Inovance

IS300

Series Servo Drive

User Manual

Shenzhen Inovance Technology Co., Ltd.

V1. 1

Data code:19010120

Preface

The IS300 series servo drive is specially designed for the permanent magnet synchronous servo motor, and implements high-performance vector control on the motor. Integrating process control (such as precise control of injection speed and pressure holding) during driving of the injection molding machine and stability control during cooperation with the injection molding machine controller, the IS300 series servo drive can well control the servo pump and provides general-purpose servo functions. The IS300 is highly cost-effective and reliable.

It is applicable to plastic molding, pipe extrusion, shoe making, rubber producing, and metal casting.

This manual is a guideline for the selection, installation, parameter setting, on-site commissioning and troubleshooting of the IS300 servo drive.

Before using the servo drive, read this manual carefully to have a thorough understanding of the product. Keep the manual well and forward it to end users with the product.

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

■ Product Checking

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

■ First-time Use

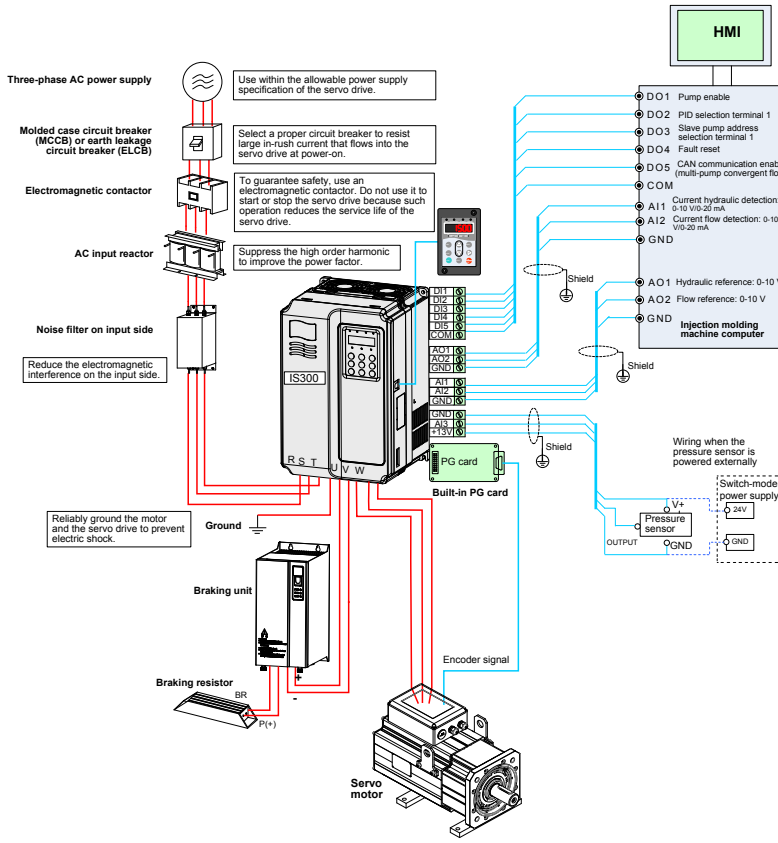
For the users who use this product for the first time, read the manual carefully. If you have any problem concerning the functions or performance, contact the technical support personnel of Inovance to ensure correct use.

■ Standard Compliant

The IS300 series servo drive complies with the following international standards:

- IEC/EN 61800-5-1: 2007, Adjustable speed electrical power drive systems – Safety requirements
- IEC/EN 61800-3: 2004, Adjustable speed electrical power drive systems – Part 3: EMC requirements and specific test methods

■ Connection to Peripheral Devices



Contents

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Safety Information and Precautions

Chapter 1 Safety Information and Precautions

In this manual, the notices are graded based on the degree of danger:

- **DANGER** indicates that failure to comply with the notice will result in severe personal injury or even death.
- **WARNING** indicates that failure to comply with the notice will result in personal injury or property damage.

Read this chapter carefully so that you have a thorough understanding, and perform all operations such as installation, commissioning or maintenance by following the notices in this chapter. Inovance will assume no liability or responsibility for any injury or loss caused by improper operation.

1.1 Safety Information

Use Stage	Safety Grade	Precautions
Before installation	WARNING	• Do not install the equipment if you find component missing or damage upon unpacking. • Use a motor with the insulation level of above B. Failure to comply may result in electric shock.
During installation	DANGER	• Install the equipment on incombustible objects such as metal, and keep it away from combustible materials. Failure to comply may result in a fire.
	WARNING	• When two servo drives are laid in the same cabinet, arrange the installation positions properly to ensure good cooling effect. • Do not drop wire end or screw into the servo drive. Failure to comply will result in damage to the servo drive.
At wiring	DANGER	• Wiring must be performed only by qualified personnel under instructions described in this manual. Failure to comply may result in unexpected accidents. • A circuit breaker must be used to isolate the power supply and the servo drive. Failure to comply may result in a fire. • Ensure that the power supply is cut off before wiring. Failure to comply may result in electric shock. • Tie the grounding terminal to ground properly according to the requirements. Failure to comply may result in electric shock.

Use Stage	Safety Grade	Precautions
At wiring	⚠WARNING	• Never connect the power cables to the output terminals (U, V, W) of the servo drive. Pay attention to the marks of the wiring terminals and ensure correct wiring. Failure to comply will result in damage to the servo drive. • Ensure that all wiring complies with the EMC requirements and local safety standard. Use wire sizes recommended in the manual. Failure to comply may result in accidents. • Never connect the braking resistor between the DC bus terminals (+) and (-). Failure to comply may result in a fire.
Before power-on	⚠DANGER	• Check that the following requirements are met: - The voltage class of the power supply is consistent with the rated voltage class of the servo drive. - The input terminals (R, S, T) and output terminals (U, V, W) are properly connected. - No short-circuit exists in the peripheral circuit. - The wiring is secured. Failure to comply may result in damage to the servo drive • Cover the servo drive properly before power-on to prevent electric shock.
	⚠WARNING	• Do not perform the voltage resistance test on any part of the servo drive because such test has been done in the factory. Failure to comply may result in accidents. • All peripheral devices must be connected properly under the instructions described in this manual. Failure to comply may result in accidents.
After power-on	⚠DANGER	• Do not open the cover of the servo drive after power-on. Failure to comply may result in electric shock. • Do not touch the servo drive or peripheral circuit with wet hands. Failure to comply may result in electric shock. • Do not touch any I/O terminal of the servo drive. Failure to comply may result in electric shock. • The servo drive automatically performs safety detection on the external strong power circuit immediately after power-on. Do not touch the U, V, W terminals of the servo drive or wiring terminals of the motor. Failure to comply may result in electric shock.
	⚠WARNING	• Do not touch the rotating part of the motor during the motor auto-tuning or running. Failure to comply may result in accidents. • Do not change the default settings of the servo drive. Failure to comply may result in damage to the servo drive.

Use Stage	Safety Grade	Precautions
During running	⚠ DANGER	• Do not get close to the mechanical device during running. Failure to comply may result in personal injury. • Do not touch the fan or the discharging resistor to check the temperature. Otherwise, you may get burnt. • Signal detection must be performed only by qualified personnel during operation. Failure to comply mayl result in personal injury or equipment damage.
	⚠ WARNING	• Avoid objects falling into the equipment when it is running. Failure to comply will result in damage to the equipment. • Do not start/stop the servo drive by turning the contactor ON/OFF. Failure to comply will result in damage to the equipment.
During maintenance	⚠ DANGER	• Repair or maintenance of the servo drive can be performed only by qualified personnel. Failure to comply will result in personal injury or damage to the servo drive. • Do not repair or maintain the servo drive at power-on. Failure to comply will result in electric shock. • Repair or maintain the servo drive after the CHARGE indicator becomes OFF. Otherwise, the residual voltage in the capacitor will result in personal injury.

1.2 General Precautions

1. Requirement on residual current device (RCD)

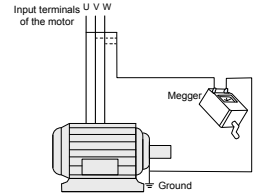
   The servo drive generates high leakage current during running, which flows through the protective earthing (PE) conductor. Thus install a type-B RCD at primary side of the power supply. When selecting the RCD, you should consider the transient and steady-state leakage current to ground that may be generated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

2. High leakage current warning

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

3. Motor insulation test

   Perform the insulation test when the motor is used for the first time, or when it is reused after being stored for a long time, or in a regular check-up, in order to prevent the poor insulation of motor windings from damaging the servo drive. The motor must be disconnected from the servo drive during the insulation test. A 500-V mega-Ohm meter is recommended for the test. The insulation resistance must not be less than 5 MΩ.



4. Thermal protection of motor

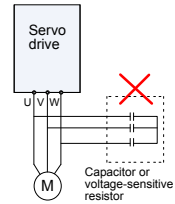
   If the rated capacity of the motor selected does not match that of the servo drive, especially when the rated power of the servo drive is greater than that of the motor, adjust the motor protection parameters on the operation panel of the servo drive or install a thermal relay in the motor circuit for protection.

5. Motor heat and noise

   The output of the servo drive is pulse width modulation (PWM) wave with certain harmonics, and therefore, the motor temperature, noise, and vibration are slightly greater than those when the servo drive runs at mains frequency.

6. Voltage-sensitive device or capacitor on the output side of the servo drive

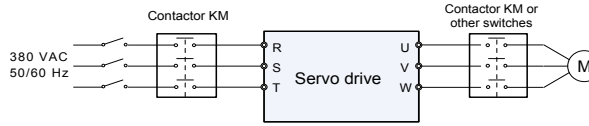
   The output of the servo drive is PWM wave. Do not install the capacitor for improving power factor or lightning protection voltage-sensitive resistor on the output side of servo drive. Otherwise, the servo drive may suffer transient overcurrent or even be damaged.



7. Contactor at the I/O terminal of the servo drive

   When a contactor is installed between the input side of the servo drive and the power supply, the servo drive must not be started or stopped by switching the contactor on or off. If the servo drive has to be operated by the contactor, ensure that the time interval between switching is at least one hour because frequent charge and discharge will shorten the service life of the capacitor inside the servo drive.

   When a contactor is installed between the output side of the servo drive and the motor, do not turn off the contactor when the servo drive is active. Otherwise, modules inside the servo drive may be damaged.



8. Use outside the rated voltage range

   The servo drive must not be used outside the allowable voltage range specified in this manual. Otherwise, the servo drive's components may be damaged. If required, use a corresponding voltage step-up or step-down device.

9. Prohibition of changing three-phase input into two-phase input

   Do not change the three-phase input of the servo drive into two-phase input. Otherwise, a fault will result or the servo drive will be damaged.

10. Surge suppressor

    The servo drive has a built-in voltage dependent resistor (VDR) for suppressing the surge voltage generated when the inductive loads (electromagnetic contactor, electromagnetic relay, solenoid valve, electromagnetic coil and electromagnetic brake) around the servo drive are switched on or off. If the inductive loads generate a very high surge voltage, use a surge suppressor for the inductive load or or use a surge suppressor together with a diode.

Note

Do not connect the surge suppressor on the output side of the servo drive.

11. Altitude and de-rating

    In places where the altitude is above 1000 m, the cooling effect reduces due to thin air, and it is necessary to de-rate the servo drive. Contact Inovance for technical support.

12. Special usage

    If wiring that is not described in this manual such as common DC bus is applied, contact the agent or Inovance for technical support.

13. Disposal

    The electrolytic capacitors on the main circuits and PCB may explode when they are burnt. Poisonous gas is generated when the plastic parts are burnt. Treat them as ordinary industrial waste.

14. Adaptable motor

    - The standard adaptable motor is PMSM.
    - The standard parameters of the adaptable motor have been configured inside the servo drive. It is still necessary to perform motor auto-tuning or modify the default values based on actual conditions. Otherwise, the running result and protection performance will be affected.
    - The servo drive may alarm or even be damaged when short-circuit exists on cables or inside the motor. Therefore, perform the insulation short-circuit test when the motor and cables are newly installed or during routine maintenance. During the test, make sure that the servo drive is disconnected from the tested parts.

15. Overcurrent and overload faults

    - When an overcurrent fault (Err02, Err03, or Err04) or overload fault (Err10) occurs, if the fault persists after you power off the servo drive and start it again, find out the causes rather than starting the servo drive frequently. Otherwise, the inverter module will be damaged by the large-current impact.

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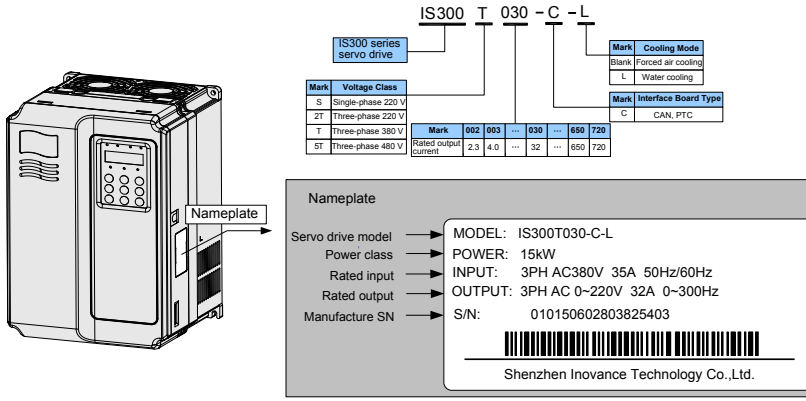
Product Information

Chapter 2 Product Information

2.1 Designation Rules and Nameplate

Figure 2-1 Designation rules and nameplate of the IS300

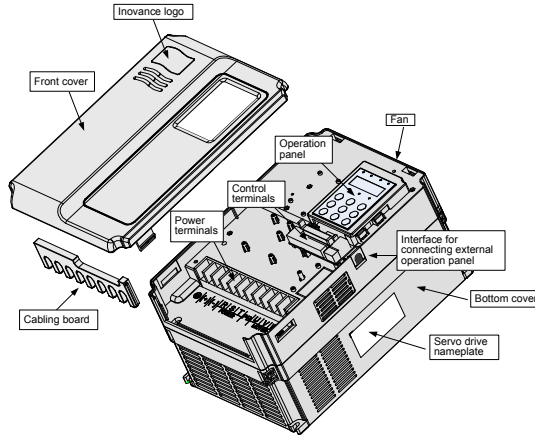


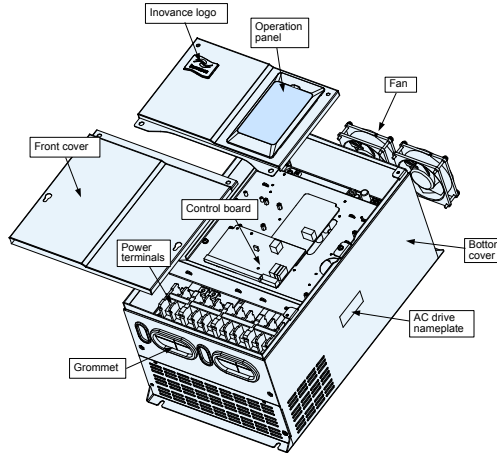
Note

"C" indicates that the interface board provides the CAN communication interface and the interface for the PTC sensor for motor overheat protection. The IS300 is configured with the PG card for connecting the encoder.

2.2 Product Appearance

Figure 2-2 Appearance of the IS300





2.3 Technical Specifications

Table 2-1 Technical specifications of the IS300

Item		Specifications
Standard functions	Maximum frequency	300 Hz
	Carrier frequency	0.5–16 kHz The carrier frequency is automatically adjusted based on the load features.
	Input frequency resolution	Digital setting: 0.01 Hz Analog setting: maximum frequency x 0.1%
	Control mode	• Closed-loop vector control (CLVC) • Voltage/Frequency (V/F) control
	Startup torque	0 Hz/150% (CLVC)
	Speed range	1:1000 (CLVC)
	Speed stability accuracy	±0.02% (CLVC)
	Torque control accuracy	±5% (CLVC)
	Overload capacity	60s for 150% of the rated current, 3s for 180% of the rated current
	Auto voltage regulation (AVR)	It can keep constant output voltage automatically when the mains voltage changes.
Protection function	Protection function	Motor short-circuit detection at power-on, input/output phase loss protection, overcurrent protection, overvoltage protection, undervoltage protection, overheat protection and overload protection

Item		Specifications
Environment	Installation location	Indoor, free from direct sunlight, dust, corrosive gas, combustible gas, oil smoke, vapour, drip or salt.
	Altitude	Lower than 1000 m (de-rated if higher than 1000 m)
	Ambient temperature	-10°C to +40°C (de-rated if the ambient temperature is between 40°C and 50°C)
	Humidity	Less than 95%RH, without condensing
	Vibration	Less than 5.9 m/s^2 (0.6 g)
	Storage temperature	-20°C to +60°C
	IP level	IP20

3

Mechanical and Electrical Installation

Chapter 3 Mechanical and Electrical Installation

3.1 Mechanical Installation

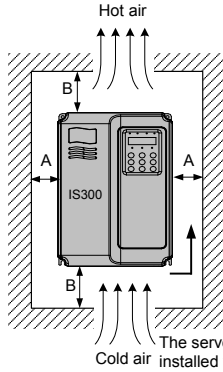
3.1.1 Installation Environment Requirements

Item	Requirements
Ambient temperature	-10°C to 50°C
Heat dissipation	Install the servo drive on the surface of an incombustible object, and ensure that there is sufficient space around for heat dissipation. Install the servo 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

3.1.2 Installation Clearance Requirements

The clearance that needs to be reserved varies with the power class of the IS300, as shown in the following figure.

Figure 3-1 Clearance around the IS300 for installation



Installation clearance requirements on the IS300 series servo drives of different power classes

Power Class	Clearance Requirements	
0.4-15 kW	A ≥ 10 mm	B ≥ 100 mm
18.5-30 kW	A ≥ 10 mm	B ≥ 200 mm
37-450 kW	A ≥ 50 mm	B ≥ 300 mm

Minimum air duct area for a servo drive

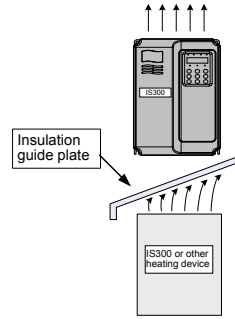
Power Class	Minimum Air Duct Area (mm²)
0.75-2.2 kW	3850
3.7-5.5 kW	6960
7.5-15 kW	14400
18.5-30 kW	17700
37-55 kW	33200
75-90 kW	53600
110-160 kW	63000
200-280 kW	81000
315-450 kW	82000

The servo drive shall be installed vertically upward.

The IS300 series servo drive dissipates heat from bottom to top. If multiple servo drives are connected together, install them side by side.

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

Figure 3-2 Installation of the insulation guide plate

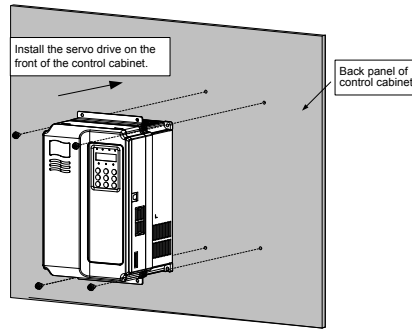


3.1.3 Mechanical Installation Method and Process

The IS300 series servo drives have two housing types, plastic housing and sheet metal housing, according to different voltage and power classes. The IS300 supports both wall-mounting installation and embedded installation in different applications.

1. Wall-mounting installation of the IS300 (plastic housing)

Figure 3-3 Wall-mounting installation of the IS300 (plastic housing)



2. Embedded installation of the IS300 (plastic housing)

Figure 3-4 External hanging brackets for the IS300

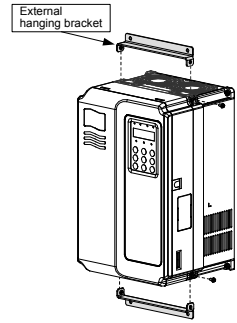


Figure 3-5 Embedded installation of the IS300 (plastic housing)

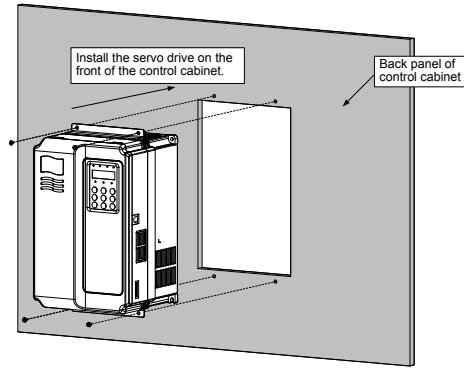
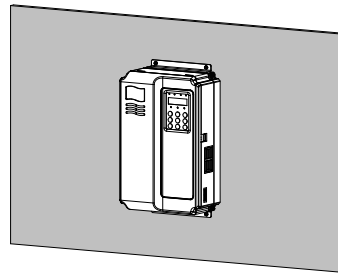


Figure 3-6 Embedded installation effect of the IS300 (plastic housing)



3. Wall-mounting installation of the IS300 (sheet metal housing)

Figure 3-7 Wall-mounting installation of the IS300 (sheet metal housing)

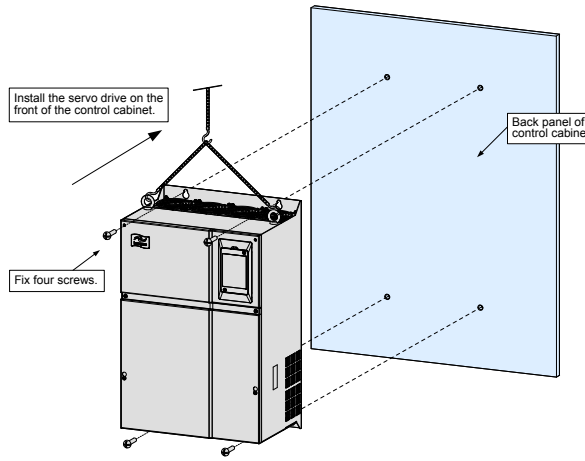
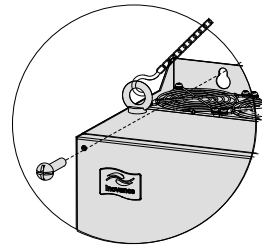


Figure 3-8 Hoisting the IS300 (sheet metal housing)



4. Embedded installation of the IS300 (sheet metal housing)

Figure 3-9 External hanging bracket for the IS300 (sheet metal housing)

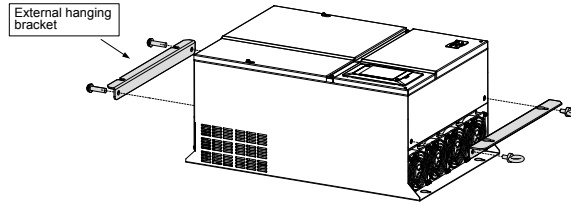


Figure 3-10 Embedded installation of the IS300 (sheet metal housing)

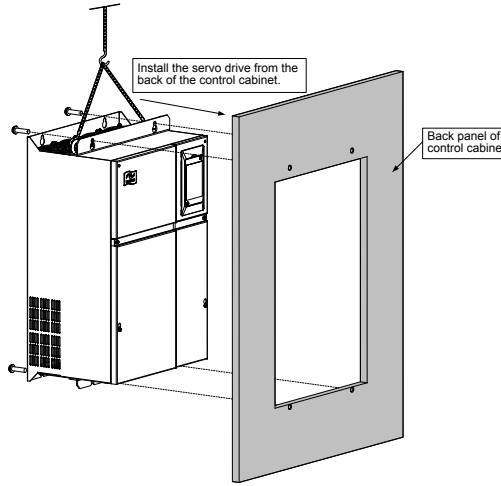
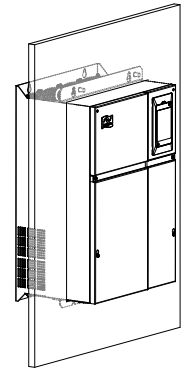


Figure 3-11 Embedded installation effect of the IS300 (sheet metal housing)



The installation precautions are as follows:

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

3.1.4 Removal of the Front Cover

For the IS300 series servo drives, you need to remove the front cover before wiring the main circuit and control circuit.

Figure 3-12 Removal of the front cover of the IS300 (plastic housing)

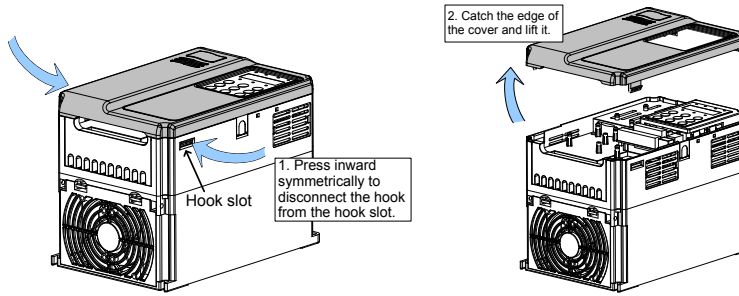
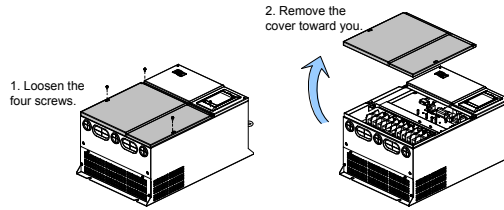


Figure 3-13 Removal of the front cover of the IS300 (sheet metal housing)



DANGER
Be careful when removing the front cover of the servo drive. Falling off of the cover may cause damage to the servo drive or personal injury.

3.2 Description and Wiring of Main Circuit Terminals

Figure 3-14 Layout of the main circuit terminals

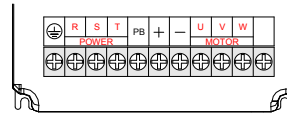
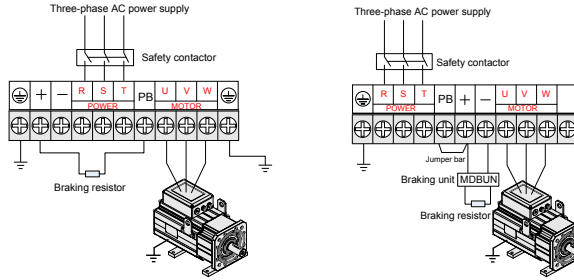


Figure 3-15 Wiring of main circuit terminals



Below IS300T07-C IS300T070-C and above

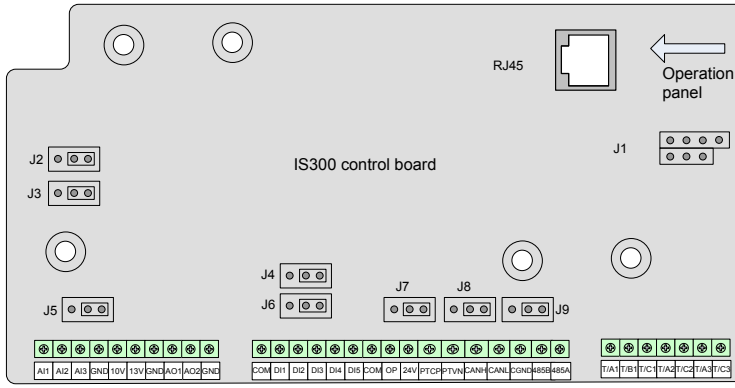
Table 3-1 Description of main circuit terminals of single-phase servo drive

Terminal	Name	Description
R, S, T	Three-phase power supply input terminals	Connect to the three-phase AC power supply
(+), (-)	Positive and negative terminals of DC bus	Common DC bus input point Connect to the external braking unit for servo drives of IS300T070-C and above.
(+), PB	Terminals for connecting braking resistor	Connect to the braking resistor for the IS300T050-C and below.

Terminal	Name	Description
P, (+)	Terminals for connecting external reactor	Connect to an external reactor for IS300T140-C and above.
U, V, W	Servo drive output terminals	Connect to a three-phase motor.
⏚	Grounding terminal	Must be grounded.

3.3 Description and Wiring of Control Circuit Terminals

Figure 3-16 Layout of the control circuit terminals



■ **Function Description of Jumpers**

Mark	Position 1	Function description	Position 2	Function description
J2		The GND terminal is connected to the to-ground capacitor (used when the servo drive is well grounded).		The GND terminal is not connected to the to-ground capacitor (used when the servo drive is poorly grounded).
J3		The COM terminal is connected to the to-ground capacitor (used when the servo drive is well grounded).		The COM terminal is not connected to the to-ground capacitor (used when the servo drive is poorly grounded).
J4		AO1 provides voltage output (0–10 VDC).		AO1 provides current output (0–20 mA).
J5		AI3 provides voltage input (-10 to 10 VDC).		AI3 provides current input (0–20 mA).
J6		AO2 provides voltage output (0–10 VDC).		AO2 provides current output (0–20 mA).
J7		Internal power supply is used for DI1 to DI5.		External power supply is used for DI1 to DI5.

Mark	Position 1	Function description	Position 2	Function description
J8		Connect to the terminal matching resistor in the case of CAN communication (used in the terminal machine during communication between multiple servo drives).		Not connect to the terminal matching resistor in the case of CAN communication (used in the medium machine during communication between multiple servo drives).
J9		Connect to the terminal matching resistor in the case of RS485 communication (used in the terminal machine during communication between multiple servo drives).		Not connect to the terminal matching resistor in the case of RS485 communication (used in the medium machine during communication between multiple servo drives).

Note

The jumper position is seen when you face the wiring terminals.

■ Description of Control Circuit Terminals

Table 3-2 Description of control circuit terminals

Type	Terminal	Name	Description
Power Supply	+10V-GND	+10 V power supply	Provide +10 V power supply externally. Generally, it provides power supply to the external potentiometer with resistance range of 1–5 kΩ. Maximum output current: 10 mA
	+13V-GND	Pressure sensor power supply	Provide 13 V±10% power supply externally. Generally, it provides power supply to the pressure sensor. Maximum output current: 10 mA
	+24V-COM	+24 V power supply	Provide +24 V power supply externally. Generally, it provides power supply to DI/DO terminals and external sensors. 24 V±10%, maximum no-load virtual voltage: 30 V Maximum output current: 200 mA Internally isolated with GND
	OP	External power supply	It is isolated with COM and +24V internally, and shorted with +24V by a jumper by default. When DI1 to DI5 need to be driven by external signal, OP needs to be connected to external power supply and be disconnected from +24 V (determined by jumper J7 on the control board).

Type	Terminal	Name	Description
Analog input	AI1-GND	Analog input 1 (pressure reference by default)	Input voltage range: ±10 VDC, 12-bit resolution, correction accuracy 0.5% Input impedance: 100 kΩ
	AI2-GND	Analog input 2 (flow reference by default)	Input voltage range: ±10 VDC, 12-bit resolution, correction accuracy 0.5% Input impedance: 100 kΩ
	AI3-GND	Analog input 3 (pressure senor signal input by default)	Input range: ±10 VDC or 0–20 mA (determined by jumper J5 on the control board), 12-bit resolution, correction accuracy 0.5% Input impedance: 100 kΩ (voltage input), 500 Ω (current input)
Digital Input	(DI1 to DI5)-COM	Digital input	Isolated sink/source input programmable terminals, input frequency < 100 Hz Input impedance: 3.3 kΩ Voltage range at level input: 9–30 V
	PTCP-PTCN	Motor overheat protection input	Motor overheat protection PTC sensor Supporting PTC130, PTC150, etc.
Communication	CANH/ CANL/CGND	CAN communication	Maximum communication speed: 1 Mbps Whether it is connected to the terminal matching resistor is determined by jumperJ8.
	485B/485A	RS485 communication	Reserved, isolated This function is not available by default Maximum communication speed: 230 Kbps Whether it is connected to the terminal matching resistor is determined by jumperJ9.
Analog output	AO1-GND	Analog output 1	Voltage or current output is decided by jumper J4. Output range: 0–10 V/0–20 mA 12-bit resolution, correction accuracy 1%, maximum load resistance value ≤ 500 Ω
	AO2-GND	Analog output 2	Voltage or current output is decided by jumper J6. Output range: 0–10 V/0–20 mA 12-bit resolution, correction accuracy 1%, maximum load resistance value ≤ 500 Ω
Relay output	T/A1-T/B1	NC terminal	Contact driving capacity: 250 VAC, 3 A, COSφ = 0.4; 30 VDC, 1 A
	T/A1-T/A3-T/C1-T/C3	NO terminal	
Auxiliary interface	CNR1	Operation panel interface	Connect to the external operation panel.

3.4 Description of PG Card Terminals on the IS300

Table 3-3 Description of PG card terminals

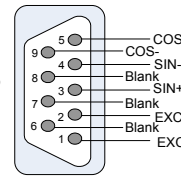
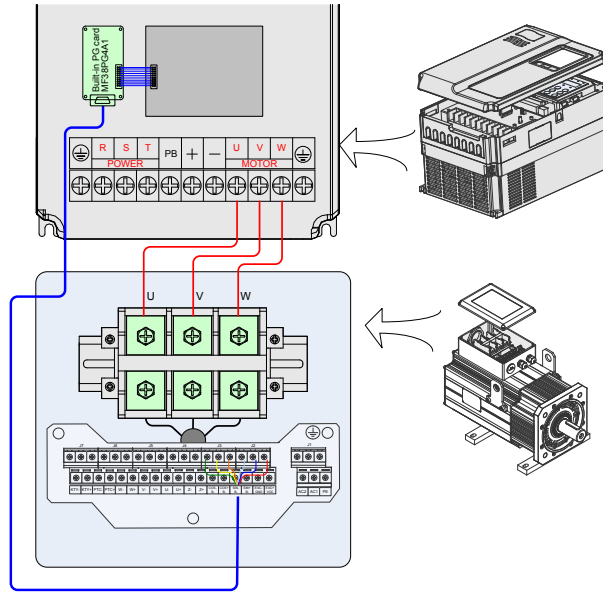
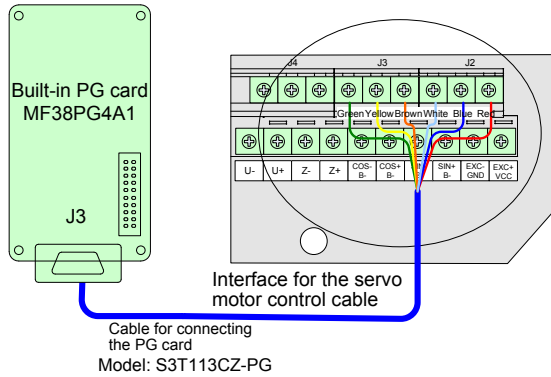
No.	Name	Description	Pin Definition
1	EXC-	Excitation signal	J3 
2	EXC+		
3	SIN+	SIN feedback signal	
4	SINL-		
5	COS+	COS feedback signal	
9	COS-		
6–8	-	-	

Table 3-4 Definition of matching signal cables for the IS300 (for reference only)

Signal Definition	EXC-	EXC+	SIN+	SIN-	COS+	COS-
Color of Matching Encoder Cable	Red	Blue	White	Brown	Yellow	Green
Corresponding PG Card and DB9 Pin	1	2	3	4	5	9

Figure 3-17 Wiring between the PG card and the motor





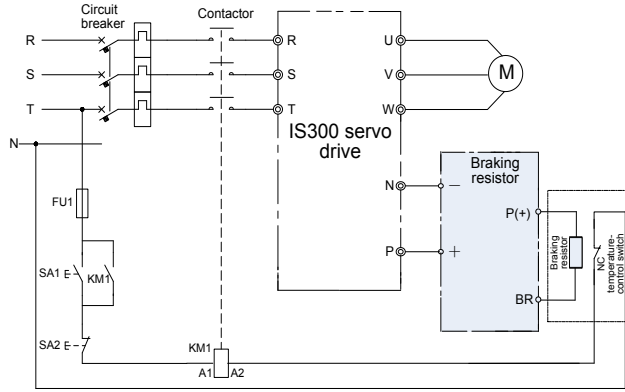
3.5 Wiring of the External Braking Unit

Two wiring methods are provided, differing in the wiring of braking resistor overheat protection.

Wiring method 1: After the signal of the braking resistor overheat relay is sent, the power supply of the IS300 is cut off.

Wiring method 2: The signal of the braking resistor overheat relay is used as input of the IS300 external fault (Err15).

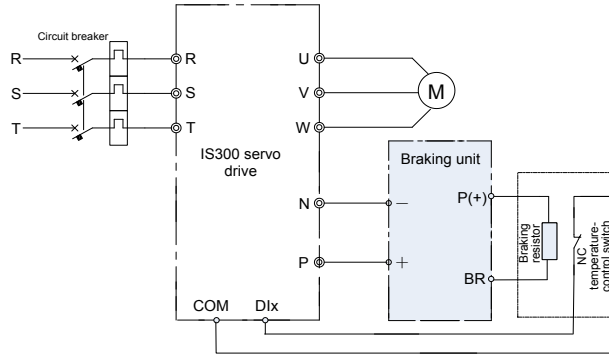
Figure 3-18 Basic wiring method 1



Note

In this wiring method, the input voltage class of the contactor control coil is 220 VAC. The NC contact of the thermal relay is connected to the power supply of the wire package driven by the main contactor. When a fault occurs, the driving power supply of the contactor is cut off to disconnect the main contactor.

Figure 3-19 Basic wiring method 2



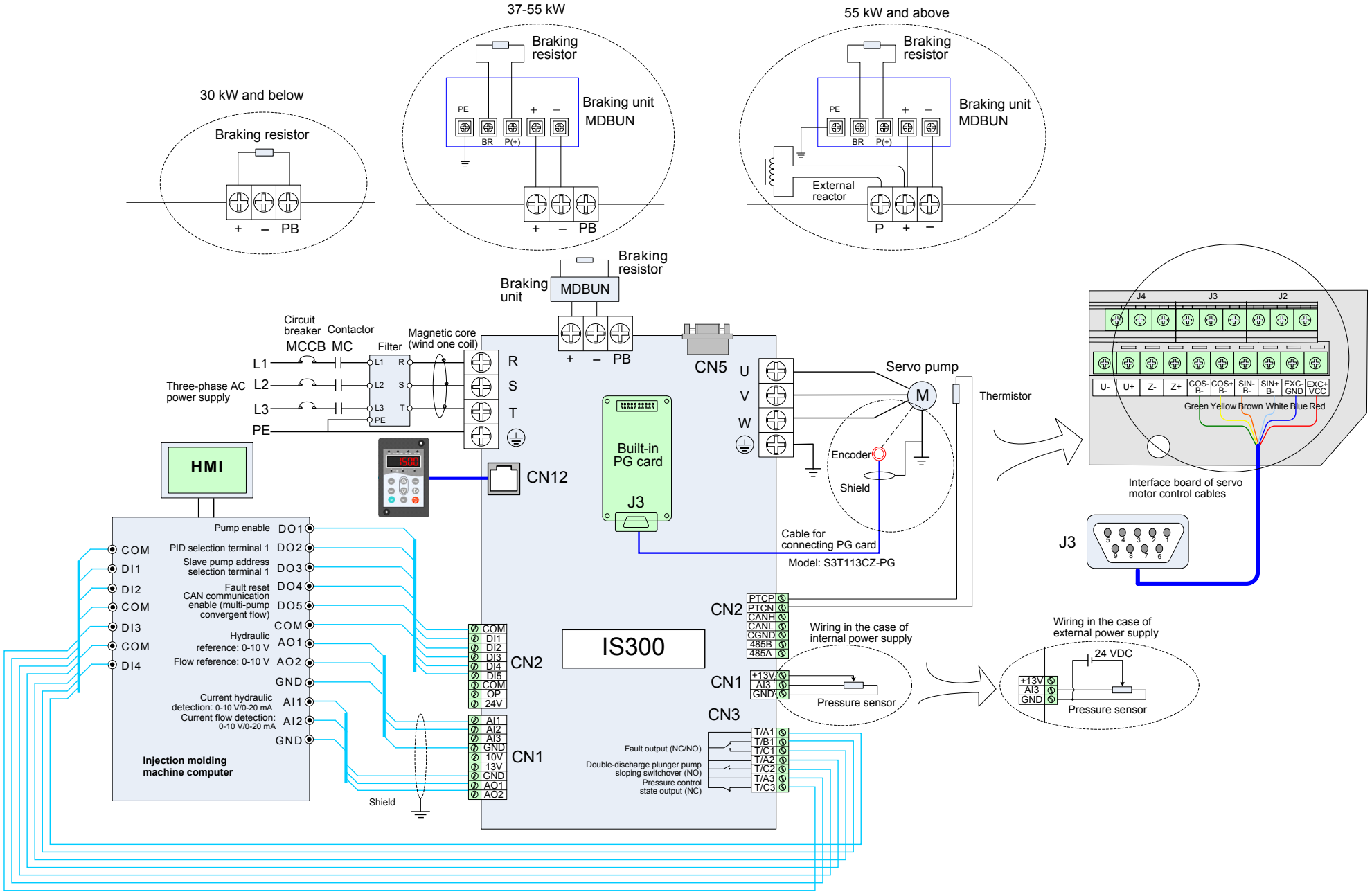
Note

1. In this wiring method, the braking unit is connected to COM on one side and DIx on the other side. The function code setting is as follows when the braking unit is connected to different DI terminals: DI1: F4-00 = 11; DI2: F4-01 = 11; DI3: F4-02 = 11; DI4: F4-03 = 11; DI5: F4-04 = 11
2. Pay much attention to the power and heat dissipation conditions of the braking resistor. If Err15 is reported, immediately cut off the power supply of the main circuit. Otherwise, it may cause a fire.

3.6 Wiring Diagram of System Application

See the last page of this chapter.

Figure 3-20 Wiring diagram of system application



4

Commissioning and Running of Servo Pump

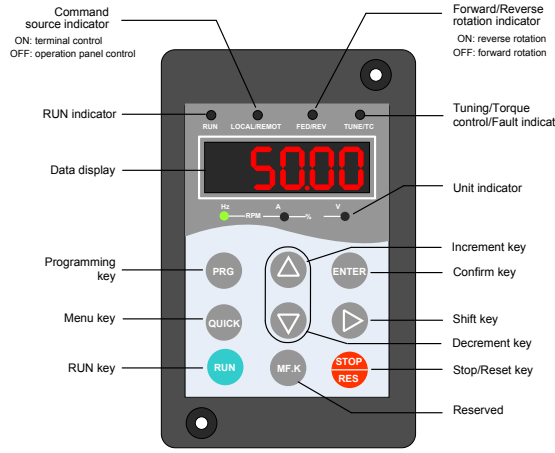
Chapter 4 Commissioning and Running of Servo Pump

4. 1 Use of the Operation Panel

The IS300 has a built-in LED operation panel; an external LED operation panel can also be connected to the RJ45 interface of the IS300 by an 8-core flat cable.

You can modify the parameters, monitor the working status and start or stop the MD380 by operating the operation panel, as shown in the following figure.

Figure 4-1 Diagram of the operation panel



4.1.1 Description of Indicators

■ **RUN**

ON indicates that the servo drive is in the running state, and OFF indicates that the servo drive is in the stop state.

■ **LOCAL/REMOT**

It indicates whether the servo drive is operated by means of operation panel, terminal or communication (remote).

○LOCAL/REMOT: OFF	Operation panel control
●LOCAL/REMOT: ON	Terminal control
◑LOCAL/REMOT: blinking	Communication control

■ **FWD/REV**

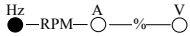
ON indicates reverse rotation, and OFF indicates forward rotation.

■ **TUNE/TC**

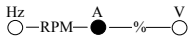
When the indicator is ON, it indicates torque control mode. When the indicator is blinking slowly, it indicates the auto-tuning state. When the indicator is blinking quickly, it indicates the fault state.

■ **Unit Indicators**

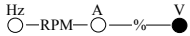
● means that the indicator is ON, and ○ means that the indicator is OFF.



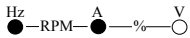
Hz: unit of frequency



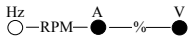
A: unit of current



V: unit of voltage



RPM: unit of rotational speed



%: percentage

■ **Digital Display**

The 5-digit LED display is able to display the set frequency, output frequency, monitoring data and fault codes.

4.1.2 Description of Keys on the Operation Panel

Table 4-1 Description of keys on the operation panel

Key	Name	Function
PRG	Programming	Enter or exit Level I menu.
ENTER	Confirm	Enter the menu interfaces level by level, and confirm the parameter setting.
△	Increment	Increase data or function code.
▽	Decrement	Decrease data or function code.
▷	Shift	Select the displayed parameters in turn in the stop or running state, and select the digit to be modified when modifying parameters.
RUN	Run	Start the servo drive in the operation panel control mode.

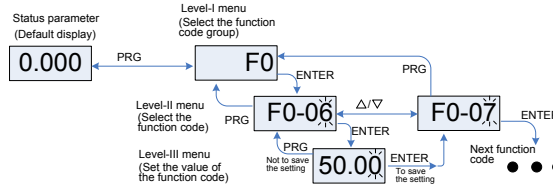
Key	Name	Function
STOP RES	Stop/Reset	Stop the servo drive when it is in the running state and perform the reset operation when it is in the fault state.
QUICK	Quick	Enter or exit Level I quick menu.
MF.K	Reserved	Reserved

4.1.3 Viewing and Modifying Function Codes

The operation panel of the IS300 adopts three-level menu.

The three-level menu consists of function code group (Level I), function code (Level II), and function code setting value (level III), as shown in the following figure.

Figure 4-2 Operation procedure on the operation panel

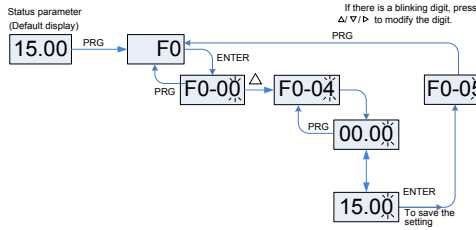


You can return to Level II menu from Level III menu by pressing PRG or ENTER .

- After you press ENTER , the system saves the parameter setting first, and then goes back to Level II menu and shifts to the next function code.
- After you press PRG , the system does not save the parameter setting, but directly returns to Level II menu and remains at the current function code.

Here is an example of changing the value of F0-04 to 15.00 Hz.

Figure 4-3 Example of changing the parameter value



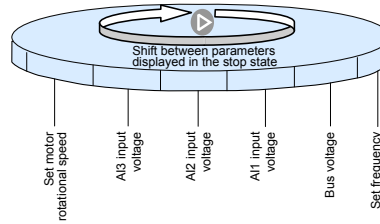
In Level III menu, if the parameter has no blinking digit, it means that the parameter cannot be modified. This may be because:

- Such a function code is only readable, such as, servo drive model, actually detected parameter and running record parameter.
- Such a function code cannot be modified in the running state and can only be changed at stop.

In the stop or running state, the operation panel can display multiple status parameters.

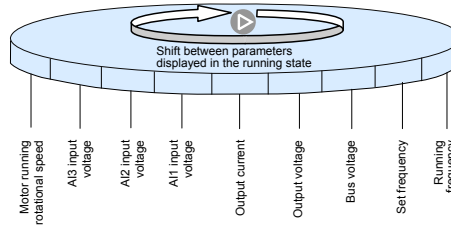
In the stop state, you can press to view the parameters circularly. For details on the parameters that can be displayed, see the description of group U0.

Figure 4-4 Shift between parameters displayed in the stop state



In the running state, you can press to view the parameters circularly. For details on the parameters that can be displayed, see the description of group U1.

Figure 4-5 Shift between parameters displayed in the running state



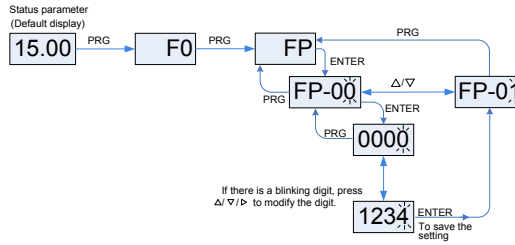
4.1.4 Password Setting

The servo drive provides the user password protection function. When FP-00 is set to a non-zero value, the value is the user password. The password takes effect after you exit the function code editing state. When you press PRG again, "------" will be displayed, and you must enter the correct user password to enter the menu.

To cancel the password protection function, enter with password and set FP-00 to 0.

The following figure shows how to set the password to 1234.

Figure 4-6 Setting the password



4.2 Application Example

4.2.1 Starting or Stopping the Servo Drive

■ **Selecting the Start/Stop Command Source**

There are three start/stop command sources, namely, operation panel control, terminal control, and communication control. You can select the command source in F0-02.

Function Code	Parameter Name	Setting Range	Description	Default
F0-02	Command source selection	0: Operation panel control (indicator OFF) 1: Terminal control (indicator ON) 2: Communication control (indicator blinking)	0: Press RUN or STOP RES to start or stop the servo drive. 1: A DI terminal needs to be defined as the run/stop terminal. 2: The communication protocol (Modbus-RTU or CANbus) is used.	0

- 0: Operation panel control

  After you press RUN, the servo drive starts running (the RUN indicator is ON). After you press STOP RES when the servo drive is in running state, the servo drive stops running (the RUN indicator is OFF).

  Note that the following operations can be performed only on the operation panel:

  - Motor auto-tuning
  - AI zero drift auto correction

- 1: Terminal control

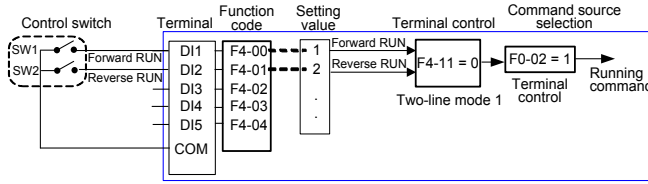
  This control mode is applicable to scenarios where the DIP switch or electromagnetic button is used to start or stop the application system or scenarios where the dry contact signal is used to start or stop the servo drive.

  The input terminals of the start/stop signal are set in F4-00 to F4-04.

Example:

To use the DIP switch as the start/stop source, and allocate the forward rotation switch signal to DI1 and the reverse rotation switch signal to DI2, perform the setting as shown in the following figure.

Figure 4-7 Setting of using the DIP switch for start/stop

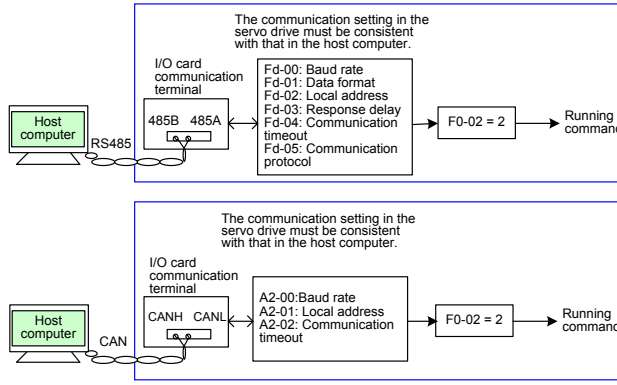


In the hydraulic mode, DI1 with function 1 (Forward RUN) is used to enable the pump.

- 2: Communicatoin control

  Set F0-02 to 2. Then, you can start or stop the servo drive in communication mode. The following figure shows the setting method.

  Figure 4-8 Setting for start/stop using the communication control mode



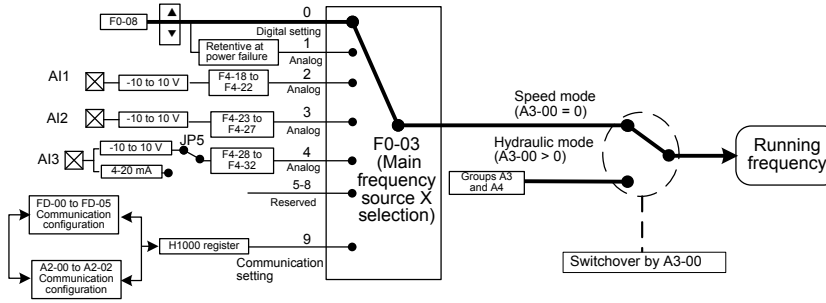
For details on the communication protocols, consult Inovance.

4.2.2 Setting the Running Frequency

The IS300 supports two control modes: speed mode and hydraulic mode, set in A3-00.

In the speed mode, there are six frequency setting sources, digital setting (UP/DOWN modification, non-retentive at power failure), (UP/DOWN modification, retentive at power failure), AI1, AI2, AI3, and communication setting. You can select one in F0-03.

Figure 4-9 Selecting the frequency source



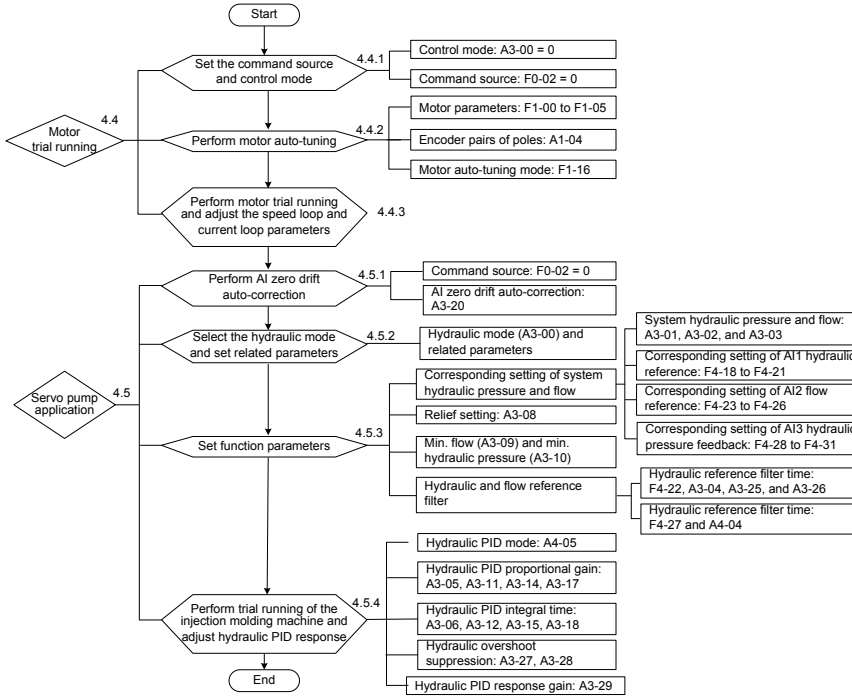
4.2.3 Setting the Motor Rotating Direction

After you restore the default setting of the servo drive and set the motor parameters correctly and motor auto-tuning is completed, press RUN to drive the motor to rotate, and the rotating direction is regarded as the forward rotation. If the rotating direction is reverse to the direction required by the equipment, power off the servo drive and exchange any two of the output UVW cables (wait until the main capacitor of the servo drive is completely discharged). Then perform motor auto-tuning and trial running to check that the rotating direction is correct.

4.3 Servo Pump Commissioning Flowchart

The servo pump commissioning process mainly includes motor auto-tuning, motor trial running, and servo hydraulic commissioning, as shown in the following figure.

Figure 4-10 Servo pump commissioning flowchart



4.4 Motor Trial Running

4.4.1 Procedure of Motor Trial Running

Step	Parameter Setting	Parameter Description	Remarks
1. Set the control mode.	A3-00 = 0	Non-hydraulic control mode	Set the non-hydraulic control mode.
2. Set the command source.	F0-02 = 0	Operation panel control	The LOCAL/REMOT indicator is OFF.
3. Perform motor auto-tuning.	Group F1 and A1 parameters	Motor and encoder parameters	For details, see section 4.4.2 "Setting and Auto-tuning of Motor Parameters".
4. Perform motor trial running.	F0-08 = 5.00 Hz	Trial running frequency	Start trial running in operation panel control and monitor whether the output current is normal. For details, see section 4.4.3 "Trial Running Check".

Note

Ensure that the overflow valve is opened completely so that there is no load during trial running.

4.4.2 Setting and Auto-tuning of Motor Parameters

■ **Parameter Setting**

The IS300 controls the servo pump in closed-loop vector control (CLVC) mode. This mode requires accurate motor parameters. To guarantee good driving performance and running efficiency, set the motor parameters strictly according to the nameplate of the standard adaptable motor. The following table lists the parameters to be set.

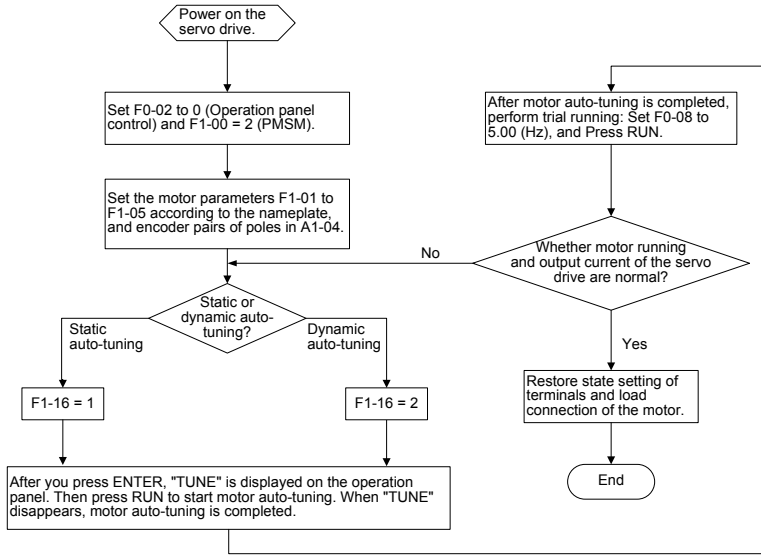
Function Code	Parameter Name	Description
F1-00	Motor type	0: Common asynchronous motor 1: Variable-frequency asynchronous motor 2: PMSM
F1-01 to F1-05	• Rated motor power • Rated motor voltage • Rated motor current • Rated motor frequency • Rated motor rotational speed	Model parameters, manual input
A1-04	Number of pole pairs of resolver	-
F1-15	Back EMF	1: Obtain the value directly from the manual provided by the motor manufacturer. 2: Obtain the value by means of dynamic auto-tuning if the value cannot be obtained from the motor manufacturer.
F1-16	Auto-tuning mode	Dynamic and static

■ **Motor Auto-tuning Setting**

Auto-tuning Mode	Function Code Setting	Application
No operation	F1-16 = 0	After motor auto-tuning is completed, the value of F1-16 is restored to 0 automatically.
Static auto-tuning 1	F1-16 = 1	This mode is used when the back EMF of the motor is known. The motor runs at a low speed during auto-tuning, and therefore, the overflow valve need not be opened.
Dynamic auto-tuning	F1-16 = 2	This mode is used when the back EMF of the motor is unknown. The motor runs at a high speed during auto-tuning, and therefore, the overflow valve must be opened. With-load auto-tuning reduces the accuracy of motor auto-tuning, affecting the system control performance.
Static auto-tuning 2	F1-16 = 3	This mode is used when the back EMF of the motor is known and there is heavy load. The motor runs at a low speed during auto-tuning, and therefore, the overflow valve need not be opened. When wiring of the encoder and motor is correct but Err43 is reported during static auto-tuning 1 or dynamic auto-tuning, use this mode.

■ **Motor Auto-tuning Procedure**

Figure 4-11 Motor auto-tuning procedure



4.4.3 Trial Running Check

- After motor auto-tuning is completed, set F0-08 to 5.00 (Hz) to make the motor carry out low-speed trial running and check whether the running current of the servo drive is small and stable.
- If the running current is large, check whether the setting of motor parameters in group F1 and pole pairs of resolver in A1-04 are correct. If there is any modification, perform motor auto-tuning again and perform low-speed running to check whether the servo drive becomes normal.
- After ensuring that motor running is normal, check whether the rotating direction is correct. If not, exchange any two of motor UVW cables and perform motor auto-tuning again.
- If the motor oscillates or generates low noise during running, weaken the speed loop and current loop properly, for example, decreasing the values of F2-00, F2-03, and F2-13 to F2-16, and increasing the values of F2-01 and F2-04.
- If the rotational speed of the motor is unstable during running, strengthen the speed loop and current loop properly, for example, increasing the values of F2-00, F2-03, and F2-13 to F2-16, and decreasing the values of F2-01 and F2-04.

Note

1. Ensure that the overflow valve is opened completely so that there is no load during running. The parameters of speed loop and current loop are defined in group F2.
2. The speed loop and current loop response directly affects pressure stability. Set stronger speed loop and current loop response if allowed.

4.5 Application Commissioning of Servo Pump

4.5.1 AI Zero Drift Auto Correction

Step	Function Code Setting	Parameter Description	Remarks
1. Set the command source.	F0-02 = 0	The operation panel control mode is used.	The LOCAL/REMOT indicator is OFF.
2. Perform AI zero drift auto correction.	A3-20 = 1	The AI zero drift auto correction function is enabled.	After the operation panel displays "Alcod", press RUN. Then, AI zero drift auto correction is carried out.

Note

1. You can also perform AI zero drift correction manually: When A3-20= 0 (that is, AI zero drift auto correction is disabled), view the values of three AIs in U1-04 to U1-06, add 10 mA to each of the values and then enter the results in F4-18, F4-23, and F4-28.
2. After AI zero drift auto correction is completed, the value of A3-20 is automatically restored to 0.

4.5.2 Selection and Parameter Setting of Hydraulic Control Mode

Table 4-2 Selection of hydraulic control mode

Hydraulic Mode Selection	Function Code Setting	Description
Non-hydraulic control mode	A3-00 = 0	The speed mode is used.
Hydraulic control mode 1	A3-00 = 1	The host computer provides the hydraulic pressure reference and flow reference by using CAN communication; AI3 provides the hydraulic pressure feedback; the servo drive conducts hydraulic control.
Hydraulic control mode 2	A3-00 = 2	AI1 provides the hydraulic pressure reference; AI2 provides flow reference; AI3 provides the hydraulic pressure feedback; the servo drive conducts hydraulic control.
CAN hydraulic control mode (specialized)	A3-00 = 3	It is the hydraulic control mode implemented by using CAN communication with the host computer. The servo pump control parameters in group A3 are invalid.
Reserved	A3-00 = 4	Reserved

When the non-hydraulic control mode (A3-00 = 0) is switched over to the hydraulic control mode (A3-00 ≠ 0), the related parameters are set automatically, as listed in the following table.

Table 4-3 Parameter setting of the hydraulic control mode

Function Code	Parameter Name	Setting
F0-01	Control mode	1: Closed-loop vector control (CLVC)

F0-02	Command source selection	1: Terminal control
F0-03	Main frequency source X selection	If A3-00 = 2, set F0-03 to 3 (AI2). If A3-00 = 1 or 3, set F0-03 to 9 (Communication setting).
F0-17	Acceleration time1	0.0s
F0-18	Deceleration time1	0.0s
F1-00	Motor type	2: PMSM
F4-00	DI1 function selection	1: Forward RUN (FWD, pump enabled)
F4-01	DI2 function selection	48: Servo pump PID selection terminal 1
F4-02	DI3 function selection	53: Slave pump address selection terminal 1
F4-03	DI4 function selection	9: Fault reset (RESET)
F4-04	DI5 function selection	50: CAN communication enabled
F5-01	Control board relay (T/A1-T/B1-T/C1) function selection	2: Fault output
F5-02	Control board relay (T/A2-T/C2) function selection	23: Double-discharge plunger pump sloping switchover (NO)
F5-03	Control board relay (T/A3-T/C3) function selection	24: Hydraulic control NC output

In the hydraulic control mode, modification of these parameters is retentive at power failure. The parameters will restore to the values automatically set when the servo drive is powered on again. After the hydraulic control mode is switched over to the non-hydraulic control mode, the parameters are restored to the values before the system is switched over to the hydraulic control mode.

4.5.3 Function Parameter Setting of Hydraulic Control

■ **Corresponding Setting of System Hydraulic Pressure and Flow**

1. Setting of system hydraulic pressure and flow

Function Code	Parameter Name	Description
A3-01	Maximum rotational speed	It is used to set the maximum rotational speed of the motor, corresponding to 100% of the flow reference.
A3-02	System hydraulic pressure	It is used to set the maximum system hydraulic pressure, ranging from 0 to the maximum hydraulic pressure (A3-03).
A3-03	Maximum hydraulic pressure	It is used to set the pressure range of the pressure sensor (0–10 VDC output pressure sensor).

2. Corresponding setting of AI1 hydraulic pressure reference

Function Code	Parameter Name	Description
F4-18	AI1 minimum input	It is used to set the minimum voltage input of the hydraulic pressure reference, corresponding to the AI1 zero drift.

Function Code	Parameter Name	Description
F4-19	Corresponding setting of AI1 minimum input	It is used to set the minimum hydraulic pressure reference. The value is 0.0% by default, that is, zero pressure.
F4-20	AI1 maximum input	It is used to set the maximum voltage input of the hydraulic pressure reference. The value is 10 V generally.
F4-21	Corresponding setting of AI1 maximum input	It is used to set the maximum hydraulic pressure reference. The value 100.0% corresponds to the system hydraulic pressure (A3-02).

These parameters are used to set the corresponding relationship between the AI1 hydraulic pressure reference 0–10 V (or other range) and 0 kg/cm^2 to the system hydraulic pressure (A3-02).

3. Corresponding setting of AI2 flow reference

Function Code	Parameter Name	Description
F4-23	AI2 minimum input	It is used to set the minimum voltage input of the flow reference, corresponding to the AI2 zero drift.
F4-24	Corresponding setting of AI2 minimum input	It is used to set the minimum flow reference. The value is 0.0% by default, that is, zero flow.
F4-25	AI2 maximum input	It is used to set the maximum voltage input of the flow reference. The value is 10 V generally.
F4-26	Corresponding setting of AI2 maximum input	It is used to set the maximum flow reference. The value 100.0% corresponds to the maximum rotational speed (A3-01).

These parameters are used to set the corresponding relationship between the AI2 flow reference 0–10 V (or other range) and 0 RPM to the maximum rotational speed (A3-01).

4. Corresponding setting of AI3 hydraulic pressure feedback

Function Code	Parameter Name	Description
F4-28	AI3 minimum input	It is used to set the minimum voltage input of the hydraulic pressure feedback, corresponding to the AI3 zero drift.
F4-29	Corresponding setting of AI3 minimum input	It is used to set the minimum hydraulic pressure feedback. The value is 0.0% by default, that is, zero pressure.
F4-30	AI3 maximum input	It is used to set the maximum voltage input of the hydraulic pressure feedback. The value is 10 V generally.
F4-31	Corresponding setting of AI3 maximum input	It is used to set the maximum hydraulic pressure feedback. The value 100.0% corresponds to the maximum hydraulic pressure (A3-03).

These parameters are used to set the corresponding relationship between the AI3 hydraulic pressure feedback 0–10 V (or other range) and the pressure sensor range: 0 kg/cm^2 to the maximum hydraulic pressure (A3-03).

■ Pressure Relief Setting

Function Code	Parameter Name	Description
A3-08	Maximum reverse rotational speed	It is used to set the maximum reverse rotational speed at pressure relief. It is a percentage relative to the maximum rotational speed (A3-01). The larger the value is, the faster the pressure relief is. Too fast pressure relief will generate large noise during pump reverse rotation.

■ Setting of Minimum Flow and Pressure

The pump has internal leakage, and the hydraulic oil in the oil channel oil tank will reflow to the oil tank when there are no flow and pressure references from the system. As a result, air enters the oil channel, causing system running noise and instability. Thus you need to set the minimum flow and the minimum pressure.

Function Code	Parameter Name	Description
A3-09	Minimum flow	The range is 0.0%–50.0%, relative to the maximum rotational speed (A3-01).
A3-10	Minimum pressure	The range is 0.0–50.0 kg/cm^2.

■ Filter Time of the Hydraulic Pressure and Flow References

1. Filter time of the hydraulic pressure reference

Function Code	Parameter Name	Description
F4-22	AI1 filter time	0.000–10.000s
A3-04	Hydraulic pressure command rise time	0–2000 ms
A3-25	S-curve rise filter time of set hydraulic pressure	0.000–1.000s
A3-26	S-curve fall filter time of set hydraulic pressure	0.000–1.000s

The shorter the filter time is, the faster the hydraulic response is, and the larger the overshoot becomes. The longer the filter time is, the slower the hydraulic response is, and the smaller the overshoot becomes.

2. Filter time of the flow reference

Function Code	Parameter Name	Description
F4-27	AI2 filter time	0.000–10.000s
A4-04	Flow filter time	0–1.000s

The shorter the filter time is, the faster the hydraulic response is, and the larger the running impact becomes. The longer the filter time is, the slower the hydraulic response is, and the smoother the running becomes.

4.5.4 Hydraulic PID Response Control

■ **Hydraulic PID Mode Selection (A4-05)**

Function Code	Parameter Name	Description
A4-05	PID control mode	1: Auto switchover 2: PID group determined by DI

1. Hydraulic PID mode 1: PID group determined by DI (A4-05 = 1)

The IS300 provides four groups of PID, one of which is selected based on the state combinations of DI2 with function 48# and DI3 with function 49#. The following table describes the relationship between PID group selection and states of the DIs.

Table 4-4 Relationship between PID group selection and states of the DIs

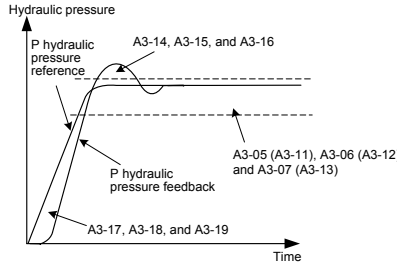
DI3 with Function 49#	DI2 with Function 48#	PID Group
0	0	PID group 1: A3-05, A3-06, and A3-07
0	1	PID group 2: A3-11, A3-12, and A3-13
1	0	PID group 3: A3-14, A3-15, and A3-16
1	1	PID group 4: A3-17, A3-18, and A3-19

To achieve a faster system response, increase the proportional gain Kp and derivative time Kd and decrease the integral time Ki. Be aware that this may lead to system oscillation.

Decreasing the proportional gain Kp and derivative time Kd and increasing the integral time will make the system response slower. Be aware that too slow response will reduce system efficiency and stability.

2. Hydraulic PID mode 2: PID group auto switchover (A4-05 = 0)

Figure 4-12 PID group auto switchover



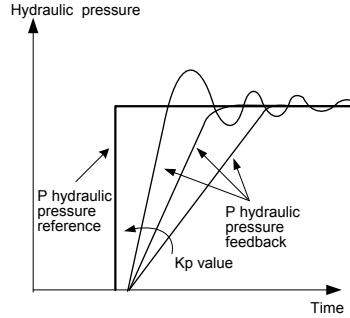
PID Function	Condition	PID group	
Pressure holding PID	The difference between the hydraulic pressurereference and the hydraulic pressure feedback is smaller than a certain threshold.	DI2 with function 48# OFF	A3-05, A3-06, and A3-07
		DI2 with function 48# ON	A3-11, A3-12, and A3-13

PID Function	Condition	PID group
Overshoot suppression PID	The hydraulic pressure feedback is larger than the hydraulic pressure reference by a certain threshold.	A3-14, A3-15, and A3-16
	The hydraulic pressure reference is larger than the hydraulic pressure feedback by a certain threshold.	A3-17, A3-18, and A3-19

■ Hydraulic PID Proportional Gain (A3-05, A3-11, A3-14, and A3-17)

The larger the proportional gain, the faster the system response; however, this will causes system oscillation. The smaller the proportional gain, the slower the system response is.

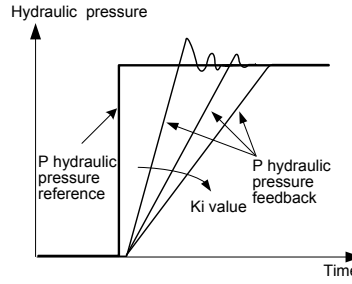
Figure 4-13 Relationship between the proportional gain and system response



■ Hydraulic PID Integral Time (A3-06, A3-12, A3-15, and A3-18)

The shorter the integral time is, the faster the system response is; however, this will cause overshoot and system oscillation. The longer the integral time is, the slower the system response is, and the more unstable the hydraulic pressure becomes.

Figure 4-14 Relationship between the integral time and system response



■ Hydraulic Overshoot Suppression (A3-27 and A3-28)

This function is used for pressure overshoot suppression at high speed.

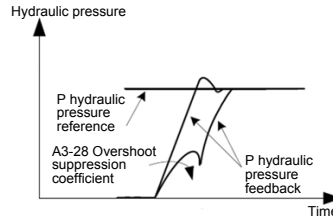
- A3-27: Overshoot suppression detection level

  The larger the value of this parameter is, the later the overshoot suppression starts, and the poorer the suppression effect becomes. The smaller the value is, the sooner the overshoot suppression starts, and the better the suppression effect and the smaller the overshoot smaller will be.

- A3-28: Overshoot suppression coefficient

  The larger the value is, the better the overshoot suppression effect is; however, this will cause the hydraulic pressure curve unsmooth. The smaller the value is, the worse the overshoot suppression effect is.

  Figure 4-15 Overshoot suppression



■ Hydraulic Loop PID Response Gain (A3-29)

It is used to adjust the response of the entire hydraulic loop. The larger the gain is, the faster the response is; however, this will cause system oscillation. The smaller the gain is, the slower the response is.

Reduce the gain when the inertia of the hydraulic system is large or the oil pipe is slim.

4.5.5 Commissioning of Pressure Holding Stability

If the holding pressure fluctuates greatly during commissioning, increase the low-speed loop response; that is, increase the value of F2-00 and decrease the value of F2-01. Note that these two parameters must be modified properly to avoid motor oscillation.

5

Troubleshooting

Chapter 5 Troubleshooting

5.1 Faults and Solutions

The IS300 provides alarm information and protective functions. When a fault occurs, IS300 implements the protective function, stops output, makes the fault relay act, and displays the fault code on the operation panel.

Before contacting Inovance for technical support, you can first determine the fault type, analyze the causes, and perform troubleshooting according to the description in this chapter. If the fault cannot be rectified, contact the agent or Inovance.

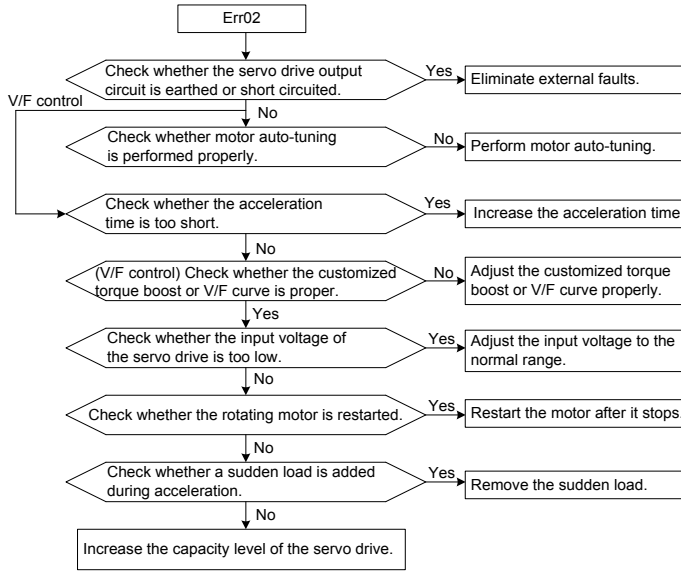
Table 5-1 Common faults expressed by fault codes

Err01: Reserved	Err17: Contactor fault
Err02: Overcurrent during acceleration	Err18: Current detection fault
Err03: Overcurrent during deceleration	Err19: Motor auto-tuning fault
Err04: Overcurrent at constant speed	Err20: Reserved
Err05: Overvoltage during acceleration	Err21: Data overflow
Err06: Overvoltage during deceleration	Err22: Reserved
Err07: Overvoltage at constant speed	Err23: Short-circuit to ground
Err08: Reserved	Err24 to Err41: Reserved
Err09: Undervoltage	Err42: CAN communication interrupted
Err10/Err11: Servo drive/Motor overload	Err43: Encoder fault during motor auto-tuning
Err12: Phase loss on input side	Err44: Speed deviation too large
Err13: Phase loss on output side	Err45: Motor overheat
Err14: Module overheat	Err46: Pressure sensor fault
Err15: External device fault	Err49: Encoder signal fault
Err16: Communication fault	Err58: Parameter restoration fault

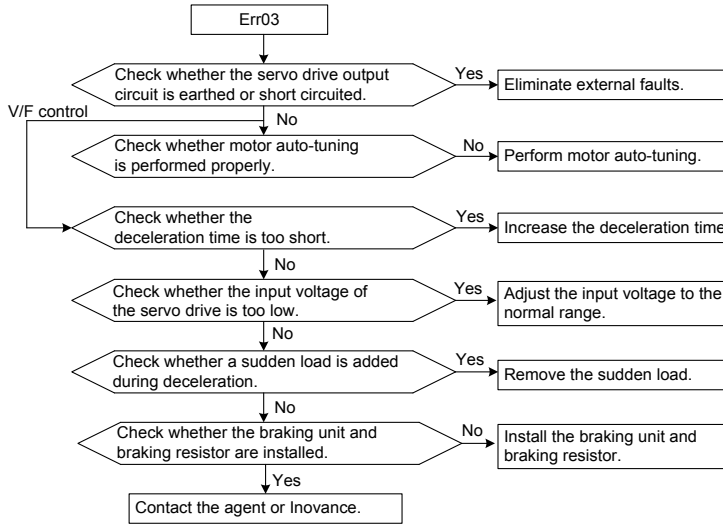
Note

1. Err47, Err48, and Err52 are faults related to the multi-pump convergent flow solution.
2. If only one pump is controlled, disable DI5. If the multi-pump convergent flow solution is used, contact Inovance to obtain information about the multi-pump control solution.

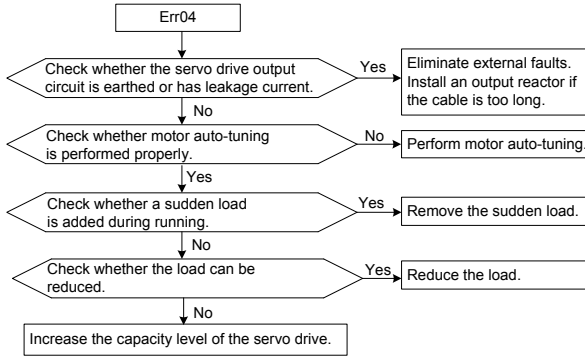
- Err01 (Reserved)
- Err02 (Overcurrent During Acceleration)



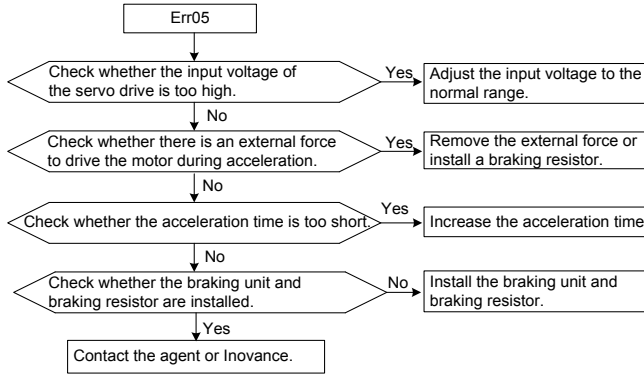
- Err03 (Overcurrent During Deceleration)



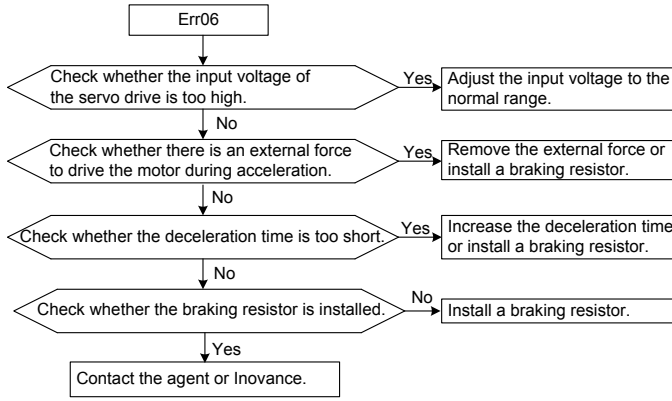
- Err04 (Overcurrent at Constant Speed)



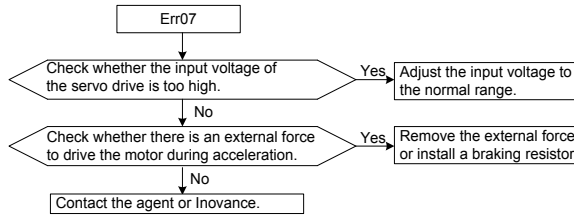
- Err05 (Overvoltage During Acceleration)



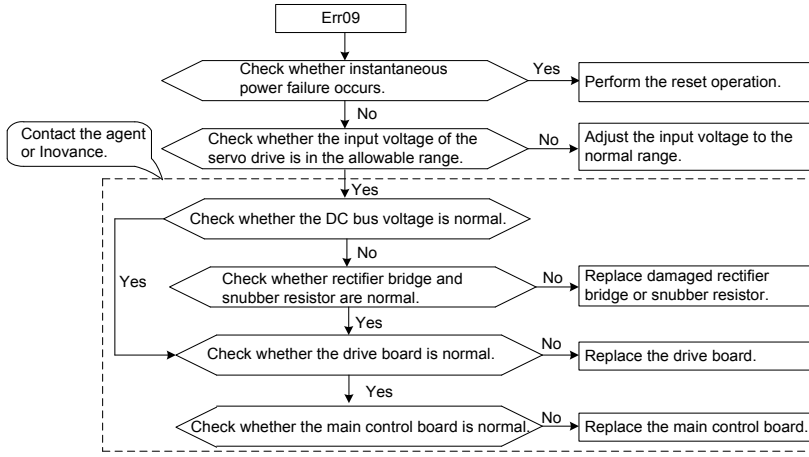
- Err06 (Overvoltage During Deceleration)



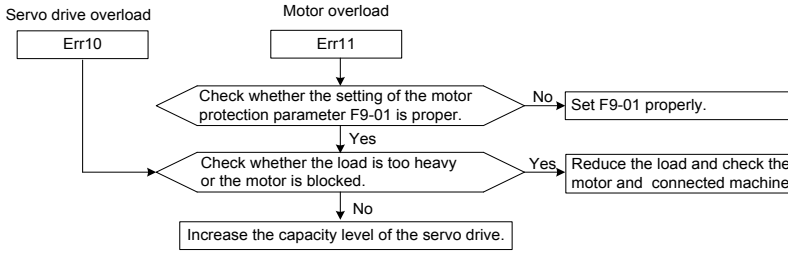
- Err07 (Overvoltage at Constant Speed)



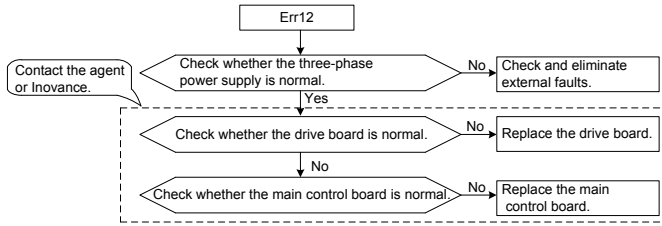
- Err08 (Reserved)
- Err09 (Undervoltage)



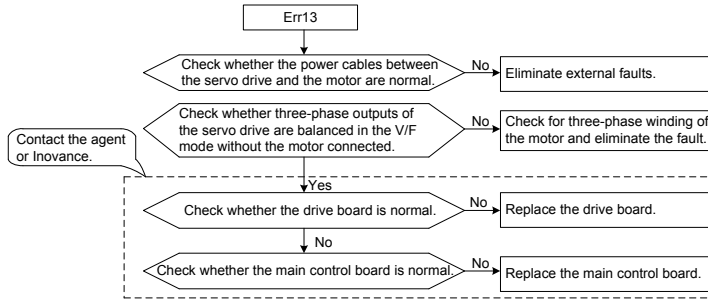
- Err10/Err11 (Servo Drive/Motor Overload)



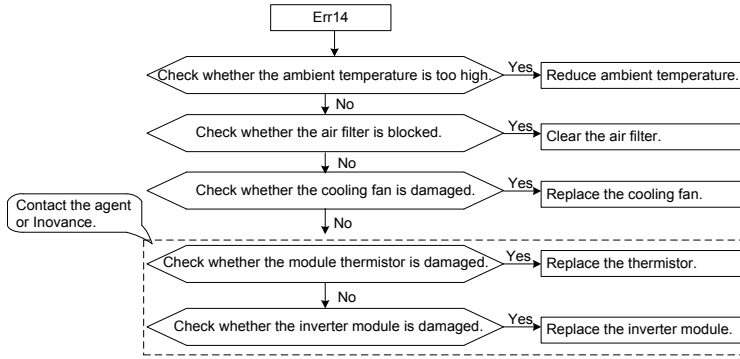
- Err12 (Phase Loss on Input Side)



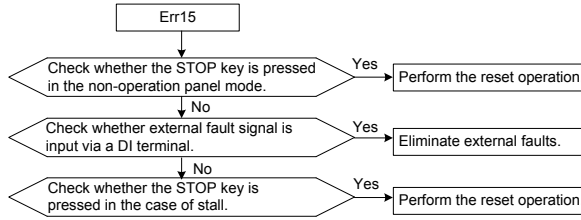
- Err13 (Phase Loss on Output Side)



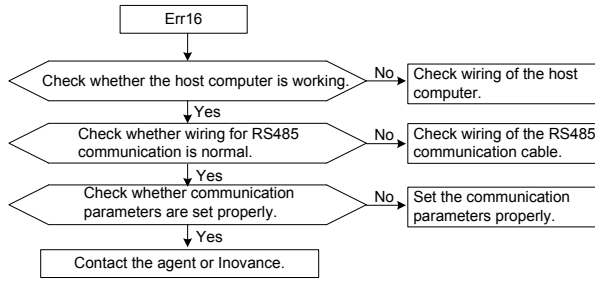
- Err14 (Module Overheat)



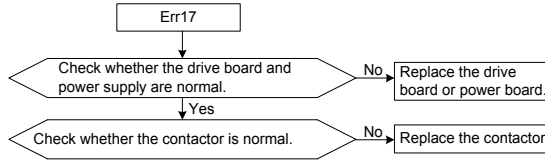
- Err15 (External Device Fault)



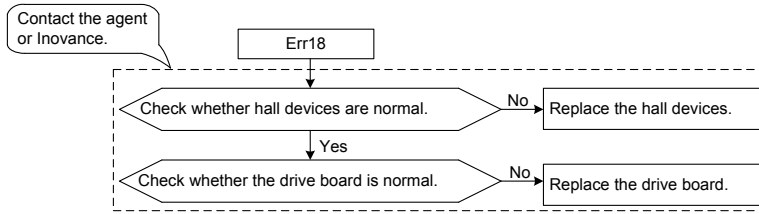
- Err16 (Communication Fault)



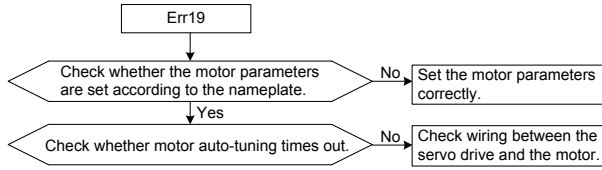
- Err17 (Contactor Fault)



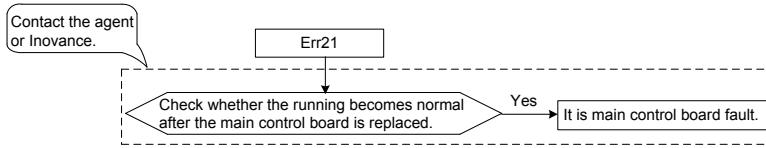
- Err18 (Current Detection Fault)



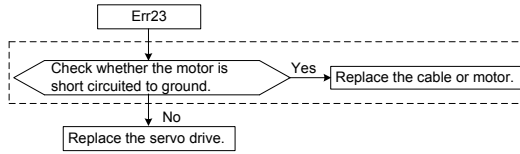
- Err19 (Motor Auto-tuning Fault)



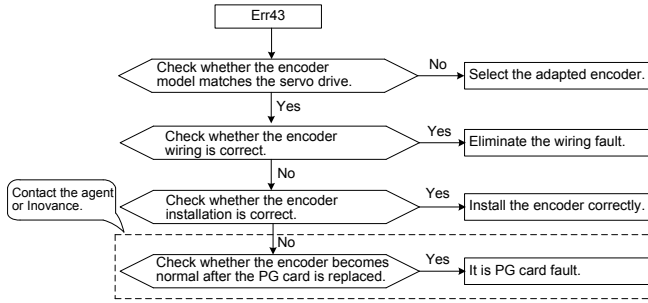
- Err20: Reserved
- Err21 (Data Overflow)



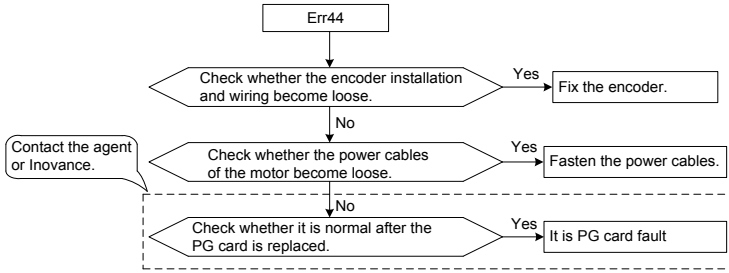
- Err22 (Reserved)
- Err23 (Short Circuit to Ground)



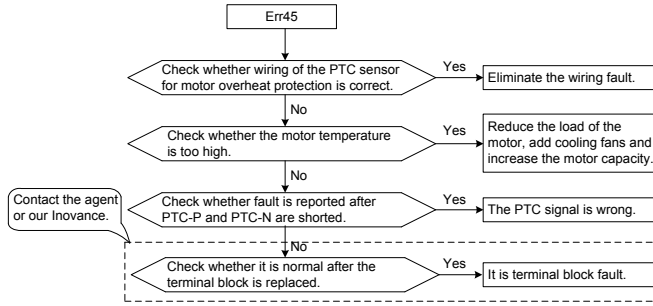
- Err24 to Err42 (Reserved)
- Err43 (Encoder Fault During Motor Auto-tuning)



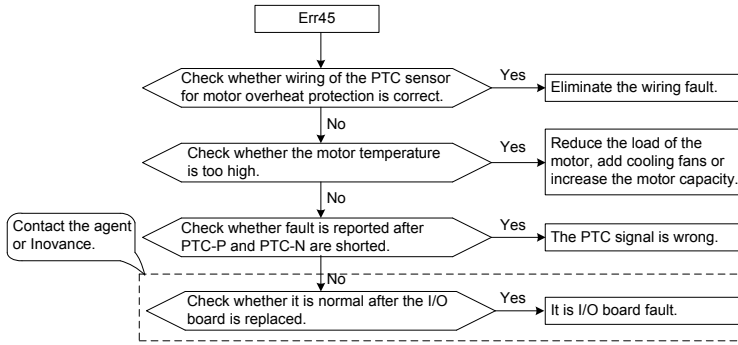
- Err44 (Speed Deviation Too Large)



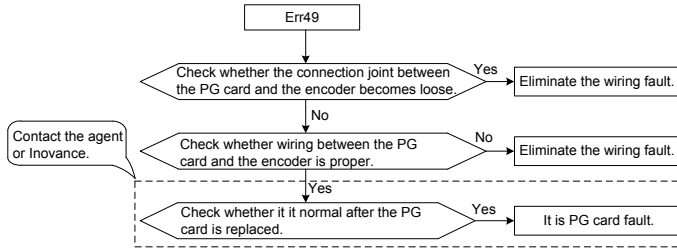
- Err45 (Motor Overheat)



- Err46 (Pressure Sensor Fault)



- Err49 (Encoder Signal Fault)



5.2 Symptoms and Diagnostics

The following symptoms may occur during use of the servo drive. When these symptoms occur, perform simple analysis based on the following table.

No.	Symptom	Possible Causes	Solutions
1	No display upon power-on	1. There is no power supply to the servo drive. 2. The 8-core cable connecting the drive board and the control board is in poor contact. 3. Components inside the servo drive are damaged.	1. Check the power input. 2. Connect the 8-core cable again. 3. Contact the agent or Inovance.
2	"HC" is displayed upon power-on.	1. The 4-core cable connecting the drive board and the control board is in poor contact. 2. Other components of the servo drive are broken.	1. Connect the 4-core cable again. 2. Contact the agent or Inovance.
3	"Err23" is displayed upon power-on.	1. The motor or the motor output cable is short circuited to the ground. 2. The servo drive is damaged.	1. Check the insulation status of the motor and the output cable with a megger. 2. Contact the agent or Inovance.

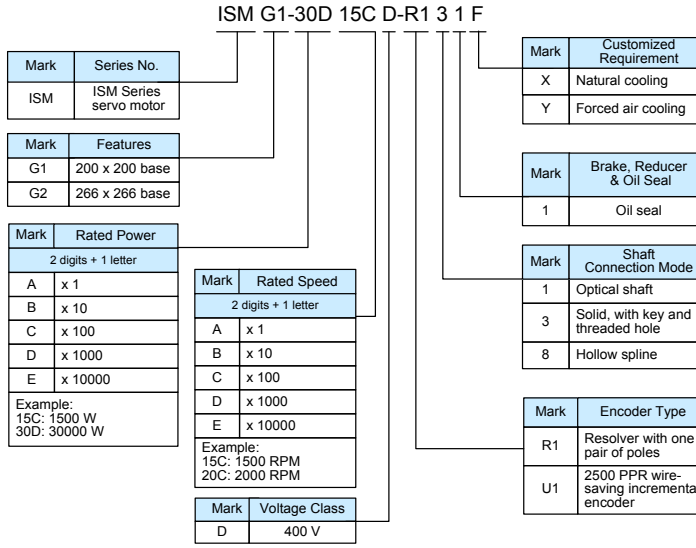
No.	Symptom	Possible Causes	Solutions
4	The servo drive display is normal upon power-on, but it displays "HC" after running and stops immediately.	The cooling fan is damaged or does not rotate.	Replace the cooling fan.
5	Err14 (module overheat) is reported frequently.	1. The carrier frequency is set too high. 2. The cooling fan is damaged, or the air filter is blocked. 3. Components (thermal coupler or others) inside the servo drive are damaged.	1. Reduce the carrier frequency (F0-15). 2. Replace the cooling fan and clean the air filter. 3. Contact the agent or Inovance.
6	The motor does not rotate after the servo drive runs.	1. The motor is damaged or locked-rotor occurs. 2. The motor parameters in group F1 are set improperly.	1. Replace the motor or rectify mechanical faults. 2. Check and set the motor parameters again.
7	DI terminals are disabled.	1. The related parameters are set incorrectly. 2. The jumper across OP and +24V becomes loose. 3. The control board is faulty.	1. Check and set the parameters in group F4 again. 2. Re-connect the cable. 3. Contact the agent or Inovance.
8	In CLVC control mode, the motor speed is always low.	1. The encoder is damaged or the encoder wiring is incorrect. 2. Components inside the servo drive are damaged.	1. Replace the encoder and correct the wiring. 2. Contact the agent or Inovance.
9	The servo drive reports overcurrent and overvoltage faults frequently.	1. The motor parameters in group F1 are set improperly. 2. The acceleration/deceleration time is improper. 3. The load fluctuates.	1. Set the motor parameters or perform motor auto-tuning again. 2. Set proper acceleration/deceleration time. 3. Contact the agent or Inovance.
10	Err17 is reported upon power-on or running.	The soft startup contactor is not closed.	1. Check: • Whether the contactor cable is loose • Whether the contactor is faulty • Whether the contactor 24 V power supply is faulty. 2. Contact the agent or Inovance.

6

ISMG Servo Motor (Voltage Class: 400 V)

Chapter 6 ISMG Servo Motor (Voltage Class: 400 V)

6.1 Designation Rules



■ **Motor Duty Type**

Motor duty types indicate the load that the motor drives, with sequential operations, involving startup, electric braking, no-load running, power-off and stop.

- S1: Continuous duty

  The operation of a motor at a rated load may take an unspecified time period to reach thermal equilibrium.

- S4: Intermittent periodic duty with start

  This is a sequence of identical duty cycles, each consisting load for a period, an operation at constant load period, followed by a stationary and de-energized period. This cycle has a great impact on temperature rise.

6.2 ISMG Servo Motor Specification Parameters

6.2.1 ISMG1 Servo Motor (200 x 200 Base/Forced Air Cooling)

See the first table on the last page of this chapter.

6.2.2 ISMG2 Servo Motor (266 x 266 Base/Forced Air Cooling)

See the second table on the last page of this chapter.

6.3 Physical Appearance and Mounting Dimensions of ISMG Servo Motor

6.3.1 ISMG1 Servo Motor (200 x 200 Base/Forced Air Cooling)

Figure 6-1 Physical appearance and mounting dimensions of the ISMG1 servo motor (200 x 200 base/forced air cooling)

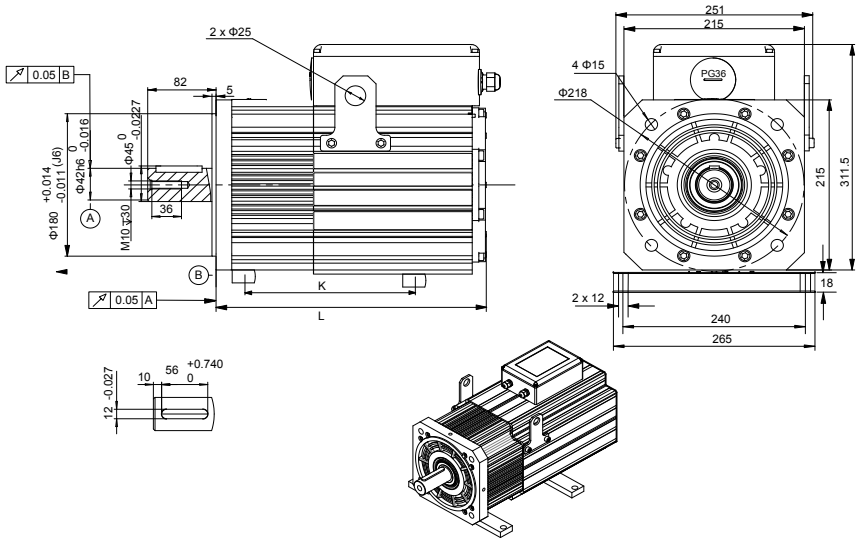


Table 6-1 Mounting dimensions of the ISMG1 servo motor (200 x 200 base/forced air cooling)

Servo Motor Model	ISMG1-95C15CD-R131F	ISMG1-14D15CD-R131F	ISMG1-22D15CD-R131F	ISMG1-30D15CD-R131F
	ISMG1-11D17CD-R131F	ISMG1-16D17CD-R131F	ISMG1-24D17CD-R131F	ISMG1-41D20CD-R131F
	ISMG1-12D20CD-R131F	ISMG1-18D20CD-R131F	ISMG1-28D20CD-R131F	-
Size K (mm)	190	230	305	380
Size L (mm)	375	410	480	550

6.3.2 ISMG2 Servo Motor (266 x 266 Base/Forced Air Cooling)

Figure 6-2 Physical appearance and mounting dimensions of the ISMG2 servo motor (266 x 266 base/forced air cooling)

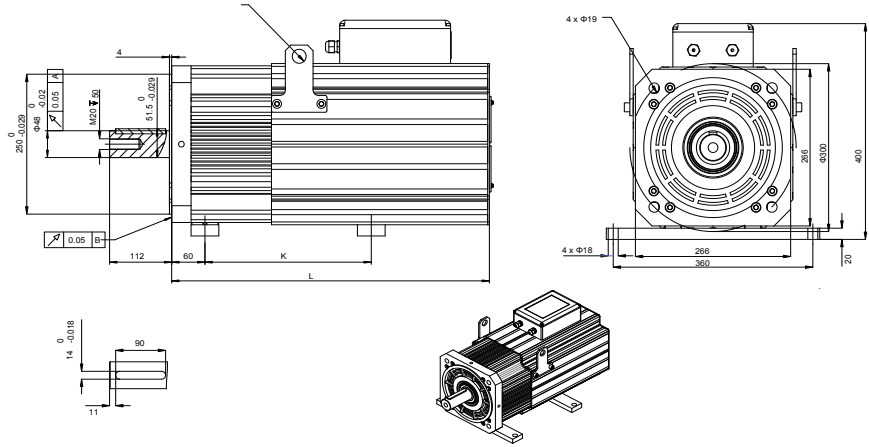


Table 6-2 Mounting dimensions of the ISMG2 servo motor (266 x 266 base/forced air cooling)

Servo Motor Model	ISMG2-20D15CD-R131F	ISMG2-31D15CD-R131F	ISMG2-42D15CD-R131F	ISMG2-60D15CD-R131F	ISMG2-80D15CD-R131F
	ISMG2-23D17CD-R131F	ISMG2-36D17CD-R131F	ISMG2-48D17CD-R131F	ISMG2-68D17CD-R131F	ISMG2-91D17CD-R131F
	ISMG2-27D20CD-R131F	ISMG2-42D20CD-R131F	ISMG2-57D20CD-R131F	ISMG2-80D20CD-R131F	ISMG2-11E20CD-R131F
Size K (mm)	200	250	300	400	500
Size L (mm)	475	525	575	675	780

6.4 Description of Supporting Board of ISMG Servo Motor Base

Model	Description
ISMG1-B02	Used for ISMG1 servo motor (cooling fan)
ISMG2-B02	Used for ISMG2 servo motor (cooling fan)

6.5 Wiring of ISMG Servo Motor

6.5.1 Terminals of PCB Board

The signal types of the terminals are defined on the PCB board. AC1 and AC2 are power supply (single-phase 220 V) to the cooling fan. AC1 and AC2 should be wired strictly according to the marks.

The matched signal lines of the IS300 servo drive are defined as below:

Signal Definition	EXC-	EXC+	SIN+	SIN-	COS+	COS-
Adapted Encoder Cable Color	Red	Blue	White	Brown	Yellow	Green
Corresponding IS300 PG Card Pin	1	2	3	4	5	9

6.5.2 Precautions on Power Terminals Matched with PCB Board

- When wiring the main circuit, ensure that the phase sequence conform to the marks.
- Connect PE terminal to the fixed screw with a special mark in the connection box.
- PTC, KTY, and resolver signal cable must not connect to the 220-V power supply. Otherwise, the motor will be damaged.
- The motor has passed the IP54 experiment. At wiring, protection measures must still be taken at the cabling holes to prevent foreign matters from falling into the motor.
- Sticky dust in the working environment will weaken heat dissipation of the motor.

Specifications of the ISMG1 motor with forced air cooling																		
Servo Motor Model	Rated Torque (Nm)		Rated Rotational Speed (RPM)	Back EMF (V)	Rated Voltage (V)		Rated Current (A)		No-load Current (A)	Rated Power (kW)		Torque Constant (Nm/A)	Back EMF Constant (V/RPM)	380-V Max. Torque (Nm)	Limit Torque (Nm)	Max. Rotational Speed	Rotor Inertia ($kg•m^2•10^{-3}$)	PTC Normal-Temperature Resistance (Ω)	Number of Poles
	S1	S4			S1	S4	S1	S4		S1	S4								
ISMG1-95C15CD-R131F	50	60	1500	305	333	340	15	19	0.6	7.9	9.5	3.24	0.203	105	160	1800	7.5	300	8
ISMG1-11D17CD-R131F	50	60	1700	296	332	338	19	23	0.8	8.9	11	2.68	0.174	105	160	2040	7.5	300	8
ISMG1-12D20CD-R131F	50	60	2000	291	325	331	21	26	0.8	10.5	12.6	2.387	0.1455	105	160	2400	7.5	300	8
ISMG1-14D15CD-R131F	75	90	1500	291	325	332	25	30	0.7	13	14.1	3.01	0.194	145	230	1800	9	300	8
ISMG1-16D17CD-R131F	75	90	1700	296	328	333	29	34	0.8	14.5	16	2.753	0.174	145	230	2040	9	300	8
ISMG1-18D20CD-R131F	75	90	2000	310	335	340	31	36	0.8	17	18.8	2.554	0.155	145	230	2400	9	300	8
ISMG1-22D15CD-R131F	115	135	1500	305	342	348	36	41	0.8	19	22	3.306	0.203	210	340	1800	12	300	8
ISMG1-24D17CD-R131F	115	135	1700	296	332	338	43	50	0.9	21.5	24	2.755	0.1741	210	340	2040	12	300	8
ISMG1-28D20CD-R131F	115	135	2000	291	322	328	47	54	0.9	25.5	28.3	2.531	0.1455	210	340	2400	12	300	8
ISMG1-30D15CD-R131F	150	195	1500	291	324	333	48	61	0.9	25	30.6	3.2	0.194	265	450	1800	15	300	8
ISMG1-41D20CD-R131F	150	195	2000	310	334	343	60	76	1	33	41	2.58	0.155	265	450	2400	15	300	8

Specifications of the ISMG2 motor with forced air cooling																			
Servo Motor Model	Rated Torque (Nm)		Rated Rotational Speed (RPM)	Back EMF (V)	Rated Voltage (V)		Rated Current (A)		No-load Current (A)	Rated Power (kW)		Torque Constant (Nm/A)	Back EMF Constant (V/RPM)	380-V Max. Torque (Nm)	Limit Torque (Nm)	Max. Rotational Speed (RPM)	Rotor Inertia ($kg•m^2•10^{-3}$)	PTC Normal-Temperature Resistance (Ω)	Number of Poles
	S1	S4			S1	S4	S1	S4		S1	S4								
ISMG2-20D15CD-R131F	116	130	1500	291	346	353	41	45	0.9	18.2	20.4	2.981	0.194	240	325	1800	22.1	300	8
ISMG2-23D17CD-R131F	116	130	1700	296	351	358	45	50	0.9	20.6	23.1	2.683	0.174	240	325	2040	22.1	300	8
ISMG2-27D20CD- R131F	116	130	2000	310	365	372	51	57	0.9	24.3	27.2	2.385	0.155	240	325	2400	22.1	300	8
ISMG2-31D15CD- R131F	170	200	1500	305	358	364	56	65	1	26.7	31.4	3.13	0.203	345	488	1800	29.6	300	8
ISMG2-36D17CD- R131F	170	200	1700	296	349	355	65	76	1	30.3	35.6	2.683	0.174	345	488	2040	29.6	300	8
ISMG2-42D20CD- R131F	170	200	2000	291	344	350	78	92	1	35.6	41.9	2.236	0.145	345	488	2400	29.6	300	8
ISMG2-42D15CD- R131F	230	270	1500	291	341	348	79	92	1	36.1	42.4	2.981	0.194	465	650	1800	36.8	300	8
ISMG2-48D17CD- R131F	230	270	1700	296	346	353	88	102	1	40.9	48.1	2.683	0.174	465	650	2040	36.8	300	8
ISMG2-57D20CD- R131F	230	270	2000	310	360	367	99	115	1	48.2	56.5	2.385	0.155	465	650	2400	36.8	300	8
ISMG2-60D15CD- R131F	340	385	1500	305	353	360	110	125	1.1	53.4	60.5	3.13	0.203	660	975	1800	50	300	8
ISMG2-68D17CD- R131F	340	385	1700	296	344	351	129	145	1.1	60.5	68.5	2.683	0.174	660	975	2040	50	300	8
ISMG2-80D20CD- R131F	340	385	2000	291	339	346	154	174	1.1	71.2	80.6	2.236	0.145	660	975	2400	50	300	8
ISMG2-80D15CD- R131F	440	510	1500	291	334	341	149	173	1.1	69.1	80.1	2.981	0.194	825	1300	1800	64	300	8
ISMG2-91D17CD- R131F	440	510	1700	329	372	379	149	173	1.1	78.3	90.8	2.981	0.194	825	1300	2040	64	300	8
ISMG2-11E20CD- R131F	440	510	2000	310	353	360	187	216	1.1	92.1	106.8	2.385	0.155	825	1300	2400	64	300	8

7

Selection and Dimensions

Chapter 7 Selection and Dimensions

7.1 Technical Data of the IS300

Table 7-1 Technical data of the IS300

IS300 Model	Power Capacity (kVA)	Input Current (A)	Output Current (A)	Adapted Motor (S1)	
				kW	HP
Single-phase power: 220–230 V, 50/60 Hz					
IS300S002-C	1	5.4	2.3	0.4	0.5
IS300S003-C	1.5	8.2	4	0.75	1
IS300S004-C	3	14	7	1.5	2
IS300S005-C	4	23	9.6	2.2	3
Three-phase power: 220 V, 50/60 Hz					
IS300-2T002-C	1.5	3.4	2.1	0.4	0.5
IS300-2T003-C	3	5	3.8	0.75	1
IS300-2T004-C	4	5.8	5.1	1.5	2
IS300-2T005-C	5.9	10.5	9	2.2	3
IS300-2T010-C	8.9	14.6	13	3.7	5
IS300-2T020-C	17	26	25	5.5	7.5
IS300-2T030-C	21	35	32	7.5	10
IS300-2T040-C	30	46.5	45	11	15
IS300-2T050-C	40	62	60	15	20
IS300-2T070-C	57	76	75	18.5	25
IS300-2T080-C	69	92	91	22	30
IS300-2T100-C	85	113	112	30	40
IS300-2T140-C	114	157	150	37	50
IS300-2T170-C	134	180	176	45	60
IS300-2T210-C	160	214	210	55	75
IS300-2T300-C	231	307	304	75	100
IS300-2T140-C-L	114	157	150	37	50
IS300-2T170-C-L	134	180	176	45	60
IS300-2T210-C-L	160	214	210	55	75
IS300-2T300-C-L	231	307	304	75	100
Three-phase power: 380–440 V, 50/60 Hz					
IS300T002-C	1.5	3.4	2.1	0.75	1
IS300T003-C	3	5	3.8	1.5	2

IS300 Model	Power Capacity (kVA)	Input Current (A)	Output Current (A)	Adapted Motor (S1)	
				kW	HP
IS300T004-C	4	5.8	5.1	2.2	3
IS300T005-C	5.9	10.5	9	3.7	5
IS300T010-C	8.9	14.6	13	5.5	7.5
IS300T015-C	11	20.5	17	7.5	10
IS300T020-C	17	26	25	11	15
IS300T030-C	21	35	32	15	20
IS300T035K-C	23	36	35	17	23
IS300T035-C	24	38.5	37	18.5	25
IS300T040-C	30	46.5	45	22	30
IS300T050-C	40	62	60	30	40
IS300T070K-C	53	71	70	35	46
IS300T070-C	57	76	75	37	50
IS300T080-C	69	92	91	45	60
IS300T100-C	85	113	112	55	75
IS300T140K-C	98	134	130	64	85.5
IS300T140-C	114	157	150	75	100
IS300T170-C	134	180	176	90	125
IS300T210-C	160	214	210	110	150
IS300T250-C	192	256	253	132	200
IS300T300-C	231	307	304	160	250
IS300T370-C	250	385	377	200	300
IS300T420-C	280	430	426	220	300
IS300T460-C	355	468	465	250	400
IS300T520-C	396	525	520	280	370
IS300T580-C	445	590	585	315	500
IS300T650-C	500	665	650	355	420
IS300T720-C	565	785	725	400	530
IS300T140-C-L	114	157	150	75	100
IS300T170-C-L	134	180	176	90	125
IS300T210-C-L	160	214	210	110	150
IS300T250-C-L	192	256	253	132	200
IS300T300-C-L	231	307	304	160	250
Three-phase power: 480 V, 50/60 Hz					
IS300-5T002-C	1.5	3.4	2.1	0.75	1
IS300-5T003-C	3	5	3.8	1.5	2

IS300 Model	Power Capacity (kVA)	Input Current (A)	Output Current (A)	Adapted Motor (S1)	
				kW	HP
IS300-5T004-C	4	5.8	5.1	2.2	3
IS300-5T005-C	5.9	10.5	9	3.7	5
IS300-5T010-C	8.9	14.6	13	5.5	7.5
IS300-5T015-C	11	20.5	17	7.5	10
IS300-5T020-C	17	26	25	11	15
IS300-5T030-C	21	35	32	15	20
IS300-5T035-C	24	38.5	37	18.5	25
IS300-5T040-C	30	46.5	45	22	30
IS300-5T050-C	40	62	60	30	40
IS300-5T070-C	57	76	75	37	50
IS300-5T080-C	69	92	91	45	60
IS300-5T100-C	85	113	112	55	70
IS300-5T140-C	114	157	150	75	100
IS300-5T170-C	134	180	176	90	125
IS300-5T210-C	160	214	210	110	150
IS300-5T250-C	192	256	253	132	175
IS300-5T300-C	231	307	304	160	210
IS300-5T370-C	250	385	377	200	260
IS300-5T420-C	280	430	426	220	300
IS300-5T460-C	355	468	465	250	350
IS300-5T520-C	396	525	520	280	370
IS300-5T580-C	445	590	585	315	420
IS300-5T650-C	500	665	650	355	470
IS300-5T720-C	565	785	725	400	530
IS300-5T140-C-L	114	157	150	75	100
IS300-5T170-C-L	134	180	176	90	125
IS300-5T210-C-L	160	214	210	110	150
IS300-5T250-C-L	192	256	253	132	175
IS300-5T300-C-L	231	307	304	160	210

Note

The models in grey are customized (servo drive of water cooling).

7.2 Selection of Braking Unit and Braking Resistor

IS300 Model	Recommended Power of Braking Resistor	Recommended Resistance	Braking Unit	Remarks
Single-phase 220–230 V				
IS300S002-C	80 W	≥ 200 Ω	Built-in	-
IS300S003-C	80 W	≥ 150 Ω		
IS300S004-C	100 W	≥ 100 Ω		
IS300S005-C	100 W	≥ 70 Ω		
Three-phase 220 V				
IS300-2T002-C	150 W	≥ 150 Ω	Built-in	-
IS300-2T003-C	150 W	≥ 110 Ω		
IS300-2T004-C	250 W	≥ 100 Ω		
IS300-2T005-C	300 W	≥ 65 Ω		
IS300-2T010-C	400 W	≥ 45 Ω		
IS300-2T020-C	800 W	≥ 22 Ω		
IS300-2T030-C	1000 W	≥ 16 Ω		
IS300-2T040-C	1500 W	≥ 11 Ω		
IS300-2T050-C	2500 W	≥ 8 Ω		
IS300-2T070-C	3.7 kW	≥ 8 Ω	External	MDBUN-45-S
IS300-2T080-C	4.5 kW	≥ 8 Ω	External	MDBUN-60-S
IS300-2T100-C	5.5 kW	≥ 6 Ω	External	MDBUN-60-S
IS300-2T140-C	7.5 kW	≥ 6 Ω	External	MDBUN-60-S
IS300-2T170-C	9 kW	≥ 4 Ω	External	MDBUN-90-S
IS300-2T210-C	11 kW	≥ 4 Ω	External	MDBUN-90-S
IS300-2T300-C	8 x 2 kW	≥ 6 Ω x 2	External	MDBUN-60-S x 2
IS300-2T140-C-L	7.5 kW	≥ 6 Ω	External	MDBUN-60-S
IS300-2T170-C-L	9 kW	≥ 4 Ω	External	MDBUN-90-S
IS300-2T210-C-L	11 kW	≥ 4 Ω	External	MDBUN-90-S
IS300-2T300-C-L	8 x 2 kW	≥ 6 Ω x 2	External	MDBUN-60-S x 2
Three-phase 380–440 V				
IS300T002-C	150 W	≥ 300 Ω	Built-in	-
IS300T003-C	150 W	≥ 220 Ω		
IS300T004-C	250 W	≥ 200 Ω		
IS300T005-C	300 W	≥ 130 Ω		
IS300T010-C	400 W	≥ 90 Ω		
IS300T015-C	500 W	≥ 65 Ω		
IS300T020-C	800 W	≥ 43 Ω		

IS300 Model	Recommended Power of Braking Resistor	Recommended Resistance	Braking Unit	Remarks
IS300T030-C	1000 W	≥ 32 Ω	Built-in	-
IS300T035K-C	1300 W	≥ 25 Ω		
IS300T035-C	1300 W	≥ 25 Ω		
IS300T040-C	1500 W	≥ 22 Ω		
IS300T050-C	2500 W	≥ 16 Ω		
IS300T070K-C	3.7 kW	≥ 16 Ω		
IS300T070-C	3.7 kW	≥ 16 Ω	External	MDBUN-45-T
IS300T080-C	4.5 kW	≥ 16 Ω	External	MDBUN-45-T
IS300T100-C	5.5 kW	≥ 16 Ω	External	MDBUN-45-T
IS300T140K-C	6.5 kW	≥ 12 Ω	External	MDBUN-60-T
IS300T140-C	7.5 kW	≥ 12 Ω	External	MDBUN-60-T
IS300T170-C	9 kW	≥ 8 Ω	External	MDBUN-90-T
IS300T210-C	5.5 kW x 2	≥ 12 Ω x 2	External	MDBUN-60-T x 2
IS300T250-C	6.5 kW x 2	≥ 8 Ω x 2	External	MDBUN-90-T x 2
IS300T300-C	16 kW	≥ 2.5 Ω	External	MDBU-200-B
IS300T370-C	20 kW	≥ 2.5 Ω	External	MDBU-200-B
IS300T420-C	22 kW	≥ 2.5 Ω	External	MDBU-200-B
IS300T460-C	12.5 kW x 2	≥ 2.5 Ω x 2	External	MDBU-200-B x 2
IS300T520-C	14 kW x 2	≥ 2.5 Ω x 2	External	MDBU-200-B x 2
IS300T580-C	16 kW x 2	≥ 2.5 Ω x 2	External	MDBU-200-B x 2
IS300T650-C	17 kW x 2	≥ 2.5 Ω x 2	External	MDBU-200-B x 2
IS300T720-C	14 kW x 3	≥ 2.5 Ω x 3	External	MDBU-200-B x 3
IS300T140-C-L	7.5 kW	≥ 8 Ω	External	MDBUN-90-T
IS300T170-C-L	11 kW	≥ 8 Ω	External	MDBUN-90-T
IS300T210-C-L	5.5 kW x 2	≥ 12 Ω x 2	External	MDBUN-60-T x 2
IS300T250-C-L	6.5 kW x 2	≥ 8 Ω x 2	External	MDBUN-90-T x 2
IS300T300-C-L	16 kW	≥ 2.5 Ω	External	MDBU-200-B
Three-phase 480 V				
IS300-5T002-C	150 W	≥ 300 Ω	Built-in	-
IS300-5T003-C	150 W	≥ 220 Ω		
IS300-5T004-C	250 W	≥ 200 Ω		
IS300-5T005-C	300 W	≥ 130 Ω		
IS300-5T010-C	400 W	≥ 90 Ω		
IS300-5T015-C	500 W	≥ 65 Ω		
IS300-5T020-C	800 W	≥ 43 Ω		

IS300 Model	Recommended Power of Braking Resistor	Recommended Resistance	Braking Unit	Remarks
IS300-5T030-C	1000 W	≥ 32 Ω	Built-in	-
IS300-5T035-C	1300 W	≥ 25 Ω		
IS300-5T040-C	1500 W	≥ 22 Ω		
IS300-5T050-C	2500 W	≥ 16 Ω		
IS300-5T070-C	3.7 kW	≥ 16 Ω	External	MDBUN-45-5T
IS300-5T080-C	4.5 kW	≥ 16 Ω	External	MDBUN-45-5T
IS300-5T100-C	5.5 kW	≥ 16 Ω	External	MDBUN-45-5T
IS300-5T140-C	7.5 kW	≥ 12 Ω	External	MDBUN-60-5T
IS300-5T170-C	9 kW	≥ 8 Ω	External	MDBUN-90-5T
IS300-5T210-C	11 kW	≥ 8 Ω	External	MDBUN-90-5T
IS300-5T250-C	6.5 kW x 2	≥ 12 Ω x 2	External	MDBUN-60-5T x 2
IS300-5T300-C	16 kW	≥ 2.5 Ω	External	MDBU-200-D
IS300-5T370-C	20 kW	≥ 2.5 Ω	External	MDBU-200-D
IS300-5T420-C	22 kW	≥ 2.5 Ω	External	MDBU-200-D
IS300-5T460-C	12.5 kW x 2	≥ 2.5 Ω x 2	External	MDBU-200-D x 2
IS300-5T520-C	14 kW x 2	≥ 2.5 Ω x 2	External	MDBU-200-D x 2
IS300-5T580-C	16 kW x 2	≥ 2.5 Ω x 2	External	MDBU-200-D x 2
IS300-5T650-C	17 kW x 2	≥ 2.5 Ω x 2	External	MDBU-200-D x 2
IS300-5T720-C	14 kW x 3	≥ 2.5 Ω x 3	External	MDBU-200-D x 3
IS300-5T140-C-L	7.5 kW	≥ 12 Ω	External	MDBUN-60-5T
IS300-5T170-C-L	9 kW	≥ 8 Ω	External	MDBUN-90-5T
IS300-5T210-C-L	11 kW	≥ 8 Ω	External	MDBUN-90-5T
IS300-5T250-C-L	6.5 kW x 2	≥ 12 Ω x 2	External	MDBUN-60-5T x 2
IS300-5T300-C-L	16 kW	≥ 2.5 Ω	External	MDBU-200-D

Note

1. " x 2" indicates that two braking units with their respective braking resistor are connected in parallel. " x 3" means the same.
2. The models in grey are customized (servo drive of water cooling).

7.3 Selection of Peripheral Electrical Devices

IS300 Model	MCCB (A)	Contactor (A)	I/O Power Cable (mm^2)	Cable of Control Circuit (mm^2)
Single-phase 220–230 V				
IS300S002-C	10	9	0.75	0.50
IS300S003-C	16	12	0.75	0.50
IS300S004-C	25	18	1.5	0.50
IS300S005-C	32	25	2.5	0.50
Three-phase 220 V				
IS300-2T002-C	6	9	0.75	0.50
IS300-2T003-C	10	9	0.75	0.50
IS300-2T004-C	10	9	0.75	0.50
IS300-2T005-C	16	12	1.5	0.50
IS300-2T010-C	20	18	2.5	0.75
IS300-2T020-C	40	32	4	0.75
IS300-2T030-C	50	38	6	0.75
IS300-2T040-C	63	50	10	0.75
IS300-2T050-C	100	65	16	0.75
IS300-2T070-C	100	80	25	1.00
IS300-2T080-C	125	95	35	1.00
IS300-2T100-C	160	115	50	1.00
IS300-2T140-C	225	170	70	1.00
IS300-2T170-C	250	205	95	1.00
IS300-2T210-C	315	245	120	1.00
IS300-2T300-C	500	300	150	1.00
IS300-2T140-C-L	225	170	70	1.00
IS300-2T170-C-L	250	205	95	1.00
IS300-2T210-C-L	315	245	120	1.00
IS300-2T300-C-L	500	300	150	1.00
Three-phase 380–440 V				
IS300T002-C	6	9	0.75	0.50
IS300T003-C	10	9	0.75	0.50
IS300T004-C	10	9	0.75	0.50
IS300T005-C	16	12	1.5	0.75
IS300T010-C	20	18	2.5	0.75
IS300T015-C	32	25	4	0.75
IS300T020-C	40	32	4	0.75

IS300 Model	MCCB (A)	Contactor (A)	I/O Power Cable (mm^2)	Cable of Control Circuit (mm^2)
IS300T030-C	50	38	6	0.75
IS300T035K-C	50	40	10	1.00
IS300T035-C	50	40	10	1.00
IS300T040-C	63	50	10	1.00
IS300T050-C	100	65	16	1.00
IS300T070K-C	100	70	25	1.00
IS300T070-C	100	80	25	1.00
IS300T080-C	125	95	35	1.00
IS300T100-C	160	115	50	1.00
IS300T140K-C	195	148	70	1.00
IS300T140-C	225	170	70	1.00
IS300T170-C	250	205	95	1.00
IS300T210-C	315	245	120	1.00
IS300T250-C	350	300	120	1.00
IS300T300-C	400	300	150	1.00
IS300T370-C	500	410	185	1.00
IS300T420-C	630	475	240	1.00
IS300T460-C	630	475	2 x 120	1.00
IS300T520-C	700	620	2 x 120	1.00
IS300T580-C	800	620	2 x 150	1.00
IS300T650-C	1000	800	2 x 185	1.00
IS300T720-C	1250	800	2 x 240	1.00
IS300T140-C	225	170	70	1.00
IS300T170-C	250	205	95	1.00
IS300T210-C	315	245	120	1.00
IS300T250-C	350	300	120	1.00
IS300T300-C	400	300	150	1.00
IS300T370-C	500	410	185	1.00
IS300T420-C	630	475	240	1.00
IS300T460-C	630	475	2 x 120	1.00
IS300T520-C	700	620	2 x 120	1.00
IS300T580-C	800	620	2 x 150	1.00
IS300T650-C	1000	800	2 x 185	1.00
IS300T720-C	1250	800	2 x 240	1.00
IS300T140-C-L	225	170	70	1.00
IS300T170-C-L	250	205	95	1.00

IS300 Model	MCCB (A)	Contactor (A)	I/O Power Cable (mm^2)	Cable of Control Circuit (mm^2)
IS300T210-C-L	315	245	120	1.00
IS300T250-C-L	350	300	120	1.00
IS300T300-C-L	400	300	150	1.00
Three-phase 480 V				
IS300-5T002-C	6	9	0.75	0.50
IS300-5T003-C	10	9	0.75	0.50
IS300-5T004-C	10	9	0.75	0.50
IS300-5T005-C	16	12	1.5	0.75
IS300-5T010-C	20	18	2.5	0.75
IS300-5T015-C	32	25	4	0.75
IS300-5T020-C	40	32	4	0.75
IS300-5T030-C	50	38	6	0.75
IS300-5T035-C	50	40	10	1.00
IS300-5T040-C	63	50	10	1.00
IS300-5T050-C	100	65	16	1.00
IS300-5T070-C	100	80	25	1.00
IS300-5T080-C	125	95	35	1.00
IS300-5T100-C	160	115	50	1.00
IS300-5T140-C	225	170	70	1.00
IS300-5T170-C	250	205	95	1.00
IS300-5T210-C	315	245	120	1.00
IS300-5T250-C	350	300	120	1.00
IS300-5T300-C	400	300	150	1.00
IS300-5T370-C	500	410	185	1.00
IS300-5T420-C	630	475	240	1.00
IS300-5T460-C	630	475	2 x 120	1.00
IS300-5T520-C	700	620	2 x 120	1.00
IS300-5T580-C	800	620	2 x 150	1.00
IS300-5T650-C	1000	800	2 x 185	1.00
IS300-5T720-C	1250	800	2 x 240	1.00
IS300-5T140-C-L	225	170	70	1.00
IS300-5T170-C-L	250	205	95	1.00
IS300-5T210-C-L	315	245	120	1.00
IS300-5T250-C-L	350	300	120	1.00
IS300-5T300-C-L	400	300	150	1.00

Note

The models in grey are customized (servo drive of water cooling).

7.4 Mounting Dimensions of the IS300

Figure 7-1 Mounting dimensions of IS300(*)002-C to IS300(*)030-C

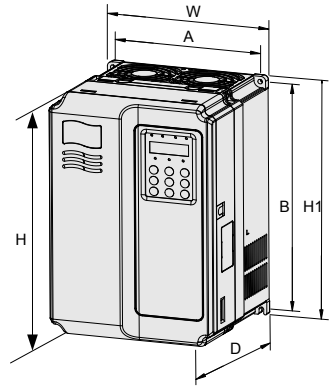


Figure 7-2 Mounting dimensions of IS300(*)035-C to IS300(*)720-C

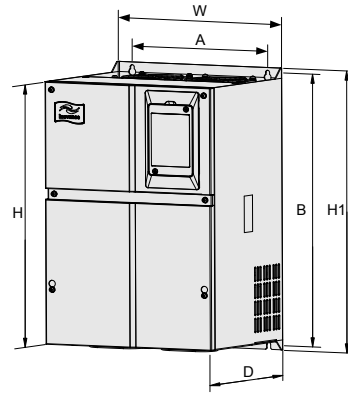


Table 7-2 Mounting dimensions of IS300

IS300 Model	Mounting Hole (mm)		Mounting Dimensions (mm)				Mounting Hole Diameter (mm)	Weight (kg)
	A	B	H	H1	W	D		
Single-phase 220–230 V								
IS300S002-C	113	172	186	-	125	164	Φ5.0	1.1
IS300S003-C								
IS300S004-C								
IS300S005-C								
Three-phase 220 V								
IS300-2T002-C	113	172	186	-	125	164	Φ5.0	1.1
IS300-2T003-C								
IS300-2T004-C								
IS300-2T005-C	148	236	248	-	160	183	Φ5.0	2.5
IS300-2T010-C								
IS300-2T020-C	190	305	322	-	208	192	Φ6	6.5
IS300-2T030-C								
IS300-2T040-C	235	447	432	463	285	228	Φ6.5	20
IS300-2T050-C								
IS300-2T070-C	260	580	549	600	385	265	Φ10	32
IS300-2T080-C								
IS300-2T100-C								
IS300-2T140-C	343	678	660	700	473	307	Φ10	47
IS300-2T170-C								
IS300-2T210-C	449	903	880	930	579	380	Φ10	90
IS300-2T300-C								
Three-phase 380–440 V								
IS300T002-C	113	172	186	-	125	164	Φ5.0	1.1
IS300T003-C								
IS300T004-C								
IS300T005-C	148	236	248	-	160	183	Φ5.0	2.5
IS300T010-C								
IS300T015-C	190	305	322	-	208	192	Φ6	6.5
IS300T020-C								
IS300T030-C								
IS300T035K-C								

IS300 Model	Mounting Hole (mm)		Mounting Dimensions (mm)				Mounting Hole Diameter (mm)	Weight (kg)
	A	B	H	H1	W	D		
IS300T035-C	235	447	432	463	285	228	Φ6.5	20
IS300T040-C								
IS300T050-C								
IS300T070-C	260	580	549	600	385	265	Φ10	32
IS300T080-C								
IS300T100-C								
IS300T140K-C								
IS300T140-C	343	678	660	700	473	307	Φ10	47
IS300T170-C								
IS300T210-C	449	903	880	930	579	380	Φ10	90
IS300T250-C								
IS300T300-C								
IS300T370-C	420	1030	983	1060	650	377	Φ12	130
IS300T420-C								
IS300T460-C								
IS300T520-C								
IS300T580-C	520	1300	1203	1358	800	400	Φ16	200
IS300T650-C								
IS300T720-C								
Three-phase 480 V								
IS300-5T002-C	113	172	186	-	125	164	Φ5.0	1.1
IS300-5T003-C								
IS300-5T004-C								
IS300-5T005-C	148	236	248	-	160	183	Φ5.0	2.5
IS300-5T010-C								
IS300-5T015-C	190	305	322	-	208	192	Φ6	6.5
IS300-5T020-C								
IS300-5T030-C								
IS300-5T035-C	235	447	432	463	285	228	Φ6.5	20
IS300-5T040-C								
IS300-5T050-C								
IS300-5T070-C	260	580	549	600	385	265	Φ10	32
IS300-5T080-C								
IS300-5T100-C								

IS300 Model	Mounting Hole (mm)		Mounting Dimensions (mm)				Mounting Hole Diameter (mm)	Weight (kg)
	A	B	H	H1	W	D		
IS300-5T140-C	343	678	660	700	473	307	Φ10	47
IS300-5T170-C								
IS300-5T210-C	449	903	880	930	579	380	Φ10	90
IS300-5T250-C								
IS300-5T300-C								
IS300-5T370-C	420	1030	983	1060	650	377	Φ12	130
IS300-5T420-C								
IS300-5T460-C								
IS300-5T520-C								
IS300-5T580-C	520	1300	1203	1358	800	400	Φ16	200
IS300-5T650-C								
IS300-5T720-C								

7.5 Physical Appearance and Mounting of Models with Water Cooling

Figure 7-3 Physical appearance and mounting dimensions of IS300(*)140-C-L and IS300(*)170-C-L

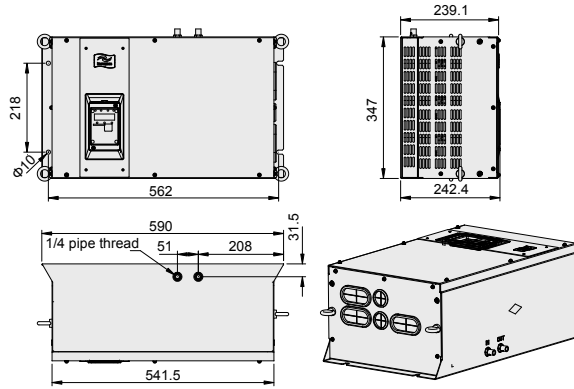
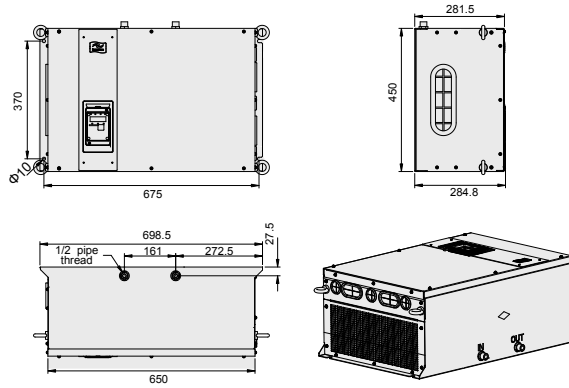


Figure 7-4 Physical appearance and mounting dimensions of IS300(*)210-C-L, IS300(*)250-C-L, and IS300(*)300-C-L



7.6 Mounting Dimensions of Optional Parts

7.6.1 External DC Reactor

The IS300(*)140-C-* and above are configured with an external DC reactor that is separately packed and delivered together with the servo drive.

When installing the DC reactor, remove the shorting copper busbar between the main circuit connection terminals P and +. Then connect the DC reactor between terminals P and + (no polarity requirement). The copper busbar is not used any longer after the installation is complete.

The models below IS300(*)140-C-* uses a built-in DC reactor.

Figure 7-5 Mounting dimensions of the external DC reactor

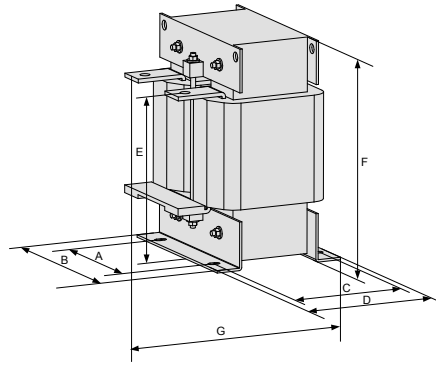


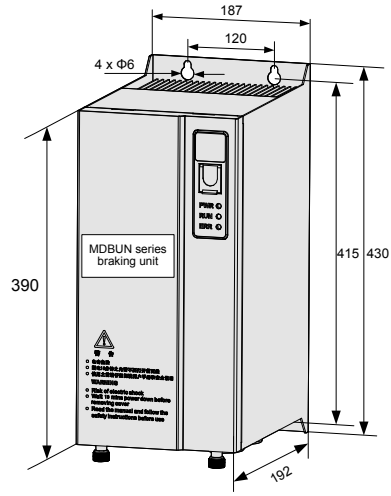
Table 7-3 DC reactor models

IS300 Model	A	B	C	D	E	F	G	Fixed Hole	Diameter of Hole for Connecting Copper Busbar	Reactor Model
IS300-2T140-C, IS300-2T170-C	160	190	125	161	192	255	195	10 x 15	Φ12	DCL-0200
IS300T140-C, IS300T170-C										
IS300-5T140-C, IS300-5T170-C										
IS300-2T210-C	160	190	125	161	192	255	195	10 x 15	Φ12	DCL-0250
IS300T210-C										
IS300-5T210-C										
IS300-2T300-C	160	190	125	161	192	255	195	10 x 15	Φ12	DCL-0360
IS300T250-C, IS300T300-C										
IS300-5T250-C, IS300-5T300-C										
IS300T370-C, IS300T420-C	190	230	93	128	250	325	200	13 x 18	Φ15	DCL-0600
IS300-5T370-C, IS300-5T420-C										
IS300T460-C, IS300T520-C	190	230	93	128	250	325	200	13 x 18	Φ15	DCL-0700
IS300-5T460-C, IS300-5T520-C										
IS300T580-C, IS300T650-C, IS300T720-C	224	250	135	165	260	330	235	12 x 20	Φ14	DCL-1000
IS300-5T580-C, IS300-5T650-C, IS300-5T720-C										

7.6.2 External Braking Unit

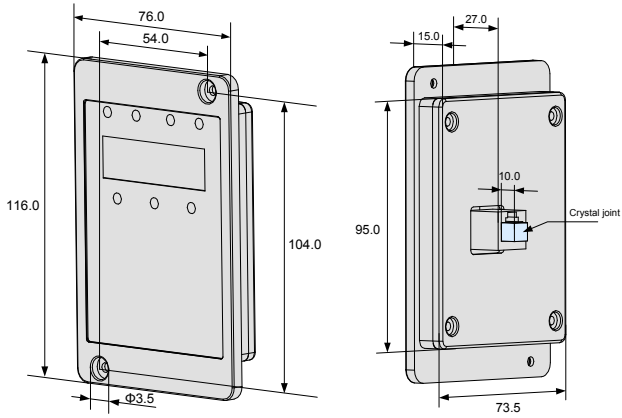
Note that the models below IS300(*)070-C-* uses the built-in braking unit.

Figure 7-6 Mounting dimensions of the MDBUN-45-X



7.6.3 External Operation Panel

Figure 7-7 Mounting dimensions of the external operation panel



7.7 Servo Motor Code

Inovance Motor Model	Motor Model Code (FP-02)	Phase Motor Model	Motor Model Code (FP-02)
ISMG1-95C15CD-R131F	00615	U1004F15.3	10415
ISMG1-11D17CD-R131F	00617	U1004F17.3	10417
ISMG1-12D20CD-R131F	00620	U1004F20.3	10420
ISMG1-14D15CD-R131F	00915	U1005F15.3	10515
ISMG1-16D17CD-R131F	00917	U1005F17.3	10517
ISMG1-18D20CD-R131F	00920	U1005F20.3	10520
ISMG1-22D15CD-R131F	01315	U1007F15.3	10715
ISMG1-24D17CD-R131F	01317	U1007F17.3	10717
ISMG1-28D20CD-R131F	01320	U1007F20.3	10720
ISMG1-30D15CD-R131F	01915	U1008F15.3	10815
ISMG1-41D20CD-R131F	01920	U1008F17.3	10817
ISMG2-20D15CD-R131F	21315	U1008F20.3	10820
ISMG2-23D17CD-R131F	21317	U1010F15.3	11015
ISMG2-27D20CD-R131F	21320	U1010F17.3	11017
ISMG2-31D15CD-R131F	22015	U1010F20.3	11020
ISMG2-36D17CD-R131F	22017	U1013F15.3	11315
ISMG2-42D20CD-R131F	22020	U1013F17.3	11317
ISMG2-42D15CD-R131F	22715	U1013F20.3	11320
ISMG2-48D17CD-R131F	22717	U1320F15.3	12015
ISMG2-57D20CD-R131F	22720	U1320F17.3	12017
ISMG2-60D15CD-R131F	23815	U1320F20.3	12020
ISMG2-68D17CD-R131F	23817	U1330F15.3	13015
ISMG2-80D20CD-R131F	23820	U1330F17.3	13017
ISMG2-80D15CD-R131F	25115	U1330F20.3	13020
ISMG2-91D17CD-R131F	25117	-	-
ISMG2-11E20CD-R131F	25120	-	-

8

EMC

Chapter 8 EMC

8.1 Definition of Terms

1) 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.

2) 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

3) 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

4) Category C1 drive

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

5) Category C2 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

6) Category C3 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

7) Category C4 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

8.2 Introduction to EMC Standard

8.2.1 CE Mark

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

CE

8.2.2 EMC Standard

The IS300 series servo drive complies with the following directives and standards.

	Directive	Standard
EMC directives	2004/18/EC	EN 61800-3 EN 55011 EN 61000-6-2
LVD directives	2006/95/EC 93/68/EEC	EN 61800-5-1

8.2.3 Installation Environment

The system manufacturer using the servo drive is responsible for compliance of the system with the European EMC directives. 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 servo drive must also have the CE mark. The system integrator is responsible for compliance of the system with the EMC directives and standard EN 61800-3: 2004 Category C2.

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

8.3 Selection of Peripheral EMC Devices

8.3.1 Installation of EMC Input Filter on Power Input Side

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

The IS300 series servo drive satisfies the requirements of category C2 only when an EMC filter is installed on the power input side. The installation precautions are as follows:

- Strictly comply with the ratings when using the EMC filter. The EMC filter is category I electric apparatus, and therefore, the metal housing ground of the filter should be in good contact with the metal ground of the installation cabinet on a large area, and requires good conductive continuity. Otherwise, it will result in electric shock or poor EMC effect.
- The ground of the EMC filter and the PE conductor of the servo 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 servo drive.

The following table lists the recommended manufacturers and models of EMC filters for the

IS300 series servo drive. Select a proper one based on actual requirements.

Table 8-1 Recommended manufacturers and models of EMC filters

IS300 Model	Power Capacity (kVA)	Rated Input Current (A)	AC Input Filter Model (Changzhou Jianli)	AC Input Filter Model (Schaffner)
Three-phase 380–480 V, 50/60 Hz				
IS300T002-C	1.5	3.4	DL-5EBK5	FN 3258-7-44
IS300T003-C	3	5	DL-5EBK5	FN 3258-7-44
IS300T004-C	4	5.8	DL-10EBK5	FN 3258-7-44
IS300T005-C	5.9	10.5	DL-16EBK5	FN 3258-16-33
IS300T010-C	8.9	14.6	DL-16EBK5	FN 3258-16-33
IS300T015-C	11	20.5	DL-25EBK5	FN 3258-30-33
IS300T020-C	17	26	DL-35EBK5	FN 3258-30-33
IS300T030-C	21	35	DL-35EBK5	FN 3258-42-33
IS300T035K-C	23	36.5	DL-50EBK5	FN3258-42-33
IS300T035-C	24	38.5	DL-50EBK5	FN 3258-42-33
IS300T040-C	30	46.5	DL-50EBK5	FN 3258-55-34
IS300T050-C	40	62	DL-65EBK5	FN 3258-75-34
IS300T070K-C	53	71	DL-80EBK5	FN3258-100-35
IS300T070-C	57	76	DL-80EBK5	FN 3258-100-35
IS300T080-C	69	92	DL-100EBK5	FN 3258-100-35
IS300T100-C	85	113	DL-130EBK5	FN 3258-130-35
IS300T140K-C	97.5	134	DL-160EBK5	FN3258-180-40
IS300T140-C	114	157	DL-160EBK5	FN 3258-180-40
IS300T170-C	134	180	DL-200EBK5	FN 3258-180-40
IS300T210-C	160	214	DL-250EBK5	FN 3270H-250-99
IS300T250-C	192	256	DL-300EBK3	FN 3270H-320-99
IS300T300-C	231	307	DL-400EBK3	FN 3270H-320-99
IS300T370-C	250	385	DL-400EBK3	FN 3270H-400-99
IS300T420-C	280	430	DL-600EBK3	FN 3270H-600-99
IS300T460-C	355	468	DL-600EBK3	FN 3270H-600-99
IS300T520-C	396	525	DL-600EBK3	FN 3270H-600-99
IS300T580-C	445	590	DL-600EBK3	FN 3270H-600-99
IS300T650-C	500	665	DL-700EBK3	FN 3270H-800-99
IS300T720-C	565	785	DL-800EBK3	FN 3270H-800-99

8.3.2 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.

Table 8-2 Recommended manufacturers and models of AC input reactors

Servo Drive Model	Rated Input Current (A)	AC Input Reactor Model (Inovance)
Three-phase 380–480 V, 50/60 Hz		
IS300T002-C	3.4	MD-ACL-7-4T-222-2%
IS300T003-C	5	MD-ACL-7-4T-222-2%
IS300T004-C	5.8	MD-ACL-7-4T-222-2%
IS300T005-C	10.5	MD-ACL-10-4T-372-2%
IS300T010-C	14.6	MD-ACL-15-4T-552-2%
IS300T015-C	20.5	MD-ACL-30-4T-113-2%
IS300T020-C	26	MD-ACL-30-4T-113-2%
IS300T030-C	35	MD-ACL-40-4T-153-2%
IS300T035K-C	36.5	MD-ACL-40-4T-153-2%
IS300T035-C	38.5	MD-ACL-40-4T-153-2%
IS300T040-C	46.5	MD-ACL-50-4T-183-2%
IS300T050-C	62	MD-ACL-80-4T-303-2%
IS300T070K-C	71	MD-ACL-80-4T-303-2%
IS300T070-C	76	MD-ACL-80-4T-303-2%
IS300T080-C	92	MD-ACL-120-4T-453-2%
IS300T100-C	113	MD-ACL-120-4T-453-2%
IS300T140K-C	134	MD-ACL-200-4T-753-2%
IS300T140-C	157	MD-ACL-200-4T-753-2%
IS300T170-C	180	MD-ACL-200-4T-753-2%
IS300T210-C	214	MD-ACL-250-4T-114-2%
IS300T250-C	256	MD-ACL-330-4T-164-2%
IS300T300-C	307	MD-ACL-330-4T-164-2%
IS300T370-C	385	MD-ACL-490-4T-224-2%
IS300T420-C	430	MD-ACL-490-4T-224-2%
IS300T460-C	468	MD-ACL-490-4T-224-2%
IS300T520-C	525	MD-ACL-660-4T-304-2%
IS300T580-C	590	MD-ACL-660-4T-304-2%
IS300T650-C	665	MD-ACL-800-4T-384-2%
IS300T720-C	785	MD-ACL-800-4T-384-2%

8.3.3 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 servo 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 servo drive.

Table 8-3 Cable length threshold when an AC output reactor is installed

AC Drive Power (kW)	Rated Voltage (V)	Minimum Cable Length (m)
IS300T005-C	200–500	50
IS300T010-C	200–500	70
IS300T015-C	200–500	100
IS300T020-C	200–500	110
IS300T030-C	200–500	125
IS300T035K-C	200–500	135
IS300T035-C	200–500	135
IS300T040-C	200–500	150
IS300T050-C and above	280–690	150

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

Table 8-4 Recommended manufacturer and models of AC output reactors

Servo Drive Model	Rated Output Current (A)	AC Output Reactor Model (Inovance)
Three-phase 380–480 V, 50/60 Hz		
IS300T002-C	2.1	MD-OCL-5-4T-152-1%
IS300T003-C	3.8	MD-OCL-5-4T-152-1%
IS300T004-C	5.1	MD-OCL-7-4T-222-1%
IS300T005-C	9	MD-OCL-10-4T-372-1%
IS300T010-C	13	MD-OCL-15-4T-552-1%
IS300T015-C	17	MD-OCL-20-4T-752-1%
IS300T020-C	25	MD-OCL-30-4T-113-1%
IS300T030-C	32	MD-OCL-40-4T-153-1%
IS300T035K-C	35	MD-OCL-50-4T-183-1%
IS300T035-C	37	MD-OCL-60-4T-223-1%
IS300T040-C	45	MD-OCL-80-4T-303-1%
IS300T050-C	60	MD-OCL-90-4T-373-1%
IS300T070K-C	70	MD-OCL-120-4T-453-1%
IS300T070-C	75	MD-OCL-150-4T-553-1%
IS300T080-C	91	MD-OCL-200-4T-753-1%
IS300T100-C	112	MD-OCL-250-4T-114-1%

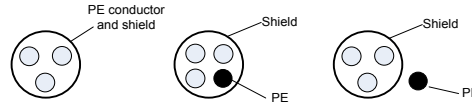
Servo Drive Model	Rated Output Current (A)	AC Output Reactor Model (Inovance)
IS300T140K-C	130	MD-OCL-250-4T-114-1%
IS300T140-C	150	MD-OCL-330-4T-164-1%
IS300T170-C	176	MD-OCL-330-4T-164-1%
IS300T210-C	210	MD-OCL-490-4T-224-1%
IS300T250-C	253	MD-OCL-490-4T-224-1%
IS300T300-C	304	MD-OCL-490-4T-224-1%
IS300T370-C	377	MD-OCL-660-4T-304-1%
IS300T420-C	426	MD-OCL-660-4T-304-1%
IS300T460-C	465	MD-OCL-800-4T-384-1%
IS300T520-C	520	MD-OCL-800-4T-384-1%
IS300T580-C	585	MD-OCL-5-4T-152-1%
IS300T650-C	650	MD-OCL-5-4T-152-1%
IS300T720-C	725	MD-OCL-7-4T-222-1%

8.4 Shielded Cable

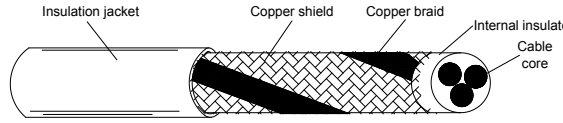
8.4.1 Requirements for Shielded Cable

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

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

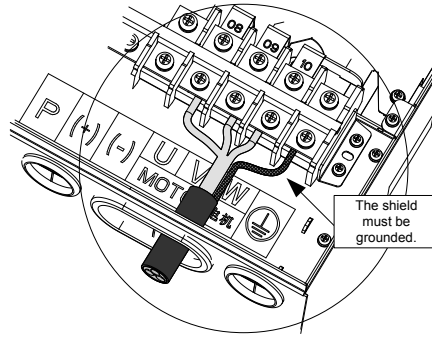


To suppress emission and conduction of the radio frequency interference effectively, the shield of the shielded cable is cooper braid. The braided density of the cooper braid should be greater than 90% to enhance the shielding efficiency and conductivity, as shown in the following figure.



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

Figure 8-1 Grounding of the shielded cable



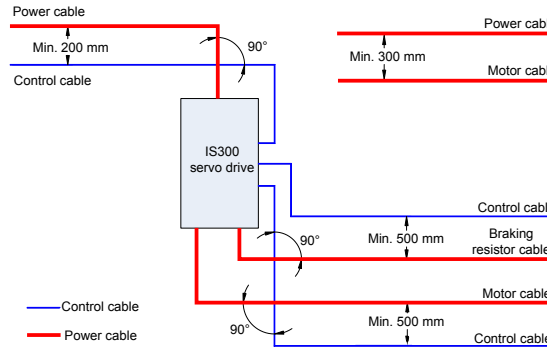
The installation precautions are as follows:

- 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 servo 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.

8.4.2 Cabling Requirements

- The motor cables must be laid far away from other cables. The motor cables of several servo 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 servo 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 servo drive.
- The power input and output cables of the servo 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. Aluminium ducts can be used to improve electric potential.
- The filter, servo drive and motor should be connected to the system (machinery or appliance) properly, with spraying protection at the installation part and conductive metal in full contact.

Figure 8-2 Cabling diagram



8.5 Solutions to Common EMC Interference Problems

The servo 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 servo drive interferes with other devices, adopt the following solutions.

Interference Type	Solution
Leakage protection switch tripping	• Connect the motor housing to the PE of the servo drive. • Connect the PE of the servo 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.
servo drive interference during running	• Connect the motor housing to the PE of the servo drive. • Connect the PE of the servo 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 servo drive. • Connect the PE of the servo 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.

9

Function Code Table

Chapter 9 Function Code Table

Function Code	Name	Setting Range	Min. Unit	Default	Property
Group U0: Viewed Servo Drive Parameters					
U0-00	Running frequency	0.00 Hz to maximum frequency (F0-10)	-	-	●
U0-01	Set frequency	0.00 Hz to maximum frequency (F0-10)	-	-	●
U0-02	Bus voltage	0–830 V	-	-	●
U0-03	Output voltage	0 V to rated motor voltage (F1-02)	-	-	●
U0-04	Output current	0.01–655.35 A	-	-	●
U0-05	Output power	0.4–1000.0 kW	-	-	●
U0-06	Output torque	0.0% to torque upper limit (F2-10)	-	-	●
U0-07	Local DI/DO state	-	-	-	●
U0-08	Extended DI/DO state	-	-	-	●
U0-09	AI1 voltage (after correction)	-10.00–+10.000 V	-	-	●
U0-10	AI2 voltage (after correction)	-10.00–+10.000 V		-	●
U0-11	AI3 voltage (after correction)	-10.00–+10.000 V	-	-	●
U0-12 to U0-27	Reserved	-	-	-	●
U0-28	Overcurrent threshold	0.01–655.35 A	-	-	●
U0-29	Overcurrent type	1: Hardware overcurrent 2: Software overcurrent	-	-	●
U0-30	AI1 voltage (before correction)	-10.00–+10.000 V	-	-	●
U0-31	AI2 voltage (before correction)	-10.00–+10.000 V	-	-	●
U0-32	AI3 voltage (before correction)	-10.00–+10.000 V	-	-	●
U0-33	Reserved	-	-	-	●
U0-34	AO1 output voltage	0.000–10.000 V	-	-	●
U0-35	AO2 output voltage	0.000–10.000 V	-	-	●
Group U1: Viewed Servo Pump Parameters					
U1-00	Real-time angle	0.0–359.9°	-	-	●

Function Code	Name	Setting Range	Min. Unit	Default	Property
U1-01	Set hydraulic pressure	0.0 kg to system hydraulic pressure (A3-02)	-	-	●
U1-02	Feedback hydraulic pressure	0.0 kg to maximum hydraulic pressure (A3-03)	-	-	●
U1-03	Motor rotational speed	-9999–+30000 RPM	-	-	●
U1-04	AI1 voltage	-10.00–+10.000 V	-	-	●
U1-05	AI2 voltage	-10.00–+10.000 V	-	-	●
U1-06	AI3 voltage	-10.00–+10.000 V	-	-	●
U1-07	AI1 zero drift	-10.00–+10.000 V	-	-	●
U1-08	AI2 zero drift	-10.00–+10.000 V	-	-	●
U1-09	AI3 zero drift	-10.00–+10.000 V	-	-	●
U1-10	Reference flow	0.00 Hz to maximum frequency (F0-10)	-	-	●
U1-11	Resolver signal interference degree	0–1000 1000: wire breaking	-	-	●
U1-12	Hydraulic pressure reference of host computer	0.0 kg to system hydraulic pressure (A3-02)	-	-	●
U1-13	CAN communication interference status	0–128 128: Disconnection	-	-	●
U1-14	Number of CAN messages sent	0–65535	-	-	●
U1-15	Number of CAN messages received	0–65535	-	-	●
U1-16	CAN buffer use ratio	0–1.00%	-	-	●
Group A0: Field Weakening and CLVC Control Parameters					
A0-00	Field weakening control mode	0: Direct calculation 1: Automatic adjustment	1	0	★
A0-01	Field weakening current coefficient	80%–200%	1	100%	★
A0-02	Field weakening current upper limit	0–120	1	100	★
A0-03	Field weakening integral multiples	200–1000	1	400	★
A0-04	Field weakening coefficient	0–100	1	4	★

Function Code	Name	Setting Range	Min. Unit	Default	Property
A0-05	Output phase loss PWM detection time	0–63000	1	0	★
Group A1: PG Card Parameters					
A1-00 to A1-01	Reserved	-	-	-	★
A1-02	Encoder installation angle	0.0–359.9°	0.1°	0.0°	☆
A1-03	Inversion of feedback speed	0–1	1	0	★
A1-04	Number of pole pairs of resolver	1–50	1	1	★
A1-05	Resolver signal fault detection time	0.000: Detection invalid 0.001–60.000s	0.001s	0.000	☆
Group A2: CAN Communication Parameters					
A2-00	Baud rate	0: 20 Kbit/s 1: 50 Kbit/s 2: 125 Kbit/s 3: 250 Kbit/s 4: 500 Kbit/s 5: 1 Mbit/s	1	5	☆
A2-01	Local address	1–255	1	1	☆
A2-02	Communication timeout	0.0s: Invalid 0.1–600.0s	0.1s	0.3s	☆
A2-03	CAN multi-pump mode	0: Broadcast mode 1: Multi-master mode	1	0	☆
A2-04	CAN slave address 1	0–65535	1	32766	☆
A2-05	CAN slave address 2	0–65535	1	0	☆
A2-06	CAN slave address 3	0–65535	1	0	☆
A2-07	CAN slave address 4	0–65535	1	0	☆
Group A3: Pump Control Parameters					
A3-00	Hydraulic control mode	0: Non-hydraulic control mode 1: Hydraulic control mode 1 (CAN setting) 2: Hydraulic control mode 2 (AI setting) 3: CAN hydraulic control mode (for special use) 4: Reserve	0	0	★
A3-01	Maximum rotational speed	Rotational speed corresponding to lower limit of maximum frequency to 30000 RPM	1 RPM	2000 RPM	★

Function Code	Name	Setting Range	Min. Unit	Default	Property
A3-02	System hydraulic pressure	0.0 kg/cm^2 to maximum hydraulic pressure (A3-03)	0.0 kg/cm^2	175.0 kg/cm^2	☆
A3-03	Maximum hydraulic pressure	System hydraulic pressure (A3-02) to 500.0 kg/cm^2	0.0 kg/cm^2	250.0 kg/cm^2	☆
A3-04	Hydraulic pressure command rise time	0–2000 ms	1 ms	20 ms	☆
A3-05	Hydraulic pressure control Kp1	0.0–800.0	0.1	210.0	☆
A3-06	Hydraulic pressure control Ti1	0.001–10.000s	0.001s	0.100s	☆
A3-07	Hydraulic pressure control Td1	0.000–1.000s	0.001s	0.000s	☆
A3-08	Maximum reverse rotational speed	0.0%–100.0%	0.1%	20.0%	☆
A3-09	Minimum flow	0.0%–50.0%	0.1%	0.5%	☆
A3-10	Minimum pressure	0.0–50.0 kg/cm^2	0.1 kg/cm^2	0.5 kg/cm^2	☆
A3-11	Hydraulic pressure control Kp2	0.0–800.0	0.1	210.0	☆
A3-12	Hydraulic pressure control Ti2	0.001–10.000s	0.001s	0.100s	☆
A3-13	Hydraulic pressure control Td2	0.000–1.000s	0.001s	0.000s	☆
A3-14	Hydraulic pressure control Kp3	0.0–800.0	0.1	210.0	☆
A3-15	Hydraulic pressure control Ti3	0.001–10.000s	0.001s	0.100s	☆
A3-16	Hydraulic pressure control Td3	0.000–1.000s	0.001s	0.000s	☆
A3-17	Hydraulic pressure control Kp4	0.0–800.0	0.1	210.0	☆
A3-18	Hydraulic pressure control Ti4	0.001–10.000s	0.001s	0.100s	☆
A3-19	Hydraulic pressure control Td4	0.000–1.000s	0.001s	0.000s	☆
A3-20	AI zero drift auto correction	0: Disabled 1: Enabled	0	0	☆
A3-21	Fault detection time of hydraulic pressure sensor	0.000s: Detection invalid 0.001–60.000s	0.001s	0.500s	☆

Function Code	Name	Setting Range	Min. Unit	Default	Property
A3-22	Setting of maximum rotational speed in pressure control	0.0%–100.0%	0.1%	10.0%	☆
A3-23	Setting of minimum hydraulic pressure in pressure control	0.0%–100.0%	0.1%	60.0%	☆
A3-24	Output delay time in pressure control	0.000–10.000s	0.001s	0.100s	☆
A3-25	S-curve rise filter time of set hydraulic pressure	0.000–1.000s	0.001s	0.040s	☆
A3-26	S-curve fall filter time of set hydraulic pressure	0.000–1.000s	0.001s	0.020s	☆
A3-27	Overshoot suppression detection level	0–2000	1	100	☆
A3-28	Overshoot suppression coefficient	0–3.000	0.001	0.200	☆
A3-29	Pressure loop gain coefficient	0.20–5.00	0.01	1.00	☆
A3-30	Torque upper limit for switchover from pressure mode to speed mode	50.0%–250.0%	0.1%	160.0%	☆
A3-31	Valve opening delay	0.000–1.000s	0.001s	0.020s	☆
A3-32	Slave minimum input	0.0% to A3-34	0.1%	0.0%	☆
A3-33	Corresponding setting of slave minimum input	-100.0%–+100.0%	0.1%	0.0%	☆
A3-34	Slave medium input	A3-32–A3-36	0.1%	0.0%	☆
A3-35	Corresponding setting of slave medium input	-100.0%–+100.0%	0.1%	0.0%	☆
A3-36	Slave maximum input	A3-34 to 100.0%	0.1%	100.0%	☆
A3-37	Corresponding setting of slave maximum input	-100.0%–100.0%	0.1%	100.0%	☆
A3-38	Reserved	-	-	-	☆
A3-39	Pressure holding control gain in multi-pump convergent flow	0.5–8.0	0.1	1.0	☆

Function Code	Name	Setting Range	Min. Unit	Default	Property
Group A4: Hydraulic Control Optimization Parameters					
A4-00	Rotational speed filter time	0–5.000s	0.001s	0.005s	☆
A4-01	Current filter time	0–5.000s	0.001s	0.010s	☆
A4-02	Pressure relief mode	1: Ordinary oil channel 2: Self-relief oil channel	1	0	☆
A4-03	Hydraulic pressure falling rate of self-relief oil channel	0–500	1	130	☆
A4-04	Flow filter time	0–1.000s	0.001s	0.100s	☆
A4-05	PID control mode	0: Auto switchover 1: PID group determined by DI	1	0	☆
A4-06	Flow leakage compensation	0.0%–50.0%	0.1%	0.0%	☆
Group F0: Basic Function Parameters					
F0-00	Model display	1: G type (heavy load) 2: Reserved	1	Model dependent	●
F0-01	Control mode	0: Reserved 1: Closed-loop vector control (CLVC) 2: V/F control	1	1	★
F0-02	Command source selection	0: Operation panel (indicator OFF) 1: Terminal (indicator ON) 2: Communication setting (indicator blinking)	1	0	☆
F0-03	Main frequency source X selection	0: Digital setting (UP/DOWN modification, non-retentive) 1: Digital setting (UP/DOWN modification, retentive) 2: AI1 3: AI2 4: AI3 5: Reserved 6: Multi-speed 7: Reserved 8: Reserved 9: Communication setting	1	1	★
F0-04 to F0-07	Reserved	-	-	-	☆
F0-08	Preset frequency	0.00 to maximum frequency (F0-10)	0.01 Hz	50.00 Hz	☆

Function Code	Name	Setting Range	Min. Unit	Default	Property
F0-09	Rotating direction	0: Same direction 1: Reverse direction	1	0	☆
F0-10	Maximum frequency	50.00–300.00 Hz	1	200.00 Hz	★
F0-11	Source of frequency upper limit	0: Set by F0-12 1: AI1 2: AI2 3: AI3 4: Reserved 5: Communication setting	1	0	★
F0-12	Frequency upper limit	Frequency lower limit (F0-14) to maximum frequency (F0-10)	0.01 Hz	200.00 Hz	☆
F0-13	Upper limit offset	0.00 Hz to maximum frequency (F0-10)	0.01 Hz	0.00 Hz	☆
F0-14	Frequency lower limit	0.00 Hz to frequency upper limit (F0-12)	0.01 Hz	0.00 Hz	☆
F0-15	Carrier frequency	0.5–16.0 kHz	0.1 kHz	Model dependent	☆
F0-16	Carrier frequency adjustment selection	0: Fixed PWM, carrier frequency temperature adjustment invalid 1: Random PWM, carrier temperature adjustment invalid 2: Fixed PWM, carrier temperature adjustment valid 3: Random PWM, carrier temperature adjustment valid	1	2	☆
F0-17	Acceleration time 1	0.0–6500.0s	0.1s	20.0s	☆
F0-18	Deceleration time 1	0.0–6500.0s	0.1s	20.0s	☆
Group F1: Motor Parameters					
F1-00	Motor type selection	0: Common asynchronous motor 1: Variable frequency asynchronous motor 2: PMSM	1	2	★
F1-01	Rated motor power	0.4–1000.0 kW	0.1 kW	Model Dependent	★
F1-02	Rated motor voltage	0–440 V	1 V	Model Dependent	★
F1-03	Rated motor current	0.01–655.35 A	0.01 A	Model Dependent	★

Function Code	Name	Setting Range	Min. Unit	Default	Property
F1-04	Rated motor frequency	0.00 to maximum frequency	0.01 Hz	Model Dependent	★
F1-05	Rated motor rotational speed	0–30000 RPM	1 RPM	Model Dependent	★
F1-06 to F1-10	Reserved	-	-	-	☆
F1-11	Shaft D inductance	0–65535	1	Model Dependent	★
F1-12	Shaft Q inductance	0–65535	1	Model Dependent	★
F1-13	Stator resistance	0–65535	1	Model Dependent	★
F1-14	Unit	00–12	01	Model Dependent	★
F1-15	Back EMF	0–65535 V	1	Model Dependent	★
F1-16	Auto-tuning mode	0: No operation 1: Static auto-tuning 1 (low speed) 2: Dynamic auto-tuning (high speed) 3: Static auto-tuning 2 (low speed)	1	0	★
Group F2: Vector Control Parameters					
F2-00	Speed loop proportional gain 1	0–100	1	60	☆
F2-01	Speed loop integration time 1	0.01–10.00s	0.01s	0.30s	☆
F2-02	Switchover frequency 1	0.00 to F2-05	0.01 Hz	5.00 Hz	☆
F2-03	Speed loop proportional gain 2	0–100	1	60	☆
F2-04	Speed loop integration time 2	0.01–10.00s	0.01s	0.30s	☆
F2-05	Switchover frequency 2	F2-02 to maximum frequency	0.01 Hz	10.00 Hz	☆
F2-06	Slip compensation coefficient	50%–200%	1%	100%	☆
F2-07	Time constant of speed loop filter	0.000–0.100s	0.001s	0.000s	☆
F2-08	Torque control	0: Invalid 1: Valid	1	0	☆

Function Code	Name	Setting Range	Min. Unit	Default	Property
F2-09	Torque upper limit source	0: F2-10 1: AI1 2: AI2 3: AI3 4: Reserved 5: Communication setting Analog input range corresponding to F2-10	1	0	☆
F2-10	Torque upper limit	0.0%–250.0%	0.1%	200.0%	☆
F2-11	Encoder PPR	1–65535	1	1024	★
F2-12	Reserved	-	-	-	★
F2-13	Shaft D current loop Kp	0–65535	1	50	★
F2-14	Shaft D current loop Ki	0–65535	1	50	★
F2-15	Shaft Q current loop Kp	0–65535	1	50	★
F2-16	Shaft Q current loop Ki	0–65535	1	50	★
Group F3: Reserved					

Function Code	Name	Setting Range	Min. Unit	Default	Property
Group F4: Input Terminals					
F4-00	DI1 function selection	0: No function 1: Forward RUN (FWD, pump enabled) 2: Reverse RUN (REV) 3: Three-line control 4: Forward JOG (FJOG) 5: Reverse JOG (RJOG) 6/7: Reserved 8: Coast to stop 9: Fault reset (RESET) 10: Reserved 11: External fault NO input 12: Multi-speed terminal 1 13: Multi-speed terminal 2 14: Multi-speed terminal 3 15: Multi-speed terminal 4 16–47: Reserved 48: Servo pump PID selection terminal 1 49: Servo pump PID selection terminal 2 50: CAN communication enabled 51: Slave pump terminal enabled 52: Switchover from pressure mode to speed mode 53: Slave pump address selection terminal 1 54: Slave pump address selection terminal 2 55: Switchover from injection to pressure holding 56: Fault reset (not allowed at overcurrent)	1	1	★
F4-01	DI2 function selection		1	0	★
F4-02	DI3 function selection		1	9	★
F4-03	DI4 function selection		1	0	★
F4-04	DI5 function selection		1	0	★
F4-05 to F4-14	Reserved		-	-	★
F4-15	DI filter time	1–10	1	4	☆
F4-16	Terminal command mode	0: Two-line 1 1: Two-line 2 2: Three-line 1 3: Three-line 2	1	0	★
F4-17	Reserved	-	-	-	☆
F4-18	AI1 minimum input	-11.00–+11.00 V	0.01 V	0.02 V	☆
F4-19	Corresponding setting of AI1 minimum input	-100.0%–+100.0%	0.1%	0.0%	☆
F4-20	AI1 maximum input	-11.00–+11.00 V	0.01 V	10.00 V	☆

Function Code	Name	Setting Range	Min. Unit	Default	Property
F4-21	Corresponding setting of AI1 maximum input	-100.0%–+100.0%	0.1%	100.0%	☆
F4-22	AI1 filter time	0.000–10.000s	0.001s	0.010s	☆
F4-23	AI2 minimum input	-11.00–+11.00 V	0.01 V	0.02 V	
F4-24	Corresponding setting of AI2 minimum input	-100.0%–+100.0%	0.1%	0.0%	☆
F4-25	AI2 maximum input	-11.00–+11.00 V	0.01 V	10.00 V	☆
F4-26	Corresponding setting of AI2 maximum input	-100.0%–+100.0%	0.1%	100.0%	☆
F4-27	AI2 filter time	0.000s–10.000s	0.001s	0.005s	☆
F4-28	AI3 minimum input	-11.00–+11.00 V	0.01 V	0.02 V	☆
F4-29	Corresponding setting of AI3 minimum input	-100.0%–+100.0%	0.1%	0.0%	☆
F4-30	AI3 maximum input	-11.00–+11.00 V	0.01 V	10.00 V	☆
F4-31	Corresponding setting of AI3 maximum input	-100.0%–+100.0%	0.1%	100.0%	☆
F4-32	AI3 filter time	0.000–10.000s	0.001s	0.000s	☆
F4-33 to F4-42	Reserved	-	-	-	☆
F4-43	AI1 sampling voltage 1	-9.999–+9.999 V	0.001 V	2.000 V	☆
F4-44	AI1 corrected voltage 1	-9.999–+9.999 V	0.001 V	2.000 V	☆
F4-45	AI1 sampling voltage 2	-9.999–+9.999 V	0.001 V	8.000 V	☆
F4-46	AI1 corrected voltage 2	-9.999–+9.999 V	0.001 V	8.000 V	☆
F4-47	AI2 sampling voltage 1	-9.999–+9.999 V	0.001 V	2.000 V	☆
F4-48	AI2 corrected voltage 1	-9.999–+9.999 V	0.001 V	2.000 V	☆
F4-49	AI2 sampling voltage 2	-9.999–+9.999 V	0.001 V	8.000 V	☆
F4-50	AI2 corrected voltage 2	-9.999–+9.999 V	0.001 V	8.000 V	☆
F4-51	AI3 sampling voltage 1	-9.999–+9.999 V	0.001 V	2.000 V	☆

Function Code	Name	Setting Range	Min. Unit	Default	Property
F4-52	AI3 corrected voltage 1	-9.999–+9.999 V	0.001 V	2.000 V	☆
F4-53	AI3 sampling voltage 2	-9.999–+9.999 V	0.001 V	8.000 V	☆
F4-54	AI3 corrected voltage 2	-9.999–+9.999 V	0.001 V	8.000 V	☆
F4-55 to F4-58	Reserved	-	-	-	☆
Group F5: Output Terminals					
F5-00	Reserved	-	-	-	☆
F5-01	Control board relay (T/A1-T/B1-T/C1) function selection	0: No output 1: Servo drive running 2: Fault output 3–5: Reserved 6: Motor overload pre-warning 7: Servo drive overload pre-warning 8–18: Reserved 19: Undervoltage status output 20: Communication setting 21–22: Reserved 23: Double-discharge plunger pump sloping switchover (NO) 24: Hydraulic control NC output 25: Slave pump alarm 26: Injection slop switchover 27: Reserved 28: Business running time reached 29: Business running time not reaching 24 hours	1	2	☆
F5-02	Control board relay (T/A2-T/C2) function selection		1	1	☆
F5-03	Control board relay (T/A3-T/C3) function selection		1	0	☆
F5-04 to F5-09	Reserved	-	-	-	☆

Function Code	Name	Setting Range	Min. Unit	Default	Property
F5-10	AO1 output selection	0: Running frequency 1: Set frequency 2: Output current 3: Output torque 4: Output power 5: Output voltage 6: Reserved 7: AI1 8: AI2 9: AI3 10: Feedback rotational speed (hydraulic control mode) 11: Feedback pressure (hydraulic control mode) 12–16: Reserved	1	10	☆
F5-11	AO2 output selection		1	11	☆
F5-12, F5-13	Reserved	-	-	-	☆
F5-14	AO1 offset coefficient	-100.0%–+100.0%	0.1%	0.0%	☆
F5-15	AO1 gain	-10.00–+10.00	0.01	1.00	☆
F5-16	AO2 offset coefficient	-100.0%–+100.0%	0.1%	0.0%	☆
F5-17	AO2 gain	-10.00–+10.00	0.01	1.00	☆
F5-18 to F5-22	Reserved	-	-	-	☆
Group F6: Reserved					
Group F7: Operation Panel and Display Parameters					
F7-00 to F7-01	Reserved	-	-	-	☆
F7-02	STOP/RESET key function	0: Valid only in operation panel control 1: Stop function valid in terminal control 2: Reset function valid in terminal control 3: Both stop and reset functions valid in terminal control	1	2	☆
F7-03 to F7-05	Reserved	-	-	-	☆
F7-06	Load speed display coefficient	0.0001–6.5000	0.0001	1.0000	☆
F7-07	Heatsink temperature 1	0.0–100°C	1°C	-	●
F7-08	Reserved	-	-	-	●

Function Code	Name	Setting Range	Min. Unit	Default	Property
F7-09	Accumulative running time	0–65535 h	1	-	●
F7-10	Software version 1	-	-	-	●
F7-11	Software version 2	-	-	-	●
Group F8: Auxiliary Functions					
F8-00 to F8-16	Reserved	-	-	-	☆
F8-17	Set accumulative running time	0–65000 h	1 h	0	☆
F8-18	Startup protection selection	0: Disabled 1: Enabled	1	0	☆
F8-19 to F8-21	Reserved	-	-	-	☆
F8-22	Detection of short-circuit to ground upon power-on	0: Disabled 1: Enabled	1	1	☆
F8-23	Action selection upon running time reached	0: Continue to run 1: Stop and report Err26	1	0	☆
F8-24	Software undervoltage threshold	100.0–380.0 V (AC voltage input, multiplied by $\sqrt{3}$ when converted to bus voltage)			
Group F9: Fault and Protection					
F9-00	Motor overload protection selection	0: Disabled 1: Enabled	1	1	☆
F9-01	Motor overload protection gain	0.20–10.00	0.01	1.00	☆
F9-02 to F9-03	Reserved	-	-	-	☆
F9-04	Braking voltage threshold	120%–150% 100% corresponding to 530 V	1%	130%	☆
F9-05 to F9-11	Reserved	-	-	-	☆
F9-12	Input phase loss protection	0: Disabled 1: Enabled	1	1	☆
F9-13	Output phase loss protection	0: Disabled 1: Enabled	1	1	☆
F9-14	Runaway speed deviation	0.50–50.00 Hz	0.01 Hz	10.00 Hz	☆
F9-15	Detection time of runaway fault	0.0s: No detection 0.1s–20.0s	0.1s	10.0s	☆

Function Code	Name	Setting Range	Min. Unit	Default	Property
F9-16	Motor temperature protection	0: Disabled 1: Enabled	1	1	☆
F9-17	Reserved	-	-	-	☆
F9-18	1st fault type	0: No fault 1: Reserved 2: Overcurrent during acceleration (Err02) 3: Overcurrent during deceleration (Err03) 4: Overcurrent at constant speed (Err04) 5: Overvoltage during acceleration (Err05) 6: Overvoltage during deceleration (Err06) 7: Overvoltage at constant speed (Err07) 8: Reserved 9: Undervoltage (Err09) 10: Servo drive overload (Err10) 11: Motor overload (Err11) 12: Phase loss on input side (Err12) 13: Phase loss on output side (Err13) 14: Module overheat (Err14) 15: External device fault (Err15) 16: Communication fault (Err16) 17: Contactor fault (Err17) 18: Current detection fault (Err18) 19: Motor auto-tuning fault (Err19) 20: Reserved 21: Data overflow (Err21) 22: Reserved 23: Short circuit to ground (Err23) 24–25: Reserved Err28: Running time reached Err27: Business running time reached 28–41: Reserved (To be continued)	1	0	●
F9-19	2nd fault type		1	0	●

Function Code	Name	Setting Range	Min. Unit	Default	Property
F9-20	Latest fault type	42: CAN communication interrupted (Err42) 43: Encoder fault during motor auto-tuning (Err43) 44: Speed deviation too large (Err44) 45: Motor overheat (Err45) 46: Pressure sensor fault (Err46) 47-48: Multi-pump parallel run fault (Err47, Err48) 49: Encoder signal fault (Err49) 52: Multi-master fault in multi-pump convergent flow (Err52) 58: Parameter restoration fault (Err58) (End)	1	0	●
F9-21	Frequency upon fault	-	0.01 Hz	-	●
F9-22	Current upon fault	-	0.1 A	-	●
F9-23	Bus voltage upon fault	-	0.1 V	-	●
F9-24	Input terminal state upon fault	-	1	-	●
F9-25	Output terminal state upon fault	-	1	-	●
Group FA: Business Timing Function					
FA-00	1st running time protection password	0–65535	1	0	☆
FA-01	1st timed running time	0 h to FA-03	1 h	0	☆
FA-02	2nd running time protection password	0–65535	1	0	☆
FA-03	2nd timed running time	FA-01 to FA-05	1 h	0	☆
FA-04	3rd running time protection password	0–65535	1	0	☆
FA-05	3rd timed running time	FA-03 to FA-07	1 h	0	☆
FA-06	4th running time protection password	0–65535	1	0	☆
FA-07	4th timed running time	FA-05 to 65535 h	1 h	0	☆

Function Code	Name	Setting Range	Min. Unit	Default	Property
FA-08	Accumulative business running time (hour)	0–65535 h	1 h	0	☆
FA-09	Accumulative business running time (second)	0–65535s	1s	0	☆
A maximum of 4-segment timed running is supported. The relationship among these segments of timed running is: FA-01 < FA-03 < FA-05 < FA-07. Each segment has a protection password. If the timed running time is set to 0, the timing function is disabled. After the timed running time of all segments is reached, the servo drive reports Err28, indicating that the business timing is reached. In this case, you need to disable the timing function or increase the timing time. The set timed running time can be viewed in FA-08 without a password.					
Group FB: Reserved					
Group FC: Multi-point AI Correction Parameters					
FC-00	Multi-point AI enable bit	0: Disabled 1: Enabled for AI1 2: Enabled for AI2 3: Enabled for AI1 and AI2	1	0	☆
FC-01	Multi-point AI1 minimum input	-11.00–+11.00 V	0.01 V	0.02 V	☆
FC-02	Corresponding setting of multi-point AI1 minimum input	-100.0%–+100.0%	0.1%	0.0%	☆
FC-03	Multi-point AI1 inflexion point 1 input	-11.00–+11.00 V	0.01 V	1.00 V	☆
FC-04	Corresponding setting of multi-point AI1 inflexion point 1 input	-100.0%–+100.0%	0.1%	10.0%	☆
FC-05	Multi-point AI1 inflexion point 2 input	-11.00–+11.00 V	0.01 V	2.00 V	☆
FC-06	Corresponding setting of multi-point AI1 inflexion point 2 input	-100.0%–+100.0%	0.1%	20.0%	☆
FC-07	Multi-point AI1 inflexion point 3 input	-11.00–+11.00 V	0.01 V	3.00 V	☆
FC-08	Corresponding setting of multi-point AI1 inflexion point 3 input	-100.0%–+100.0%	0.1%	30.0%	☆
FC-09	Multi-point AI1 inflexion point 4 input	-11.00–+11.00 V	0.01 V	4.00 V	☆

Function Code	Name	Setting Range	Min. Unit	Default	Property
FC-10	Corresponding setting of multi-point AI1 inflexion point 4 input	-100.0%–+100.0%	0.1%	40.0%	☆
FC-11	Multi-point AI1 inflexion point 5 input	-11.00–+11.00 V	0.01 V	5.00 V	☆
FC-12	Corresponding setting of multi-point AI1 inflexion point 5 input	-100.0%–+100.0%	0.1%	50.0%	☆
FC-13	Multi-point AI1 inflexion point 6 input	-11.00–+11.00 V	0.01 V	6.00 V	☆
FC-14	Corresponding setting of multi-point AI1 inflexion point 6 input	-100.0%–+100.0%	0.1%	60.0%	☆
FC-15	Multi-point AI1 inflexion point 7 input	-11.00–+11.00 V	0.01 V	7.00 V	☆
FC-16	Corresponding setting of multi-point AI1 inflexion point 7 input	-100.0%–+100.0%	0.1%	70.0%	☆
FC-17	Multi-point AI1 inflexion point 8 input	-11.00–+11.00 V	0.01 V	8.00 V	☆
FC-18	Corresponding setting of multi-point AI1 inflexion point 8 input	-100.0%–+100.0%	0.1%	80.0%	☆
FC-19	Multi-point AI1 inflexion point 9 input	-11.00–+11.00 V	0.01 V	9.00 V	☆
FC-20	Corresponding setting of multi-point AI1 inflexion point 9 input	-100.0%–+100.0%	0.1%	90.0%	☆
FC-21	Multi-point AI1 inflexion point 10 input	-11.00–+11.00 V	0.01 V	10.00 V	☆
FC-22	Corresponding setting of multi-point AI1 inflexion point 10 input	-100.0%–+100.0%	0.1%	100.0%	☆
FC-23	Multi-point AI1 inflexion point 11 input	-11.00–+11.00 V	0.01 V	10.00 V	☆

Function Code	Name	Setting Range	Min. Unit	Default	Property
FC-24	Corresponding setting of multi-point AI1 inflexion point 11 input	-100.0%–+100.0%	0.1%	100.0%	☆
FC-25	Multi-point AI1 inflexion point 12 input	-11.00–+11.00 V	0.01 V	10.00 V	☆
FC-26	Corresponding setting of multi-point AI1 inflexion point 12 input	-100.0%–+100.0%	0.1%	100.0%	☆
FC-27	Multi-point AI1 inflexion point 13 input	-11.00–+11.00 V	0.01 V	10.00 V	☆
FC-28	Corresponding setting of multi-point AI1 inflexion point 13 input	-100.0%–+100.0%	0.1%	100.0%	☆
FC-29	Multi-point AI1 inflexion point 14 input	-11.00–+11.00 V	0.01 V	10.00 V	☆
FC-30	Corresponding setting of multi-point AI1 inflexion point 14 input	-100.0%–+100.0%	0.1%	100.0%	☆
FC-31	Multi-point AI1 inflexion point 15 input	-11.00–+11.00 V	0.01 V	10.00 V	☆
FC-32	Corresponding setting of multi-point AI1 inflexion point 15 input	-100.0%–+100.0%	0.1%	100.0%	☆
FC-33	Multi-point AI1 inflexion point 16 input	-11.00–+11.00 V	0.01 V	10.00 V	☆
FC-34	Corresponding setting of multi-point AI1 inflexion point 16 input	-100.0%–+100.0%	0.1%	100.0%	☆
FC-35	Multi-point AI1 inflexion point 17 input	-11.00–+11.00 V	0.01 V	10.00 V	☆
FC-36	Corresponding setting of multi-point AI1 inflexion point 17 input	-100.0%–+100.0%	0.1%	100.0%	☆

Function Code	Name	Setting Range	Min. Unit	Default	Property
FC-37	Multi-point AI1 maximum input	-11.00–+11.00 V	0.01 V	10.00 V	☆
FC-38	Corresponding setting of multi-point AI1 maximum input	-100.0%–+100.0%	0.1%	100.0%	☆
FC-39	Multi-point AI2 minimum input	-11.00–+11.00 V	0.01 V	0.02 V	☆
FC-40	Corresponding setting of multi-point AI2 minimum input	-100.0%–+100.0%	0.1%	0.0%	☆
FC-41	Multi-point AI2 inflexion point 1 input	-11.00–+11.00 V	0.01 V	1.00 V	☆
FC-42	Corresponding setting of multi-point AI2 inflexion point 1 input	-100.0%–+100.0%	0.1%	10.0%	☆
FC-43	Multi-point AI2 inflexion point 2 input	-11.00–+11.00 V	0.01 V	2.00 V	☆
FC-44	Corresponding setting of multi-point AI2 inflexion point 2 input	-100.0%–+100.0%	0.1%	20.0%	☆
FC-45	Multi-point AI2 inflexion point 3 input	-11.00–+11.00 V	0.01 V	3.00 V	☆
FC-46	Corresponding setting of multi-point AI2 inflexion point 3 input	-100.0%–+100.0%	0.1%	30.0%	☆
FC-47	Multi-point AI2 inflexion point 4 input	-11.00–+11.00 V	0.01 V	4.00 V	☆
FC-48	Corresponding setting of multi-point AI2 inflexion point 4 input	-100.0–+100.0%	0.1%	40.0%	☆
FC-49	Multi-point AI2 inflexion point 5 input	-11.00–+11.00 V	0.01 V	5.00 V	☆
FC-50	Corresponding setting of multi-point AI2 inflexion point 5 input	-100.0%–+100.0%	0.1%	50.0%	☆
FC-51	Multi-point AI2 inflexion point 6 input	-11.00–+11.00 V	0.01 V	6.00 V	☆

Function Code	Name	Setting Range	Min. Unit	Default	Property
FC-52	Corresponding setting of multi-point AI2 inflexion point 6 input	-100.0%–+100.0%	0.1%	60.0%	☆
FC-53	Multi-point AI2 inflexion point 7 input	-11.00–+11.00 V	0.01 V	7.00 V	☆
FC-54	Corresponding setting of multi-point AI2 inflexion point 7 input	-100.0–+100.0%	0.1%	70.0%	☆
FC-55	Multi-point AI2 inflexion point 8 input	-11.00–+11.00 V	0.01 V	8.00 V	☆
FC-56	Corresponding setting of multi-point AI2 inflexion point 8 input	-100.0%–+100.0%	0.1%	80.0%	☆
FC-57	Multi-point AI2 inflexion point 9 input	-11.00–+11.00 V	0.01 V	9.00 V	☆
FC-58	Corresponding setting of multi-point AI2 inflexion point 9 input	-100.0%–+100.0%	0.1%	90.0%	☆
FC-59	Multi-point AI2 inflexion point 10 input	-11.00–+11.00 V	0.01 V	10.00 V	☆
FC-60	Corresponding setting of multi-point AI2 inflexion point 10 input	-100.0%–+100.0%	0.1%	100.0%	☆
Group FD: Modbus Communication Parameters					
FD-00	Baud rate	0: 300 bit/s 1: 600 bit/s 2: 1200 bit/s 3: 2400 bit/s 4: 4800 bit/s 5: 9600 bit/s 6: 19200 bit/s 7: 38400 bit/s	1	5	☆
FD-01	Data format	0: No check, data format <8,N,2> 1: Even parity check, data format <8,E,1> 2: Odd Parity check, data format <8,O,0>	1	0	☆
FD-02	Local address	0: Broadcast address 1–247	1	1	☆

Function Code	Name	Setting Range	Min. Unit	Default	Property
FD-03	Response delay	0–20 ms	1	2 ms	☆
FD-04	Timeout duration	0.0s: Invalid 0.1–60.0s	0.1s	0.0s	☆
FD-05	Communication protocol	0: Standard Modbus protocol, used for host computer parameter reading/writing and running control 1: Inovance private protocol, used for communication with background oscilloscope	1	1	☆
Group FP: User Password					
FP-00	User password	0–65535	1	0	☆
FP-01	Restore default settings	0: No operation 1: Restore default settings except motor parameters 2: Clear fault records 3: Restore user backup parameters	1	0	☆
FP-02	Motor model code	0–65535	1	0	☆
FP-04	Password for user storage operation	0–65535	1	0	☆
FP-05	User storage mode	0: No operation 1: Store user parameters	1	0	☆
FP-06	Device specifications displayed on operation panel	0–65535	1	0	☆

Warranty Agreement

1. The warranty period of the product is 18 months (refer to the barcode on the equipment). During the warranty period, if the product fails or is damaged under the condition of normal use by following the instructions, Inovance will be responsible for free maintenance.
2. Within the warranty period, maintenance will be charged for the damages caused by the following reasons:

   a. Improper use or repair/modification without prior permission

   b. Fire, flood, abnormal voltage, other disasters and secondary disaster

   c. Hardware damage caused by dropping or transportation after procurement

   d. Improper operation

   e. Trouble out of the equipment (for example, external device)
3. If there is any failure or damage to the product, please correctly fill out the Product Warranty Card in detail.
4. The maintenance fee is charged according to the latest Maintenance Price List of Inovance.
5. The Product Warranty Card is not re-issued. Please keep the card and present it to the maintenance personnel when asking for maintenance.
6. If there is any problem during the service, contact Inovance's agent or Inovance directly.
7. This agreement shall be interpreted by Shenzhen Inovance Technology Co., Ltd.

Shenzhen Inovance Technology Co., Ltd.

Address: Building E, Hongwei Industrial Park, Liuxian 2nd Road, Baocheng 70th Zone, Bao'an District, Shenzhen P.C.: 518101

Website: www.inovance.cn

Product Warranty Card

Customer information	Company address:	
	Company name: P.C.:	Contact person:
		Tel.:
Product information	Product model:	
	Product barcode (Attach here):	
	Name of agent:	
Failure information	(Maintenance time and content): Maintenance personnel:	

Innovation+ Advance

Shenzhen Inovance Technology Co.,LTD.
Address: Building E, Hongwei Industrial Park, Liuxian 2nd Road, Baocheng
70th Zone, Bao'an District, Shenzhen 518101, P.R. China
Tel: +86-755-2979 9595
Fax: +86-755-2961 9897
Technical support: 400-777-1260
http://www.inovance.cn