is valid only when b0.00 and b0.01 are set correctly.</td></tr>
</table>

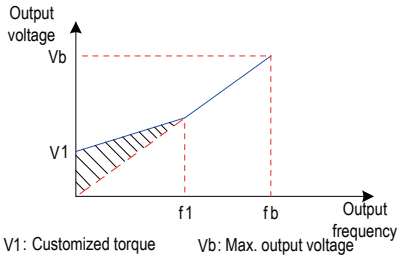
4.3 Parameters of Level-III Menu (Group F)

Level-III menu includes the parameters for adjusting output performance of the AC drive and factory parameters. The parameters in level-III menu rarely need be modified.

To enter the level-III menu, input the password set in FF0.00 correctly.

<table>
<tr><th>Function Code</th><th>Parameter Name</th><th>Description</th><th>Setting Range</th><th>Default</th></tr>
<tr><td colspan="5">Group F0: Motor Parameters</td></tr>
<tr><td>F0.00</td><td>Stator resistance (asynchronous motor)</td><td rowspan="5">These five parameters are asynchronous motor parameters. They are unavailable on the motor nameplate and are obtained through motor auto-tuning. You can obtain F0.00 to F0.02 through the motor auto-tuning 1 and obtain all these five parameters through the motor auto-tuning 3. Besides these five parameters, you can obtain the encoder phase sequence and current loop PI parameters through the motor auto-tuning 2.
When the rated motor power (A0.01) is modified, the AC drive modifies the value of these five parameters automatically to the parameter value for standard Y series motor.</td><td>(≤ 55 kW): 0.001 to 65.535 Ω
(> 55 kW): 0.0001 to 6.5535 Ω</td><td>Motor dependent</td></tr>
<tr><td>F0.01</td><td>Rotor resistance (asynchronous motor)</td><td>(≤ 55 kW) 0.001 to 65.535 Ω
(> 55 kW) 0.0001 to 6.5535 Ω</td><td>Motor dependent</td></tr>
<tr><td>F0.02</td><td>Leakage inductive reactance (asynchronous motor)</td><td>(≤ 55 kW): 0.01 to 655.35 mH
(> 55 kW): 0.001 to 65.535 mH</td><td>Motor dependent</td></tr>
<tr><td>F0.03</td><td>Mutual inductive reactance (asynchronous motor)</td><td>(≤ 55 kW): 0.1 to 6553.5 mH
(> 55 kW): 0.01 to 655.35 mH</td><td>Motor dependent</td></tr>
<tr><td>F0.04</td><td>No-load current (asynchronous motor)</td><td>(≤ 55 kW): 0.01 to A0.03
(> 55 kW): 0.1 to A0.03</td><td>Motor dependent</td></tr>
<tr><td>F0.16</td><td>Carrier frequency</td><td>It is used to adjust the carrier frequency of the AC drive, helping to reduce the motor noise, avoid the resonance of the mechanical system, reduce the leakage current to ground and reduce interference generated by the AC drive.
When the carrier frequency is low, the output current high harmonics increases, the motor power loss increases and the motor temperature rises also increases.
When the carrier frequency is high, the motor power loss reduces, the motor temperature rise decreases, but the AC drive has an increase in power loss and temperature rise, generates more interference.
Adjusting carrier frequency will cause the following influences.
<table>
<tr><td>Carrier frequency</td><td>Low.....High</td></tr>
<tr><td>Motor noise</td><td>Large.....Small</td></tr>
<tr><td>Output current waveform</td><td>Bad.....Good</td></tr>
<tr><td>Motor temperature rise</td><td>High.....Low</td></tr>
<tr><td>AC drive temperature rise</td><td>Low.....High</td></tr>
<tr><td>Leakage current</td><td>Small.....Large</td></tr>
<tr><td>External radiation interference</td><td>Small.....Large</td></tr>
</table></td><td>0.5 to 16.0 kHz</td><td>Model dependent</td></tr>
</table>

Function Code	Parameter Name	Description	Setting Range	Default
Group F1: Vector Control Parameters				
F1.00	Speed loop proportional gain 1	The speed loop PI parameters are selected according to the running frequency of the AC drive. If the frequency reference is smaller than the switchover frequency 1 (F1.02), the speed loop parameters are F1.00 and F1.01. If the frequency reference is larger than the switchover frequency 2 (F1.05), the speed loop PI parameters are F1.03 and F1.04. If the frequency reference is between F1.02 and F1.05, the two groups of speed loop PI parameters are switched over linearly. The speed dynamic response in vector control can be adjusted by setting the proportional gain and integral time of the speed regulator. To achieve a faster system response, increase the proportional gain and reduce the integral time. Be aware that this may lead to system oscillation. If default setting cannot satisfy requirements, make fine adjustment. Increase the proportional gain first to ensure no system oscillation, and then reduce the integral time to ensure quick system response and small overshoot. Note: Improper setting of PI parameters may result in too large overshoot and even overvoltage during overshoot drop.	1 to 100	60
F1.01	Speed loop integral time 1		0.01s to 10.00s	0.50s
F1.02	Switchover frequency 1		0.00 Hz to F1.05	5.00 Hz
F1.03	Speed loop proportional gain 2		1 to 100	20
F1.04	Speed loop integral time 2		0.01s to 10.00s	1.00s
F1.05	Switchover frequency 2		F1.02 to b1.02	10.00 Hz
F1.06	Time constant of speed loop filter	In vector control, the output of the speed loop regulator is torque current reference. This parameter is used to filter the torque reference. It rarely need be modified. Increase the filter time in the case of big speed fluctuation, and decrease it in the case of motor oscillation. If the speed loop filter time constant is small, the output torque of the AC drive may fluctuate greatly but the response is quick.	0.000s to 1.000s	0.080s
F1.08	Excitation adjustment proportion gain	These are current loop PI parameters for vector control. They are obtained automatically through the motor auto-tuning 2 and rarely need be modified. Note: The integral regulator of the current loop does not take integral but integral gain as the dimension. Too large setting of the current loop PI gain may lead to oscillation of the entire control loop. Therefore, when current oscillation or torque fluctuation is very large, decrease the proportional gain or integral gain here.	0 to 20000	2000
F1.09	Excitation adjustment integral gain		0 to 20000	1300
F1.10	Torque adjustment proportion gain		0 to 20000	2000
F1.11	Torque adjustment integral gain		0 to 20000	1300

<table>
<tr><th>Function Code</th><th>Parameter Name</th><th>Description</th><th>Setting Range</th><th>Default</th></tr>
<tr><td colspan="5">Group F2: V/F Control Parameters</td></tr>
<tr><td>F2.01</td><td>Torque boost</td><td rowspan="2">To compensate the low frequency torque characteristics of V/F control, you can boost the output voltage of the AC drive at low frequency.
If the setting of torque boost is too large, the motor may overheat and overcurrent may occur on the AC drive.
If the load is large and the motor startup torque is insufficient, increase the value of this parameter. If the load is small, decrease the value of this parameter.
If it is set to 0.0, the AC drive performs automatic torque boost. In this case, the AC drive automatically calculates the torque boost value based on motor parameters including the stator resistance.
F2.02 specifies the freuquency under which torque boost is active. Torque boost becomes inactive when this frequency is exceeded, as shown in the following figure.
 

V1: Customized torque boost voltage Vb: Max. output voltage
f1: Customized torque boost cutoff frequency fb: Rated running frequency</td><td>0.0% to 30.0%</td><td>Determined by motor power</td></tr>
<tr><td>F2.02</td><td>Cutoff frequency of torque boost</td><td>0.00 Hz to b1.02</td><td>50.00 Hz</td></tr>
<tr><td>F2.09</td><td>V/F slip compensation gain</td><td>This parameter is valid only for asynchronous motor.
It can compensate the speed slip of asynchronous motor when the load of the motor increases, stabilizing the motor speed in case of load change.
If it is set to 100.0%, it indicates that the compensation is the rated motor slip when the motor bears rated load. The rated motor slip is automatically obtained by the AC drive through calculation based on the rated motor frequency and rated motor speed in group F1.
The principle of adjusting this parameter is to make the motor speed under rated load the same as the target motor speed.
Generally, if the motor speed is different from the target speed, slightly adjust this parameter.</td><td>0.0% to 100.0%</td><td>0.0%</td></tr>
<tr><td>F2.11</td><td>Oscillation suppression gain</td><td>Set this parameter as small as possible in the prerequisite of efficient oscillation suppression to avoid influence on V/F control.
Set it to 0 if the motor has no oscillation. Increase the value properly only when the motor has obvious oscillation. The larger the value is, the better the oscillation suppression result will be.
When this function is enabled, the rated motor current and no-load current must be correct. Otherwise, the V/F oscillation suppression effect will not be satisfactory.</td><td>0, 100</td><td>Model dependent</td></tr>
</table>

Function Code	Parameter Name	Description	Setting Range	Default
Group F3: Control Optimization Parameters				
F3.00	DPWM DPWM switchover frequency upper limit	It determines the digital DPWM pattern in V/F control. When the output frequency is below the value of F3.00, the 7-segment continuous modulation pattern is used. When above the value of F3.00, the 5-segment intermittent modulation pattern is used. In the 7-segment continuous modulation pattern, the switching loss is large but the current ripple is small. In the 5-segment intermittent modulation pattern, the switching loss is small but the current ripple is large. It rarely need be modified because instable motor running may result at high frequency. For instability in V/F control, see the description of F2.11. For the AC drive loss and temperature rise, for the commissioning of F0.16.	5.00 Hz to max. frequency (b1.02)	12.00 Hz
F3.01	PWM modulation pattern	It is effective only for V/F control. "Synchronous modulation" indicates that carrier frequency varies linearly with change of output frequency, ensuring that ratio of carrier frequency to output frequency remains unchanged. It is applied when the drive's output frequency is high, improving quality of output voltage. Synchronous modulation is not required at low output frequency (100 Hz or below). This is because asynchronous modulation is preferred when the ratio of carrier frequency to output frequency is high. Synchronous modulation takes effect when the frequency reference is higher than 85 Hz. If below 85 Hz, asynchronous modulation is used. 0: Asynchronous modulation 1: Synchronous modulation	0, 1	0
F3.02	Dead zone compensation mode selection	It rarely need be modified. Try to use a different compensation mode only when there is special requirement on the output voltage waveform quality or oscillation occurs on the motor. For large-power application, compensation mode 2 is recommended. 0: No compensation 1: Compensation mode 1 2: Compensation mode 2	0 to 2	1
F3.03	Random PWM depth	It aims at lowering the unpleasant motor noise and reducing the electromagnetic interference. 0: Random PWM disabled 1 to 10	0 to 10	0
F3.04	Selection of fast current limit	This function helps to minimize occurrence of AC drive overcurrent, ensuring continuous running of the drive. But if the AC drive stays in long-time fast current limit state, the AC drive may be damaged due to overheating. In this case, the AC drive reports the 40# fault, indicating that the AC drive is overloaded and must stop. 0: Disabled 1: Enabled	0, 1	1
F3.05	Current detection delay compensation	It is used to set the drive's current detection compensation and rarely need be modified. Too large setting may deteriorate the control performance.	0 to 100	5
F3.06	Undervoltage threshold	It is used to set voltage threshold for the 09# fault (undervoltage). When bus voltage is below the value, the AC drive enters unervoltage state but continues to run.	210.0 to 630.0	350.0V

Function Code	Parameter Name	Description	Setting Range	Default
Group F4: Reserved				
Group FF: Auxiliary Parameters in Level-III Menu				
FF.00	Level-III menu password	It is used to set the password for viewing and modifying the level-III menu parameters. If it is set to a non-zero value, input this password when entering the level-III menu. If the password is input incorrectly for three consecutive times, the menu is locked. In this case, you need to re-power on the AC drive to view or modify the parameters.	0 to 65535	0
FF.10	Restore default setting of parameters in the level-III menu	0: No operation 1: Restore default setting of parameters in level-III menu (except F0.00 to F0.04, F0.16, F2.01, F2.11 and FF.00) 2: Restore all parameters	0 to 2	0
FF.11	Level-III menu parameters display setting	0, Display all parameters in the level-III menu 1: Only display the parameters in the level-III menu that are modified	0, 1	0

Chapter 5 EMC

5.1 Definition of Terms

- EMC

  Electromagnetic compatibility (EMC) describes the ability of electronic and electrical devices or systems to work properly in the electromagnetic environment and not to generate electromagnetic interference that influences other local devices or systems.

  In other words, EMC includes two aspects: The electromagnetic interference generated by a device or system must be restricted within a certain limit; the device or system must have sufficient immunity to the electromagnetic interference in the environment.

- First environment

  Environment that includes domestic premises, it also includes establishments directly connected without intermediate transformers to a low-voltage power supply network which supplies buildings used for domestic purposes

- Second environment

  Environment that includes all establishments other than those directly connected to a low-voltage power supply network which supplies buildings used for domestic purposes

- Category C1 AC Drive

  Power Drive System (PDS) of rated voltage less than 1 000 V, intended for use in the first environment

- Category C2 AC Drive

  PDS of rated voltage less than 1 000 V, which is neither a plug in device nor a movable device and, when used in the first environment, is intended to be installed and commissioned only by a professional

- Category C3 AC Drive

  PDS of rated voltage less than 1 000 V, intended for use in the second environment and not intended for use in the first environment

- Category C4 AC Drive

  PDS of rated voltage equal to or above 1 000 V, or rated current equal to or above 400 A, or intended for use in complex systems in the second environment

5.2 Introduction to EMC Standard

5.2.1 CE Mark

CE mark on S5300 declares that the AC drive complies with the European low voltage directive (LVD) and EMC directive .

CE

5.2.2 EMC Standard

The S5300 series AC drive satisfes the requirements of standard EN 61800-3: 2004 Category C2. The AC drives are applied to both the first environment and the second environment.

5.2.3 Installation Environment

The system manufacturer using the AC drive is responsible for compliance of the system with the European EMC directive. Based on the application of the system, the integrator must ensure that the system complies with standard EN 61800-3: 2004 Category C2, C3 or C4.

The system (machinery or appliance) installed with the AC drive must also have the CE mark. The system integrator is responsible for compliance of the system with the EMC directive and standard EN 61800-3: 2004 Category C2.

⚠WARNING
If applied in the first environment, the AC drive may generate radio interference. Besides the CE compliance described in this chapter, users must take measures to avoid such interference, if necessary.

5.3 Selection of Peripheral EMC Devices

5.3.1 Installation of EMC Input Filter on Power Input Side

An EMC filter installed between the AC drive and power supply can not only restrict the interference of electromagnetic noise in the surrounding environment on the AC drive, but also prevents the interference from the AC drive on the surrounding equipment.

The S5300 satisfes requirements of category C2 only with an EMC flter installed on power input side. Installation precautions are as follows:

- Strictly comply with the ratings when using the EMC filter. The EMC filter is category I electric apparatus, and therefore, the metal housing ground of the filter should be in good contact with the metal ground of the installation cabinet on a large area, and requires good conductive continuity. Otherwise, it will result in electric shock or poor EMC effect.
- The ground of the EMC filter and the PE conductor of the AC drive must be tied to the same common ground. Otherwise, the EMC effect will be affected seriously.
- The EMC filter should be installed as closely as possible to the power input side of the AC drive.

The following table lists the recommended manufacturers and models of EMC flters for the S5300 series AC drive. Select a proper one based on actual requirements.

AC Drive Model	Power Capacity (kVA)	Rated Input Current (A)	AC Input Filter Model (Changzhou Jianli)	AC Input Filter Model (Schaffner)
Three-phase 380–500 V, 50/60 Hz				
S5300-5R5G-4	8.9	14.6	DL-16EBK5	FN 3258-16-33
S5300-7R5G-4	11	20.5	DL-25EBK5	FN 3258-30-33
S5300-011G-4	17	26	DL-35EBK5	FN 3258-30-33
S5300-015G-4	21	35	DL-35EBK5	FN 3258-42-33
S5300-018G-4	24	38.5	DL-50EBK5	FN 3258-42-33
S5300-022G-4	30	46.5	DL-50EBK5	FN 3258-55-34
S5300-030G-4	40	62	DL-65EBK5	FN 3258-75-34
S5300-037G-4	57	76	DL-80EBK5	FN 3258-100-35
S5300-045G-4	69	92	DL-100EBK5	FN 3258-100-35
S5300-055G-4	85	113	DL-130EBK5	FN 3258-130-35
S5300-075G-4	114	157	DL-160EBK5	FN 3258-180-40

5.3.2 Installation of AC Input Reactor on Power Input Side

An AC input reactor is installed to eliminate the harmonics of the input current. As an optional device, the reactor can be installed externally to meet strict requirements of an application environment for harmonics. The following table lists the recommended manufacturers and models of input reactors.

AC Drive Model	Rated Input Current (A)	AC Input Reactor Model (Inovance)
Three-phase power: 380–500 V, 50/60 Hz		
S5300-5R5G-4	14.6	MD-ACL-15-5T-552-2%
S5300-7R5G-4	20.5	MD-ACL-30-5T-113-2%
S5300-011G-4	26	MD-ACL-30-5T-113-2%
S5300-015G-4	35	MD-ACL-40-5T-153-2%
S5300-018G-4	38.5	MD-ACL-40-5T-153-2%
S5300-022G-4	46.5	MD-ACL-50-5T-183-2%
S5300-030G-4	62	MD-ACL-80-5T-303-2%
S5300-037G-4	76	MD-ACL-80-5T-303-2%
S5300-045G-4	92	MD-ACL-120-5T-453-2%
S5300-055G-4	113	MD-ACL-120-5T-453-2%
S5300-075G-4	157	MD-ACL-200-5T-753-2%

5.3.3 Installation of AC Output Reactor on Power Output Side

Whether to install an AC output reactor on the power output side is dependent on the actual situation. The cable connecting the AC drive and the motor should not be too long; capacitance enlarges when an over-long cable is used and thus high-harmonics current may be easily generated.

If the length of the output cable is equal to or greater than the value in the following table, install an AC output reactor on the power output side of the AC drive.

AC Drive Power (kW)	Rated Voltage (V)	Cable Length Threshold(m)
5.5	200–500	70
7.5	200–500	100
11	200–500	110
15	200–500	125
18.5	200–500	135
22	200–500	150
≥ 30	280–690	150

The following table lists the recommended manufacturer and models of AC output reactors

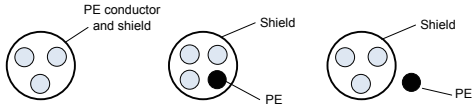
AC Drive Model	Rated Output Current (A)	AC Output Reactor Model (Shanghai Eagtop)
Three-phase 380–500 V, 50/60 Hz		
S5300-5R5G-4	13	OCL-0015-EISC-EM47
S5300-7R5G-4	17	OCL-0020-EISC-EM35
S5300-011G-4	25	OCL-0030-EISC-EM23
S5300-015G-4	32	OCL-0040-EISC-EM18
S5300-018G-4	37	OCL-0050-EISC-EM14
S5300-022G-4	45	OCL-0060-EISC-EM12
S5300-030G-4	60	OCL-0080-EISC-E87U
S5300-037G-4	75	OCL-0090-EISC-E78U
S5300-045G-4	91	OCL-0120-EISC-E58U
S5300-055G-4	112	OCL-0150-EISH-E47U
S5300-075G-4	150	OCL-0200-EISH-E35U

5.4 Shielded Cable

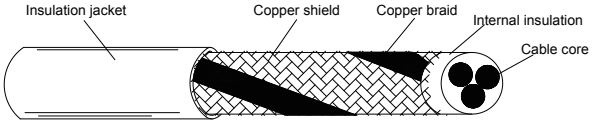
5.4.1 Requirements for Shielded Cable

The shielded cable must be used to satisfy the EMC requirements of CE marking. Shielded cables are classified into three-conductor cable and four-conductor cable. If conductivity of the cable shield is not sufficient, add an independent PE cable, or use a four-conductor cable, of which one phase conductor is PE cable.

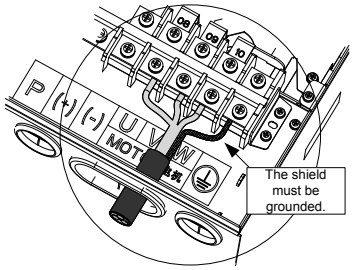
The three-conductor cable and four-conductor cable are shown in the following figure.



To suppress emission and conduction of radio frequency interference effectively, shield of shielded cable is cooper braid. Braided density of cooper braid must be larger than 90% to enhance shielding efficiency and conductivity, as shown in the following figure.



The following figure shows the grounding method of the shielded cable.

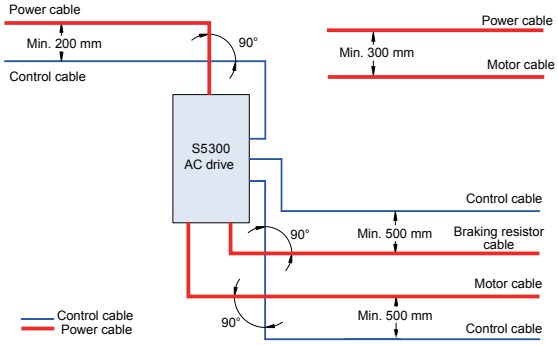


The installation precautions are as follows:

- Symmetrical shielded cable is recommended. The four-conductor shielded cable can also be used as an input cable.
- The motor cable and PE shielded conducting wire (twisted shielded) should be as short as possible to reduce electromagnetic radiation and external stray current and capacitive current of the cable. If the motor cable is over 100 meters long, an output filter or reactor is required.
- It is recommended that all control cables be shielded.
- It is recommended that a shielded cable be used as the output power cable of the AC drive; the cable shield must be well grounded. For devices suffering from interference, shielded twisted pair (STP) cable is recommended as the lead wire and the cable shield must be well grounded.

5.4.2 Cabling Requirements

- The motor cables must be laid far away from other cables. The motor cables of several AC drives can be laid side by side.
- It is recommended that the motor cables, power input cables and control cables be laid in different ducts. To avoid electromagnetic interference caused by rapid change of the output voltage of the AC drive, the motor cables and other cables must not be laid side by side for a long distance.
- If the control cable must run across the power cable, make sure they are arranged at an angle of close to 90°. Other cables must not run across the AC drive.
- The power input and output cables of the AC drive and weak-current signal cables (such as control cable) should be laid vertically (if possible) rather than in parallel.
- The cable ducts must be in good connection and well grounded. Aluminum ducts can be used to improve electric potential.
- The filter, AC drive and motor should be connected to the system (machinery or appliance) properly, with spraying protection at the installation part and conductive metal in full contact.



5.5 Solutions to Common EMC Interference Problems

The AC drive generates very strong interference. Although EMC measures are taken, the interference may still exist due to improper cabling or grounding during use. When the AC drive interferes with other devices, adopt the solutions provided in the following table.

Interference Type	Solution
Leakage protection switch tripping	• Connect the motor housing to the PE of the AC drive. • Connect the PE of the AC drive to the PE of the mains power supply. • Add a safety capacitor to the power input cable. • Add magnetic rings to the input drive cable.
AC drive interference during running	• Connect the motor housing to the PE of the AC drive. • Connect the PE of the AC drive to the PE of the mains voltage. • Add a safety capacitor to the power input cable and wind the cable with magnetic rings. • Add a safety capacitor to the interfered signal port or wind the signal cable with magnetic rings. • Connect the equipment to the common ground.
Communication interference	• Connect the motor housing to the PE of the AC drive. • Connect the PE of the AC drive to the PE of the mains voltage. • Add a safety capacitor to the power input cable and wind the cable with magnetic rings. • Add a matching resistor between the communication cable source and the load side. • Add a common grounding cable besides the communication cable. • Use a shielded cable as the communication cable and connect the cable shield to the common grounding point.
I/O interference	• Enlarge the capacitance at the low-speed DI. A maximum of 0.11 uF capacitance is suggested. • Enlarge the capacitance at the AI. A maximum of 0.22 uF is suggested.

Chapter 6 Troubleshooting

6.1 Description of Fault Levels

The S5300 monitors all input signals, running conditions, and external feedback information. After a fault occurs, the AC drive implements the protection function, and displays the fault code on the operation panel (if the operation panel is available). Before contacting Inovance for technical support, you can first determine the fault type, analyze the causes, and perform troubleshooting according to the following tables. If the fault cannot be rectified, contact the agent or Inovance.

The S5300 is the core of the entire crane electrical control system. The fault information of the S5300 is classifed into four levels, and the AC drive performs different actions for different fault levels, as listed in the following table.

Fault Level	Fault Type	Action	Display
Level 1	Stop upon fault	Display fault code. Disable output function 1 (Brake control). Enable output function 2 (Stop upon fault). Perform the operation of coasting to stop.	Er1**
Level 2	Alarm upon fault	Display fault code. Enable output function 3 (Alarm upon fault). Perform quick stop.	Er2**
Level 3	Prompt upon fault	Display fault code. Enable output function 4 (Prompt upon fault). The working conditions are not affected.	Er3**
Level 4	Fault shielded	The working conditions are not affected.	Normal display

Note	Faults 01# to 40# are AC drive driving performance faults, and are considered as level 1 faults by default, and therefore, the levels of these faults cannot be modified. Faults 41# to 65# are AC drive function faults, and you can modify the fault levels by bF.10 to bF.14 (for details, see the descriptions of bF.10 to bF.14). Faults 66# to 99# are faults about the crane process card; for details, see the description of the crane process card.

6.2 Fault Information and Troubleshooting

If faults listed in the following table occur, you can perform initial fault analysis and troubleshooting according to the corresponding instruction.

No.	Fault Symptom	Possible Causes	Solution
1	There is no display at power-on.	1. The mains voltage is unavailable or too low. 2. The power switch on the drive board of the AC drive is faulty. 3. The rectifier bridge is damaged. 4. The snubber resistor of the AC drive is damaged. 5. The control board or the operation panel is faulty. 6. The cable between the control board, the drive board, and operation panel is broken.	1. Check the power supply. 2. Check the bus voltage. 3. Re-connect the 8-core and 28-core cables. 3. Contact the agent or Inovance for technical support.

No.	Fault Symptom	Possible Causes	Solution
2	"CRANE" is displayed continuously for a long time.	1. The cable between the drive board and the control board is in poor contact. 2. Components on control board are damaged. 3. The motor or motor cable is short-circuited to ground. 7. A hall fault occurs. 8. Mains voltage is too low.	1. Re-connect the 8-core and 28-core cables. 2. Contact the agent or Inovance for technical support.
3	Err23 is displayed after power-on.	1. The motor or the motor output cable is short-circuited to ground. 2. The AC drive is damaged.	1. Measure the insulation of the motor and the output cable with a megger. 2. Contact the agent or Inovance.
4	The AC drive display is normal upon power-on, but "CRANE" is displayed after running and the AC drive stops immediately.	1. The fan is damaged or stalls. 2. Wiring of the external control terminals is short-circuited.	1. Replace the fan. 2. Eliminate external short-circuit fault.
5	Err14 (module overheat) is reported frequently.	1. The setting of carrier frequency is too high. 2. The cooling fan is damaged, or the air filter is blocked. 3. Components inside the AC drive (thermal coupler or others) are damaged.	1. Lower the carrier frequency (F0.15). 2. Replace the fan and clean the air filter. 3. Contact the agent or Inovance.
6	The motor does not rotate after the AC drive runs.	1. The motor is in poor contact with the motor cable. 2. The motor parameters are set incorrectly. 3. The cable between the drive board and the control board is in poor contact. 4. The drive board is faulty.	1. Re-connect the cable between the AC drive and the motor. 2. Replace the motor or rectify mechanical faults. 2. Check and re-set the motor parameters.
7	The DI terminals are disabled.	1. The parameters are set incorrectly. 2. External signals are incorrect. 2. The jumper between OP and +24V terminals is loose. 3. The control board is faulty.	1. Check and re-set the parameters in group b3. 2. Re-connect the external signal cable. 3. Check the jumper between OP and +24V. 3. Contact the agent or Inovance.
8	The motor speed is always low in CLVC mode.	1. The encoder is damaged. 2. The encoder wiring is incorrect or in poor contact. 2. The PG card is faulty. 3. The drive board is faulty.	1. Replace the encoder and ensure that the cabling is proper. 2. Replace the PG card. 3. Contact the agent or Inovance.
9	The AC drive reports overcurrent and overvoltage faults frequently.	1. The motor parameters are set incorrectly. 2. The acceleration/deceleration time is incorrect. 3. The load fluctuates.	1. Re-set the motor parameters or perform motor auto-tuning. 2. Set the proper acceleration/deceleration time. 3. Contact the agent or Inovance.
10	Err17 is reported upon power-on or running.	The soft startup contactor is not closed.	1. Check whether the contactor cable is loose. 2. Check whether the contactor is faulty. 3. Check whether 24 V power supply of the contactor is faulty. 4. Contact the agent or Inovance.
11	88888 is displayed upon power-on.	Related component on the control board is damaged.	Replace the control board.

Fault codes and troubleshooting

Fault Code	Fault Name	Possible Causes	Solution
02#	Overcurrent during acceleration	1. The main circuit is grounded or short-circuited on the output side. 2. Vector control is used but motor auto-tuning is not performed. 3. The acceleration time is too short. 4. The customized torque boost or V/F curve is improper. 5. Startup is performed on the rotating motor. 6. Sudden load is added during acceleration. 7. The AC drive model is lower than the one actually required.	1. Eliminate external problems. 2. Perform motor auto-tuning. 3. Increase the acceleration time. 4. Adjust the customized torque boost or V/F curve. 5. Adjust the voltage to the normal range. 6. Choose rotational speed tracing startup or perform startup after the motor stops completely. 7. Cancel the sudden load. 7. Use AC drive of a higher power rating.
03#	Overcurrent during deceleration	1. The main circuit is grounded or short-circuited on the output side. 2. Vector control is used but motor auto-tuning is not performed. 3. The deceleration time is too short. 4. The voltage is too low. 5. Sudden load is added during deceleration. 7. No braking unit and braking resistor are installed.	1. Eliminate external problems. 2. Perform motor auto-tuning. 3. Increase the deceleration time. 4. Adjust the voltage to the normal range. 5. Cancel the sudden load. 6. Install braking unit and braking resistor.
04#	Overcurrent at constant speed	1. The main circuit is grounded or short-circuited on the output side. 2. Vector control is used but motor auto-tuning is not performed. 3. The voltage is too low. 4. Sudden load is added during acceleration. 5. The AC drive model is lower than the one actually required.	1. Eliminate external problems. 2. Perform motor auto-tuning. 3. Adjust the voltage to the normal range. 4. Cancel the sudden load. 5. Use AC drive of a higher power rating.
05#	Overvoltage during acceleration	1. The input voltage is too high. 2. External force drags the motor during acceleration. 3. The acceleration time is too short. 4. No braking unit and braking resistor are installed.	1. Adjust the voltage to the normal range. 2. Eliminate the external force or install a braking resistor. 3. Increase the acceleration time. 4. Install braking unit and braking resistor.
06#	Overvoltage during deceleration	1. The input voltage is too high. 2. External force drags the motor during deceleration. 3. The deceleration time is too short. 4. No braking unit and braking resistor are installed.	1. Adjust the voltage to the normal range. 2. Eliminate the external force or install a braking resistor. 3. Increase the deceleration time. 4. Install braking unit and braking resistor.
07#	Overvoltage at constant speed	1. The input voltage is too high. 2. External force drags the motor during running.	1. Adjust the voltage to the normal range. 2. Eliminate the external force or install a braking resistor.
08#	Control power supply fault	The input voltage is outside the specified range.	Adjust the voltage to the normal range.
09#	Undervoltage protection	1. Instantaneous failure of input power occurs. 2. The input voltage is outside the specified range. 3. The bus voltage is abnormal. 4. The rectifier bridge and snubber resistor are abnormal. 5. The drive board is abnormal. 6. The control board is abnormal.	1. Reset the fault. 2. Adjust the voltage to the normal range. 2. Contact the agent or Inovance for technical support.

Fault Code	Fault Name	Possible Causes	Solution
10#	AC drive overload	1. The load is too heavy or locked-rotor occurs on the motor. 2. The AC drive model is lower than the actually required one.	1. Reduce the load, and check the motor and mechanical conditions. 2. Use the AC drive of a higher power rating.
11#	Motor overload	1. bE.01 is set incorrectly. 2. The load is too heavy or locked-rotor occurs on the motor. 3. The AC drive model is lower than the actually required one.	1. Modify the setting of bE.01. 2. Reduce the load, and check the motor and mechanical conditions. 3. Use the AC drive of a higher power rating.
12#	Phase loss on input side	1. The three-phase power supply is abnormal. 2. The drive board is abnormal. 3. The lightning protection board is abnormal. 4. The control board is abnormal.	1. Eliminate problems of the external line. 2. Contact the agent or Inovance for technical support.
14#	Module overheat	1. The ambient temperature is too high. 2. The air filter is blocked. 3. The fan is damaged. 4. The thermistor is damaged. 3. The inverter module is damaged.	1. Reduce the ambient temperature. 2. Clean the air filter. 3. Replace the fan. 4. Replace the thermistor. 5. Replace the inverter module.
17#	Contactor fault	1. The drive board and power supply are abnormal. 2. The contactor is abnormal.	1. Replace the drive board or power supply board. 2. Replace the contactor.
18#	Current detection fault	1. The hall device is abnormal. 2. The drive board is abnormal.	1. Replace the hall device. 2. Replace the drive board.
19#	Motor auto-tuning fault	1. The motor parameters are not set according to the nameplate. 2. Motor auto-tuning times out.	1. Re-set the motor parameters according to the nameplate. 2. Check the cable between the AC drive and the motor.
20#	Encoder fault	1. The encoder model does not match the motor. 2. The cabling of the encoder is incorrect. 3. The encoder is damaged. 4. The PG card is faulty.	1. Set encoder type correctly according to actual conditions. 2. Eliminate external problems such as wiring error. 3. Replace the encoder. 4. Replace the PG card.
23#	Ground short-circuit fault	The motor is short-circuited to ground.	Replace the cable or motor.
25#	Phase loss on output side	1. The cable between the AC drive and the motor is abnormal. 2. The three-phase output of the AC drive is asymmetric during motor running. 3. The drive board is faulty. 4. A module is faulty.	1. Eliminate external problems. 2. Check whether the three-phase windings of the motor are abnormal; if not, rectify the fault. 3. Contact the agent or Inovance for technical support.
37#	Frequency direction abnormal	The direction of the target set frequency is reverse to the direction of the motor feedback frequency. 1. The motor parameters are set incorrectly. 2. The load is too heavy.	1. Re-set the motor parameters. 2. Reduce the load. 3. Change the value of bC.02.
38#	Frequency following abnormal	The following deviation between the target set frequency and the motor feedback frequency is too large. 1. The motor parameters are set incorrectly. 2. The load is too heavy.	1. Re-set the motor parameters. 2. Reduce the load. 3. Change the values of bC.03 and bC.04.
38#	Output cable breaking protection	Three phases are lost on the output side of the AC drive.	Check the wiring to the motor.

Fault Code	Fault Name	Possible Causes	Solution
40#	Pulse-by-pulse current limit fault	1. The load is too heavy or locked-rotor occurs on the motor. 2. The AC drive model is lower than the actually required one.	1. Reduce the load, and check the motor and mechanical conditions. 2. Select the AC drive of a higher power rating.
41#	Brake release fault	The input brake feedback signal is incorrect. For details, see the description of b6.08.	1. Check the circuit wiring of the brake. 2. Check the function selection (input function 11) of the brake release feedback input terminal on the control board.
42#	Brake apply fault	The input brake feedback signal is incorrect. For details, see the description of b6.08.	1. Check the circuit wiring of the brake. 2. Check the function selection (input function 12) of the brake apply feedback input terminal on the control board.
43#	Shaft-cooling motor low-speed running timeout	See the descriptions of b0.00 and b0.01.	1. Adjust the setting of b0.00 and b0.01. 2. Prevent the motor from overheating.
44#	Forward and Reverse RUN commands valid simultaneously	The AC drive detects both forward RUN and reverse RUN commands at the same time.	1. Check the wiring of the terminals respectively for forward RUN and reverse RUN. 2. Increase the terminal filter time.
45#	Joystick not returned	The AC drive detects input of the RUN command or frequency setting signal at power on.	1. Ensure that all NO input contacts are disabled during power-on. 2. Enter RUN commands after system initialization is completed.
46#	Process card communication fault	Communication between the AC drive and the process card (CS70CF*) is abnormal.	1. Check the setting of bF.18. 2. Contact the agent or Inovance for technical support.
47#	CANlink communication fault	1. The CANlink extension card is abnormal. 2. The communication cable is abnormal.	1. Check whether the communication cables between all extension cards are loose. 3. Check whether the connection of each extension card is loose. 4. Shorten the distance between all communication nodes.
48#	RS485 communication fault	1. The host computer is abnormal. 2. The communication cable is abnormal. 3. The communication parameters in group bd are set incorrectly.	1. Check cabling to the host computer. 2. Check the communication cables. 3. Set the type of the communication extension card correctly. 4. Set the communication parameters correctly.
49#	EEPROM read-write fault	The EEPROM chip is damaged.	Replace the control board.
50#	External input fault	DI function 6 is enabled.	Reset the AC drive.

Appendix A: Extension I/O Card S5300IO1

It is applied to the S5300 of 3.7 kW and above.

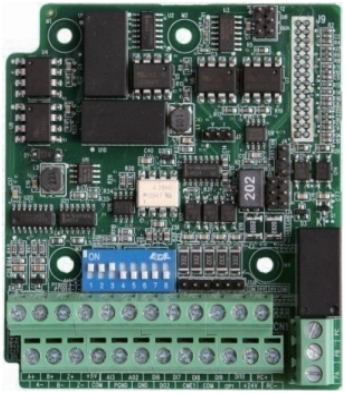
A.1 Overview

S5300IO1 is developed by Inovance and is designed for extension of input and output terminals of the S5300 drive .

Item	Specification
Input terminals	Five digital input (DI) terminals
Output terminals	One relay output
	One digital output
	One analog output
Communication	RS485 communication interface
	CAN communication interface

A.2 Mechanical Installation and Description of Terminals

■ Physical Appearance



■ Mechanical Installation

The S5300IO1 an embedded extension card Power off the drive and wait for a period of 10 minutes until the charging indicator goes off before starting the installation work.

As shown in the following fgure, insert the S5300IO1 card into the drive and fx it with the prepared screws.

■ Terminal Description

Type	Terminal	Terminal Name	Function Description
Power supply	+24V-COM	External +24V power supply	Provides a +24V power supply to an external unit Generally used to supply the DI/DO terminals and external sensors Max. output current: 200mA
	OP1	Digital input power terminal	Connect to +24V by the jumper J8 by default. When applying an external power supply, remove the jumper J8.
Digital inputs	DI6-OP1	Digital input 6	1. Optically-coupled isolation, compatible with dual-polarity inputs 2. Input resistance: 2.4 kΩ 3. Voltage range for level input: 9 to 30 V
	DI7-OP1	Digital input 7	
	DI8-OP1	Digital input 8	
	DI9-OP1	Digital input 9	
	DI10-OP1	Digital input 10	
Analog output	AO2-GND	Analog output 2	1. Output voltage range: 0 to 10 V 2. Output current range: 0 to 20mA
Digital output	DO2-CME	Digital output 2	Optically-coupled isolation, dual-polarity open collector output Output voltage range: 0 to 24V Output current range: 0 to 50mA Note that CME1 and COM are internally insulated, but are shorted by the jumper J7 internally. Remove the jumper J7 if you need to apply external power to DO2.
Relay outputs (RELAY2)	PA- PB	Normally-closed (NC) terminal	Contact driving capacity 250 VAC, 3 A, COSφ = 0.4. 30 VDC, 1 A
	PA- PC	Normally-open (NO) terminal	
RS485 communication	485+/485-	Communication interface	Modbus-RTU communication input and output terminal, isolated input
CAN communication	CANH/CANL	Communication interface	CANlink communication input terminal, isolated input

■ Jumper Description

Jumper	Description
J3	AO2 output selection: voltage or current
J4	CAN terminal resistor matching selection
J1	RS485 terminal resistor matching selection
J7	CME1 connecting mode selection
J8	OP1 connecting mode selection

When using the CANlink or Modbus protocol for communication, connect a terminal resistor to the end AC drive via jumper J4 or S2.