Inovance

inovA automation Monarch

Advanced User Guide

IS580 Series Hydraulic Servo Drive

Closed Loop Pressure and Flow Control

A00
Data Code：19010433

Please Read This Important Information

Inovance Technology designs and manufactures the IS580 Series of servo drives for the industrial automation market and is committed to a policy of continuous product development and improvement.

The product is supplied with the latest version software and the contents of this guide are correct at the time of printing. If there is any doubt with regards to the software version or the guide contents, please contact Inovance Technology or the Authorised Distributor.

Inovance Technology accepts no liability for any consequences resulting from negligent or incorrect installation or parameter adjustment of the servo drive, including mismatching of the servo drive with the motor.

The servo drive is intended as an industrial automation component for professional incorporation into a complete machine or process system. It is the responsibility of the user or machine builder or installation contractor or electrical designer/engineer to take all necessary precautions to ensure that the system complies with current standards, and to provide any devices (including safety components), required to ensure the overall safety of the equipment and personnel. The servo drive, under no circumstances, be considered as a safety device. If in doubt, please contact Inovance Technology or the Authorised Distributor.

Please read this guide before starting work on the servo drive. Only qualified personnel with relevant training and experience should be allowed to work on the servo drive as high voltages (including DC voltage) exists within the servo drive, even after power OFF. Strict adherence to this instruction is required to ensure a high level of safety. If in doubt, please consult with Inovance Technology or the Authorised Distributor.

Contents

Safety Information and Precautions

Warnings, Cautions and Notes

WARNING

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

CAUTION

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

Note

A Note contains information which helps to ensure correct operation.

Electrical Safety

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

Machine/System Design and Safety of Personnel

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

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

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

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

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

Working Environment and Handling

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

Electrical Installation - Safety

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

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

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

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

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

Factors in determining leakage current:

• Size of the servo drive

• Servo drive carrier frequency

• Motor cable type and length

• EMI/RFI filter

For more information, contact Inovance.

Complying with Local Regulations

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

2014/35/EU: Low Voltage Directive

2014/30/EU: Electromagnetic compatibility

Adjusting Servo Drive Parameters

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

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

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

1. Product Information

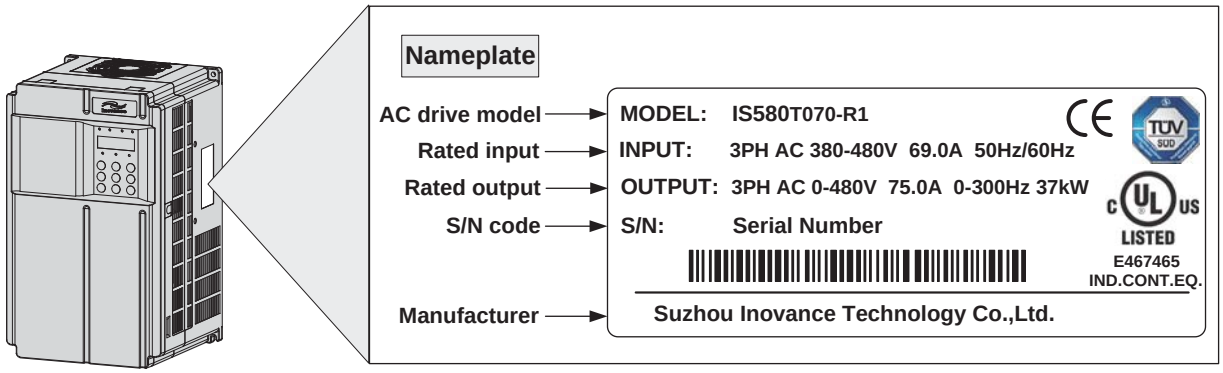
Chapter 1 Product Information

Safety Information	
CAUTION	• Do not lift/carry the drive by carrying the front cover. Failure to comply may result in personal injury. • Follow proper electrostatic discharge (ESD) procedures when operating the drive. Failure to comply will risk damaging the internal circuit of the drive.

1.1 Product Type Identification

Each model in the range of the drive systems has a model number that identifies important characteristics and specifications for that particular unit.

Figure 1-1 Product type identification



IS580 **T** **070** **-R1**

IS580 series hydraulic servo drive

Mark	Version
Blank	Variant 1
-INT	Variant 2

Mark	Voltage Class
T	Three-phase 380 to 480 V
-2T	Three-phase 220 V

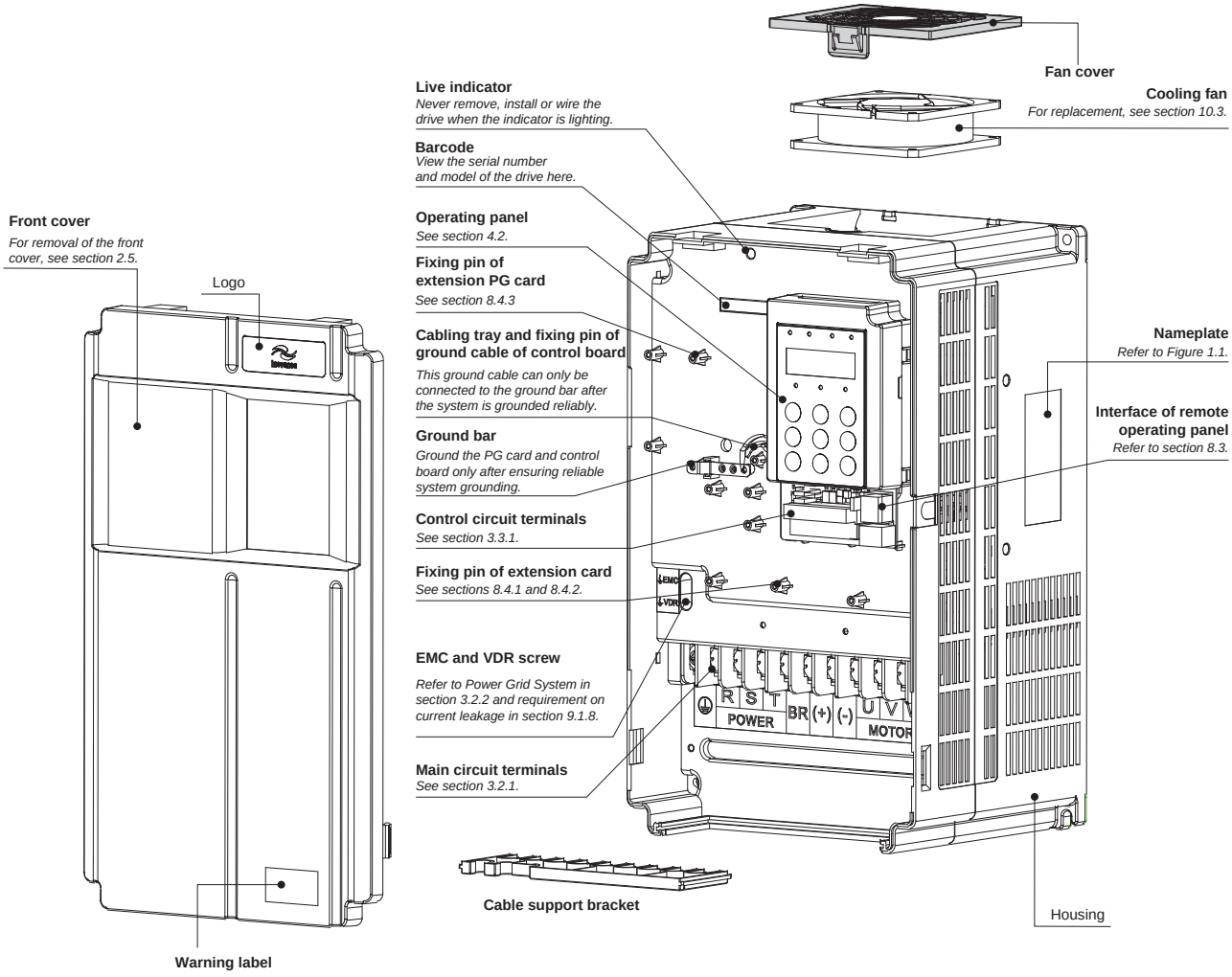
Mark	Type of PG card
-R1	Resolver (S58-PG-B1)
-D	Differential ABZ encoder (MD38PGMD)

Mark	20	30	35	···	300	···
Rated output current(A)	25	32	37	···	304	···

1.2 Internal View of IS580

The drive can have either a plastic housing or a sheet metal housing, depending on the power rating.

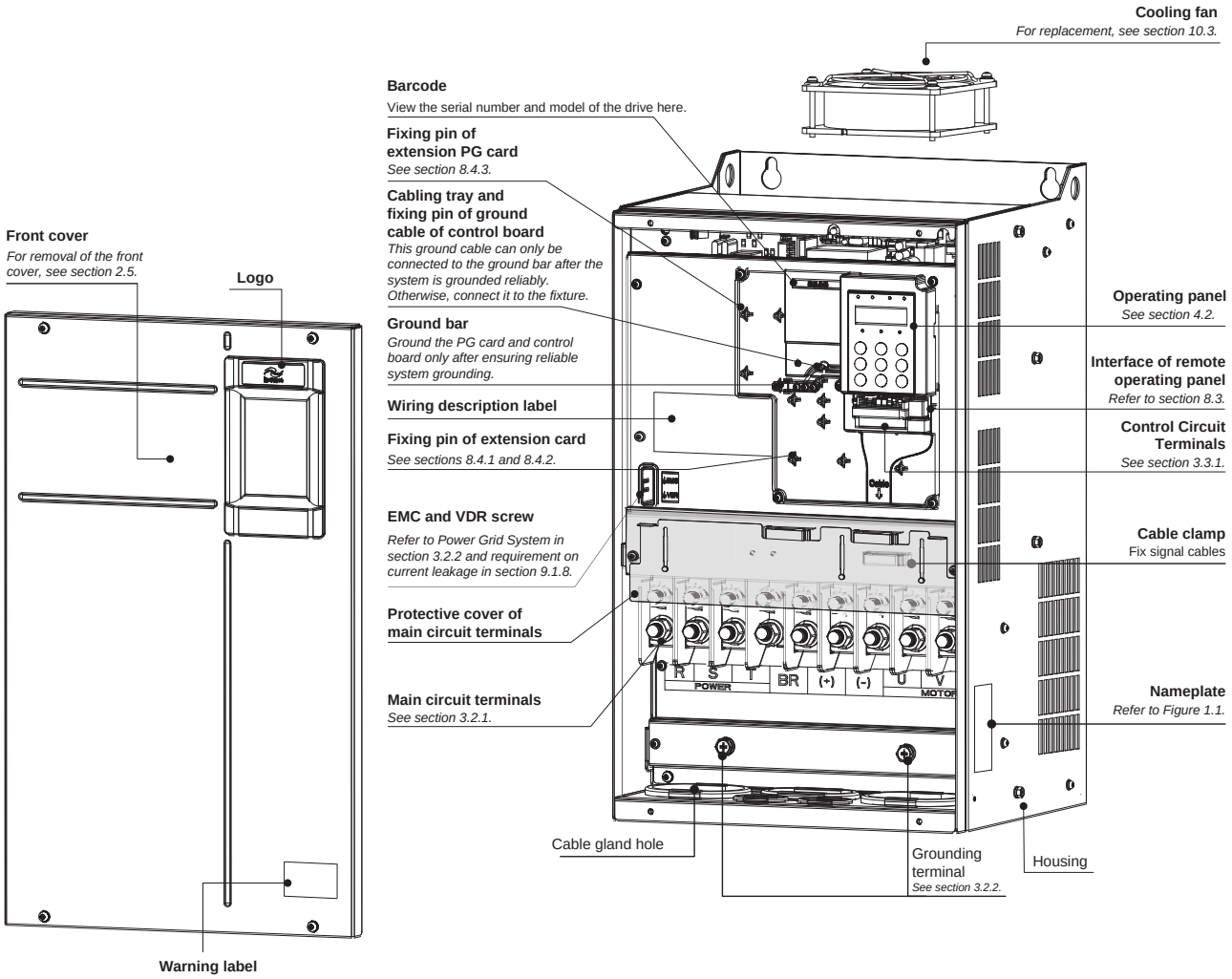
Figure 1-2 Internal view of IS580T020-R1-T to IS580T040-R1-T, IS580T020-R1 to IS580T070-R1 and IS580-2T020-R1 to IS580-2T070-R1 (plastic housing)



Read the user guide of the servo drive carefully before installation or operation.

Do not remove the front cover while the power is on or within10 minutes after the power is turned off.
Wait for a period of 10 minutes after the servo drive is powered off before starting any repair, maintenance or wiring work .

Figure 1-3 Internal view of IS580T080-R1 to IS580T300-R1 and IS580-2T080-R1 to IS580-2T300-R1 (sheet metal housing)



Read the user guide of the servo drive carefully before installation or operation.

Do not remove the front cover while the power is on or within10 minutes after the power is turned off.
Wait for a period of 10 minutes after the servo drive is powered off before starting any repair, maintenance or wiring work .

1.3 Ratings

Table 1-1 IS580 ratings

Voltage class		Three-phase 380 to 480 VAC												
Model: IS580Txxx		020	030	035	040	050	070	080	100	140	170	210	250	300
Drive Output	Rated power, [kW]	11	15	18.5	22	30	37	45	55	75	90	110	132	160
	Rated output current, [A]	25	32	37	45	60	75	91	112	150	176	210	253	304
	Default carrier frequency, [kHz]	6	6	4	4	4	4	4	3	2	2	2	2	2
	Carrier frequency range, [kHz]	1 to 8												
	Overload capacity	150% for 60 sec & 180% for 2 sec												
	Max. output voltage	Three-phase 380 to 480 VAC (proportional to input voltage)												
	Max. output frequency	300 Hz												
Drive Input	Rated input voltage	Three-phase 380 to 480v, -15% to +10%												
	Rated input current, [A]	36.3	45.1	49.5	59	57	69	89	106	139	164	196	240	287
	Rated input frequency	50/60 Hz, ±5%												
Power capacity, [kVA]		30	39	45	54	52	63	81	97	127	150	179	220	263
Braking Resistor	Recommended power, [kW]	0.8	1	1.3	1.5	2.5	3.7	4.5	5.5	7.5	9	5.5 x 2	6.5 x 2	16
	Min. Resistance, [Ω]	43	32	25	22	16	16	16	16	12	8	12 x 2	8 x 2	2.5
Enclosure		IP20												

Note	[1] : Current derating is required in order to raise the carrier frequency.

Voltage class		Three-phase 220 VAC										
Model: IS580-2Txxx		020	030	040	050	070	080	100	140	170	210	300
Drive Output	Rated power, [kW]	5.5	7.5	11	15	18.5	22	30	37	45	55	80
	Rated output current, [A]	25	32	45	60	75	91	112	150	176	210	304
	Default carrier frequency, [kHz]	6	6	4	4	4	4	4	3	2	2	2
	Carrier frequency range, [kHz]	1 to 8										
	Overload capacity	150% for 60 sec & 180% for 2 sec										
	Max. output voltage	Three-phase 220 VAC (proportional to input voltage)										
	Max. output frequency	300 Hz										
Drive Input	Rated input voltage	Three-phase 220 V										
	Rated input current, [A]	36.3	45.1	59	57	69	89	106	139	164	196	287
	Rated input frequency	50/60 Hz, ±5% rated input frequency										
Power capacity, [kVA]		30	39	54	52	63	81	97	127	150	179	263
Braking Resistor	Recommended power, [kW]	0.8	1.0	1.5	2.5	3.7	4.5	5.5	7.5	9	11	8 x 2
	Min. Resistance, [Ω]	22	16	11	8	8	8	6	6	4	4	6 x 2
Enclosure		IP20										

Note	[1] : Current derating is required in order to raise the carrier frequency.

1.4 Technical Specifications

Table 1-2 Technical specifications of IS580

Item		Description
Standard functions	Input frequency resolution	Digital setting: 0.01 Hz Analog setting: Max. frequency x 0.025%
	Control mode	Sensorless vector control (SVC) Feedback vector control (FVC) Voltage/Frequency (V/F) control
	Startup torque	● 0.25 Hz/150% (SVC) ● 0 Hz/180% (FVC)
	Speed range	● 1:200 (SVC) ● 1:1000 (FVC)
	Speed stability accuracy	● ±0.5% (SVC) ● ±0.02% (FVC)
	Torque control accuracy	● ±5% for 10 Hz above (SVC) ● ±3% (FVC)
	Torque boost	Customized boost 0.1 % to 30.0 %
	V/F curve	Straight-line V/F curve
	Ramp mode	● Straight-line ramp ● S-curve ramp Four separate acceleration/deceleration time settings in the range of 0s to 6500s.
	DC injection braking	DC injection braking frequency: 0 Hz to max. frequency DC injection braking active time: 0.0s to 36.0s. Current level of DC injection braking: 0.0% to 100.0%.
	Jog running	Frequency range of jog running: 0.00 to 50.00 Hz Acceleration/Deceleration time of jog running:0.0s to 6500.0s
	Onboard PID	The system implements the proportional-integral-derivative (PID) function in the closed-loop control.
	Automatic voltage regulation (AVR)	The system maintains a constant output voltage automatically when the grid voltage changes through the permissible range.
	Voltage limit and Current limit control	The system limits the output current and voltage automatically during operation to prevent frequent or excessive trips.

Item		Description
Individualized functions	Overcurrent fast prevention	The function helps to avoid frequent overcurrent faults.
	Multiple field buses	The drive supports three field buses: ● Modbus-RTU ● CANlink ● CANopen
	Motor overheat protection	Option: The optional input/output (I/O) extension card allows AI3 to receive a signal from the motor temperature sensor input (PT100, PT1000) to implement motor overheat protection.
	Multiple encoder types	The drive supports a range of different encoder types: ● Differential encoder ● Resolver
	Advanced background software	Software in the drive allows users to configure some operating parameters, and provides a virtual oscilloscope display that shows system status.
RUN	Command source	Allows different methods of switching between command sources: ● Operating panel (keypad & display) ● Terminal I/O control ● Serial communication
	Frequency reference setting channel	Supports up to 10 frequency reference setting channels and allows different methods of switching between frequency reference setting channels: ● Digital setting ● Analog voltage reference ● Analog current reference ● Pulse reference ● Communication reference
	Input terminals	Standard: ● Five digital input (DI) terminals. ● Three analog input (AI) terminals, two of which support only 0 to10 V input, and the other supports 0 to 10 V and 4 to 20 mA current input.
	Output terminals	Standard ● Single digital output (DO) terminal ● Two relay output terminal ● Two analog output (AO) terminals that support either a current output in the range 0 to 20 mA or a voltage output in the range 0 to 10 V.

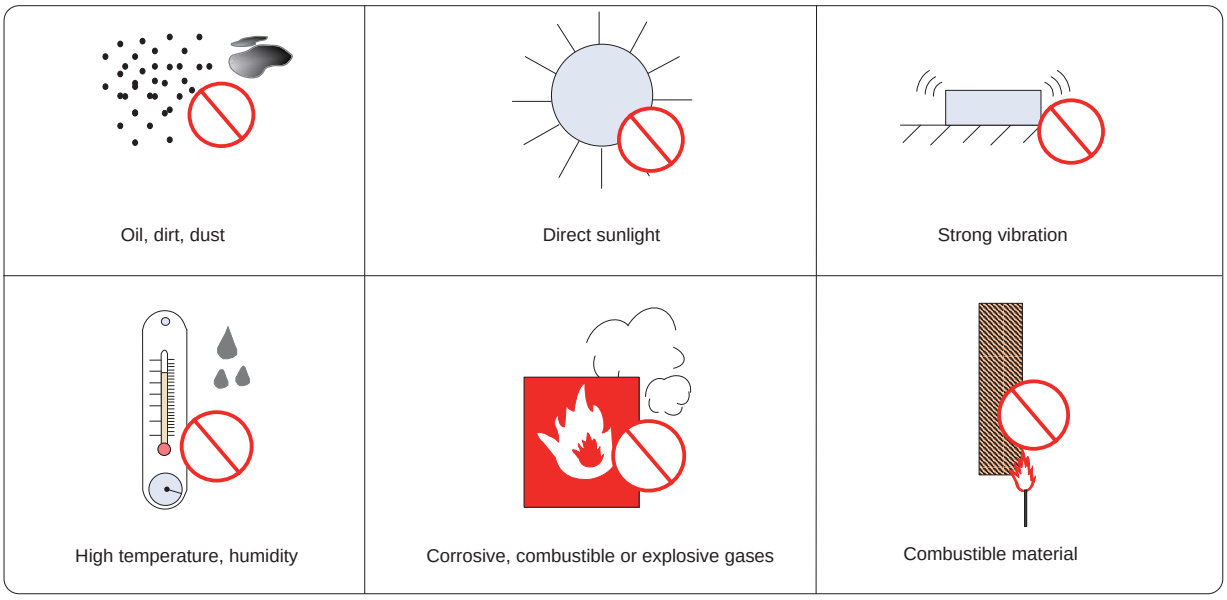
Item		Description
Display and operating panel	LED display	The 6-character LED display shows parameter values.
	Key locking and function selection	● Keys on the control panel can be locked or partially locked electronically to prevent accidental operation. ● The range of some functions can be limited to a permitted range to prevent incorrect settings.
Protections	Phase loss protection	● Input phase loss protection ● Output phase loss protection
	Instantaneous overcurrent protection	Stop when 250% of rated output current is exceeded
	Overvoltage protection	Stop when the main circuit DC voltage is above 820 V
	Undervoltage protection	Stop when the main circuit DC voltage is below 350 V
	Overheat protection	Protection triggered when the inverter bridge gets overheated.
	Overload protection	Stop after running at 150% of rated current for 60 seconds
	Overcurrent protection	Stop when 2.5 times of rated current of the servo drive is exceeded.
	Braking protection	● Braking unit overload protection ● Braking resistor short-circuit protection
	Short-circuit protection	● Output inter-phase short-circuit protection ● Output short-circuit to ground protection
Environment	Installation location	Install the servo drive where it is indoors and protected from direct sunlight, dust, corrosive or combustible gases, oil smoke, vapour, ingress from water or any other liquid, and salt.
	Altitude	Below 1000 m Highest altitude: 3000 m If the altitude exceeds 1000 m, de-rate the drive 1% per 100 meters.
	Ambient temperature	–10°C to +40°C If the ambient temperature is not in this range, rated output current must be de-rated for 1.5% per 1°C temperature rise. Permissible maximum temperature is 50°C.
	Humidity	Less than 95% RH non-condensing.
	Vibration	Less than 5.9 m/s² (0.6 g).
	Storage temperature	–20°C to +60°C

2. Mechanical Installation

Chapter 2 Mechanical Installation

2.1 Installation Environment

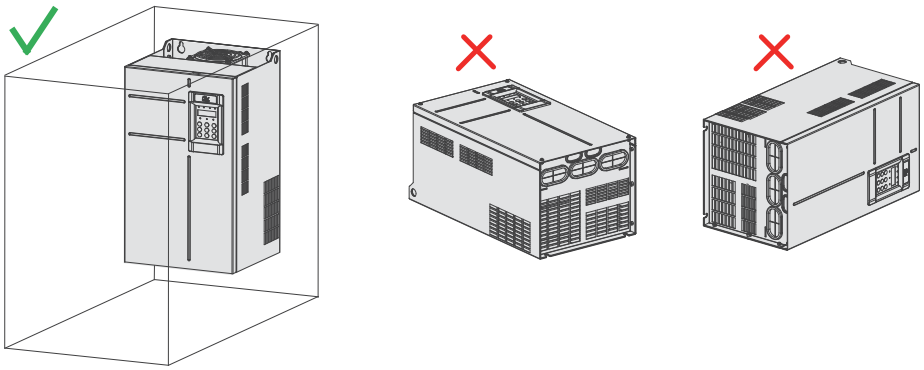
Item	Requirements
Working temperature	The permissible working temperature is -10°C to 40°C in the close vicinity of the servo drive. De-rating of the servo drive is required if operating continuously above 40°C.
Cooling and ventilation	Install the servo drive on a backplate, and ensure there is sufficient space around the enclosure to allow for efficient heat dissipation. For details, see *2.2 Mounting Orientation and Clearance*.
Mounting location	Ensure the mounting location is: • Away from direct sunlight • In an area where humidity is 95% RH or less with no condensation • Protected against corrosive, combustible or explosive gases and vapours • Free from oil, dirt, dust or metallic powders.
Vibration	Ensure the mounting location is not affected by levels of vibration that exceeds 0.6 g. Avoid installing the enclosure near punching machines or other mechanical machinery that generates high levels of vibration or mechanical shock.
Protective enclosure	The servo drive must be installed in a nonconbustible cabinet that provides effective electrical and mechanical protection for CE requirements. Installation must conform to local and regional laws and regulations, and to relevant IEC requirements.



2.2 Mounting Orientation and Clearance

■ Mounting Orientation

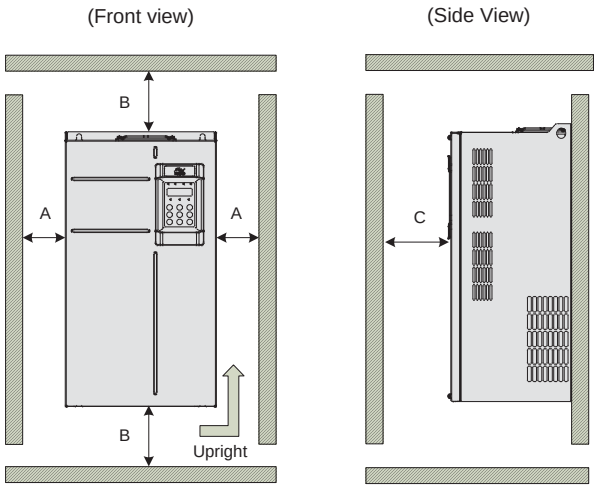
Always mount the servo drive in an upright position.



■ Mounting Clearance

The mechanical clearance varies with the power ratings of the servo drive.

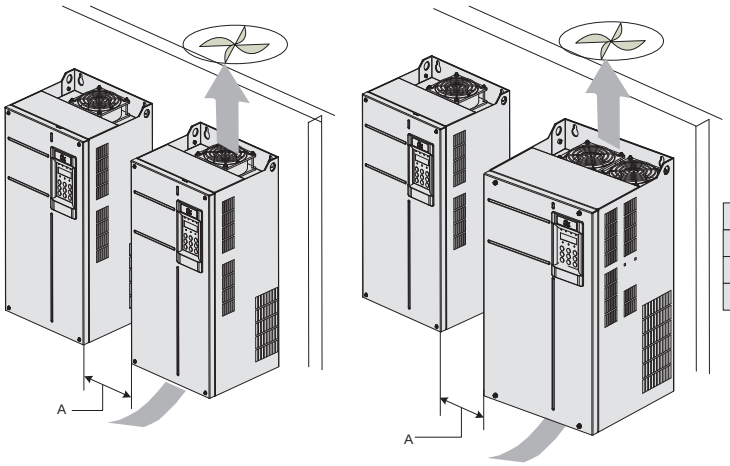
Figure 2-1 Correct mounting clearance



Power Rating	Clearance Requirements		
18.5 to 22 kW	A ≥ 10 mm	B ≥ 200 mm	C ≥ 40 mm
30 to 37 kW	A ≥ 50 mm	B ≥ 200 mm	C ≥ 40 mm
45 to 160 kW	A ≥ 50 mm	B ≥ 300 mm	C ≥ 40 mm

The servo drive is designed with the cooling air flow direction from bottom to top. When installing several servo drives within a cabinet, it is necessary to line up the tops of the drives and allow cooling air clearance "A" as shown in Figure 2-2.

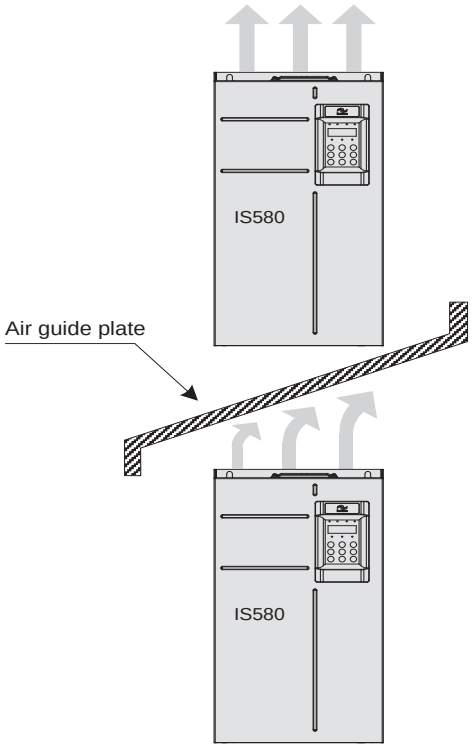
Figure 2-2 Clearance for multi-drive installation



Power Rating	Clearance Requirements
18.5 to 22 kW	A ≥ 10 mm
30 to 37 kW	A ≥ 50 mm
45 to 160 kW	A ≥ 50 mm

Where an servo drive is required to be mounted directly above another servo drive, it is recommended to install an Air Guide Plate to divert exhaust cooling air of the bottom unit away from the top unit.

Figure 2-3 Installation of an air guide plate



2.3 Mounting Dimensions

Figure 2-4 Overall dimensions of IS580T020-R1-T to IS580T040-R1-T, IS580T020-R1 to IS580T070-R1 and IS580-2T020-R1 to IS580-2T070-R1 (plastic housing)

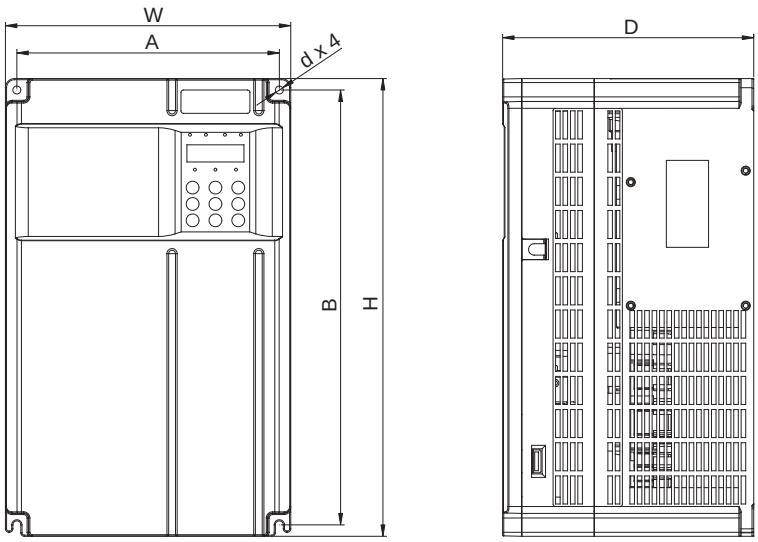


Figure 2-5 Overall dimensions of IS580T080-R1 to IS580T300-R1 and IS580-2T080-R1 to IS580-2T300-R1 (sheet metal housing)

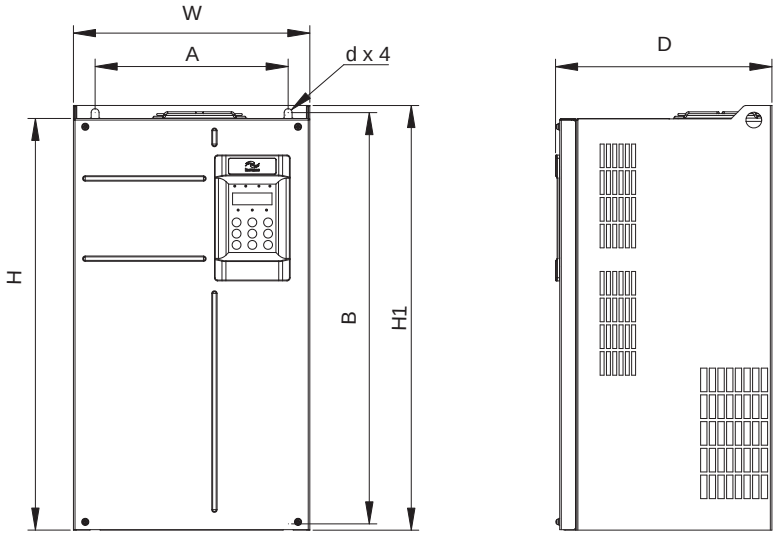


Table 2-1 Mounting dimensions of IS580

IS580 Model	Dimensions (mm)							Weight (kg)	Housing Type
	A	B	H	H1	W	D	d		
IS580T020-R1	195	335	350	-	210	192	Ø6	9.1	Plastic housing
IS580T020-R1-T									
IS580-2T020-R1									
IS580T030-R1									
IS580T030-R1-T									
IS580-2T030-R1									
IS580T035-R1									
IS580T035-R1-T									
IS580T040-R1									
IS580T040-R1-T									
IS580-2T040-R1									
IS580T050-R1	230	380	400	-	250	220	Ø7	17.5	Plastic housing
IS580-2T050-R1									
IS580T070-R1									
IS580-2T070-R1									
IS580T080-R1	245	523	525	542	300	275	Ø10	35	Sheet metal housing
IS580-2T080-R1									
IS580T100-R1									
IS580-2T100-R1									
IS580T140-R1	270	560	554	580	338	315	Ø10	51.5	Sheet metal housing
IS580-2T140-R1									
IS580T170-R1									
IS580-2T170-R1									
IS580T210-R1									
IS580-2T210-R1									
IS580T250-R1	320	890	874	915	400	320	Ø10	85	
IS580T300-R1									
IS580-2T300-R1									

2.4 Installation Method and Procedures

■ Installation Method

The drive units enclosed in a sheet-metal housing (45 kW and above) have weights of 35 kg or more. These units have eye bolts that allow a mechanical hoist to support the weight of the unit during installation. To prevent personal injury or damage to the equipment, you must fit and use these eye bolts to support the drive during installation.

Mounting Method	Applicable Housing	Remark
Backplate mounting	Plastic housing Sheet metal housing	The servo drive is mounted directly on the backplate of the cabinet . It is secured using four screws or bolts at the corners of the backplate.
Through hole mounting	Plastic housing Sheet metal housing	It requires a cut-out in the backplate. The housing must be secured in place by using the through-hole mounting bracket and then be lifted into the cut-out.

2.4.1 Backplate Mounting

Note	It is very important that you identify correct mounting hole locations and diameters of the drive you are installing. And check that you have identified correct dimensions before you start to drill the mounting holes.

The backplate mounting process is as follows:

1. Select a suitable location. See recommendations in *2.1 Installation Environment*.

   CAUTION

   Check that there are no items of equipment, cables or pipes behind mounting surface that might be damaged when you drill mounting holes.

2. Measure and mark the drilling centers for the four mounting holes according to the dimensions for your model of the drive.
3. Carefully drill the four mounting holes at the correct diameter as shown in *Table 2-1* for your model of the drive.
4. If necessary, lift the drive to the installation location. Hold it in correct position until there are fixings in place to secure it safely.
5. Add locking washers and flat washers to the securing bolts or screws, insert them through the four mounting holes in the housing, and tighten them to secure the housing to the backplate.

Figure 2-6 Backplate-mounted installation of a plastic housing

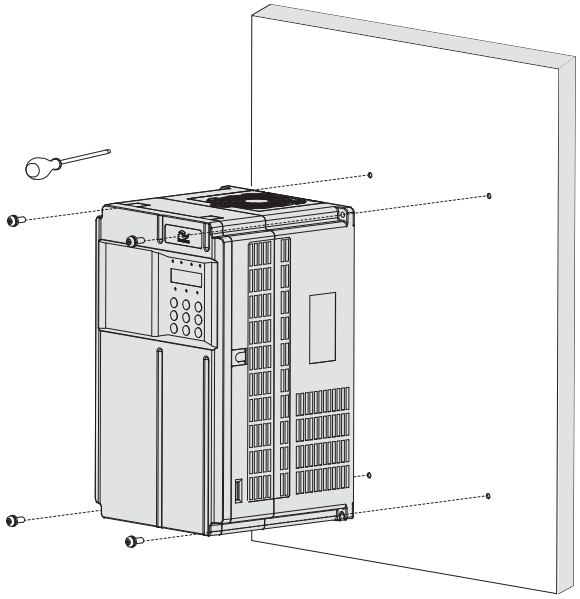
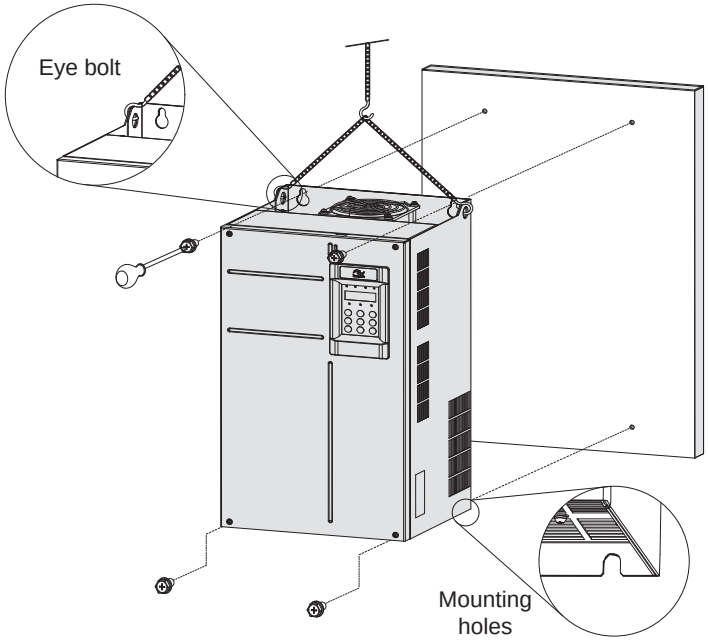


Figure 2-7 Backplate-mounted installation of a sheet metal housing



2.4.2 Through Hole Mounting

There are three stages in process of preparing a through hole mounting for the servo drive.

■ Stage 1: Installing the through-hole mounting bracket

CAUTION

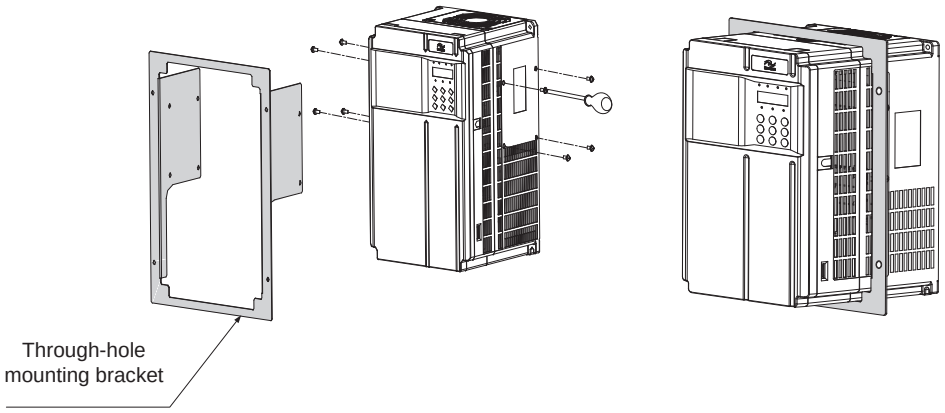
- The servo drive enclosed in a sheet-metal housing have weights of 35 kg or more. These units have eye bolts that allow a mechanical hoist to support the weight of the unit during installation. To prevent personal injury or damage to the equipment, you must fit and use these eye bolts to support the drive during installation.
- Always use suitable help to carry, move or support heavy drive housings. The sheet-metal housings are heavy, and you risk personal injury or damage to equipment if you attempt to carry, move or support them without help.

- Lay the drive housing on a strong, flat surface with control panel facing upwards.
- Fit the supplied through-hole mounting brackets to the housing:

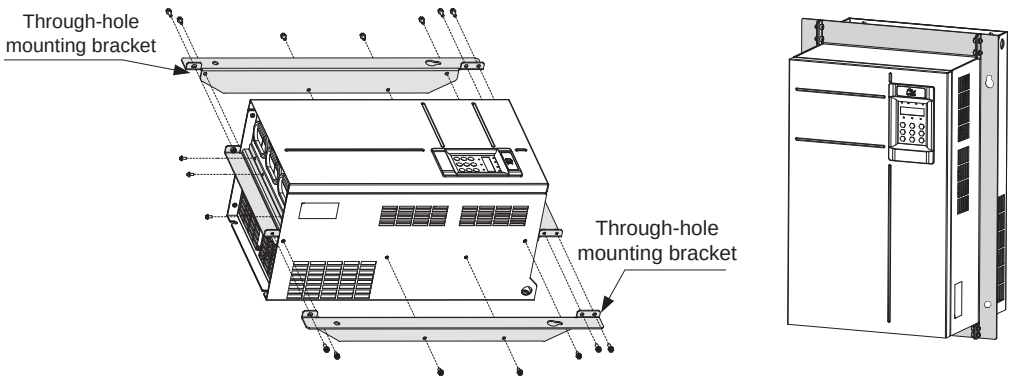
  Fit brackets in correct orientation, depending on whether you are pushing the housing through the front or from the rear of the supporting surface.

  For sheet metal housing, use the two supplied eye bolts to secure the bracket to the top of the housing.

Through-hole mounting bracket installation for a plastic housing



Through-hole mounting bracket installation for a sheet metal housing



- Ensure all screws and bolts that secure the brackets to the housing are tight.

Note	The through-hole mounting bracket is an option. For dimensions, refer to the chart in *8.5 Through-hole Mounting Bracket*.

■ Stage 2: Preparing the Backplate for Hole Cut-out

- Refer to *Table 2-1* to identify your model of the drive housing, and make a careful note of the following dimensions:
- Mounting hole distances A and B
- Mounting hole diameter d
- Overall dimensions of the housing H and W
- Mark the backplate to identify the centers of the four mounting holes.
- Mark an outline for the cut-out by using the dimensions H and W. Ensure the cut-out is centred with respect to the mounting holes.
- Carefully drill the four mounting holes.
- Carefully cut a rectangular cut-out hole in the supporting surface according to the markings you made in step 6.
- Prepare edges of the cut-out to remove sharp edges and burrs.

■ Stage 3: Installing the Servo Drive into the Hole Cut-out

- Lift the servo drive into the cut-out you have prepared.

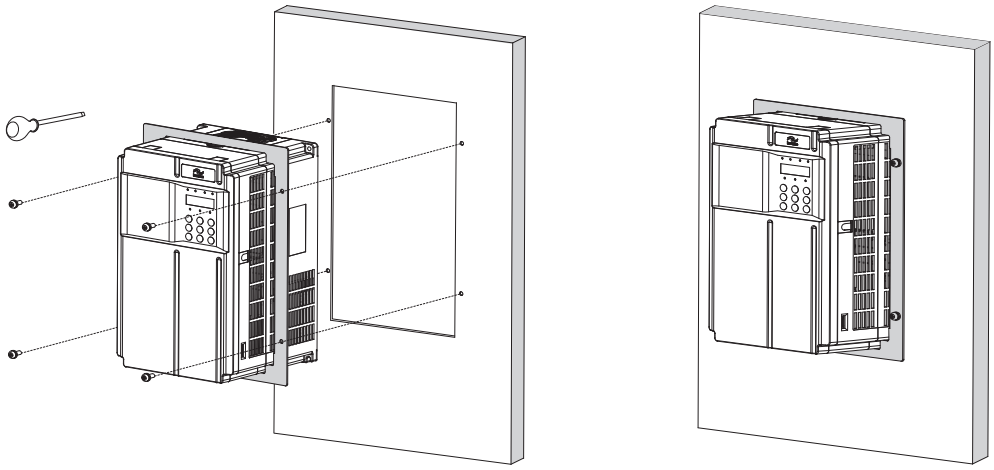
  Insert the servo drive from the correct side of the mounting surface, depending on whether you are using a front-mounting or a rear-mounting arrangement.

CAUTION

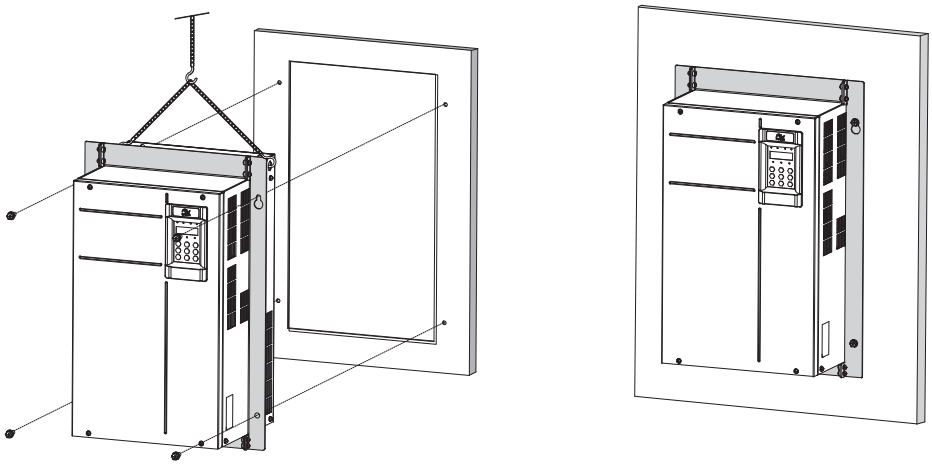
For the sheet metal housing, use a mechanical lift/device to support the housing in its mounting location until you have fixed it in place.

- Insert securing screws/bolts in the brackets, and secure the servo drive to the backplate.

Through hole installation of a plastic housing



Through hole installation of a sheet metal housing



■ Through-hole Mounting Bracket Models

Through-hole Mounting Bracket Model	Applicable IS580 Model			Bracket Dimensions
MD500-AZJ-A1T5	IS580T020-R1	IS580-2T020-R1	IS580T020-R1-1	Refer to *8.5 Through-hole Mounting Bracket.*
	IS580T030-R1	IS580-2T030-R1	IS580T030-R1-1	
	S580T035-R1	-	S580T030-R1-T	
	IS580T040-R1	IS580-2T040-R1	IS580T040-R1-T	
MD500-AZJ-A1T6	IS580T050-R1	IS580-2T050-R1	-	
	IS580T070-R1	IS580-2T070-R1	-	
MD500-AZJ-A1T7	IS580T080-R1	IS580-2T080-R1	-	
	IS580T100-R1	IS580-2T100-R1	-	
MD500-AZJ-A1T8	IS580T140-R1	IS580-2T140-R1	-	
	IS580T170-R1	IS580-2T170-R1	-	
	IS580T210-R1	IS580-2T210-R1		
	IS580T250-R1	-	-	
	IS580T300-R1	IS580-2T300-R1		

2.5 Remove and Refit the Front cover

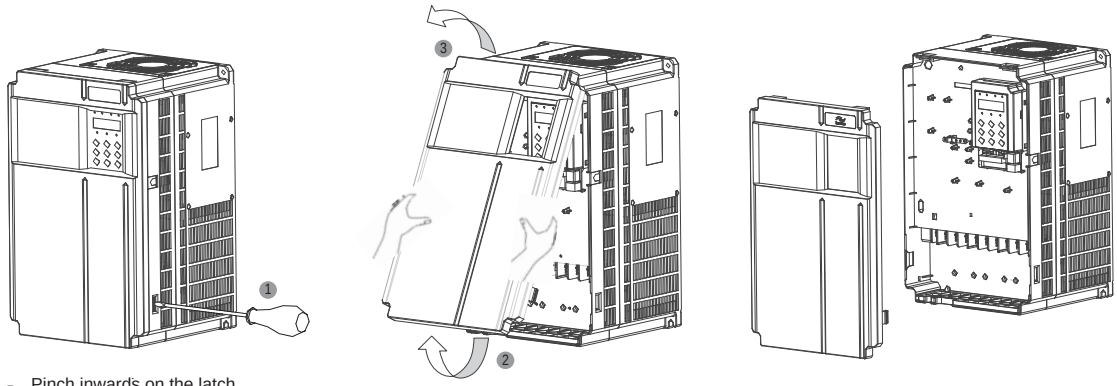
You must remove the front cover before performing electrical installation

WARNING

- Ensure the drive power-off time exceeds 10 minutes before removing the cover.
- Be careful when removing the front cover. A falling cover may cause damage to the drive or personal injury.

■ Remove and Refit the Front Cover of a Plastic Housing

Removal

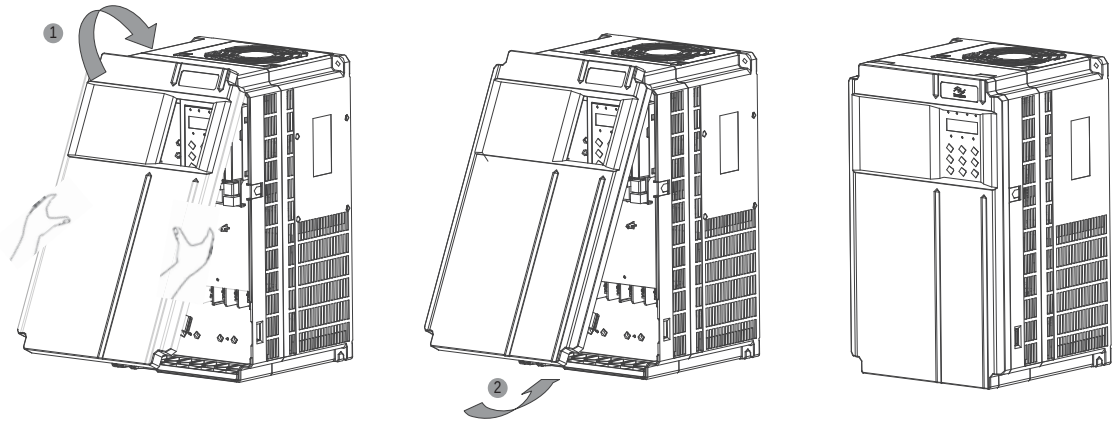


1 Pinch inwards on the latch on both sides of the cover to release the cover .

2 Hold the lower part of the front cover.

3 Lift the front cover.

Refitting



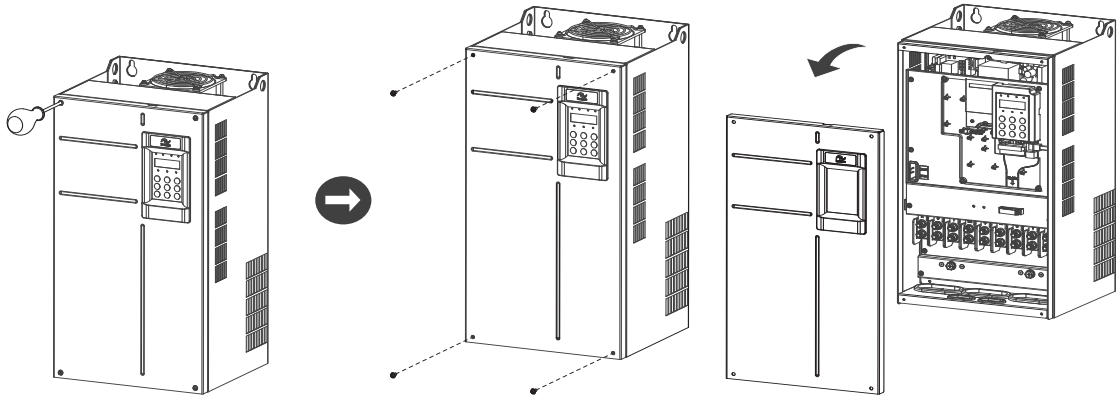
1 Locate the cover top at its fixing position.

2 Align the front cover to the drive and push it down in the arrow direction until the side latches are in place.

■ Remove and Refit the Front cover of a Sheet Metal Housing

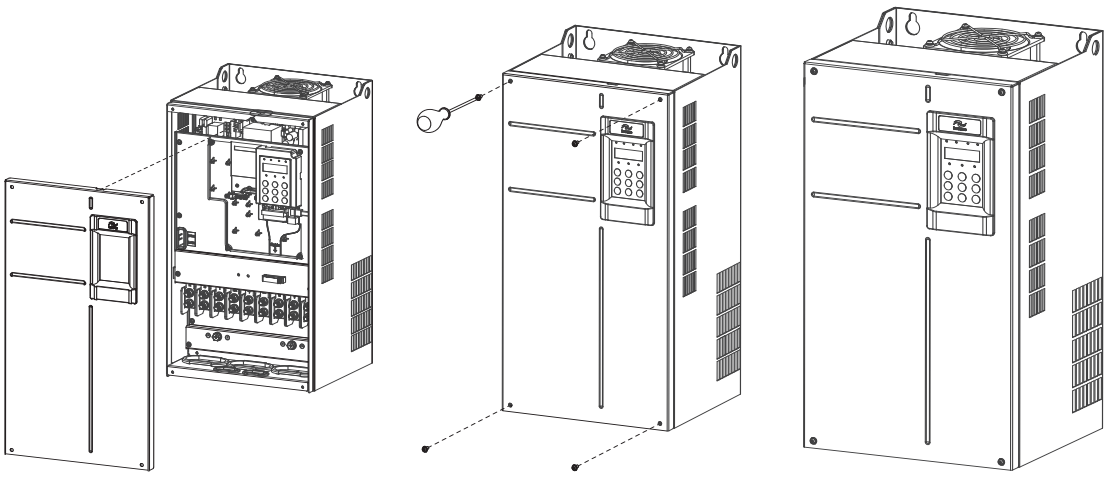
Removal

Loosen four screws from the front cover, and then remove the front cover.



Reattaching

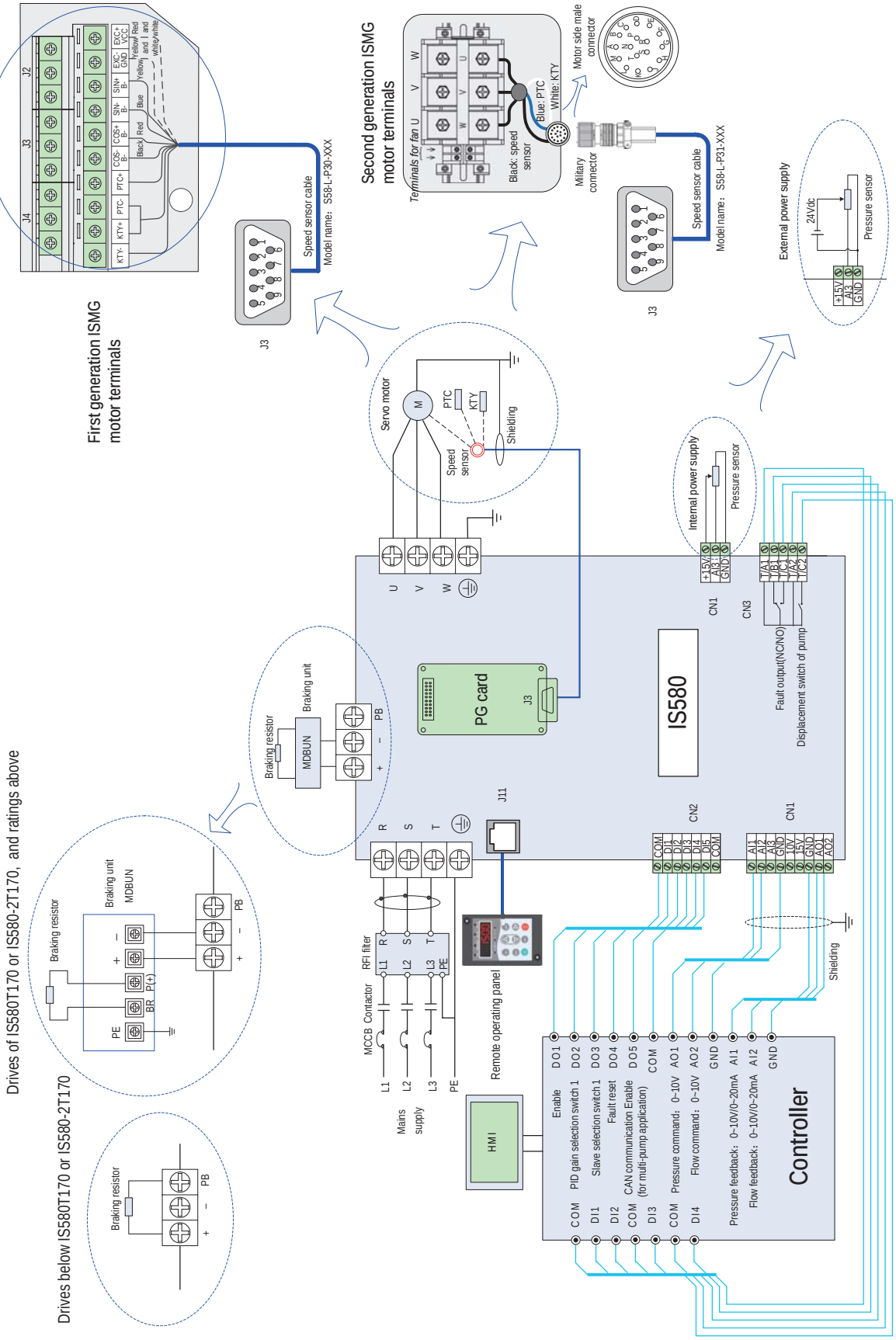
Locate and align the fixing hook at the top of the cover and secure the four screws.



3. Electrical Installation

Chapter 3 Electrical Installation

3.1 Typical System Connection



3.2 Main Circuit Wiring

3.2.1 Main Circuit Terminals

Figure 3-1 Terminals of IS580T020 to IS580T040, IS580T020-T to IS580T040-T and IS580-2T020 to IS580-2T040

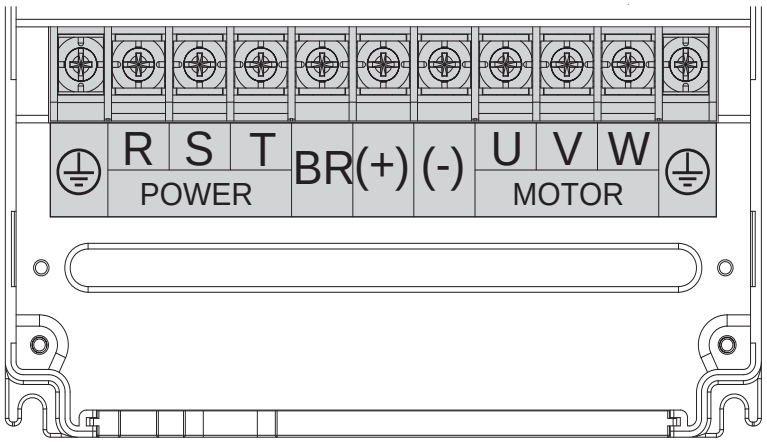


Figure 3-2 Terminals of IS580T050 to IS580T070 and IS580-2T050 to IS580-2T070

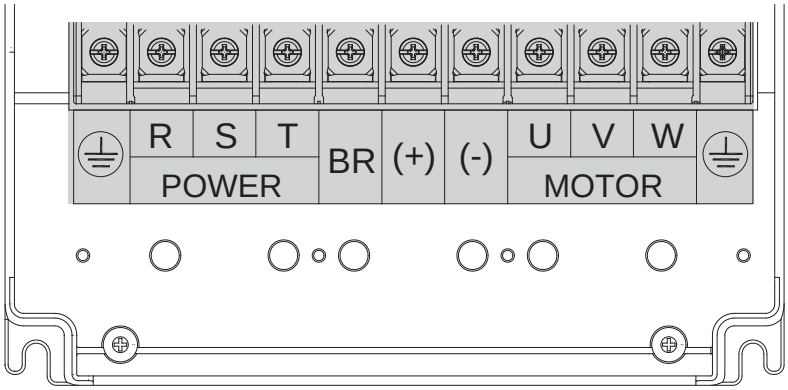


Figure 3-3 Terminals of IS580T080 to IS580T100 and IS580-2T080 to IS580-2T100

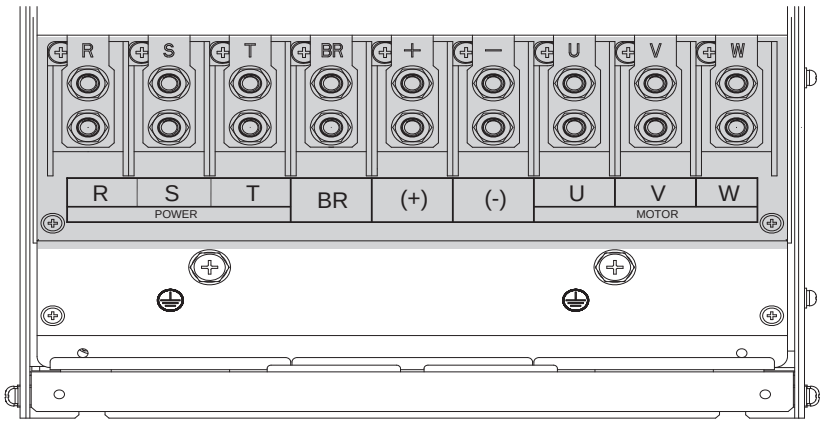
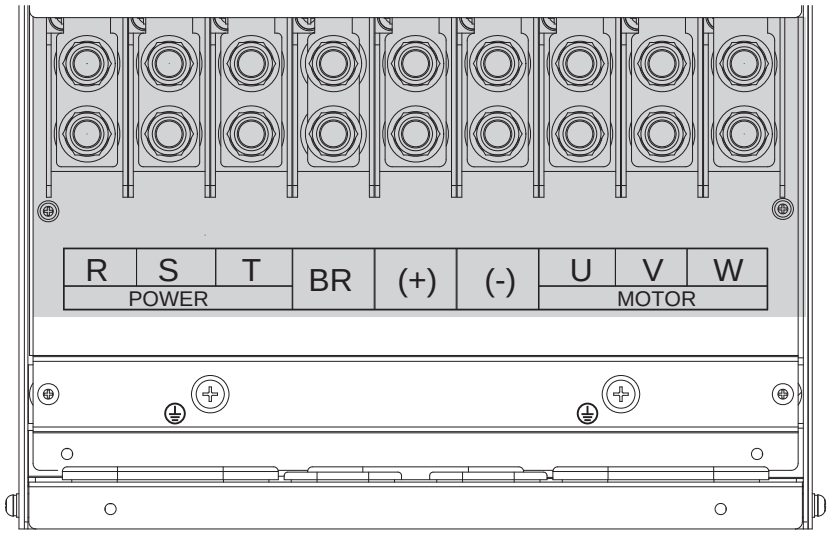


Figure 3-4 Terminals of IS580T140 to IS580T300 and IS580-2T140 to IS580-2T300



Terminal	Terminal name	Description
R, S, T	Three-phase supply input	Connect to the three-phase ac power supply.
(-), (+)	DC bus terminals	Connected to external braking unit (MDBUN) with servo drive units of 90 kW and above.
BR, (+)	Braking resistor connection	Connected to external braking resistor for servo drive units of 75 kW and below.
U, V, W	Output terminals	Connect to a three-phase motor.
⏚	Ground (PE)	Grounding connection.

■ Cable Dimensions and Tightening Torque

Note	
	• Data and models recommended in this section are for reference only. The user selected cable diameter must not be larger than the terminal width in the following figures. • Selection of IEC cables is based on: – Standards EN 60204-1 and IEC 60364-5-52 – PVC insulation – 40°C ambient temperature and 70°C surface temperature – Symmetrical cable with copper mesh shield – A maximum of 9 cables are allowed in a cable tray. • For North America, the recommended cables in the preceding table must be copper wires rated 600 V, 75°C.

Figure 3-5 Terminal dimensions of IS580T020-R1/IS580T040-R1, IS580T020-R1-T/IS580T040-R1-T and IS580-2T020-R1/IS580-2T040-R1

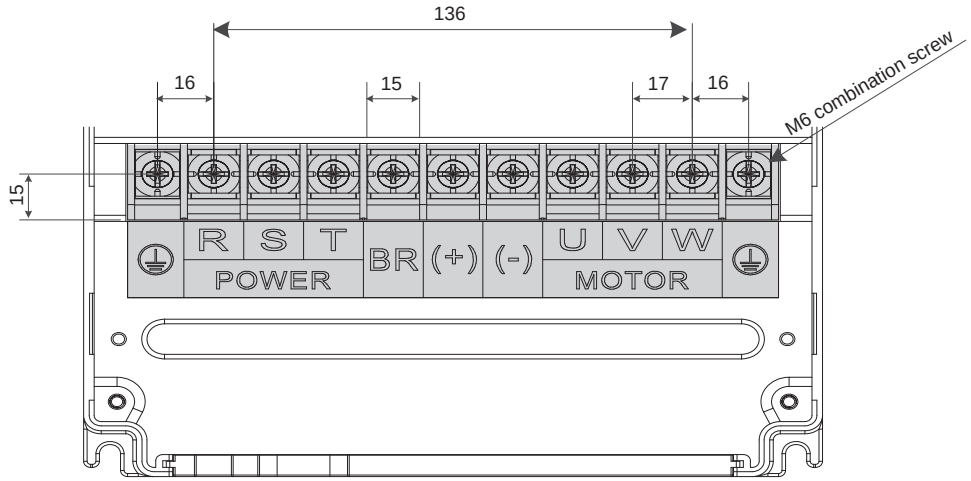


Table 3-1 Recommended cable dimensions and tightening torque of IS580T020-R1/IS580T040-R1 and IS580-2T020-R1/IS580-2T040-R1

Servo Drive Model	Rated Input Current (A)	Power Input/Output Cable	Crimp Terminal Model	Ground Cable	Crimp Terminal Model	Tightening Torque (N·m)	Screw Spec.
IS580T020-R1	49.5	3 x 6 mm^2	8-6	6 mm^2	8-6	4.0	M6
IS580-2T020-R1		3 x 8 AWG		8 AWG			
IS580T040-R1	59	3 x 16 mm^2	14-6	16 mm^2	8-6	4.0	M6
IS580-2T040-R1		3 x 4 AWG		8 AWG			

Figure 3-6 Terminal dimensions of IS580T050-R1/IS580T070-R1 and IS580-2T050-R1/IS580-2T070-R1

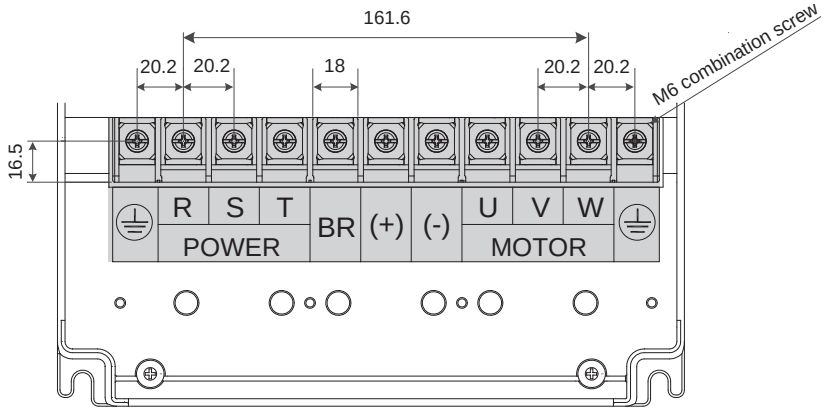


Table 3-2 Recommended cable dimensions and tightening torque of IS580T050-R1/IS580T070-R1 and IS580-2T050-R1/IS580-2T070-R1

Servo Drive Model	Rated Input Current (A)	Power Input/Output Cable	Crimp Terminal Model	Ground Cable	Crimp Terminal Model	Tightening Torque (N·m)	Screw Spec.
IS580T050-R1	57	3 x 16 mm^2	14-L6	16 mm^2	8-6	4.0	M6
IS580-2T050-R1		3 x 4 AWG		8 AWG			
IS580T070-R1	69	3 x 25 mm^2	14-L6	16 mm^2	14-L6	4.0	M6
IS580-2T070-R1		3 x 2 AWG		6 AWG			

Figure 3-7 Terminal dimensions of IS580T080-R1/IS580T100-R1 and IS580-2T050-R1/IS580-2T070-R1

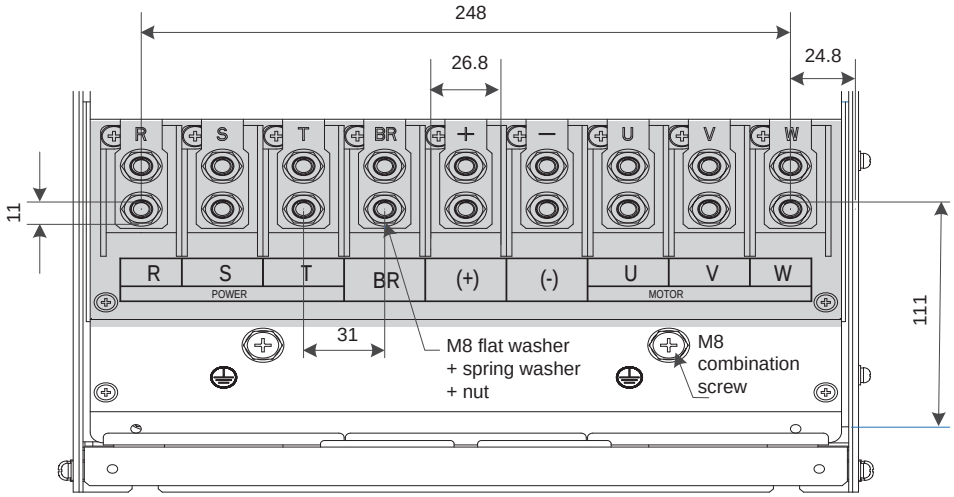


Table 3-3 Recommended cable dimensions and tightening torque of IS580T080-R1/IS580T100-R1 and IS580-2T080-R1/IS580-2T100-R1

Servo Drive Model	Rated Input Current (A)	Power Input/Output Cable	Crimp Terminal Model	Ground Cable	Crimp Terminal Model	Tightening Torque (N·m)	Screw Spec.
IS580T080-R1	89	3 x 25 mm^2	22-8	25 mm^2	14-8	10.5	M8
IS580-2T080-R1		3 x 2 AWG		6 AWG			
IS580T100-R1	106	3 x 50 mm^2	60-8	25 mm^2	14-8	10.5	M8
IS580-2T100-R1		3 x 1/0 AWG		6 AWG			

Figure 3-8 Terminal dimensions of IS580T140-R1/IS580T170-R1/IS580T210-R1 and IS580-2T140-R1/IS580-2T170-R1/IS580-2T210-R1

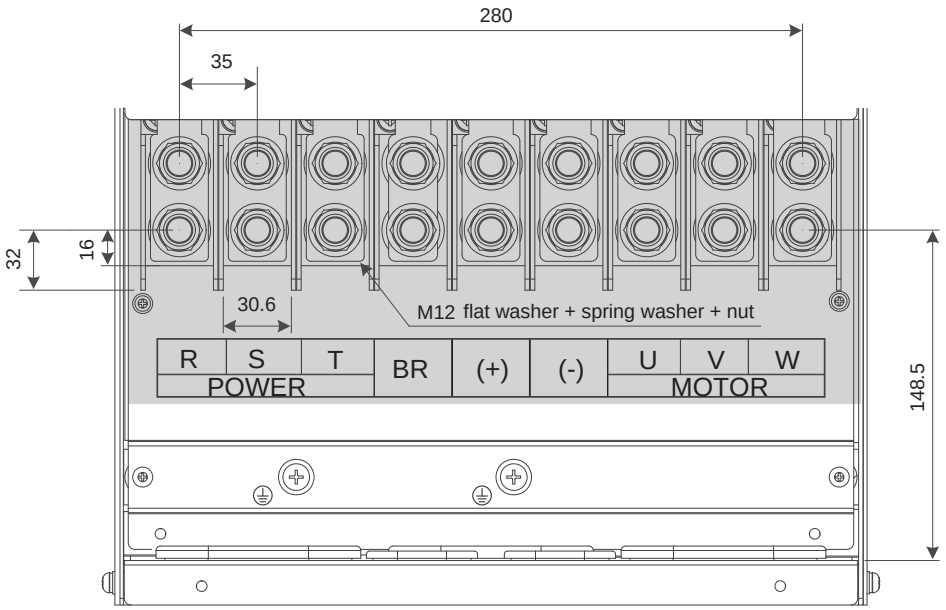


Table 3-4 Recommended cable dimensions and tightening torque of IS580T140-R1/IS580T170-R1/ IS580T210-R1 and IS580-2T140-R1/IS580-2T170-R1/IS580-2T210-R1

Servo Drive Model	Rated Input Current (A)	Input/Output Power Cable	Crimp Terminal Model	Ground Cable	Crimp Terminal Model	Tightening Torque (N·m)	Screw Spec.
IS580T140-R1	139	3 x 70 mm^2	70-12	35 mm^2	22-12	35.0	M12
IS580-2T140-R1		3 x 2/0 AWG		4 AWG			
IS580T170-R1	164	3 x 95 mm^2	80-12	50 mm^2	22-12	35.0	M12
IS580-2T170-R1		3 x 3/0 AWG		4 AWG			
IS580T210-R1	196	3 x 120 mm^2	100-12	70 mm^2	38-12	35.0	M12
IS580-2T210-R1		3 x 4/0 AWGl		3 AWG			

Figure 3-9 Terminal dimensions of IS580T250-R1/IS580T300-R1 and IS580-2T300-R1

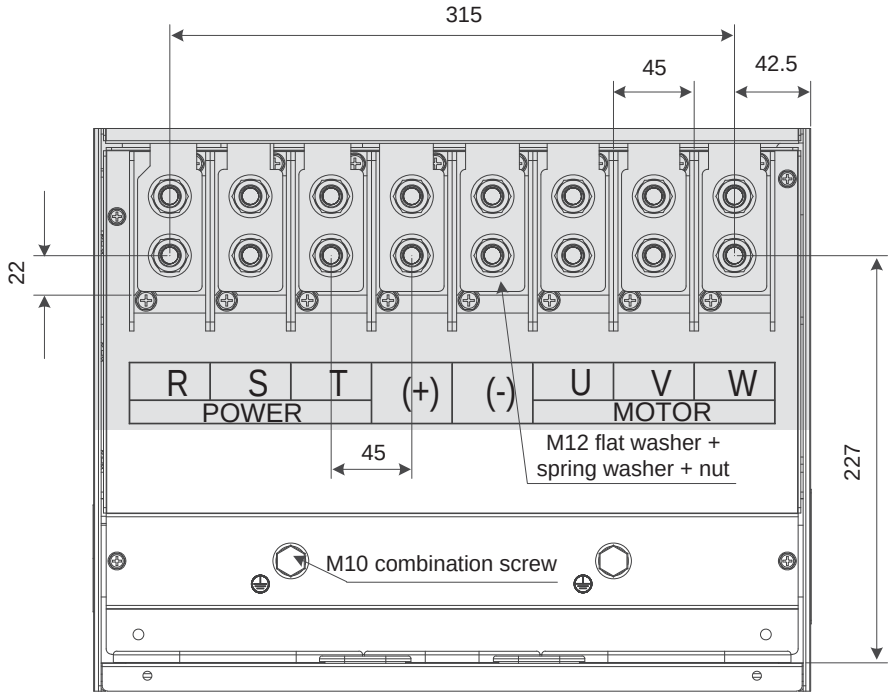


Table 3-5 Recommended cable dimensions and tightening torque of IS580T250-R1/IS580T300-R1 and IS580-2T300-R1

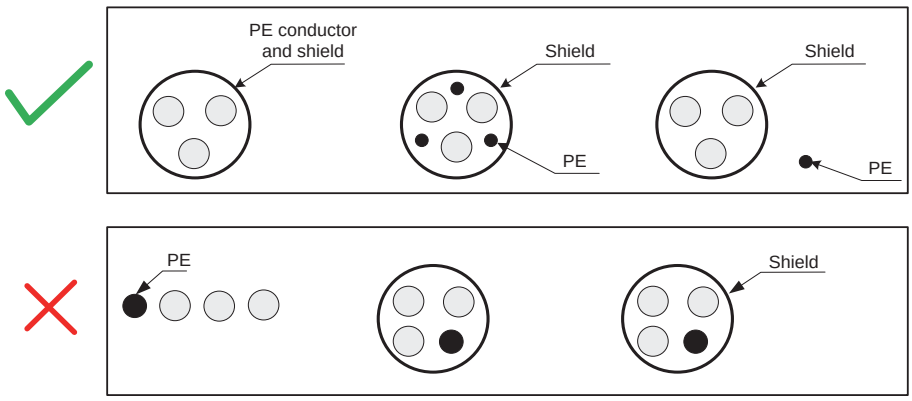
Servo Drive Model	Rated Input Current (A)	Power Input/Output Cable	Crimp Terminal Model	Ground Cable	Crimp Terminal Model	Tightening Torque (N·m)	Screw Spec.
IS580T250-R1	240	3 x 150 mm^2 350 kcmil	150-12	95 mm^2 2 AWG	38-12	35.0	M12
IS580T300-R1 IS580-2T300-R1	287	3 x 185 mm^2 500 kcmil	250-12	95 mm^2 2 AWG	38-12	35.0	M12

3.2.2 Main Circuit Cable Recommendations

■ Main Circuit Cable Selection

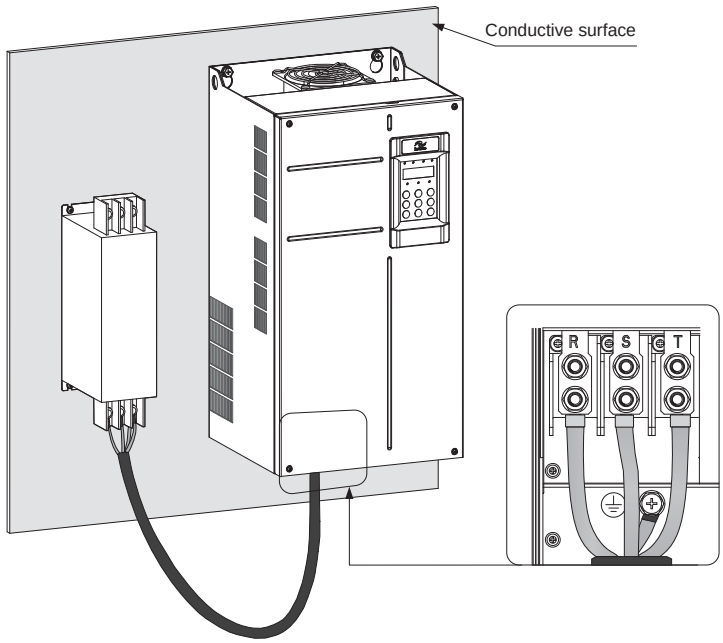
Inovance recommends symmetrical shielded cable as main circuit cable, which can reduce electromagnetic radiation of entire conductive system compared with four-conductor cable

Figure 3-10 Symmetrical shielded cable is recommended



■ Power Input

- There are no phase sequence requirements for three-phase cable connections.
- Specification and installation of all external power cables must comply with local safety regulations and relevant IEC standards.
- Install filter close to power input side of the servo drive with cable shorter than 30 cm. Connect the ground terminal of filter and the ground terminal of the drive together to the cabinet main grounding terminal.



■ DC Bus Terminals

WARNING

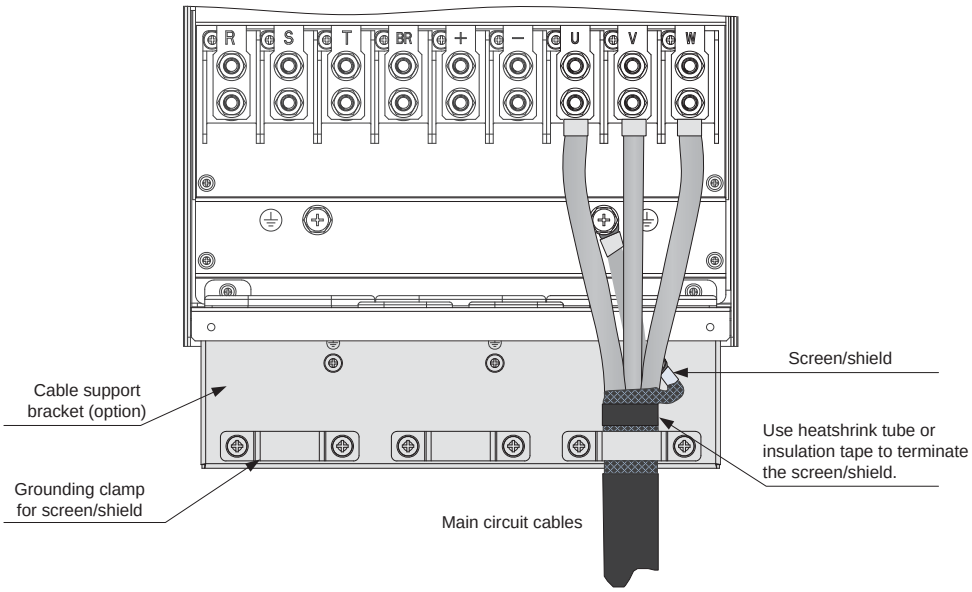
- DC bus terminals, labeled (+) and (-), are terminals that carry a residual voltage for a period after the drive has been switched off.
- To avoid risk of equipment damage or fire, when you select an external braking unit for use with an servo drive of 90 kW and above, **DO NOT reverse the poles (+) and (–)**.
- Use a cable not exceeding10 m to connect DC bus terminals to external MDBUN braking unit. Use twisted pair wires or close pair wires for this connection.
- Fire risk! Do not connect braking resistor directly to DC bus.

■ Braking Resistor

CAUTION

- Fire risk! Fit overtemperature sensors or thermal overload relay to the braking resistor, and use double insulated cables for the dynamic brake circuit to the brake resistors.
- Braking resistor terminals (+) and PB are only for the drive units up to 75 kW that are fitted with an internal braking unit.
- To avoid risk of equipment damage, use a cable not exceeding 5 m to connect an external braking resistor.
- To avoid risk of ignition due to overheating of the braking resistor, do not place anything combustible around the braking resistor.
- Set F6-15 (Braking use ratio) and F9-08 (Braking unit action initial voltage) correctly according to load after connecting braking resistor to the drive of up to 75 kW that is fitted with an internal braking unit.

■ Servo Drive Outputs U, V, W to Motor



The Cable Support Bracket is an optional accessory which provides mechanical support for input, output and dynamic brake cables and which also provides grounding clamps for the screen/shield of the cables. Installation of the bracket is shown below.

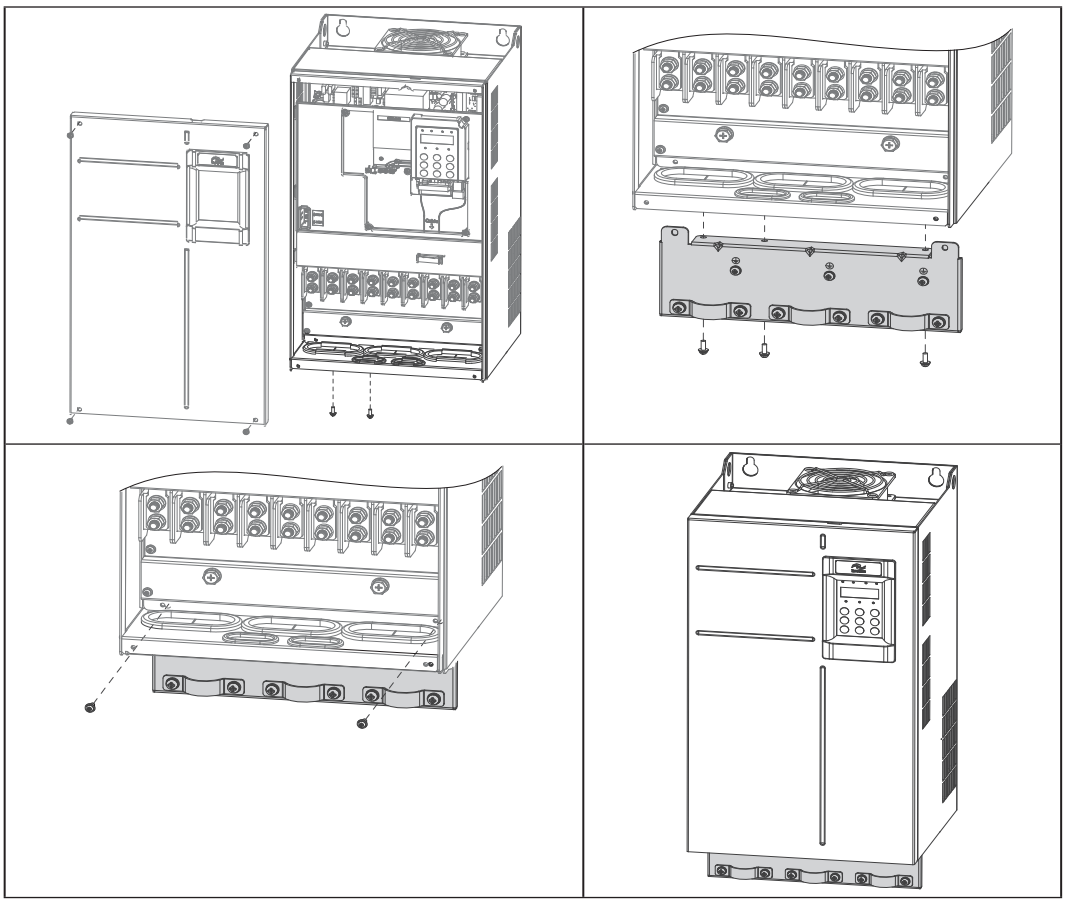
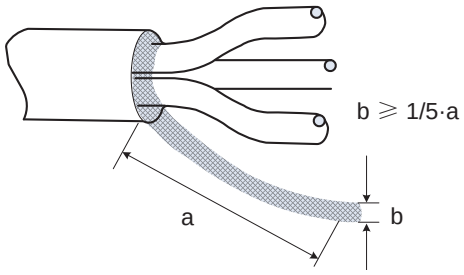


Table 3-6 Cable support bracket models

Cable Support Bracket Model	Applicable Drive Model		
MD500-AZJ-A2T5	IS580T020-R1	IS580-2T020-R1	IS580T020-R1-T
	IS580T030-R1	IS580-2T030-R1	IS580T030-R1-T
	IS580T035-R1	-	IS580T035-R1-T
	IS580T040-R1	IS580-2T040-R1	IS580T040-R1-T
MD500-AZJ-A2T6	IS580T050-R1	IS580-2T050-R1	-
	IS580T070-R1	IS580-2T070-R1	-
MD500-AZJ-A2T7	IS580T080-R1	IS580-2T080-R1	-
	IS580T100-R1	IS580-2T100-R1	-
MD500-AZJ-A2T8	IS580T140-R1	IS580-2T140-R1	-
	IS580T170-R1	IS580-2T170-R1	-
	IS580T210-R1	IS580-2T210-R1	-
	IS580T250-R1	-	-
	IS580T300-R1	IS580-2T300-R1	

- Cable specification and installation of all cables connected to the drive output U, V, W must comply with local safety regulations and relevant IEC standards.
- To avoid risk of equipment damage or operating faults, do not connect capacitor or surge absorber to the output side of the servo drive.
- Long motor cables can contribute to electrical resonance caused by distributed capacitance and inductance. In some cases, this might cause equipment damage in the drive, in motor or in cables. To avoid these problems, install an AC output reactor close to the drive if cable is longer than about 100 m.
- If the cable support bracket is not used, screen/shield has to be directly grounded to the grounding (PE) terminal. Ensure pig tail of screen/shield is as short as possible.



■ Grounding (PE) Connection

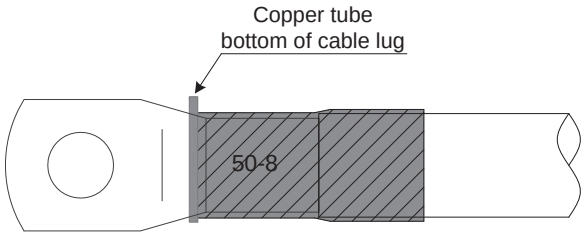
WARNING

Electrical Shock Hazard. Ensure the protective earthing conductor complies with technical standards and local safety regulations. Because the leakage current exceeds 3.5 mA in all models, IEC 61800-5-1 states that either the power supply must be automatically disconnected in case of discontinuity of the protective earthing conductor or a protective earthing conductor with a cross-section of at least 10 mm^2 (Cu) or 16 mm^2 (Al) must be used. Failure to comply may result in death or serious injury.

- For personal safety and reliability of the equipment, it is important to connect ground (PE) terminal to an effective electrical ground. Resistance value of the ground cable must be less than 10 Ω.
- Do not connect the grounding (PE) terminal of the drive to neutral conductor of the power system.
- Protective grounding conductor must be able to carry large short-term current that might arise if a fault occurs.
- Use proper grounding cable with yellow/green insulation for protective grounding conductor.
- Ground the shield.
- It is recommended that the drive be installed on a metal mounting surface.
- Install filter and drive on the same mounting surface and ensure filtering effect.

■ Main Circuit Cable Protection

Add heat shrink tube to cable lug cooper tube and cable core part of main circuit cable and ensure the heat shrink tube completely covers the cable conductor part, as shown in the following figure.



■ Power Input Protection

- Install protection devices (a fuse and a MCCB) at power input to the drive. The protection devices must provide protection on overcurrent and short-circuit, and be able to completely isolate the drive from the electrical power input.
- Cables and protection device on power input must be suitably rated for the power and voltage class of the drive under normal conditions, and under possible fault conditions such as system overload and short-circuit on the power input.

■ Power Grid System

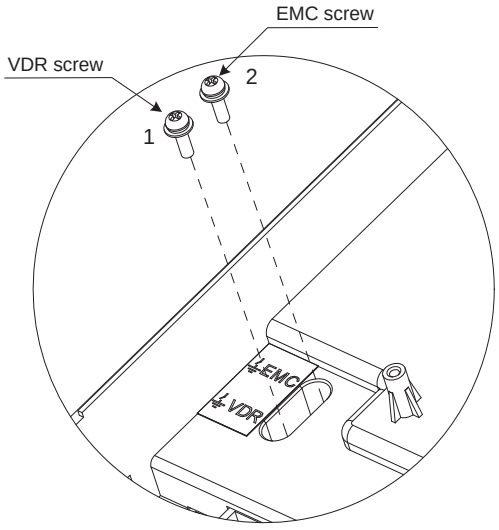
- The drive is applicable to system with neutral point grounded.

WARNING

If the drive is used in an IT power system with an ungrounded power system or a high resistance grounded [over 30 ohms] power system, it is necessary to remove both VDR and EMC screws as shown in Figure 3-16. Do not install a filter. Failure to comply may result in personal injury or damage to the drive.

- If a residual-current device (RCD) is used and it trips at start, remove the EMC screw as shown in the following figure.

Figure 3-11 EMC screw and VDR screw

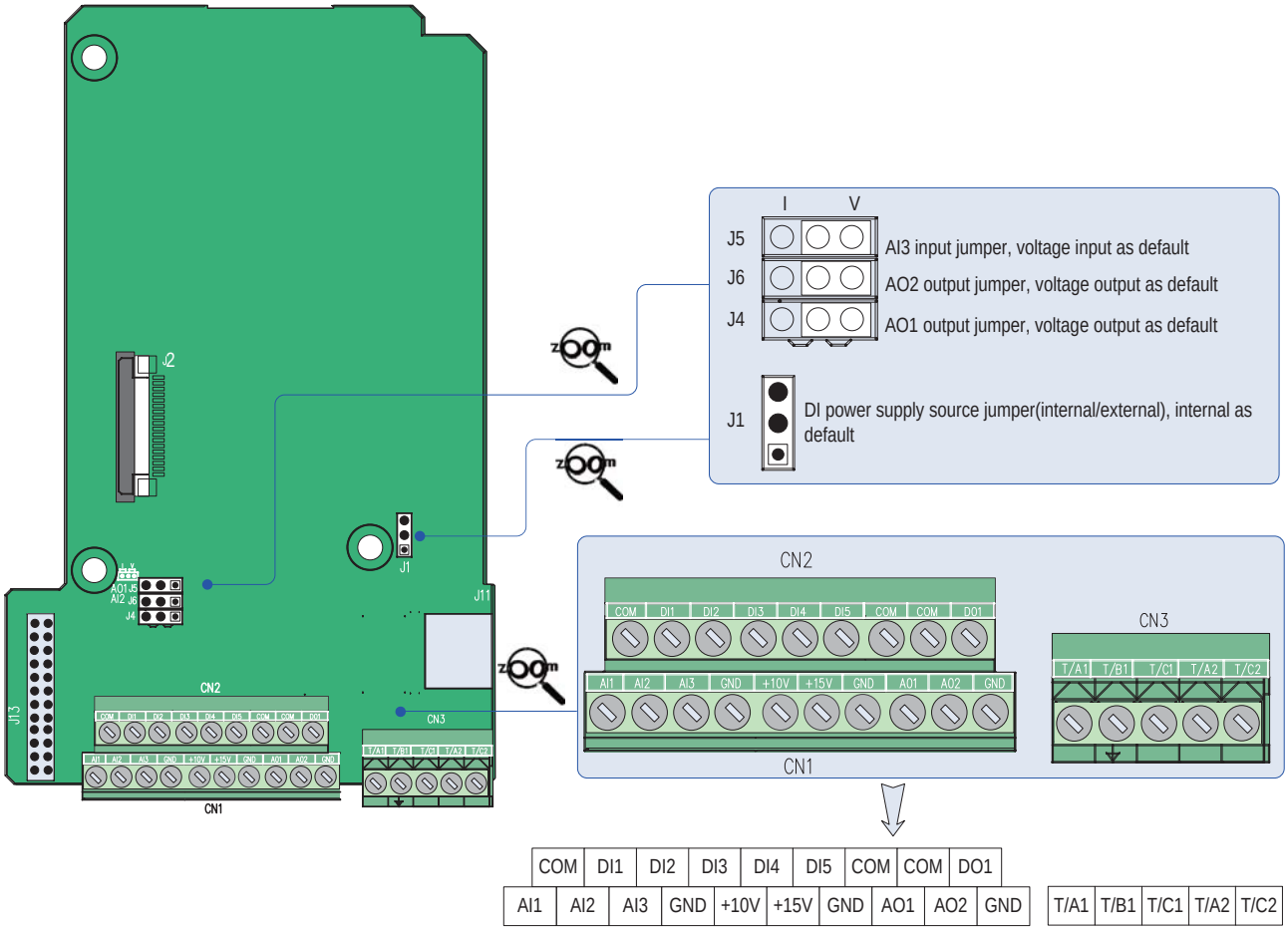


3.3 Control Circuit Wiring

3.3.1 Control Circuit Terminals

■ Terminal Arrangement

Figure 3-12 Control circuit terminal arrangement



■ Terminal Function

Terminal	Terminal name	Description
+10V-GND	+10 VDC power supply	Internal 10 VDC power supply
+15V-GND	+15 VDC power supply	Internal 15 VDC power supply can be used for pressure sensor Max. Output current: 10 mA
AI1-GND	Analog input 1	1. Input voltage range: 0 to 10 VDC 2. Input impedance: 22 kΩ
AI2-GND	Analog input 2	
AI3-GND	Analog input 3	1. Input voltage range: 0 to 10 VDC/0 to 20 mA, selected by J5 jumper 2. Input impedance: 22 kΩ (voltage input), 500 Ω (current input)

Terminal	Terminal name	Description
DI1- COM	Digital input 1	1. Optically-coupled isolation, input frequency less than 100 Hz, 2.Power supply source determined by jumper J1 3. Input impedance: 1.39 kΩ 4. Voltage range for inputs: 9 to 30 V
DI2- COM	Digital input 2	
DI3- COM	Digital input 3	
DI4- COM	Digital input 4	
DI5- COM	Digital input 5	
AO1-GND	Analogue output 1	1. Either a voltage or a current output, Determined by jumper J4. 2. Max. Load resistance: 500 Ω 3. Output voltage range: 0 to 10 V 4. Output current range: 0 to 20 mA.
AO2-GND	Analogue output 1	1. Either a voltage or a current output, determined by jumper J6. 2. Max. Load resistance: 500 Ω 3. Output voltage range: 0 to 10 V 4. Output current range: 0 to 20 mA.
DO1-COM	Digital output 1	1. Optically-coupled isolation, dual-polarity open-collector output 2. Output voltage range: 0 to 24 V 3. Output current range: 0 to 50 mA. 4. DO1 can only be driven by external power supply
T/A1-T/B1	Relay (normally closed)	250 VAC, 3 A, COSØ = 0.4 30 VDC, 1 A
T/A1-T/C1	Relay (normally open)	
T/A2-T/C2	Relay (normally open)	
J13	Extension card interface	28-pin connector , to connect with extension cards (various bus cards)
J2	PG card interface	Supporting resolver and differential encoder
J11	External keypad interface	External operating panel interface
J1	Jumper	DC power supply source selection, internal 24V selected by default
J4	Jumper	Voltage/current selection, voltage output by default
J6	Jumper	Voltage/current selection, voltage output by default
J5	Jumper	Voltage/current selection, voltage input by default

Note	• <2>: For positions of jumpers J7, J9 and J10, refer to *Figure 3-12*.

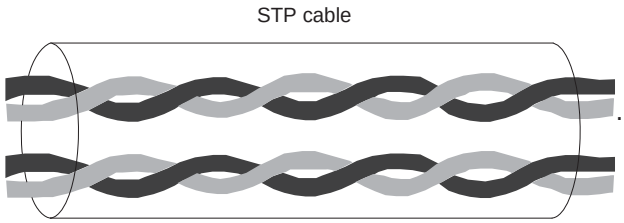
3.3.2 Wiring Diagrams

■ Selection of Control Circuit Wirings

All control wirings must be shielded.

For different analog signals, use independent shielded cables and do not use the same shield.

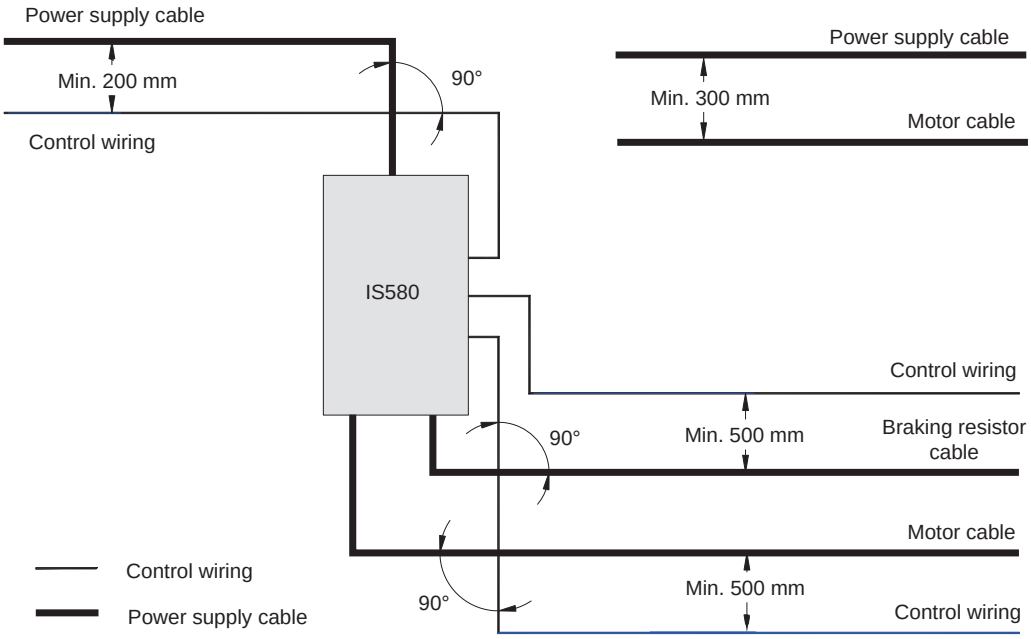
For digital signals, shielded twisted pair (STP) cable is recommended.



■ Cabling Requirements

- Motor cables must be segregated from control wiring to minimize electrical interference from the PWM effects of the motor cable.
- Do not run motor cables, power input cables and control wirings in the same duct to avoid electromagnetic interference caused by coupling of these cables.
- If control wiring must run across power cable, ensure they are arranged at an angle of 90°.

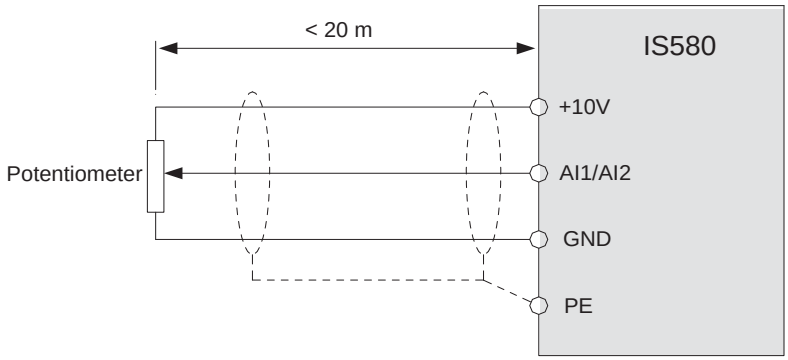
The recommended cabling diagram is as follows:



■ Wiring of AI1/AI2

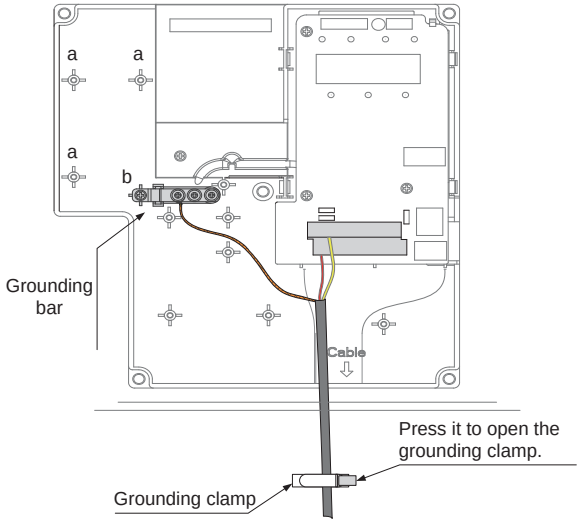
Analog signals at low levels can suffer from effects of external interference. To reduce this effect, it is important to use shielded cables shorter than 20 m long to carry analog signals.

Figure 3-13 Wiring of AI1/AI2



In applications where analog signals suffer from effects of severe external interference, install a filter capacitor or a ferrite magnetic core at source of analog signal. The pig tail of the shield must be connected to the PE terminal on the drive.

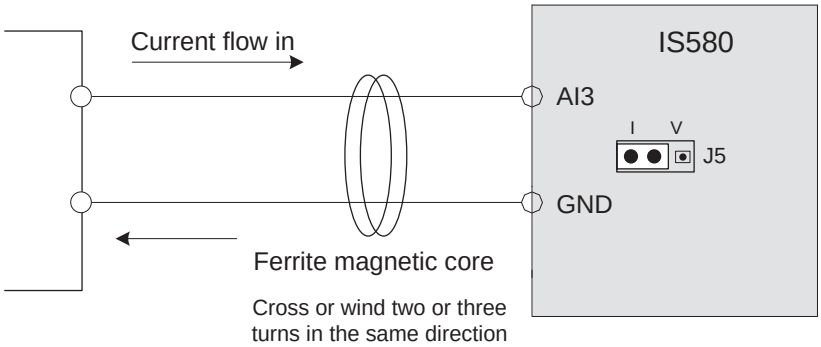
Figure 3-14 Connect shield to the PE terminal of the drive



■ Wiring of AI3

When you select voltage input via AI2, use the same wiring method as AI1. When you select current input via AI2, set jumper J9 to the I side.

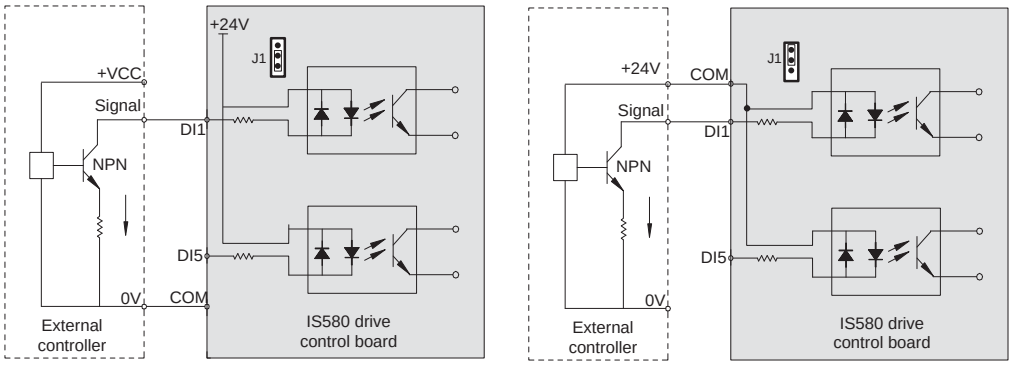
Figure 3-15 Wiring for analog input 2



■ Wiring of DI1 to DI5

- SINK wiring

Figure 3-16 Wiring in SINK mode



Internal 24 V power supply is applied.

External 24 V power supply is applied.

Applying internal 24 V power supply is the most commonly used wiring mode. In this mode, short pin 1 and pin 2 of jumper J1 on the control board and connect COM to external power 0V (ensure COM and external power 0V can be connected before wiring).

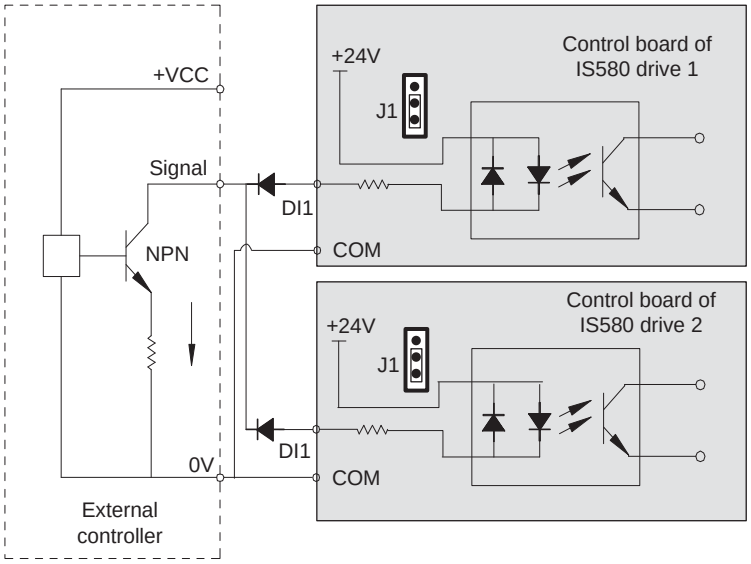
To apply external 24V power supply, short pin 2 and pin 3 of jumper J1 on the control board, and connect COM to external power 24V.

CAUTION

In SINK mode, do not connect DI terminals of different servo drives in parallel, otherwise, an DI malfunction will occur. If it is necessary to connect different servo drives in parallel, connect a diode in series at digital input. The diode characteristics must satisfy the following requirements:

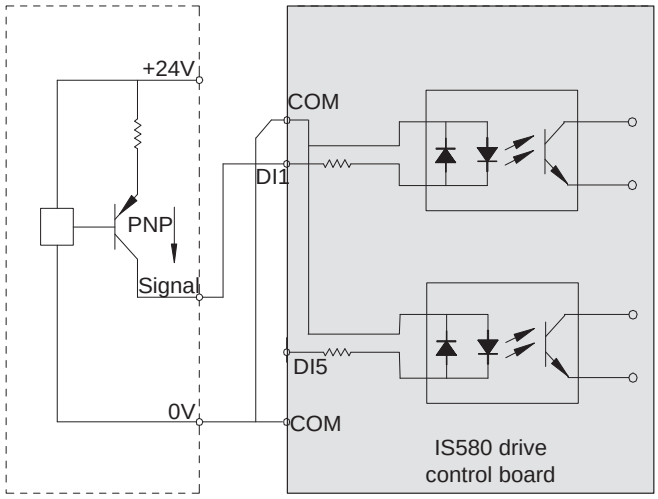
- IF: > 40 mA
- VR: > 40 V

Figure 3-17 Parallel connection of DI terminals in SINK mode



- Source wiring

Figure 3-18 Wiring in SOURCE mode

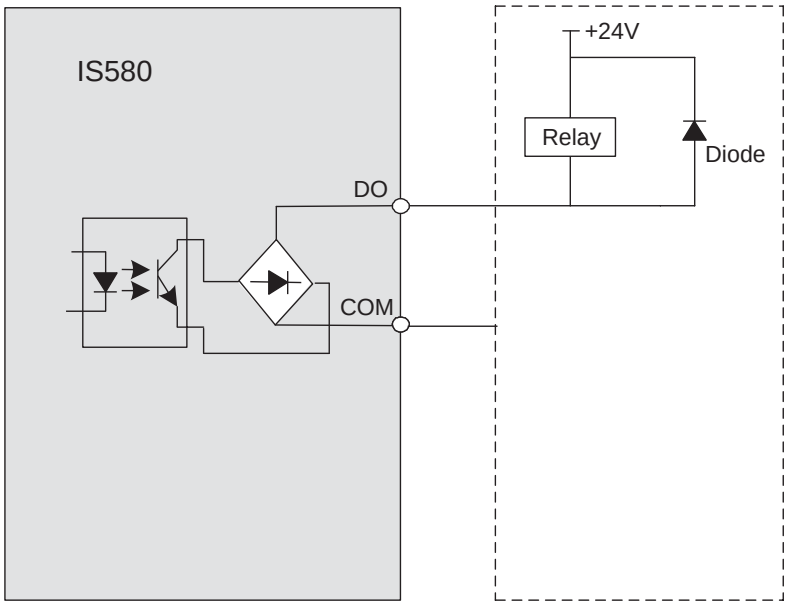


When using SOURCE wiring mode, external 24V power is required. In this case, short pin 2 and pin 3 of J1 on the control board. Meanwhile, ensure COM and external 0V can be connected.

■ Wiring of DO

When digital output terminal must drive relay, it is necessary to install an absorption diode across relay coil. This diode prevents inductive switching transients causing damage to the DC 24V power supply. The absorption diode must have a forward current rating of 50 mA.

Figure 3-19 Wiring of digital output terminal



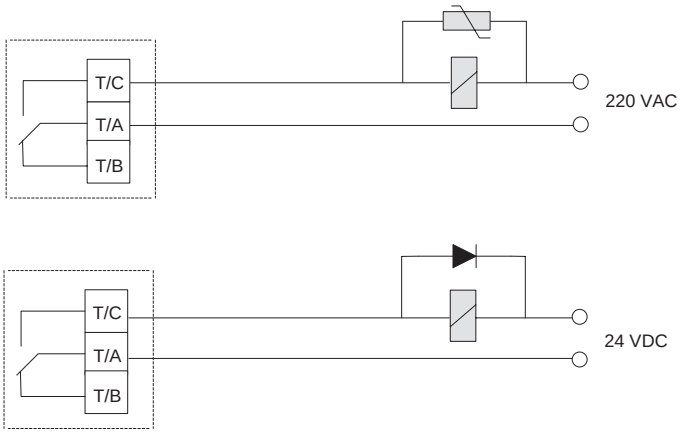
CAUTION

- Be careful to install absorption diode with correct polarity, to prevent damage to the 24 VDC power supply.
- DO1 can be driven only by external +24 V. When external +24V is applied, check whether external +24V power ground and control board ground can be connected.

■ Wiring of Relay

To smooth peak voltage that results from cutting off power to inductive load (relay, contactor and motor), use a voltage dependent resistor (VDR) at the relay contact and add absorbing circuit to the inductive load, such as VDR, RC absorbing circuit or diode.

Figure 3-20 Wiring of relay



■ Wire Size and Torque Specification

Please use a ferrule-type terminal with insulated sleeves. Prepare wire ends with insulated sleeves before connecting to the drive.

Figure 3-21 Ferrule dimensions

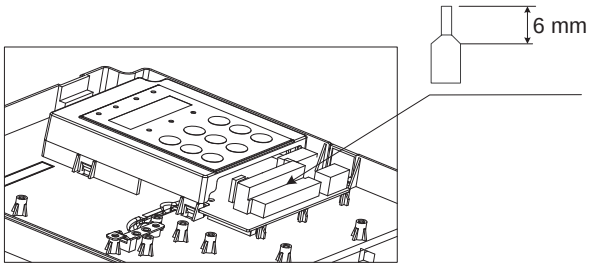


Table 3-7 Wire size and torque specification

Terminal Block	Single Wire (AWG/mm^2)	Twisted Wire (AWG/mm^2)	Tightening Torque (N·m)
Control circuit	AWG 24 to 18 (0.2 to 0.75 mm^2)		0.565

3.4 Wiring Checklist

□ √	No.	Item
□	1	Check that you receive a correct model .
□	2	Ensure correct peripheral devices (braking resistor, braking unit, AC reactor, filter and breaker) are used.
□	3	Check optional cards to ensure the receiving is correct.
□	4	Check that mounting method and location meet the requirements.
□	5	Check power input is within specification, e.g. 380/400/415/440/460/480 VAC.
□	6	Check that rated motor voltage matches the drive output specification.
□	7	Connect power supply to the R, S, T terminals of the drive properly.
□	8	Connect motor input cables to the U, V, W terminals of the drive properly.
□	9	Check that cable diameter of main circuit complies with specification.
□	10	Decrease F0-15 (carrier frequency) if motor output cable exceeds 50 m.
□	11	Ground the servo drive properly.
□	12	Check that output terminals and control signal terminals are connected securely and reliably.
□	13	When using braking resistor and braking unit, check whether they are wired properly and whether their resistance value is proper.
□	14	Use shielded twisted pair (STP) cables as signal lines.
□	15	Connect optional cards correctly.
□	16	Segregate control wiring from power supply and motor cables.

4. Operating Panel (Keypad & Display)

Chapter 4 Operating Panel (Keypad & Display)

4.1 Introduction

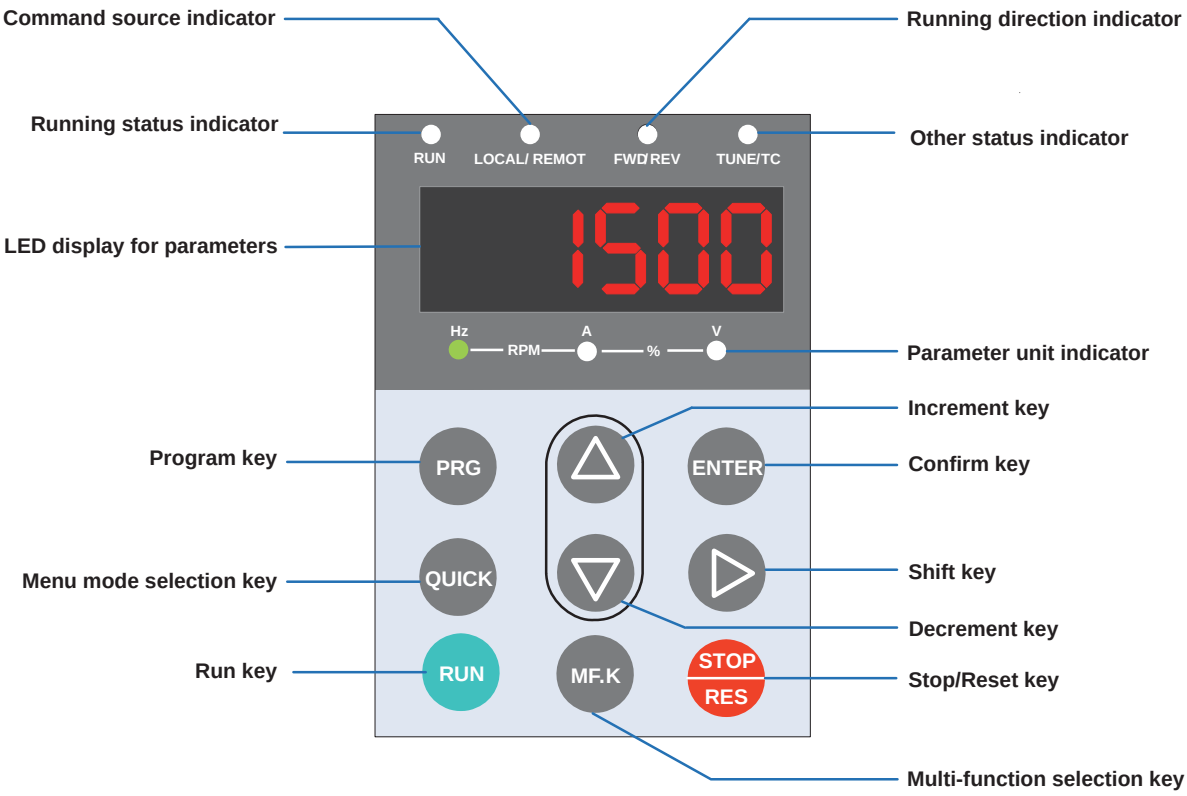
The servo drive has an inbuilt programming/operating panel with LED indicators and display. It allows you to operate function parameters and monitor/control system status.

Remote/external operating panel is available as an option (refer to *Chapter 8 Peripherals and Options*). MD32NKE1 is an LED version with identical functions to the inbuilt version.

4.2 Inbuilt LED Operating Panel

The LED operating panel allows you to monitor system operation, modify parameters and start or stop the servo drive.

Figure 4-1 Details of the operating panel



■ Keys on LED Operating Panel

Key	Key Name	Function
PRG	Programming	Enter or exit level i menu. Return to the previous menu.
ENTER	Confirm	Enter each level of menu interface. Confirm displayed parameter setting.
△	Increment	When navigating a menu, it moves the selection up through the screens available. When editing a parameter value, it increases the displayed value. When the servo drive is in run mode, it increases the speed.
▽	Decrement	When navigating a menu, it moves the selection down through the screens available. When editing a parameter value, it decreases the displayed value. When the servo drive is in running mode, it decreases the speed.
▷	Shift	Select the displayed parameter in the stop or running status. Select the digit to be modified when modifying a parameter value
RUN	RUN	Start the servo drive when using the operating panel control mode. It is inactive when using the terminal or communication control mode.
STOP RES	Stop/Reset	Stop the servo drive when the drive is in the running status. Perform a reset operation when the drive is in the fault status. Note: the functions of this key can be restricted by using function F7-02.
MF.K	Multifunction	Perform a function switchover as defined by the setting of F7-01, for Example to quickly switch command source or direction.
QUICK	Menu mode selection	Press it to switch over between menu modes as defined by the setting of FP-03.

■ Relevant Parameters for Operating Panel Setting

Function Code	Parameter Name	Setting Range	Default
F7-02	STOP/RESET key function	0: Only the key can stop motor. 1: In terminal control, the key can stop motor 2: In terminal control, the key can reset fault 3: In terminal control, the key can stop motor and reset fault	1

■ Status Indicators

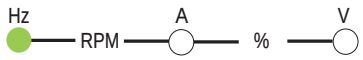
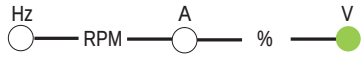
There are four red LED status indicators at the top of the operating panel.

Indicator	Indication
○ **RUN**	OFF indicates the STOP status.
	ON indicates the RUNNING status.
○ **LOCAL/REMOT**	OFF indicates under operating panel control.
	ON indicates under terminal control.
	FLASHING indicates under serial communication control.
○ **FWD/REV**	OFF indicates reverse motor rotation.
	ON indicates forward motor rotation.
○ **TUNE/TC**	ON indicates torque control mode.
	FLASHING SLOWLY (once a second) indicates auto-tuning status.
	FLASHING QUICKLY (four times a second) indicates a fault condition.

■ Unit Indicators

There are three red unit indicators below the data display. These indicators operate individually or in pairs to show the units used to display data, as shown in Table 4-1.

Table 4-1 Unit indicator explanation

Indicator appearance	Meaning
	Hz for frequency
	A for current
	V for voltage
	RPM for motor speed
	Percentage

■ LED Display

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

- Frequency reference
- Output frequency
- Monitoring information
- Fault code

The following table lists indication of LED display.

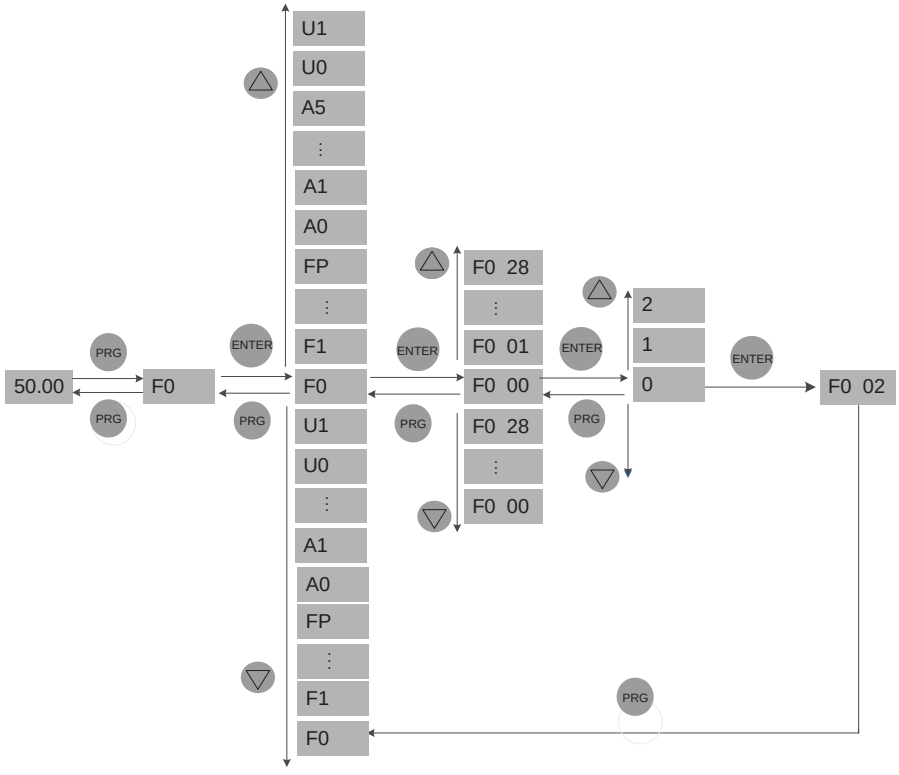
LED Display	Indication	LED Display	Indication	LED Display	Indication	LED Display	Indication
0	0	6	6	C	C	N	N
1	1	7	7	c	c	P	P
2	2	8	8	d	D	r	R
3	3	9	9	E	E	T	T
4	4	A	A	F	F	U	U
5	5, S	b	B	L	L	u	u

4.2.1 LED Operating Panel Menu Structure

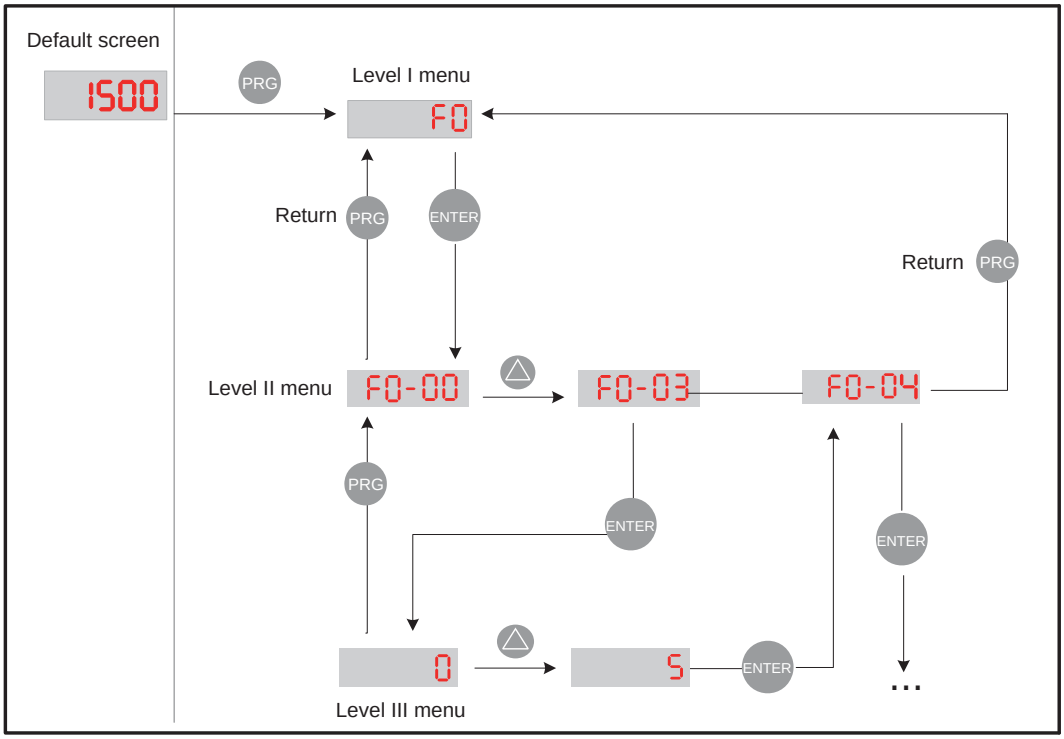
The drive operating panel has three levels of menu:

1. Level I - function parameter group
2. Level II - function parameter
3. Level III - function parameter value

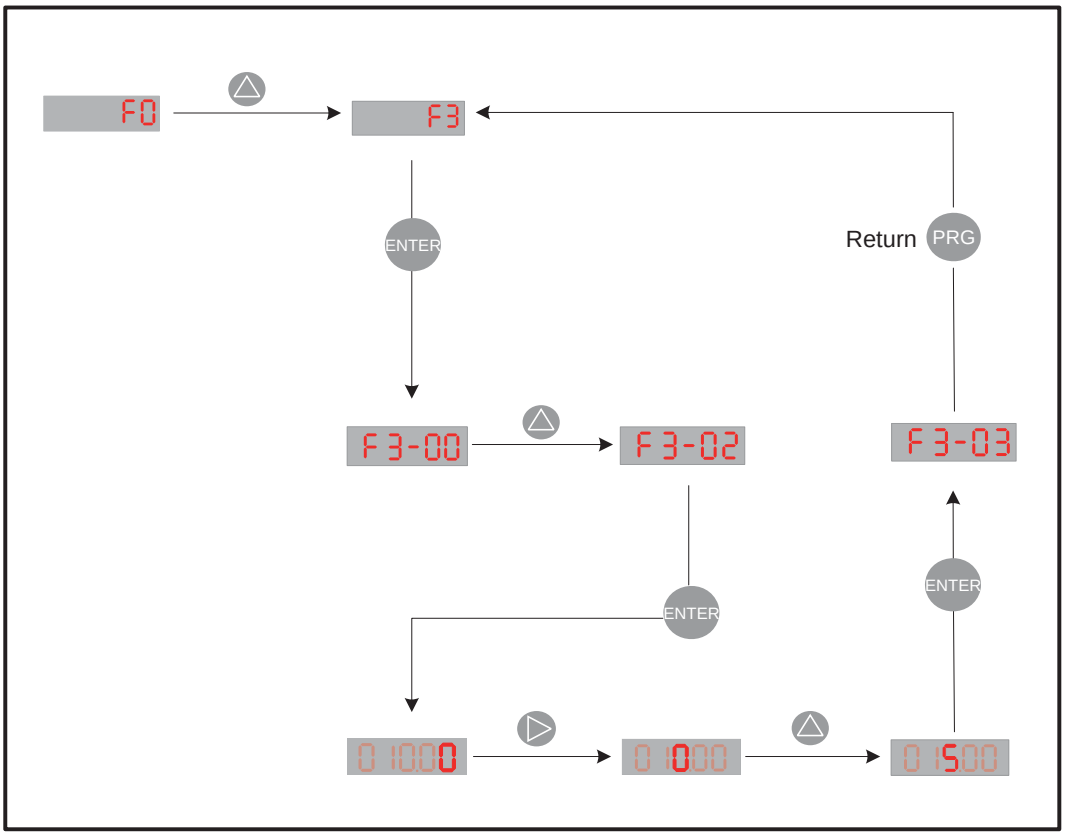
Figure 4-2 Structure of three levels of menu



Operation procedure of the three levels of menu is as follows:



The following example shows how to modify F3-02 from 10.00 Hz to 15.00 Hz.



Press ENTER from a Level III menu to:

1. Save the parameter value you have set
2. Return to Level II menu, and then
3. Select the next function parameter.

Press PRG from a Level III menu to:

1. Return to Level II menu without saving the parameter value, and remain at the current function code.

■ Unmodifiable Parameters

When operating in Level III menus, if the parameter does not include a flashing digit, then it is not possible to modify that parameter. There are two possible reasons for this:

1. The function parameter you have selected is read-only. This is because:

   The display is showing the servo drive model.

   The display is showing an actual parameter detected by the system.

   The display is showing a running record parameter.

2. The displayed function parameter cannot be modified while the servo drive is in the RUNNING status. You can modify these types of parameter only when the servo drive is in the STOP status.

4.2.2 Overall Arrangement of Function Parameters

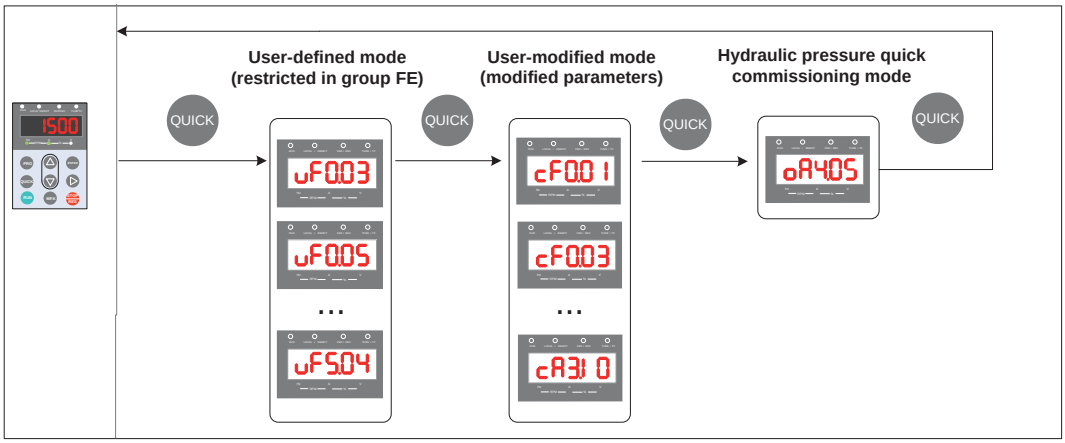
Function Code Group	Description	Standard Function Parameters
F0 to FP	Standard function code group	Standard function parameters
A0 to AF		
U0 and U1	RUNNING status function code group	Display of basic parameters

4.2.3 Function Parameter Operations

■ Viewing Function Parameters

The drive provides three display modes for viewing parameters.

Figure 4-3 Switching between three function parameter display modes



To view user-defined parameters, press QUICK on the operating panel to enter the user-defined mode uF0.03. If NULL is displayed, it means the user-defined menu is empty.

A maximum of 16 user-defined parameters can be set in group FE (FE-00 to FE-15). There is no user-defined parameter in group FE by default.

To view user-modified parameters, press QUICK on the operating panel to enter the user-modified mode cF0.01. The list of user-modified parameters are generated by the servo drive automatically.

■ Editing Function Parameters

This editing method is mostly used in on-site commissioning.

- Pressing △ and ▽ in Level I menu is to quickly change function parameter group.
- Pressing △ and ▽ in Level II menu is to quickly increase or decrease function parameter number.
- Pressing △ and ▽ in Level III menu is to quickly increase or decrease function parameter value. To save parameter setting, press ENTER. To cancel parameter setting, press PRG.

4.2.4 Saving and Restoring Settings

After you change value of any function parameter, the drive saves the new value locally so that it remains effective when you power on the drive next time. The drive also retains alarm information and cumulative running time data.

The drive allows you to make a separate external backup of parameter settings. This feature allows you to load a set of parameter settings during commissioning, or to restore a set of parameter settings after completing a maintenance or repair operation on the drive.

You can also restore default parameter settings, or clear running data by using function parameter FP-01.

Function Code	Parameter Name	Setting Range	Default
FP-01	Parameter initialization	0: No operation 1: Restore factory parameters 2: Clear records 3: Restore back-up user parameter 4: Restore factory parameters except A2-01 5: Restore factory parameters except FA and FP	0

4.2.5 Password Security

The servo drive provides a security protection function that requires a user-defined password. Function parameter FP-00 controls this function.

When FP-00 has the default value zero, it is not necessary to enter a password to program the servo drive.

To enable password protection, do as follows:

1. Set a non-zero value for FP-00. This value is the user-defined password.
2. Make a written note of the value you have set for FP-00 and keep the note in a safe location.
3. Press ENTER to exit the function parameter editing mode.

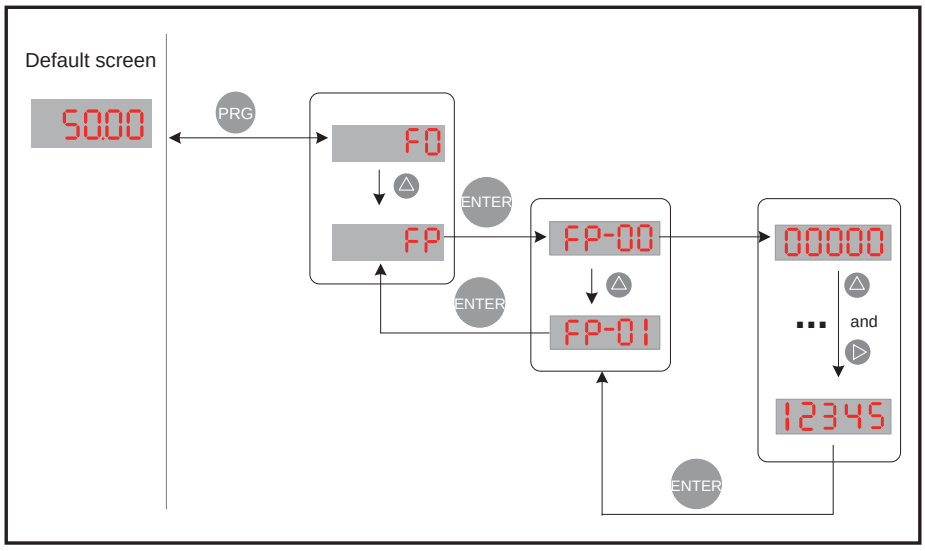
The password protection is successfully enabled. Then when you press PRG , the display shows "------". You must enter the correct password to enter the programming menu.

To remove password protection, do as follows:

1. Use the current password to enter the function parameter editing mode.
2. Set FP-00 to zero.
3. Press ENTER to exit the function parameter editing mode.

The password protection is successfully removed.

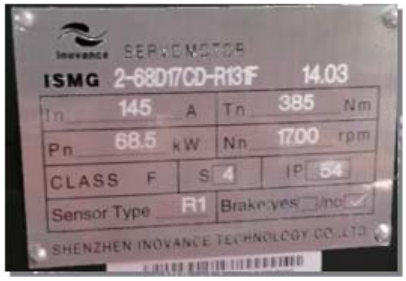
The following figure gives an example, showing how to set the password to 12345.



5. Quick Setup

Chapter 5 Quick Setup

5.1 Hydraulic Application Setup Flowchart

Start	Para. No.	Para. Name	Default	Commissioning
Disable servo drive				
↓		Note: usually if any DI is set as forward or reverse run and the signal is active, then some operations cannot succeed, such as restoring parameters, changing command source, which are necessary steps for setup. So it's seriously recommended to disable servo drive at the beginning of commissioning.		
Restore parameters	FP-01	Parameter operation	0	1
↓		0: no operation 1: restore factory parameters Note: usually users have no idea what parameters have been changed, so it's seriously recommended to restore parameters to default at the beginning of commissioning.		
Set motor parameters		Motor nameplate		
↓				
	F1-01	Rated motor power	Model dependent	
		Unit: kW		
	F1-02	Rated motor voltage	Model dependent	
		Unit: V Note: please follow motor technical specifications to set this parameter, otherwise motor would probably run with vibration.		
	F1-03	Rated motor current	Model dependent	
		Unit: A		
	F1-04	Rated motor frequency	Model dependent	
		Unit: Hz Note: please follow motor nameplate to set this parameter, otherwise motor auto-tuning would fail and get E45. Here is the formula for motor frequency: Frequency = number of motor poles * speed (rpm) / 120.		
	F1-05	Rated motor speed	Model dependent	
		Unit: rpm.		

Continued	Para. No.	Parameter Name	Default	Commissioning

Continued	Para. No.	Para. Name	Default	Commissioning
Select command source	F0-02	Command source selection	0	0
		0: operation panel control (Indicator 'local/remote' off) 1: terminal control (Indicator 'local/remote' on) 2: communication control (Indicator 'local/remote' blinking)		
Perform motor auto tuning	F1-16	Auto-tuning selection	0	1
		0: no auto-tuning 1: static auto-tuning 1 (runs at very low speed) 2: complete dynamic auto-tuning (runs very fast) Note: when user Doesn't know back EMF of motor, this auto-tuning method is necessary. Bear in mind that better DO it without load, if with load, please confirm that valves are set correctly and motor running does not hurt hydraulic pump. 3: static auto-tuning 2 (runs at very low speed) Auto-tuning steps: set F1-16 = 1 and press RUN and ENTER, then auto-tuning starts, the whole process will take about 1 minute.		
Set IS580 as hydraulic controller	A3-00	Hydraulic control mode selection	0	2
		0: non-hydraulic control mode 1: hydraulic control mode (can commands used) 2: hydraulic control mode(AI commands used) 3: can hydraulic control mode (customized-can-control mode) 4: reserved Note: as a result of setting A3-00 as 2, some parameters are set automatically by firmware. Here is the list:		

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

Continued	Para. No.	Para. Name	Default	Commissioning

Continued	Para. No.	Para. Name	Default	Commissioning
Set speed command upper limit	A3-01	Maximum rotational speed	2000	
		Unit: rpm; Note: for hydraulic control mode, A3-01 is seen as 100% speed command, and now F0-10 has nothing to DO with speed command.		
Set pressure command upper limit	A3-02	System hydraulic pressure	175.0	
		Unit: kg/cm^2; range from 0.0 to maximum hydraulic pressure (a3-03). Note: a3-02 is maximum pressure of press machine, for example, 1000 ton press is 265.0 kg/cm^2. Also bear in mind A3-02 is seen as 100% pressure command.		
Set pressure feedback upper limit	A3-03	Maximum hydraulic pressure	250.0	
		Unit: kg/cm^2; range from 0.0 to 500.0 kg/cm^2. Note: A3-03 is maximum pressure of press sensor feedback.		
Set DI function	F4-00	DI1 function selection	1	
		0: no function 1: forward run (FWD) 2: reverse run (REV) 4: forward jog (FJOG) 5: reverse jog (RJOG) 9: fault reset (reset) 11: external fault normally open (NO) input 33: external fault normally closed (NC) input Setting range: 0 to 59;		
	F4-01	DI2 function selection	0	
		Setting range same as DI1;		
	F4-02	DI3 function selection	0	
		Setting range same as DI1		
	F4-03	DI4 function selection	9	
		Setting range same as DI1.		
	F4-04	DI5 function selection	0	
		Setting range same as DI1;		

Continued	Para. No.	Para. Name	Default	Commissioning

Continued	Para. No.	Para. Name	Default	Commissioning
Set AI1 range: pressure command	F4-18	AI curve 1 minimum input	0.00	0.00
		-11.00 to11.00 v;		
	F4-19	Corresponding setting of AI1minimum input	0.0	0.0
		-100.0% to 100.0% Note: 0v pressure command is designed by press plc to represent 0% pressure.		
	F4-20	AI1 maximum input	10.00	5.00
		-11.00 to 11.00 v		
	F4-21	Corresponding setting of AI1maximum input	100.0	100.0
		-100.0% to 100.0%		
Set AI2 range: flow command	F4-23	AI curve 2 minimum input	0.00	0.00
		-11.00 to11.00 v;		
	F4-24	Corresponding setting of AI2 minimum input	0.0	0.0
		-100.0% to 100.0%		
	F4-25	AI2 maximum input	10.00	10.00
		-11.00 to 11.00 v		
	F4-26	Corresponding setting of AI2 maximum input	100.0	100.0
		-100.0% to 100.0%		
Set AI3 range: pressure feedback	F4-28	AI curve 3 minimum input	0.00	0.00
		-11.00 to11.00 v;		
	F4-29	Corresponding setting of AI3minimum input	0.0	0.0
		-100.0% to 100.0%		
	F4-30	AI3 maximum input	10.00	10.00
		-11.00 to 11.00 v		
	F4-31	Corresponding setting of AI3maximum input	100.0	100.0
		-100.0% to 100.0% Note: 10v pressure feedback represents 100% pressure feedback. This is related to A3-03.		

Note: AI 1 is fixed as pressure command input, AI2 is fixed as speed/flow command input, and AI3 is fixed as pressure sensor feedback input. This configuration can't be changed!

Continued	Para. No.	Para. Name	Default	Commissioning

Continued	Para. No.	Para. Name	Default	Commissioning
other hydraulic basic settings	A3-08	Maximum reverse rotational speed	20.0	
		Range from 0.0 to 100.0%.		
	A3-09	Minimum flow	0.5	
		Range from 0.0 to 50.0%. Note: both A3-09 and A3-10 are for keeping hydraulic circuit some pressure, even if pressure or flow command is zero, because usually there is oil leakage which leads to air penetration which causes running noise and pressure vibration. But if user thinks it unnecessary, then set it 0.		
	A3-10	Minimum pressure	0.5	
		Range from 0.0 to 50.0 kg/cm2. Note: both A3-09 and A3-10 are for keeping hydraulic circuit some pressure, even if pressure or flow command is zero, because usually there is oil leakage which leads to air penetration which causes running noise and pressure vibration. But if user thinks it unnecessary, then set it 0.		
pressure response commissioning	A3-05	Hydraulic pressure control proportional gain kp1	210.0	
		Range from 0.0 to 800.0. Note: the larger the kp1, the shorter the rise time of pressure, at the same time, large kp1 may cause too large overshoot.		
	A3-06	Hydraulic pressure control integral time ti1	0.100	
		Range from 0.001 to 10.000sec. Note: the smaller the ti1, the smaller the static error of pressure, at the same time, small ti1 may cause too large overshoot. Static error means the difference between command and feedback when feedback reaches steady state.		
	A3-07	Hydraulic pressure control derivative time td1	0.000	
		Range from 0.000 to 1.000sec. Note: the larger the td1, the smaller the overshoot and the shorter the adjusting time. At the beginning of pressure response commissioning, A3-07 is unnecessary, only when overshoot is not easy to overcome by adjusting kp1 and ti1.		
Backup user's parameters	FP-05	User's parameter backup operation	0	
		0: no operation 1: backup user's parameters Note: every time when finish this quick setup, please use FP-05 to back up the above parameters, which is useful especially when it is not sure what parameter changes have happened. Besides, it's easy to restore user's parameters by setting FP-01=3.		
OVER				

6. Troubleshooting

Chapter 6 Troubleshooting

6.1 Safety Information

Safety Information

WARNING

- Do not disconnect the servo drive while power is on, and keep all breakers in OFF state. Failure to comply may result in electric shock.

CAUTION

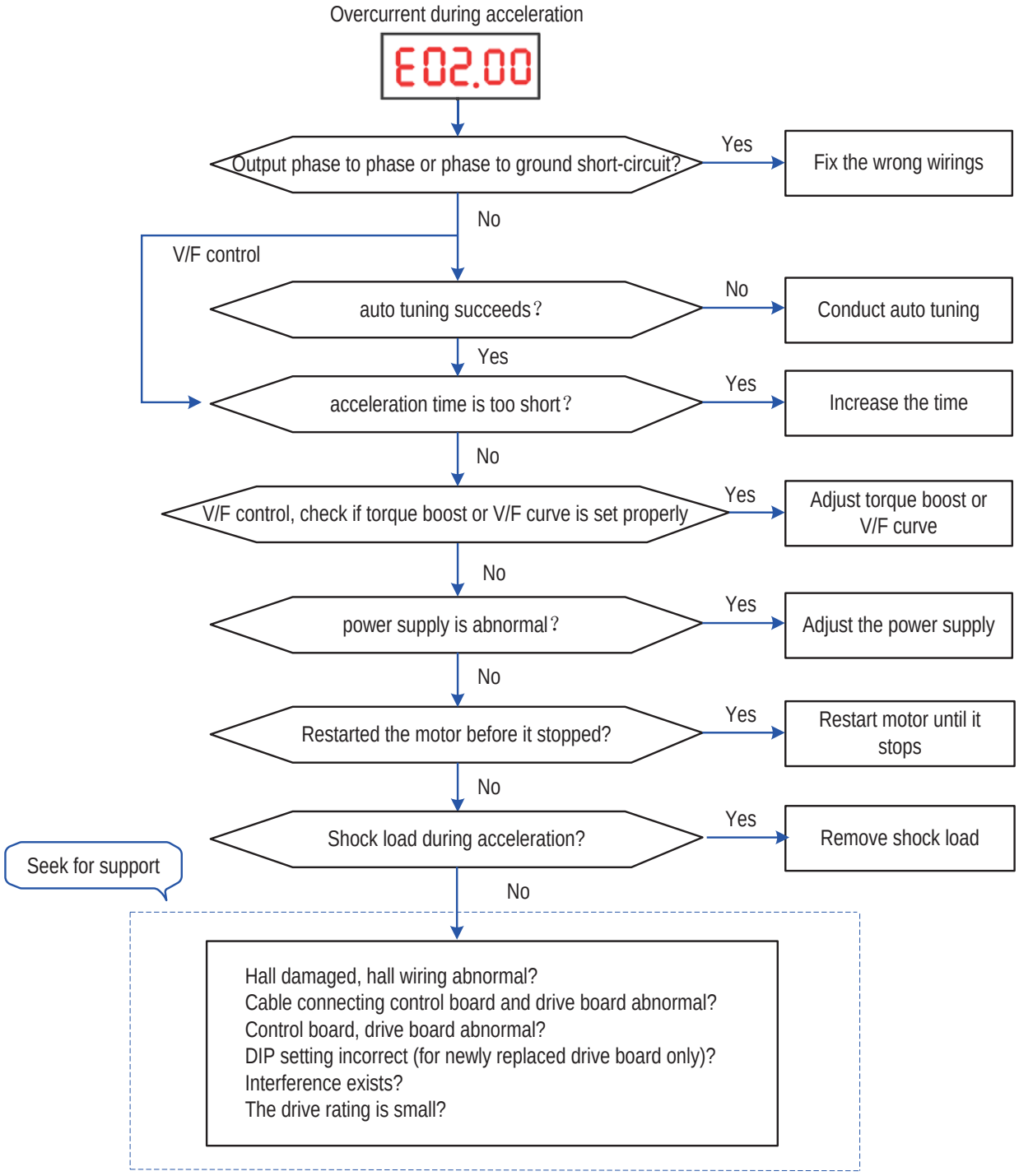
- Make sure to ground the servo drive according to local laws and regulations. Failure to comply may result in electric shock or a fire.
- Do not remove the front cover or touch internal circuit while the power is on. Failure to comply may result in electric shock.
- Do not allow unqualified personnel to perform any maintenance, inspection or part replacement work.
- When installing the drive inside an enclosed cabinet, use cooling fan or air conditioner to keep temperature below 50°C. Failure to comply may result in overheating or even a fire.
- Tighten all screws based on the specified tightening torque. Failure to comply may result in electric shock or a fire.
- Always confirm input voltage is within nameplate rating. Failure to comply may result in electric shock or a fire.
- Keep flammable and combustible materials away from the drive.
- Cover the top of the drive with a temporary cloth or paper during installation so as to prevent foreign matter such as metal shavings, oil and water from falling into the drive. After the installation is completed, remove the temporary cloth or paper.
- Follow proper electrostatic discharge (ESD) procedures when operating the servo drive. Failure to comply will damage internal circuit of the drive.

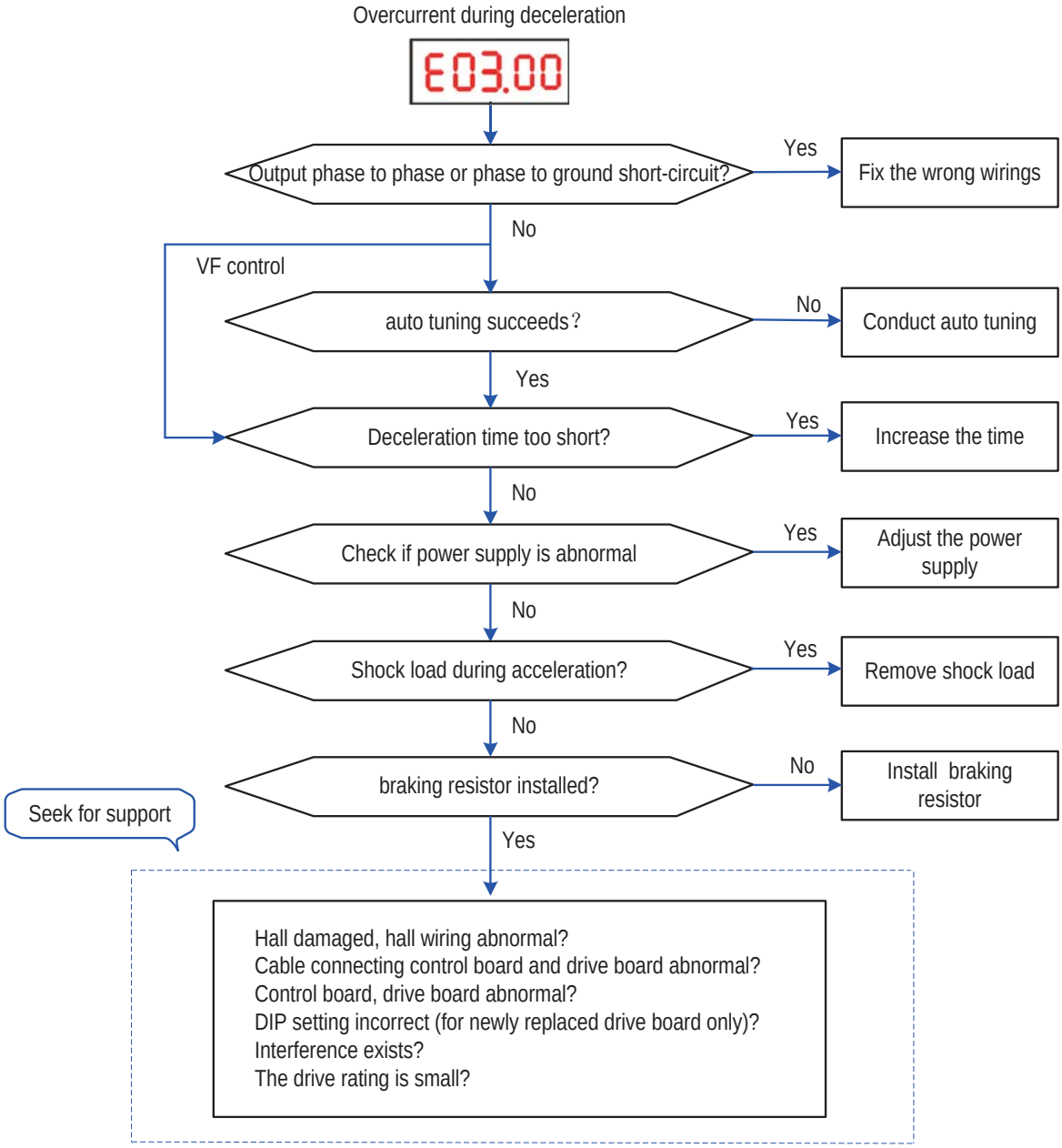
6.2 Servo Fault Codes and Solutions

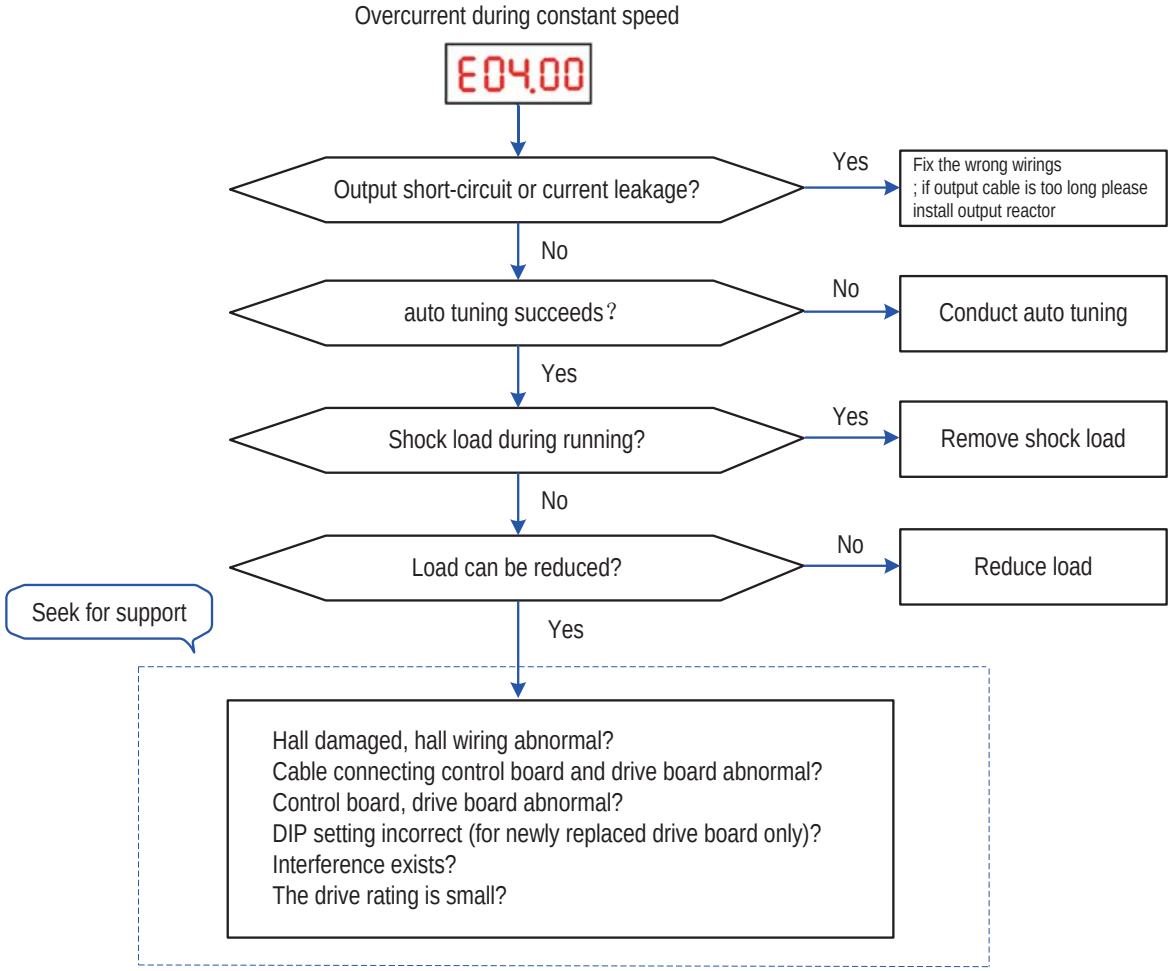
Fault Name	Display	Reasons	Solutions
Overcurrent during acceleration	E02.00	Output current exceeds hardware limit	Please refer to following diagram
Overcurrent during deceleration	E03.00	Output current exceeds hardware limit	Please refer to following diagram
Overcurrent during constant speed	E04.00	Output current exceeds hardware limit	Please refer to following diagram
Overvoltage during acceleration	E05.00	DC BUS voltage exceeds overvoltage level	Please refer to following diagram
Overvoltage during deceleration	E06.00	DC BUS voltage exceeds overvoltage level	Please refer to following diagram
Overvoltage during constant speed	E07.00	DC BUS voltage exceeds overvoltage level	Please refer to following diagram
Pre-charge resistor fault	E08.00	Pre-charge resistor works more than once in short period	Disconnect power supply and seek for maintenance
Undervoltage	E09.□□	DC BUS voltage lower than undervoltage level	Please refer to following diagram
Drive overload	E10.00	Drive is overloaded	Please refer to following diagram
	E10.01	Speed sensor is faulty	Set A1-05=2s and start speed sensor self check
Input phase loss	E12.00	RST power supply loses one phase or is unbalance	Please refer to following diagram
Output phase loss	E13.00	Output phases lost upon starting	Please refer to following diagram
IGBT overheat	E14.00	IGBT overheat	Please refer to following diagram
External fault	E15.00	External fault input(through DI)	Please refer to following diagram
Communication fault	E16.03	MODBUS communication fault	Please refer to following diagram
Pre-charge relay fault	E17.00	Pre-charge relay fault	Disconnect power supply and seek for maintenance
Current sensing fault	E18.00	Current sensing is abnormal	Disconnect power supply and seek for maintenance
Motor auto tuning overtime	E19.□□	Auto tuning is overtime	Please refer to following diagram
Auto tuning speed feedback fault	E20.00	Auto tuning speed feedback fault	Please refer to following diagram
EEPROM fault	E21.□□	EEPROM is broken	Disconnect power supply and seek for maintenance
Motor ground fault	E23.00	Overcurrent during power on	1.check if motor winding is short-circuit to ground, consider change motor cable or even motor. 2.disconnect power supply and seek for maintenance
Motor ground fault	E23.09	Motor runs fast during power on	Do not connect power supply until motor stops

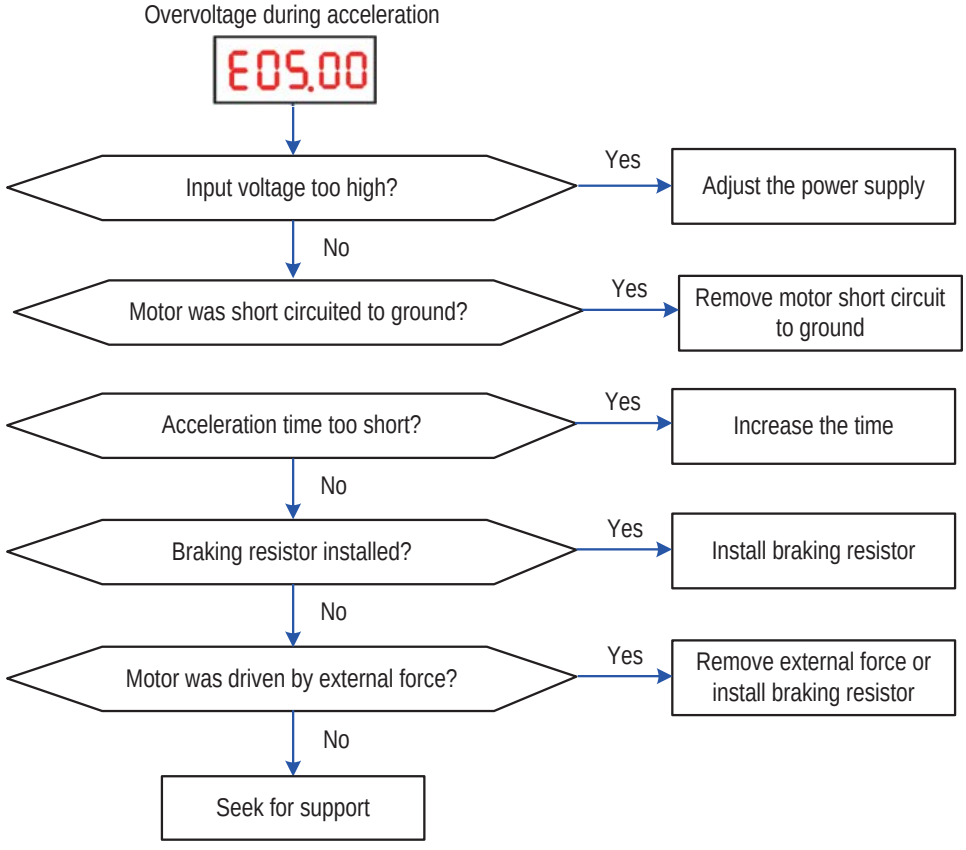
Fault Name	Display	Reasons	Solutions
Output phase to phase short-circuit fault	E24.00	Output phase to phase is short-circuited	Please check the outputs
Time out	E26.00	Time is out	Please refer to following diagram
Business time out	E27.00	Business setting time is out	Please refer to following diagram
Overcurrent multi prevention fault	E40.00	Overcurrent multi prevention fault	Please refer to following diagram
CAN communication fault	E42.01	Communication gets interrupted	1.check if BUS wirings have loose connection or wrong connection 2.check if BUS shielding is well connected, or if BUS cable is longer than limit
	E42.02	Communication gets interfered	
	E42.03	The communication never gets online.	1.check if A2-00.A2-01 are setting correctly 2.check if BUS wirings have loose connection or wrong connection
	E42.04	BUS card fault	Disconnect power supply and seek for maintenance
	E42.05	Canlink address conflicts	Set address A2-01 correctly
	E42.06	Canlink address setting fault	Set address A2-01 correctly
	E42.07	Canopen fault	Disconnect power supply and seek for maintenance
Speed sensor fault during motor auto-tuning	E43.00	Speed sensor fault during motor auto tuning	Please refer to following diagram
Speed error fault	E44.00	Speed error exceeds limit	Please refer to following diagram
	E44.01	Drive parameter setting fault	Increase F2-10
	E44.02	Speed sensor fault	Disconnect power supply and seek for maintenance
	E44.03	Drive parameter setting fault and speed sensor fault	1.Increase F2-10 2.Disconnect power supply and seek for maintenance
Motor temperature fault	E45.00	Motor PTC overheat	Please refer to following diagram
	E45.01	Temperature sensor disconnected	Check if motor temperature sensor is connected
	E45.02	PG card flat cable fault	1.check if PG card flat cable is well connected 2.check if motor temperature sensor is short-circuit
	E45.03	Motor KTY overheat	Please refer to following diagram

Fault Name	Display	Reasons	Solutions
Pressure sensor fault	E46.00	Pressure sensor is faulty	Please refer to following diagram
	E46.01	Motor rotor gets locked or pump gets stuck	1.check if rotor can be turned by hand 2.check if F2-10 sets properly 3.check if auto tuning can be conducted
	E46.02	Pressure sensor calibration fault	1.check if pressure feedback is around zero 2.check if pressure sensor is well connected 3.check if F4-28 to 31 are set properly
	E46.03	Pressure sensor output is beyond setting range	Pressure sensor output is beyond setting range [A3-55, A3-56], please check the sensor
Slave fault	E47.00	Slave fault	Refer to <multi pumps solution> in User Guide
Communication address conflict	E48.00	Communication address conflict	Refer to <multi pumps solution> in User Guide
Speed sensor fault	E49.01	Speed sensor disconnected	Please refer to following diagram
	E49.02	Speed sensor interfered	
Multi-master fault	E52.00	Multi masters	Refer to <multi pumps solution> in User Guide
User parameter restoring fault	E58.00	Restore without saving user parameters	Please refer to following diagram
Back EMF fault during auto tuning	E59.00	From dynamic tuning, back EMF is smaller than lower limit	Please refer to following diagram
Braking IGBT works overtime	E6 1.00	Braking IGBT works overtime	Please refer to following diagram
	E2 101	Braking resistor disconnected	Check if braking resistor is well connected, and set F8-26 to start self check
Braking IGBT overload	E62.00	Braking IGBT short-circuit	Disconnect power supply and seek for maintenance
	E62.02	Braking IGBT gets overloaded	1. check if braking resistor is shirt-circuit, and if the resistance is proper □ 2. Check if DC BUS voltage is normal□ 3. Disconnect power supply and seek for maintenance
Reverse running time out	E63.00	Reverse running time reaches A4-09	Please refer to following diagram
Braking resistor fault	E66.01	Braking resistor disconnected	1. Check wirings 2. If braking resistor is unnecessary, then set F8-26 = 0
	E66.02	Braking resistor resistance smaller than minimum	1.replace with a proper resistor
Parameter initialization fault	E67.00	Parameter initialization fault	Disconnect power supply and seek for maintenance

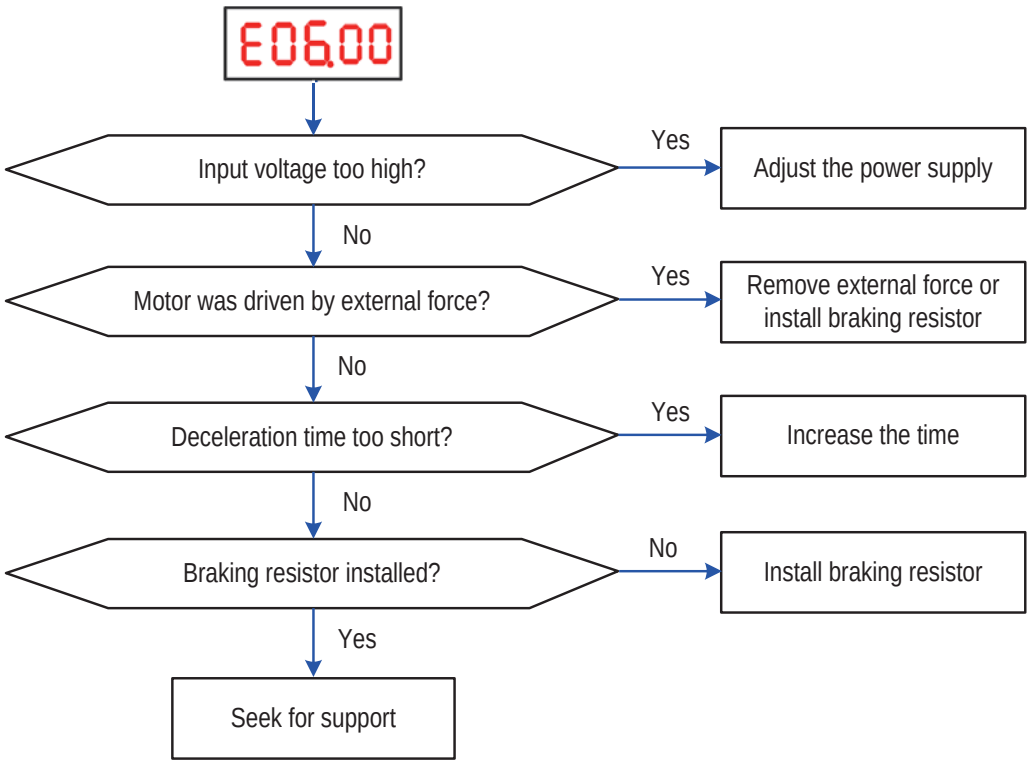

Overcurrent during acceleration
E02.00
Output phase to phase or phase to ground short-circuit?
Yes
Fix the wrong wirings
No
V/F control
auto tuning succeeds?
No
Conduct auto tuning
Yes
acceleration time is too short?
Yes
Increase the time
No
V/F control, check if torque boost or V/F curve is set properly
Yes
Adjust torque boost or V/F curve
No
power supply is abnormal?
Yes
Adjust the power supply
No
Restarted the motor before it stopped?
Yes
Restart motor until it stops
No
Shock load during acceleration?
Yes
Remove shock load
Seek for support
No
Hall damaged, hall wiring abnormal?
Cable connecting control board and drive board abnormal?
Control board, drive board abnormal?
DIP setting incorrect (for newly replaced drive board only)?
Interference exists?
The drive rating is small?


Overcurrent during deceleration
E03.00
Output phase to phase or phase to ground short-circuit?
Yes
Fix the wrong wirings
No
VF control
auto tuning succeeds?
No
Conduct auto tuning
Yes
Deceleration time too short?
Yes
Increase the time
No
Check if power supply is abnormal
Yes
Adjust the power supply
No
Shock load during acceleration?
Yes
Remove shock load
No
braking resistor installed?
No
Install braking resistor
Seek for support
Yes
Hall damaged, hall wiring abnormal?
Cable connecting control board and drive board abnormal?
Control board, drive board abnormal?
DIP setting incorrect (for newly replaced drive board only)?
Interference exists?
The drive rating is small?

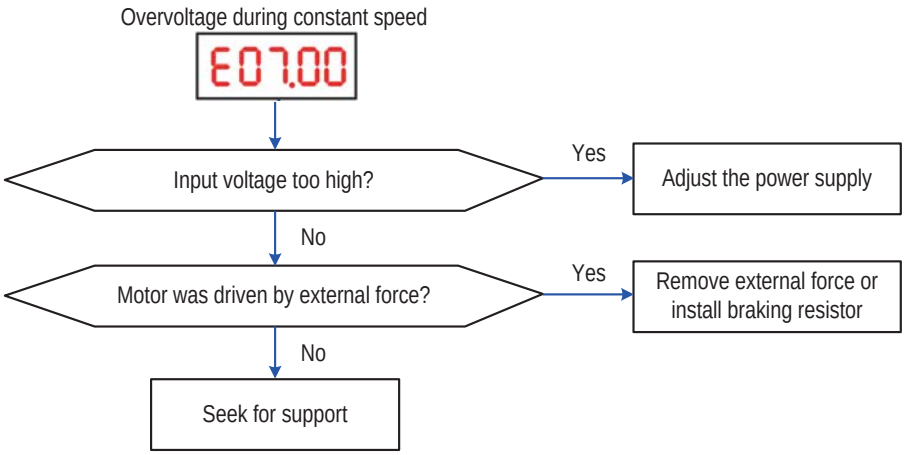

Overcurrent during constant speed
E04.00
Output short-circuit or current leakage?
Yes
Fix the wrong wirings
; if output cable is too long please install output reactor
No
auto tuning succeeds?
No
Conduct auto tuning
Yes
Shock load during running?
Yes
Remove shock load
No
Load can be reduced?
No
Reduce load
Seek for support
Yes
Hall damaged, hall wiring abnormal?
Cable connecting control board and drive board abnormal?
Control board, drive board abnormal?
DIP setting incorrect (for newly replaced drive board only)?
Interference exists?
The drive rating is small?

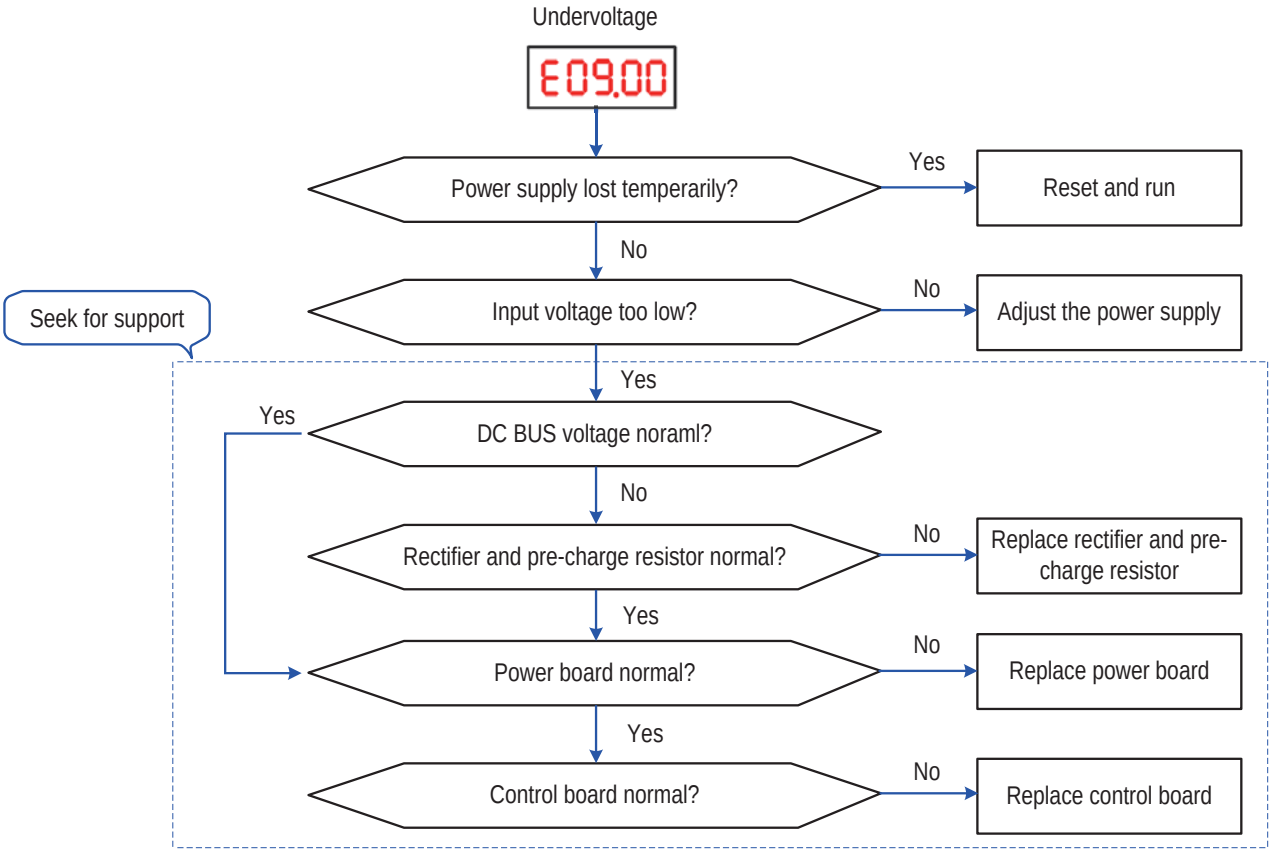

Overvoltage during acceleration
E05.00
Input voltage too high?
Yes
Adjust the power supply
No
Motor was short circuited to ground?
Yes
Remove motor short circuit to ground
Acceleration time too short?
Yes
Increase the time
No
Braking resistor installed?
Yes
Install braking resistor
No
Motor was driven by external force?
Yes
Remove external force or install braking resistor
No
Seek for support

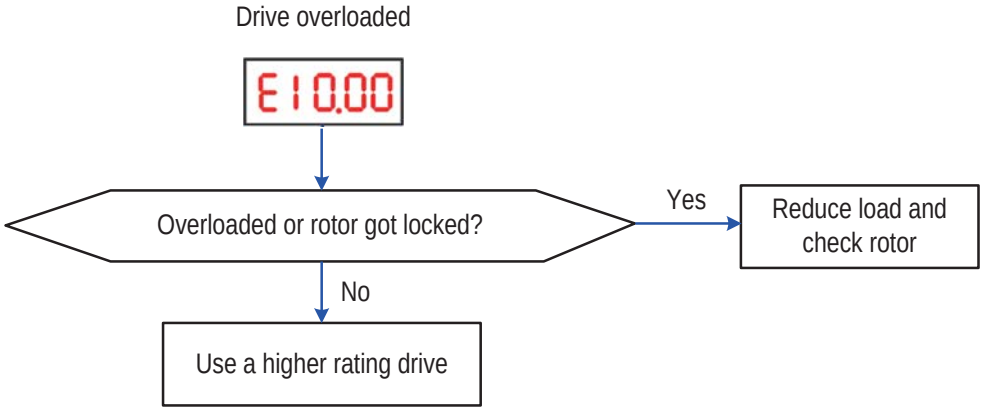
Overvoltage during deceleration

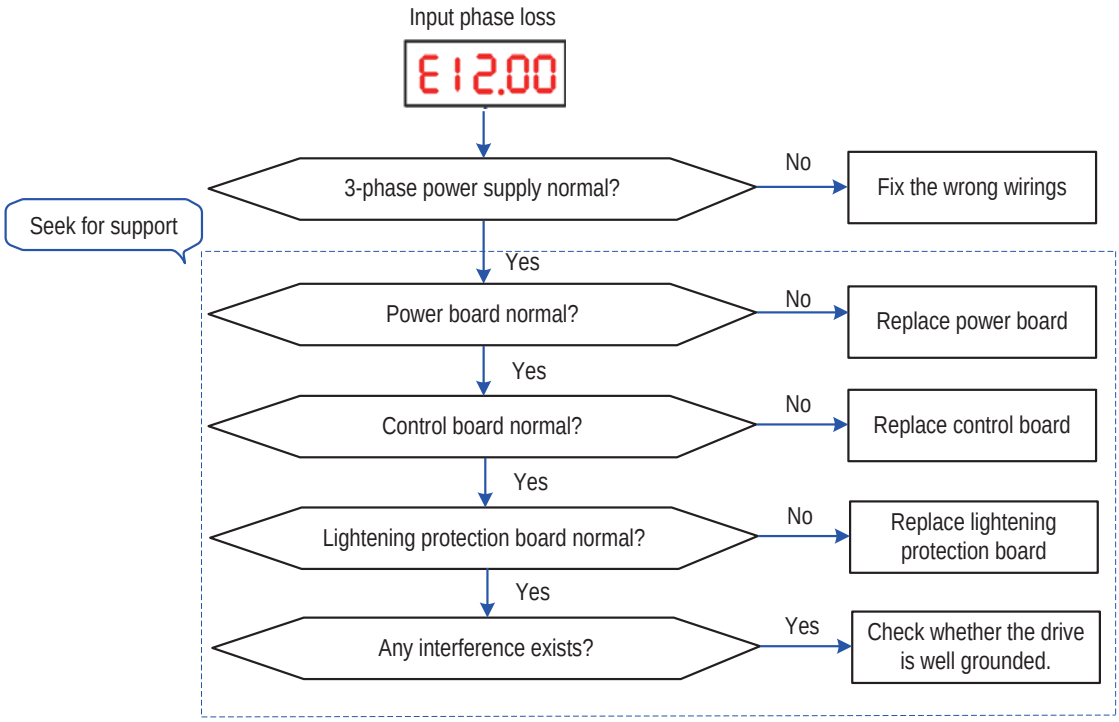


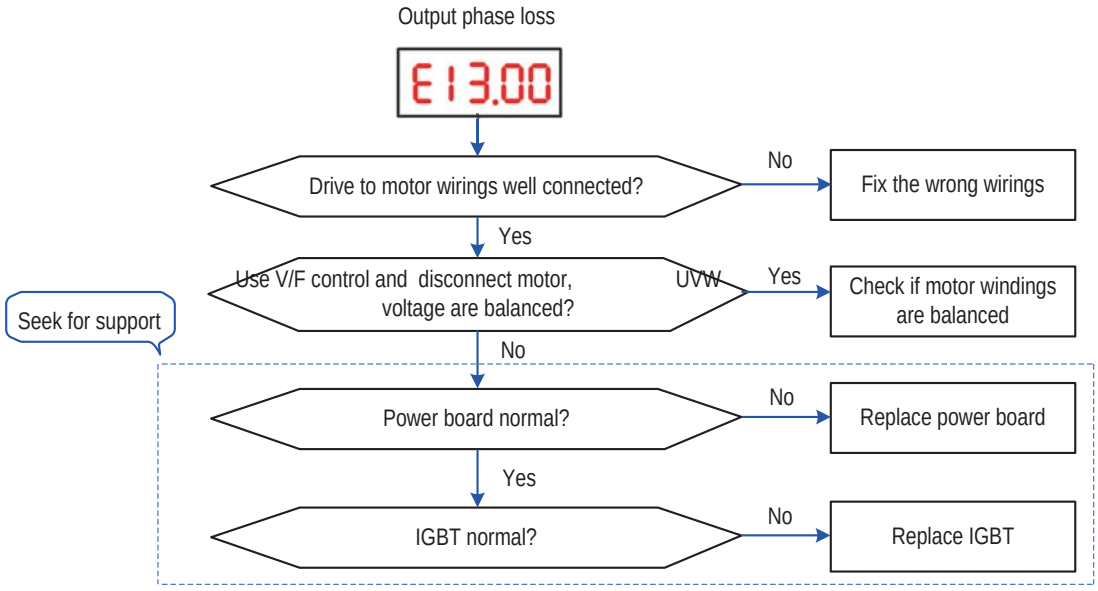
Overvoltage during constant speed

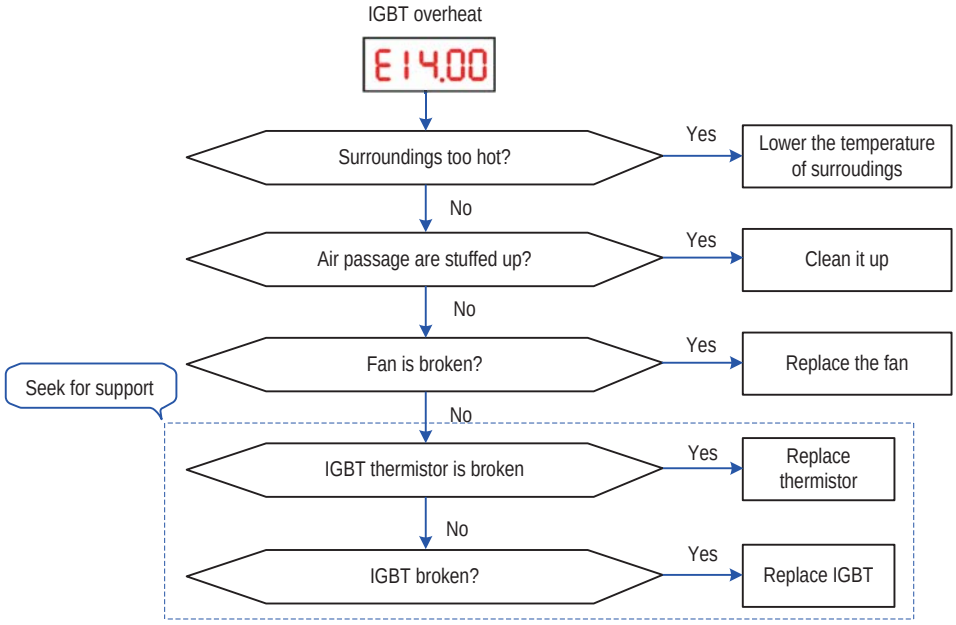


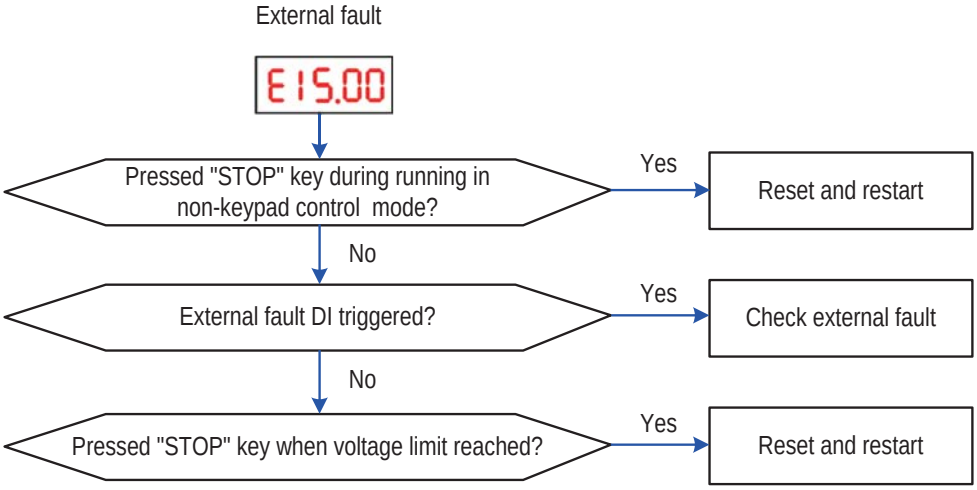

Undervoltage
E09.00
Power supply lost temperarily?
Yes
Reset and run
No
Input voltage too low?
No
Adjust the power supply
Seek for support
Yes
DC BUS voltage noraml?
Yes
No
Rectifier and pre-charge resistor normal?
No
Replace rectifier and pre-charge resistor
Yes
Power board normal?
No
Replace power board
Yes
Control board normal?
No
Replace control board

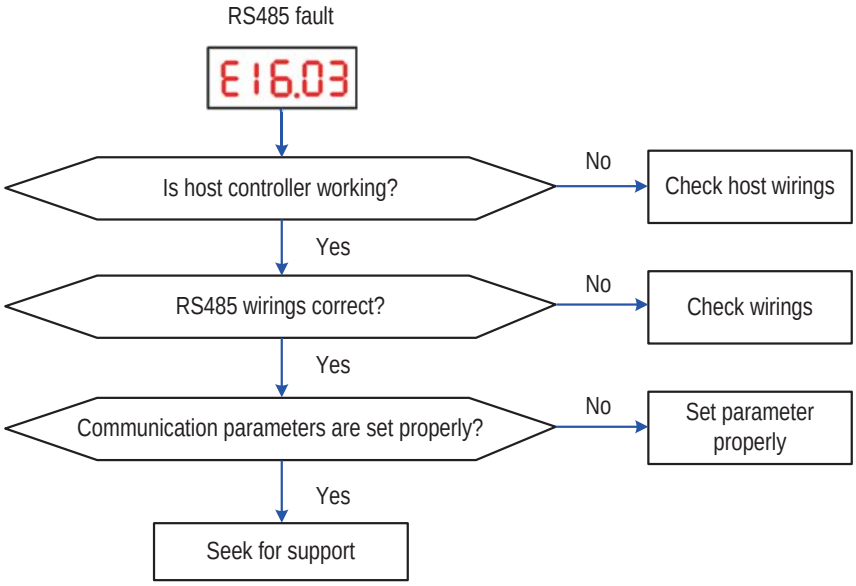

Drive overloaded
E10.00
Overloaded or rotor got locked?
Yes
Reduce load and check rotor
No
Use a higher rating drive

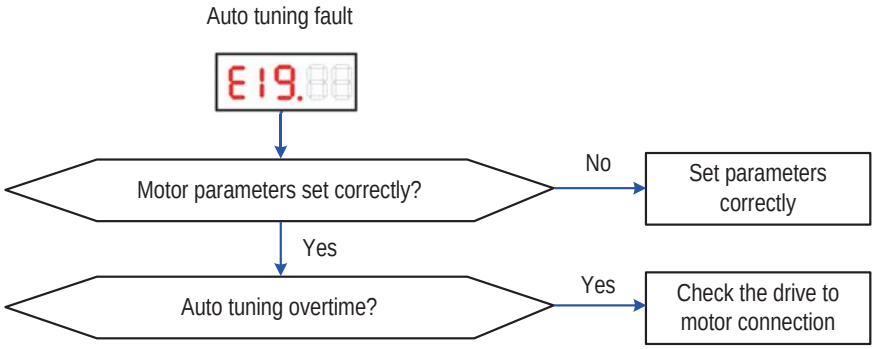

Input phase loss
E12.00
3-phase power supply normal?
No
Fix the wrong wirings
Seek for support
Yes
Power board normal?
No
Replace power board
Yes
Control board normal?
No
Replace control board
Yes
Lightening protection board normal?
No
Replace lightening protection board
Yes
Any interference exists?
Yes
Check whether the drive is well grounded.

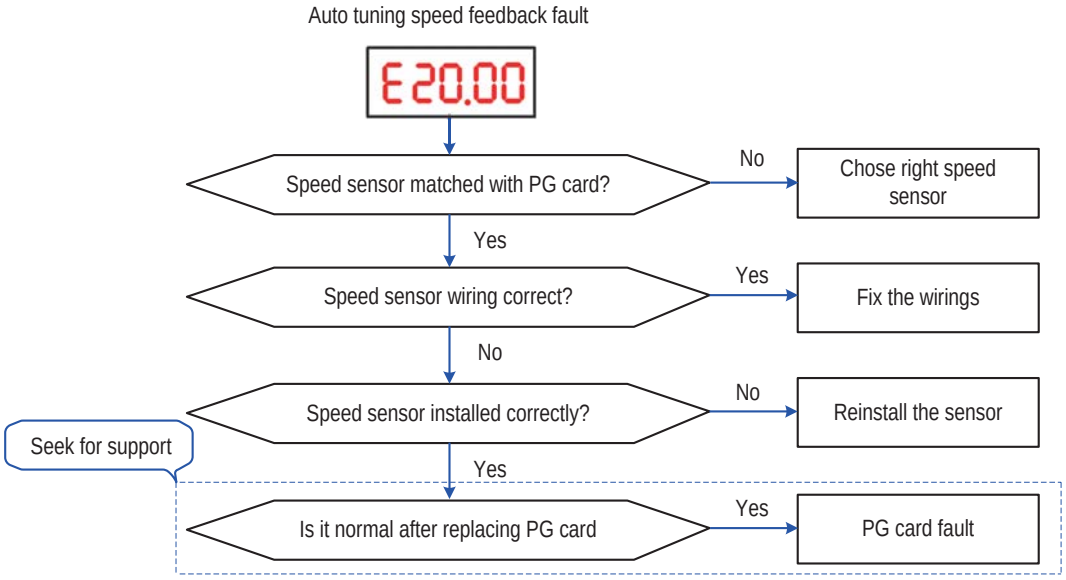

Output phase loss
E13.00
Drive to motor wirings well connected?
No
Fix the wrong wirings
Yes
Use V/F control and disconnect motor, UVW voltage are balanced?
Yes
Check if motor windings are balanced
Seek for support
No
Power board normal?
No
Replace power board
Yes
IGBT normal?
No
Replace IGBT

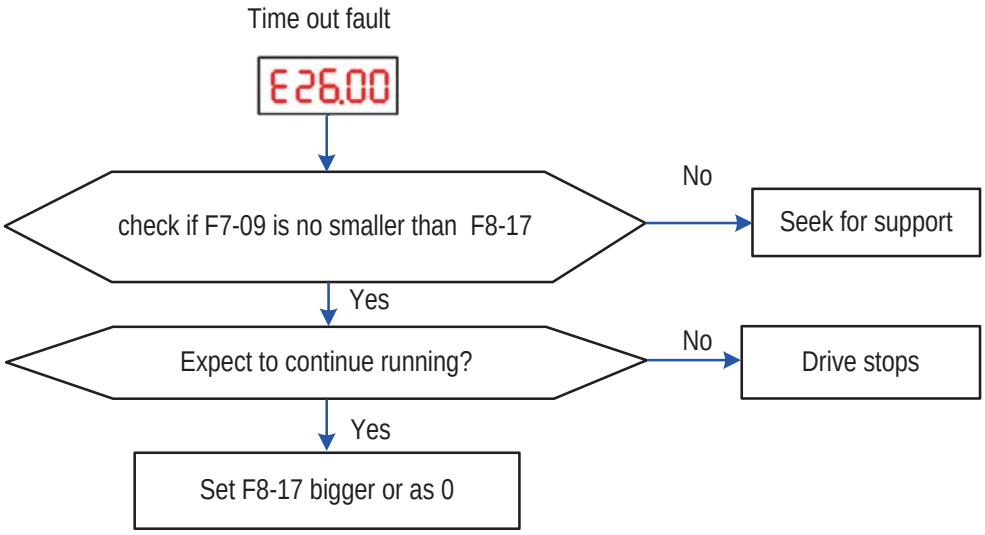

IGBT overheat
E14.00
Surroundings too hot?
Yes
Lower the temperature of surroudings
No
Air passage are stuffed up?
Yes
Clean it up
No
Fan is broken?
Yes
Replace the fan
Seek for support
No
IGBT thermistor is broken
Yes
Replace thermistor
No
IGBT broken?
Yes
Replace IGBT


External fault
E15.00
Pressed "STOP" key during running in non-keypad control mode?
Yes
Reset and restart
No
External fault DI triggered?
Yes
Check external fault
No
Pressed "STOP" key when voltage limit reached?
Yes
Reset and restart

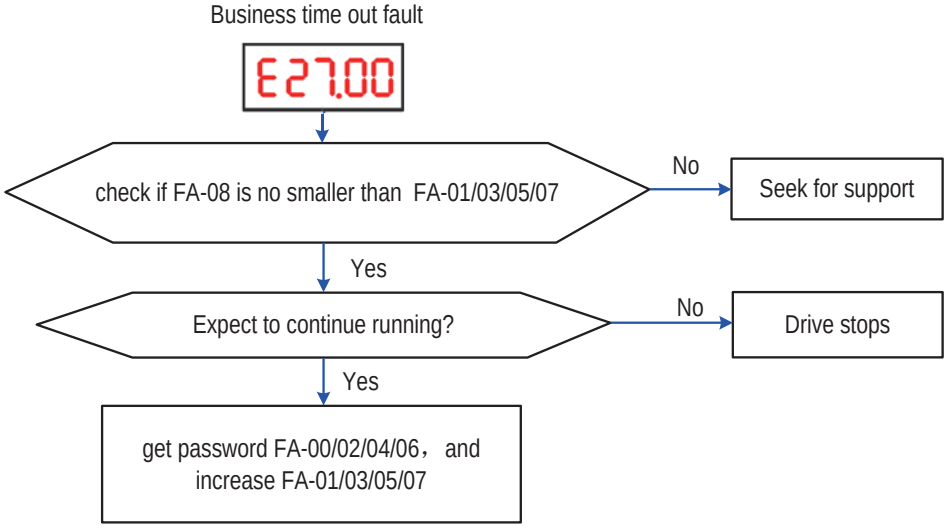

RS485 fault
E16.03
Is host controller working?
No
Check host wirings
Yes
RS485 wirings correct?
No
Check wirings
Yes
Communication parameters are set properly?
No
Set parameter properly
Yes
Seek for support


Auto tuning fault
E19.
Motor parameters set correctly?
No
Set parameters correctly
Yes
Auto tuning overtime?
Yes
Check the drive to motor connection

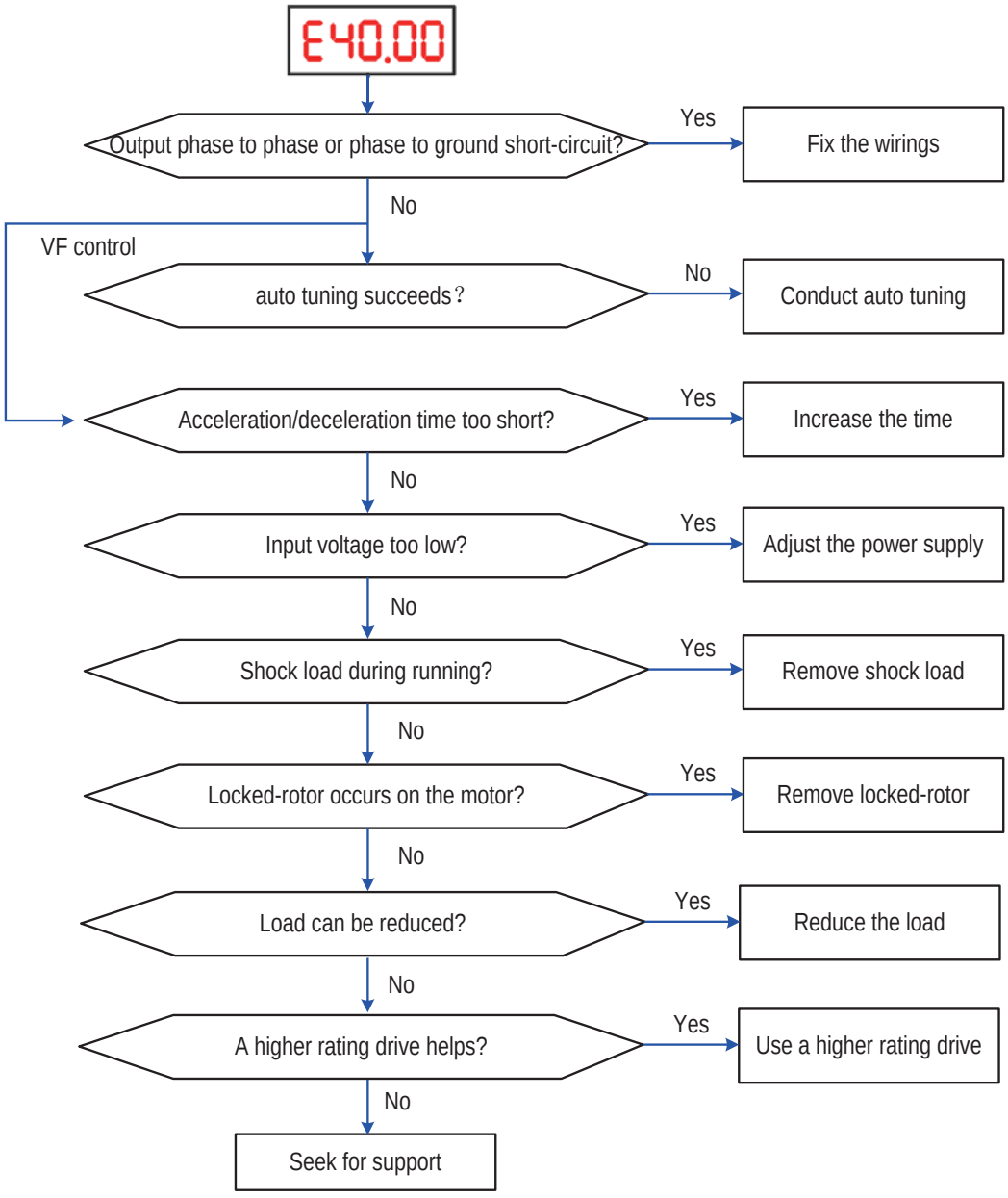

Auto tuning speed feedback fault
E20.00
Speed sensor matched with PG card?
No
Chose right speed sensor
Yes
Speed sensor wiring correct?
Yes
Fix the wirings
No
Speed sensor installed correctly?
No
Reinstall the sensor
Seek for support
Yes
Is it normal after replacing PG card
Yes
PG card fault


Time out fault
E26.00
check if F7-09 is no smaller than F8-17
No
Seek for support
Yes
Expect to continue running?
No
Drive stops
Yes
Set F8-17 bigger or as 0

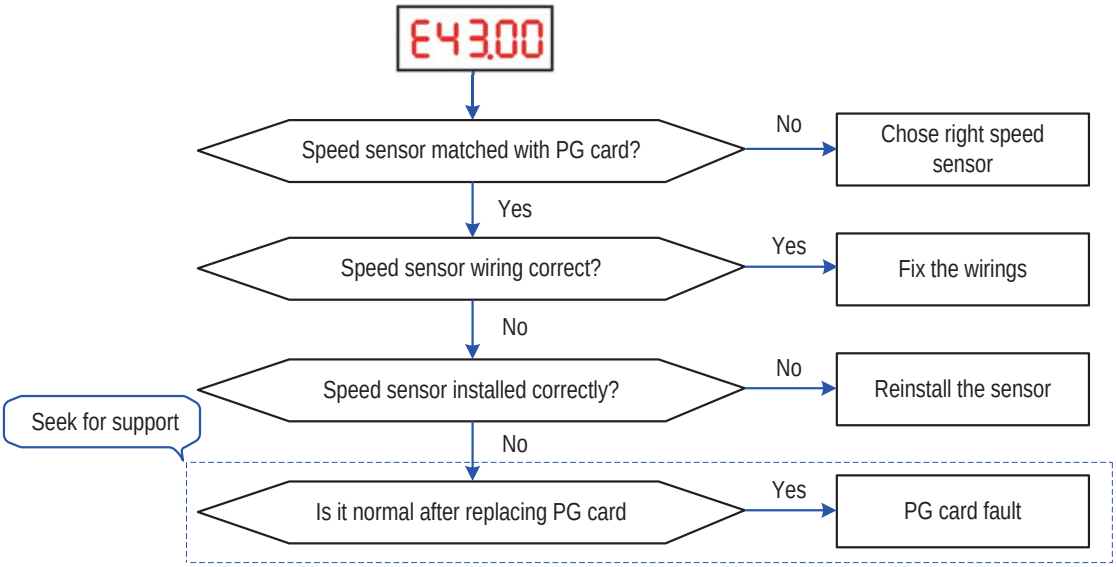
Business time out fault



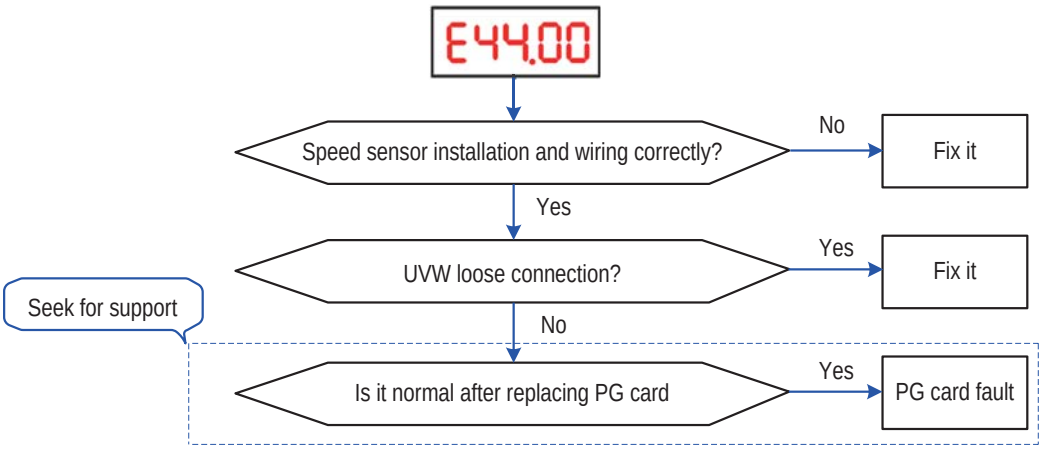
Overcurrent multi prevention fault



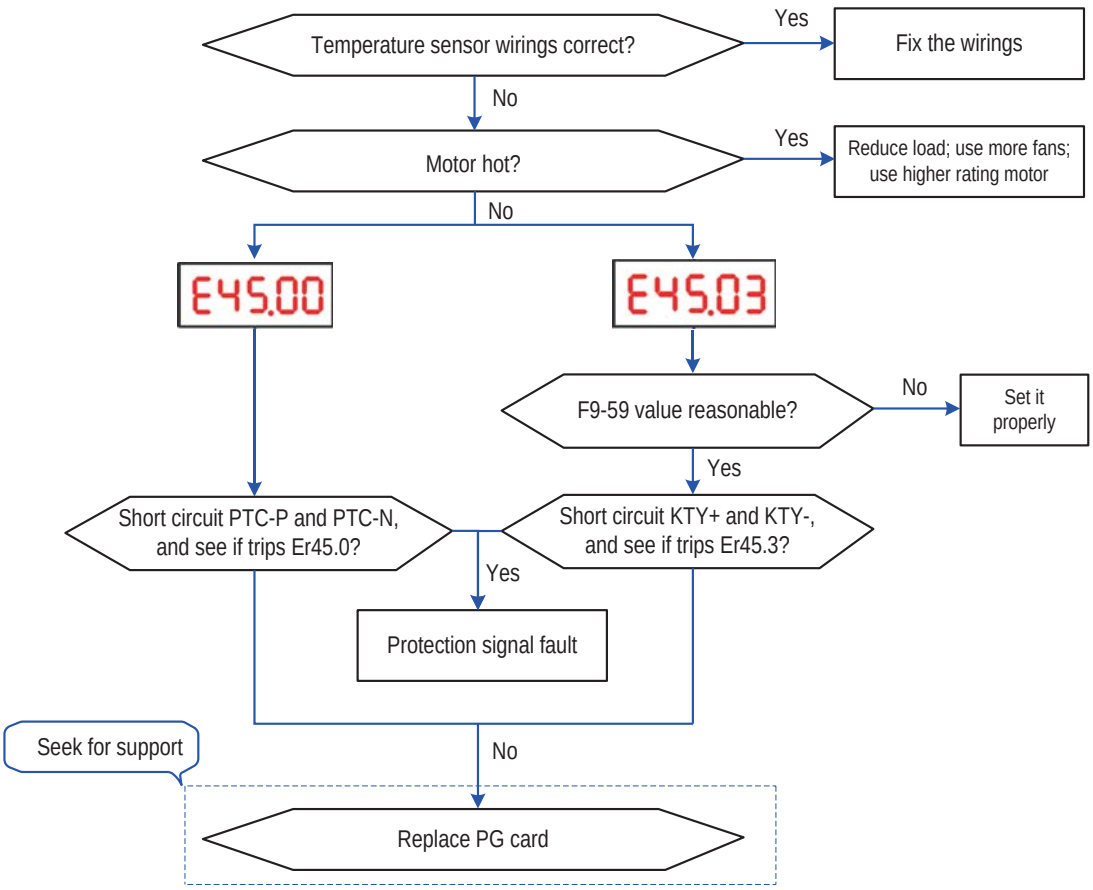
Speed sensor fault during auto tuning



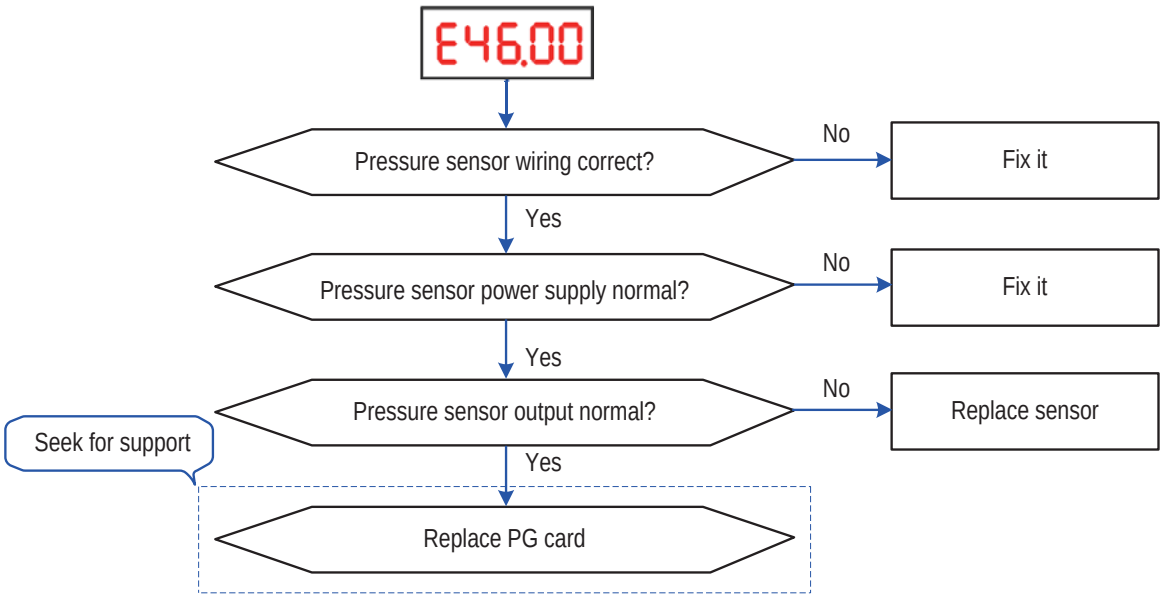
Speed error exceeds limit

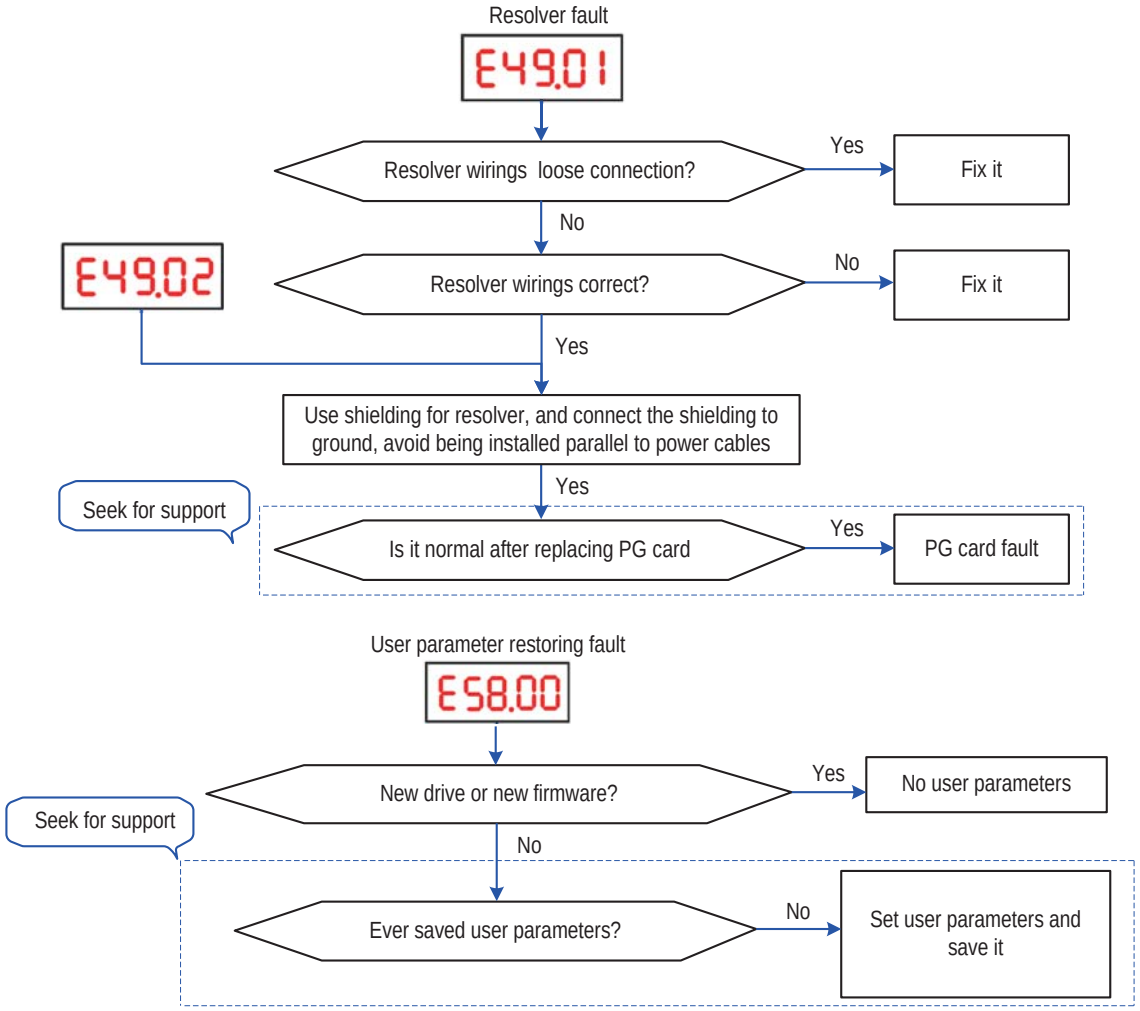


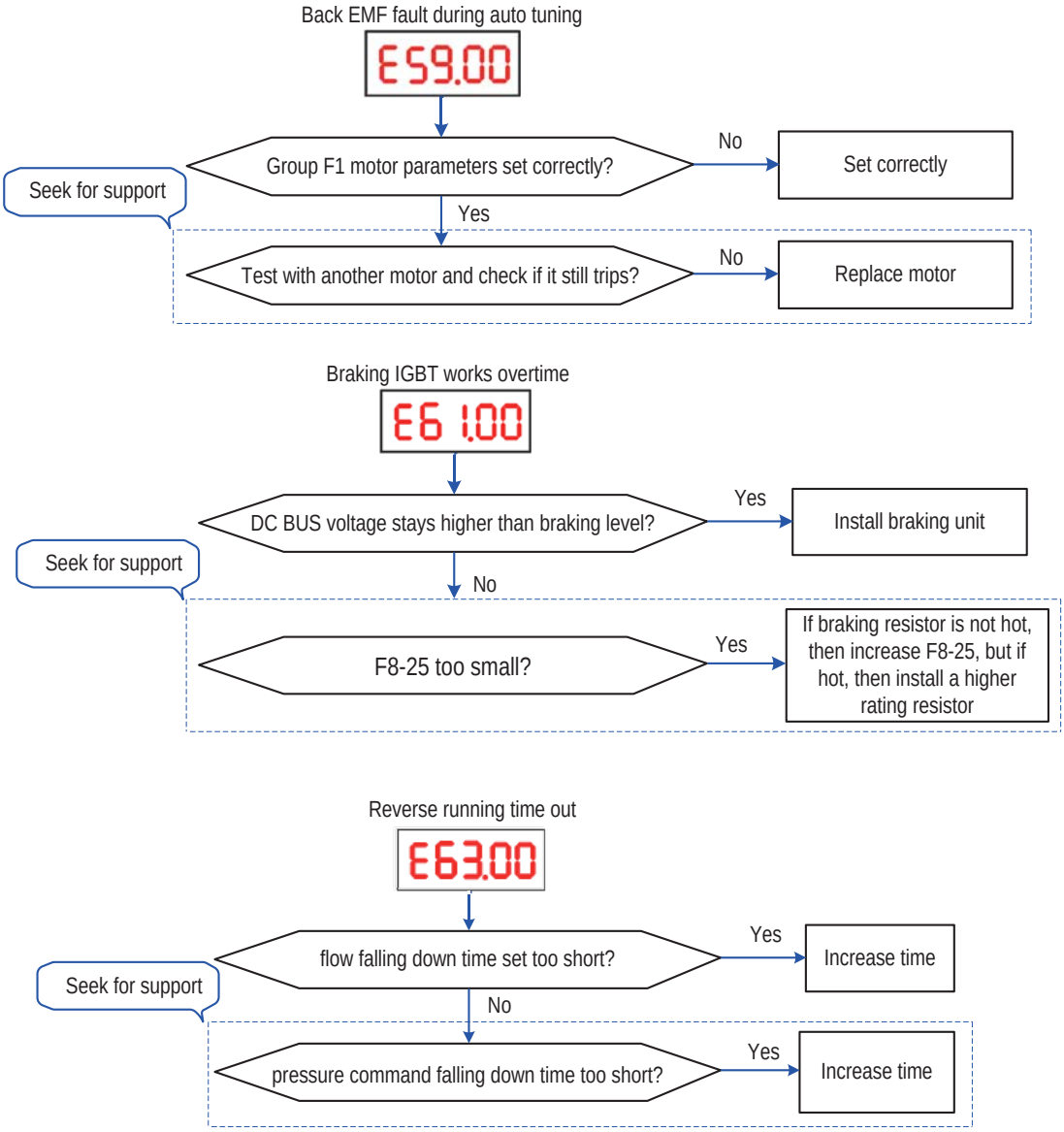
Motor overheat fault



Pressure sensor fault




Resolver fault
E49.01
Resolver wirings loose connection?
Yes
Fix it
No
E49.02
Resolver wirings correct?
No
Fix it
Yes
Use shielding for resolver, and connect the shielding to ground, avoid being installed parallel to power cables
Yes
Seek for support
Is it normal after replacing PG card
Yes
PG card fault
User parameter restoring fault
E58.00
New drive or new firmware?
Yes
No user parameters
Seek for support
No
Ever saved user parameters?
No
Set user parameters and save it



Note	E47 and E48 are multi-pump related faults, please refer to <multi pumps solution> User Guide.

6.3 Servo Common Symptoms and Diagnostics

Fault Name	Possible Causes	Solutions
There is no display at power-on.	The Mains voltage is not input or too low.	Check the power supply.
	The switching power supply on drive board of the servo drive is faulty.	Check bus voltage. Check that the 24v output and +10v output on the control board are normal.
	Wires between control board and drive board and between control board and operating panel break.	Re-connect the 8-pin wire and 40-pin wire.
	Pre-charge resistor of the servo drive is damaged.	Contact Inovance.
	Control board or operating panel is faulty.	
	Rectifier bridge is damaged.	
HC is displayed at power-on.	Wire between drive board and control board is in poor contact.	Re-connect the 8-pin wire and 28-pin wire.
	Related components on control board are damaged	Contact Inovance.
	The motor or motor cable is short circuited to ground.	
	The hall is damaged.	
	The Mains voltage is too low.	
The display is normal upon power-on, but HC is displayed after start and the motor stops immediately.	The cooling fan is damaged or locked-rotor occurs.	Replace the fan.
	Short circuit exists in wiring of control terminals.	Eliminate short circuit fault in control circuit wiring.
The motor does not rotate after the servo drive runs.	It is motor or motor cable problem.	Check that wiring between servo drive and motor is normal.
	Related servo drive and motor parameters are set improperly.	Restore the factory parameters and re-set the following parameters properly: Encoder parameters Motor ratings, such as rate motor frequency and rated motor speed Motor 1 control mode (F0-01) and command source selection (F0-02) F3-01 (torque boost) in V/F control under heavy-load start.
	Cable connection between drive board and control board is in poor contact.	Re-connect wirings and ensure secure connection.
	The drive board is faulty.	Contact Inovance.
The DI terminals are Disabled.	Related parameters are set incorrectly.	Check and set parameters in group f4 again.
	External signals are incorrect.	Re-connect external signal cables.
	Jumper across op and +24 v becomes loose.	Re-confirm the jumper bar across op and +24 v.
	The control board is faulty.	Contact Inovance.

Fault Name	Possible Causes	Solutions
Motor speed Does not rise in FVC control.	Encoder is faulty.	Replace encoder and re-confirm cable connection.
	Encoder connection is incorrect or in poor contact.	Reconnect the encoder to ensure in good contact.
	PG card is faulty.	Replace the PG card.
	Drive board is faulty.	Contact Inovance.
The servo drive detects overcurrent and overvoltage frequently.	Motor parameters are set improperly.	Set motor parameters or perform motor auto-tuning again.
	Acceleration/deceleration time is improper.	Set proper acceleration/ deceleration time.
	Load fluctuates.	Contact Inovance.
Pre-charge resistor burnt down	Cable of braking resistor touches the metal housing (short circuited to PE).	Enhance insulation on cable of braking resistor, such as wrapping electric tape.
	Braking pipe is burnt down.	Replace the braking pipe

7. Maintenance and Inspection

Chapter 7 Maintenance and Inspection

7.1 Daily Inspection

Safety Information

WARNING

- Do not connect or disconnect wiring while the power is on.
- Disconnect all power and wait for several minutes. Do not touch any terminals before the capacitors have fully discharged.
- Do not modify or disconnect wiring, remove optional extension card or replace the cooling fan while the power is on.
- Make sure to connect the motor-side grounding terminal. Failure to comply may result in electric shock due to touching motor housing.
- Do not allow unqualified personnel to do the repair & maintenance work.
- Installation, wiring, commissioning, repair & maintenance, and component replacement must be performed only by qualified technicians.

CAUTION

- Do not run the servo drive with front cover removed.
- Drawings in the guide are sometimes shown without covers or protective guards. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with instructions.
- Tighten all terminal screws based on specified tightening torque.
- Ensure that input voltage is within permissible range. Incorrect input voltage of main circuit may result in abnormal running.
- Keep combustible materials far away from the servo drive or mount the servo drive on incombustible surfaces such as a metal wall.
- Replace the cooling fan in correct ways as specified in this chapter. Ensure correct air outlet direction of the fan. Incorrect air direction will diminish the cooling effects.
- Do not connect or disconnect motor while the drive is running. Failure to comply may result in electric shock and damage to the servo drive.
- Use shielded cables for control circuit wiring. Meanwhile, ground the shield to the grounding terminal reliably.
- Do not modify the drive circuitry. Failure to comply will damage the servo drive.
- Make sure to connect the output terminals of the servo drive and the motor terminals correctly.
- If it is necessary to change the motor rotation direction, exchange any two of UVW cables of the servo drive.
- Do not operate the servo drive that has been damaged. This is to prevent further damage to external equipments.

Influence of ambient temperature, humidity, dust and vibration will cause aging of components in the servo drive, which may cause potential faults or reduce the product life. Therefore, it is necessary to carry out routine and periodic maintenance.

More frequent inspection will be required if it is used in harsh environments, such as:

- High ambient temperature
- Frequent starting and stopping
- Fluctuations in the AC power supply or load
- Excessive vibrations or shock loading
- Dust, metal dust, salt, sulfuric acid, chlorine atmospheres
- Poor storage conditions.

Check the following items daily to avoid deterioration in performance or product. Copy this checklist and sign the "checked" column after each inspection.

Inspection Item	Inspection Points	Solutions	Checked
Motor	Inspect whether abnormal oscillation or noise exists.	● Check mechanical connections. ● Check power phases of the motor. ● Tighten all loose screws.	
Fan	Inspect whether the cooling fan of the servo drive and the motor works abnormally.	● Check running of the drive-side cooling fan. ● Check running of the motor-side cooling fan. ● Check whether the cooling fan is clogged or dirty. ● Check whether ambient temperature is within the permissible range.	
Installation environment	Inspect whether the cabinet and cable duct are abnormal.	● Check for input and output cables with insulation damaged. ● Check for vibration of hanging bracket. ● Check whether copper ground bars and terminals become loose or get corroded.	
Load	Inspect whether the drive output current exceeds the drive or motor rating for an extended period of time.	● Check for setting of motor parameters. ● Check for excessive load. ● Check for mechanical vibration (< 0.6 g on normal condition).	
Input voltage	Check main power supply and control voltage.	● Adjust the input voltage to the permissible range. ● Check whether start of heavy load exists.	

7.2 Periodic Inspection

7.2.1 Periodic Inspection Items

Always keep the servo drive clean. Clear away dusts especially metal powder on the surface of the servo drive, to prevent dust from entering the drive. Clear oil dirt from the cooling fan of the servo drive.

WARNING

- Do not perform inspection work while the power is on.
- Disconnect all power and wait for several minutes. Do not touch any terminal before the capacitors have fully discharged.

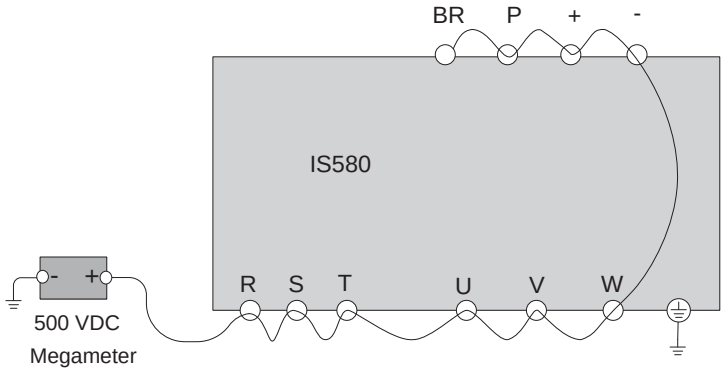
Check the following items every day to avoid deterioration in performance or product. Copy this checklist and sign the "checked" column after each inspection.

Inspection Item	Inspection Points	Solutions	Checked
General	Inspect for wastes, dirt and dust on the surface of the servo drive.	Use a vacuum cleaner to suck up wastes and dust to prevent direct touching. Wipe surface dirt gently with a soft cloth immersed in neutral detergent.	
Cables	Inspect power cables and connections for discoloration. Inspect wiring insulation for aging or wear.	Replace cracked cable. Replace damaged terminals.	
Peripheral devices such as relay and contactor	Inspect contactors and relays for excessive noise during operation. Inspect coils for signs of overheating such as melted or cracked insulation.	Check whether the coil voltage is normal. Replace abnormal peripheral device.	
Ventilation	Inspect whether ventilation and heatsink are clogged. Check whether the fan is damaged.	Clean ventilation. Replace the fan.	
Control circuit	Inspect for control components in poor contact. Inspect for loose terminal screws. Inspect for control cables with cracked insulation.	Clear away foreign matters on the surface of control cables and terminals. Replace damaged or corroded control cables.	

7.2.2 Insulation Test on Main Circuit

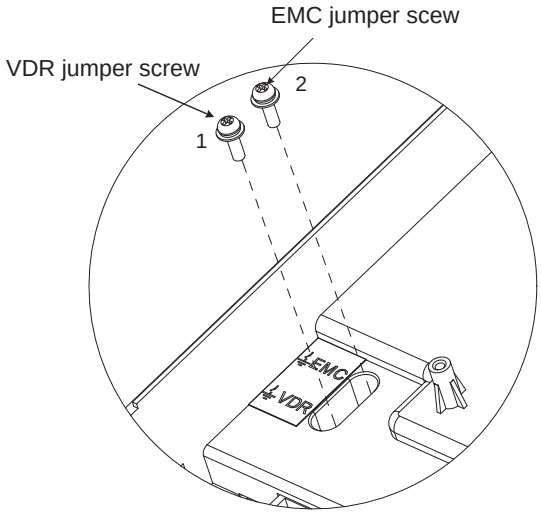
Note	
	• Before measuring insulation resistance with megameter (500 VDC megameter recommended), disconnect the main circuit from the servo drive. • Do not conduct the dielectric strength test. High voltage (> 500 V) test need not be performed again because it has been completed before delivery.

Figure 7-1 Test insulation on the main circuit



The measured insulation resistance must be greater than 5 MΩ.

Before test, remove the VDR screw, as shown in the following position.



7.3 Lifetime of Fans and Electrolytic DC Bus Capacitors

Wearing components of the servo drive include the cooling fan and bus electrolytic capacitor. Their service life is related to the operating environment and maintenance status. Generally, the service life is shown as follows:

Component	Service Life	Possible Cause	Judging Criteria
Fan	≥ 5 years	• Bearing worn • Blade aging	• Whether there is crack on the blade • Whether there is abnormal vibration noise upon startup
Electrolytic DC bus capacitors	≥ 5 years	• Input power supply in poor quality • High ambient temperature • Frequent load jumping • Electrolytic aging	• Whether there is liquid leakage. • Whether the safe valve has projected. • Measure the static capacitance. • Measure the insulation resistance.

The standard service time indicates the service time when the servo drive is used on the following conditions:

- Ambient temperature: about 40°C on average yearly
- Load rate: below 80%
- Operating rate: below 24 hours per day

You can determine when to replace these parts according to the actual operating time.

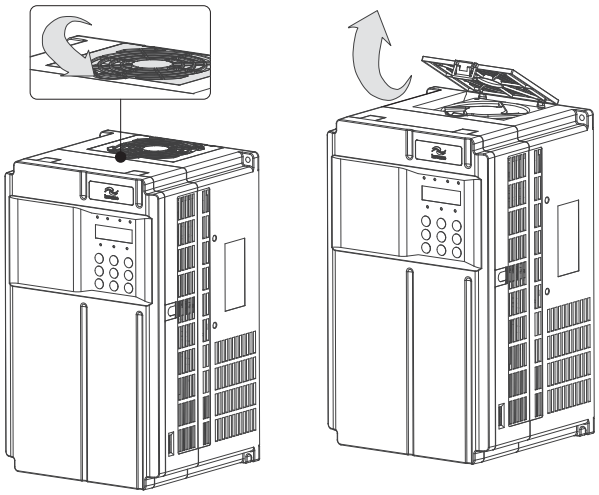
■ Number of Fans on the Drive

IS580 Model			Number of Fans
IS580T020-R1	IS580-2T020-R1	IS580T020-R1-T	1
IS580T030-R1	IS580-2T030-R1	IS580T030-R1-T	1
IS580T035-R1	-	IS580T035-R1-T	1
IS580T040-R1	IS580-2T040-R1	IS580T040-R1-T	1
IS580T050-R1	IS580-2T050-R1	-	1
IS580T070-R1	IS580-2T070-R1	-	1
IS580T080-R1	IS580-2T080-R1	-	1
IS580T100-R1	IS580-2T100-R1	-	1
IS580T140-R1	IS580-2T140-R1	-	2
IS580T170-R1	IS580-2T170-R1	-	2
IS580T210-R1	IS580-2T210-R1	-	2
IS580T250-R1	-	-	2
IS580T300-R1	IS580-2T300-R1	-	2

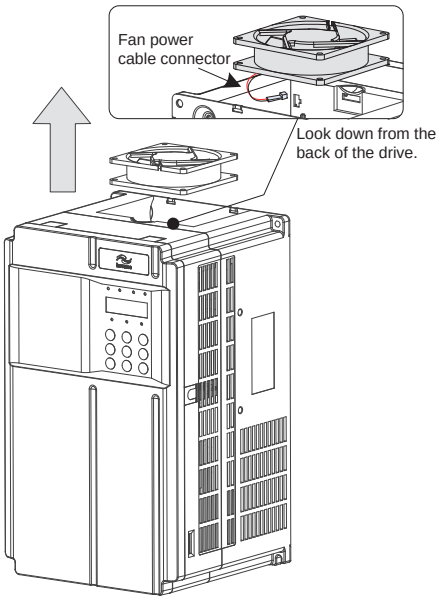
■ Removing and Installing the Fan of a Plastic Housing (IS580T020-R1-T to IS580T040-R1-T, IS580T020-R1 to IS580T070-R1 and IS580-2T020-R1 to IS580-2T070-R1)

Removal

1. Depress the fan cover hook and take the fan cover off the top of the drive.

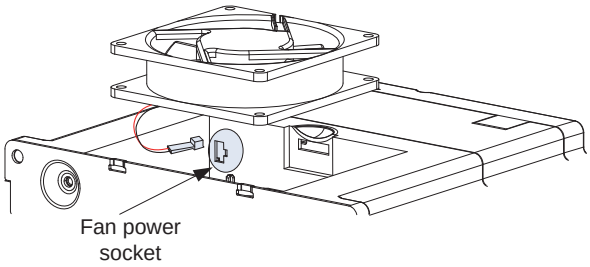


2. Pull the fan upward and disconnect the pluggable connector of power cable.

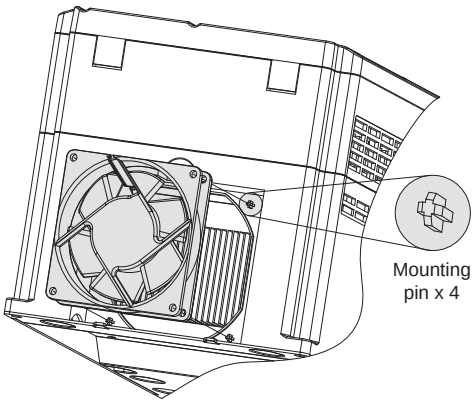


Installing

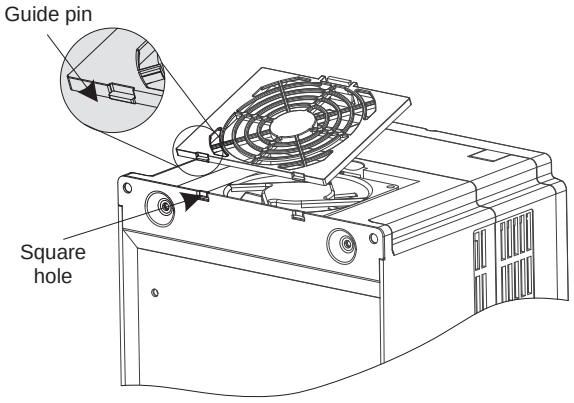
1. Plug in the fan power cable .



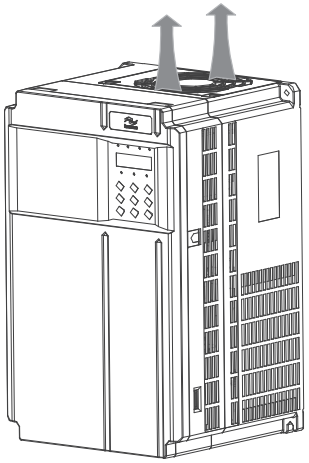
2. Install the fan into the drive and ensure that the mounting pins are aligned.



3. Insert the two guide pins into the square holes and then press in the hook.



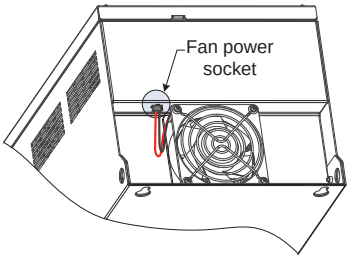
4. Keep air flow direction upward.



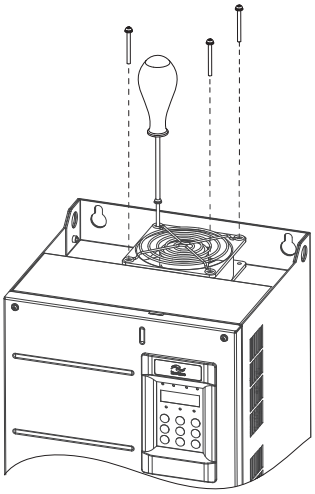
■ Removing and Installing the Fan of a Sheet Metal Housing (IS580T080-R1 to IS580T300-R1 and IS580-2T080-R1 to IS580-2T300-R1)

Removal

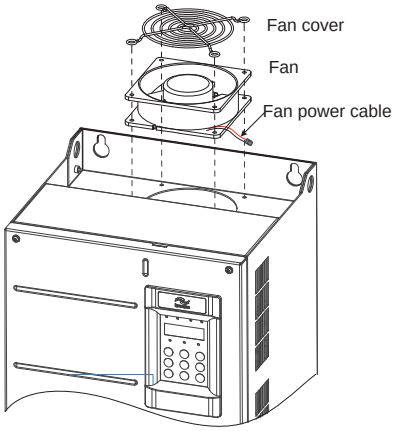
1. Disconnect the fan cable from the drive



2. Remove the four screws from the drive.



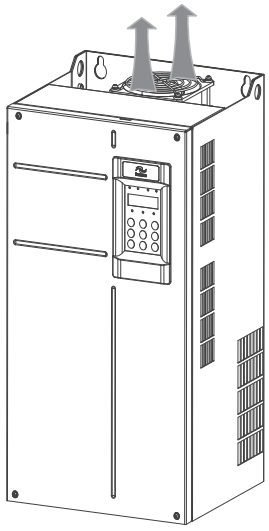
3. Remove the fan and fan cover from the drive.



Installing

1. Align the mounting holes of the cooling fan, fan cover and the drive.
2. Install the fan and fan cover on the servo drive.
3. Fix the screws and ensure correct air flow direction.

Keep the air flow direction upward.



■ Replacement of Electrolytic Capacitor

If replacement of electrolytic capacitor is required, contact the agent or Inovance to perform complete drive replacement.

7.4 Storage

For storage of the servo drive, pay attention to the following three aspects:

- Pack the servo drive with original packing box provided by Inovance.
- Do not place the servo drive in an area of moisture (95% H or more) or high temperature (over 60°C) or outdoors for long time.
- The electrolytic capacitor will deteriorate after being stored for a long time. Thus, the servo drive must be switched on and off once every 2 years, each time lasting at least 5 hours. Ensure to increase the input voltage gradually to rated value by using voltage regulator.

7.5 Warranty Agreement

Free warranty only applies to the servo drive itself. Reasonable repair expenses will be charged for the damages due to the following causes:

- Improper operation without following the instructions
- Fire, flood or abnormal voltage.
- Using the servo drive for non-recommended function
- The maintenance fee is charged according to Inovance's uniform standard. If there is an agreement, the agreement prevails.

8. Peripherals and Options

Chapter 8 Peripherals and Options

Safety Information

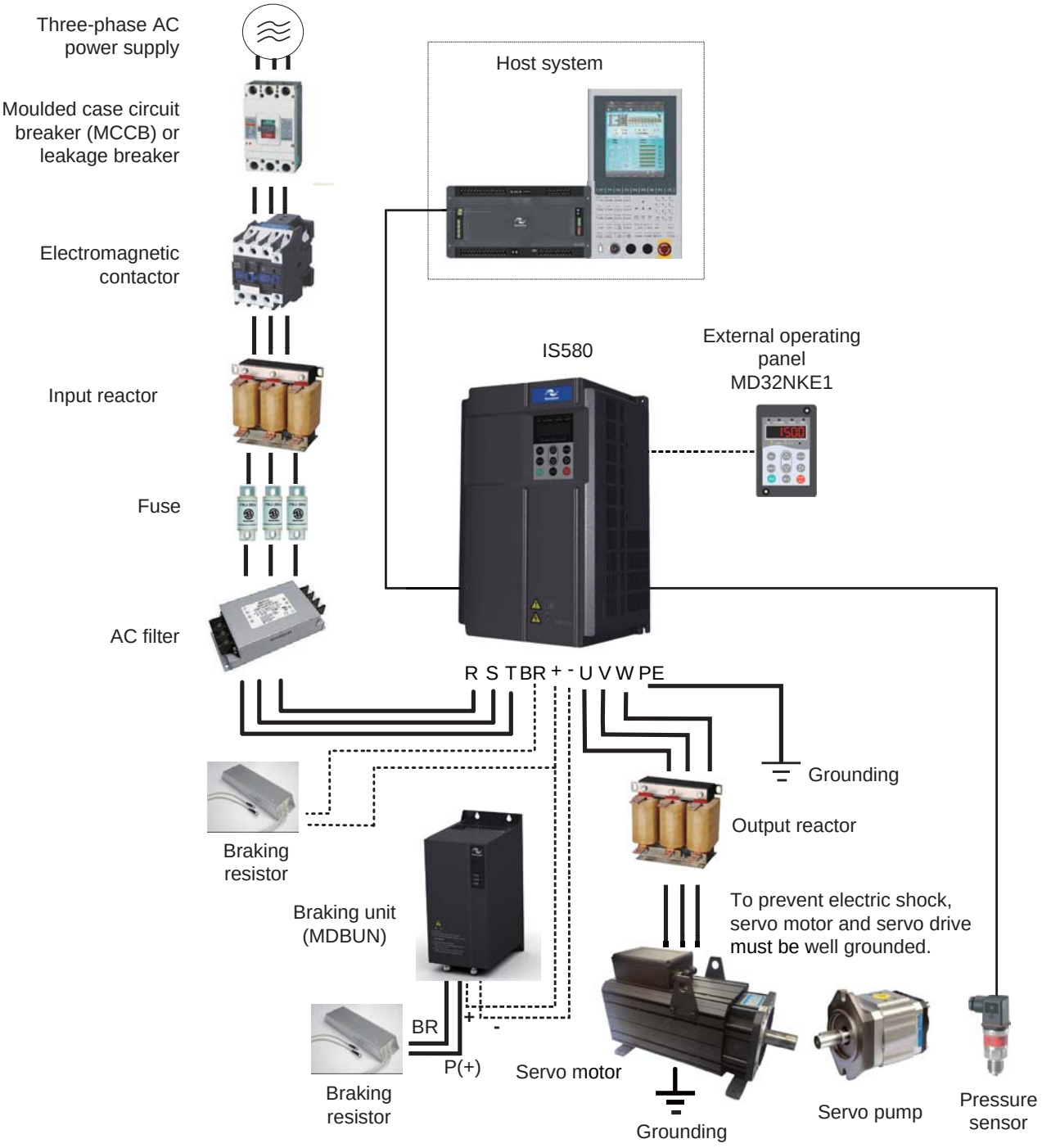
WARNING

- Do not connect or disconnect wirings while the power is on. Failure to comply will result in electric shock.
- Always keep breakers in OFF state at wiring or inspection.

CAUTION

- When installing the drive inside an enclosed cabinet, use cooling fan or air conditioner to keep air inlet temperature below 50°C. Failure to comply may result in overheating or a fire.
- Cover the top of the drive with a temporary cloth or paper during installation so as to prevent foreign matter such as metal shavings, oil and water from falling into the drive. After installation is completed, remove the temporary cloth or paper.
- Follow proper ESD procedures when operating the servo drive. Failure to comply will damage the drive because of static electricity .
- Operating the motor at low speed lowers the cooling effect and increases the motor temperature, which, unless the output torque is significantly reduced, may result in damage to the motor. If the required motor speed range differs from that of the motor manufacturer, please contact them for advice.
- If the torque characteristic is different with drive operation compared with operation from a commercial power supply, please check the load torque characteristic of the connected machine.
- Pay attention to the load torque characteristic when selecting the drive capacity. In addition, when there is a long distance between the motor and drive, use a cable with a large cross sectional area to connect between the motor and the drive to prevent motor torque reduction
- Do not lift the servo drive while the front cover is removed. Failure to comply may result in damage to PCB and terminal block.

How to configure the servo drive (three-phase 380 to 480 V, 18.5 kW and above) to operate with the peripheral devices is shown as below:



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

Description of Peripheral Electrical Devices

Device	Mounting Location	Function Description
Breaker	Power input side	MCCB: Cut off power supply when overcurrent occurs on downstream devices
		Leakage breaker: Provide protection against potentially leakage current during drive running to prevent electric shock and even a fire.
Fuse	Servo drive input side	Provide protection in case of short circuit.
Contactor	Between breaker and servo drive input side	Switch ON/OFF the servo drive. Do not start/stop the servo drive frequently by switching contactor ON/OFF (time interval is at least one hour) nor use it to directly start the servo drive.
Input reactor	Servo drive input side	Improve power factor of power input side. Eliminate higher harmonics of the input side effectively and prevent other devices from being damaged due to distortion of voltage waveform. Eliminate input current unbalance due to inter-phase unbalance.
AC filter	Servo drive input side	Reduce external conduction and radiation interference of the servo drive. Decrease conduction interference flowing from power supply to the servo drive and improve the anti-interference capacity of the servo drive.
DC reactor	-	It is standard configuration for all servo drive models. Improve power factor of the input side. Improve efficiency and thermal stability of the servo drive. Eliminate impact of higher harmonics of the servo drive input side and reduce external conduction and radiation interference.
Braking resistor	-	Use braking resistor for the model of 75 kW and below. Dissipate regenerative energy during motor deceleration.
Braking unit	-	Use braking unit MDBUN of Inovance and recommended braking resistor for G-type model of 90 kW and above. Dissipate regenerative energy during motor deceleration
Output reactor (du/dt fitler)	Between servo drive output side and the motor, close to the servo drive	Output side of servo drive generally has much higher harmonics. When motor is far from servo drive, there is much distributed capacitance in the circuit and certain harmonics may cause resonance in the circuit, which will: Degrade motor insulation performance and damage motor in long run. Generate large leakage current and cause frequent servo drive protection trips. If distance between servo drive and motor is greater than 100 m, install an AC output reactor.
Output ferrite core	Servo drive output side, close to the servo drive	Reduce bearing current.
Host system	Some control sigals connected to the servo drive	The host system mainly controls action of complete machine, sends various commands and references to the servo drive, and interacts with the servo drive.
Servo motor	Servo drive output side	Select an appropriate motor according to recommendation.
Servo pump	Connected to servo motor	The servo pump provides flow and pressure to the hydraulic system.

Device	Mounting Location	Function Description
Pressure sensor	Mounted at oil outlet circuit	With feedback signal connected to the servo drive, the pressure sensor provides hydraulic circuit pressure feedback analog sigal.

Note	
	• Do not install capacitor or surge suppressor on output side of servo drive. Otherwise, it may damage the servo drive. • Inputs/Outputs (main circuit) of the servo drive contain harmonics, which may interfere with communication device connected to the servo drive. Therefore, install an anti-interference filter to minimize interference.

8.1 MCCB, Fuse and Contactor

IS580 Model	Fuse Bussmann (Pass UL Certification)		Contactor Specification	MCCB Specification
	Rated Current (A)	Model	Rated Current (A)	Rated Current (A)
IS580T020-R1	60	FWH-60B	40	50
IS580T020-R1-T				
IS580-2T020-R1				
IS580T030-R1	70	FWH-70B	50	63
IS580T030-R1-T				
IS580-2T030-R1				
IS580T035-R1	80	FWH-80B	65	80
IS580T035-R1-T				
IS580T040-R1	100	FWH-100B	65	80
IS580T040-R1-T				
IS580-2T040-R1				
IS580T050-R1	100	FWH-100B	65	80
IS580-2T050-R1				
IS580T070-R1	125	FWH-125B	80	100
IS580-2T070-R1				
IS580T080-R1	150	FWH-150B	95	160
IS580-2T080-R1				
IS580T100-R1	200	FWH-200B	115	160
IS580-2T100-R1				
IS580T140-R1	250	FWH-250A	150	250
IS580-2T140-R1				
IS580T170-R1	275	FWH-275A	170	250
IS580-2T170-R1				
IS580T210-R1	325	FWH-325A	205	400
IS580-2T210-R1				
IS580T250-R1	400	FWH-400A	245	400
IS580T300-R1	500	FWH-500A	300	400
IS5802T300-R1				

8.2 Braking Unit and Braking Resistor

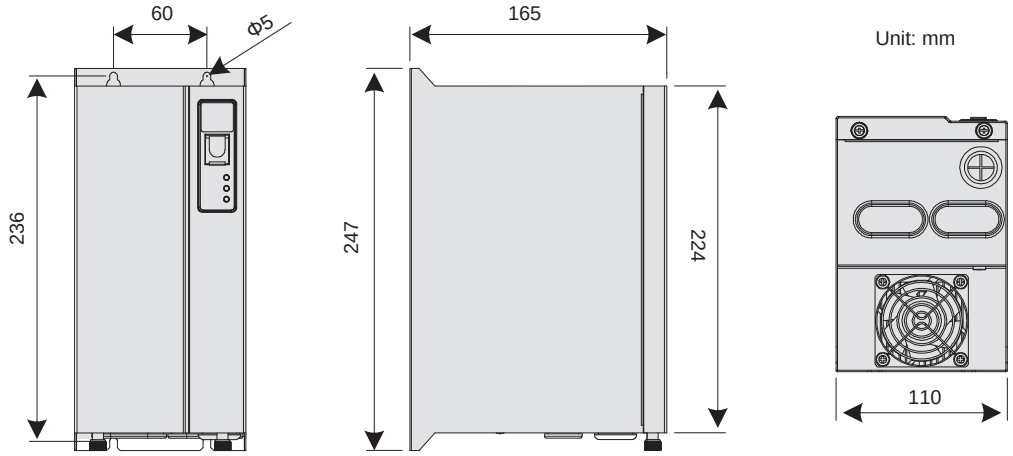
■ Selection Guidance

IS580 Model	Recommended Value of Braking Resistor		Braking Unit	Remark
	Resistance	Power		
Three-phase 380 to 480 VAC, 50/60 Hz				
IS580T020-R1/IS580T020-R1-T	43 Ω	800 W	Built-in	-
IS580T030-R1/IS580T030-R1-T	32 Ω	1000 W		
IS580T035-R1/IS580T035-R1-T	25 Ω	1300 W		
IS580T040-R1/IS580T040-R1-T	25 Ω	1500 W		
IS580T050-R1	20 Ω	2500 W		
IS580T070-R1	16 Ω	3700 W		
IS580T080-R1	16 Ω	4500 W		
IS580T100-R1	16 Ω	5500 W		
IS580T140-R1	12 Ω	7500 W		
IS580T170-R1	12 Ω x 2	4500 W x 2	External	MDBUN-60-T x 2 (< 440 V) MDBUN-60-5T x 2 (> 440 V)
IS580T210-R1	12 Ω x 2	5500 W x 2	External	MDBUN-60-T x 2 (< 440 V) MDBUN-60-5T x 2 (> 440 V)
IS580T250-R1	6.3 Ω x 2	6500 W x 2	External	MDBUN-90-T x 2
IS580T300-R1	6.3 Ω x 2	16 kW	External	MDBUN-90-T x 2
Three-phase 220 VAC, 50/60 Hz				
IS580-2T020-R1	22 Ω	800 W	Built-in	-
IS580-2T030-R1	16 Ω	1000 W		
IS580-2T040-R1	11 Ω	1500 W		
IS580-2T050-R1	8 Ω	2500 W		
IS580-2T070-R1	8 Ω	3.7 kW		
IS580-2T080-R1	8 Ω	4.5 kW		
IS580-2T100-R1	6 Ω	5.5 kW		
IS580-2T140-R1	6 Ω	7.5 kW		
IS580-2T170-R1	4 Ω	9 kW	External	MDBUN-90-S
IS580-2T210-R1	4 Ω	11 kW	External	MDBUN-90-S
IS580-2T300-R1	6 Ω x 2	8 kW x 2	External	MDBUN-60-S x 2

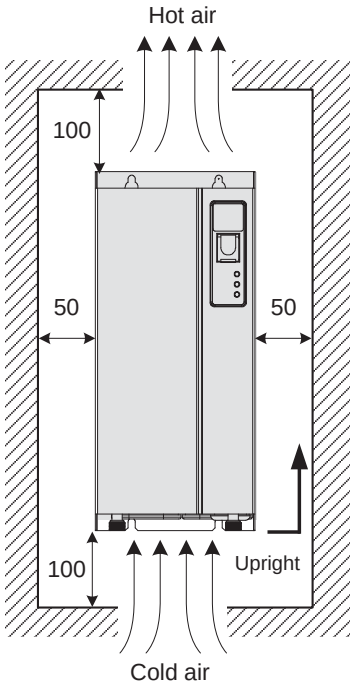
Note

- x 2 indicates two braking units are connected with their respective braking resistor in parallel.
- Default initial braking voltage of built-in braking unit is 750 V. Default initial braking voltage of MDBUN-60-T is 670 V, and that of MDBUN-60-5T is 760 V. When grid voltage changes, the user can adjust braking voltage(F9-08).
- The preceding table is for a reference only. You can select resistance and power of braking resistor based on actual needs. Resistance must not be lower than the reference value. Power may be higher than the reference value. Selection of braking resistor model is determined by generation power of motor and is also related to system inertia, deceleration time and potential energy load. For systems with high inertia, and/or short deceleration time, and/or frequent braking, select a braking resistor with higher power and lower resistance value.
- A braking resistor cannot be connected to two servo drives in parallel simultaneously. Failure to comply will result in fire.

■ Mounting Dimensions of MDBUN Series Braking Unit

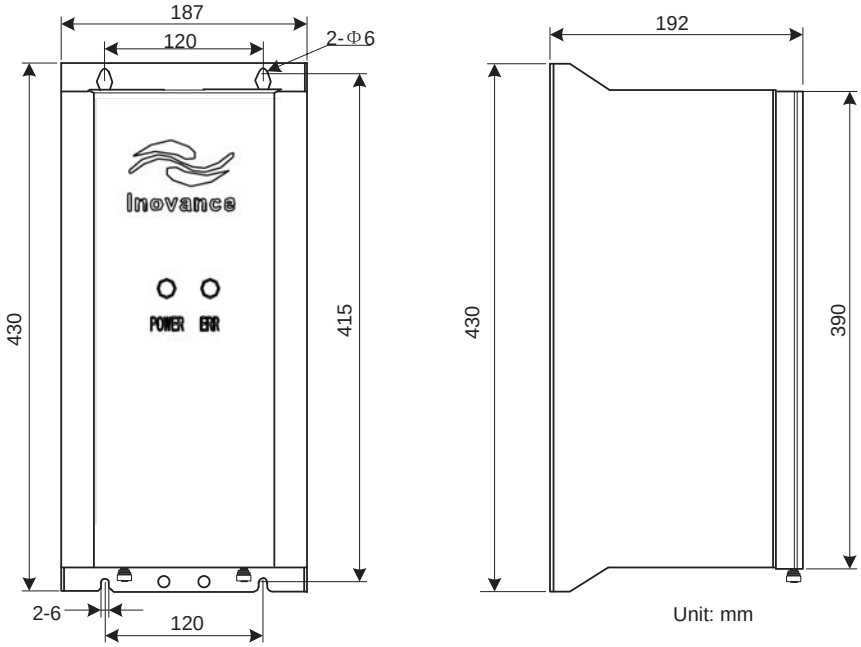


Always mount MDBUN series braking unit in an upright position.



For use and installation of MDBUN series braking unit, refer to the MDBUN Series Braking Unit User Manual.

■ Mounting Dimensions of MDBU Series Braking Unit

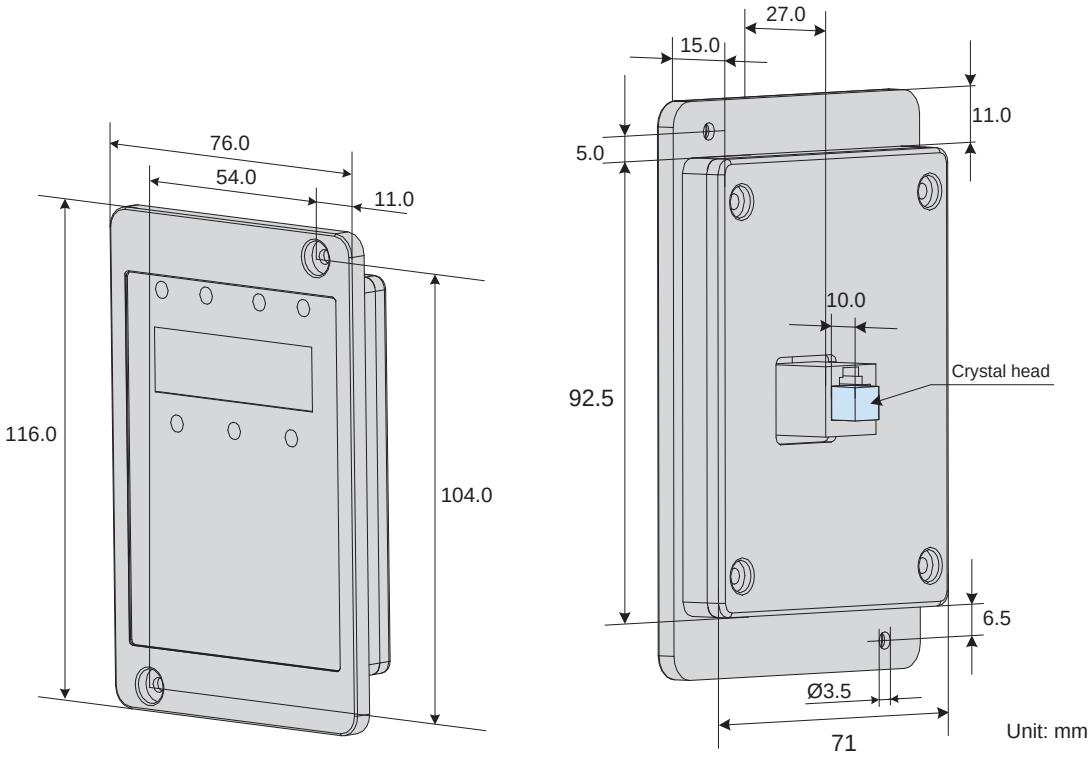


For use and installation of MDBU series braking unit, refer to the MDBU Series Braking Unit User guide.

8.3 External Operating Panel

The MD32NKE1 is the external operating panel applicable to the drive. It adopts the LED display and has the same operation mode as the operating panel on the drive. For details, refer to *Chapter 4 Operating Panel (Keypad & Display)*.

The following figures show the physical appearance and mounting dimensions of the MD32NKE1.



■ Connecting Cable

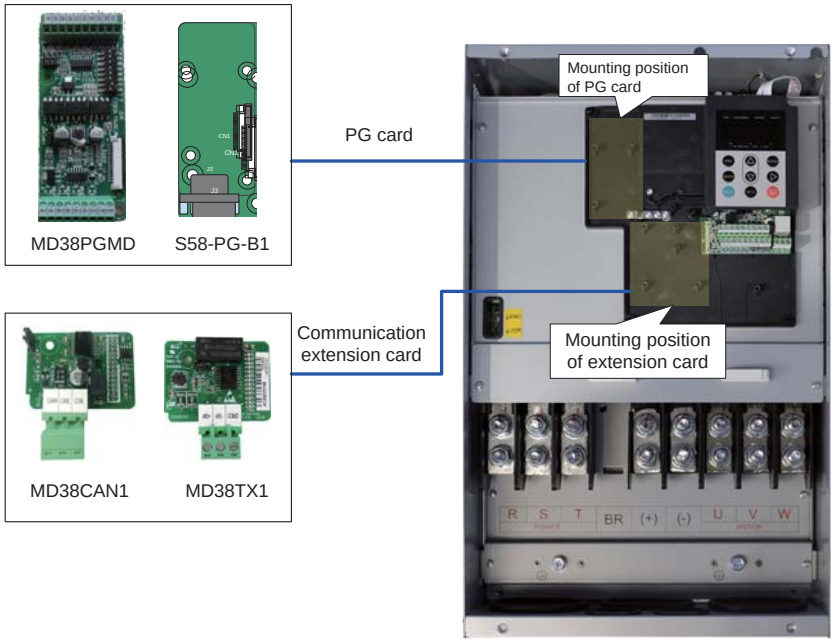
Inovance provides MDCAB-MD (3 meters) and MDCAB2-MD (1.5 meters) for the user to connect external operating panel. The users can prepare connecting cable by themselves.

Note	Once external operating panel is connected, the inbuilt operating panel becomes invalid.

8.4 Extension Cards

The drive can implement field bus by connecting various extension cards. It supports different types of encoders and user programming function. This chapter describes installation and use of these extension cards. For more details, refer to the user guide that is delivered together with product.

The following figure shows the mounting positions of these extension cards.



8.4.1 Extension Communication Cards

■ Extension CAN Card (MD38CAN1)

MD38CAN1 is designed to connect the drive to high-speed CAN bus. .

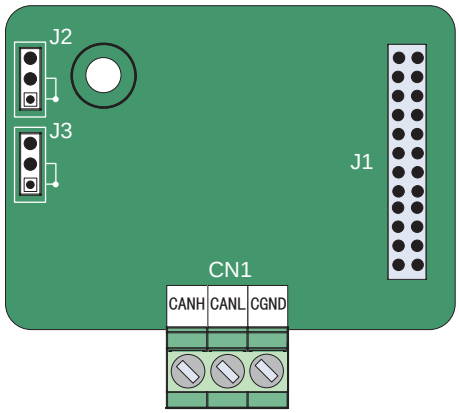
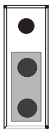
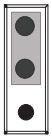


Table 8-1 Terminal descriptions of MDCAN1

Type	Terminal	Terminal Name	Function Description
CAN communication terminal	CANH	CAN positive input	Connect to positive pole of CAN bus.
	CANL	CAN negative input	Connect to negative pole of CAN bus.
	COM	Power ground	Connect to reference ground of all CAN nodes.

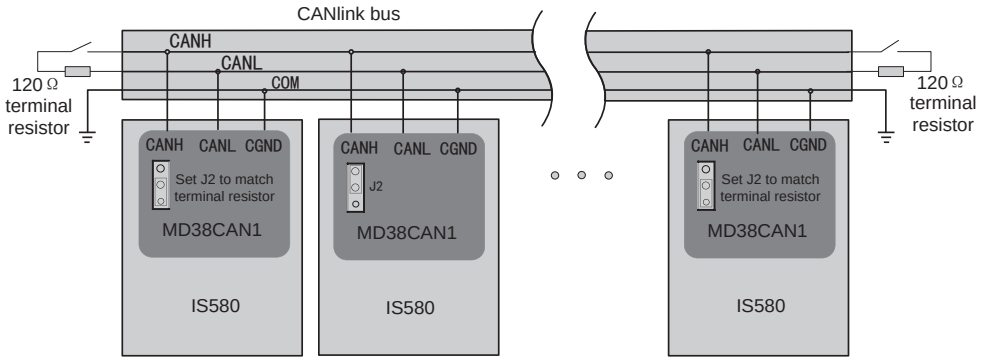
Table 8-2 Jumper descriptions of MDCAN1

Jumper	Description	Meaning	Setting	Remark
J2, J3	CAN terminal resistor matching selection	Matching the terminal resistor		J2 and J3 must jump to the same pin simultaneously.
		Not matching the terminal resistor		

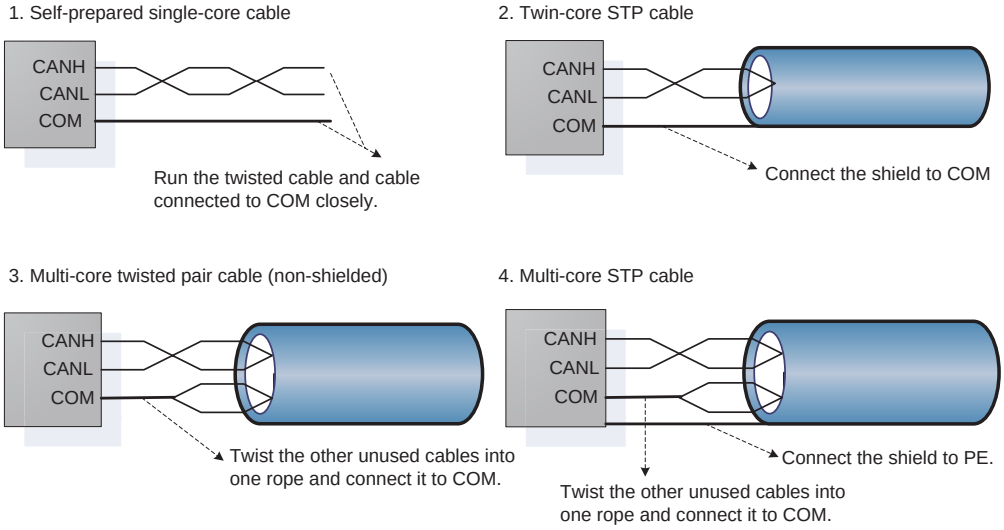
Note	Setting of jumpers takes top view with main terminals at the bottom of the card as visual angle. Jumpers are silk-screened on the card.

- Use of CANlink bus

The CANlink bus topology is shown as follows:



It is recommended to use an STP cable as the CAN bus and use a twisted cable to connect CANH and CANL. Connect a matching terminal resistor of 120 Ω respectively at both ends of the bus to prevent signal reflection. The CAN bus allows connection of a maximum of 64 nodes and the distance of each node branch must be smaller than 0.3 m. Connect the reference ground of all nodes together.



- CANlink Transmission Distance

The transmission distance of the CANlink bus is directly related to the baud rate and communication cable. The relationship between the maximum transmission distance of the CANlink bus and the baud rate is shown in the following table.

No.	Max. Transmission Distance	Baud Rate	Number of Nodes	Cable Diameter
1	25 m	1 Mbps	64	0.205 mm^2
2	95 m	500 kbps	64	0.34 mm^2
3	560 m	100 kbps	64	0. 5 mm^2
4	1100 m	50 kbps	64	0.75 mm^2

■ Extension RS485 Card (MD38TX1)

MD38TX1 is specially designed to provide the drive with RS485 communication function. It adopts isolation scheme and electrical parameters conform to international standard. It helps to implement control of drive running and parameter setting through remote serial interface.

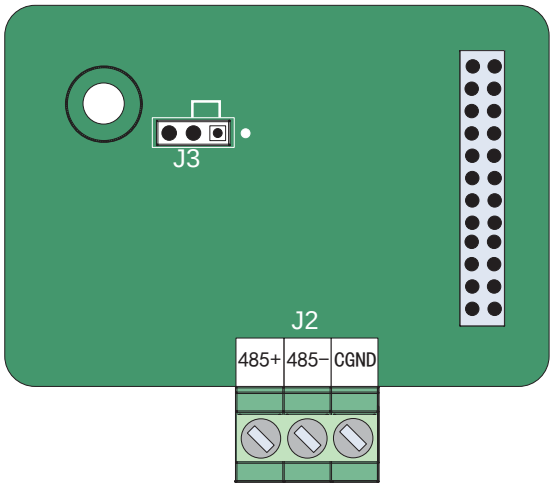
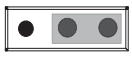
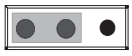


Table 8-7 Terminal descriptions of MD38TX1

Type	Terminal	Terminal Name	Function Description
RS485 communication terminal	485+	RS485 positive input	RS485 communication terminal with isolation input
	485-	RS485 negative input	RS485 communication terminal with isolation input
	CGND	RS485 Power ground	Isolated power

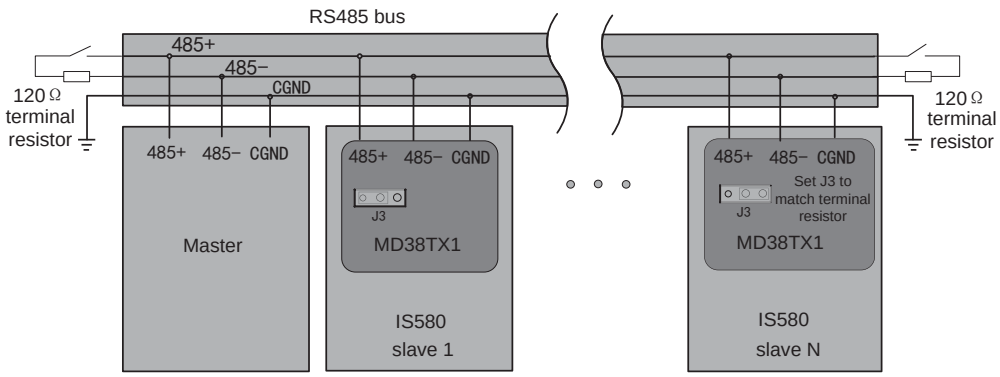
Table 8-8 Jumper descriptions of MD38TX1

Jumper	Description	Meaning	Setting
J3	RS485 terminal resistor matching selection	Matching the terminal resistor	
		Not matching the terminal resistor	

Note	Setting of jumpers takes top view with main terminals at the bottom of the card as visual angle. Jumpers are silk-screened on the card.

- RS485 bus topology

  The RS485 bus topology is shown as follows:

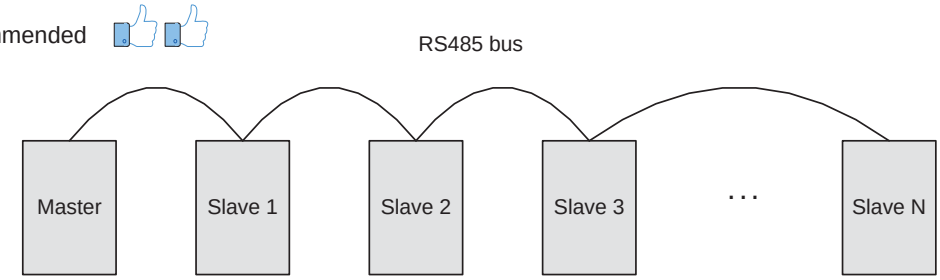


It is recommended to use an STP cable as the RS485 bus and use a twisted cable to connect 485+ and 485-. Connect a matching terminal resistor of 120 Ω respectively at both ends of the bus to prevent signal reflection. The RS485 bus allows connection of a maximum of 128 nodes and the distance of each node branch must be smaller than 3 m. Connect the reference ground of all nodes together.

The connecting modes of multiple nodes are described as below:

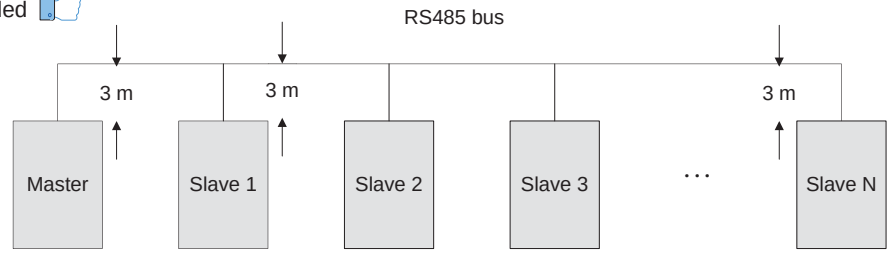
Daisy chain connection mode

Recommended



Branching connection mode

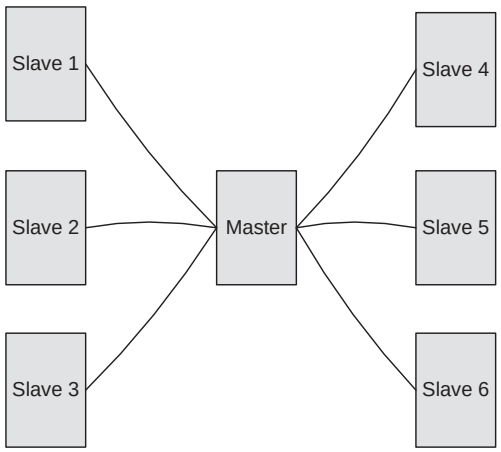
Recommended



Note	Distance from the bus to the node cannot exceed 3 m.

Star connection mode (prohibited)

Prohibited



- Terminal wiring

  – Terminal wiring if node has CGND

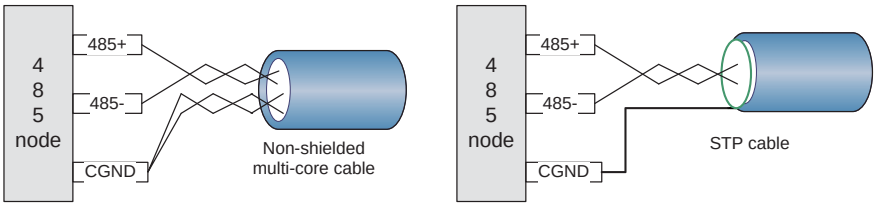
    MD38TX1 has three cables to connect 485+, 485- and CGND terminals respectively. Check that RS485 bus on site has these three cables and terminals are not connected reversely or wrongly.

    If a shielded cable is used, shield must also be connected to CGND. Except CGND, prevent shield from touching anywhere of the drive including drive housing and grounding terminal.

    Due to cable attenuation, if connection length is larger than 3 m, use AGW26 or a thicker cable. Always use a twisted pair cable to connect 485+ and 485- respectively.

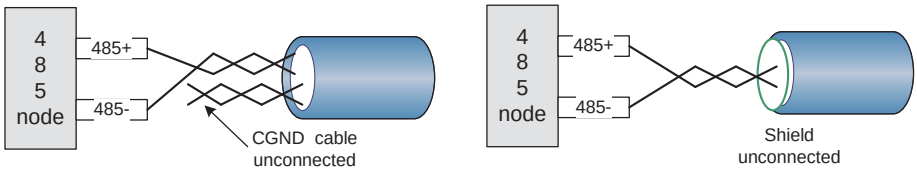
    Non-shielded multi-core twisted pair cable and STP cable are recommended. If non-shielded multi-core twisted pair cable is used, take twisted pair to connect 485+ and 485- and twist the unused cables into one rope and connect it to CGND.

    If an STP cable is used, connect twisted pair to 485+ and 485- respectively and shield to CGND. Shield can be connected to CGND only. It must not be connected to ground.



  – Terminal wiring if node does not have CGND

    For nodes without CGND, do not connect CGND cable or shield to PE of node directly.



    Take the following steps to handle it.

    Step 1: Check whether a common reference ground of 485 circuit exists on other ports of this node. If yes, connect CGND cable or shield to the pin.

    Step 2: Check whether reference ground of 485 circuit exists on board of node. If yes, connect CGND cable or shield to it.

    Step 3: If reference ground of 485 circuit is not found, keep CGND cable or shield unconnected and use an extra ground cable to connect this node to PE of other nodes.

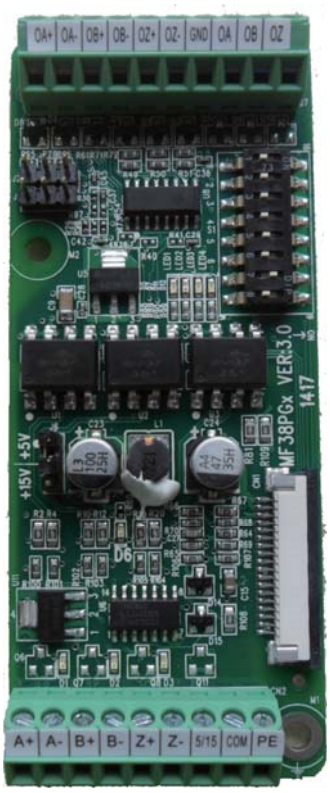
- Transmission Distance

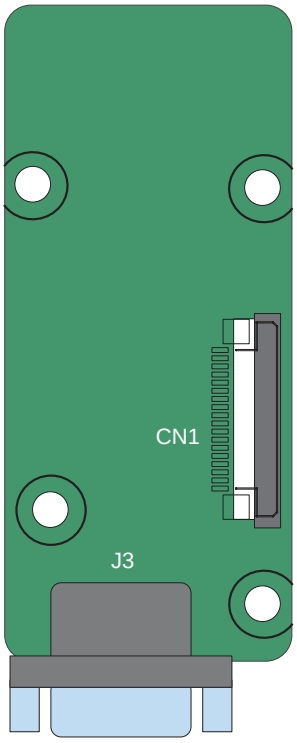
  Maximum number of nodes and transmission distance of standard RS485 circuit vary with different baud rates, as listed in the following figure:

No.	Baud Rate	Max. Transmission Distance	Number of Nodes	Cable Diameter
1	115.2 Kbps	100 m	128	AWG 26 (0.1 mm^2)
2	19.2 Kbps	1000 m	128	AWG 26 (0.1 mm^2)

8.4.2 Extension PG Cards

Specifications of extension PG cards are as follows:





MD38PGMD Specification	
User interface	Oblique terminal block
Clearance	3.5 mm
Screw	Flathead
Cable specification	26 to 16 AWG (0.1 to 1.3 mm^2)
Max. frequency	Differential: 500 kHz Open-collector: 100 kHz
Frequency dividing coefficient	0 to 63
Encoder power supply	5 V/200 mA, 15 V/100 mA
Encoder interface type	Differential, open-collector, push-pull
Frequency dividing interface type	Differential, open-collector

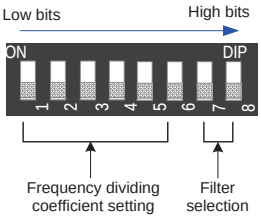
S58-PG-B1 Specification	
User interface	DB9 female
Pluggable	Yes
Cable specification	> 22 AWG
Resolution	12 bits
Excitation frequency	10 kHz
VRMS	7 V
VP-P	3.15±27%
Frequency dividing range	Without frequency dividing function

■ Extension PG Card (MD38PGMD)

Table 8-17 Terminal descriptions of MD38PGMD

Terminal		Function Description
CN2	A+	Encoder output signal A positive
	A-	Encoder output signal A negative
	B+	Encoder output signal B positive
	B-	Encoder output signal B negative
	Z+	Encoder output signal Z positive
	Z-	Encoder output signal Z negative
	5V/15V	Encoder 5V/15V power supply
	COM	Encoder power ground
	PE	Shield connecting point
J7	OA+	Differential frequency dividing output signal A positive
	OA-	Differential frequency dividing output signal A negative
	OB+	Differential frequency dividing output signal B positive
	OB-	Differential frequency dividing output signal B negative
	OZ+	Differential frequency dividing output signal Z positive
	OZ-	Differential frequency dividing output signal Z negative
	GND	Frequency dividing output reference ground
	OA	Open-collector frequency dividing output signal A
	OB	Open-collector frequency dividing output signal B
	OZ	Open-collector frequency dividing output signal Z
CN1	18-pin FFC interface, connecting to J4 on the control board of the servo drive	

- DIP Switch Setting

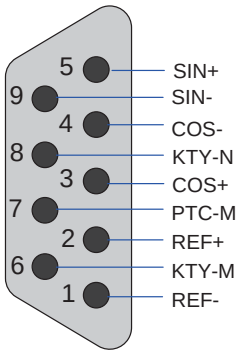
Filter Selection		Definition	Address Setting						Value	Frequency Dividing Coefficient	DIP Switch
8	7		6	5	4	3	2	1			
0	0	Non-self-adaptive filter	0	0	0	0	0	0	Reserved	No output	
			0	0	0	0	0	1	1	Frequency divided by 1	
0	1	Self-adaptive filter	0	0	0	0	1	0	2	Frequency divided by 2	
			0	0	0	0	1	1	3	Frequency divided by 3	
1	0	Fixed inter-lock	...								
			1	1	1	1	0	1	61	Frequency divided by 61	
1	1	Automatic inter-lock	1	1	1	1	1	0	62	Frequency divided by 62	
			1	1	1	1	1	1	63	Frequency divided by 63	

- Indicators

Indicator	Indication	State	Description
D1/D2/D3	Encoder input signal indicator	ON or flash	The encoder has signal input.
		OFF	The encoder does not have signal input.
D6	Power indicator	ON	Normal.
		OFF	Power is not connected.
LED1	Encoder input signal quality indicator	ON	Input signal is slightly instable, which occurs when motor accelerates/decelerates or encoder signal input suffers slight interference.
		OFF	Input signal is normal, speed is stable and there is no interference.
		Flash slowly	Input signal is moderately instable, which occurs when motor accelerates/decelerates or encoder signal input suffers moderate interference.
		Flash quickly	Input signal is seriously instable, which occurs when motor accelerates/decelerates quickly or encoder signal input suffers severe interference.
LED2	Signal processing quality indicator	ON	Signal is slightly instable, which occurs when motor accelerates/decelerates or interference during signal input is not completely filtered (The number of interference pulses that are not filtered is less than 10 per time unit).
		OFF	Signal processing is normal, speed is stable and there is no interference.
		Flash slowly	Signal is moderately instable, which occurs when motor accelerates/decelerates or interference during signal input is not completely filtered (The number of interference pulses that are not filtered is less than 30 per time unit).
		Flash quickly	Signal is seriously instable, which occurs when motor accelerates/decelerates or interference during signal input is not completely filtered (The number of interference pulses that are not filtered is more than 30 per time unit).
LED3	Inter-lock state indicator	ON	Inter-lock enabled.
		OFF	Inter-lock disabled.
LED4	System state indicator	ON	Normal.
		OFF	The system is not operating or abnormal.
		Flash	The encoder cable breaks.

■ Extension Resolver Card (S58-PG-B1)

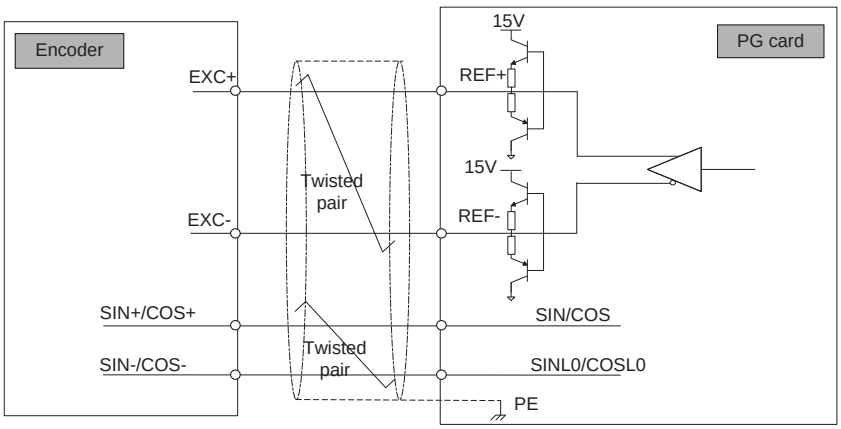
Table 8-10 Terminal descriptions of S58-PG-B1

Terminal	Pin	Definition	Function Description	Pin Arrangement
J3	1	REF-	Resolver excitation negative	
	2	REF+	Resolver excitation positive	
	3	COS+	Resolver feedback COS positive	
	4	COS-	Resolver feedback COS negative	
	5	SIN+	Resolver feedback SIN positive	
	6	KTY-M	KTY resistor positive	
	7	PTC-M	PTC resistor positive	
	8	KTY-N	KTY or PTC resistor negative	
	9	SIN-	Resolver feedback SIN negative	
CN1	18-pin FFC interface, connecting J2 of control board of the drive			

- Indicators

Indicator	S58-PG-B1 Status	Possible Causes and Solutions
	Normal	-
	Phase-locked loop failure	Generally, it is caused by too large lag in phase of resolver selected.
	Signal SIN/ COS amplitude exceeding upper limit	Generally, it is caused by interference. In this case, ground the motor well and connect the grounding point of the PG card to the PE terminal of the drive.
	Signal SIN/COS amplitude too small.	Generally, this is because DB9 connector is not connected, is wrongly connected or even wire breaking occurs. If the conditions described here does not occur, check whether the resolver selected matches S58-PG-B1.

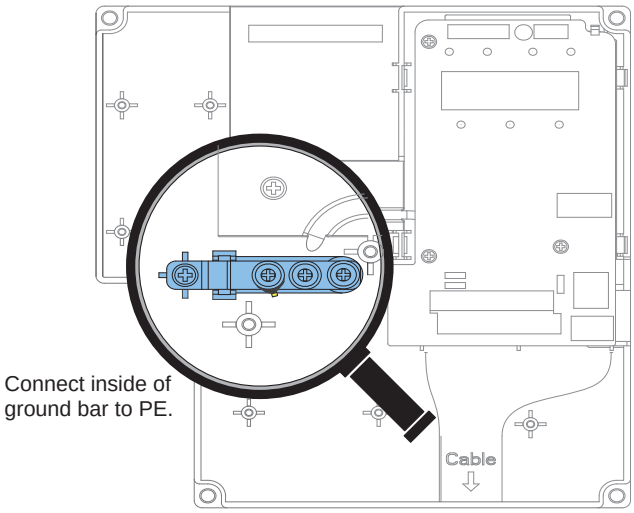
Wiring of S58-PG-B1 is shown as follows:



Note	
	• Selection of resolver must satisfy parameter setting requirement of S58-PG-B1. Especially excited input DC resistance must be larger than 17 Ω (can be measured by multimeter). Otherwise, S58-PG-B1 cannot work normally. • It is suggested to select a resolver with a maximum of four pole-pairs. Otherwise, S58-PG-B1 will be overloaded.

■ Grounding Shield of Extension Encoder Card

On prerequisite that servo drive parameters are set properly, if PG card feedback speed or position is instable, it indicates that PG card suffers electromagnetic interference. In this case, connect shield of encoder signal lines to PE of the servo drive to restrain interference.



After installation of the PG card is done, PE of PG card is connected automatically. When connecting encoder, connect shield of signal lines to PE of PG card to complete the shield grounding.

To install PG card, remove screw in amplified position and align mounting holes of PG card to the four fixing pins and fix PG card with the prepared M3 x 8 screws.

■ EMC Guidance

- Do not bundle encoder cable and power cables together. Failure to comply will result in encoder interference.
- Motor housing must be connected to PE of the servo drive. Meanwhile, connect grounding cable of motor to motor housing reliably. Failure to comply will result in poor grounding effect.
- An STP cable is suggested. For differential encoders, perform cable connection based on differential pairs properly and connect shield to PE of the servo drive.
- For large equipment applications where servo drive is far away from motor and motor cable is longer than 10 m, grounding effect is not good due to influence of cable inductance. In this case, encoder shield need not be connected to PE of servo drive.

8.5 Through-hole Mounting Bracket

Figure 8-1 Bracket dimensions and hole size of IS580T020-R1 to IS580T040-R1, IS580T020-R1-T to IS580T040-R1-T and IS580-2T020-R1 to IS580-2T040-R1 (unit: mm)

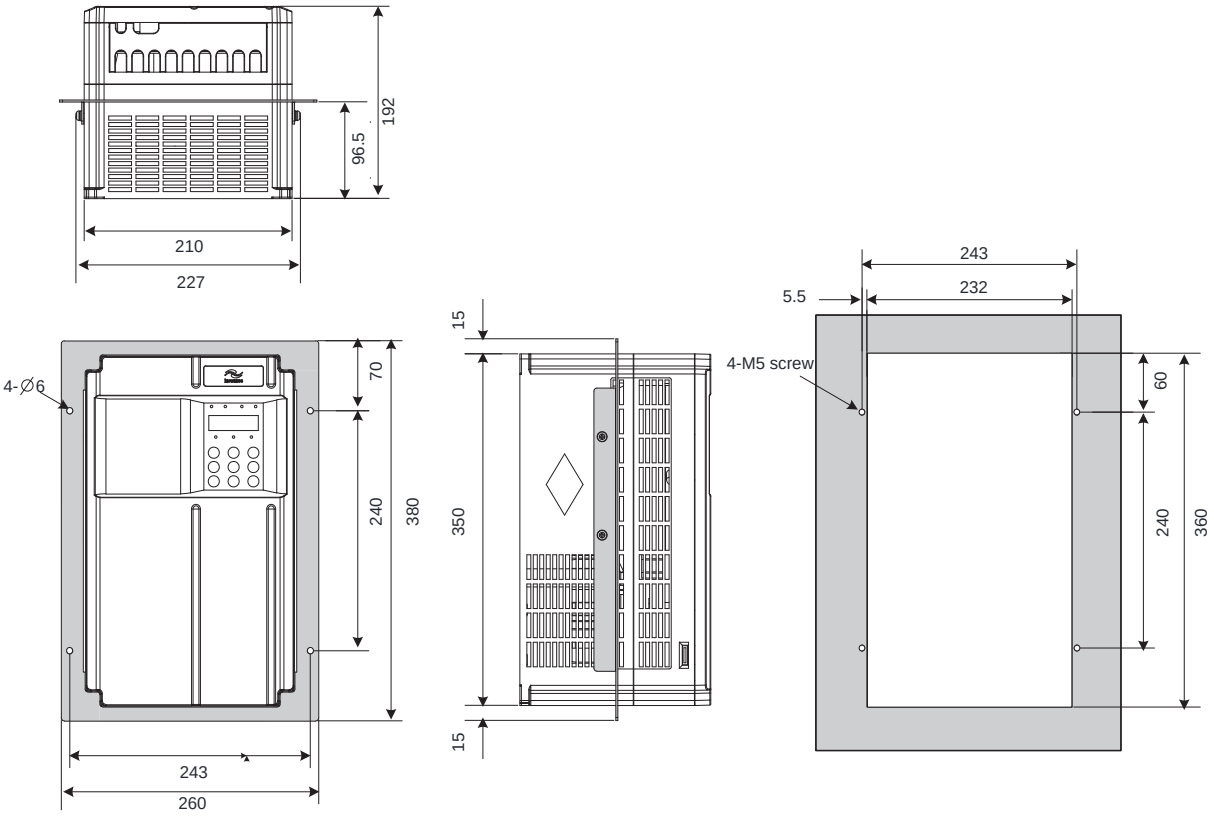


Figure 8-2 Bracket dimensions and hole size of IS580T050-R1 and IS580T070-R1 and IS580-2T050-R1 and IS580-2T070-R1 (unit: mm)

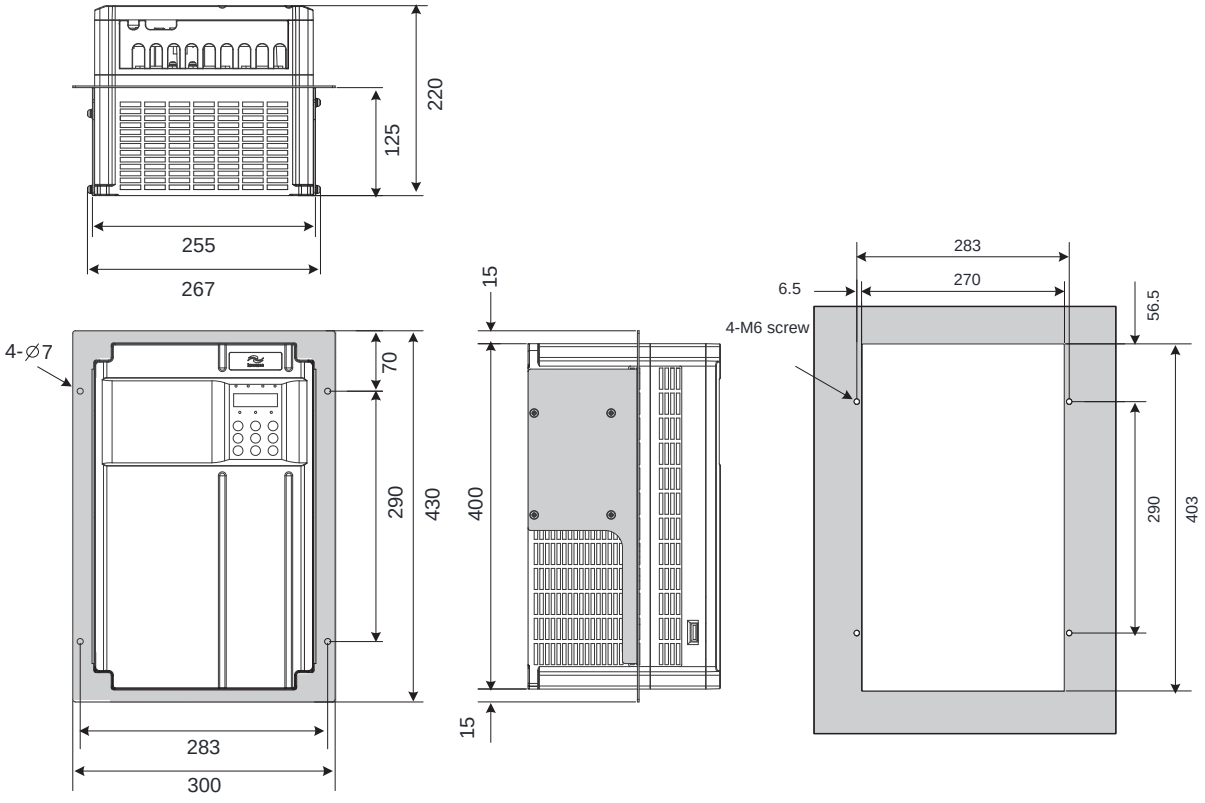


Figure 8-3 Bracket dimensions and hole size of IS580T080-R1 and IS580T100-R1 and IS580-2T080-R1 and IS580-2T100-R1 (unit: mm)

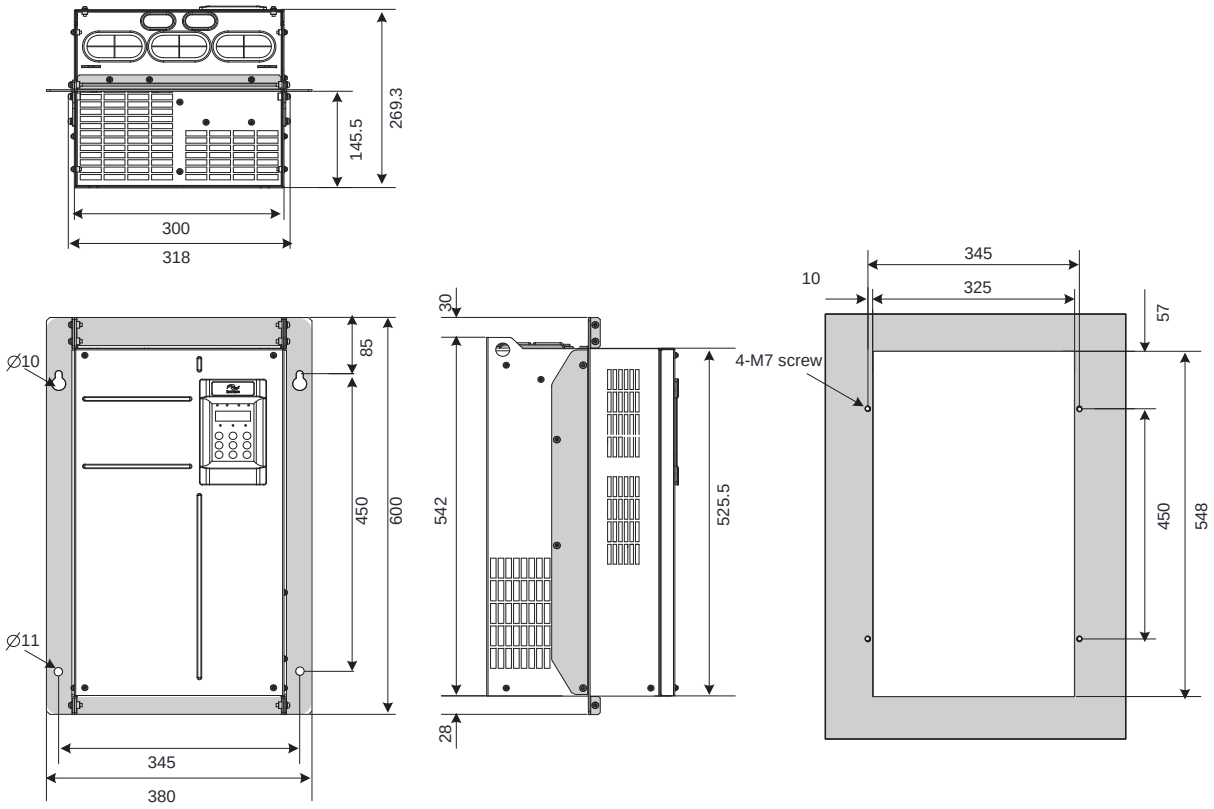
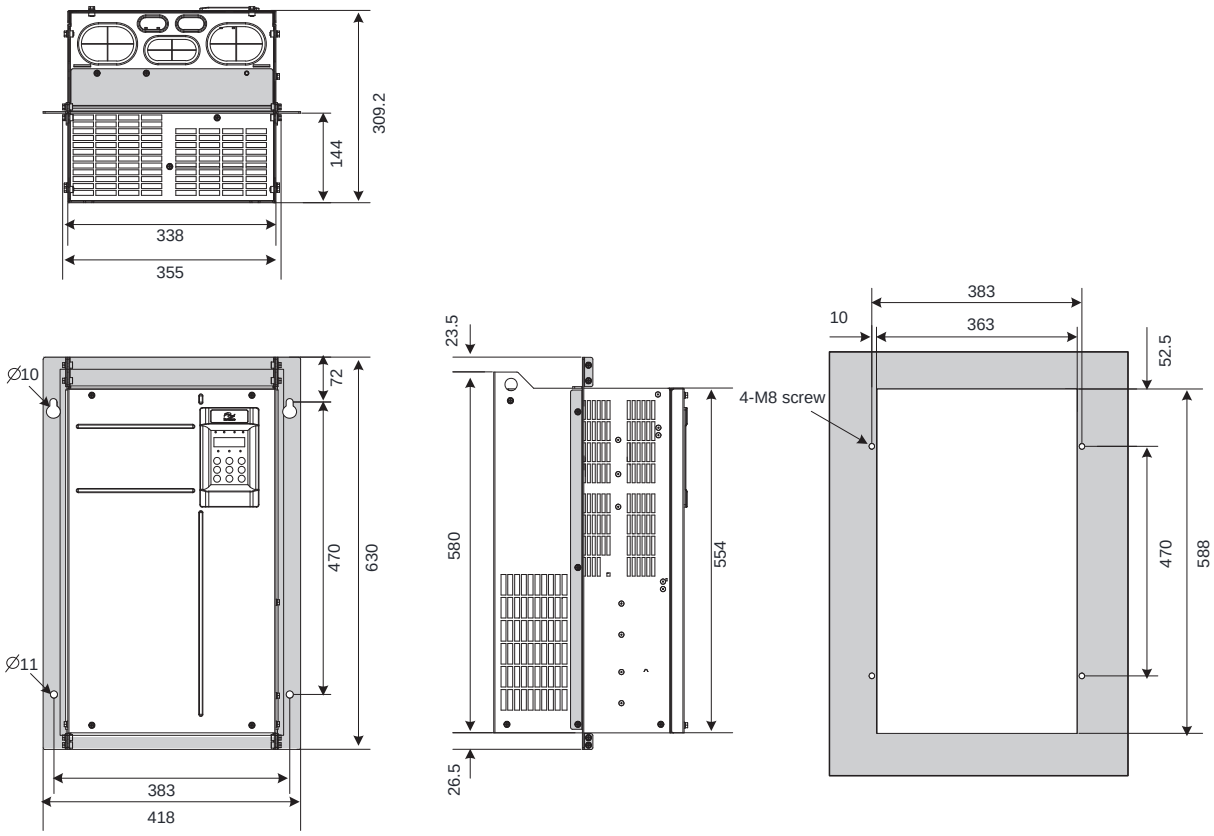


Figure 8-4 Bracket dimensions and hole size of IS580T140-R1 to IS580T300-R1 and IS580-2T140-R1 to IS580-2T300-R1 (unit: mm)



9. ISMG Servo Motor

Chapter 9 ISMG Servo Motors

9.1 Designation Rules

ISM G1-30D 15C D-R1 3 1 F A

Mark	Series No.
ISM	ISM Series servo motor

Mark	Features
G1	200 x 200 base
G2	266 x 266 base

Mark	Rated Power
2 digits + 1 letter	
A	x 1
B	x 10
C	x 100
D	x 1000
E	x 10000
Example: 15C: 1500 W 30D: 30000 W	

Mark	Rated Speed
2 digits + 1 letter	
A	x 1
B	x 10
C	x 100
D	x 1000
E	x 10000
Example: 15C: 1500 RPM 20C: 2000 RPM	

Mark	Voltage Class
D	380 V

Mark	Version

Mark	Customized Feature
X	Naturally ventilated
F	Force ventilated

Mark	Brake, Gear, Oil Seal
1	Oil seal

Mark	Shaft Connection
1	Plain shaft
3	Keyed + tapped hole
6	Taper shaft
A	Salient-pole motor

Mark	Encoder Type
R1	Resolver

Note

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.

9.2 Specification

9.2.1 ISMG1 (200 x 200 Base/Force Ventilated)

ISMG1 Specification with Force Ventilated									
Servo Motor Model	Rated Torque (Nm)		Efficiency	Rated Speed (RPM)	Rated Frequency (Hz)	Back EMF (V)	Rated Voltage (V)	Rated Current (A)	
	S1	S4						S1	S4
ISMG1-95C15CD-R131FA	50	60	91.0%	1500	100	311.9	380	15.4	18.5
ISMG1-11D17CD-R131FA	50	60	91.5%	1700	113.33	303	380	18.1	21.7
ISMG1-12D20CD-R131FA	50	60	91.9%	2000	133.33	297	380	21.6	26
ISMG1-14D15CD-R131FA	75	90	92.0%	1500	100	297	380	24.4	29.2
ISMG1-16D17CD-R131FA	75	90	92.4%	1700	113.33	303	380	27.1	32.5
ISMG1-18D20CD-R131FA	75	90	92.9%	2000	133.33	316.8	380	30.4	36.4
ISMG1-17D15CD-R131FA	92	110	92.5%	1500	100	297	380	29.9	35.7
ISMG1-20D17CD-R131FA	92	110	92.9%	1700	113.33	295	380	34.1	40.7
ISMG1-23D20CD-R131FA	92	110	93.3%	2000	133.33	297	380	39.8	47.6
ISMG1-22D15CD-R131FA	115	135	93.0%	1500	100	311.9	380	35.5	41.7
ISMG1-24D17CD-R131FA	115	135	93.3%	1700	113.33	303	380	41.5	48.7
ISMG1-28D20CD-R131FA	115	135	93.6%	2000	133.33	297	380	49.8	58.4
ISMG1-30D15CD-R131FA	150	195	93.7%	1500	100	297	380	48.7	63.3
ISMG1-34D17CD-R131FA	150	195	93.9%	1700	113.33	303	380	54.2	70.4
ISMG1-41D20CD-R131FA	150	195	94.3%	2000	133.33	316.8	380	60.7	78.9

ISMG1 Specification with Force Ventilated							
Servo Motor Model	Rated Power (kW)		Torque Constant in Cold State	Peak Torque (Nm)	Max. Speed	Rotor Inertia ($kg \cdot m^2 10^{-3}$)	Net Weight (kg)
	S1	S4					
ISMG1-95C15CD-R131FA	7.9	9.5	3.24	130	1800	7.5	45.2
ISMG1-11D17CD-R131FA	8.9	11	2.77	130	2040	7.5	45.2
ISMG1-12D20CD-R131FA	10.5	12.6	2.31	130	2400	7.5	45.2
ISMG1-14D15CD-R131FA	11.8	14.1	3.08	180	1800	9	51.9
ISMG1-16D17CD-R131FA	13.4	16	2.77	180	2040	9	51.9
ISMG1-18D20CD-R131FA	15.7	18.8	2.47	180	2400	9	51.9
ISMG1-17D15CD-R131FA	14.5	17.3	3.1	230	1800	10.5	59
ISMG1-20D17CD-R131FA	16.4	19.6	2.7	230	2040	10.5	59
ISMG1-23D20CD-R131FA	19.3	23	2.3	230	2400	10.5	59
ISMG1-22D15CD-R131FA	18.1	22	3.24	280	1800	12	66
ISMG1-24D17CD-R131FA	20.5	24	2.77	280	2040	12	66
ISMG1-28D20CD-R131FA	24.1	28.3	2.31	280	2400	12	66
ISMG1-30D15CD-R131FA	23.6	30.6	3.08	380	1800	15	79.8
ISMG1-34D17CD-R131FA	26.7	34.7	2.77	380	2040	15	79.8
ISMG1-41D20CD-R131FA	31.4	41	2.47	380	2400	15	79.8

9.2.2 ISMG2 (266 x 266 Base/Force Ventilated)

ISMG2 Specification with Force Ventilated									
Servo Motor Model	Rated Torque (Nm)		Efficiency	Rated Speed (RPM)	Rated Frequency (Hz)	Back EMF (V)	Rated Voltage (V)	Rated Current (A)	
	S1	S4						S1	S4
ISMG2-31D15CD-R131FA	170	200	93.7%	1500	100	311.9	380	52.5	61.7
ISMG2-36D17CD-R131FA	170	200	94.0%	1700	113.33	303	380	61.4	72.2
ISMG2-42D20CD-R131FA	170	200	94.3%	2000	133.33	297	380	73.6	86.6
ISMG2-42D15CD-R131FA	230	270	94.1%	1500	100	297	380	74.7	87.7
ISMG2-48D17CD-R131FA	230	270	94.5%	1700	113.33	303	380	83	97.5
ISMG2-57D20CD-R131FA	230	270	94.8%	2000	133.33	316.8	380	93.1	109.3
ISMG2-60D15CD-R131FA	340	385	94.8%	1500	100	311.9	380	104.9	118.8
ISMG2-68D17CD-R131FA	340	385	94.9%	1700	113.33	303	380	122.7	139

ISMG2 Specification with Force Ventilated							
Servo Motor Model	Rated Power (kW)		Torque Constant in Cold State	Peak Torque (Nm)	Max. Speed	Rotor Inertia ($kg \cdot m^2\ 10^{-3}$)	Net Weight (kg)
	S1	S4					
ISMG2-31D15CD-R131FA	26.7	31.4	3.18	330	1800	29.6	122
ISMG2-36D17CD-R131FA	30.3	35.6	2.72	330	2040	29.6	122
ISMG2-42D20CD-R131FA	35.6	41.9	2.27	330	2400	29.6	122
ISMG2-42D15CD-R131FA	36.1	42.4	3.03	440	1800	36.8	141.3
ISMG2-48D17CD-R131FA	40.9	48.1	2.72	440	2040	36.8	141.3
ISMG2-57D20CD-R131FA	48.2	56.5	2.42	440	2400	36.8	141.3
ISMG2-60D15CD-R131FA	53.4	60.5	3.18	660	1800	50	175.4
ISMG2-68D17CD-R131FA	60.5	68.5	2.72	660	2040	50	175.4

9.2.3 ISMG2 Salient Pole (266 x 266 Base/Force Ventilated)

ISMG2 Salient Pole Specification with Force Ventilated									
Servo Motor Model	Rated Torque (Nm)		Efficiency	Rated Speed (RPM)	Rated Frequency (Hz)	Back EMF (V)	Rated Voltage (V)	Rated Current (A)	
	S1	S4						S1	S4
ISMG2-31D15CD-R1A1FA	170	200	93.7%	1500	100	311.9	380	52.5	61.7
ISMG2-36D17CD-R1A1FA	170	200	94.0%	1700	113.33	303	380	61.4	72.2
ISMG2-42D20CD-R1A1FA	170	200	94.3%	2000	133.33	297	380	73.6	86.6
ISMG2-42D15CD-R1A1FA	230	270	94.1%	1500	100	297	380	74.7	87.7
ISMG2-48D17CD-R1A1FA	230	270	94.5%	1700	113.33	303	380	83	97.5
ISMG2-57D20CD-R1A1FA	230	270	94.8%	2000	133.33	316.8	380	93.1	109.3
ISMG2-60D15CD-R1A1FA	340	385	94.8%	1500	100	311.9	380	104.9	118.8
ISMG2-68D17CD-R1A1FA	340	385	94.9%	1700	113.33	303	380	122.7	139
ISMG2-80D20CD-R1A1FA	340	385	95.3%	2000	133.33	297	380	147.2	166.7
ISMG2-80D15CD-R1A1FA	440	510	95.2%	1500	100	297	380	142.9	165.6
ISMG2-91D17CD-R1A1FA	440	510	95.3%	1700	113.33	336.6	380	142.9	165.6
ISMG2-11E20CD-R1A1FA	440	510	95.5%	2000	133.33	316.8	380	178.1	206.5

ISMG2 Specification with Force Ventilated							
Servo Motor Model	Rated Power (kW)		Torque Constant in Cold State	Peak Torque (Nm)	Max. Speed	Rotor Inertia ($kg \cdot m^2 10^{-3}$)	Net Weight (kg)
	S1	S4					
ISMG2-31D15CD-R1A1FA	26.7	31.4	3.18	330	1800	34.6	122
ISMG2-36D17CD-R1A1FA	30.3	35.6	2.72	330	2040	34.6	122
ISMG2-42D20CD-R1A1FA	35.6	41.9	2.27	330	2400	34.6	122
ISMG2-42D15CD-R1A1FA	36.1	42.4	3.03	440	1800	43	141.3
ISMG2-48D17CD-R1A1FA	40.9	48.1	2.72	440	2040	43	141.3
ISMG2-57D20CD-R1A1FA	48.2	56.5	2.42	440	2400	43	141.3
ISMG2-60D15CD-R1A1FA	53.4	60.5	3.18	660	1800	58.5	175.4
ISMG2-68D17CD-R1A1FA	60.5	68.5	2.72	660	2040	58.5	175.4
ISMG2-80D20CD-R1A1FA	71.2	80.6	2.27	660	2400	58.5	175.4
ISMG2-80D15CD-R1A1FA	69.1	80.1	3.03	825	1800	75	217
ISMG2-91D17CD-R1A1FA	78.3	90.8	3.03	825	2040	75	217
ISMG2-11E20CD-R1A1FA	92.1	106.8	2.42	825	2400	75	217

9.3 Physical Appearance and Mounting Dimensions

9.3.1 ISMG1 (200 x 200 Base/Force Ventilated)

Figure 9-1 Physical appearance and mounting dimensions of the ISMG1 (200 x 200 base/force ventilated)

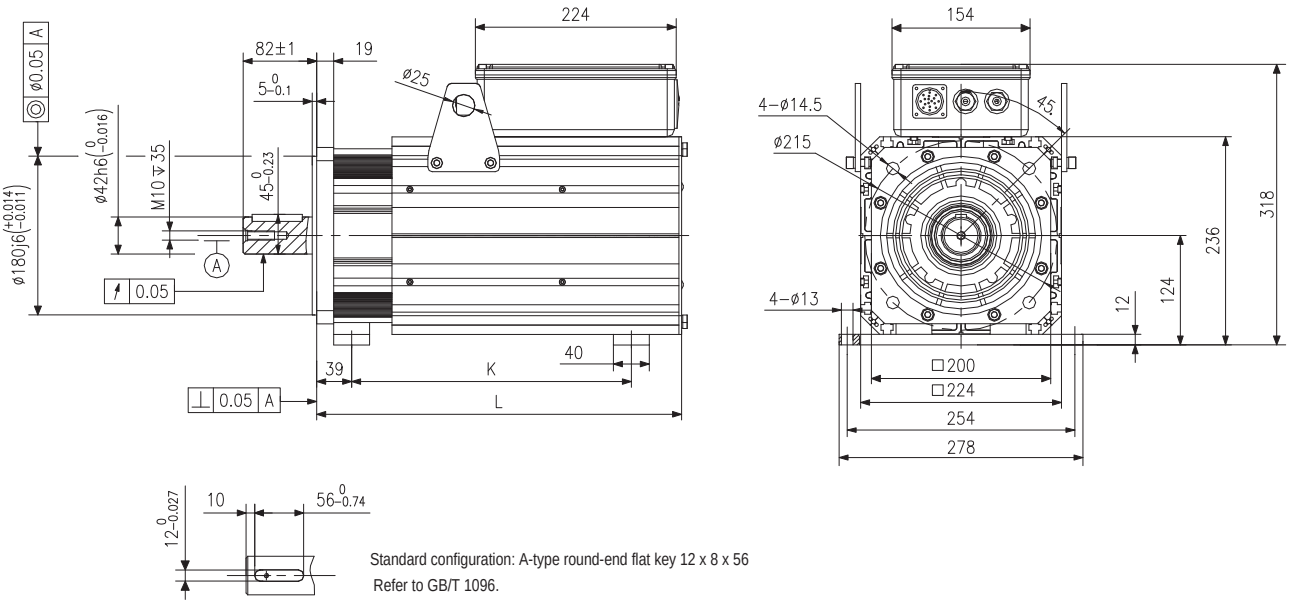


Table 9-1 Mounting dimensions of ISMG1 (200 x 200 base/force ventilated)

Servo Motor Model	ISMG1-95C15CD-R131FA	ISMG1-14D15CD-R131FA	ISMG1-17D15CD-R131FA	ISMG1-22D15CD-R131FA	ISMG1-30D15CD-R131FA
	ISMG1-11D17CD-R131FA	ISMG1-16D17CD-R131FA	ISMG1-20D17CD-R131FA	ISMG1-24D17CD-R131FA	ISMG1-34D17CD-R131FA
	ISMG1-12D20CD-R131FA	ISMG1-18D20CD-R131FA	ISMG1-23D20CD-R131FA	ISMG1-28D20CD-R131FA	ISMG1-41D20CD-R131FA
K	285	312	354	396	471
L	375	410	445	480	550

9.3.2 ISMG2 (266 x 266 Base/Force Ventilated)

Figure 9-2 Physical appearance and mounting dimensions of ISMG2 (266 x 266 base/force ventilated)

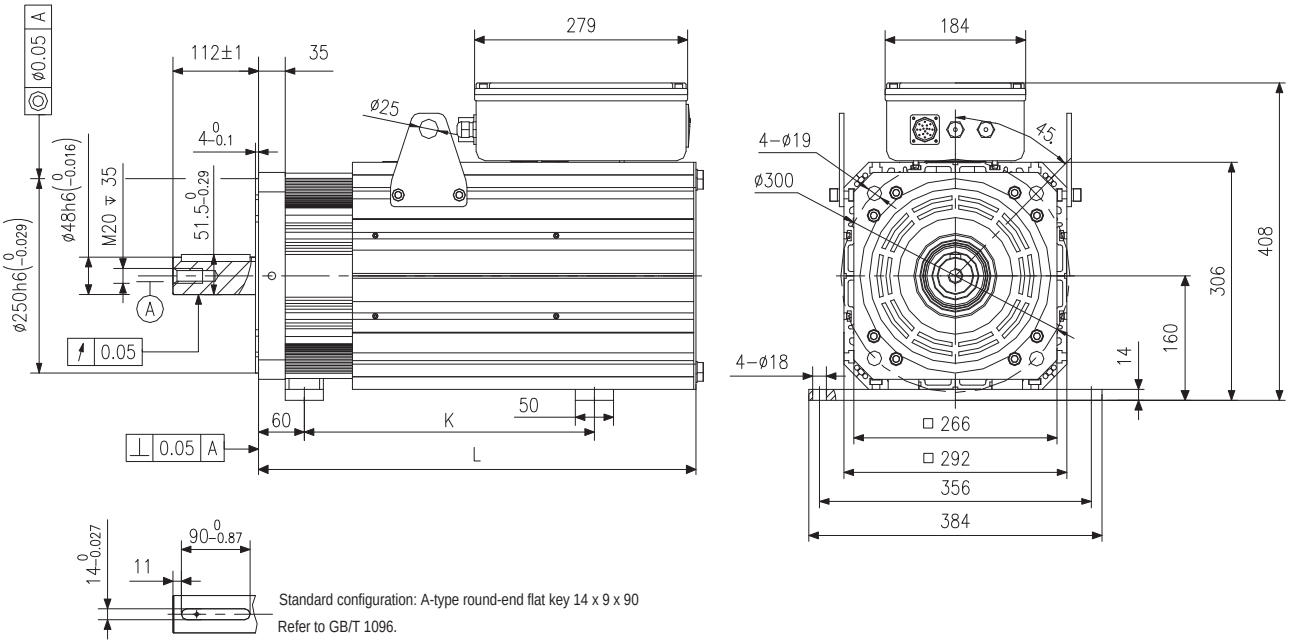


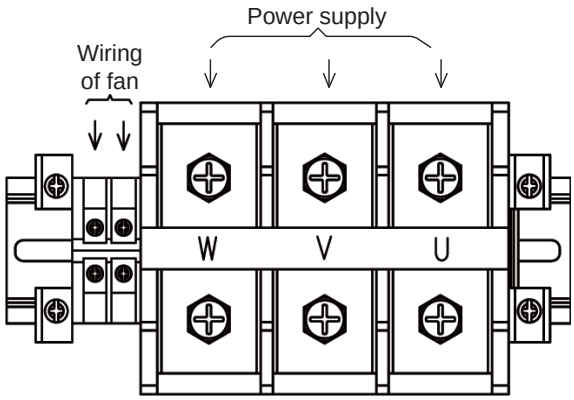
Table 9-2 Mounting dimensions of ISMG2 (266 x 266 base/force ventilated)

Servo Motor Model	ISMG2-31D15CD-R131FA	ISMG2-42D15CD-R131FA	ISMG2-60D15CD-R131FA	ISMG2-80D15CD-R1A1FA	ISMG1-30D15CD-R131FA
	ISMG2-36D17CD-R131FA	ISMG2-48D17CD-R131FA	ISMG2-68D17CD-R131FA	ISMG2-91D17CD-R1A1FA	ISMG1-34D17CD-R131FA
	ISMG2-42D20CD-R131FA	ISMG2-57D20CD-R131FA	ISMG2-80D20CD-R1A1FA	ISMG2-11E20CD-R1A1FA	ISMG1-41D20CD-R131FA
K	360	370	476	583	471
L	525	575	675	780	550

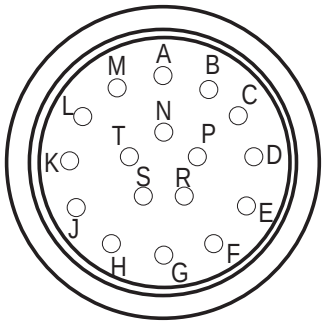
9.4 Wiring of ISMG Servo Motor

9.4.1 Layout and Wiring Description of Junction Box

Terminals of main circuit



Military spec.



Definition of IS580 supporting signal lines and military spec. pins is shown in the following table.

17P Military Spec.	A	B	C	D	E	F	G	H	L	K	J
DB9 Connector	1	2	3	4	5	9	7	8		6	Housing
Signal Definition	REF+	REF-	Cos+	Cos-	Sin+	Sin-	PTC-M	KTY-N	PTC-N	KTY-M	Shield
Wire Colour	Yellow/ White	Red/ White	Red	Black	Yellow	Blue	Brown	Orange		Grey	Shield
Remark	One pair		One pair		One pair		-	KTY, PTC common		-	-

■ Precautions on Wiring Servo Motor Main Circuit Terminals

When wiring main circuit terminals, ensure phase sequence conform to the terminal symbols. Connect PE terminal to the fixed screw with a special mark in the junction box.

Note	• PTC, KTY, and resolver signal cable cannot 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. Refer to section 10.5 to clean the cooling fan.

Figure 9-3 Wiring with military spec. (applicable to the second generation ISMG motor)

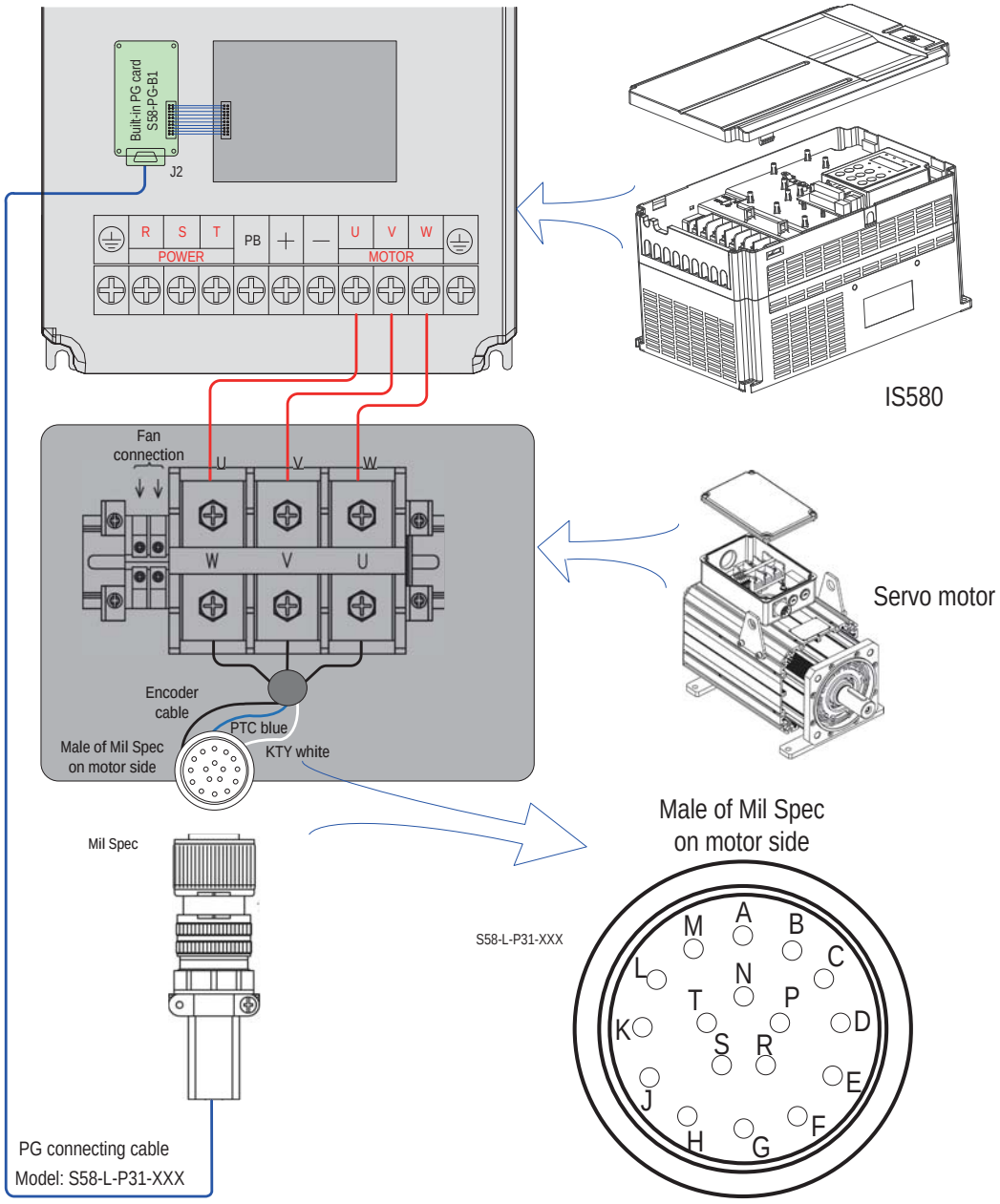
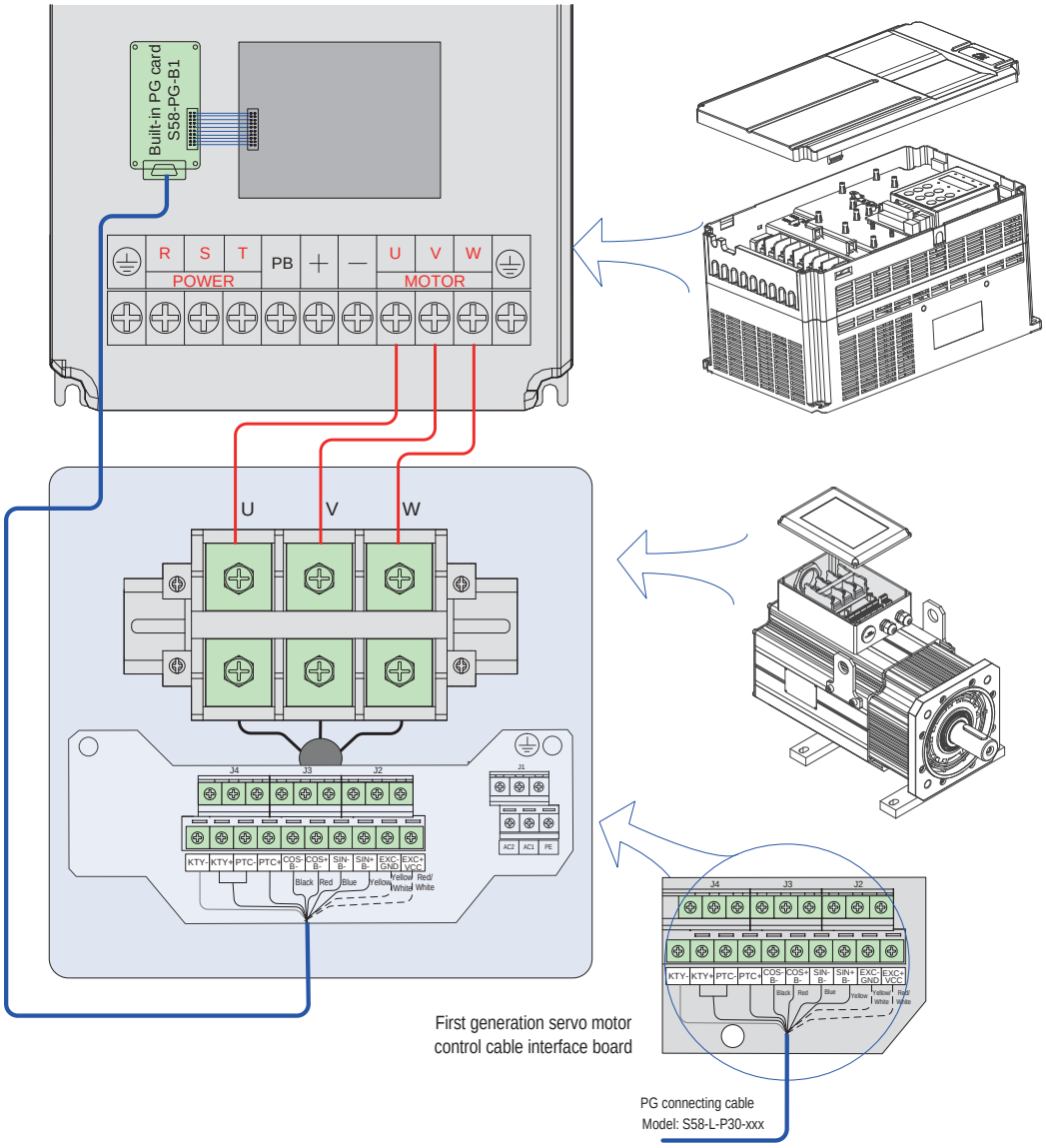


Figure 9-4 Wiring without military spec. (applicable to the first generation ISMG motor)



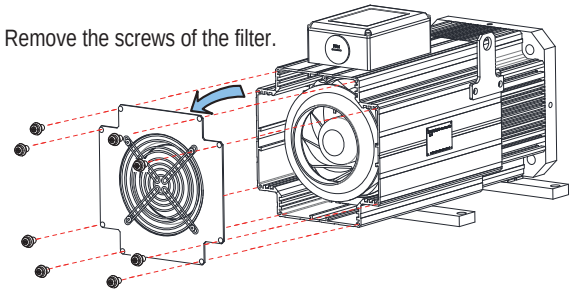
9.5 Cleaning the Fan of Servo Motor

The estimated service life of the fan of servo motor is 40000 hours. On the condition that the fan runs continuously at full speed, rated voltage and 40°C.

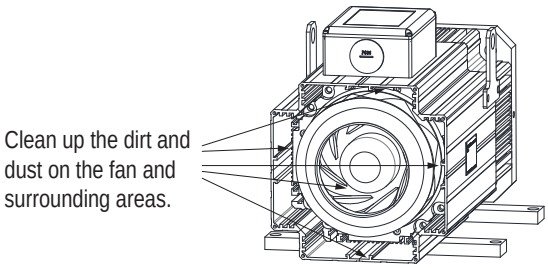
After the fan is jammed with foreign matters, performance of the fan degrades and air volume reduces. After air filter is blocked, air resistance increases and air volume reduces, thus influencing motor dissipation. Once motor winding temperature exceeds motor protection temperature, the servo drive reports Err45.

The procedure of cleaning cooling fan is as follows:

1. Remove the eight screws that fix the filter at the tail of the motor (G1 is the M4 hex socket, G2 is the M5 hex socket) and then remove the cover.



2. Clean up the dirt and dust on the surface of the fan and in the air filter using a small flathead screwdriver and then use airgun to blow off the remaining dirt and dust.



3. Attach the cover to the drive and fix the screws.
4. Determine how often you clean the fan according to the actual working condition.

Appendix

Appendix A Standards Compliance

A.1 CE

A.1.1 CE Mark

CE mark indicates compliance with European safety and environmental regulations. It is required for engaging in business and commerce in Europe.

European standards include the Machinery Directive for machine manufacturers, the Low Voltage Directive for electronics manufacturers, and EMC guidelines for controlling noise.

This drive is marked with CE mark based on the following EMC guidelines and the Low Voltage Directive.

- 2014/35/EU: Low Voltage Directive
- 2014/30/EU: Electromagnetic compatibility

Machines and devices used in combination with this drive must also be CE certified and marked. The integrator who integrates the drive with the CE mark in into other devices has the responsibility of ensuring compliance with CE standards and verifying that conditions meet European standards.

A.1.2 CE Low Voltage Directive Compliance

This drive has been tested according to IEC 61800-5-1: 2007, and it complies with the Low Voltage Directive completely.

To enable machines and devices integrating this drive to comply with the Low Voltage Directive, be sure to meet the following conditions:

■ Mounting Location

Mount the servo drive in places with pollution not higher than severity 2 and overvoltage category 3 in accordance with IEC60664.

■ Installing Fuse on the Input Side

To prevent accidents caused by short circuit, install fuse on the input side and the fuse must comply with the UL standard.

■ Preventing Entry of Foreign Objects

The drive units must be installed in a fireproof cabinet with doors that provide effective electrical and mechanical protection. The installation must conform to local and regional laws and regulations, and to relevant IEC requirements.

■ Grounding

If using an servo drive of the 400 V class, tie the neutral point of the drive power supply to ground.

A.1.3 EMC Guidelines Compliance

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.

The drive satisfies the European EMC directive 2004/108/EC and the standard EN 61800-3: 2004 +A1: 2012 Category C2. The servo drives are applied to both the first environment and the second environment.

When applied in the first environment, the servo drive may generate radio interference. Besides the CE compliance described in this chapter, take measures to avoid the radio interference if required.

The integrator of the system installed with the servo drive is responsible for compliance of the system with the European EMC directive and standard EN 61800-3: 2004 +A1: 2012 Category C2, C3 or C4 according to the system application environment.

A.1.4 Definition of Terms

- First environment

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

- Second environment

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

- Category C1 servo drive

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

- Category C2 servo 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 person.

- Category C3 servo drive

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

- Category C4 servo 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

A.1.5 Selection of Peripheral EMC Devices

■ AC Input Filter Installation

Note	Select a cable as short as possible to connect filter and drive. Cable length must be less than 30 cm. Make sure to connect filter and drive to the same grounding reference surface to implement reliable grounding of the filter. Otherwise, desired filtering effect will not be achieved.

- Standard EMC filter

  This series filters satisfy the EN 61800-3 C2 emission requirement of CE certification. Connect filter to ground reliably and ensure that length of the cable connecting drive and filter is less than 30 cm.

  – Physical appearance

Schaffner FN3258 series filter

Schaffner FN3359 series filter

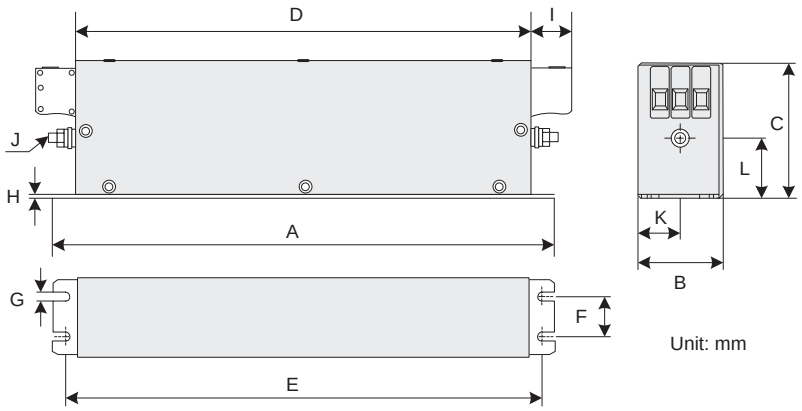
Changzhou Jianli EBK5 series filter

  – Selection

IS580 Model			Input AC Filter Model (Schaffner)	Input AC Filter Model (Changzhou Jianli)
IS580T020-R1	IS580-2T020-R1	IS580T020-R1-T	FN 3258-42-33	DL-50EBK5
IS580T030-R1	IS580-2T030-R1	IS580T030-R1-T	FN 3258-55-34	DL-50EBK5
IS580T035-R1	-	IS580T035-R1-T	FN 3258-55-34	DL-50EBK5
IS580T040-R1	IS580-2T040-R1	IS580T040-R1	FN 3258-75-34	DL-65EBK5
IS580T050-R1	IS580-2T050-R1	-	FN 3258-75-34	DL-65EBK5
IS580T070-R1	IS580-2T070-R1	-	FN 3258-100-35	DL-80EBK5
IS580T080-R1	IS580-2T080-R1	-	FN 3258-100-35	DL-100EBK5
IS580T100-R1	IS580-2T100-R1	-	FN 3258-130-35	DL-130EBK5
IS580T140-R1	IS580-2T140-R1	-	FN 3258-180-40	DL-160EBK5
IS580T170-R1	IS580-2T170-R1	-	FN 3258-180-40	DL-200EBK5
IS580T210-R1	IS580-2T210-R1	-	FN 3258-250-28	DL-250EBK5
IS580T250-R1	-	-	FN 3359-250-28	DL-300EBK3
IS580T300-R1	IS580-2T300-R1	-	FN 3359-320-99	DL-400EBK3

– Mounting Dimensions

Dimensions of Schaffner FN 3258 series 50-180A filter

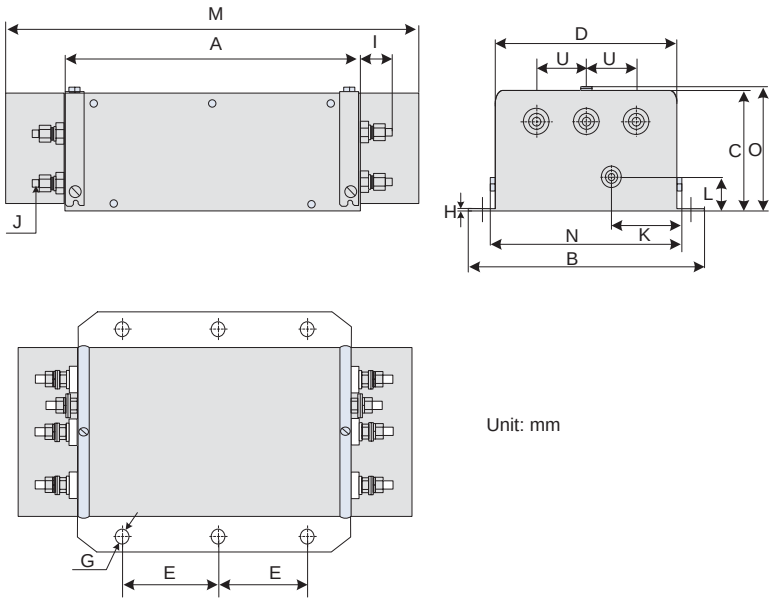


Unit: mm

Rated Current (A)	A	B	C	D	E	F	G	H	I	J	K	L
7	190	40	70	160	180	20	4.5	1	22	M5	20	29.5
16	250	45	70	220	235	25	5.4	1	22	M5	22.5	29.5
30	270	50	85	240	255	30	5.4	1	25	M5	25	39.5
42	310	50	85	280	295	30	5.4	1	25	M6	25	37.5
55	250	85	90	220	235	60	5.4	1	39	M6	42.5	26.5
75	270	80	135	240	255	60	6.5	1.5	39	M6	40	70.5
100	270	90	150	240	255	65	6.5	1.5	45	M10	45	64
130	270	90	150	240	255	65	6.5	1.5	45	M10	45	64
180	380	120	170	350	365	102	6.5	1.5	51	M10	60	47

Dimensions of Schaffner FN 3359 series 150-250A filter

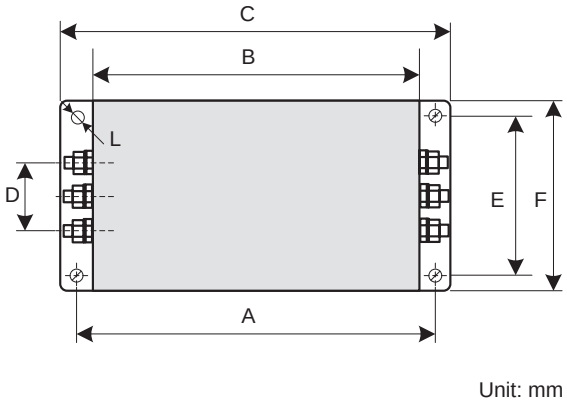
150 to 250 A



Unit: mm

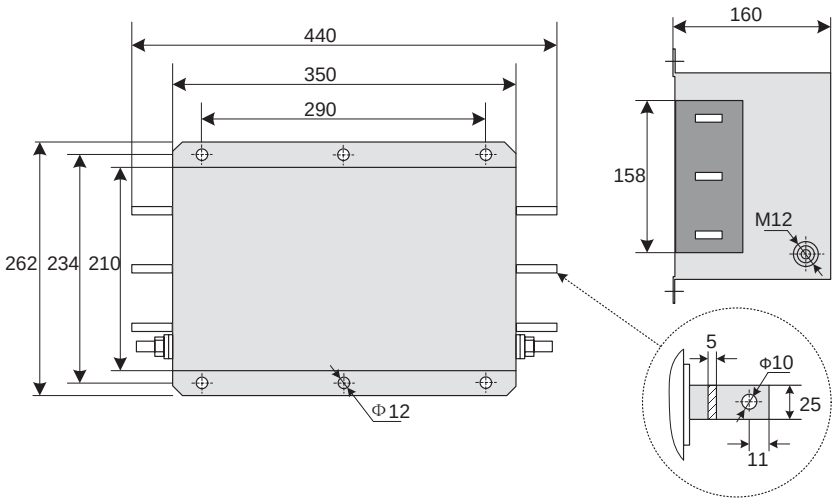
Dimensions	150 A	180 A	250 A
	(mm)		
A	300	300	300
B	200	200	200
C	86	86	86
D	240	240	240
E	275	275	275
F	165	165	165
G	Φ11	Φ11	Φ11
H	2	2	2
I	40	40	40
J	M10	M10	M10
K	92	92	92
L	37	37	37
M	380	380	380
N	211	211	211
O	93	93	93
P	26.5	26.5	26.5
U	60	60	60
V	20	20	20
W	3	3	3
X	10	10	10
Y	37	37	37
Z	Φ9	Φ9	Φ9

Dimensions of Jianli series 50-200A filter



Filter Model	A	B	C	D	E	F	G	H	I	J	K	M	N	P	L
	(mm)														
DL-25EBK5	243	224	265	58	70	102	25	92	M6	58	M4	74	49	M6	6.4 x 9.4
DL-35EBK5															
DL-50EBK5															
DL-65EBK5															
DL-80EBK5	354	323	388	66	155	188	30	92	M8	62	M4	86	56	M8	6.4 x 9.4
DL-100EBK5															
DL-130EBK5															
DL-160EBK5															
DL-200EBK5															

Dimensions of the Jianli series 250 A



- Simple EMC Filter

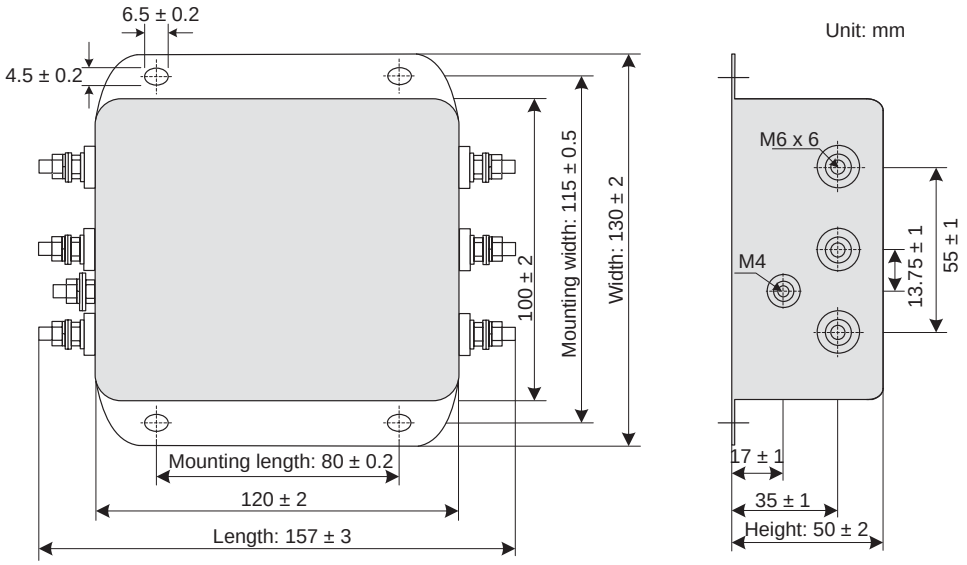
  A simple EMC filter is installed to prevent the surrounding interference and prevent the interference from the servo drive during running.

  Connect the simple EMC filter to ground reliably and ensure that the length of the cable connecting the drive and the filter is less than 30 cm.

  – Selection

IS580 Model	Simple EMC filter
IS580T020-R1	DL65EB1/10
IS580T020-R1-T	
IS580-2T020-R1	
IS580T030-R1	
IS580T030-R1-T	
IS580-2T030-R1	
IS580T035-R1	
IS580T035-R1-T	
IS580T040-R1	
IS580T040-R1-T	
IS580-2T040-R1	
IS580T050-R1	
IS580-2T050-R1	
IS580T070-R1	DL-120EB1/10
IS580-2T070-R1	
IS580T080-R1	
IS580-2T080-R1	
IS580T100-R1	DL-180EB1/10
IS580-2T100-R1	
IS580T140-R1	
IS580-2T140-R1	
IS580T170-R1 and IS580T300-R1 IS580-2T170-R1 and IS580-2T300-R1	Unavailable

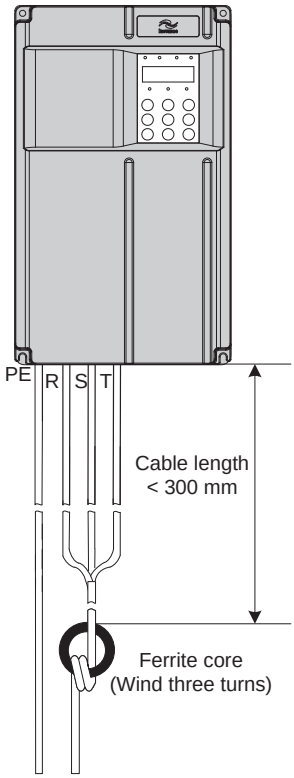
– Mounting Dimensions



Simple EMC Filter Model	Overall Dimensions (Length x Width x Height)	Mounting Dimensions (Mounting Length x Mounting Width) (mm)
DL-15EB1/10	157 x 130 x 50	80 x 115
DL-35EB1/10	218 x 140 x 80	184 x 112
DL-65EB1/10	218 x 140 x 80	184 x 112
DL-120EB1/10	334 x 185 x 90	304 x 155
DL-180EB1/10	388 x 220 x 100	354 x 190

- Ferrite Core

  In some applications, wind a ferrite core to remove interference during drive running.



  – Physical appearance of ferrite core

  – Selection of ferrite core

Ferrite Core Model	SN	Dimensions (Outer Diameter x Inner Diameter x Thickness) (mm)
DY644020H	11013031	64 x 40 x 20
DY805020H	11013032	80 x 50 x 20
DY1207030H	11013033	120 x 70 x 30

■ AC Input Reactor Installation

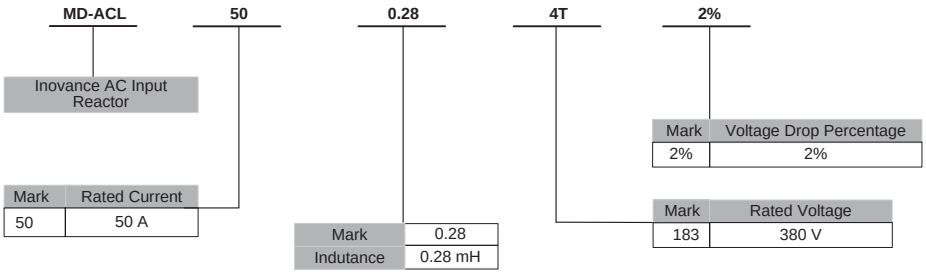
- AC Input Reactor Model

  The AC input reactor is connected to suppress harmonic current on the input side. Install an AC input reactor when the application has higher requirements on harmonic suppression.

  The recommended AC input reactor models are listed in the following table.

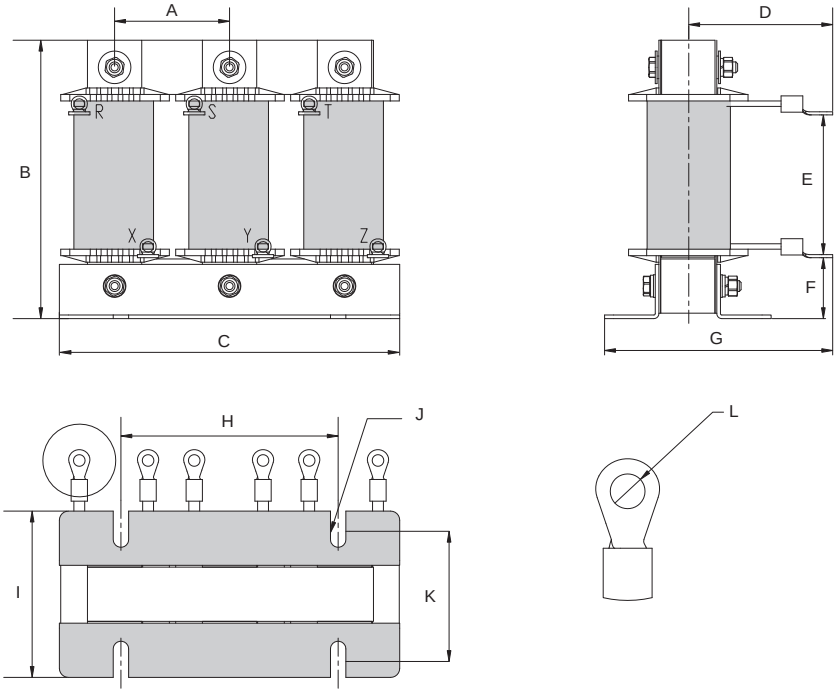
Servo Drive Model			AC Input Reactor Model (Inovance)
IS580T020-R1	IS580-2T020-R1	IS580T020-R1-T	MD-ACL-50-0.28-4T-2%
IS580T030-R1	IS580-2T030-R1	IS580T030-R1-T	MD-ACL-50-0.28-4T-2%
IS580T035-R1	-	IS580T035-R1-T	MD-ACL-50-0.28-4T-2%
IS580T040-R1	IS580-2T040-R1	IS580T040-R1-T	MD-ACL-60-0.24-4T-2%
IS580T050-R1	IS580-2T050-R1	-	MD-ACL-80-0.17-4T-2%
IS580T070-R1	IS580-2T070-R1	-	MD-ACL-90-0.16-4T-2%
IS580T080-R1	IS580-2T080-R1	-	MD-ACL-120-0.12-4T-2%
IS580T100-R1	IS580-2T100-R1	-	MD-ACL-150-0.095-4T-2%
IS580T140-R1	IS580-2T140-R1	-	MD-ACL-200-0.07-4T-2%
IS580T170-R1	IS580-2T170-R1	-	MD-ACL-250-0.056-4T-2%
IS580T210-R1	IS580-2T210-R1	-	MD-ACL-250-0.056-4T-2%
IS580T250-R1	-	-	MD-ACL-330-0.042-4T-2%
IS580T300-R1	IS580-2T300-R1	-	MD-ACL-330-0.042-4T-2%

– Designation rules



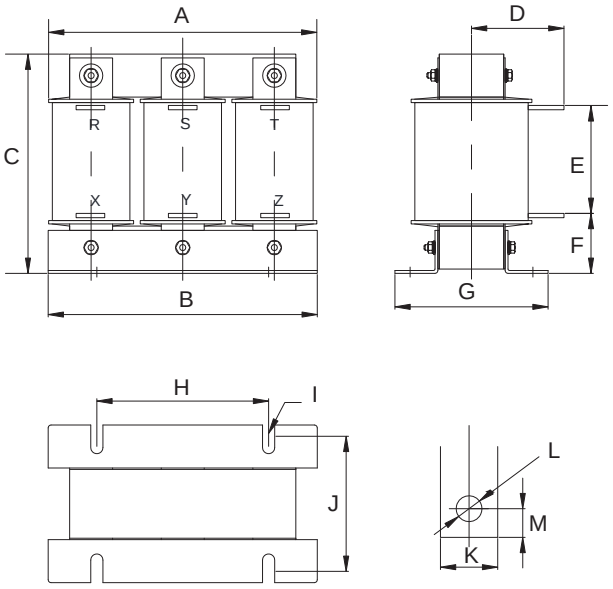
– Dimensions

Dimensions of AC input reactor of 50 to 60 A are shown as below:



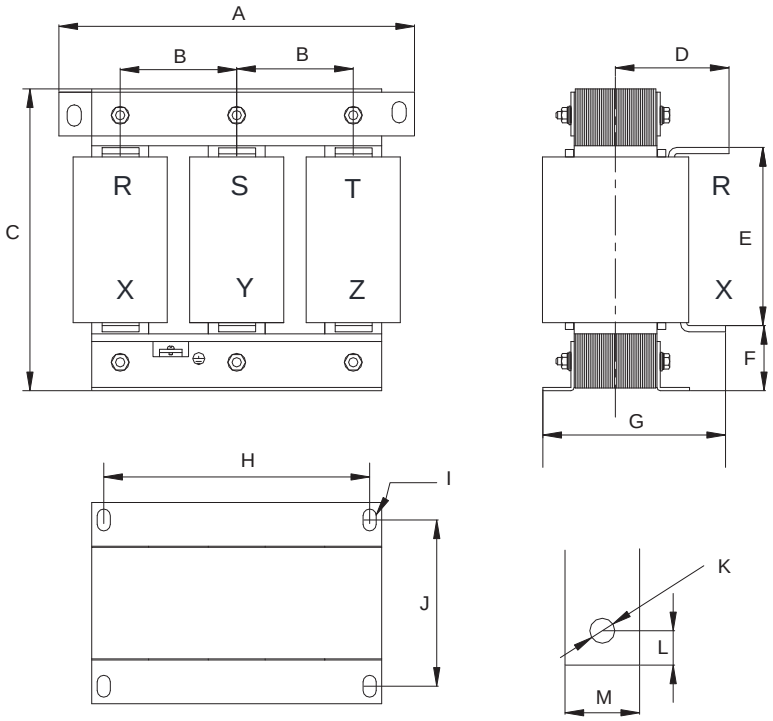
Rated Current	A	B	C	D	E	F	G	H	I	J	K	L
A	mm											
50	64	160	195	80±10	75±5	35±5	135	120±1	92±2	Φ8.5 x 20	72±2	Φ6.4
60	64	160	195	80±10	75±5	35±5	135	120±1	92±2	Φ8.5 x 20	72±2	Φ6.4

Dimensions of AC reactor of 90 to 120 A are shown as below:



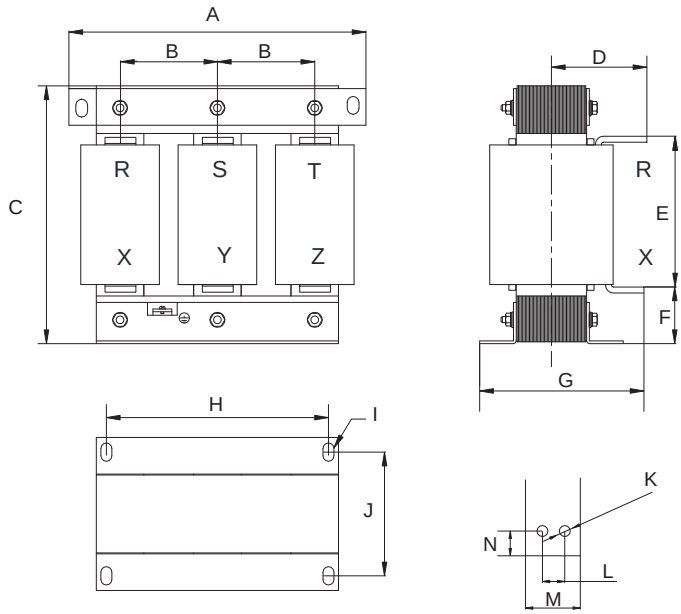
Rated Current	A	B	C	D	E	F	G	H	I	J	K	L	M
A	mm												
90	195	188±1	160	-	-	-	150	120±1	Φ8.5 x 20	72±2	-	-	-
120	195	188±1	160	78±10	79±5	40±5	135	120±1	Φ8.5 x 20	92±2	20	Φ9	10

Dimensions of AC reactor of 150 to 330 A are shown as below:



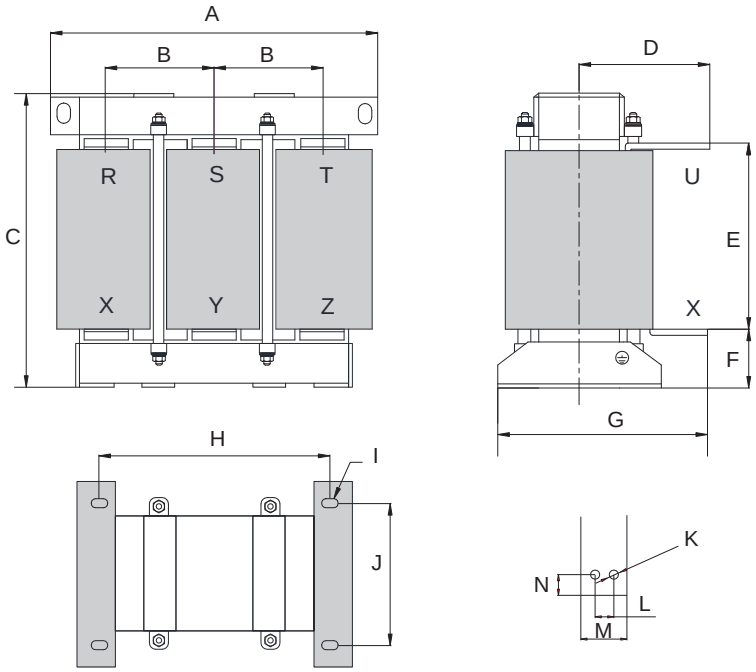
Rated Current	A	B	C	D	E	F	G	H	I	J	K	L	M
A	mm												
150	250	81±5	230	92±10	145±5	38±5	155	182±1	Φ11 x 18	76±2	Φ11	13	25
200	250	81±5	230	102±10	145±5	40±5	175	182±1	Φ11 x 18	96±2	Φ11	13	25
250	250	81±5	260	102±10	160±5	50±5	175	182±1	Φ11 x 18	96±2	Φ11	13	25
330	250	81±5	275	107±10	160±5	60±5	180	214±1	Φ11 x 18	100±2	Φ12	15	30

Dimensions of AC reactor of 490 to 660 A are shown as below:



Rated Current	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A	mm													
490	320	106±5	305	137±10	198±5	60±5	220	243±1	Φ12 x 20	122±2	Φ12	22	50	23
660	320	106±5	305	145±10	203±5	50±5	240	243±1	Φ12 x 20	137±2	Φ12	22	50	23

Dimensions of AC reactor of 800 to 1000 A are shown as below:



Rated Current	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A	mm													
800	385	123±5	390	142±10	238±5	70±5	250	260±2	Φ12 x 20	175±1	Φ12	22	50	23
1000	385	123±5	390	142±10	238±5	70±5	250	260±2	Φ12 x 20	175±1	Φ12	22	50	23

■ AC Output Reactor (du/dt Filter) Installation

Whether to install an AC output reactor (du/dt filter) on power output side is dependent on actual situation. Cable connecting servo drive and motor should not be too long; capacitance enlarges when an over-long cable is used and thus high-harmonics current may be easily generated.

When an output reactor (Inovance) is used, cable length can be increased to the value in below table.

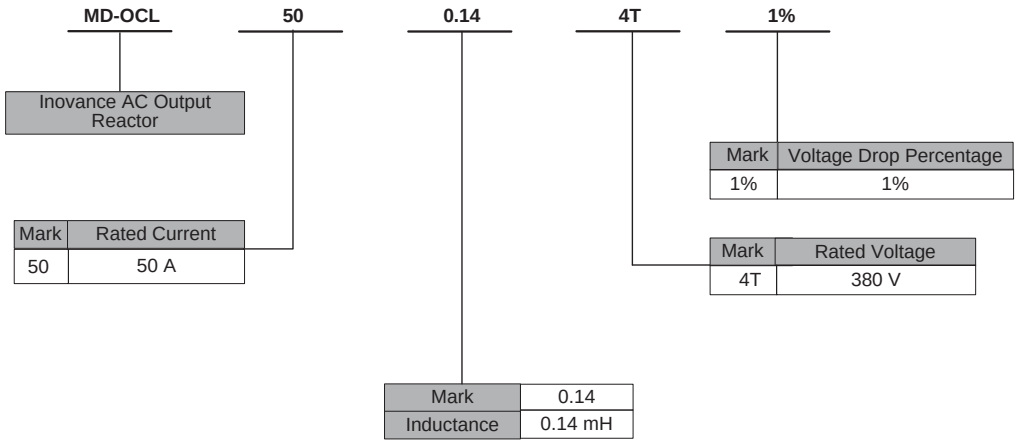
Servo Drive Power (kW)	Rated Voltage (V)	Cable Length Limit (m)
IS580T020-R1	200 to 500	110
IS580T020-R1-T		
IS580-2T020-R1		
IS580T030-R1	200 to 500	125
IS580T030-R1-T		
IS580-2T030-R1		
IS580T035-R1	200 to 500	135
IS580T035-R1-T		
IS580T040-R1	200 to 500	150
IS580T040-R1-T		
IS580-2T040-R1		
≥ IS580T050-R1	200 to 690	150
≥ IS580-2T050-R1		

- AC Output Reactor Model (Inovance)

  The recommended AC output reactor models (Inovance) are listed in the following table.

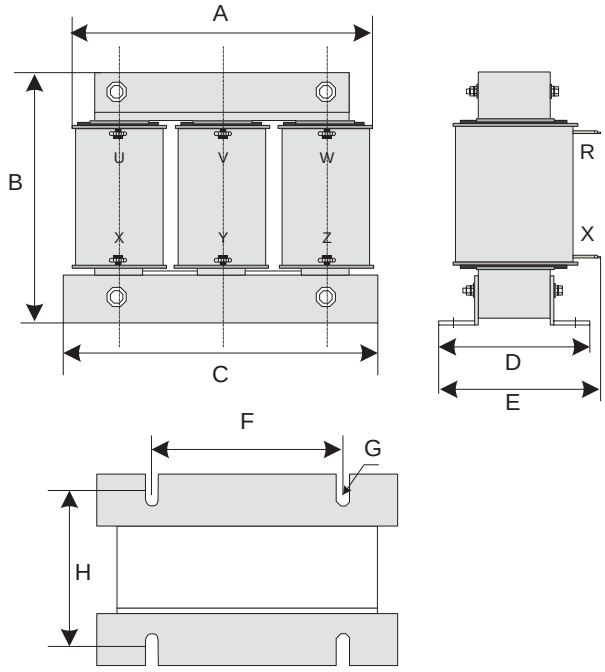
Servo Drive Model			AC Output Reactor Model (Inovance)
IS580T020-R1	IS580-2T020-R1	IS580T020-R1-T	MD-OCL-50-0.14-4T-1%
IS580T030-R1	IS580-2T030-R1	IS580T030-R1-T	MD-OCL-50-0.14-4T-1%
IS580T035-R1	-	IS580T035-R1-T	MD-OCL-50-0.14-4T-1%
IS580T040-R1	IS580-2T040-R1	IS580T040-R1-T	MD-OCL-60-0.12-4T-1%
IS580T050-R1	IS580-2T050-R1	-	MD-OCL-80-0.087-4T-1%
IS580T070-R1	IS580-2T070-R1	-	MD-OCL-90-0.078-4T-1%
IS580T080-R1	IS580-2T080-R1	-	MD-OCL-120-0.058-4T-1%
IS580T100-R1	IS580-2T100-R1	-	MD-OCL-150-0.047-4T-1%
IS580T140-R1	IS580-2T140-R1	-	MD-OCL-200-0.035-4T-1%
IS580T170-R1	IS580-2T170-R1	-	MD-OCL-250-0.028-4T-1%
IS580T210-R1	IS580-2T210-R1	-	MD-OCL-250-0.028-4T-1%
IS580T250-R1	-	-	MD-OCL-330-0.021-4T-1%
IS580T300-R1	IS580-2T300-R1	-	MD-OCL-330-0.021-4T-1%

- Designation rules



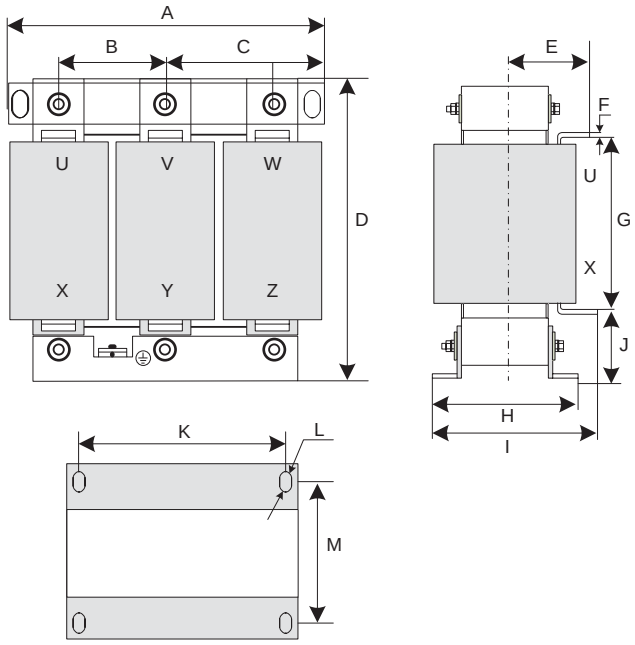
- Mounting dimensions

  Dimensions of AC output reactor of 50 to 120 A are shown as below:



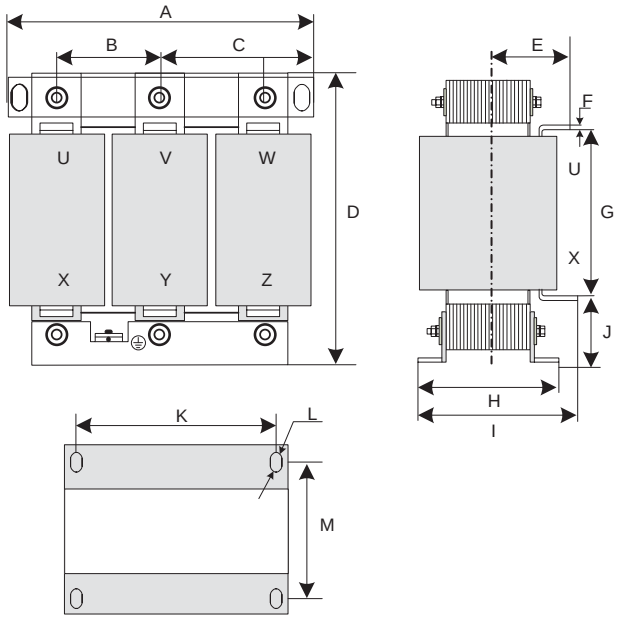
Rated Current	A	B	C	D	E	F	G	H
(A)	(mm)							
50	155	130	148	95	135	95	6 x 15	80
60	195	165	188	92	130	120	8.5 x 20	72
80	195	165	188	92	130	120	8.5 x 20	72
90	195	165	188	92	130	120	8.5 x 20	72
120	195	165	188	112	140	120	8.5 x 20	92

Dimensions of AC output reactor of 150 to 250 A are shown as below:



Rated Current	A	B	C	D	E	F	G	H	I	J	K	L	M
A	mm												
150	250	81	81	230	97	5	140	113	170	42	182	11 x 18	87
200	250	81	81	230	102	5	140	123	175	42	182	11 x 18	97
250	250	81	81	230	102	5	140	123	175	42	182	11 x 18	97

Dimension of AC output reactor of 330 A



Rated Current	A	B	C	D	E	F	G	H	I	J	K	L	M
(A)	(mm)												
330	290	95	95	250	110	5	155	132	190	45	214	11 x18	106

Note	The dimensions of the AC input and output reactors are for reference only.

- du/dt Filter (Schaffner) Selection

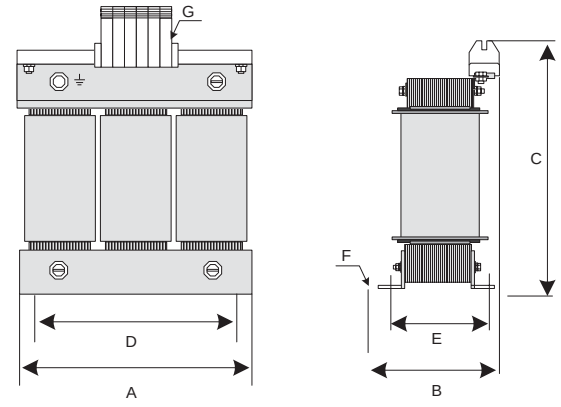
  Connect a du/dt reactor on the output side to reduce large du/dt filter, protecting the motor winding from insulation breakdown, lowering motor temperature and extending the motor service life and meanwhile reduce interference on surrounding devices.

  Selection of the du/dt filter (Schaffner)

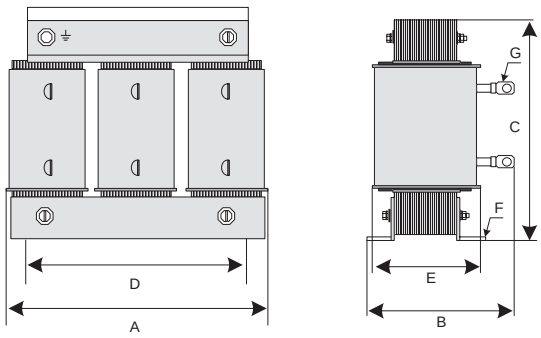
du/dt Reactor Model	Rated Current at 40°C (A)	Rated Motor Power (kW)	Rated Inducance (mH)	Power Consumption (W)	I/O Terminal Selection			Total (kg)
								
RWK 305-24-KL	24	11	0.245	45	KL	-	-	2.5
RWK 305-32-KL	32	15	0.184	55	KL	-	-	3.9
RWK 305-45-KL	45	22	0.131	60	KL	-	-	6.1
RWK 305-60-KL	60	30	0.098	65	KL	-	-	6.1
RWK 305-72-KL	72	37	0.082	70	KL	-	-	6.1
RWK 305-90-KL	90	45	0.065	75	KL	-	-	7.4
RWK 305-110-KL	110	55	0.053	90	KL	-	-	8.2
RWK 305-124-KS	124	55	0.047	110	-	KS	-	8.2
RWK 305-143-KS	143	75	0.041	115	-	KS	-	10.7
RWK 305-156-KS	156	75	0.038	120	-	KS	-	10.7
RWK 305-170-KS	170	90	0.035	130	-	KS	-	10.7
RWK 305-182-KS	182	90	0.032	140	-	KS	-	16
RWK 305-230-KS	230	132	0.026	180	-	KS	-	22
RWK 305-280-KS	280	160	0.021	220	-	KS	-	29
RWK 305-330-KS	330	160	0.018	240	-	KS	-	32

- Mounting Dimensions (Unit: mm)

60-110A



124-330A

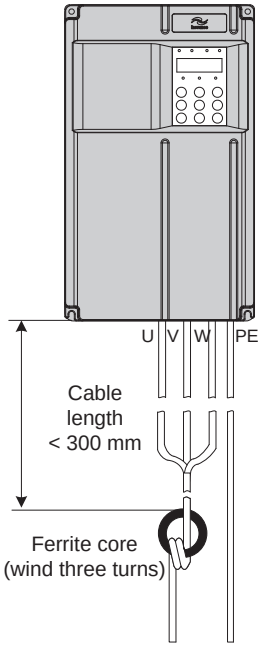


Reactor Series	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G
24A	125	max.75	max.135	100	55	5 x 8	4 mm^2
32A	155	max.95	max.170	130	56	8 x 12	10 mm^2
45A	155	max.110	max.190	130	72	8 x 12	10 mm^2
60 and 72A	155	max.125	max.190	130	70	8 x 12	16 mm^2
90A	190	max.115	max.225	170	57	8 x 12	35 mm^2
110A	190	max.130	max.220	170	67	8 x 12	35 mm^2
124A	190	max.180	max.160	170	67	8 x 12	f8
143A	190	max.180	max.160	170	77	8 x 12	f8
156 and 170A	190	max.180	max.160	170	77	8 x 12	f10
182A	210	max.180	max.185	175	97	8 x 12	f10
230A	240	220		190	119	11 x 15	f12
280A	240	235		190	133	11 x 15	f12
330A	240	240		190	135	11 x 15	f12

■ Ferrite Core

The ferrite core is installed on output side (close to servo drive) to reduce bearing current and reduce interference on surrounding devices.

The following figure shows installation of ferrite core.



The following figure shows physical appearance of ferrite core.

Ferrite Core Model	SN	Dimensions (Outer Diameter x Inner Diameter x Thickness) (mm)
DY644020H	11013031	64 x 40 x 20
DY805020H	11013032	80 x 50 x 20
DY1207030H	11013033	120 x 70 x 30

A.1.6 Breaker & Fuse Selection

Earth leakage current of servo drive is larger than 3.5 A, requiring grounding protection.

The servo drive produces DC leakage current inside protective conductor, thus a B-type (delay-type) leakage breaker must be used.

When leakage breaker acts accidentally, you can:

- Use a leakage breaker of higher rated action current or use a delay-type leakage breaker.
- Lower the carrier frequency of servo drive.
- Shorten the length of drive cables of motor.
- Take leakage current suppression measures.

Recommended leakage breaker manufacturers are CHINT and Schneider.

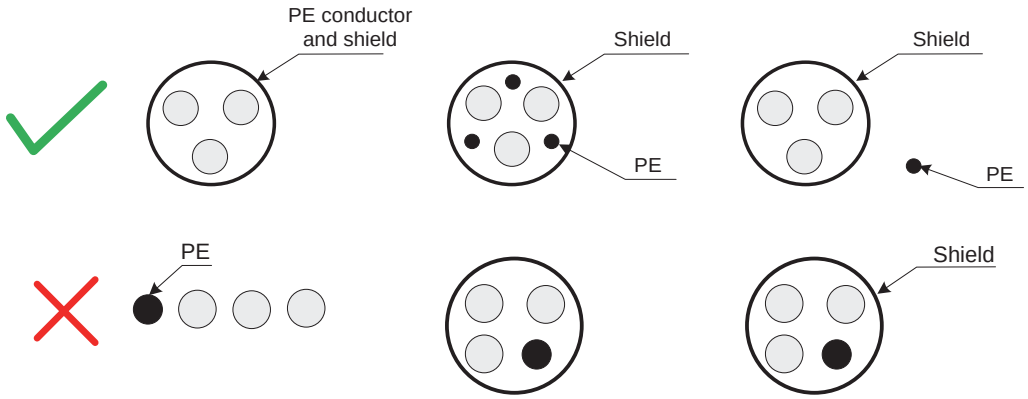
For selection of fuse and breaker, see *8.1 MCCB, Fuse and Contactor*.

A.1.7 Shielded Cable

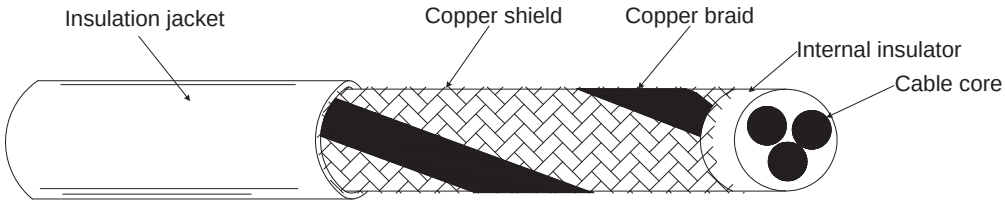
■ Requirements for Shielded Cable

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

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



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



■ Cabling Requirements

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

A.1.8 Solutions to Current Leakage

Servo drive outputs high-speed pulse voltage, producing high-frequency leakage current during running of the drive. Each servo drive produces more than 100 mA leakage current. Therefore, it is necessary to select a residual current circuit-breaker with rated operating current of 100 mA above.

Servo drive generates DC leakage current in protective conductor. In this case, a time-delay B-type breaker must be used. If multiple servo drives are required, each servo drive must be installed with a circuit-breaker.

Factors that influence the leakage current are as follows:

- Servo drive capacity
- Carrier frequency
- Type and length of motor cable
- EMI filter

When leakage current causes the circuit-breaker to act, you should:

- Increase sensitivity current of circuit-breaker.
- Replace circuit-breaker with a new one with high-frequency suppression function.
- Reduce carrier frequency.
- Shorten length of the output cable.
- Install a current leakage suppression device.

Recommended residual current circuit-breaker manufacturers are Chint Electric and Schneider.

A.1.9 Solutions to Common EMC Interference Problems

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

Interference Type	Solution
Leakage protection switch tripping	● Reduce carrier frequency. ● Shorten length of the servo drive cables. ● Wind ferrite core around the drive input cable except PE cable. ● For tripping at the moment of power-on, cut off the large capacitance to ground on power input side by disconnecting grounding terminal of external or built-in filter and disconnecting grounding terminal of Y capacitance to ground of input terminals. ● For tripping during drive running or when drive enabled, take leakage current suppression measures (install a leakage current filter, install safety capacitor + wind ferrite core).
Servo drive interference during running	● Connect motor housing to PE of servo drive. ● Connect PE of servo drive to PE of grid. ● Wind power input cable with ferrite core. ● Add a safety capacitor or ferrite core to interfered signal terminal. ● Add an extra common ground.
Communication interference	● Connect motor housing to PE of servo drive. ● Connect PE of servo drive to PE of grid. ● Wind power input cable with ferrite cores. ● Add a matching resistor between communication cable source and load. ● Add a common grounding cable besides communication cable. ● Use a shielded cable as communication cable and connect cable shield to common grounding point. ● Adopt daisy chain mode for multi-node communication and reserve branch length of less than 30 cm.
I/O interference	● Enlarge capacitance at low-speed DI. A maximum of 0.11 uF capacitance is suggested. ● Enlarge capacitance at AI. A maximum of 0.22 uF is suggested.

A.2 Certifications

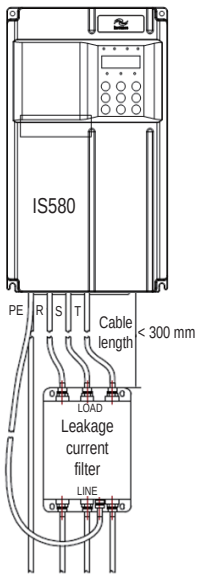
The IS580 drives of different models and ISMG series of motors are certificated as follows:

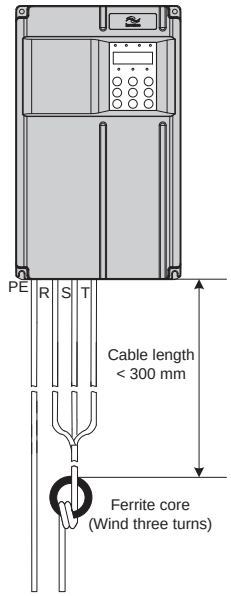
Series	Model Name	Certificate			
		CE	cULus	Ghost	KC
IS580	IS580T020-R1	■	■	-	-
	IS580T020-R1-T	■	■	-	-
	IS580T030-R1	■	■	-	-
	IS580T030-R1-T	■	■	-	-
	IS580T035-R1	■	■	-	-
	IS580T035-R1-T	■	■	-	-
	IS580T040-R1	■	■	-	-
	IS580T040-R1-T	■	■	-	-
	IS580T050-R1	■	■	-	-
	IS580T070-R1	■	■	-	-
	IS580T080-R1	■	■	-	-
	IS580T100-R1	■	■	-	-
	IS580T140-R1	■	■	-	-
	IS580T170-R1	■	■	-	-
	IS580T210-R1	■	■	-	-
	IS580T250-R1	■	-	-	-
	IS580T300-R1	■	-	-	-
	IS580-2T020-R1	-	-	-	-
	IS580-2T030-R1	-	-	-	-
	IS580-2T040-R1	-	-	-	-
	IS580-2T050-R1	-	-	-	-
	IS580-2T070-R1	-	-	-	-
	IS580-2T080-R1	-	-	-	-
	IS580-2T100-R1	-	-	-	-
	IS580-2T140-R1	-	-	-	-
	IS580-2T170-R1	-	-	-	-
	IS580-2T210-R1	-	-	-	-
	IS580-2T300-R1	-	-	-	-

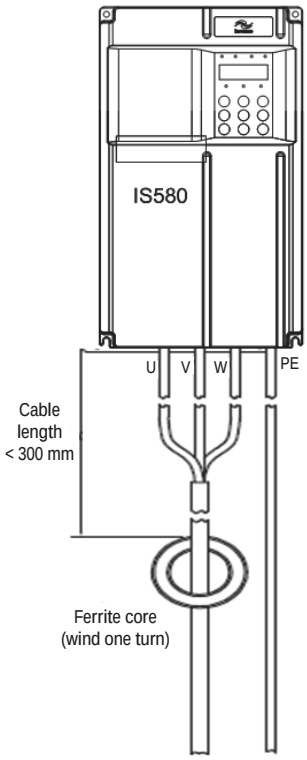
Series	Model Name	Certificate			
		CE	cULus	Ghost	KC
ISMG1 second generation	ISMG1-95C15CD-R131FA	■	■	-	-
	ISMG1-11D17CD-R131FA	■	■	-	-
	ISMG1-12D20CD-R131FA	■	■	-	-
	ISMG1-14D15CD-R131FA	■	■	-	-
	ISMG1-16D17CD-R131FA	■	■	-	-
	ISMG1-18D20CD-R131FA	■	■	-	-
	ISMG1-17D15CD-R131FA	■	■	-	-
	ISMG1-20D17CD-R131FA	■	■	-	-
	ISMG1-23D20CD-R131FA	■	■	-	-
	ISMG1-22D15CD-R131FA	■	■	-	-
	ISMG1-24D17CD-R131FA	■	■	-	-
	ISMG1-28D20CD-R131FA	■	■	-	-
	ISMG1-30D15CD-R131FA	■	■	-	-
	ISMG1-34D17CD-R131FA	■	■	-	-
	ISMG1-41D20CD-R131FA	■	■	-	-
ISMG2 second generation	ISMG2-31D15CD-R131FA	■	■	-	-
	ISMG2-36D17CD-R131FA	■	■	-	-
	ISMG2-42D20CD-R131FA	■	■	-	-
	ISMG2-42D15CD-R131FA	■	■	-	-
	ISMG2-48D17CD-R131FA	■	■	-	-
	ISMG2-57D20CD-R131FA	■	■	-	-
	ISMG2-60D15CD-R131FA	■	■	-	-
	ISMG2-68D17CD-R131FA	■	■	-	-
	ISMG2-80D20CD-R1A1FA	■	■	-	-
	ISMG2-80D15CD-R1A1FA	■	■	-	-
	ISMG2-91D17CD-R1A1FA	■	■	-	-
	ISMG2-11E20CD-R1A1FA	■	■	-	-

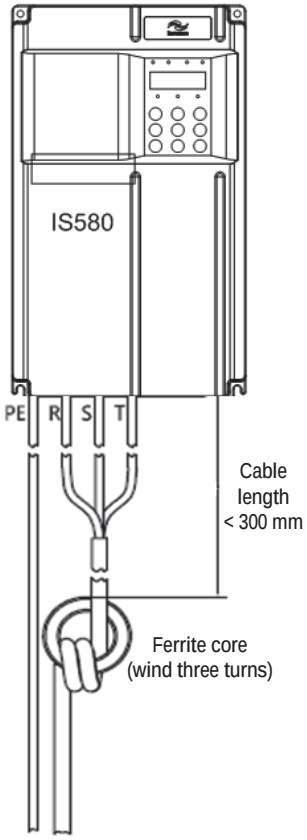
Appendix B Leakage Current Suppression Solution and Leakage Protector Selection

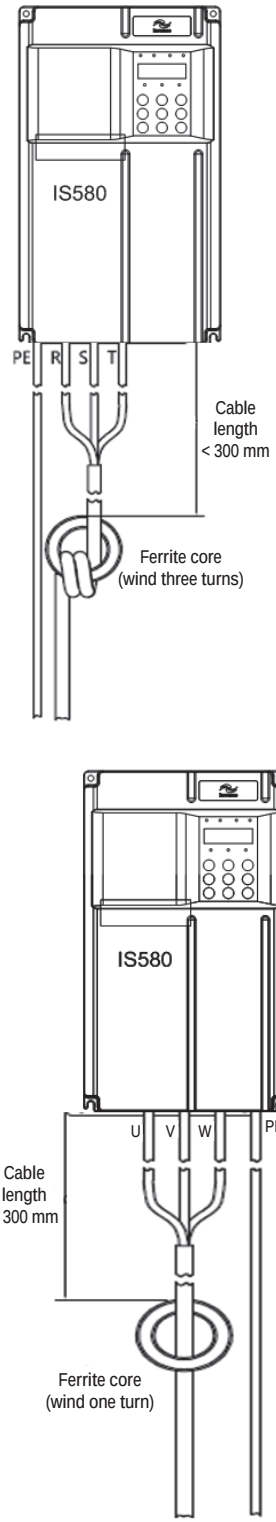
Note	In the following tables, • "-" indicates that the leakage current suppression solution does not cover the power. • The residual current circuit breaker (RCCB), RCD and leakage protector indicate the same concept.

<table>
<tr><th rowspan="2">Servo Drive Model</th><th colspan="5">Solution 1: Require Leakage Current During Running < 30 mA (Use Leakage Current Filter).</th></tr>
<tr><th>Leakage Protector Selection With Leakage Current Suppression Solution</th><th>Leakage Protector Selection Without Leakage Current Suppression Solution</th><th>Leakage Current Filter</th><th>Installation Wiring Diagram</th><th>Leakage Protector Selection</th></tr>
<tr><td>Reserved</td><td rowspan="19">CHINT Electric DZ series,
CHINT Electric NM1LE series, Changshu MCCBCM3L series, ABB F200 series, Schneider i1D leakage protector</td><td rowspan="2">Action current I△n ≥ 100 mA</td><td>DL-15EB1/10</td><td rowspan="19">Note: The leakage current filter has the direction. Therefore, connect the servo drive to the LOAD side of the filter.
 
</td><td rowspan="18">Action current I△n ≥ 100 mA</td></tr>
<tr><td>IS580T035-R1</td><td>DL-35EB1/10</td></tr>
<tr><td>IS580T040-R1</td><td rowspan="5">DL65EB1/10</td></tr>
<tr><td>IS580-2T040-R1</td></tr>
<tr><td>IS580T050-R1</td><td rowspan="8">Action current I△n ≥ 300 mA</td></tr>
<tr><td>IS580-2T050-R1</td></tr>
<tr><td>IS580T070-R1</td><td rowspan="4">DL-120EB1/10</td></tr>
<tr><td>IS580-2T070-R1</td></tr>
<tr><td>IS580T080-R1</td></tr>
<tr><td>IS580-2T080-R1</td></tr>
<tr><td>IS580T100-R1</td><td rowspan="6">DL-180EB1/10</td></tr>
<tr><td>IS580-2T100-R1</td></tr>
<tr><td>IS580T140-R1</td></tr>
<tr><td>IS580-2T140-R1</td></tr>
<tr><td>IS580T170-R1</td></tr>
<tr><td>IS580-2T170-R1-</td></tr>
<tr><td>IS580T210-R1</td><td colspan="2">-</td><td>-</td><td>Action current I△n ≥ 300 mA</td></tr>
<tr><td>IS580-2T210-R1</td><td colspan="4"></td></tr>
</table>

<table>
<tr><td rowspan="2">Servo Drive Model</td><td colspan="5">Solution 2: Require Leakage Current During Running < 100 mA (Wind Ferrite Core Three Turns)</td></tr>
<tr><td>Leakage Protector Selection With Leakage Suppression Solution</td><td>Leakage Protector Selection Without Leakage Suppression Solution</td><td>Ferrite Core Model</td><td>Installation Wiring Diagram</td><td>Leakage Protector Selection</td></tr>
<tr><td>Reserved</td><td rowspan="16">CHINT Electric DZ series,
CHINT Electric NM1LE series, Changshu MCCBCM3L series,
ABB F200 series, Schneider i1D leakage protector</td><td rowspan="8">Action current I△n ≥ 100 mA</td><td>DY644020</td><td rowspan="15">Note: Never run the PE cable around the ferrite core together with the RST cable.
 
</td><td rowspan="15">Action current I△n ≥ 100 mA</td></tr>
<tr><td>IS580T035-R1</td><td rowspan="7">DY805020H</td></tr>
<tr><td>IS580T040-R1</td></tr>
<tr><td>IS580-2T040-R1</td></tr>
<tr><td>IS580T050-R1</td></tr>
<tr><td>IS580-2T050-R1</td></tr>
<tr><td>IS580T070-R1</td></tr>
<tr><td>IS580-2T070-R1</td></tr>
<tr><td>IS580T080-R1</td><td rowspan="8">Action current I△n ≥ 300 mA</td><td rowspan="7">DY1207030H</td></tr>
<tr><td>IS580-2T080-R1</td></tr>
<tr><td>IS580T100-R1</td></tr>
<tr><td>IS580-2T100-R1</td></tr>
<tr><td>IS580T140-R1</td></tr>
<tr><td>IS580-2T140-R1</td></tr>
<tr><td>IS580T170-R1</td><td>-</td><td>-</td><td rowspan="4">Action current I△n ≥ 300 mA</td></tr>
<tr><td>IS580-2T170-R1</td></tr>
<tr><td>IS580T210-R1</td><td>-</td><td>-</td></tr>
<tr><td>IS580-2T210-R1</td></tr>
</table>

<table>
<tr><td rowspan="2">Servo Drive Model</td><td colspan="3">Solution 3: Require Leakage Current During Running < 200 mA (Wind Ferrite Core One Turn).</td></tr>
<tr><td>Ferrite Core Model</td><td>Installation Wiring Diagram</td><td>Leakage Protector Selection</td></tr>
<tr><td>Reserved</td><td>DY644020H</td><td rowspan="18">Note: Never run the PE cable around the ferrite core together with the RST cable.
 
</td><td rowspan="18">Action current $I_{\triangle n}$ ≥ 100 mA</td></tr>
<tr><td>IS580T035-R1</td><td rowspan="7">DY805020H</td></tr>
<tr><td>IS580T040-R1</td></tr>
<tr><td>IS580-2T040-R1</td></tr>
<tr><td>IS580T050-R1</td></tr>
<tr><td>IS580-2T050-R1</td></tr>
<tr><td>IS580T070-R1</td></tr>
<tr><td>IS580-2T070-R1</td></tr>
<tr><td>IS580T080-R1</td><td rowspan="6">DY1207030H</td></tr>
<tr><td>IS580-2T080-R1</td></tr>
<tr><td>IS580T100-R1</td></tr>
<tr><td>IS580-2T100-R1</td></tr>
<tr><td>IS580T140-R1</td></tr>
<tr><td>IS580-2T140-R1</td></tr>
<tr><td>IS580T170-R1</td><td rowspan="4">DY1207030H</td></tr>
<tr><td>IS580-2T170-R1</td></tr>
<tr><td>IS580T210-R1</td></tr>
<tr><td>IS580-2T210-R1</td></tr>
</table>

<table>
<tr><td rowspan="2">Servo Drive Model</td><td colspan="3">Solution 4: Require Leakage Current During Running Reducing 50% (Wind the Input or Output Ferrite Core Three Turns).</td></tr>
<tr><td>Ferrite Core Model</td><td>Installation Wiring Diagram</td><td>Leakage Protector Selection</td></tr>
<tr><td>Reserved</td><td>DY644020H</td><td rowspan="16">For the wiring diagram of winding the output UVW cable three turns, for the wiring diagram in solution 5.
Note: Never run the PE cable around ferrite core together with the RST cable.
 
</td><td rowspan="14">Action current I△n ≥ 100 mA</td></tr>
<tr><td>IS580T035-R1</td><td rowspan="7">DY805020H</td></tr>
<tr><td>IS580T040-R1</td></tr>
<tr><td>IS580-2T040-R1</td></tr>
<tr><td>IS580T050-R1</td></tr>
<tr><td>IS580-2T050-R1</td></tr>
<tr><td>IS580T070-R1</td></tr>
<tr><td>IS580-2T070-R1</td></tr>
<tr><td>IS580T080-R1</td><td rowspan="8">DY1207030H</td></tr>
<tr><td>IS580-2T080-R1</td></tr>
<tr><td>IS580T100-R1</td></tr>
<tr><td>IS580-2T100-R1</td></tr>
<tr><td>IS580T140-R1</td></tr>
<tr><td>IS580-2T140-R1</td></tr>
<tr><td>IS580T170-R1</td><td rowspan="2">-</td><td rowspan="2">-</td></tr>
<tr><td>IS580-2T170-R1</td><td rowspan="3">Action current I△n ≥ 300 mA</td></tr>
<tr><td>IS580T210-R1</td><td rowspan="2">-</td><td rowspan="2">-</td></tr>
<tr><td>IS580-2T210-R1</td></tr>
</table>

<table>
<tr><td rowspan="2">Servo Drive Model</td><td colspan="3">Solution 5: Require Leakage Current During Running Reducing 25% (Wind the Input or Output Ferrite Core One Turn).</td></tr>
<tr><td>Ferrite Core Model</td><td>Installation Wiring Diagram</td><td>Leakage Protector Selection</td></tr>
<tr><td>Reserved</td><td>DY644020H</td><td rowspan="19"> 
</td><td rowspan="2">Action current I△n ≥ 100 mA</td></tr>
<tr><td>IS580T035-R1</td><td rowspan="7">DY805020H</td></tr>
<tr><td>IS580T040-R1</td></tr>
<tr><td>IS580-2T040-R1</td></tr>
<tr><td>IS580T050-R1</td></tr>
<tr><td>IS580-2T050-R1</td></tr>
<tr><td>IS580T070-R1</td></tr>
<tr><td>IS580-2T070-R1</td></tr>
<tr><td>IS580T080-R1</td><td rowspan="6">DY1207030H</td></tr>
<tr><td>IS580-2T080-R1</td></tr>
<tr><td>IS580T100-R1</td></tr>
<tr><td>IS580-2T100-R1</td></tr>
<tr><td>IS580T140-R1</td></tr>
<tr><td>IS580-2T140-R1</td></tr>
<tr><td>IS580T170-R1</td><td rowspan="4">DY1207030H</td><td rowspan="4">Action current I△n ≥ 300 mA</td></tr>
<tr><td>IS580-2T170-R1</td></tr>
<tr><td>IS580T210-R1</td></tr>
<tr><td>IS580-2T210-R1</td></tr>
</table>

Appendix C Multi-pump Control of Injection Molding Machine

C.1 Parallel Pump Control

The parallel pump control is classified into multi-pump convergent flow and multi-pump distributed flow.

- The multi-pump convergent flow

  A servo drive is used as the master drive, and the other drives are used as slave drives connected in parallel. The host computer outputs a set of flow and pressure analog signals.

  In flow control state (the feedback pressure is less than the reference pressure), the master drive and the slave drives rotate at the same speed.

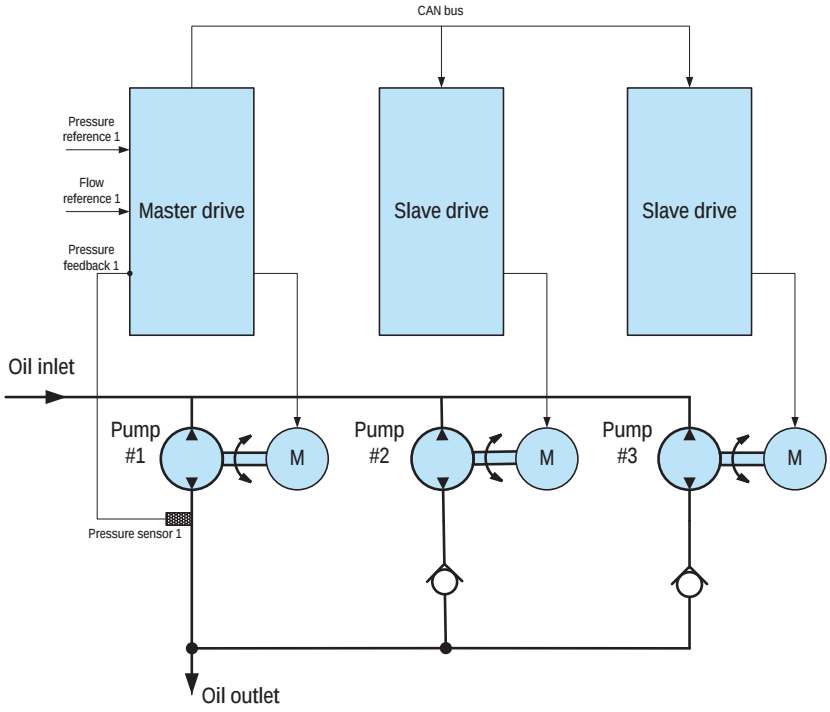
  In pressure control state (the feedback pressure is greater than or equal to the reference pressure), the slave drives are shut down, and the master drive independently controls the pumps.

- The multi-pump distributed flow

  Multiple servo drives may work in multi-pump convergent flow mode or multi-pump distributed flow mode (distributed PID control based on the oil pressure). The host computer outputs multiple sets of flow and pressure analog signals

  The following figure shows the multi-pump convergent flow structure chart.

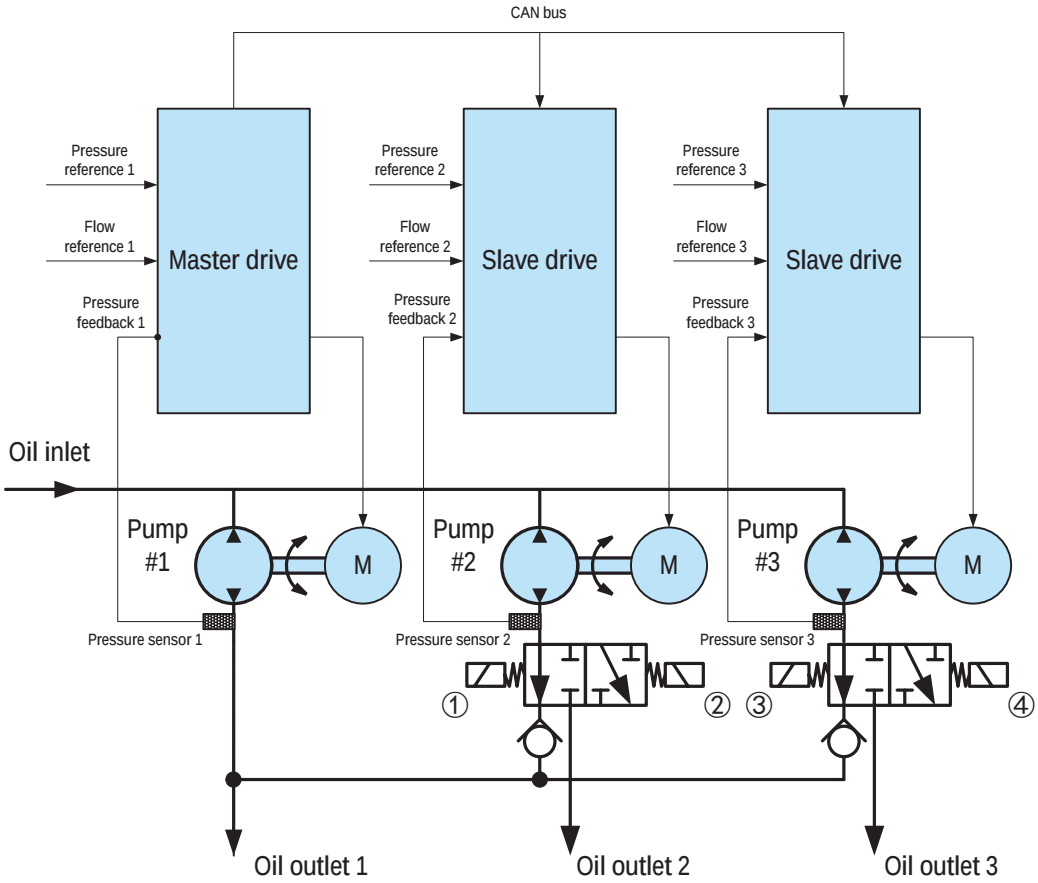
  Figure C-1 The multi-pump convergent flow structure chart



Note	• For detailed wiring and CAN communication wiring, refer to the foldouts at the end of this chapter. • For the parameter setting, refer to the following related parameter setting part. • You can ensure the same motor speed through the communication.

The following figure shows the multi-pump distributed flow structure chart.

Figure C-2 The multi-pump distributed flow structure chart



Note	• For detailed wiring and CAN communication wiring, refer to the foldouts at the end of this chapter. • For the parameter setting, refer to the following related parameter setting part. • You can ensure the same motor speed through the communication. • The convergent flow and distributed flow of pump 2 and pump 3 can be controlled by energizing solenoid valves ① ② ③ ④. In the convergent flow control, the pressure reference, flow reference and pressure feedback signal received by the drive are invalid. In the distributed flow control, the CAN communication command received by the drive are invliad.

C.2 Multi-pump Control Mode

Para. No.	Para. Name	Setting Range
A2-03	CAN multi-pump mode	0: Multi-pump 1 (old mode) 1: Multi-pump 2 (new mode)

- Multi-pump 1

  This mode is the old mode and is applicable to simple multi-pump control.

  When the slave pump is switched over to the master pump, the slave pump cannot be controlled.

  To enable the multi-pump mode, set the DI terminal for the 50# function.

  After disconnecting the DI terminal set for the 50# function of the slave pump, the slave pump is switched over to the master pump.

- Multi-pump 2

  This mode is the new mode and can satisfy more complicated multi-pump convergent and distributed flow control. It supports a maximum of four multi-pump distributed flow control combinations.

The two multi-pump modes have different wiring methods and applications.

■ Wiring

For the wiring of multi-pump convergent flow, see the foldout 1 and foldout 2 at the end of this chapter. In the multi-pump convergent flow control, Set the corresponding parameter in group F5 to 25 (slave alarm output) and connect this signal to the system computer for alarm display.

Note that high-pressure without cause occurs on the oil channel of the slave pump in the pressure control when leakage of the check valve is large while the inner discharge of the slave pump is small. To relieve the high-pressure state of the oil channel, do as follows:

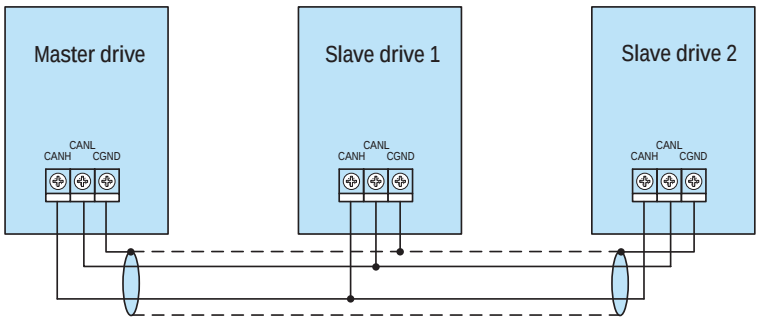
- Reduce the discharge of the slave pump to reasonable range.
- Decrease the torque upper limit of the slave drive to reasonable range.
- Set the speed response curve according to the max. discharge speed of the master pump, ensuring that the slave drive implements automatic pressure relief at low-speed holding pressure. For detailed parameter setting, refer to the following "Parameter Setting for Slave Pump Response to Master Pump Reference" part.

For the wiring of multi-pump distributed flow, see the foldout 3 and foldout 4 at the end of this chapter.

1. CAN Communication Wiring

The CAN bus connection of all pumps is shown in the following figure.

Figure C-3 CAN bus connection of all pumps



Note	• User shielded twisted pair (STP) cables for the CAN bus connection. • Connet the CANH and CANL terminals on the control boards of all drives together, and connect the CGND terminal together through the shield. • The first drive and the end drive at the CAN bus must connect the CAN communication terminal resistor through the jumper J4.

■ Parameter Settings for Slave Pump Response to Master Pump Reference

Para. No.	Para. Name	Default	Description
A3-32	Slave min. input	0.0%	The slave pump drive setting
A3-33	Corresponding setting of slave min. input	0.0%	
A3-34	Slave medium input	0.0%	
A3-35	Corresponding setting of slave medium input	0.0%	
A3-36	Slave max. input	100.0%	
A3-37	Corresponding setting of slave max. input	100.0%	

The setting of A3-32 to A3-37 can implement automatic pressure relief of the slave pump when the master pump is in the low-speed pressure holding state, avoid occurrence of holding high pressure on the slave pump and ensure the system flow linearity.

For example:

Condition 1: Suppose the max. pressure holding speed of the master is 50 rpm/min., the max. speed of the master is 2000 rpm/min., and the max. speed of the slave is 2000 rpm/min.

Condition 2: At pressure hoding, the master works and the slave stops.

Condition 3: To ensure flow linearity, The master is over 100 rpm/min. and the slave keeps the same speed.

That is, when the master pump is below 50 rpm/min., the slave pump stops running. When the master pump is above 100 rpm/min, the master pump and the slave pump keep the same speed.

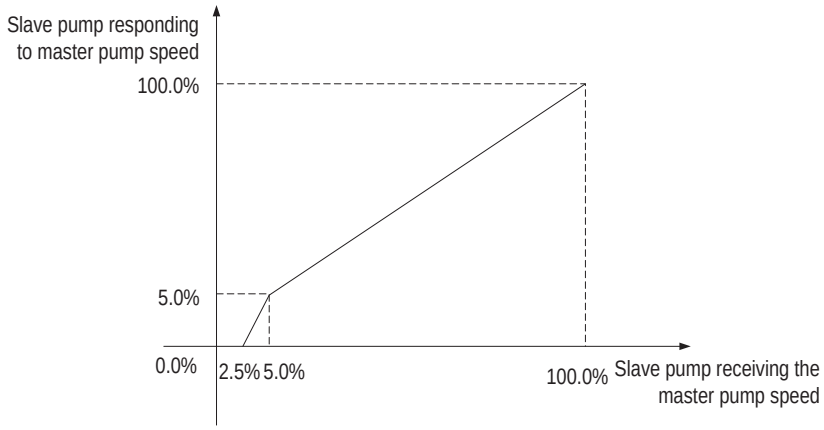
The speed reference of the master pump is 0% to 100%. You can set A3-32 to A3-37 to get the three-point curve to make the slave pump respond to the speed reference as follows:

A3-32, A3-33 = Slave pump input reference: 50 rpm/min., slave response reference: 0 rpm/min. = 2.5%, 0.0%

A3-34, A3-35 = Slave pump input reference: 100 rpm/min., slave response reference: 100 rpm/min. = 5.0%, 5.0%

A3-36, A3-37 = Slave pump input reference: 2000 rpm/min., slave response reference: 2000 rpm/min. = 100%, 100%

Figure C-4 Slave pump response to the master pump speed reference



Note	The two multi-pump modes have the same parameter setting for the slave pump response to the master pump speed reference.

C.3 Parameter Setting on Master Drive

- Multi-pump mode 1 (A2-03 = 0)

  The parameter setting is simple. For all servo drives, allocate a DI terminal for the 50# function and set it to ON.

Para. No.	Para. Name	Setting	Description
A2-01	CAN communication address	1	-
A2-03	Multi-pump mode 1	0	-
F4-**	Multi-pump control enabled	50	Short DI5 to COM directly.
F5-02	Relay on the control board (T/A2-T/C2) output selection	25	Slave alarm output (normally-open)

- Multi-pump mode 2 (A2-03 = 1)

  The servo drive with address 1 must be the master pump. A maximum of four combined distributed flow control can be implemented. The related parameter settings are as follows:

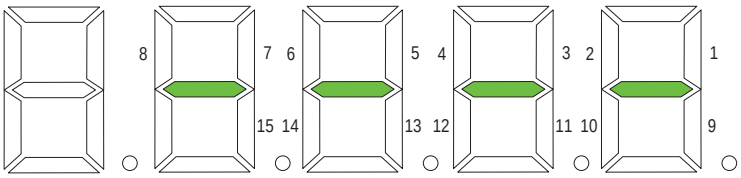
Para. No.	Para. Name	Setting	Description
F4-**	Slave pump address selection terminal 1	53	In multi-pump distributed flow control, these parameters are used to set which slave pumps the master pump selects for convergent flow.
F4-**	Slave pump address selection terminal 2	54	
F5-02	Relay on the control board (T/A2-T/C2) output selection	25	Slave alarm output (normally-open)
A2-01	CAN communication address	1	-
A2-03	Multi-pump mode 1	1	-
A2-04	CAN slave address 1	0	Together with the two DI terminals set for the 53# and 54# functions, the four combined distributed flow control can be implemented.
A2-05	CAN slave address 2	0	
A2-06	CAN slave address 3	0	
A2-07	CAN slave address 4	0	

- Slave pump address DI input selection

Setting of DI Set for 54# Function	Setting of DI Set for 54# Function	CAN Slave Address Selection
0	0	A2-04: CAN slave address 1
0	1	A2-05: CAN slave address 2
1	0	A2-06: CAN slave address 3
1	1	A2-07: CAN slave address 4

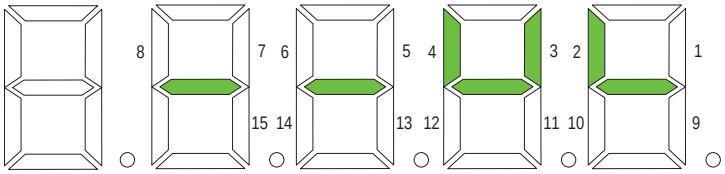
- Description of slave pump address setting

  The LED display of the slave pump address setting is as follows:



Note	• The numbers in the LED display correspond to the slave pump address station No. • If the nixie tube of a number is ON, it indicates that the slave pump of the address station No. • The IS580 supports the setting of a total of 15 slave pump addresses.

For example, 1# is the master pump. The setting of slave pump addresses in A2-04 is shown in the following figure, indicating that 1# is the master pump and works with slave pumps 2#, 3# and 4#.



The key operation of the slave pump address is described below:

– The address of slave pumps 1# to 8# is set by △ and ▷.

– The address of slave pumps 9# to 15# is set by ▽ and ▷.

C.4 Parameter Setting on Slave Drive

- Multi-pump mode 1 (A2-03 = 0)

  The following table lists the parameter setting of the slave drive. Perform the same parameter setting as you do in the common servo pump mode.

Para. No.	Para. Name	Setting	Description
A2-01	CAN communication address	> 1	Slave drive
F4-**	Multi-pump control enabled	50	Slave pump may switch over to master pump control.

If the slave pump switches over to master pump, disconnect the DI terminal set for the 50# function of the slave pump.

- Multi-pump mode 2 (A2-03 = 1)

  The following table lists the parameter setting of the slave drive. Perform the same parameter setting as you do in the common servo pump mode.

Para. No.	Para. Name	Setting	Description
A2-01	CAN communication address	> 1	Slave drive
F4-**	Slave pump address selection terminal 1	53	When the slave pump is used as the master pump, it need be triggered by the terminal. For the slave pump address setting, refer to section B.3 Parameter Setting on Master Drive.
F4-**	Slave pump address selection terminal 2	54	

C.5 Applications of Multi-pump Convergent and Distributed Flow Control

C.5.1 Multi-pump Mode 1 (A2-03 = 0)

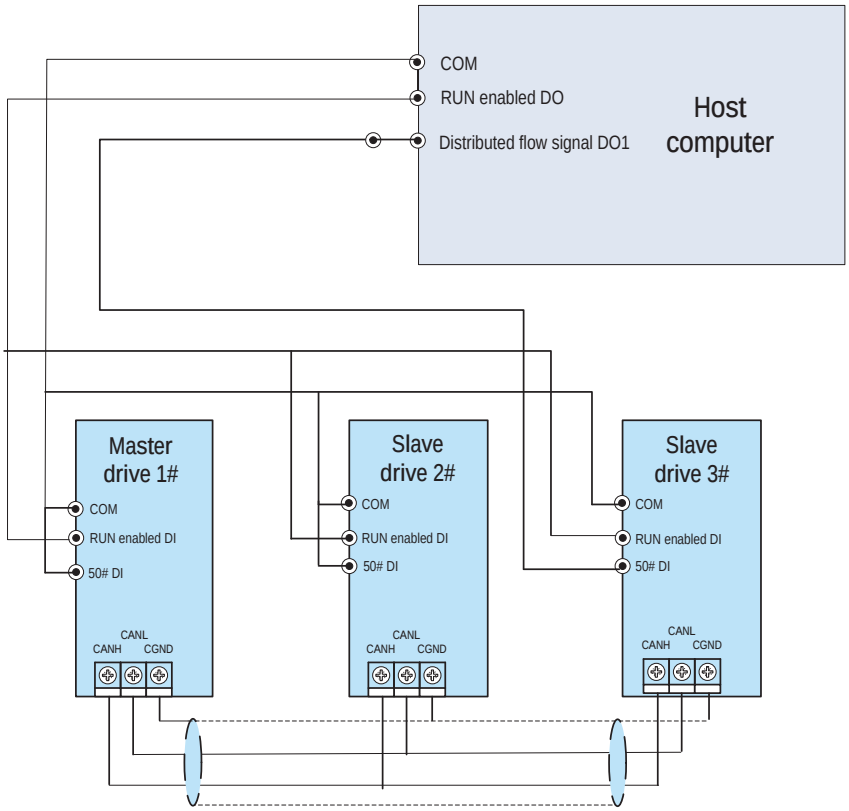
For example, the IMM servo pump system consists of three pumps with the address set as 1#, 2# and 3#. In the multi-pump mode 1, when a slave pump is used as the master pump, the slave pump does not follow its speed.

There are the follwoing two combinations:

- Combination 1: 3-pump convergent flow
- Combination 2: 2+1 combination for distributed flow control, 1# master pump is followed by the 2# slave pump, and the 3# pump switches over to the master pump.

■ Combination 1: 3-pump Convergent Flow

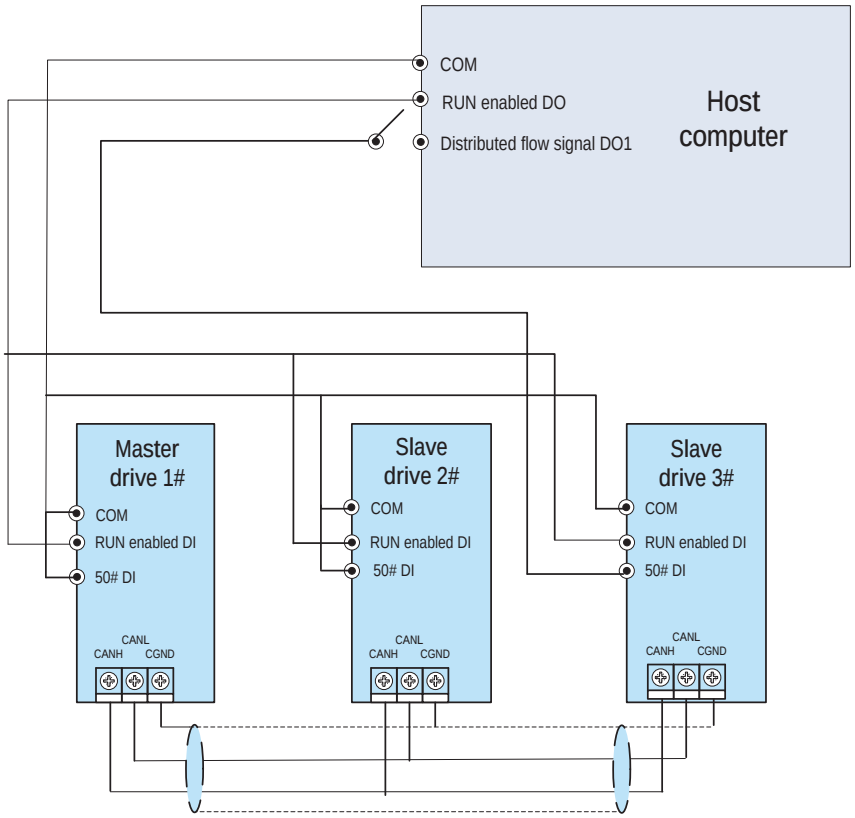
Figure C-5 Wiring of 3-pump convergent flow



Note	• Because the 1# pump is always the master pump and the 2# pump always the slave pump, directly short the DI terminal set for the 50# function. • The 3# pump switches over to the master pump in the following combination 2, which requires an external switchover signal. When the host computer sends the closing signal, the DI terminal set for the 50# function of the slave pump closes to process the multi-pump convergent flow.

■ Combination 2: 2+1 combination for distributed flow control

Figure C-6 2+1 combination for distributed flow control



Note	You can switch over the 3# pump to the master pump by disconnect the DI terminal set for the 50# function of the slave pump.

B.5.2 Multi-pump Mode 2 (A2-03 = 1)

For example, the IMM servo pump system consists of four pumps with the address set as 1#, 2#, 3# and 4#. There are three combinations as follows:

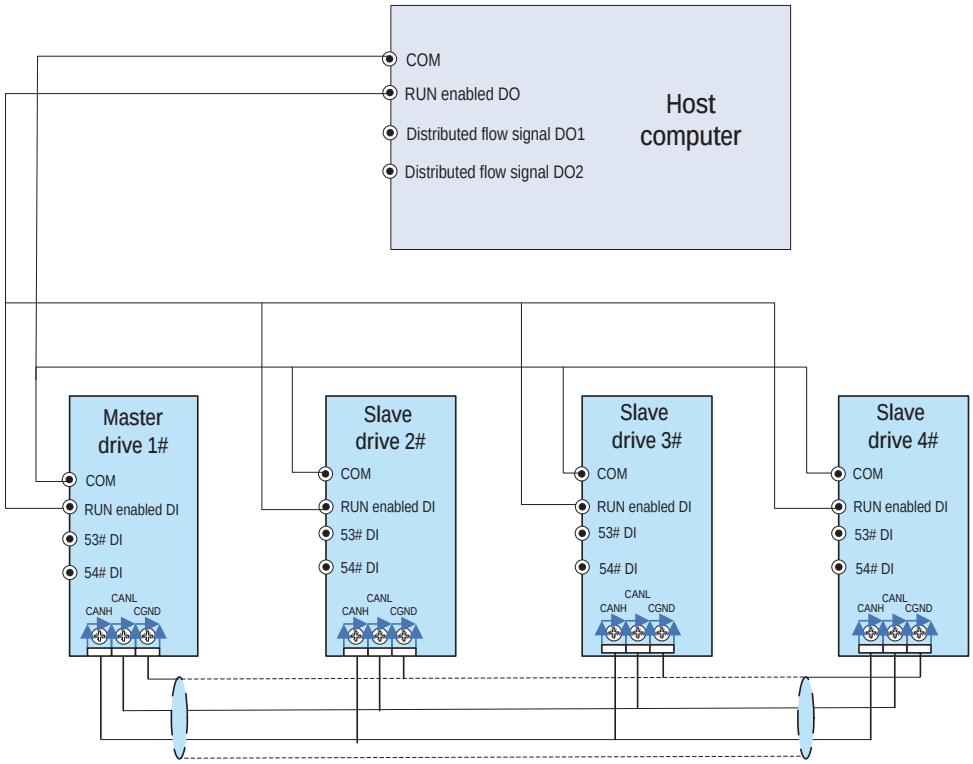
- Combination 1: 4-pump convergent flow
- Combination 2: 2+2 combination for distributed flow control

  The 1# pump is the master pump and is followed by the 2# slave pump. The 3# pump works as the master pump and is followed by the 4# slave pump.
- Combination 3: 3+1 combination for distributed flow control

  The 1# pump is the master pump and is followed by the 3# and 4# slave pumps. The 2# slave pump switches over to the master pump.

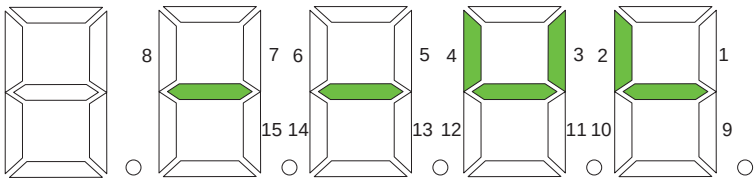
■ Combination 1: 4-pump Convergent Flow

Figure C-7 Wiring of 4-pump convergent flow



Note	The convergent flow control requires very simple wiring including CAN bus and DI terminal wiring.

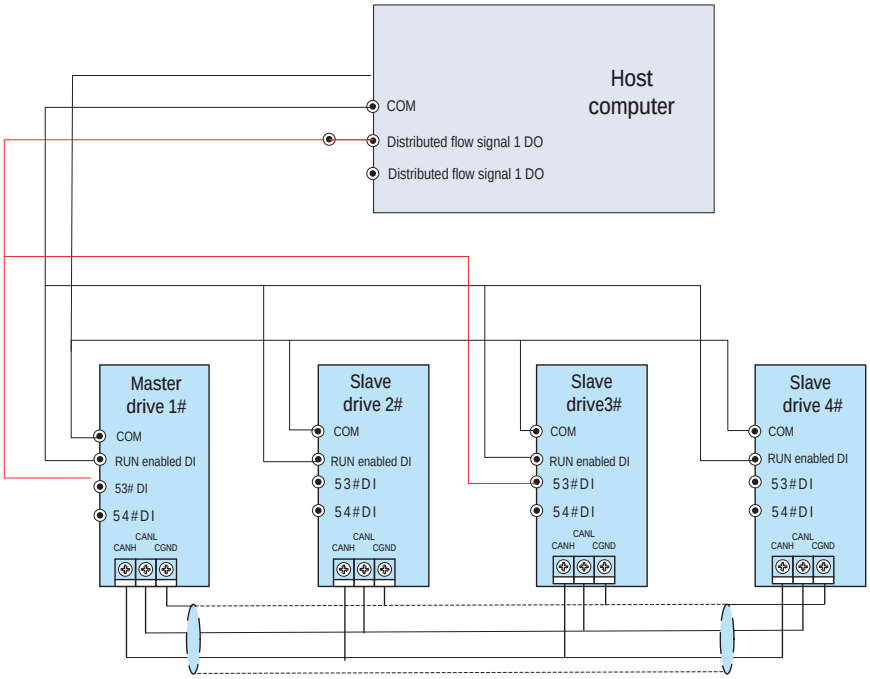
The 1# pump is the master pump, and the 2#, 3# and 4# pumps are slave pumps. The setting of address of corresponding slave pumps in A2-04 is as follows:



■ Combination 2: 2+2 combination for distributed flow control

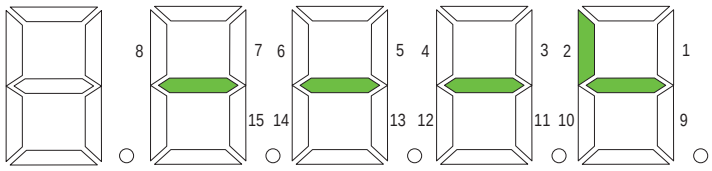
The 1# pump is the master pump and is followed by the 2# slave pump. The 3# pump works as the master pump and is followed by the 4# slave pump.

Figure C-8 Wiring of 4combination for distributed flow control

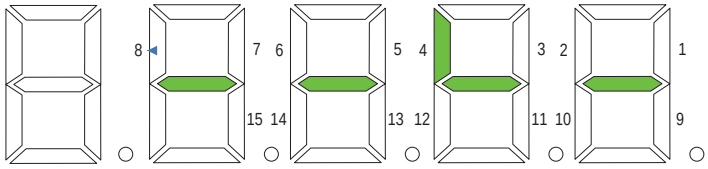


Note	The host computer provides the distributed flow signal. Connect the distributed flow signal to the DI terminal set for the 53# function of the master drive. The master pump identifies the slave pump address through the 53# DI signal. The slave pump switches over to the master pump and identifies the slave pump address by using the 53# DI signal.

In this combination, the 1# pump and 3# pump are the master pumps. The slave pump changes and the address of the slave pump needs to be set. The slave pump of the 1# master pump is 2# pump. The setting of the slave pump address in A2-05 is as follows:

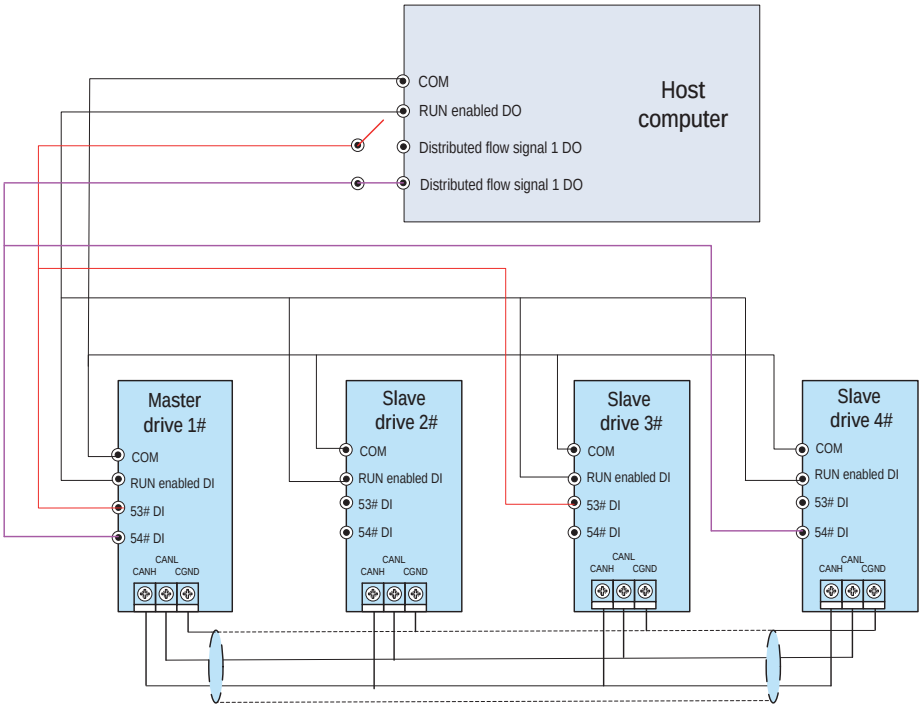


The slave pump of the 3# master pump is 4# pump. The setting of the slave pump address in A2-05 is as follows:



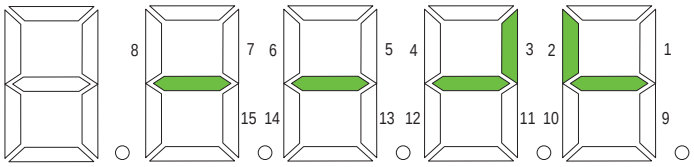
■ Combination 2: 3+1 combination for distributed flow control

Figure C-9 Wiring of 3+1 combination for distributed flow control

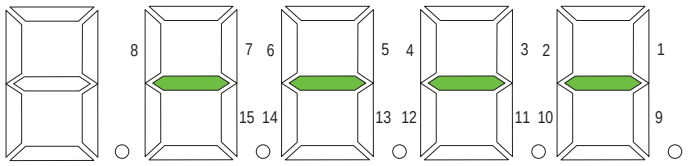


Note	• The host computer provides the distributed flow signal. Connect the distributed flow signal to the DI terminal set for the 54# function of the master drive. The master pump identifies the slave pump address through the 54# DI signal. The slave pump switches over to the master pump and identifies the slave pump address by using the 54# DI signal. • Disconnect the DI terminal set for the 53# function in the second combination.

In this combination, the 1# pump and the 4# pump are master pumps. The slave pump changes and the address of the slave pump needs to be set. The slave pumps of the 1# master pump are the 2# pump and 3# pump. The setting of the slave pump address in A2-06 is as follows:



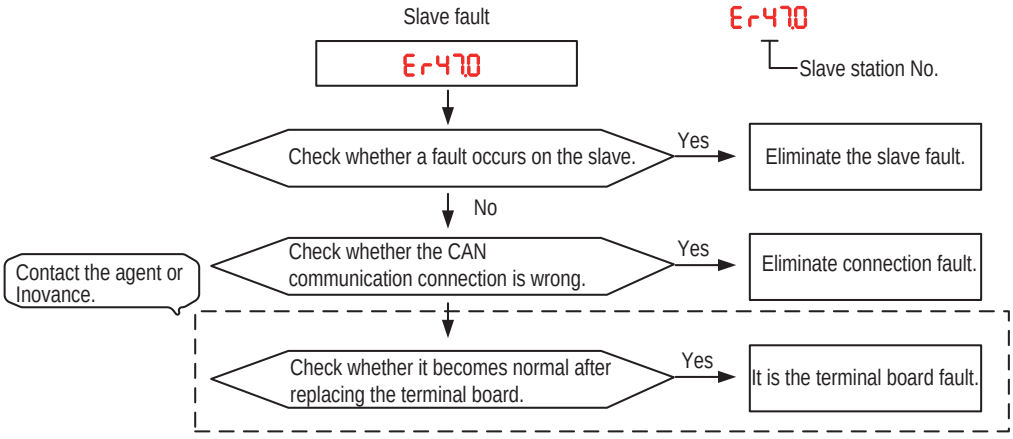
After the 4# slave pump switches over to the master pump, no slave follows it. Therefore, A2-06 does not need to be set.



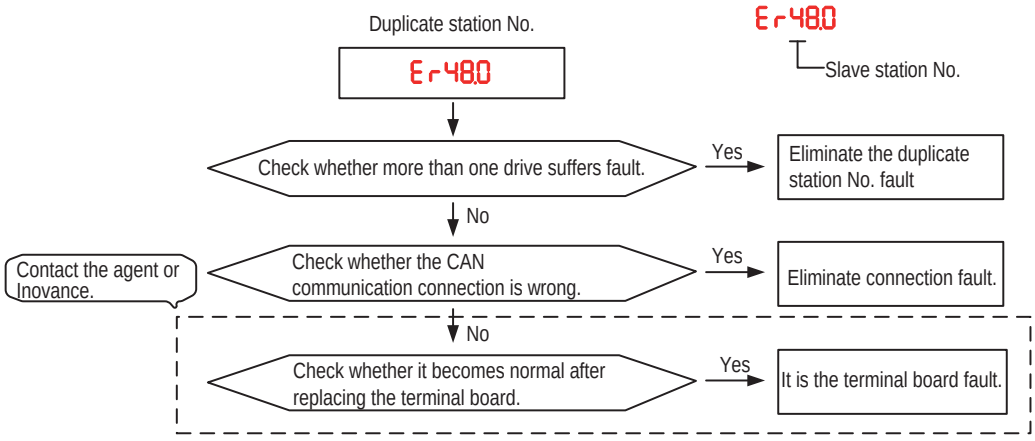
C.6 Fault Description

The fault occurring in the multi-pump control is described as follows:

Err47 Oil pressure sensor fault



Err48 Oil pressure sensor fault



Appendix D Parameter Table

D.1 Introduction

Note	Password protection is available for use with the drive. If this protection has been enabled, you will need to know the user-defined password before you can edit the function codes described in this chapter. See *4.2.5 Password Security* for instructions to set and remove password protection.

Groups F and A include standard function parameters. Group U includes the monitoring function parameters and extension card communication parameters.

The parameter description tables in this chapter use the following symbols.

The symbols in the parameter table are described as follows:

Symbol	Meaning
☆	It is possible to modify the parameter with the drive in the stop or in the Run status.
★	It is not possible to modify the parameter with the drive in the Run status.
•	The parameter is the actual measured value and cannot be modified.
*	The parameter is a factory parameter and can be set only by the manufacturer.

D.2 Standard Parameters

Para. No.	Para. Name	Setting Range	Unit	Default	Property
Group A0: Flux Weakening Control					
A0-00	Flux weakening method selection	0: by calculation 1: auto adjusted	1	1	★
A0-01	Flux weakening current factor	0 to 500	1	5	☆
A0-02	Pm motor flux weakening depth	0 to 50	%	5	☆
A0-03	Factor of pm motor max. output torque	20 to 300	%	100	☆
A0-04	Factor of pm motor field current	40 to 200	%	100	☆
Group A1: PG Card					
A1-00	PG card type selection	0: resolver 1: reserved 2: ABZ encoder	1	0	★
A1-02	Encoder installation angle	0.0 to 359.9	°	0	☆
A1-03	Speed feedback direction	0: same 1: reverse	1	-	★
A1-04	Number of resolver pole-pairs	1 to 50	1	Model dependent	★
A1-05	Resolver fault detection time	0.000 to 60.000	Sec	2.000	☆
A1-06	Encoder resolution	0 to 65535	1	1024	★
A1-08	Speed sensor interference counts	0 to 60000	1	0	☆
Group A2: CAN Communication					
A2-00	Baud rate	0: 20 1: 50 2: 125 3: 250 4: 500 5: 1024	kHz	4	☆
A2-01	CANLink address	1 to 64	1	1	☆
A2-02	CANLink continuous communication time	0.1 to 600.0	sec	0.3	☆
A2-03	CANLink multi-pump mode selection	0: broadcast 1: multi masters	1	0	☆
A2-04	CANLink slave address 1	0 to 65535	1	0	☆
A2-05	CANLink slave address 2	0 to 65535	1	0	☆
A2-06	CANLink slave address 3	0 to 65535	1	0	☆
A2-07	CANLink slave address 4	0 to 65535	1	0	☆
A2-09	Can protocol selection in speed control mode	0: original 1: CANOpen 2: CANLink	1	0	★

Para. No.	Para. Name	Setting Range	Unit	Default	Property
Group A3: Basic Hydraulic Control					
A3-00	Pressure control mode	0: non-hydraulic 1: hydraulic control mode 1 by can 2: hydraulic control mode 2 by AI 3: can hydraulic control mode 4: EST mode(original) 5: EST mode(new) 6: CANOpen mode 7: CANLink3.0 mode	1	0	★
A3-01	Max. Motor speed	1 to 30000	rpm	2000	★
A3-02	System pressure	0.0 to A3-03	kg/cm^2	175.0	☆
A3-03	Max. Pressure	A3-02 to 500.0	kg/cm^2	250.0	☆
A3-04	Pressure command acceleration time 1	0 to 2000	ms	20	☆
A3-05	Pressure loop proportional gain kp 1	0.0 to 800.0		210.0	☆
A3-06	Pressure loop integral time ti 1	0.001 to 10.000	S	0.100	☆
A3-07	Pressure loop differential time td 1	0.000 to 1.000	S	0.000	☆
A3-08	Max. Reverse motor speed	0.0 to 100.0	%	10.0	☆
A3-09	Minimum flow	0.0% to 50.0%	%	0.5	☆
A3-10	Minimum pressure	0.0 to 50.0 kg/cm^2	kg/cm^2	0.5	☆
A3-11	Pressure loop proportional gain kp 2	0.0 to 800.0	0.1	210.0	☆
A3-12	Pressure loop integral time ti 2	0.001s to 10.000s	S	0.100	☆
A3-13	Pressure loop differential time td 2	0.000s to 1.000s	S	0.000	☆
A3-14	Pressure loop proportional gain kp 3	0.0 to 800.0	0.1	210.0	☆
A3-15	Pressure loop integral time ti 3	0.001s to 10.000s	S	0.100	☆
A3-16	Pressure loop differential time td 3	0.000s to 1.000s	0.001s	0.000	☆
A3-17	Pressure loop proportional gain kp 4	0.0 to 800.0	0.1	210.0	☆
A3-18	Pressure loop integral time ti 4	0.001s to 10.000s	0.001s	0.100	☆
A3-19	Pressure loop differential time td 4	0.000s to 1.000s	0.001s	0.000	★
A3-20	AI zero drift self-adjusting enable	0: disable 1: enable	1	0	☆
A3-21	Pressure sensor fault detection time	0.001s to 60.000s	0.001s	0.500	☆
A3-22	Max. flow in pressure control state	0.0% to 100.0%	0.1%	10.0	☆
A3-23	Min. Pressure in pressure control state	0.0% to 100.0%	0.1%	60.0	☆
A3-24	Output delay in pressure control state	0.001s to 10.000s	0.001s	0.100s	☆

Para. No.	Para. Name	Setting Range	Unit	Default	Property
A3-25	Pressure command s-curve acceleration filter time 1	0.001s to 1.000s	0.001s	0.030s	☆
A3-26	Pressure command s-curve deceleration filter time 1	0.001s to 1.000s	0.001s	0.030s	☆
A3-27	Overshoot suppression detection factor 1	0 to 2000	1	200	☆
A3-28	Overshoot suppression factor 1	0 to 3.000	0.001	0.200	☆
A3-29	Pressure loop gain factor	0.20 to 5.00	0.01	1.00	☆
A3-30	Max. torque during switch from pressure control to flow control state	50.0% to 250.0%	0.1%	160.0%	☆
A3-31	Pressure command delay time 1	0.000s to 0.500s	0.001s	0.000s	☆
A3-32	Slave drive min. Input	0.0% to A3-34	0.1%	0.0%	☆
A3-33	Slave drive min. Input frequency.	-100.0% to 100.0%	0.1%	0.0%	☆
A3-34	Slave drive mid-point input	A3-32 to A3-36	0.1%	0.0%	☆
A3-35	Slave drive mid-point input frequency.	-100.0% to 100.0%	0.1%	0.0%	☆
A3-36	Slave drive max. Input	A3-34 to 100.0%	0.1%	100.0%	☆
A3-37	Slave drive max. Input frequency.	-100.0% to 100.0%	0.1%	100.0%	☆
A3-38	Multi-pump host check whether to enable slave pump	0: slave enable forbidden 1: slave enable permitted	1	0	☆
A3-39	Multi-pump confluence mode pressure holding gain	20 to 800	1	100	☆
A3-40	Multi-pump injection state acceptable pressure error during gain decrease	0.0 to 50.0 kg	0.1kg	5.0kg	☆
A3-41	Multi-pump injection state acceptable min. Flow during gain decrease	0 to 30000 rpm	1 rpm	0 rpm	☆
A3-42	Multi-pump injection state flow detection time during gain decrease	0.200 to 2.000s	0.001s	0.400s	☆
A3-43	Multi-pump CANLink state pressure error threshold to Disable slave pump	0 to 50.0 kg	0.1 kg	5.0 kg	☆
A3-44	Multi-pump CANLink state min. flow to Disable slave pump	-100.0% to 100.0%	0.1%	0.0%	☆
A3-45	Withdrew speed command slave pump delays to stop	0.100 to 5.000s	0.001s	1.000s	☆
A3-46	Withdrew speed command slave pump deceleration time	0.001 to 5.000s	0.001s	0.200s	☆

Para. No.	Para. Name	Setting Range	Unit	Default	Property
A3-47	Valve decompression enable delay	0.001 to 5.000s	0.001s	0.100s	☆
A3-48	Valve decompression Disable delay	0.001 to 5.000s	0.001s	0.100s	☆
A3-49	Pressure error lower threshold for valve decompression enable	0.0 to A3-02 (system pressure)	0.1 kg	0.0 kg	☆
A3-50	Pressure command lower threshold for valve decompression enable	0.0 to A3-02 (system pressure)	0.1 kg	0.0 kg	☆
A3-51	Current lower threshold for pressure sensor fault detection	20 to 300%	1%	100%	☆
A3-52	Speed upper threshold for pressure sensor fault detection	20 to 100%	1%	50.0%	☆
A3-53	Deceleration time of second set high flow	0.000 to 5.000s	0.001s	0.100s	☆
A3-54	Threshold of second set high flow	0 to 100.0%	0.1%	100.0%	☆
A3-55	Pressure difference of stop valve pressure relief	0.0 to A3-02	0.1 V	0.0	☆
A3-56	Torque lower limit in zero torque mode	0.0 to 250.0	0.1	0.0	☆
A3-57	Upper threshold of pressure sensor fault	A3-58 to 11.000 V	0.001 V	10.000 V	☆
A3-58	Lower threshold of pressure sensor fault	0.000 V to A3-57	0.001 V	0 V	☆
A3-59	Judging time of voltage exceeding limit of pressure sensor	0.000s to 60.000s	0.001s	0s	☆
A3-60	Output signal selection of pressure sensor	0: 0 to 10 V/4 to 20 mA (need check the jumper) 1: 1 to 5 V 2: 1 to 6 V 3: 1 to 10 V 4: 0.25 to 10.25 V	1	0	☆
Group A4: Hydraulic Advanced					
A4-00	Current filter	0.000s to 5.000s	0.001s	0.005s	☆
A4-01	Speed filter	0.000s to 5.000s	0.001s	0.010s	☆
A4-02	Pressure command deceleration time 1	0.001s to 2.000s	0.001s	0.020s	☆
A4-03	Flow command acceleration time 1	0 to 5.000s	0.001s	0.100	☆
A4-04	Flow command deceleration time 1	0 to 5.000s	0.001s	0.100	☆
A4-06	Flow leakage compensation	0.0% to 50.0%	0.1%	0.0%	☆

Para. No.	Para. Name	Setting Range	Unit	Default	Property
A4-08	Reverse decompression min. pressure	0.0 kg/cm^2 to A3-02	0.1 kg/cm^2	0.0 kg/cm^2	☆
A4-09	Reverse decompression protection time	0.0s to 500.0s	0.1s	0.000s	☆
A4-10	Pressure command s-curve acceleration filter time 2	0.001s to 1.000s	0.001s	0.030s	☆
A4-11	Pressure command s-curve deceleration filter time 2	0.001s to 1.000s	0.001s	0.030s	☆
A4-12	Flow command acceleration time 2	0.001 to 5.000s	0.001s	0.100	☆
A4-13	Flow command deceleration time 2	0.001 to 5.000s	0.001s	0.100	☆
A4-14	Pressure command acceleration time 2	0.001 to 2.000s	0.001s	0.020s	☆
A4-15	Pressure command deceleration time 2	0.001 to 2.000s	0.001s	0.020s	☆
A4-16	Overshoot suppression detection factor 2	1 to 2000	1	200	☆
A4-17	Overshoot suppression factor 2	0.001 to 3.000s	0.001s	0.200s	☆
A4-18	Pressure command delay time 2	0.000s to 0.500s	0.001s	0.000s	☆
A4-22	Pressure error threshold for pressure suppression Disabling	0 to A3-02	0.1 kg	10.0 kg	☆
A4-23	Pressure error threshold for integral limitation	0 to A3-02	0.1 kg	45.0 kg	☆
A4-24	Integral limitation mode selection	0 to 1	1	0	☆
A4-25	Increase of pressure loop max. Output	0 to 50.0	0.1s	2. 0	☆
A4-26	Pressure control PID switching mode selection	0: original algorithm 1: algorithm 1 2: algorithm 2 3: algorithm 3	1	3	★
A4-33	Integral factor 1 of algorithm 3	0 to 1.00	0.01	0.08	☆
A4-34	Integral factor 2 of algorithm 3	0 to 1.00	0.01	0.08	☆
A4-35	Integral factor 3 of algorithm 3	0 to 1.00	0.01	0.08	☆
A4-36	Integral factor 4 of algorithm 3	0 to 1.00	0.01	0.08	☆
Group F0: Basic Control					
F0-00	G/p selection	1: g 2: p	1	1	●
F0-01	Control mode	0: SVC 1: Closed loop vector control 2: V/F	1	1	★

Para. No.	Para. Name	Setting Range	Unit	Default	Property
F0-02	Command source selection	0: keypad 1: terminals 2: communication	1	0	☆
F0-03	Main frequency source x selection	0: Digital setting (non-retentive at power down) 1: Digital setting (retentive at power down) 2: AI1 3: AI2 4: AI3 5 to 8: reserved 9: communication	1	0	★
F0-08	Preset frequency	0.00 to F0-10	0.01 Hz	50.00 Hz	☆
F0-09	Running direction	0: same 1: reverse	1	0	★
F0-10	Max. frequency	50.00 to 300.00 Hz	0.01 Hz	200.00 Hz	★
F0-11	Frequency upper limit source	0: F0-12 1: AI1 2: AI2 3: AI3 4: reserve 5: communication	1	0	★
F0-12	Frequency upper limit	F0-14 to F0-10	Hz	200.00	☆
F0-13	Frequency upper limit offset	0.00 to F0-10	Hz	0.00	☆
F0-14	Frequency lower limit	0.00 to F0-12	Hz	0.00	☆
F0-15	Carrier frequency	1 to 8.0	kHz	Model dependent	☆
F0-16	Carrier frequency auto adjusting selection	0: Disable 1: enable	1	1	☆
F0-17	Acceleration time 1	0.0s to 6500.0s	0.1s	20.0s	☆
F0-18	Deceleration time 1	0.0s to 6500.0s	0.1s	20.0s	☆
Group F1: Motor Parameters					
F1-00	Motor type selection	0: induction motor 1: frequency variable induction motor 2: PMSM	1	2	★
F1-01	Rated power	0.4 to 1000.0 kW	0.1 kW	Model dependent	★
F1-02	Rated voltage	0 to 480 V	1 V	Model dependent	★
F1-03	Rated current	0.0 to 6500.0 A	0.1 A	Model dependent	★
F1-04	Rated frequency	0.00 Hz to F0-10	0.01 Hz	Model dependent	★
F1-05	Rated rotating speed	0 to 30000 rpm	1 rmp	Model dependent	★

Para. No.	Para. Name	Setting Range	Unit	Default	Property
F1-11	D-axis inductance	0 to 65.535 mH	0.001 mh	Model dependent	★
F1-12	Q-axis inductance	0 to 65.535 mG	0.001 mh	Model dependent	★
F1-13	Stator resistance	0 to 65.535	0.001 Ω	Model dependent	★
F1-14	Motor manufacturer selection	0: none 1: manual motor angle input (A1-02) 2: reserved 3: Inovance motor 4: PHASE motor 5: HAI TIAN motor	1	0	☆
F1-15	Back-EMF	0 to 65535 V	1 V	Model dependent	★
F1-16	Motor auto-tuning method selection	0: no auto-tuning 1: no-load static 2: no-load dynamic, reverse running fast 3: with-load static 4: with-load dynamic, reverse running fast 5: no-load dynamic, forward running fast 6: no-load dynamic and short time, forward running fast	1	0	★
Group F2: Vector Control					
F2-00	Speed loop proportional gain kp1	1 to 400	1	60	☆
F2-01	Speed loop integral gain ki1	0.01s to 10.00s	0.01s	0.3s	☆
F2-02	Switching frequency 1 for speed loop gains	0.00 Hz to F2-05	0.01 Hz	5.00 Hz	☆
F2-03	Speed loop proportional gain kp2	1 to 400	1	60	☆
F2-04	Speed loop integral gain ki1	0.01s to 10.00s	0.01s	0.3s	☆
F2-05	Switching frequency 2 for speed loop gains	F2-02 to F0-10	0.01 Hz	10.00 Hz	☆
F2-07	Speed loop filter time	0.5 to 10.0 ms	0.1 ms	1.0 ms	☆
F2-08	Torque upper limit enable	0: speed control 1: torque control	0	0	☆
F2-09	Torque upper limit source selection	0: F2-10 1: AI1 2: AI2 3: AI3 4: reserved 5: communication	0	0	☆
F2-10	Torque upper limit	0.0% to 250.0%	0.1%	200.0%	☆
F2-29	Back EMF compensation	0: disable 1: enable	1	0	★

Para. No.	Para. Name	Setting Range	Unit	Default	Property
Group F3: V/F Control					
F3-00	V/F curve setting	0: linear V/F 1: multi-point V/F 2: square V/F 3: 1.2-power V/F 4: 1.4-power V/F 6: 1.6-power V/F 8: 1.8-power V/F 9: reserved 10: V/F complete separation 11: V/F half separation	0	0	★
F3-01	Torque boost	0.0% to 30.0%	0.1%	1.0%	☆
F3-02	Cut-off frequency of torque boost	0.00 Hz to F0-10	0.01 Hz	50.00 Hz	★
F3-03	Multi-point V/F frequency 1	0.00 Hz to F3-05	0.01 Hz	0.00 Hz	★
F3-04	Multi-point V/F voltage 1	0.0% to 100.0%	0.1%	0.0%	★
F3-05	Multi-point V/F frequency 2	0.00 Hz to F3-07	0.01 Hz	0.00 Hz	★
F3-06	Multi-point V/F voltage 2	0.0% to 100.0%	0.1%	0.0%	★
F3-07	Multi-point V/F frequency 3	0.00 Hz to F1-04	0.01 Hz	0.00 Hz	★
F3-08	Multi-point V/F voltage 3	0.0% to 100.0%	0.1%	0.0%	★
F3-09	V/F slip compensation	0.0% to 200.0%	0.1%	0.0%	☆
F3-10	V/F over-excitation gain	0 to 200	1	64	☆
F3-11	V/F oscillation suppression gain	0 to 100	1	40	☆
F3-12	V/F oscillation suppression mode selection	0 to 3	1	3	★
F3-13	Voltage source for V/F separation	0 to 8	1	0	★
F3-14	Digital setting of voltage for V/F separation	0 to F1-02	0	0	★
F3-15	Voltage rise time of V/F separation	0 to 1000.0	0.1	0	☆
F3-16	Voltage decline time of V/F separation	0 to 1000.0	0.1	0	★
F3-17	Stop mode selection for V/F separation	0 to 1	1	0	★
F3-18	Current limit level	0 to 200	1	130	★
F3-19	Current limit selection	0 to 1	1	1	☆
F3-20	Current limit gain	0 to 100	1	20	☆
F3-21	Compensation factor of speed multiplying current limit level	50 to 200	1	50	★
F3-22	Voltage limit	650.0 to 800.0 V	0.1 V	780.0 V	★

Para. No.	Para. Name	Setting Range	Unit	Default	Property
F3-23	Voltage limit selection	0 to 1	1	1	★
F3-24	Frequency gain for voltage limit	0 to 100	1	30	☆
F3-25	Voltage gain for voltage limit	0 to 100	1	30	☆
F3-26	Frequency rise threshold during voltage limit	0 to 50	1	5	★
F3-27	Slip compensation time constant	0.1 to 10.0	0.1	0.5	☆
F3-28	Auto frequency boost enable	0 to 1	1	0	★
F3-29	Minimum torque current	10 to 100	1	50	★
F3-30	Maximum torque current	10 to 100	1	20	★
F3-31	Auto frequency boost kp	0 to 100	1	50	☆
F3-32	Auto frequency boost kp	0 to 100	1	50	☆
F3-33	Online torque compensation gain	80 to 150	1	100	★
Group F4: Input Terminals					
F4-00	DI1 function selection	0: no function 1: Forward run (FWD) (oil pump enable) 2: Reverse run (REV) 3: 3 wire control 4: jog forward 5: jog reverse 6 to 7: reserved 8: coast to stop 9: fault reset 10: reserved 11: external fault(normally open) 12 to 17: reserved 18 frequency source switch 19 to 32: reserved 33: external fault(normally closed) 34 to 38: reserved 39: switch from frequency source x to preset frequency 40: switch from frequency source y to preset frequency 41 to 47: reserved 48: PID selection 1 49: PID selection 2 50: can communication enable 51: slave pump enable 52: switch from pressure mode to speed mode (torque upper limit = AI1/max. voltage x A3-30) 53: slave pump address selection 1 54: slave pump address selection 2 55: switch from injection to pressure holding 56: error reset(except overcurrent) 57: switch from pressure mode to speed mode (torque upper limit = F2-10)	1	1	★
F4-01	DI2 function selection		1	48	★
F4-02	DI3 function selection		1	53	★
F4-03	DI4 function selection		1	9	★
F4-04	DI5 function selection		1	50	★
F4-05	Reserved		1	0	★
F4-06	Reserved		1	0	★
F4-07	Reserved		1	0	★
F4-15	DI filter time	1 to 10	1	4	☆

Para. No.	Para. Name	Setting Range	Unit	Default	Property
F4-18	AI1 min. Input	-11.00 to 11.00 V	0.01 V	0.02 V	☆
F4-19	AI1 min. Input frequency	-100.0% to 100.0%	0.1%	0.0%	☆
F4-20	AI1 max. Input	-11.00 to 11.00 V	0.01 V	10.00 V	☆
F4-21	AI1 max. Input frequency	-100.0% to 100.0%	0.1%	100.0%	☆
F4-22	AI1 filter time	0.000s to 10.000s	0.001s	0.01s	☆
F4-23	AI2 min. Input	-11.00 to 11.00 V	0.01 V	0.02 V	☆
F4-24	AI2 min. Inp frequency	-100.0% to 100.0%	0.1%	0.0%	☆
F4-25	AI2 max. Input	-11.00 to 11.00 V	0.01 V	10.00 V	☆
F4-26	AI2 max. Input frequency	-100.0% to 100.0%	0.1%	100.0%	☆
F4-27	AI2 filter time	0.000s to 10.000s	0.001s	0.005s	☆
F4-28	AI3 min. Input	-11.00 to 11.00 V	0.01 V	0.02 V	☆
F4-29	AI3 min. Input frequency	-100.0% to 100.0%	0.1%	0.0%	☆
F4-30	AI3 max. Input	-11.00 to 11.00 V	0.01 V	10.00 V	☆
F4-31	AI3 max. Input frequency	-100.0% to 100.0%	0.1%	100.0%	☆
F4-32	AI3 filter time	0.000s to 10.000s	0.001s	0.000s	☆
F4-43	AI1 Display value 1	-9.999 to 9.999 V	0.001 V	2.000 V	☆
F4-44	AI1 measured value 1	-9.999 to 9.999 V	0.001 V	2.000 V	☆
F4-45	AI1 Display value 2	-9.999 to 9.999 V	0.001 V	8.000 V	☆
F4-46	AI1 measured value 2	-9.999 to 9.999 V	0.001 V	8.000 V	☆
F4-47	AI2 Display value 1	-9.999 to 9.999 V	0.001 V	2.000 V	☆
F4-48	AI2 measured value 1	-9.999 to 9.999 V	0.001 V	2.000 V	☆
F4-49	AI2 Display value 2	-9.999 to 9.999 V	0.001 V	8.000 V	☆
F4-50	AI2 measured value 2	-9.999 to 9.999 V	0.001 V	8.000 V	☆
F4-51	AI3 Display value 1	-9.999 to 9.999 V	0.001 V	2.000 V	☆
F4-52	AI3 measured value 1	-9.999 to 9.999 V	0.001 V	2.000 V	☆
F4-53	AI3 Display value 2	-9.999 to 9.999 V	0.001 V	8.000 V	☆
F4-54	AI3 measured value 2	-9.999 to 9.999 V	0.001 V	8.000 V	☆
Group F5: Output Terminals					
F5-01	T/a1-t/b1-t/c1 function selection	0: no function 1: drive is running 2: fault output 3 to 5: reserved 6: motor overload warning 7: drive overload warning 8 to 11: reserved 12: time is out 13 to 14: reserved 15: drive is ready 16: abs AI1 value is bigger than abs AI2 value after correction 17 to 19: reserved 20: communication control 21 to 22: reserved	1	2	☆

Para. No.	Para. Name	Setting Range	Unit	Default	Property
F5-02	T/a2-t/c2 function selection	23: Displacement switch of dual displacements piston pump (normally open) 24: pressure control (normally close) 25: slave pump warning 26: Displacement switch of dual Displacements piston pump (normally open) 27: DC bus voltage established 28: business preset running time out 29: business preset running time less than 24 hours 30: maximum reverse speed 31: warning 32: KTY temperature reached	1	23	☆
F5-03	DO1 function selection		1	24	☆
F5-10	AO1 function selection	0: running frequency 1: frequency reference 2: output current 3: output torque 4: output power 5: output voltage 6: reserved 7: AI1 8: AI2 9: AI3 10: feedback speed 11: feedback pressure 14: by communication control 12 to 16: reserved	1	10	☆
F5-11	AO2 function selection		1	11	☆
F5-14	AO1 offset factor	-100.0% to 100.0%	0.1%	0.0%	☆
F5-15	AO1 gain	-10.00 to 10.00	0.01	1.00	☆
F5-16	AO2 offset factor	-100.0% to 100.0%	0.1%	0.0%	☆
F5-17	AO2 gain	-10.00 to 10.00	0.01	1.00	☆
F5-23	AO1 measured value 1	-9.999 to 9.999 V	0.001 V	2.000 V	☆
F5-24	AO1 calculated value 1	-9.999 to 9.999 V	0.001 V	2.000 V	☆
F5-25	AO1 measured value 2	-9.999 to 9.999 V	0.001 V	8.000 V	☆
F5-26	AO1 calculated value 2	-9.999 to 9.999 V	0.001 V	8.000 V	☆
F5-27	AO2 measured value 1	-9.999 to 9.999 V	0.001 V	2.000 V	☆
F5-28	AO2 calculated value 1	-9.999 to 9.999 V	0.001 V	2.000 V	☆
F5-29	AO2 measured value 2	-9.999 to 9.999 V	0.001 V	8.000 V	☆
F5-30	AO2 calculated value 2	-9.999 to 9.999 V	0.001 V	8.000 V	☆
Group F6: Stopping					
F6-10	Stopping mode	0: deceleration to stop 1: coast to stop	1	0	☆

Para. No.	Para. Name	Setting Range	Unit	Default	Property
Group F7: Keypad and Display					
F7-02	The function of stop/reset key on keypad	0: only the key can stop motor 1: in terminal control, the key can stop motor 2.in terminal control, the key can reset fault 3: in terminal control, the key can stop motor and reset fault	1	2	☆
F7-06	Load linear speed display factor	0.0001 to 6.5000	0.0001	1.0000	☆
F7-07	IGBT temperature	-1000°C to 1000°C	1°C		●
F7-09	Total running time	0 to 65535 h	1 h	-	●
F7-10	Firmware version 1	-	-	-	●
F7-11	Firmware version 2	-	-	-	●
F7-12	Temporary firmware version 1	-	-	-	●
F7-13	Temporary firmware version 2	-	-	-	●
Group F8: Auxiliary Functions					
F8-17	Preset running time	0 to 65000 h	1 h	0 h	☆
F8-18	Protection enable upon startup	0: Disable 1: enable	1	0	☆
F8-22	Ground fault detection enable upon power on	0: Disable 1: enable	1	1	☆
F8-23	Selection for reactions of preset running time out	0: Disable 1: enable	1	0	☆
F8-24	Undervoltage level(the voltage of input)	148.5 to 321.7 V	0.1 V	247.5 V	☆
F8-25	Braking operation duration limit	0.0s to 3600.0s	0.1s	5.0s	☆
F8-26	Braking resistor protection	0: Disable 1: enable	1	1	☆
F8-27	Output ground fault protection upon starting	0: Disable 1: enable	1	0	☆
F8-28	Output phase loss protection upon starting	0: Disable 1: enable	1	1	☆
F8-29	Braking resistor overload protection	0: Disable 1: enable	0 to 1	1	☆
Group F9: Protection and Fault					
F9-00	Motor overload protection	0: disable 1: enable	1	0	☆
F9-01	Motor overload protection factor	0.20 to 10.00	0.01	2.00	☆
F9-08	Braking level	700 to 800 V	1 V	750 V	☆
F9-12	Input phase loss detection enable	0: disable 1: enable	1	1	☆
F9-13	Output phase loss detection enable	0: Disable 1: enable	1	1	☆

Para. No.	Para. Name	Setting Range	Unit	Default	Property
F9-14	Speed error protection threshold	0.50 to 50.00 Hz	0.01 Hz	10.00 Hz	☆
F9-15	Speed error protection time	0.0s to 20.0s	0.1s	10.0s	☆
F9-16	Motor temperature protection enable	0: Disable 1: enable	1	1	☆
F9-18	The third last fault	0: no fault 1: reserved 2: overcurrent (E02) 3: overcurrent (E03) 4: overcurrent (E04) 5: overvoltage (E05) 6: overvoltage (E06) 7: overvoltage (E07) 8: reserved 9: undervoltage (E09) 10: drive overload (E10) 12: input phase loss (E12) 13: output phase loss (E13) 14: heatsink overheat (E14) 15: external fault (E15) 16: modbus fault (E16) 17: contactor fault (E17) 18: current sensing fault (E18) 19: motor tuning fault (E19) 20: reserved (E20) 21: EEPROM fault (E21) 22: reserved (E22) 23: ground fault (E23) 24 to 25: reserved 26: time is out (E26) 27: bussiness time is out (E27) 28 to 39: reserved 40: multi times overcurrent (E40) 41: reserved 42: can communication fault (E42) 43: resolver tuning fault (E43) 44: speed error protection fault (E44) 45: motor overheat (E45) 46: pump sensor fault (E46) 47: slave fault warning (E47) 48: can address conficting (E48) 49: resolver loose wiring (E49) 52: multi masters fault (E52) 58: user parameter restore fault (E58) 59: back EMF error (E59) 61: braking overtime (E61) 62: braking IGBT fault (E62) 63: reverse running time out (E63) 66: braking resistor fault (E66) 67: function code initialization fault (E67)	1	-	●
F9-19	The second last fault		1	-	●
F9-20	The last fault		1	-	●
F9-21	Frequency upon the last fault	-	-	-	●
F9-22	Current upon the last fault	-	-	-	●
F9-23	Bus voltage upon the last fault	-	-	-	●

Para. No.	Para. Name	Setting Range	Unit	Default	Property
F9-24	DI status upon the last fault	-	-	-	●
F9-25	DO status upon the last fault	-	-	-	●
F9-26	The subtype of the last fault	-	-	-	●
F9-30	Frequency upon the second last fault	-	-	-	●
F9-31	Current upon the second last fault	-	-	-	●
F9-32	Bus voltage upon the second last fault	-	-	-	●
F9-33	DI status upon the second last fault	-	-	-	●
F9-34	DO status upon the second last fault	-	-	-	●
F9-35	The subtype of the second last fault	-	-	-	●
F9-39	Frequency upon the third last fault	-	-	-	●
F9-40	Current upon the third last fault	-	-	-	●
F9-41	Bus voltage upon the third last fault	-	-	-	●
F9-42	DI status upon the third last fault	-	-	-	●
F9-43	DO status upon the third last fault	-	-	-	●
F9-44	The subtype of the third last fault	-	-	-	●
F9-48	KTY temperature reached	0 to 300.0	0.1	0	☆
F9-58	KTY temperature	-40.0 to 300.0	0.1	-	●
F9-59	KTY overheat fault threshold	-40.0 to 300.0	0.1	130.0	☆
Group FA: Business Countdown Function					
FA-00	Password of first countdown setting	0 to 65535	1	0	☆
FA-01	First countdown	0 to 65535 h	1 h	0	☆
FA-02	Password of second countdown setting	0 to 65535	1	0	☆
FA-03	Second countdown	0 to 65535 h	1 h	0	☆
FA-04	Password of third countdown setting	0 to 65535	1	0	☆
FA-05	Third countdown	0 to 65535 h	1 h	0	☆
FA-06	Password of forth countdown setting	0 to 65535	1	0	☆
FA-07	Forth countdown	0 to 65535 h	1 h	0	☆
FA-08	Business running time in total (hour)	0 to 65535 h	1 h	0	●
FA-09	Business running time in total (second)	0s to 3600s	1s	0	●

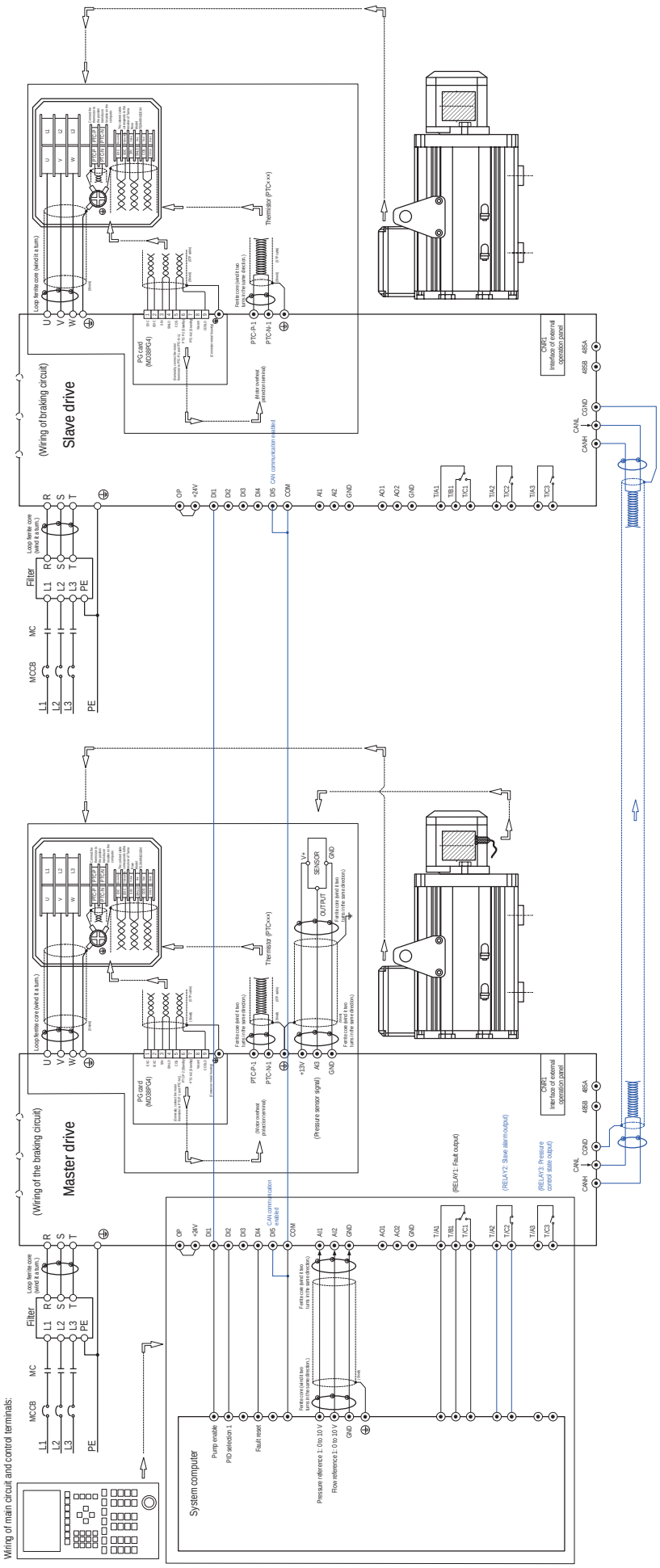
Para. No.	Para. Name	Setting Range	Unit	Default	Property
Group FB	Optimization				
FB-04	Overcurrent prevention enable	0: Disable 1: enable	1	1	★
Group FC:	Multi-point Calibration				
FC-00	Multi-point AI calibration enable	0: no calibration 1: AI1 enable 2: AI2 enable 3: AI1 and AI2 enable	0	0	★
FC-01	Minimum AI1 input	-11.00 to 11.00 V	0.01 V	0.02 V	☆
FC-02	Correspondent value of minimum AI1 input	-100.0% to 100.0%	0.1%	0.0%	☆
FC-03	AI1 point 1 input	-11.00 to 11.00 V	0.01 V	1.00 V	☆
FC-04	Correspondent value of AI1 point 1 input	-100.0% to 100.0%	0.1%	10.0%	☆
FC-05	AI1 point 2 input	-11.00 to 11.00 V	0.01 V	2.00 V	☆
FC-06	Correspondent value of AI1 point 2 input	-100.0% to 100.0%	0.1%	20.0%	☆
FC-07	AI1 point 3 input	-11.00 to 11.00 V	0.01 V	3.00 V	☆
FC-08	Correspondent value of AI1 point 3 input	-100.0% to 100.0%	0.1%	30.0%	☆
FC-09	AI1 point 4 input	-11.00 to 11.00 V	0.01 V	4.00 V	☆
FC-10	Correspondent value of AI1 point 4 input	-100.0% to 100.0%	0.1%	40.0%	☆
FC-11	AI1 point 5 input	-11.00 to 11.00 V	0.01 V	5.00 V	☆
FC-12	Correspondent value of AI1 point 5 input	-100.0% to 100.0%	0.1%	50.0%	☆
FC-13	AI1 point 6 input	-11.00 to 11.00 V	0.01 V	6.00 V	☆
FC-14	Correspondent value of AI1 point 6 input	-100.0% to 100.0%	0.1%	60.0%	☆
FC-15	AI1 point 7 input	-11.00 to 11.00 V	0.01 V	7.00 V	☆
FC-16	Correspondent value of AI1 point 7 input	-100.0% to 100.0%	0.1%	70.0%	☆
FC-17	AI1 point 8 input	-11.00 to 11.00 V	0.01 V	8.00 V	☆
FC-18	Correspondent value of AI1 point 8 input	-100.0% to 100.0%	0.1%	80.0%	☆
FC-19	AI1 point 9 input	-11.00 to 11.00 V	0.01 V	9.00 V	☆
FC-20	Correspondent value of AI1 point 9 input	-100.0% to 100.0%	0.1%	90.0%	☆
FC-21	AI1 point 10 input	-11.00 to 11.00 V	0.01 V	10.00 V	☆
FC-22	Correspondent value of AI1 point 10 input	-100.0% to 100.0%	0.1%	100.0%	☆
FC-23	AI1 point 11 input	-11.00 to 11.00 V	0.01 V	10.00 V	☆
FC-24	Correspondent value of AI1 point 11 input	-100.0% to 100.0%	0.1%	100.0%	☆
FC-25	AI1 point 12 input	-11.00 to 11.00 V	0.01 V	10.00 V	☆

Para. No.	Para. Name	Setting Range	Unit	Default	Property
FC-26	Correspondent value of AI1 point 12 input	-100.0% to 100.0%	0.1%	100.0%	☆
FC-27	AI1 point 13 input	-11.00 to 11.00 V	0.01 V	10.00 V	☆
FC-28	Correspondent value of AI1 point 13 input	-100.0% to 100.0%	0.1%	100.0%	☆
FC-29	AI1 point 14 input	-11.00 to 11.00 V	0.01 V	10.00 V	☆
FC-30	Correspondent value of AI1 point 14 input	-100.0% to 100.0%	0.1%	100.0%	☆
FC-31	AI1 point 15 input	-11.00 to 11.00 V	0.01 V	10.00 V	☆
FC-32	Correspondent value of AI1 point 15 input	-100.0% to 100.0%	0.1%	100.0%	☆
FC-33	AI1 point 16 input	-11.00 to 11.00 V	0.01 V	10.00 V	☆
FC-34	Correspondent value of AI1 point 16 input	-100.0% to 100.0%	0.1%	100.0%	☆
FC-35	AI1 point 17 input	-11.00 to 11.00 V	0.01 V	10.00 V	☆
FC-36	Correspondent value of AI1 point 17 input	-100.0% to 100.0%	0.1%	100.0%	☆
FC-37	Maximum AI1 input	-11.00 to 11.00 V	0.01 V	10.00 V	☆
FC-38	Correspondent value of maximum AI1 input	-100.0% to 100.0%	0.1%	100.0%	☆
FC-39	Minimum AI1 input	-11.00 to 11.00 V	0.01 V	0.02v	☆
FC-40	Correspondent value of minimum AI2 input	-100.0% to 100.0%	0.1%	0.0%	☆
FC-41	AI2 point 1 input	-11.00 to 11.00 V	0.01 V	1.00v	☆
FC-42	Correspondent value of AI2 point 1 input	-100.0% to 100.0%	0.1%	10.0%	☆
FC-43	AI2 point 2 input	-11.00 to 11.00 V	0.01 V	2.00v	☆
FC-44	Correspondent value of AI2 point 2 input	-100.0% to 100.0%	0.1%	20.0%	☆
FC-45	AI2 point 3 input	-11.00 to 11.00 V	0.01 V	3.00v	☆
FC-46	Correspondent value of AI2 point 3 input	-100.0% to 100.0%	0.1%	30.0%	☆
FC-47	AI2 point 4 input	-11.00 to 11.00 V	0.01 V	4.00v	☆
FC-48	Correspondent value of AI2 point 4 input	-100.0% to 100.0%	0.1%	40.0%	☆
FC-49	AI2 point 5 input	-11.00 to 11.00 V	0.01 V	5.00v	☆
FC-50	Correspondent value of AI2 point 5 input	-100.0% to 100.0%	0.1%	50.0%	☆
FC-51	AI2 point 6 input	-11.00 to 11.00 V	0.01 V	6.00v	☆
FC-52	Correspondent value of AI2 point 6 input	-100.0% to 100.0%	0.1%	60.0%	☆
FC-53	AI2 point 7 input	-11.00 to 11.00 V	0.01 V	7.00v	☆
FC-54	Correspondent value of AI2 point 7 input	-100.0% to 100.0%	0.1%	70.0%	☆
FC-55	AI2 point 8 input	-11.00 to 11.00 V	0.01 V	8.00v	☆

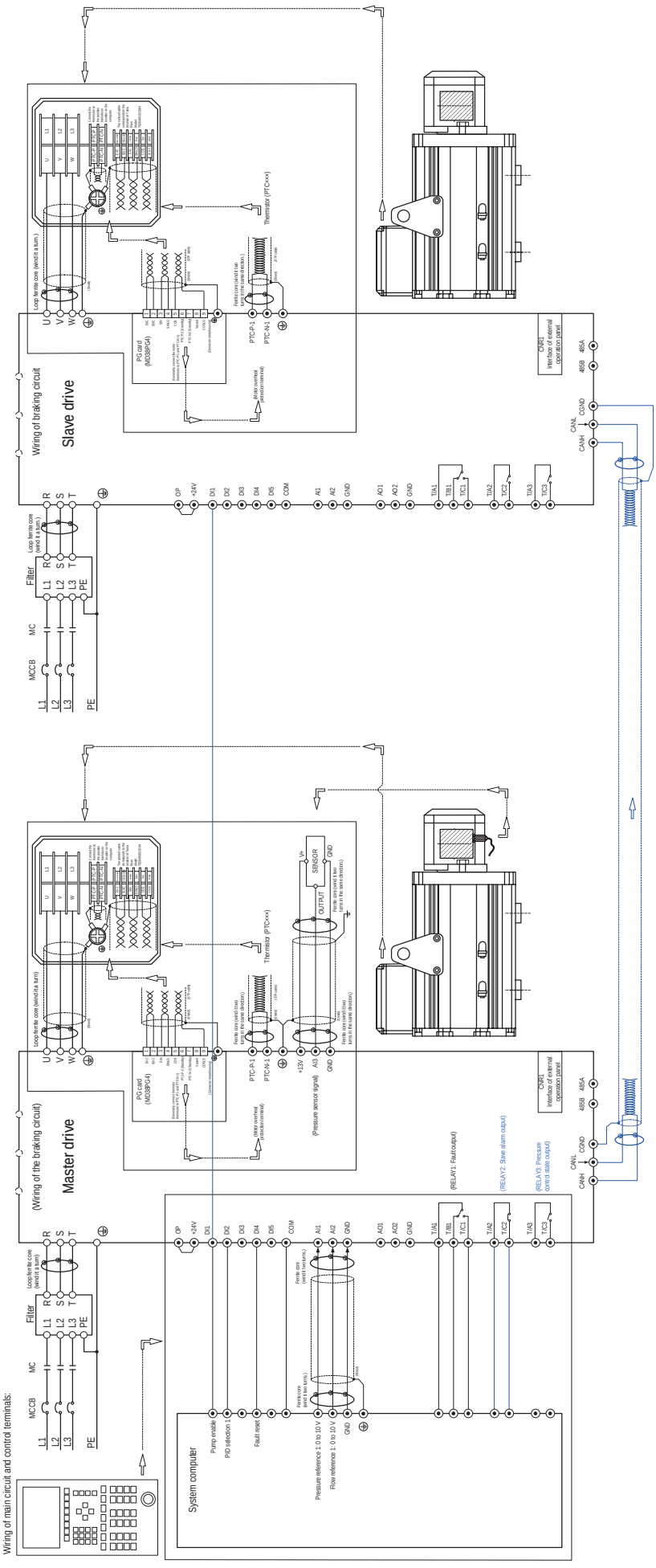
Para. No.	Para. Name	Setting Range	Unit	Default	Property
FC-56	Correspondent value of AI2 point 8 input	-100.0% to 100.0%	0.1%	80.0%	☆
FC-57	AI2 point 9 input	-11.00 to 11.00 V	0.01 V	9.00v	☆
FC-58	Correspondent value of AI2 point 9 input	-100.0% to 100.0%	0.1%	90.0%	☆
FC-59	Maximum AI2 input	-11.00 to 11.00 V	0.01 V	10.00 V	☆
FC-60	Correspondent value of maximum AI2 input	-100.0% to 100.0%	0.1%	100.0%	☆
Group FD: Bus communication and PC Software Setting					
FD-00	Baud rate	0: 300 bps 1: 600 bps 2: 1200 bps 3: 2400 bps 4: 4800 bps 5: 9600 bps 6: 19200 bps 7: 38400 bps 8: 57600 bps 9: 115200 bps	1	5	☆
FD-01	Data format symbol	0: no parity check (8-n-2) 1: even parity check 2: odd parity check 3: no parity check (8-n-1)	1	0	☆
FD-02	Local address	0 to 247	1	1	☆
FD-03	Response delay	0 to 20 ms	1 ms	2 ms	☆
FD-04	Communication timeout	0.0s to 60.0s	0.1s	0.0s	☆
FD-30	PC software communication enable	0: Disable 1: enable	1	0.0	☆
FD-31	Channel 1 selection	0 to 999	1	10	☆
FD-32	Channel 1 selection	0 to 999	1	10	☆
FD-33	Channel 1 selection	0 to 999	1	10	☆
FD-34	Channel 1 selection	0 to 999	1	10	☆
FD-35	Sampling period	0 to 65535	1	1	☆
FD-36	Object of trigger a	0 to 999	1	1	☆
FD-37	Condition of trigger a	0 to 2	1	0	☆
FD-38	Level of trigger a	0 to 65535	1	0	☆
FD-39	Object of trigger b	0 to 999	1	1	☆
FD-40	Condition of trigger b	0 to 2	1	0	☆
FD-41	Level of trigger b	0 to 65535	1	0	☆
FD-42	Switch of trigger a/b	0: a 1: b	1	0	☆
FD-43	Carrier period of data saving	0 to 65535	1	0	★
FD-44	Fault code	0 to 65535	1	0	★
FD-45	Setting value of data saving	0 to 2	1	0	☆
FD-46	Data retrieve area selection	0: ram 1: flash	1	0	☆
FD-47	Flash rewritten selection	0 to 1	1	1	☆

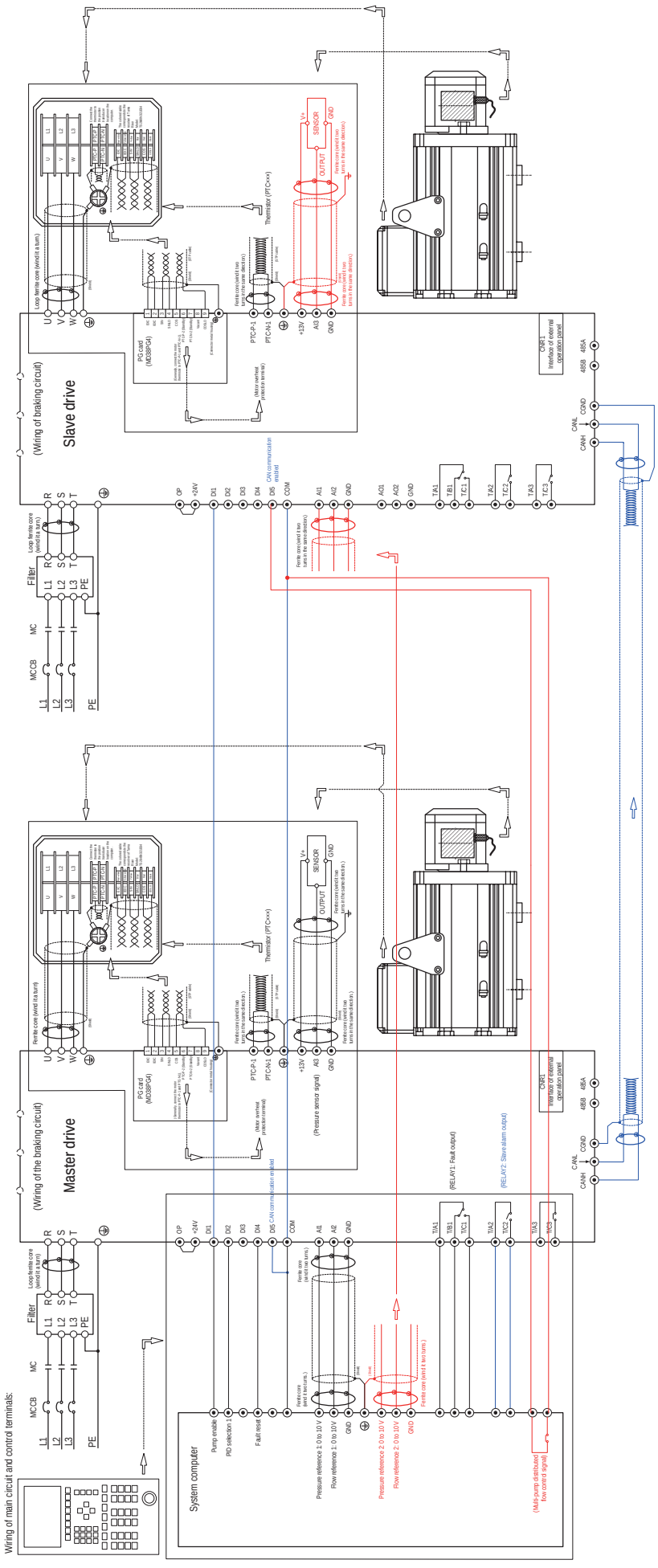
Para. No.	Para. Name	Setting Range	Unit	Default	Property
Group FE: User-defined Parameters					
FE-00	User-defined parameter 0	F0.00 to FP.xx A0.00 to A4.xx U0.00 to U1.xx	-	-	☆
FE-01	User-defined parameter 1		-	-	☆
FE-02	User-defined parameter 2		-	-	☆
FE-03	User-defined parameter 3		-	-	☆
FE-04	User-defined parameter 4		-	-	☆
FE-05	User-defined parameter 5		-	-	☆
FE-06	User-defined parameter 6		-	-	☆
FE-07	User-defined parameter 7		-	-	☆
FE-08	User-defined parameter 8		-	-	☆
FE-09	User-defined parameter 9		-	-	☆
FE-10	User-defined parameter 10		-	-	☆
FE-11	User-defined parameter 11		-	-	☆
FE-12	User-defined parameter 12		-	-	☆
FE-13	User-defined parameter 13		-	-	☆
FE-14	User-defined parameter 14		-	-	☆
FE-15	User-defined parameter 15		-	-	☆
Group FP: Password and Parameter Operation					
FP-00	User password	0 to 65535	1	0	☆
FP-01	Parameter initialization	0: no operation 1: restore factory parameters 2: clear records 3: restore back-up user parameter 4: restore factory parameters except A2-01 5: restore factory parameters except FA and FP	1	0	★
FP-02	Motor model number	0 to 65535	1	0	★
FP-04	User parameter password	0 to 65535	1	0	☆
FP-05	Back up user parameters	0: no operation 1: back up	1	0	★
FP-06	Bilingual (EN/CH) HMI specification	0 to 65535	1	0	☆

Para. No.	Para. Name	Setting Range	Unit	Default	Property
Group AF: Communication Process Data (Visible only in CANopen)					
AF-00	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-02	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-04	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-06	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-08	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-10	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-12	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-14	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-16	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-18	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-20	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-22	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-24	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-26	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-28	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-30	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-32	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-34	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-36	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-38	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-40	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-42	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-44	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-46	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-48	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-50	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-52	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-54	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-56	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-58	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-60	Communication process data	0 to 0xffffffff	1	H.0000	☆
AF-62	Communication process data	0 to 0xffffffff	1	H.0000	☆

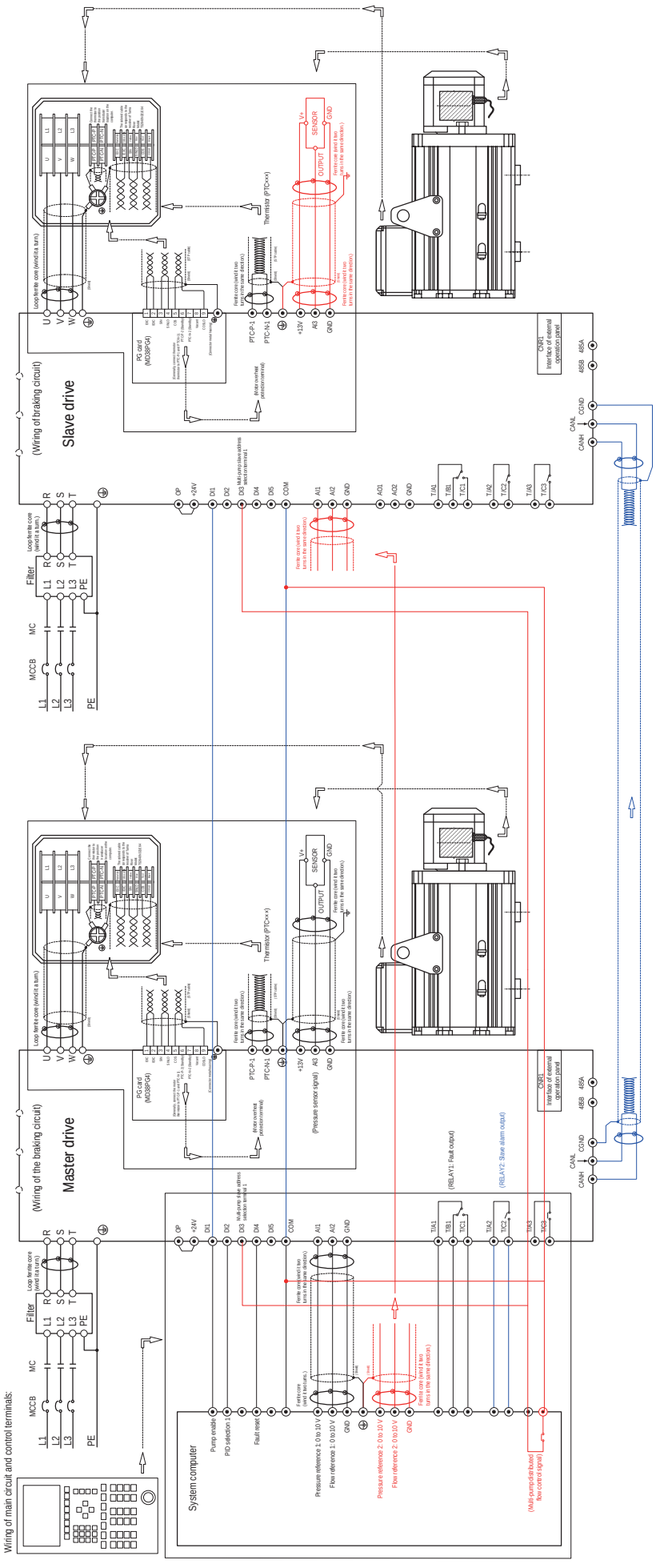


Note:
In multi-pump mode 1, only when DI terminals allocated with the 50# function for both master pump and slave pump are switched ON, multi-pump convergent flow control can be enabled.


Wiring of main circuit and control terminals:
Slave drive
Wiring of braking circuit
Master drive
(Wiring of the braking circuit)
System computer
Pump enable
PID selection 1
Fault reset
Pressure reference 1 0 to 10 V
Flow reference 1 0 to 10 V
(Pressure sensor signal)
(RELAY1: Fault output)
(RELAY2: Slave alarm output)
(RELAY3: Pressure control state output)
Thermistor (PTC×××)
Filter
MCCB
MC
PG card (MCB-PG4)
CN4C Interface for external operation panel
Note:
In multi-pump mode 2, connect the CAN bus for the multi-pump convergent flow control and set the address of the slave pump that responds to the master pump flow reference.



Note:
The distributed flow signal sent by the computer board is used to open the DI terminal set for the 50# function of the slave. Then the drive receives the pressure, flow reference 2 and pressure feedback 2 and enters the oil pressure PID control.



Note:
Connect the slave alarm output signal to the system computer for alarm display.
In this control mode, the slave drive independently receives the pressure feedback 2 from the pressure sensor mounted on the oil channel of the slave pump.
Therefore, high-pressure without cause will never occur on the oil channel of the slave pump in the pressure control.

Version Change Record

Date of Publication	Dept. of Publication	Version	Description
August 8, 2016	PMT	A00	First issue Related firmware version: F7-10 = 1.06

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