Preface

Thank you for choosing **ARTENGO ATG900 Series High Performance Heavy-duty AC Motor Drives for Asynchronous Motor**. This user manual presents a detailed description of ATG900 series with respect to product features, structural characteristics, functions, installation, parameter setting, troubleshooting, commissioning and daily maintenance, etc.

ARTINGO ELECTRONIC INVERTER CO.

IMPORTANT NOTES
● Please assure the intactness of product enclosure and all safety covers before installation. Operation must conform to the requirements of this manual and local industrial safety regulations and/or electrical codes. ● Contents of this manual may be subject to appropriate modification as a result of product upgrade, specification change and update of the manual. ● In the event of damage or loss of user manual, users may ask local distributors, offices or our Technical Service Department for a new one. ● If any item as stated in this manual is not clear, please contact our Technical Service Department. ● If any anomaly occurs after power up or during the operation, it is essential to stop the machine and identify the fault or seek technical services as soon as possible.

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Chapter 1 Safety Precautions

Safety Precautions

Safety signs in this manual:

⚠ **WARNING**: indicates the situation in which the failure to follow operating requirements may result in fire or serious personal injury or even death.

⚠ **ATTENTION:** indicates the situation in which the failure to follow operating requirements may cause moderate or slight injury and damage to equipment.

Users are requested to read this chapter carefully when installing, commissioning and repairing this product and perform the operation according to safety precautions as set forth in this chapter without violation. ARTENGO bears no responsibility for any injury and loss as a result of any violation operation.

1.1 Safety Considerations

1.1.1 Prior to Installation

⚠ **WARNING**
● Do not touch control terminals, circuit boards and any other electronic parts and components with bare hands. ● Do not use the drive whose component(s) is/are missing or damaged. Failure to comply may result in more faults and/or personal injury even death.

⚠ **ATTENTION**
● Check if the product information indicated on the nameplate is consistent with the order requirements. If not, do not install it. ● Do not install the drive in the event that the packing list does not match with real equipment.

1.1.2 Installation

⚠ **WARNING**
● Only qualified personnel familiar with drives and associated machinery should plan or implement the installation. Failure to comply may result in equipment damage and/or personnel injury even death.

- This equipment must be mounted on metal or other flame retardant objects. Failure to comply may result in fire.
- This equipment must be mounted in an area which is away from combustibles and heat sources. Failure to comply may result in fire.
- This equipment must in no case be mounted in the environment exposed to explosive gases. Failure to comply may result in explosion.
- Never adjust mounting bolts of this equipment, especially the ones with red markers. Failure to comply may result in equipment damage.

⚠ ATTENTION

- Handle the equipment gently and take hold of its sole plate so as to avoid foot injury or equipment damage.
- Mount the equipment where its weight can be withstood. Failure to comply may result in equipment damage and/or personnel injury if falling happens.
- Make sure the installation environment conforms to the requirements as stated in Section 2.4. If not, de-rating is necessary. Failure to comply may result in equipment damage.
- Prevent drilling residues, wire ends and screws from falling into the equipment during installation. Failure to comply may result in faults or equipment damage.
- When mounted in a cabinet, this equipment should be provided with appropriate heat dissipation. Failure to comply may result in faults or equipment damage.

1.1.3 Wiring

⚠ WARNING

- Only qualified personnel familiar with drives and associated machinery should plan or implement the wiring. Failure to comply may result in personnel injury and/or equipment damage.
- Wiring must strictly conform to this manual. Failure to comply may result in personnel injury and/or equipment damage.
- Make sure the input power supply has been completely disconnected before wiring. Failure to comply may result in personnel injury and/or equipment damage.
- All wiring operations must comply with EMC and safety regulations and/or electrical codes, and the conductor diameter should conform to recommendations of this manual. Failure to comply may result in personnel injury and/or equipment damage.
- Since overall leakage current of this equipment may be bigger than 3.5mA, for safety's sake, this equipment and its associated motor must be well grounded so as to avoid risk of electric shock.

- Be sure to implement wiring in strict accordance with the marks on this equipment's

terminals. Never connect three-phase power supply to output terminals U/T1, V/T2 and W/T3. Failure to comply may result in equipment damage.

- Install braking resistors at terminals ⊕ / B1, and B2 only. Failure to comply may result in equipment damage.
- Wiring screws and bolts for main circuit terminals must be screwed tightly. Failure to comply may result in equipment damage.
- AC 220V signal is prohibited from connecting to other terminals than control terminals RA, RB, RC and TA, TB, TC. Failure to comply may result in equipment damage.

⚠ ATTENTION

- Since all drives from ARTENGO have been subjected to hi-pot test before delivery, users are prohibited from implementing such a test on this equipment. Failure to comply may result in equipment damage.
- Signal wires should to the best of the possibility be away from main power lines. If this cannot be ensured, vertical cross-arrangement shall be implemented, otherwise interference noise to control signal may occur.
- If motor cables are longer than 100m, it is recommended output AC reactor be used. Failure to comply may result in faults.
- The encoder must be provided with shielded cables whose shielded layer must be well grounded.

1.1.4 Run

⚠ WARNING

- Drives which have been stored for more than 2 years should be used with voltage regulator to gradually boost the voltage when applying power to the drives. Failure to comply may result in equipment damage.
- Be sure to implement the wiring as per Section 3.5 before applying power to the drive. Failure to comply may result in equipment damage and/or electric shock hazard.
- Be sure to confirm the completion and correctness of the drive wiring and close the cover before applying power to the drive. Do not open the cover after applying power. Failure to comply may result in electric shock hazard.
- After applying the power, never touch the drive and peripheral circuits no matter what state the drive is under, otherwise there will be electric shock hazard.
- Prior to the running of the drive, check there is no person in surrounding area who can reach the motor so as to prevent personal injury.
- During the running of the drive, foreign bodies should be prevented dropping into the equipment. Failure to comply may result in faults and/or equipment damage.
- Only qualified technicians familiar with drives are allowed to perform signal test during

operation. Failure to comply may result in equipment damage and/or personal injury.

- Never change the drive parameters at will. Failure to comply may result in equipment damage.

ATTENTION

- Make sure the number of phases of power supply and rated voltage are consistent with product nameplate. If not, contact the seller or GTAKE.
- Check there are no short circuits in peripheral circuits connected with the drive, and make sure the connection is tight. Failure to comply may result in equipment damage.
- Make sure the motor and associated machinery are within allowable range of service prior to operation. Failure to comply may result in equipment damage.
- Never touch fans, heat sink and braking resistor with bare hands. Failure to comply may result in equipment damage and/or personal injury.
- It is not allowed to start & stop the driver frequently via direct switching power on or off. Failure to comply may result in equipment damage.
- Make sure the drive is in a non-output status before switch-on/switch-off of the drive output and/or contactor. Failure to comply may result in equipment damage.

1.1.5 Maintenance

WARNING

- Only qualified technicians are allowed to implement the maintenance, and troubleshooting.
- Never implement the maintenance, and troubleshooting before power supply has been turned off and discharged completely. Failure to comply may result in equipment damage and/or personal injury.
- To avoid an electric shock hazard, wait at least 10 minutes after the power has been turned off and make sure the residual voltage of the bus capacitors has discharged to 0V before performing any work on the drive.
- After the replacement of the drive, be sure to perform the same procedures in strict accordance with above-noted rules.

⚠ ATTENTION

- Do not touch the electric components with bare hands during maintenance, and troubleshooting. Failure to do this may result in component damage due to ESD.
- All pluggable components can be inserted or pulled out only when power has been turned off.

1.2 Other Considerations

1.2.1 Input Power Supply

This series of drives are not applicable to applications out the range of operating voltage as set forth in this manual. If necessary, please use booster to rise or drop the voltage to regulated voltage range.

This series of drives support common DC bus input. Users are suggested to consult ARTENGO technical personnel before use.

1.2.2 Surge Protection

This series of drives are furnished with surge suppressor that has certain resistance to lightning induction. However, users in areas with frequent occurrence of lightning need to mount an external surge suppressor in front of the drive power input side.

1.2.3 Operation of Contactor

As to the configuration of peripheral devices recommended by this manual, it is necessary to mount a contactor between the power supply and this drive input side. Such a contactor should not be used as a control device for start and stop of the drive, as frequent charging & discharging shall reduce the service life of internal electrolytic capacitors.

When it is necessary to mount a contactor between the drive output and the motor, it should be ensured the drive is in a non-output status before switch-on/switch-off of such a contactor. Failure to comply may result in drive damage.

1.2.4 Output Filter

Since the drive output is PWM high frequency chopping voltage, mounting filter devices such as an output filter and an output AC reactor between the motor and the drive shall effectively reduce output noise, avoiding interference to other surrounding equipments.

If the length of cable between the drive and the motor exceeds 100m, an output AC reactor is

recommended to use with the purpose of preventing drive fault as a result of overcurrent caused by excessive distributed capacitance. An output filter is optional depending on field requirements.

Be sure not to mount phase-shifting capacitor or surge absorber at output side of the drive since this may result in drive damage as a result of over-temperature.

1.2.5 Motor Heating & Noise

If the motor does not match the rated capacity of the drive, especially when the rated power of the drive is greater than that of the motor, make sure to adjust the related parameter values of the motor in the drive or install a thermal relay in front of the motor to protect the motor. As the output voltage of the drive is PWM wave, which contains harmonics, so the motor's temperature rise, noise, and vibration will increase slightly compared with the operation in grid frequency.

1.2.6 Insulation of the Motor

In view of the fact that the drive output is PWM high frequency chopping voltage accompanied by higher harmonics, the noise, temperature rise and vibration of the motor is higher compared with sinusoidal voltage. Particularly this debases motor insulation. Therefore, the motor should be subjected to insulation inspection before initial use or reuse after being stored for a long period of time. The motor in regular service should also be subjected to regular insulation inspection so as to avoid the drive damage as a result of motor insulation damage. A 500V voltage mode mega-ohmmeter is recommended to use for the measurement of the motor insulation, during which, it is essential to disconnect the motor from the drive. Normally, the insulation resistance of the motor should be bigger than 5MΩ.

1.2.7 Derating

Due to the thin air in high-altitude areas, the radiating performance of the drive with forced air cooling may degrade while the electrolyte of electrolytic capacitors is more volatile, which can result in reduction in product life. Drive should be derated when used in an area at the altitude above 1000 meters. It is recommended to derate 1% for every 100m when the altitude is above 1000 meters.

1.2.8 Mechanical Vibration

This drive provides an output frequency ranging from 0Hz to 600Hz. If more than 50Hz is needed at site, the mechanical load-bearing capacity of the equipment must be taken into consideration. At some output frequencies, the drive may encounter mechanical resonance points of the load equipment, which can be avoided by setting the parameter of skip frequency.

1.2.9 Precautions for the disposal of drives

Electrolytic capacitors on the main circuit and PCB may explode when they are burnt. Toxic gases may be produced when plastic parts are burned. Please dispose of them as industrial waste.

Chapter 2 Product Information

2.1 Model Explanation

Model shown on product nameplate indicates the series name, applicable type of power supply, power class and the version of software and hardware, etc. via the combination of numbers, symbols and letters.

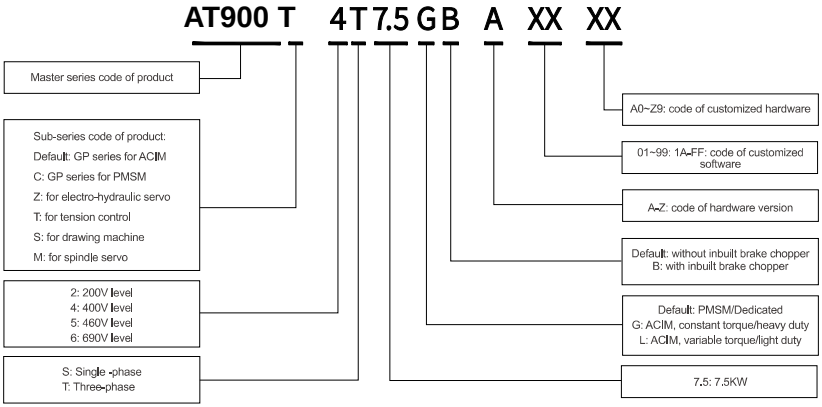


Fig. 2-1 Product model explanation

ATTENTION:

When the sub-series of AT900 model is default, the load type is divided into G and L. When there is a product sub-series, the load type is default.

2.2 Nameplate Information

Fig. 2-2 Nameplate information

2.3 Information of Product Model

Table 2-1 Product model and technical data

■ AT900-4T□□□L(B), three-phase 400V level (light-duty)

Model	Power Rating (kW)	Rated Output Current (A)	Rated Input current (A)	Applicable motor (kW)	Brake chopper	DC reactor	Frame No.
AT900-4T0.75LB	0.75	2.5	3.5	0.75	Inbuilt	/	S01
AT900-4T1.5LB	1.5	3.8	5.0	1.5			
AT900-4T2.2LB	2.2	5.5	6.0	2.2			
AT900-4T3.7LB	3.7	9.0	10.5	3.7			
AT900-4T5.5LB	5.5	13	14.6	5.5			
AT900-4T7.5LB	7.5	18	20.5	7.5			S02
AT900-4T11LB	11	24	29	11			
AT900-4T15LB	15	32	35	15			
AT900-4T18.5LB	18.5	37	44	18.5			S03
AT900-4T22LB	22	45	50	22			
AT900-4T30LB	30	60	65	30			
AT900-4T37L(B)*	37	75	80	37	Inbuilt optional		S04
AT900-4T45L(B)*	45	91	83	45			
AT900-4T55L(B)*	55	112	102	55		Inbuilt	S05
AT900-4T75L(B)*	75	150	143	75			
AT900-4T90L(B)*	90	176	160	90			S06
AT900-4T110L	110	210	192	110	Externally mounted		
AT900-4T132L	132	253	232	132			
AT900-4T160L	160	304	285	160			S07
AT900-4T185L	185	341	318	185			
AT900-4T200L	200	380	354	200			S08
AT900-4T220L	220	430	403	220			
AT900-4T250L	250	470	441	250			
AT900-4T280L	280	520	489	280			S09
AT900-4T315L	315	590	571	315			

AT900-4T355L	355	650	624	355			S10
AT900-4T400L	400	725	699	400			
AT900-4T450L	450	800	770	450			
AT900-4T500L	500	860	828	500			

* means brake chopper is optionally inbuilt for models from 37 to 90kW. Take 37kW as an example, the model without brake chopper is AT900-4T37L, while with brake chopper is AT900-4T37LB. Braking resistor needs to be mounted externally with reference to 3.5.3.

2.4 Technical Features of AT900

Table 2-2 Technical features of AT900

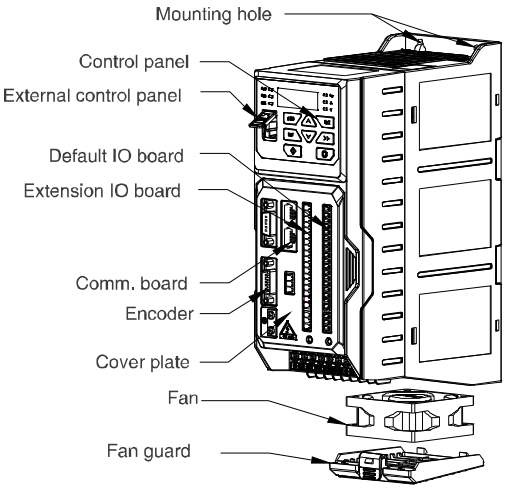
Power input	Rated input voltage	400V level: three phase 380V~480V
	Frequency	50Hz/60Hz, tolerance ±5%
	Voltage range	Continuous voltage fluctuation ±10%, short fluctuation -15%~+10%, i.e. 400V: 323V~484V;
		Voltage out-of-balance rate <3%, distortion rate as per the requirements of IEC61800-2
	Allowable frequency fluctuation	±5%
	Rated input current	See Section 2.3
Power output	Applicable motor (kW)	See Section 2.3
	Rated current (A)	See Section 2.3
	Output voltage (V)	3-phase: 0~ rated input voltage, error < ±3%
	Output frequency (Hz)	0.00~ 600.00Hz; unit: 0.01Hz
	Overload capacity	120% - 1min 130% - 30s 150% - 1s
Control characteristics	V/f patterns	V/f control Sensor-less vector control 1 Sensor-less vector control 2
	Range of speed regulation	1:100 (V/f control, sensor-less vector control 1) 1:200 (sensor-less vector control 2)
	Speed accuracy	±0.5% (V/f control) ±0.2% (sensor-less vector control 1 & 2)

	Speed fluctuation	±0.3% (sensor-less vector control 1 & 2)
	Torque response	< 10ms (sensor-less vector control 1 & 2)
	Torque control accuracy	±7.5% (sensor-less vector control 2)
	Starting torque	0.5Hz:180% (V/f control, sensor-less vector control 1) 0.25Hz: 180% (sensor-less vector control 2)
Basic functions	Start frequency	0.00~ 600.00Hz
	Accel/ Decel time	0.00~60000s
	Switching frequency	0.8kHz~16kHz
	Frequency setting	Digital setting + control panel ∧/∨ Digital setting + terminal UP/DOWN Communication Analog setting (AI1/AI2/AI3/AI4) Terminal pulse setting
	Motor start-up methods	Started from start frequency DC injection braking start Flying start
	Motor stop methods	Ramp to stop Coast to stop Ramp to stop + DC injection brake
	Dynamic braking capacity	Brake choppers for AT900-4T90 and below are inbuilt or can be inbuilt. See table 2-1
		Brake chopper working voltage: 400V class: 650V~750V
		Service time: 0.0~100.0s
	DC brake capacity	DC injection braking start frequency: 0.00~600.00Hz DC injection braking current: 0.0~100.0% DC injection braking time: 0.00~30.00s
	Input terminals	5 digital inputs, one of which can be used for high-speed pulse input. Compatible with active open collectors NPN, PNP and dry contact input. 2 analog inputs, voltage/current programmable.
	Output terminals	2 digital outputs, one of which can be used for high-speed pulse output terminal, 0~50kHz square signal;

		can output set frequency, output frequency and so forth One relay output terminal
		1 analog output terminals, voltage/current programmable; can output set frequency, output frequency and so forth
	Encoder signal terminals	Supports different types of encoder signal inputs such as open collector, push-pull, differential, rotary, Sine-Cos, and absolute etc.
Extension functions	Input terminals	Expandable with five digital input terminals, two analog input terminals, two sets of STO input terminals, and one leakage current collection terminal
	Output terminals	Expandable with three digital output terminals, one analog output terminal, and one set of relay output terminals
Featured functions	Parameter copy, parameter backup, common DC bus, free switchover between two motors' parameters, flexible parameter displayed & hidden, various master & auxiliary frequency reference and switchover, reliable speed search started, a variety of Accel/Decel curves programmable, automatic correction of analog, 16-step speed control programmable (2-step support flexible frequency reference), count function, three faults recorded, over excitation brake, over voltage stall protection programmable, under voltage stall protection programmable, restart upon power loss, skip frequency, frequency binding, four kinds of Accel/Decel time, motor thermal protection, flexible fan control, process PID control, simple PLC, multi-functional key programmable, droop control, asynchronous and synchronous motor tune, field-weakening control, high-precision torque control, V/f separated control, torque control at sensor-less vector control.	
Protection functions	Refer to Chapter 6- Troubleshooting	
Environment	Place of operation	Indoors, no direct sunlight, free from dust, corrosive gases, flammable gases, oil mist, water vapor, water drop and salt, etc.
	Altitude	0~2000m. De-rate 1% for every 100m when the altitude is above 1000 meters
	Ambient temperature	-10℃~40℃. The rated output current should be derated 1.5% for every 1℃ when the ambient temperature is 40℃~50℃
	Relative humidity	5%~95%, no condensation

	Vibration	Less than 5.9m/s2 (0.6g)
	Storage temperature	-40℃~+70℃
Others	Efficiency at rated Amps	7.5kW and below: ≥93% 11~ 45kW: ≥ 95% 55kW and above: ≥98%
	Installation	560kW and 630kW are cabinet type, the others are wall-mounted
	Installation	Book-type wall-mounted
	IP grade	IP20/IP00
	Cooling method	Forced air cooling

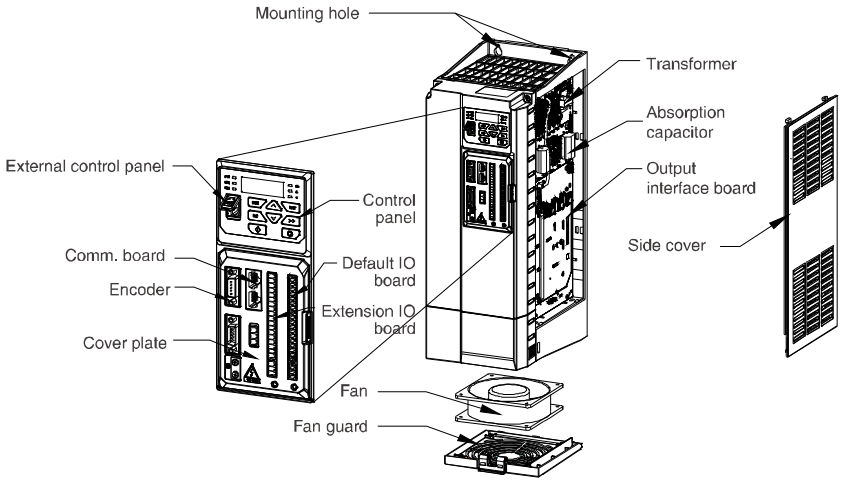
2.5 Parts Drawing



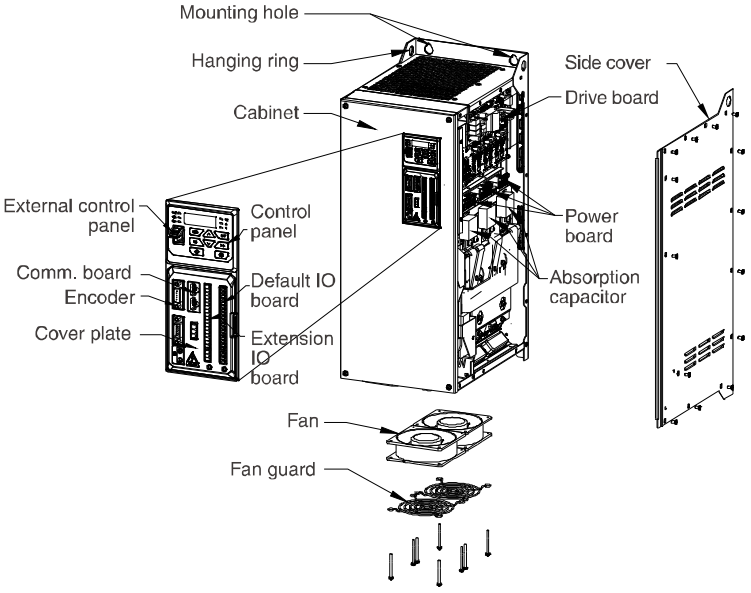
a) AT900-4T15LB and below

ATTENTION:

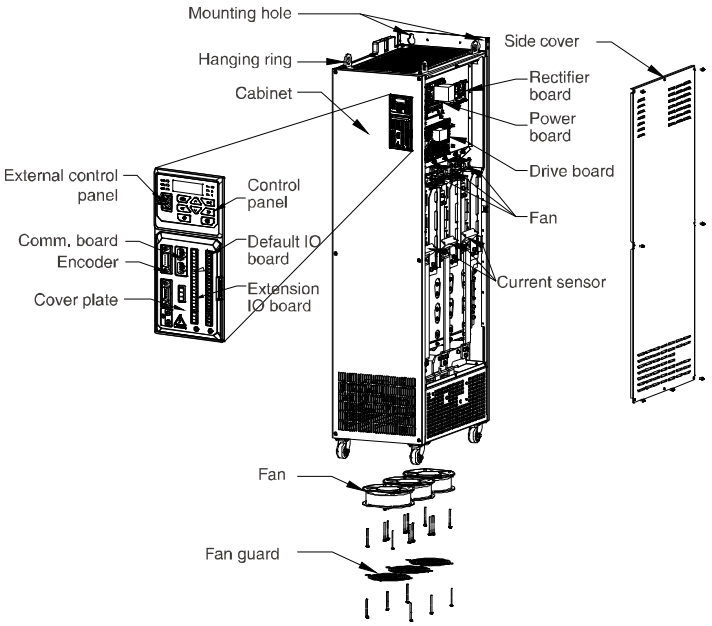
When the AT900 series drive is connected to the external control panel, open the flip cover of the network interface, and then connect the external control panel to the network interface with dual-port network cable.



b) AT900-4T18.5LB~ AT900-4T45L(B)



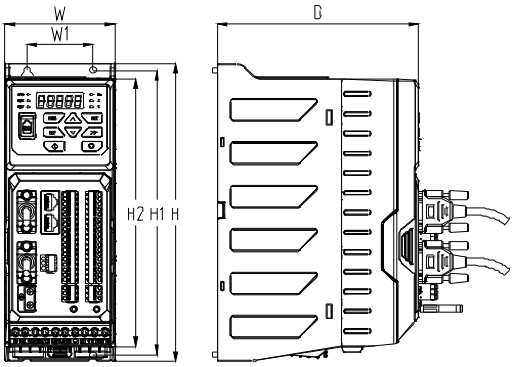
c) AT900-4T55L(B) ~ AT900-4T250L



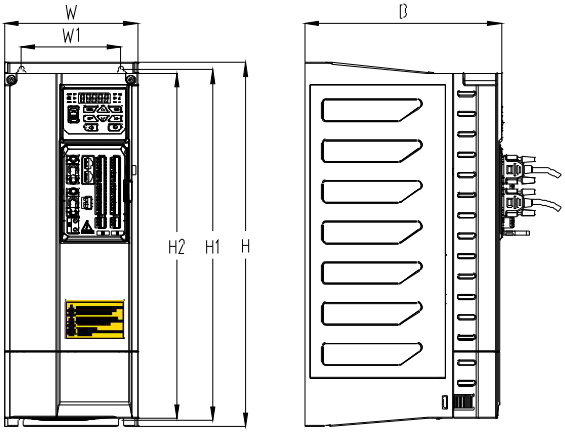
d) AT900-4T280L and above

Fig.2-3 Parts drawing

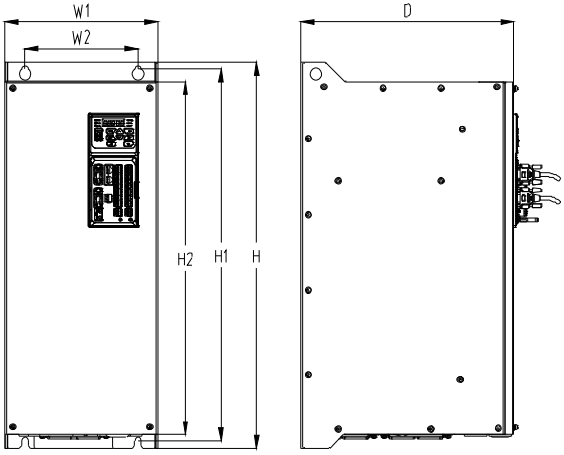
2.6 Appearance, Mounting Dimensions and Weight



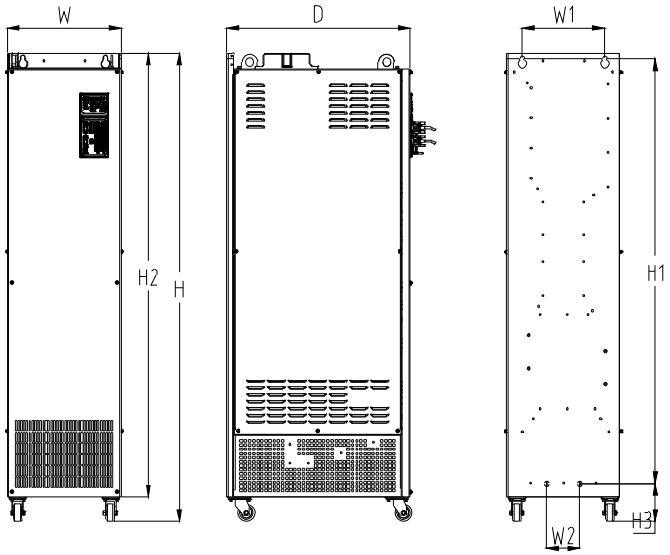
a) AT900-4T15LB and below



b) AT900-4T18.5LB~AT900-4T45L(B)



c) AT900-4T45L(B) ~AT900-4T250L



d) AT900-4T280L and above

Fig.2-4 External dimensions

Table 2-3 Appearance, mounting dimensions and weight

Model	Frame No.	External and installation dimensions (mm)									Weight (kg)
		W	H	D	W1	W2	H1	H2	H3	d	
AT900-4T0.75LB	S01	84	226	153	50	/	216	204	/	4.5	1.6
AT900-4T1.5LB											1.6
AT900-4T2.2LB											1.6
AT900-4T3.7LB											1.6
AT900-4T5.5LB											1.6
AT900-4T7.5LB	S02	93	285	183	55	/	272	/	/	5.5	2.9
AT900-4T11LB											2.9
AT900-4T15LB											2.9
AT900-4T18.5LB	S03	135	365	217	111	/	350	/	/	5.5	8.0
AT900-4T22LB											8.0
AT900-4T30L(B)											8.0
AT900-4T37L(B)	S04	158	430	233	118	/	415	/	/	6.5	11.1

AT900-4T45L(B)											11.1
AT900-4T55L(B)	S05	230	545	300	175	/	525	490	/	10	31.0
AT900-4T75L(B)											31.0
AT900-4T90L	S06	250	635	350	185	/	612	580	/	11	45.0
AT900-4T110L											45.0
AT900-4T132L											45.0
AT900-4T160L	S07	300	738	399	230	/	715	682	/	11	67.0
AT900-4T185L											67.0
AT900-4T200L	S08	300	895	460	230	/	872	840	/	11	103.5
AT900-4T220L											103.5
AT900-4T250L											103.5
AT900-4T280L	S09	330	1245	533	240	96	1122	1175	109	13	142.0
AT900-4T315L											142.0
AT900-4T355L	S10	330	1365	533	240	96	1242	1295	109	13	181.0
AT900-4T400L											181.0
AT900-4T450L											181.0
AT900-4T500L											181.0

2.7 External Dimensions of Control Panel

The LED control panel model of AT900 series is KBU-BX1 whose appearance and external dimensions are shown in Fig. 2-5.

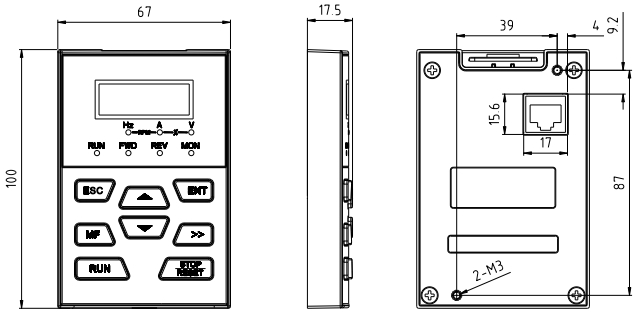
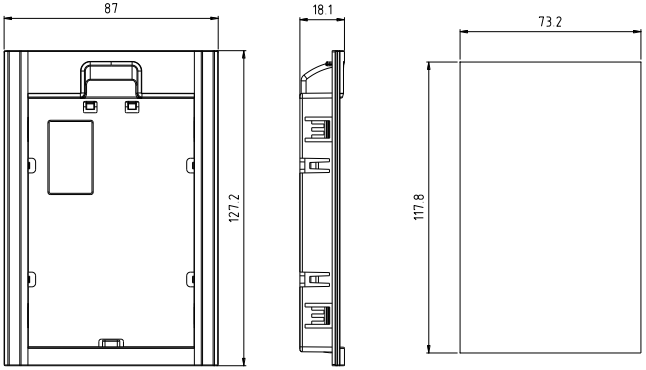


Fig. 2-5 External dimensions of KBU-BX1

2.8 External Dimensions of Control Panel Bracket

A bracket should be provided to support the electric panel and a hole in the cabinet needs to be opened when the control panel KBU-BX1 needs to be remotely used. Bracket model is KBU-DZ1 whose external dimensions are shown in Fig. 2-6 a). Fig. 2-6 b) shows applicable hole dimensions in the cabinet.



a) External dimensions of KBU-DZ1 b) Hole dimensions in the cabinet

Fig. 2-6 External dimensions of KBU-DZ1 and cabinet hole dimensions

Chapter 3 Installation and Wiring

3.1 Installation Environment

1) Ambient temperature is in the range of -10℃ to 50℃.
2) Drive should be installed on surface of flame retardant object, with adequate surrounding space for heat dissipation.
3) Installation should be performed where vibration is less than 5.9m/s^2 (0.6g).
4) Avoid installation in places exposed to direct sunlight, moisture, condensation, or water droplets.
5) Avoid installation in areas with oil contamination, heavy metal dust, excessive dust, or high salt content.
6) Do not expose to an atmosphere with flammable gases, corrosive gases, explosive gases or other harmful gases. Prevent drilling residues, wire ends and screws falling into drive.
7) Ventilation part of the drive should be installed outside from harsh environment (e.g. textile facilities with fiber particles and chemical facilities filled with corrosive gases).

3.2 Minimum Mounting Clearances

3.2.1 Single drive mounting

When mounting the AT900 series drive, adequate surrounding space shall be reserved according to its power rating. Meanwhile, to ensure favorable heat dissipation, the drive shall be mounted upright but not upside down.

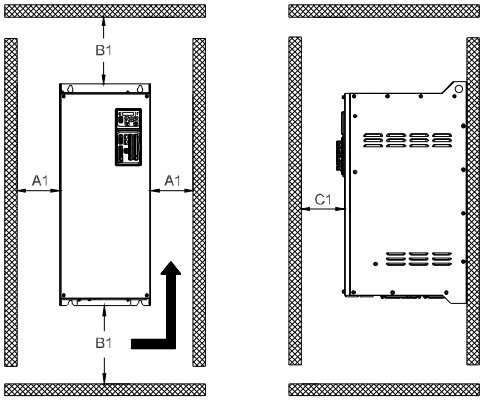


Fig. 3-1 Single drive mounting clearances (AT900-4T0.75LB to AT900-4T250L)

ATTENTION:

When a AT900-4T250LB or below needs to be mounted in parallel in a cabinet, it is required to ensure the mounting clearance in the table below. When multiple drives are mounted in the same cabinet, parallel side-by-side mounting is recommended. For details, please refer to Section 3.2.2.

Table 3-1 Single drive mounting clearances

(AT900-4T0.75LB~AT900-4T250L)

Power rating	Mounting clearances (mm)		
	A1	B1	C1
AT900-4T0.75LB~AT900-4T5.5LB	≥2	≥100	≥50
AT900-4T7.5LB~AT900-4T15LB	≥20	≥100	≥50
AT900-4T18.5LB~AT900-4T30LB	≥20	≥150	≥50
AT900-4T37L(B)~AT900-4T45L(B)	≥50	≥250	≥50
AT900-4T55L(B)~AT900-4T250L	≥80	≥400	≥50

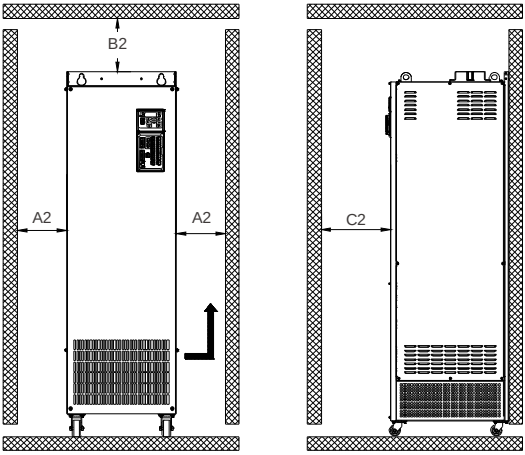


Fig. 3-2 Mounting clearances for AT900-4T250G to AT900-4T450G

Table 3-2 Single drive mounting clearances

AT900-4T280L~AT900-4T500L

AC drive power rating	Mounting clearances (mm)		
	A2	B2	C2
AT900-4T280L~AT900-4T500L	≥20	≥300	≥50

3.2.2 Mounting multiple drives

The heat of AT900 drives is emitted from the bottom to the top. When multiple drives operate, it is recommended to mount the drives side-by-side. Besides, align the upper parts of the drives, especially when those drives are of different sizes, and ensure there is enough space left around to facilitate heat dissipation, as shown in Figure 3-3.

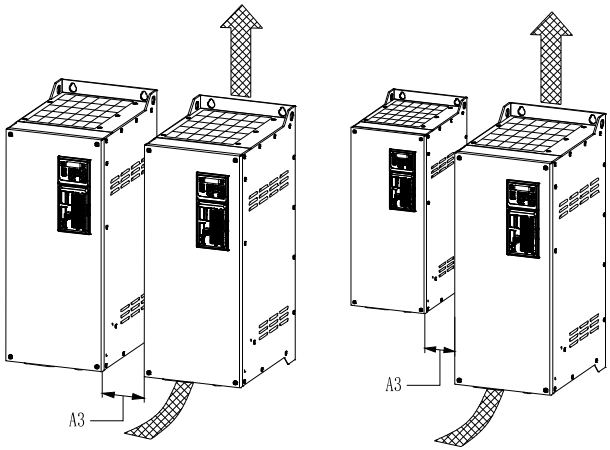


Fig. 3-3 Minimum mounting clearances of **AT900-4T0.75LB~AT900-4T500L**

Table 3-3 Minimum mounting clearances of multiple drives in parallel (AT900-4T0.75LB~AT900-4T500L)

Power ratings	*Mounting clearances* A3 (mm)
AT900-4T0.75LB~AT900-4T5.5LB	≥*2*
AT900-4T7.5LB~AT900-4T30LB	≥*20*
AT900-4T37L(B)~AT900-4T45L(B)	≥*50*
AT900-4T55L(B)~AT900-4T500L	≥*50*

3.2.3 Vertical mounting

When the drives are mounted vertically as shown in Fig. 3-4, measures such as installing a heat insulation deflector is a must in case the heat emitted from the lower drive causes the temperature of the upper drive to rise, and results in faults such as over temperature or overload.

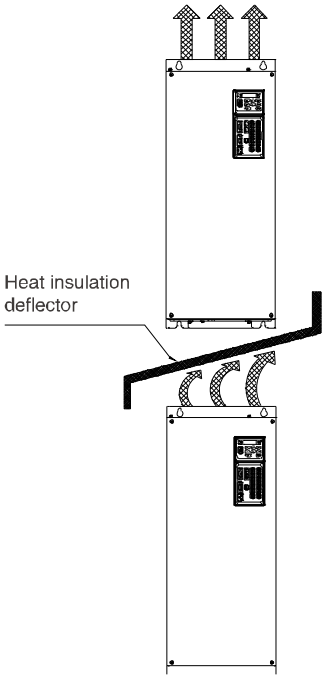


Fig. 3-4 Requirements of mounting drives vertically

ATTENTION:

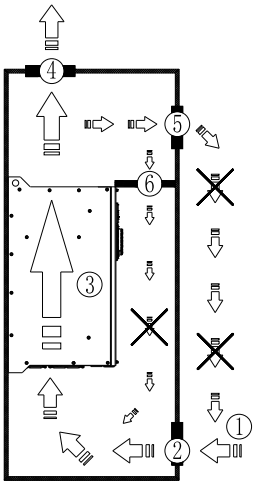
Models from AT900-4T280L to AT900-4T500L can be mounted in a single cabinet or in parallel side-by-side, but cannot be mounted vertically.

3.2.4 Attentions for mounting inside the cabinet

When the AT900 drive is mounted inside the cabinet, the heat is emitted from the bottom to the top. In order to avoid the circulation of hot air inside the cabinet, the following measures can be taken:

1. The grill can be used to guide the air flow at the air inlet and outlet;
2. The cold air inlet can be located at the lower part of the front cabinet. Mount additional exhaust fans on the top of the cabinet.
3. To prevent hot air from circulating inside the cabinet, install a heat insulation air deflector inside the cabinet.

The proper air duct is shown in the figure below.



① Main air inlet ② Air inlet filter ③ drive ④ Main air outlet
⑤ Front air outlet ⑥ Heat insulation air deflector

Fig. 3-5 Requirements for mounting inside the cabinet

Meanwhile, to ensure the working temperature rise of the drive mounted in the cabinet is within the allowable range, the air volume V required by the cabinet should meet the following requirements:

$V= (P_{LOSS}/T_{RISE})$ x1.82

Among which:

V--air volume required by the drive to maintain the allowable temperature rise, unit: CFM;

P_{LOSS} -- heat loss power of the drive, unit: W; refer to Table 3-4;

T_{RISE} -- allowable temperature rise of the drive inside the cabinet. For example, inside the cabinet are a 45kW and a 90kW drive separately. The ambient temperature is 35°C, and the maximum allowable operating temperature of the drive is 50°C, that is, T_{RISE}=15°C. According to Table 3-4, the corresponding drive loss P_{LOSS} is 1363+2056=3419W. The drive cabinet needs to be equipped with a fan with air volume V=3419 X 1.82/15=415CFM.

🕮 ATTENTION:

The designed power loss of single AT900 drive and corresponding minimum required air volume (unit: CFM) is shown in Table 3-4, which customers can refer to according to needs.

Table 3-4 Heat dissipation and minimum required air volume of each power rating

Drive model	HDC (W)	Min. air volume (CFM)	Drive model	HDC (W)	Min. air volume (CFM)
AT900-4T0.75LB	15	21	AT900-4T90L(B)	2050	325
AT900-4T1.5LB	23	21	AT900-4T110L	2056	325
AT900-4T2.2LB	49	21	AT900-4T132L	2838	325
AT900-4T3.7LB	72	21	AT900-4T160L	3359	595
AT900-4T5.5LB	116	21	AT900-4T185L	3787	595
AT900-4T7.5LB	170	42	AT900-4T200L	4124	692
AT900-4T11LB	261	58	AT900-4T220L	4701	692
AT900-4T15LB	337	78	AT900-4T250L	5133	692
AT900-4T18.5LB	417	105	AT900-4T280L	5625	975
AT900-4T22LB	500	105	AT900-4T315L	6598	975
AT900-4T30LB	632	105	AT900-4T355L	7215	946
AT900-4T37L(B)	737	185	AT900-4T400L	8384	946
AT900-4T45L(B)	979	185	AT900-4T450L	8473	946
AT900-4T55L(B)	1363	224	AT900-4T500L	8876	946
AT900-4T75L(B)	1789	224			

3.3 Remove & Mount Covers

Power ranges from 0.75kW to 5.5kW of AT900 Series Light-duty AC Motor Drives do not equip with terminal cover plates.

3.3.1 Remove & mount covers of AT900-4T45L(B) and below

- Open the cover

Removing method 1: Fix both thumbs on the terminal cover plate, and simultaneously press inward with both index fingers on the two side slots (along the PRESS direction indicated in Figure 3-6 below). The buckles will naturally detach from the slot, and then remove the cover from an upward diagonal direction away from the drive.

Removing Method 2: Align the flat-head screwdriver with the bottom of the indicated slot (on both sides), gently push inward, and the two side clips will naturally detach from the slot. At this point, you can remove the cover from an upward diagonal direction away from the drive.

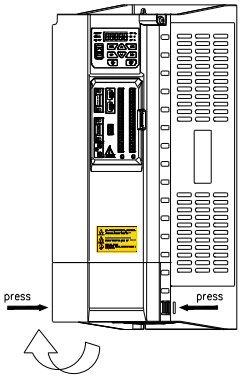


Fig. 3-6 Open the cover

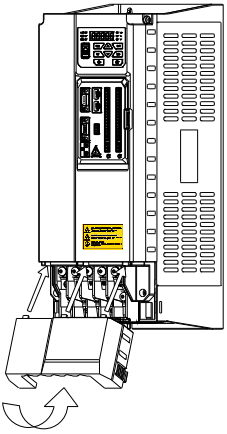


Fig. 3-7 Mount the cover

- Mount the cover

Once all the wiring is completed, insert the upper clips of the terminal cover plate into the three clips on the middle housing, as shown in Figure 3-7. Then, press the side cover plate clips into the slots by hand. When you hear a "click" sound, it indicates that the clips have securely engaged with the slots, and the cover plate installation is completed.

3.3.3 Open & Mount the Covers of AT900-4T55L(B)~AT900-4T250L

- Open the cover

Method: Use a cross screwdriver to remove the installation screws located at the four corners of the drive cover plate, as shown in Figure 3-8. Once the screws are removed, carefully set them aside, and then take out the cover upwards to remove it.

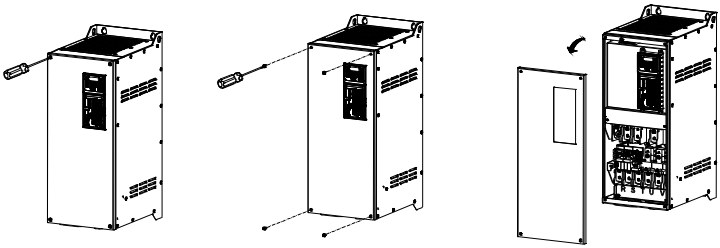


Fig. 3-8 Remove the cover

- Mount the cover

On the completion of wiring, set aside the cover. Use a cross screwdriver to tighten the four screws as shown in Figure 3-9. After the cover fits the housing, the cover is installed.

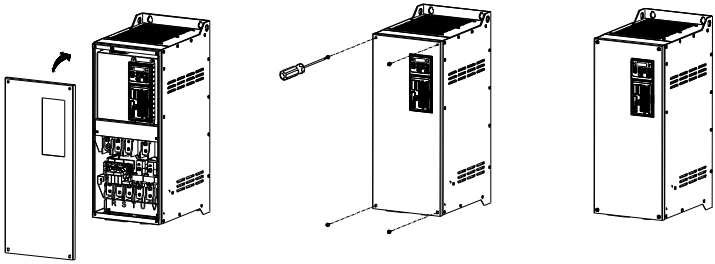


Fig. 3-9 Mount the cover

3.3.4 Open & Mount the Covers of AT900-4T280L and above

- Open the cover

Use a cross screwdriver to remove the screws on the cover, as shown in Figure 3-8. After setting aside the screws, take out the cover.

- Mount the cover

On the completion of wiring, put aside the cover. Use a cross screwdriver to tighten the screws as shown in Figure 3-11. After the cover fits the housing, the cover is installed.

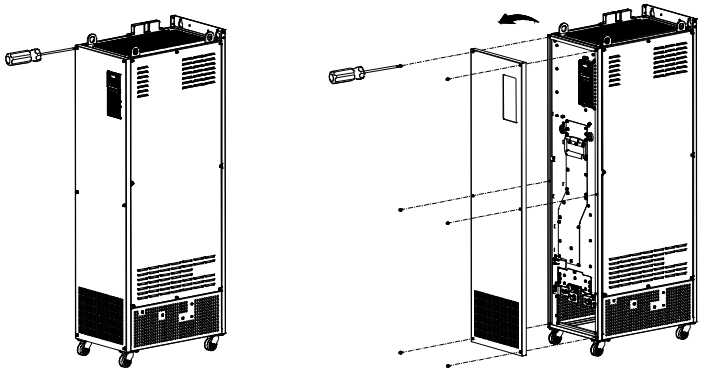


Fig. 3-10 Open the cover

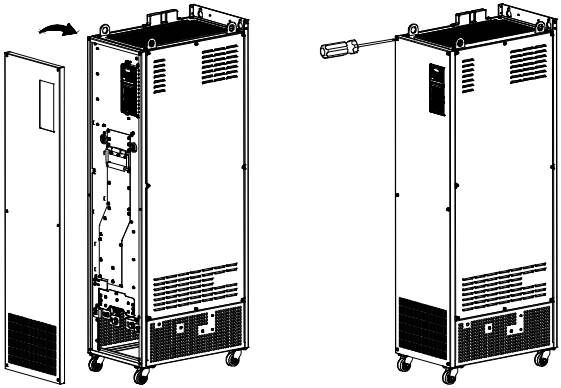


Fig. 3-11 Mount the cover

3.4 Remove and mount option boards

3.4.1 Remove and mount the default IO board and extension IO board

- Remove the extension IO board

After removing all pluggable terminals on the IO board, press the clips on both sides of the drive at the same time to remove the cover plate. Then take out the board from the internal slots and

the fixed metal clips.

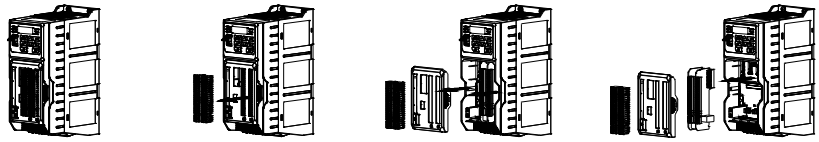


Fig. 3-12 Remove and mount the default IO board and extension IO board

ATTENTION:

Before removing all extension boards on the AT900 drive, first remove the pluggable terminals, cover plate, and wires from the extension board.

- Mount the option board

Insert the option board along the slot inside the housing, with the side containing DB connectors facing outward. If the socket is securely connected to pins on the control board and the option board is inserted into the metal clips, the option board is considered preliminarily installed. Afterward, you may close the small cover plate, mount and wire the terminals. (Notice: at this point, make sure the corresponding partition on the cover plate is already perforated, If not, you can break it or use a small knife to cut through the adhesive points.)

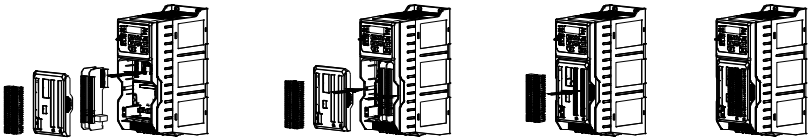


Fig. 3-13 Mount the default IO board and extension IO board

ATTENTION:

The final step for mounting all extension boards of the AT900 drives is the installation of the small cover plate and the pluggable terminals. To avoid repetitive actions, make sure all extension boards are correctly mounted before closing the cover.

The default I/O board is mounted before delivery. Please pay attention to the corresponding partition on the perforated cover plate when mounting the other boards, and use the bursting or cutting method according to the situation. Depending on the situation, you can break it or use a small knife to cut through the adhesive points.

3.4.2 Remove and mount the communication board

- Remove the extension board

After removing all pluggable terminals and wires on the communication board, press the clips on both sides of the drive at the same time to remove the cover plate. Then take out the communication board from the slot in the housing and the fixed metal clip.

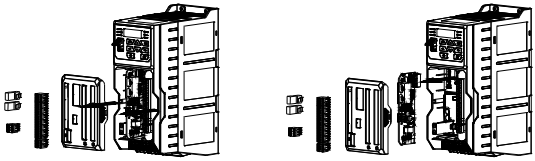


Fig. 3-14 Remove the communication board

- Mount the extension board

Insert the option board along the slot inside the housing, with the side containing DB connectors facing outward. If the socket is securely connected to pins on the control board and the option board is inserted into the metal clips, the option board is considered preliminarily installed. Afterward, you may close the small cover plate, mount and wire the terminals. (Notice: at this point, make sure the corresponding partition on the cover plate is already perforated, If not, you can break it or use a small knife to cut through the adhesive points.)

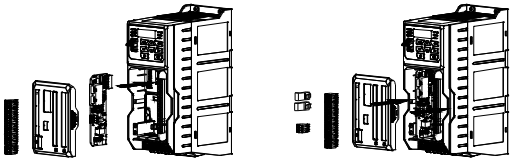


Fig. 3-15 Mount the communication board

3.4.3 Mount and remove the encoder board

The AT900 series drives support two types of encoder extension boards: the 18PIN pluggable terminal (referred to as "18PIN") and the DB15 metal connector (referred to as "DB15"). In this section, we will introduce these two wiring configurations separately.

Both types of encoder extension boards can be installed interchangeably. Before using an encoder extension board, customers need to correctly configure the corresponding partition on the small cover plate. It is recommended to use a knife to cut through the adhesive points. The

specific procedure is shown in the following diagram:

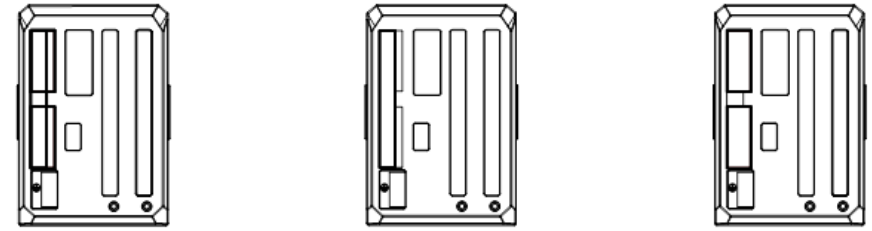


Fig. 3-16 Corresponding partition configuration of encoder extension board

3.4.3.1 Remove and mount the encoder board-18PIN

- Remove the option board

After removing all pluggable terminals, press the clips on both sides of the drive to remove the cover plate, and then remove the encoder option board from the slot in the housing and the fixed metal clips.

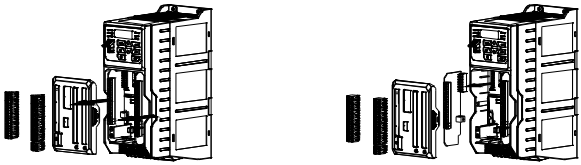


Fig. 3-17 Remove the encoder board -18PIN

- Mount the extension board

Insert the option board along the slot inside the housing, with the side containing DB connectors facing outward. If the socket is securely connected to pins on the control board and the option board is inserted into the metal clips, the option board is considered preliminarily installed. Afterward, you may close the small cover plate, mount and wire the terminals. (Notice: at this point, make sure the corresponding partition on the cover plate is already perforated, If not, you can break it or use a small knife to cut through the adhesive points. For details, please check Fig. 3-16.)

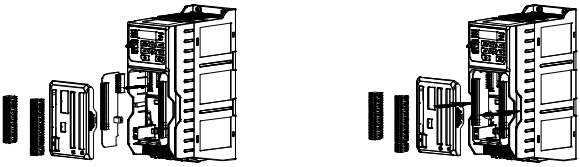


Fig. 3-18 Mount the encoder board-18PIN

3.4.3.2 Remove and mount the encoder board-DB15

- Remove the option board

After removing all pluggable terminals, press the clips on both sides of the drive to remove the cover plate, and then remove the encoder option board from the slot in the housing and the fixed metal clips.

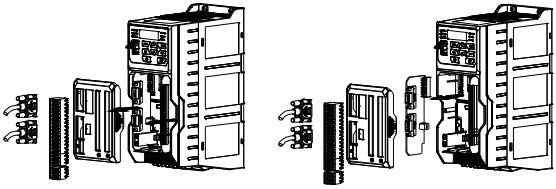


Fig. 3-19 Remove the encoder board -DB15

- Mount the extension board

Insert the option board along the slot inside the housing, with the side containing DB connectors facing outward. If the socket is securely connected to pins on the control board and the option board is inserted into the metal clips, the option board is considered preliminarily installed. Afterward, you may close the small cover plate, mount and wire the terminals. (Notice: at this point, make sure the corresponding partition on the cover plate is already perforated, If not, you can break it or use a small knife to cut through the adhesive points, for details, please refer to Fig. 3-16.)

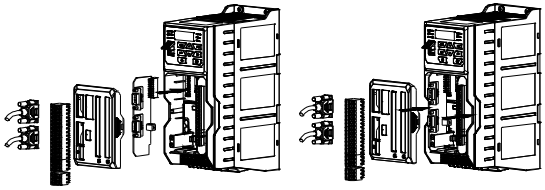


Fig. 3-20 Mount the encoder board-DB15

3.5 Configuration of Peripheral Devices

3.5.1 Standard Configuration of Peripheral Devices

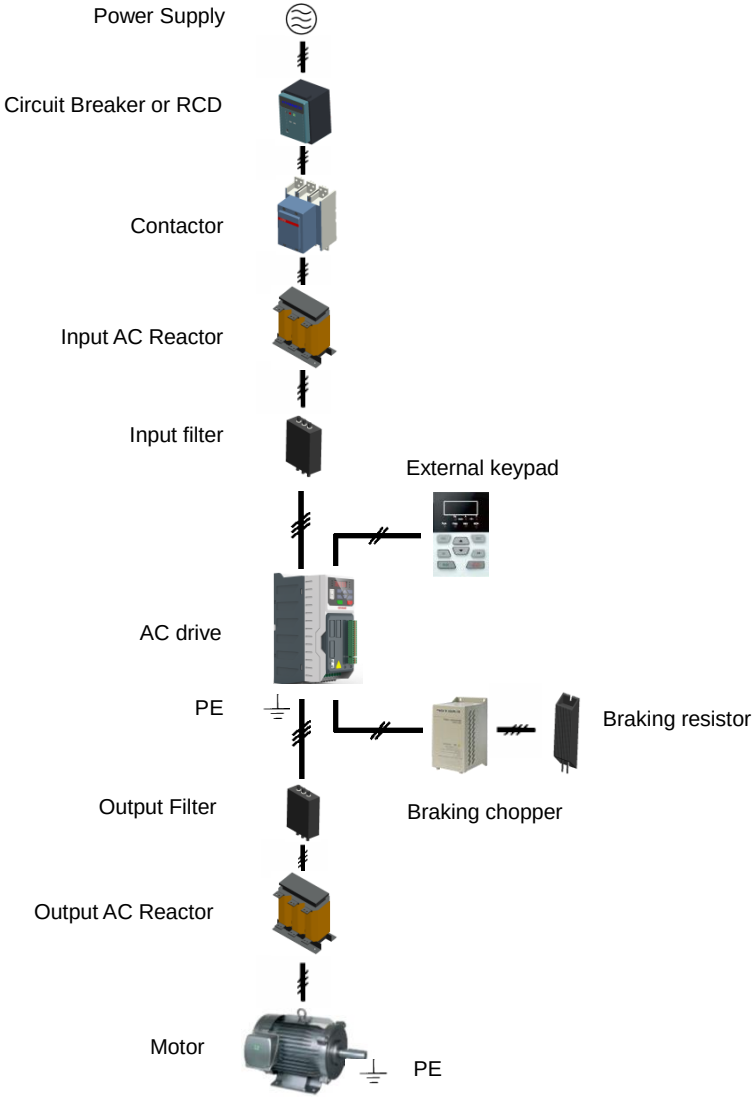


Fig. 3-21 Standard configuration of peripheral devices

3.5.2 Instructions of Peripheral Devices

Table 3-5 Instructions of peripheral devices

Device	Instructions
Power supply	Input three-phase AC power supply should be in the range as specified in this manual
Circuit breaker	Purpose: disconnect power supply and protect the equipment in case of abnormal overcurrent occurs Type selection: breaking current of circuit breaker is defined to be 1.5~2 times the rated current of the drive Breaking time characteristic of circuit breaker should be selected based on overload protection time characteristic of the drive
RCD	Purpose: since the drive outputs PWM HF chopping voltage, HF leakage current is inevitable Type selection: To prevent electric shock accidents and the occurrence of electrical fires, please select a suitable residual current protective device according to the site conditions. Type B dedicated RCD is recommended.
Contactor	For safety's sake, do not frequently close and break the contactor since this may bring about equipment faults Do not control the start & stop of the drive directly through switch on and off the contactor since this will result in a reduction on the product life
Input AC reactor or DC choke	Improve power factor Reduce the impact of imbalanced three-phase input AC power supply on the system Suppress higher harmonics and reduce the conducted and radiated interference to peripheral devices Restrict the impact of impulse current on rectifier bridges
Input filter	Reduce conducted interference from power supply to the drive, improve the immunity of the drive from noise Reduce conducted and radiated interference of the drive to peripheral devices
Brake chopper and braking resistor	Purpose: consume motor feedback energy to attain quick brake Type selection: Contact ARTENGO technical personnel for type selection of brake chopper. Refer to type selection of braking resistor in Table 3.5.3 Selection of Peripheral Devices for the drive model with B at the end.
Output filter	Reduce conducted and radiated interference of the drive to peripheral devices
Output AC reactor	Avoid the motor insulation damage result from harmonic voltage Reduce frequent protection from the drive caused by leakage current The cable between the drive and the motor should not be too long. If the cable is too long, its distributed capacitance will be high, which can easily generate high harmonic currents. Generally, when the distance between the drive and the motor exceeds 100m, it is recommended to install an output AC reactor.
Motor	Should match the drive
External keypads	Support external LED and LCD keypads

3.5.3 Selection of Peripheral Devices

Table 3-6 Selection of peripheral devices

Drive model	Circuit breaker (A)	Contactor (A)	Braking resistor/Brake chopper *	
			Resistor configuration	Min. Resistance
AT900-4T0.75LB	6	9	150W 600Ω	96
AT900-4T1.5LB	6	9	150W 600Ω	96
AT900-4T2.2LB	10	9	300W 300Ω	96
AT900-4T3.7LB	13	12	440W 200Ω	64
AT900-4T5.5LB	25	26	740W 120Ω	40
AT900-4T7.5LB	32	26	1100W 80Ω	40
AT900-4T11LB	50	38	1500W 60Ω	40
AT900-4T15LB	63	50	2200W 40Ω	25
AT900-4T18.5LB	63	50	3000W 30Ω	20
AT900-4T22LB	80	65	4000W 24Ω	20
AT900-4T30L(B)	80	80	4500W 20Ω	20
AT900-4T37L(B)	100	80	6000W 15Ω	13.2
AT900-4T45L(B)	160	95	7500W 15Ω**	13.2
AT900-4T55L(B)	160	115	9000W 10Ω	10
AT900-4T75L(B)	250	150	11000W 10Ω**	10
AT900-4T90L	250	170	15000W 6Ω	6
AT900-4T110L	250	205	Brake chopper is optional	
AT900-4T132L	400	245		
AT900-4T160L	400	300		
AT900-4T185L	500	410		
AT900-4T200L	500	410		
AT900-4T220L	500	410		
AT900-4T250L	630	410		
AT900-4T280L	630	475		
AT900-4T315L	800	620		
AT900-4T355L	800	620		
AT900-4T400L	800	620		
AT900-4T450L	1000	800		
AT900-4T500L	1000	800		

* When brake chopper is inbuilt, the power and resistance value of braking resistor should meet the requirement as stated in the table.

When brake chopper is mounted externally, the resistance value of the brake resistor shall be selected based on the brake chopper.

The recommended power rating for the braking resistor in the table is the minimum value recommended for use under accidental braking load conditions (braking torque 100% to 125%, braking frequency 10%). Users can choose different resistor values and power ratings based on the actual operating conditions of the braking resistor. On the premise of ensuring that the braking requirements are met, the braking resistor used should be greater than the minimum resistor limit specified in the table. Failure to comply may result in damage to the drive.

It should be noted that the braking resistor is not inbuilt and needs to be purchased separately.

If the braking resistor is left exposed for a long time, conductive dust may accumulate, leading to a short circuit to ground. In this case, it is necessary to add a dust cover or place the resistor in a resistor box, depending on the actual situation.

**The braking torque is 100% and the braking frequency is 10% for this configuration. (For other power ratings, it is recommended to configure a braking torque of 125% and a braking frequency of 10%.)

3.6 Terminal Configuration

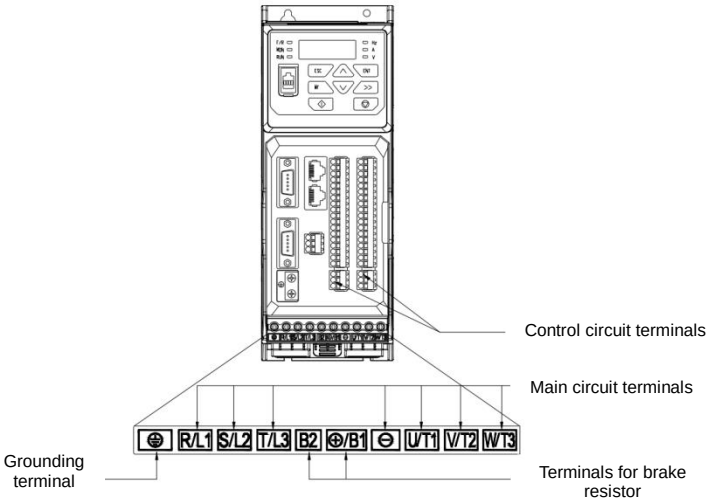


Fig. 3-22 Terminal configuration

3.7 Main Circuit Terminals and Wiring

WARNING

- Only qualified personnel familiar with AC motor drives are allowed to implement wiring. Failure to comply may result in equipment damage and/or personnel injury even death.
- Wiring should be in strict accordance with this manual, otherwise hazard of electric shock or equipment damage exists.
- Make sure input power supply has been completely disconnected before wiring operation. Failure to comply will result in personnel injury even death.
- All wiring operations and lines should comply with EMC and national and local industrial safety regulations and/or electrical codes. The conductor diameter should be in accordance with recommendations of this manual. Otherwise, hazard of equipment damage, fire, and/or personnel injury exists.
- Since leakage current of the drive may exceed 3.5mA, for safety's sake, the drive and the motor must be grounded so as to avoid hazard of electric shock.
- Be sure to perform wiring in strict accordance with the drive terminal marks. Never connect three-phase power supply to output terminals U/T1, V/T2 and W/T3. Failure to comply will result in equipment damage.
- Only mount braking resistors at terminals /B⊕, and B2 when needed. Failure to comply will result in equipment damage.
- Wiring screws and bolts for main circuit terminals must be screwed tightly. Failure to comply may result in faults and/or equipment damage.

ATTENTION

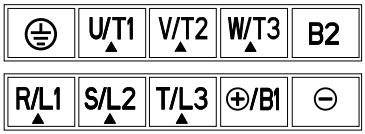
- Signal wires should be away from main power lines to the best of possibility. In the event that this cannot be ensured, vertical cross arrangement should be adopted, reducing EMI interference to the signal wires as much as possible.
- In case the motor cable exceeds 100m, an appropriate output reactor should be mounted.

3.7.1 Main Circuit Terminals of AT900-4T0.75LB~AT900-4T5.5LB

Terminal marks	Designation and function of terminals
R/L1, S/L2, T/L3	Three-phase AC input terminals
⊕ /B1, B2	Braking resistor connection terminals when brake unit is inbuilt*
⊕ / B1, ⊖	DC power supply input terminals**

U/T1, V/T2, W/T3	Three-phase AC output terminals
⏚	Ground terminal PE

3.7.2 Main Circuit Terminals of AT900-4T7.5LB~AT900-4T45L(B)

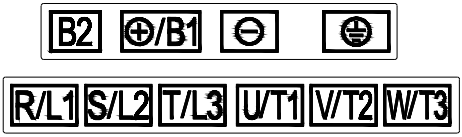


Terminal marks	Designation and function of terminals
R/L1, S/L2, T/L3	Three-phase AC input terminals
⊕/B1, B2	Braking resistor connection terminals when brake unit is inbuilt*
⊕/B1, ⊖	DC power supply input terminals
U/T1, V/T2, W/T3	Three-phase AC output terminals
⏚	Ground terminal PE

For AT900-4T37L~AT900-4T45L drives without “B” in the model, there is no built-in brake unit as factory default, brake resistor connected between B1 and B2 terminals is invalid.

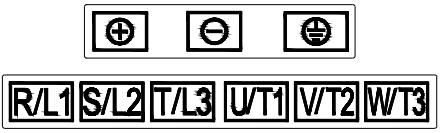
3.7.3 Main Circuit Terminals of AT900-4T55L(B) ~AT900-4T250L

- AT900-4T55LB~AT900-4T90LB



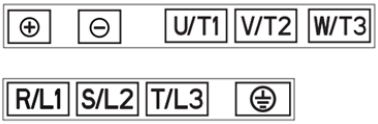
Terminal marks	Designation and function of terminals
R/L1, S/L2, T/L3	Three-phase AC input terminals
⊕/B1, B2	Braking resistor connection terminals when brake unit is inbuilt*
⊕/B1, ⊖	DC power supply input terminals
U/T1, V/T2, W/T3	Three-phase AC output terminals
⏚	Ground terminal PE

- AT900-4T55L~AT900-4T132L



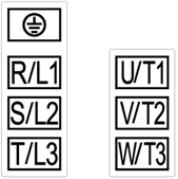
Terminal marks	Designation and function of terminals
R/L1, S/L2, T/L3	Three-phase AC input terminals
⊕, ⊖	DC power supply input terminals
U/T1, V/T2, W/T3	Three-phase AC output terminals
⏚	Ground terminal PE

- AT900-4T160L~AT900-4T250L



Terminal marks	Designation and function of terminals
R/L1, S/L2, T/L3	Three-phase AC input terminals
⊕ , ⊖	DC power supply input terminals
U/T1, V/T2, W/T3	Three-phase AC output terminals
⏚	Ground terminal PE

3.7.4 Main Circuit Terminals of AT900-4T280L ~AT900-4T500L



Terminal marks	Designation and function of terminals
R/L1, S/L2, T/L3	Three-phase AC input terminals
U/T1, V/T2, W/T3	Three-phase AC output terminals
⏚	Ground terminal PE

3.7.5 Terminal Screw and Wiring Requirement

Table 3-7 Terminal screw and wiring requirement

Drive model	Power terminal			Ground terminal		
	Cable (mm2)	Screw	Torque (kgf.cm)	Cable (mm2)	Screw	Torque (kgf.cm)
AT900-4T0.75LB	0.75	M3.5	10±0.5	0.75	M3.5	10±0.5
AT900-4T1.5LB	0.75	M3.5	10±0.5	0.75	M3.5	10±0.5
AT900-4T2.2LB	0.75	M3.5	10±0.5	0.75	M3.5	10±0.5
AT900-4T3.7LB	0.75	M3.5	10±0.5	0.75	M3.5	10±0.5
AT900-4T5.5LB	1.0	M3.5	10±0.5	1.0	M3.5	10±0.5
AT900-4T7.5LB	1.5	M4	14±0.5	1.5	M4	14±0.5
AT900-4T11LB	2.5	M4	14±0.5	2.5	M4	14±0.5
AT900-4T15LB	4.0	M4	14±0.5	4.0	M4	14±0.5
AT900-4T18.5LB	6.0	M5	28±0.5	6.0	M5	28±0.5
AT900-4T22LB	10	M5	28±0.5	10	M5	28±0.5
AT900-4T30L(B)	16	M5	28±0.5	16	M5	28±0.5
AT900-4T37L(B)	16	M6	48±0.5	16	M6	48±0.5
AT900-4T45L(B)	16	M6	48±0.5	16	M6	48±0.5
AT900-4T55L(B)	25	M8	120±0.5	25	M8	120±0.5
AT900-4T75L(B)	50	M8	120±0.5	25	M8	120±0.5
AT900-4T90L	70	M8	120±0.5	35	M8	120±0.5
AT900-4T110L	95	M8	120±0.5	50	M8	120±0.5
AT900-4T132L	120	M8	120±0.5	70	M8	120±0.5
AT900-4T160L	150	M10	250±0.5	95	M10	250±0.5
AT900-4T185L	185	M10	250±0.5	95	M10	250±0.5
AT900-4T200L	185	M10	250±0.5	95	M10	250±0.5
AT900-4T220L	95×2	M10	250±0.5	95	M10	250±0.5
AT900-4T250L	120×2	M10	250±0.5	120	M10	250±0.5
AT900-4T280L	120×2	M12	440±0.5	120	M10	250±0.5
AT900-4T315L	150×2	M12	440±0.5	150	M10	250±0.5

Drive model	Power terminal			Ground terminal		
	Cable (mm2)	Screw	Torque (kgf.cm)	Cable (mm2)	Screw	Torque (kgf.cm)
AT900-4T355L	185×2	M12	440±0.5	185	M10	250±0.5
AT900-4T400L	185×2	M12	440±0.5	185	M10	250±0.5
AT900-4T450L	240×2	M12	440±0.5	240	M10	250±0.5
AT900-4T500L	240×2	M12	440±0.5	240	M10	250±0.5

3.8 Control Terminal Wiring

WARNING

- Only qualified personnel familiar with AC motor drives are allowed to implement wiring. Failure to comply may result in equipment damage and/or personnel injury even death.
- Wiring should be in strict accordance with this manual, otherwise hazard of electric shock or equipment damage exists.
- Make sure input power supply has been completely disconnected before wiring operation. Failure to comply will result in personnel injury even death.
- All wiring operations and lines should comply with EMC and national and local industrial safety regulations and/or electrical codes. The conductor diameter should be in accordance with recommendations of this manual. Otherwise, hazard of equipment damage, fire, and/or personnel injury exists.
- Screws or bolts for terminal wiring must be screwed tightly.
- AC 220V signal is prohibited from connecting to other terminals than control terminals RA, RB, RC and TA, TB, TC.

ATTENTION

- Signal wires should to the best of possibility be away from main power lines. If this cannot be ensured, vertical cross arrangement should be adopted, reducing EMI interference to the signal wires as much as possible.
- Encoder must be provided with shielded cables whose shielded layer must be properly grounded.

3.8.1 Control Board Diagram

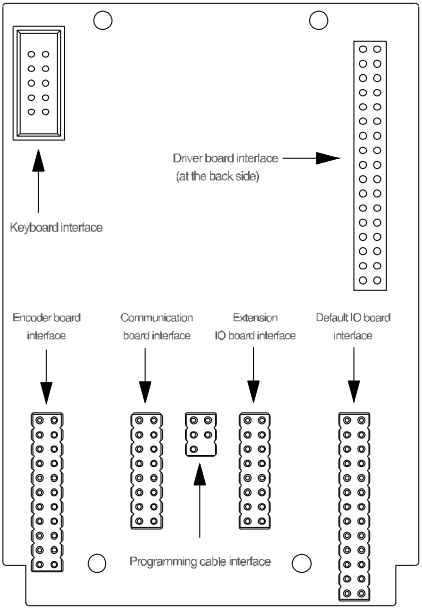


Fig. 3-23 Control Board Diagram

3.8.2 AT900 Wiring Diagram

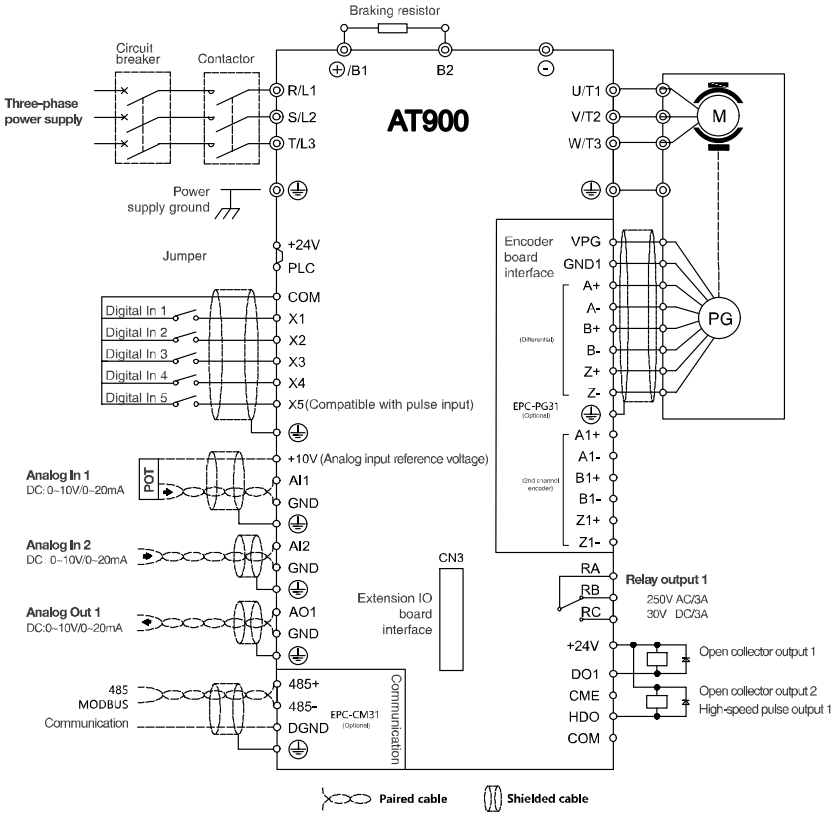


Fig. 3-24 Wiring Diagram

3.9 Control Terminal Specification

Table 3-8 Default IO board terminal specification (EPC-TM31)

Category	Terminal	Terminal designation	Specification
Analog input	+10V	Analog input	10.3V ±3%
			Maximum output current 10mA

Category	Terminal	Terminal designation	Specification
		reference voltage	The resistance of external potentiometer should be larger than 1kΩ
	GND	Analog ground	Isolated from COM interiorly
	AI1	Analog input 1	0~20mA: input impedance - 500Ω, maximum input current - 25mA
			0~10V: input impedance - 22kΩ, maximum input voltage - 12.5V
			Switch S1 on control board for jumping between 0~20mA and 0~10V, factory default: 0~10V
	AI2	Analog input 2	0~20mA: input impedance: 500Ω, maximum input current: 25mA
			0~10V: input impedance: 22kΩ, maximum input voltage: 12.5V;
			Switch S3 on control board for jumping between 0~20mA and 0~10V, factory default: 0~10V
Analog output	AO1	Analog output 1	0~20mA: impedance: 200Ω~500Ω
			0~10V: impedance ≥ 10kΩ
			Switch S2 on control board for jumping between 0~20mA and 0~10V, factory default: 0~10V
	GND	Analog ground	Isolated from COM interiorly
Digital input	X1~X4	Digital input Terminals 1~4	Input: 24VDC, 10mA
			Range of frequency: 0~200Hz
			Voltage range: 10V~30V
	X5	Digital input/pulse input	Input: 24VDC, 10mA
			Pulse input: 0Hz～50kHz
	COM	+24V ground	Isolated from GND interiorly
Digital Output	DO1	Open collector output	Range of voltage: 0~24V
			Range of current: 0~50mA
	HDO	Open collector output / pulse output	Open collector output: same as DO1
			Pulse output: 0~50kHz;
	CME	DO1 reference ground	Reference ground of DO1

Category	Terminal	Terminal designation	Specification
	COM	HDO reference ground	Reference ground of HDO
COM Terminal	COM	+24V ground	isolated from GND interiorly
	PLC	COM of digital input terminal	For switching high & low levels, short-circuited with +24V via jumper S4 as default, i.e. low value of digital input activated
			When power is supplied externally, jumper S4 must be removed.
	+24V	+24V	24V±10%, isolated from GND interiorly, maximum load 200mA
Relay 1 output	RA/RB/RC	Relay output	RA-RB: NC
			RA-RC: NO
			Contact capacity: 250VAC/3A, 30VDC/3A

Table 3-9 Extension IO board terminal specification (EPC-TM32)

Category	Terminal	Terminal designation	Specification
Analog input	AI3	Analog input 3	0~20mA: input impedance - 500Ω, maximum input current - 25mA
			0~10V: input impedance - 22kΩ, maximum input voltage - 12.5V
			Switch S2 on control board for jumping between 0~20mA and 0~10V, factory default: 0~10V
			Compatible with motor temperature sampling through jumper switch S4
	AI4	Analog input 4	0-20mA: Input impedance 500 Ω, maximum input current 25mA
			0-10V: Input impedance: 22kΩ, maximum input voltage 12.5V
			Switch S3 on control board for jumping between 0~20mA and 0~10V, factory default: 0~10V
	LCT	Current leakage detection	Rated current of transformer: 800A (≤355kW) or 1500A (≥400kW)
			Transformer turn ratio: 800:5 (≤355kW) or 1500：5(≥400kW)
	AO2		0~20mA: impedance: 200Ω-500Ω

Analog output		Analog output 2	0～10V: impedance: ≥10kΩ
			Switch S1 on control board for jumping between 0~20mA and 0~10V, factory default: 0~10V
	GND	Analog ground	Internal and COM isolation
Digital input	X6～X10	Digital input 6-10	Input: 24VDC，10mA
			Frequency range: 0-200Hz
			Voltage range: 10V~30V
	COM	+24V ground	isolated from GND interiorly
Digital Output	DO2~DO4	Open collector output	Voltage range: 0-24V
			Current range: 0-50mA
	CME	Reference GND of DO	Reference ground for DO2~DO4
STO input	+24	+24V	24V±10%, isolated from GND interiorly, Maximum load: 200mA
	STO1	STO signal input 1	STO function is on as default. If the STO function is not used, short-circuit STO1 and+24V externally, as well as short-circuit STO2 and+24V externally, input : 24VDC, 10mA
	STO2	STO signal input 2	
Relay 2 output	TA/TB/TC	Relay output	TA−TB: NC
			TA−TC: NO
			Contact capacity: 250VAC/3A，30VDC/3A

Table 3-10 485/CAN communication board terminal specification (EPC-CM31/32)

Category	Terminal	Terminal designation	Specification
EPC-CM31 (Dual RJ45 interface)	2 pin	485+	Rate: 4800/9600/19200/38400/57600/115200bps The maximum distance is 500 meters (using standard network cable).
	4 pin	485-	
	8 pin	DGND	Communication signal reference ground, isolated from GND interiorly
EPC-CM31A (Dual RJ45 interface)	3 pin	485+	Rate: 4800/9600/19200/38400/57600/115200bps The maximum distance is 500 meters (using standard network cable).
	4 pin	485-	
	2 pin	DGND	Communication signal reference ground, isolated from GND interiorly
EPC-CM31B	3 pin	485+	Rate: 4800/9600/19200/38400/57600/115200bps
	2 pin	485-	

(Terminal block)	1 pin	DGND	Communication signal reference ground, isolated from GND interiorly
EPC-CM32 (Dual RJ45 interface)	7 pin	CAN+	Rate: 4800/9600/19200/38400/57600/115200bps The maximum distance is 500 meters (using standard network cable).
	5 pin	CAN-	
	2 pin	DGND	Communication signal reference ground, isolated from GND interiorly
EPC-CM32A (Terminal block)	3 pin	CAN+	Rate: Maximum 1M bps
	2 pin	CAN-	
	1 pin	DGND	Communication signal reference ground, isolated from GND interiorly

ATTENTION:

When 485 communication interface is used, DGND terminal must be well connected to 485 communication power supply ground of host computer. Failure to comply may result in damage of system 485 communication circuit. The same is true to CAN communication interface.

This user manual includes information on optional boards (see Appendix section). Users can choose different communication extension boards and encoder extension boards based on needs. Separate manuals are provided for each type of extension board, and users can refer to the corresponding manual for specific usage instructions.

3.10 Control Terminal Usage

3.10.1 Lay-out of Control Terminals

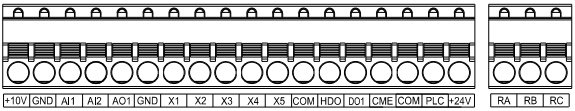


Fig. 3-25 Lay-out of control terminals (Default IO board EPC-TM31)

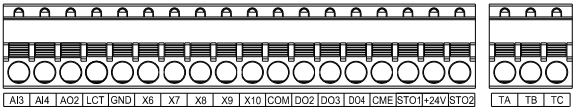


Fig. 3-26 Lay-out of control terminals (Extension IO board EPC-TM32)

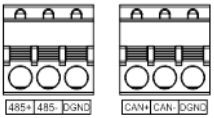


Fig. 3-27 Lay-out of control terminals (485 communication board EPC-CM31B & CAN communication board EPC-CM32A)

ATTENTION:

The above figure shows the corresponding wiring terminals. If the communication board adopts a dual RJ45 network port wiring method, please refer to the pin definitions in Table 3-10.

3.10.2 Control Terminal Wiring Requirement

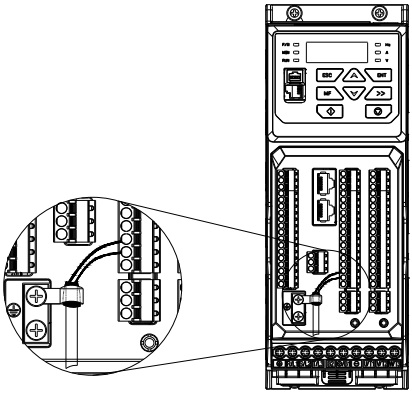


Fig. 3-28 Shielded Cable Grounded

ATTENTION:

The shielded cable needs to be connected to PE at the side near the drive.

Table 3-11 Control Terminal Wiring Specification

Cable type	Cable requirement (mm^2)
Shielded cable	1.0

3.10.3 Instructions of Analog Input/Output Terminals

Being particularly vulnerable to noise, analog input & output signals cables should be as short as possible, shielded, and their shielded layers should be properly grounded, close to the side of drive. The cables should not exceed 20m.

Control cables shall be kept no less than 20cm away from main circuit and strong current lines (e.g. power lines, motor lines, relay lines and contactor lines) and should not be arranged in

parallel with strong current lines. In case it is inevitable to intersect strong current line, vertical wiring is recommended so as to avoid drive faults as the result of noise.

Where analog input & output signals are severely interfered, the side of analog signal source should be provided with filter capacitor or ferrite core.

3.10.4 Instructions of Digital Input/Output Terminals

Digital input & output signals cables should be as short as possible, shielded, and their shielded layers should be properly grounded close to the side of drive. The cables should not exceed 20m. When active drive is selected, take necessary filtering measures against power crosstalk, for which dry contact control is recommended.

Control cables shall be kept no less than 20cm away from main circuit and strong current lines (e.g. power lines, motor lines, relay lines and contactor lines) and should not be arranged in parallel with strong current lines. In case it is inevitable to intersect strong current line, vertical wiring is recommended to avoid drive faults as a result of noise.

- **Instructions of digital input terminal**

◆ **Dry contact**

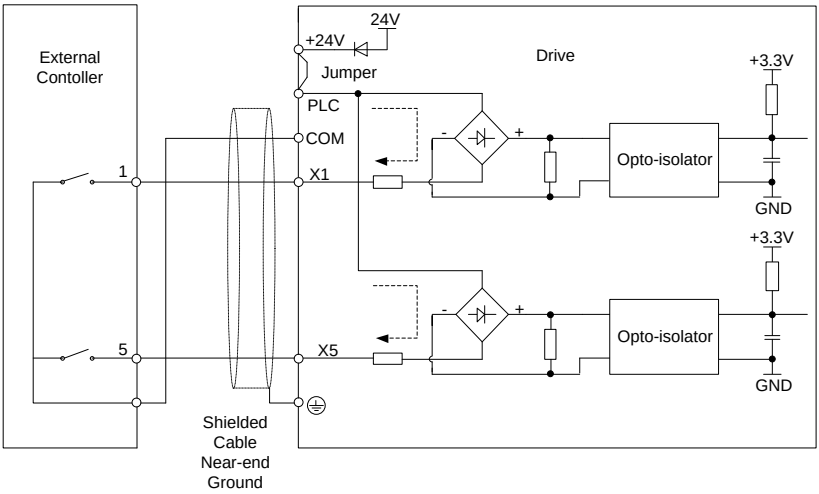


Fig. 3-29 Internal power supply dry contact

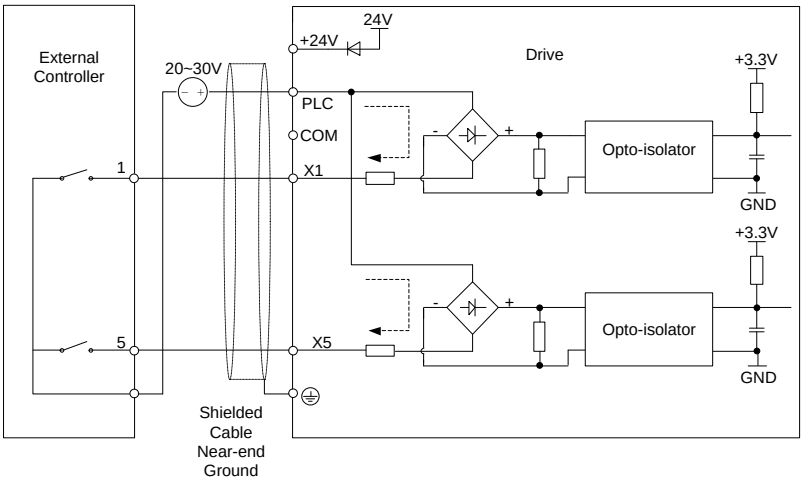


Fig. 3-30 External power supply dry contact

ATTENTION:

When X5 terminal is set to pulse input, it can accept a pulse signal from 0 to 50kHz.

When external power supply is used, the jumper S4 between +24V and PLC must be removed. Otherwise, it may result in equipment damage.

For wiring methods of the power supply of extension IO board and NPN, the jumper S4 between +24V and PLC must be removed. Otherwise, it may result in equipment damage.

The voltage range of external power supply should be within the range of DC20~30V. Otherwise, normal operation could not be assured and/or result in equipment damage.

◆ **Open collector NPN connection**

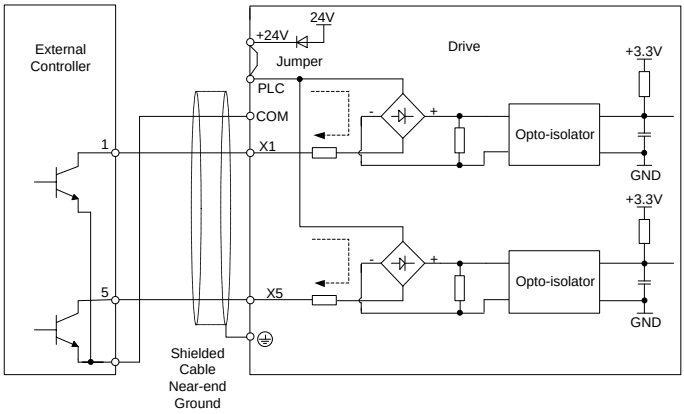


Fig. 3-31 Internal power supply open collector NPN connection

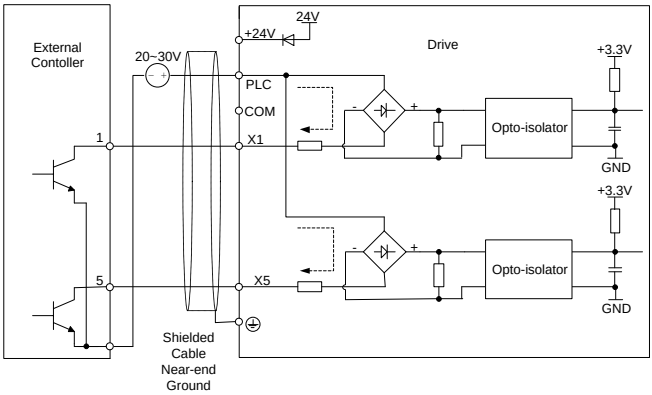


Fig. 3-32 External power supply open collector NPN connection

ATTENTION:

When X5 terminal is set to pulse input, it can accept a pulse signal from 0 to 50kHz.

When external power supply is used, the jumper S4 between +24V and PLC must be removed. Otherwise, it may result in equipment damage.

For wiring of the power supply of extension IO board and NPN, the jumper S4 between +24V and PLC must be removed. Besides, the voltage range of external power supply should be within the range of DC20~30V. Otherwise normal operation could not be assured and/or hazard of equipment damage exists.

◆ **Open collector PNP connection**

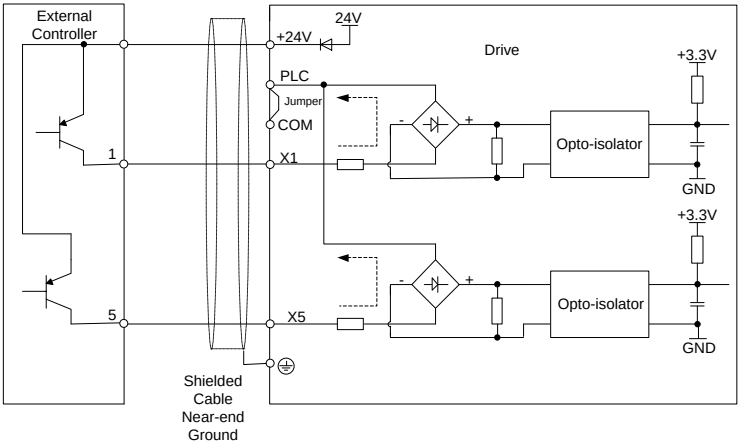


Fig. 3-33 Internal power supply open collector PNP connection

ATTENTION:

When PNP wiring is selected, the jumper S4 between +24V and PLC must be switched to between PLC and COM. Otherwise normal operation could not be assured and/or hazard of equipment damage exists.

The PNP wiring for the extension IO board is the same as method of the default IO board.

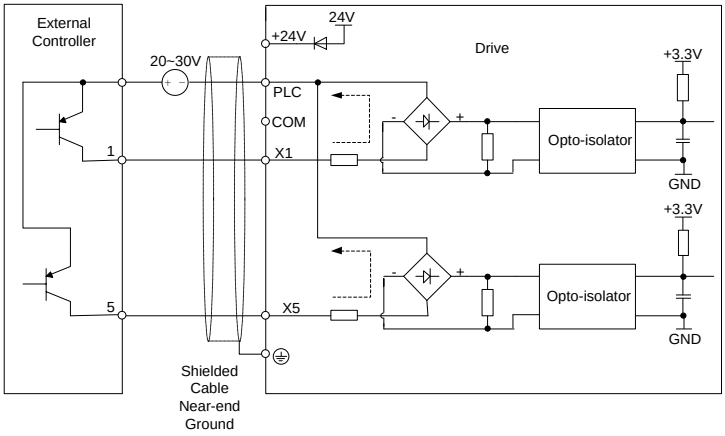


Fig. 3-34 External power supply open collector PNP connection

ATTENTION:

When X5 terminal is set to pulse input, it can accept a pulse signal from 0 to 50kHz.

When external power supply is used, the jumper S4 between +24V and PLC must be removed. Otherwise, it may result in equipment damage.

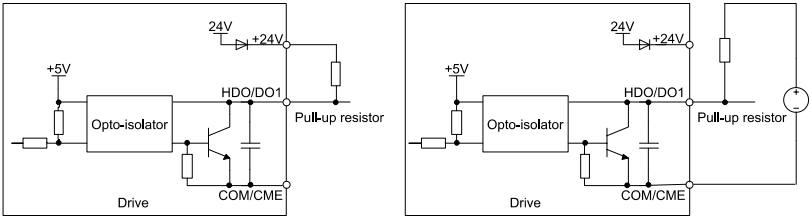
The PNP wiring for the extension IO board is the same as the method of default IO board.

The voltage range of external power supply should be DC20~30V. Otherwise, normal operation could not be assured and/or result in equipment damage.

For PNP wiring method of the external power supply to the extension IO board, the jumper S4 between +24V and PLC must be removed. Besides, the voltage range of external power supply should be within the range of DC20~30V. Otherwise normal operation could not be assured and/or hazard of equipment damage exists.

- **Instructions of digital output terminal**

◆ **Instructions of HDO and DO output terminals**



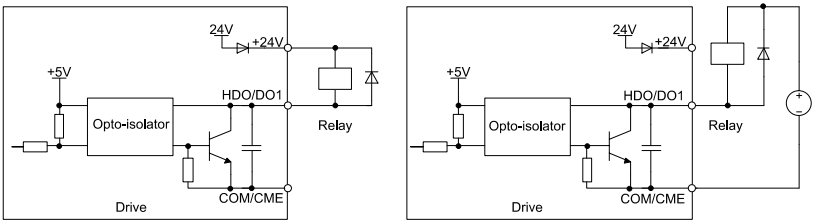
a) Internal power supply b) External power supply

Fig. 3-35 Wiring when HDO and DO1 output with pull-up resistors

ATTENTION:

When set to pulse output, HDO terminal shall output 0~50kHz pulse signal.

CME and COM are not connected together as default. When DO1 terminal uses the internal power supply, short-circuit COM and CME.



a) Internal power supply b) External power supply

Fig. 3-36 Wiring diagram when HDO and DO1 drive relay

ATTENTION:

When relay coil voltage is lower than 24V, a resistor as voltage divider should be mounted between relay and output terminal, based on coil impedance.

In addition, a freewheeling diode must be installed with correct polarity according to the diagram. The driving capacity should not exceed 50mA.

CME and COM are not connected together as default. When DO1 terminal uses the internal power supply, short-circuit COM and CME.

◆ **Wiring instruction of relay output terminal**

Control boards of AT900 series drives are provided with two programmable relay dry contact outputs.

Default IO board is configured with one relay, with contacts RA/RB/RC, among which RA and RB are normally closed, while RA and RC are normally open. The function definitions are as shown in parameter C1-02 in Chapter 4.

Extension IO board is configured with one relay, with contacts TA/TB/TC, among which TA and TB are normally closed, while TA and TC are normally open contacts. The function definitions are as shown in parameter C1-03 in Chapter 4.

ATTENTION:

In case inductive load (e.g. electromagnetic relay or contactor) is to be driven, a surge voltage absorbing circuit such as RC absorbing circuit (note that its leakage current shall be less than holding current of controlled contactor or relay), piezo-resistor or fly-wheel diode etc. shall be mounted (be sure to pay close attention to polarity in case of DC electromagnetic circuit). Absorbing devices should be mounted close to the ends of relay or contactor.

3.10.5 Instruction of IO board jumper signal switch

Table 3-12 Instructions of Jumpers of default IO board (EPC-TM31)

Designation	Function	Default setting
S1	Selection of AI1 AI1_I: 0～20mA AI1_V: 0～10V	0～10V
S2	Selection of AO1 AO1_I: 0～20mA AO1_V: 0～10V	0～10V
S3	Selection of AI2 AI2_I: 0～20mA AI2_V: 0～10V	0～10V
S4	Selection between high and low levels of digital input COM P24: PLC and +24V short-circuited COM1: PLC and COM short-circuited (For external power supply, jumper S4 shall be removed.)	Short-circuited with +24V

Table 3-13 Instructions of Jumpers of Extension IO board (EPC-TM32)

Designation	Function	Default setting
S1	Selection of AO2 AO2_I: 0～20mA AO2_V: 0～10V	0～10V
S2	Selection of AI3 AI3_I: 0～20mA AI3_V: 0～10V	0～10V
S3	Selection of AI4 AI4_I: 0～20mA AI4_V: 0～10V	0～10V
S4	Selection of temperature sensor (corresponding to AI3, share the same jumper with S2) PT100: KTY84-130 motor temperature sensor /PT100 motor temperature sensor PT1000: PT1000 motor temperature sensor/ NTC motor temperature sensor	None

3.11 EMC Solutions

Due to its working principle, the drive will inevitably produce certain noise that may influence and disturb other equipment. Moreover, since the internal weak electric signal of drive is also susceptible to the interference of drive itself and other equipment, EMC problems shall be inevitable. In order to reduce or avoid the interference of drive to external environment and protect drive against interference from external environment, this section makes a brief description of noise abatement, ground handling, leakage current suppression and the application of power line filters.

3.11.1 Noise Abatement

- When peripheral equipment and drive share the power supply of one system, noise from drive may be transmitted to other equipment in this system via power lines and result in misoperation and/or faults. In such a case, the following measures could be taken:
  1) Mount input noise filter at input terminal of the drive;
  2) Mount power supply filter at power input terminal of affected equipment;
  3) Use isolation transformer to isolate the noise transmission path between other equipment and the drive.
- As the wiring of peripheral equipment and drive constitutes a circuit, the unavoidable earthing leakage current of inverter will cause equipment misoperation and/or faults. Disconnect the grounding connection of equipment may avoid this misoperation and/or faults.
- Sensitive equipment and signal lines shall be mounted as far away from drive as possible.
- Signal lines should be provided with shielded layer and well grounded. Alternatively, signal cable could be put into metallic conduits between which the distance shall be no less than 20cm, and shall be kept as far away from drive and its peripheral devices and cables as possible. Never make signal lines in parallel with power lines or bundle them.
- Signal lines must orthogonally cross power lines if this cross is inevitable. Motor cables shall be placed in thick protective screen like more than 2mm-thick pipelines or buried cement groove, also, power lines can be put into metallic conduit and grounded well with shielded cables.
- Use 4-core motor cables of which one is grounded at close side of the drive and the other side is connected to motor enclosure. Input and output terminals of drive are respectively equipped with radio noise filter and linear noise filter. For example, ferrite common mode choke can restrain radiation noise of power lines.

3.11.2 Grounding

Recommended ground electrode is shown in the figure below:

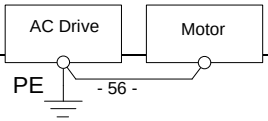


Fig. 3-37 Grounding

- Use to the fullest extent the maximum standard size of grounding cables to reduce the impedance of grounding system.
- Grounding wires should be as short as possible. Grounding point shall be as close to the drive as possible.
- One wire of 4-core motor cables shall be grounded at the drive side and connected to grounding terminal of motor at the other side. Better effect will be achieved if motor and drive are provided with dedicated ground electrodes.
- When grounding terminals of various parts of system are linked together, leakage current turns into a noise source that may influence other equipment in the system, thus, grounding terminals of the drive and other vulnerable equipment should be separated. Grounding cable shall be kept away from input & output of noise-sensitive equipment.

3.11.3 Leakage Current Suppression

- Leakage current passes through the line-to-line and ground distributed capacitors at input & output sides of drive, and its size is associated with the capacitance of distributed capacitor and the switching frequency. Leakage current is classified into ground leakage current and line-to-line leakage current.
- Ground leakage current not only circulates inside drive system, but may also influence other equipment via ground loop. Such a leakage current may result in malfunction of RCD and other equipment. The higher the switching frequency of drive is, the bigger the ground leakage current would be. The longer the motor cables and the bigger the parasitic capacitance are, the bigger the ground leakage current would be. Therefore, the most immediate and effective method for suppression of ground leakage current is to reduce switching frequency and minimize the length of motor cables.
- The higher harmonics of line-to-line leakage current that passes through between cables at output side of drive will Accel the aging of cables and may bring about malfunction of other equipment. The higher the switching frequency of drive is, the bigger the line-to-line leakage current would be. The longer the motor cables and the bigger the parasitic capacitance are, the bigger the line-to-line leakage current would be. Therefore, the most immediate and effective method for suppression of ground leakage current is to reduce switching frequency and minimize the length of motor cable. Line-to-line leakage current can also be effectively suppressed by mounting additional output reactors.

3.11.4 Use of Power Supply Filter

Since drives may generate strong interference and are also sensitive to outside interference,

power supply filters are recommended. Pay close attention to the following instructions during the use:

- Enclosure of the filter needs to be well grounded;
- Input lines of the filter shall be kept as far away from output lines as possible so as to avoid mutual coupling;
- Filter shall be as close to the drive side as possible;
- Filter and drive must be connected to the same common ground.

Chapter 4 Operation and Run Instructions

4.1 Operation of Control Panel

As a human-machine interface, control panel is the main part for the drive to receive command and display parameters.

Fig. 4-1 Control Panel

4.1.1 Key Functions on Control Panel

On control panel there are 8 keys whose functions are as shown in Table 4-1.

Table 4-1 Key functions on control panel

Indicator	Designation	Meaning
ENT	Enter key	1) Parameter edition enter 2) Confirmation of parameter settings 3) Confirmation of MF key function
ESC	Escape key	1) Return function 2) Invalid parameter edit value
∧	Increase key	1) Increase of selected bit of function code 2) Increase of selected bit of parameter 3) Increase of set frequency
∨	Decrease key	1) Decrease of selected bit of function code 2) Decrease of selected bit of parameter value 3) Decrease of set frequency
>>	Shift key	1) Selection of parameter serial bit 2) Selection of parameter serial bit 3) Selection of stop/run status display parameter value 4) Fault status switches to parameter display status
RUN	Run key	Run

STOP RESET	Stop/reset key	1) Stop 2) Fault reset
MF	Multi-function key	See Table 4-2 " MF key function definition"

Table 4-2 MF key function definition

L0-00 set value	Function of MF key	Meaning
0	Disabled	MF key disabled
1	Forward JOG	Forward JOG function
2	Reverse JOG	Reverse JOG function
3	Forward/Reverse switch	Run direction forward and reverse switching
4	Emergency STOP 1	Press MF to STOP, with decel time b2-09
5	Emergency STOP 2	Coast to stop, the drive cuts off output
6	Run command setting mode switch	Control panel control -> Terminal control -> Communication control -> Control panel control, press ENT to confirm within 5 seconds

4.1.2 Control Panel Indicators

Control panel is furnished with 7 indicators whose descriptions are as below

Table 4-3 Description of indicators

Indicator	Designation	Meaning
Hz	Frequency indicator	ON: currently displayed parameter value is running frequency or the current parameter unit is frequency Flash: currently displayed parameter value is set frequency
A	Current indicator	ON: currently displayed parameter value is current
V	Voltage indicator	ON: currently displayed parameter value is voltage
Hz+A	Running speed indicator	ON: currently displayed parameter value is running speed Flash: currently displayed parameter value is setting speed
A+V	Percentage indicator	ON: currently displayed parameter value is a percentage value
All OFF	No unit	No unit

Indicator	Designation	Meaning
MON	Run command setting mode indicator	ON: Control panel OFF: Terminal Flash: Communication
RUN	Run status indicator	ON: Run OFF: Stop Flash: Stopping
F/R	Forward/Reverse indicator	ON: If the drive is in stop status, forward command is enabled. If the drive is in run status, the drive is running forward. OFF: If the drive is in stop status, reverse command is enabled. If the drive is in run status, the drive is running reversely. Flash: Forward is being transferred to reverse. Reverse is being transferring to forward.

4.1.3 Control Panel Display Status

Control panel indicates eight types of status, STOP parameters display, RUN parameters display, Fault display, parameter number edition, parameter setting, Password authentication, Direct frequency modification and Prompt message. The operation relating to these statuses and the switching among these statuses is described as follows.

4.1.3.1 Display of STOP Parameters

The drive normally gets into STOP parameters display once run has been stopped. By default, set frequency is displayed in such a status, and other parameters can be displayed through setting of L1-02 parameters and the » key. For example, when users need to check set frequency as well as the values of bus voltage and AI1 value in stop status, make L1-02=0013 (refer to setting method of parameters) and press the » key to display the value of bus voltage and then press » again to display the value of AI1.

Fig. 4-2 Stop parameter display status (Displaying setting frequency – 50.00Hz)

Run status would be enabled immediately upon the receipt of run command in stop status. Press ENT to get into parameter edit status (get into password authentication status if parameter under password protection). Directly get into frequency modification status when receive UP/DOWN command from terminal, or and press on Control panel. Switch to fault display status once a fault occurs or an alarm is given.

4.1.3.2 Run Parameters Display Status

In case there is no fault, the drive will get into run parameters display status upon receipt of run command. Default display is run frequency, and other parameters can be displayed through setting of L1-00 and L1-01 and press » to shift. For example, in run status, when users need to check bus voltage, motor speed, and input terminals status, please set L1-00= 0084 and L1-01= 0004, and press » to shift to the display of bus voltage, then press » again to display motor speed, and then press » to display input terminals state value.

Fig. 4-3 Run parameter display status (Displaying run frequency – 50.00Hz)

Stop status will be enabled immediately upon receipt of stop command in such a status.

Press ENT to get into parameter edit status (get into password authentication status if parameter under password protection). Directly get into frequency modification status when receiving UP/DOWN command from terminal, or pressing or switch to fault alarm display status once a fault occurs or an alarm is given.

4.1.3.3 Fault Alarm Display Status

In case a fault occurs or an alarm is given, the drive will get into fault or alarm display status.

Fig. 4-4 Fault or alarm display status (CCL: Contactor act fault)

In such a status, the drive gets into stop status upon receipt of pressing ENT , and would get into parameter edit status when receiving pressing ENT command again (if parameter is under password protection, the drive would get into password authentication status). Directly get into frequency modification status when receiving UP/DOWN command from terminal, or pressing or .

4.1.3.4 Parameter Edit Status

Enter parameter edit status immediately upon pressing ENT in STOP status, run parameters display status, and direct frequency modification status. This status could also be entered upon receipt of consecutive twice pressing ENT in fault display status. The drive shall quit current status and be previous status upon receipt of pressing ESC.

Fig. 4-5 Parameter edit status

4.1.3.5 Parameter Value Setting Status

Enter parameter value setting status upon receipt of pressing ENT when in parameter value edit status. When pressing ENT or ESC command is received in such a state, escape

parameter edit status.

Fig. 4-6 Parameter setting status (b0-02 is set to 49.83Hz)

4.1.3.6 Password Authentication Status

On condition that parameters are under password protection, users would have to go through password authentication when they want to modify function code parameter value. Only A0-00 is visible in such a state.

Under password protection, the password authentication status will be first entered upon the receipt of pressing ENT STOP parameter display status, run parameter display status, or direct frequency modification status (refer to the setting method of parameters). It will enter parameter edit status upon the completion of password authentication.

4.1.3.7 Direct Frequency Modification Status

In the status of STOP, fault or run, the drive will enter frequency modification status when terminal UP/DOWN is enabled, or pressing ∧ or ∨.

Fig. 4-7 Direct frequency modification status

4.1.3.8 Prompt Message Status

Prompt message status shall be displayed at the completion of some certain operations. For instance, the “bASIC” prompt message would be displayed upon the completion of setting parameter A0-01 to 0.

Fig. 4-8 Prompt message status

Prompt message characters and their meanings are shown as specified in Table 4-4.

Table 4-4 Prompt characters

Prompt symbol	Meaning	Prompt symbol	Meaning
bASIC	When A0-01 is set to 0	Cpyb1	Backup parameter value
dISP1	When A0-01 is set to 1	LoAd	Parameter upload to control panel
USEr	When A0-01 is set to 2	dnLd1	Parameter download from control panel (motor parameter excluded)
ndFLt	When A0-01 is set to 3	dnLd2	Parameter download from control panel (motor parameter included)
LoC-1	Control panel locked 1 (full locked)	P-SEt	Password has been set
LoC-2	Control panel locked 2 (all locked except RUN, STOP/RESET)	P-CLr	Password cleared
LoC-3	Control panel locked 3 (all locked except STOP/RESET)	TUNE	Motor tune in process
LoC-4	Control panel locked 4 (all locked except shift >>)	LoU	Drive undervoltage
PrtCt	Control panel protection	CLr-F	Clear fault record
UnLoC	Control panel lock cleared	dEFt1	Restore to factory default parameters (motor parameter excluded)

rECy1	Read the backup parameter value to parameter	dEFt2	Restore to factory default parameters (motor parameter included)

Table 4-5 shows meanings of the characters displayed on control panel.

Table 4-5 Meanings of displayed characters

Displayed character	Character Meaning	Displayed character	Character Meaning	Displayed character	Character Meaning	Displayed character	Character Meaning
	0		A		I		T
	1		b		J		t
	2		C		L		U
	3		c		N		v
	4		d		n		y
	5		E		o		-
	6		F		P		8.
	7		G		q		.
	8		H		r		
	9		h		S		

4.1.4 Setting Method of Parameters

4.1.4.1 Parameter System

AT900 series drive parameter group: A0~A1, b0~b2, C0~C4, D0~D5, E0~E2, F0~F4, H0, L0~L1, U0~U2-

Each parameter group contains a number of parameters. Parameters are identified by the combination “parameter group character + parameter subgroup number + parameter number”. For instance, “F3-07” indicates the seventh function code at subgroup 3, group F.

4.1.4.2 Parameter Display Structure

Parameters and the parameter values are subject to a two-tier structure. Parameters correspond to first-tier display, while parameter values correspond to second-tier display.
First-tier display shown in Fig. 4-9:

Fig. 4-9 First-tier display of parameter

Second-tier display shown in Fig. 4-10:

Fig. 4-10 Second-tier display of parameter (“3” is the value of b0-00)

4.1.4.3 Example of Setting of Parameter

Parameter values are divided into decimal (DEC) and hexadecimal (HEX) values. When a parameter value is expressed by a hexadecimal, all its bits are independent of each other during edition and the range of value would be (0~F). Parameter value is composed of the ones, tens, hundreds and thousands place. Shift Key is used to select the bit to be changed, while and are used to increase or decrease numerical value.

- Example of parameter password setting
  - ◆ Setting of password (A0-00 is set to 1006)

1) In non-parameter edit status, it displays current parameter A0-00 when pressing ENT .
2) Press ENT to display parameter value 0000 that belongs to A0-00;
3) Press ▲ for six times to change the rightmost digit "0" to "6";
4) Press » to move the flashing digit to the leftmost bit;
5) Press ▲ once to change "0" in leftmost bit to "1";
6) Press ENT to save the value of A0-00, then Control panel will switch to display the next parameter A0-01;
7) Press ▼ to change A0-01 to A0-00;
8) Repeat steps 2) till 6). A0-01 will be displayed after control panel displaying **P-Set**;
9) There are three methods for users to bring the password setting above into effect:
① Press ESC + ENT + ▲ simultaneously (PrtCt displayed), ② won't operate control panel within 5 minutes, ③ restart the drive.

Flow chart of user password setting:

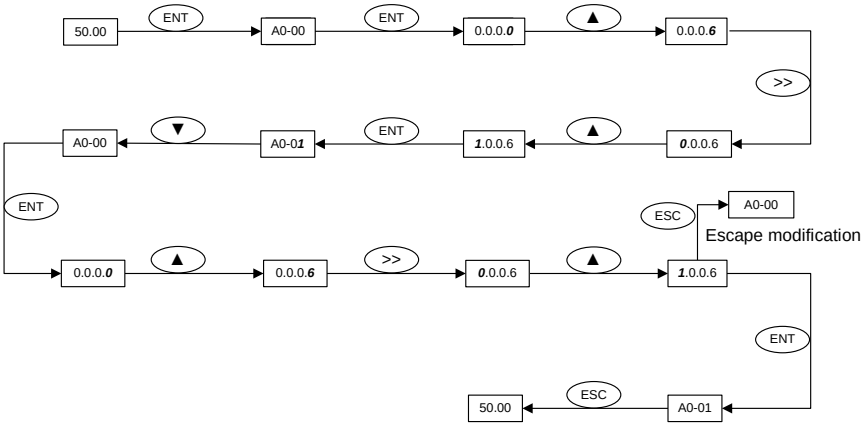


Fig. 4-11 Flow chart of user password setting

ATTENTION:

User's password is successfully set when step 8 finished, but will not take effect until the completion of step 9.

◆ **Password authentication**

In non-parameter edit status, press ENT to enter first-tier display A0-00, then press ENT to enter second-tier display 0.0.0.0. Control panel will implement the display of other parameters only when correct password entered.

◆ **Clear password**

Upon the successful password authentication, access password setting code A0-00. Password can be cleared by writing value 0000 into A0-00 for twice.

- **Example of parameter setting**

◆ **Example 1**: modify upper limit frequency from 600Hz to 50Hz (change b0-09 from 600.00 to 50.00)

1) In non-parameter edit status, press ENT to display current parameter A0-00;
2) Press » to move flashing digit to modification bit (A flashes);
3) Press ▲ once to change “A” to “b”;
4) Press » to move flashing to modification bit (0 in ones place flashing);
5) Press ▲ nine times to change “0” to “9”;
6) Press ENT to view the parameter value (600.00) of b0-09;
7) Press » to move flashing digit to modification digit (6 flashing);
8) Press ▼ six times to change “6” to “0”;
9) Press » once to move flashing digit rightwards by one bit;
10) Press ▲ for five times to change “0” to “5”;
11) Press ENT to save the value (50.00) of b0-09. Then the control panel will automatically switch to display the next function code (b0-10);
12) Press ESC to exit parameter edit status.

Flow chart is shown below:

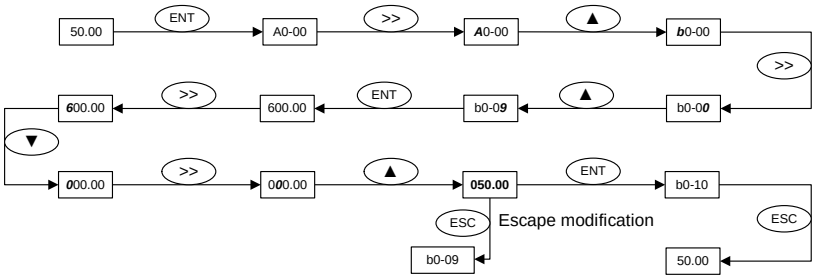


Fig. 4-12 Flow chart of upper limit frequency modification

◆ **Example 2: user parameter initialization**

1) In non-parameter edit status, press ENT to display current parameter A0-00;
2) Press ▲ three times to change “0” in the rightmost bit of A0-00 to “3”;
3) Press ENT to display parameter value 0 of A0-03;
4) Press ▲ once to change “0” to “2” or “3” (“2” motor parameter excluded, “3” means motor parameter included);
5) Press ENT to save the value of A0-03.Then control panel will automatically display parameter A0-00;
6) Press ESC to escape parameter edit status.

Flow chart is shown below:

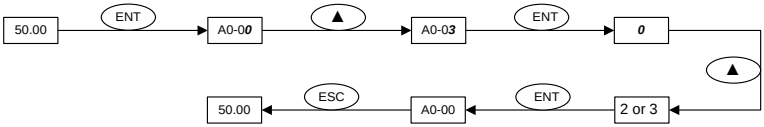


Fig. 4-13 Flow chart of user parameter initialization

◆ **Example 3**: setting method of hexadecimal parameter

Take L1-02 (LED STOP display parameter) for example, if LED control panel is required to display: setting frequency, bus voltage, AI1, running linear speed, and setting linear speed. Since all bits are independent of each other, the ones place, tens place, hundreds place and thousands place should be set separately. Determine the binary numbers of each bit and then convert the binary numbers into a hexadecimal number. See Table 4-6, the corresponding relation between binary numbers and a hexadecimal number.

Table 4-6 Corresponding relation between binary and hexadecimal

Binary numbers				Hexadecimal (LED bit display value)
BIT3	BIT2	BIT1	BIT0	
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	A
1	0	1	1	B
1	1	0	0	C
1	1	0	1	D
1	1	1	0	E
1	1	1	1	F

Set the value in the ones place:

As shown in Fig. 4-14, "setting frequency" and "bus voltage" are respectively determined by BIT0 and BIT1 in ones place of L1-02. If BIT0=1, setting frequency will be displayed. The bits

that correspond to the parameters which are not required to display shall be set to 0. Therefore, the value in ones place should be 0011, corresponding to 3 in a hexadecimal number. Set the ones place to 3.

Set the value in tens place:

As shown in Fig. 4-14, since it is required to display "AI1", the binary set value of tens place is 0001, corresponding to 1 in a hexadecimal number. Thus, bit of tens place shall be set to 1.

Set the value in hundreds place:

As shown in Fig. 4-14, the parameter required to display does not involve hundreds place, so the hundreds place shall be set to zero.

Set thousands place:

As shown in Fig. 4-14, since required to display “running linear speed” and “setting linear speed”, the binary set value of thousand place shall be 0011 that corresponds to 3 in a hexadecimal number.

To sum up, L1-02 should be set to 3013.

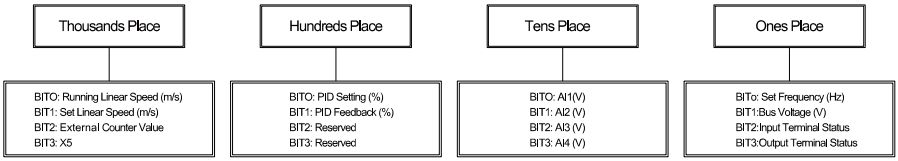


Fig. 4-14 Setting of hexadecimal parameter L1-02

Under parameter setting status, the parameter value cannot be modified if the value has no flashing digit. Possible causes include:

1) The parameter cannot be modified, such as actual detection parameters, running recording parameters, etc;
2) This parameter cannot be modified in run status but could be changed when motor stopped;
3) Parameter under protection. When parameter A0-02 is set to 1, parameters cannot be modified as the parameter protection against misoperation enabled. To edit parameter in such a circumstance, it is necessary to set A0-02 to 0 as first step.

4.1.4.4 Lock/Unlock Control Panel

- **Lock control panel**

  All or some keys of CONTROL PANEL can be locked by any of the following three methods. See the definition of parameter L0-01 for further information.

  Method 1: set the parameter value of L0-01 to non-zero, then press

  ESC + ENT + ∧ simultaneously.

Method 2: do not operate CONTROL PANEL within five minutes after L0-01 is set to non-zero.

Method 3: cut the power off and then applying power on after L0-01 parameter is set to non-zero.

Refer to flow chart 4-15 for locking CONTROL PANEL.

- **Unlock control panel**

  To unlock control panel, press ESC + » + ▼ simultaneously. Unlocking won't change the value of parameter L0-01. In other words, control panel will be locked again if the condition of locking control panel is fulfilled. To unlock control panel completely, L0-01 value must be modified to 0 after unlocking.

Refer to flow chart 4- 16 of unlocking control panel

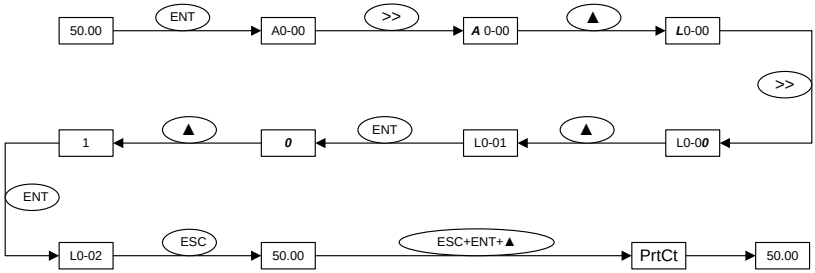


Fig. 4-15 Flow chart of locking control panel

Fig. 4-16 Flow chart of unlocking control panel

4.2 First-time Power up

Perform wiring in strict accordance with technical requirements as set forth in Chapter 3 – mount and Wiring.

4.2.1 Flow chart of first-time power up of asynchronous motor

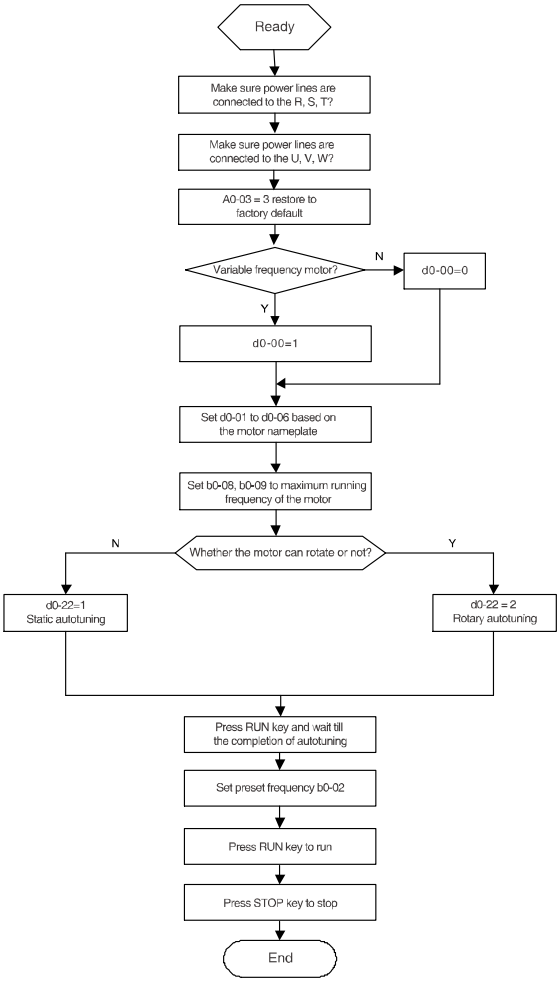


Fig. 4-17 Flow chart of first-time power up for asynchronous motor

Chapter 5 List of Parameters

AT900 parameter groups are listed below:

Category	Parameter Group	Reference Page
Group A: System Parameters and Parameter Management	A0: System Parameters	P78-79
	A1: User-defined Display Parameters	P79-80
Group b: Run Parameter Setting	b0: Frequency Reference	P80-83
	b1: Start/Stop Control	P83-86
	b2: Accel/Decel Parameters	P86-87
Group C: Input & Output Terminals	C0: Digital Input	P87-92
	C1: Digital Output	P93-95
	C2: Analog and Pulse Input	P95-98
	C3: Analog and Pulse Output	P98-99
	C4: Automatic Correction of Analog Input	P99-100
Group d: Motor and Control Parameters	d0: Parameters of Motor 1	P101-102
	d1: V/f Control Parameters of Motor 1	P102-104
	d2: Vector Control Parameters of Motor 1	P104-108
	d3: Parameters of Motor 2	P108-109
	d4: V/f Control Parameters of Motor 2	P109-111
	d5: Vector Control Parameters of Motor 2	P111-115
Group E: Enhanced Function and Protection Parameters	E0: Enhanced Function	P115-117
	E1: Protection Parameters	P117-121
	E2: Enhanced Functions of Motor Control	P121-123
Group F: Application Parameters	F0: Process PID	P123-125
	F1: Multi-step Frequency	P125-126
	F2: Simple PLC	P126-131
Group H: Communication Parameters	H0: Communication Parameters	P131-133
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🕮 ATTENTION:

Change attribute:

"△" means the value of this parameter can be modified in stop and run status of drive;

"×" means the value of this parameter cannot be modified when drive is running;

"◎" means this parameter is a measured value that cannot be modified;

Factory default: The value when restored to factory default. Neither measured parameter value nor recorded value will be restored.

Scope: the scope of setting and display of parameter values.

Param.	Designation	Scope	Factory Default	Attr
Group A: System Parameters and Parameter Management				
Group A0: System Parameters				
A0-00	Setting of user password	0000～FFFF	0000	△
A0-01	Parameter display	0: Display all parameters 1: Only display A0-00 and A0-01 （Valid for A1-20～A1-21 parameter group display/hide） 2: Only display A0-00, A0-01 and user-defined parameters A1-00~A1-19 3: Only display A0-00, A0-01, and the parameters different from factory default	0	△
A0-02	Parameter protection	0: All parameter programmable 1: Only A0-00 and this parameter programmable	0	△
A0-03	Parameter restoration	0: No operation 1: Clear fault record	0	×

Param.	Designation	Scope	Factory Default	Attr
		2: Restore all parameters to factory default (prior to U0 group, excluding motor parameters) 3: Restore all parameters to factory default (prior to U0 group, including motor parameters) 4: Restore all parameters to backup parameters (prior to U0 group)		
A0-04	Parameter backup	0: No operation 1: Backup all parameters (prior to U0 group)	0	×
A0-05	Parameter copy	0: No operation 1: Upload parameter 2: Download parameter (excluding motor parameters) 3: Download parameter (including motor parameters)	0	×
A0-08	Motor 1 / motor 2 selection	0: Motor 1 1: Motor 2	0	×
A0-09	Motor control technique	Ones place: motor 1 control technique Tens place: motor 2 control technique 0: V/f control 1: Sensor-less vector control 1 2: Sensor-less vector control 2 Note: Torque control is not available if set to 0 or 1)	00	×
Group A1: User-defined Display Parameters				

Param.	Designation	Scope	Factory Default	Attr
A1-00-A1-19	User-defined display parameter 1-20	Setting range of thousands place: A, b, C, d, E, F, H, L, U Setting range of hundreds place: 0~9 Setting range of tens place: 0~9 Setting range of ones place: 0~9	0	×
A1-20	Parameter group display/hide setting 1	0～FFFF	FFFF	×
A1-21	Parameter group display/hide setting 2	0～FFFF	FFFF	×
Group b Run Parameter Setting				
Group b0 Frequency Reference				
b0-00	FREQ set mode	0: Master frequency reference 1: Master & auxiliary computation result 2: Switch between master and auxiliary frequency reference 3: Switch between master frequency reference, and master & auxiliary computation result 4: Switch between auxiliary frequency reference, and master & auxiliary computation result	0	×

Param.	Designation	Scope	Factory Default	Attr
b0-01	Master FREQ set	0: Digital setting (b0-02) + control panel ∧/∨ adjustment 1: Digital setting (b0-02) + terminal UP/DOWN adjustment 2: AI1(on default IO board) 3: AI2 (on default IO board) 4: AI3 (on extension IO board) 5: A4 (on extension IO board) 6: X5 pulse input 7: Process PID output 8: PLC 9: Multi-step speed 10: Communication input 11: PA/PB input 12. Rotating knob keypad input	00	×
b0-02	Master FREQ digital setting	b0-10～b0-09	50.00Hz	△
b0-03	Auxiliary FREQ set	0: No command 1: Digital setting (b0-02) + Control panel ∧/∨ adjustment 2: Digital setting (b0-04) + terminal UP/DOWN adjustment 3: AI1(on default IO board) 4: AI2(on default IO board) 5: AI3 (on extension IO board) 6: AI4 (on extension IO board) 7: X5 pulse input 8: Process PID output 9: PLC	00	×

Param.	Designation	Scope	Factory Default	Attr
		10: Multi-step speed 11: Communication 12: Rotating knob keypad input		
b0-04	Auxiliary FREQ digital setting	Lower limit frequency ~ upper limit frequency	0.00Hz	△
b0-05	Auxiliary FREQ range	0: Relative to maximum frequency 1: Relative to master frequency	0	×
b0-06	Auxiliary FREQ coeff	0.0%~100.0%	100.0%	△
b0-07	Computation of master and auxiliary FREQ	0: Master + auxiliary 1: Master - auxiliary 2: Max {master, auxiliary} 3: Min {master, auxiliary}	0	×
b0-08	Maximum FREQ	Upper limit frequency ~600.00Hz	50.00Hz	×
b0-09	Upper limit FREQ	Lower limit frequency ~ maximum frequency	50.00Hz	×
b0-10	Lower limit FREQ	0.00Hz~upper limit frequency	0.00Hz	×
b0-11	Operation when set FREQ lower than lower limit FREQ	0: Run at lower limit frequency 1: Run at 0 Hz 2: Stop	0	×
b0-12	Time-delay of stop when set FREQ lower than lower limit FREQ	0.0s ~ 6553.5s	0.0s	×
b0-13	Lower limit of skip FREQ band 1	0.00Hz~upper limit frequency	0.00Hz	×
b0-14	Upper limit of skip FREQ band 1	0.00Hz~upper limit frequency	0.00Hz	×
b0-15	Lower limit of skip FREQ band 2	0.00Hz~upper limit frequency	0.00Hz	×

Param.	Designation	Scope	Factory Default	Attr
b0-16	Upper limit of skip FREQ band 2	0.00Hz~upper limit frequency	0.00Hz	×
b0-17	Lower limit of skip FREQ band 3	0.00Hz~upper limit frequency	0.00Hz	×
b0-18	Upper limit of skip FREQ band 3	0.00Hz~upper limit frequency	0.00Hz	×
b0-19	Jog FREQ	0.00Hz~upper limit frequency	5.00Hz	△
Group b1: Start/Stop Control				
b1-00	Run command	0: Control panel control 1: Terminal control 2: Communication control	0	×
b1-01	Binding of run command and frequency set	Ones place: frequency reference source bundled under control panel control: Tens place: frequency reference source bundled under terminal control: Hundreds place: frequency reference source bundled under communication control: 0: No binding 1: Digital setting (b0-02) + control panel ∧/∨ adjustment 2: Digital setting (b0-02) + terminal UP/DOWN adjustment 3: Analog input AI1 4: Analog input AI2 5: Analog input AI3 (on extension IO board)	000	×

Param.	Designation	Scope	Factory Default	Attr
		6: Analog input AI4 (on extension IO board) 7. X5 pulse input 8: Process PID output 9: PLC A: Multi-step frequency B: Communication input C. PA/PB input D. Rotating knob keypad input		
b1-02	Run direction	0: Forward 1: Reverse	0	△
b1-03	Reverse disabled	0: Reverse enabled 1: Reverse disabled	0	×
b1-04	Dead time between forward and reverse	0.0s～3600.0s	0.0s	△
b1-05	Start method	0: From start frequency (b1-06) 1: DC injection braking start 2: Flying start	0	×
b1-06	Start FREQ	0.00Hz~upper limit frequency	0.00Hz	×
b1-07	Holding time of start FREQ	0.0s～3600.0s	0.0s	△
b1-08	DC braking current at start	0.0%～100.0%	0.0%	△
b1-09	DC braking time at start	0.00s～30.00s	0.00s	△
b1-10	Flying start current	0.0%～200.0%	100.0%	△
b1-11	Flying start Decel time	0.1s～20.0s	2.0s	△
b1-12	Flying start V/F coeff	0.0%～100.0%	1.0%	△

Param.	Designation	Scope	Factory Default	Attr
b1-13	Stop method	0: Ramp to stop 1: Coast to stop 2: Ramp to stop + DC injection brake	0	×
b1-14	Start FREQ of DC brake stop	0.00Hz~upper limit frequency	0.00Hz	△
b1-15	DC brake current	0.0%～100.0%	0.0%	△
b1-16	DC brake time	0.00s～30.00s	0.00s	△
b1-17	Overexcitation brake	0: Disabled 1: Enabled based on DC bus voltage 2: Enabled on 120% rated voltage 3: Enabled on 125% rated voltage 4: Enabled on 130% rated voltage 5: Enabled on 135% rated voltage 6: Enabled on 140% rated voltage 7:Enabled on 145% rated voltage 8: Enabled on 150% rated voltage	1	×
b1-18	Dynamic brake	0: disabled 1: enabled	0	×
b1-19	Dynamic brake threshold voltage	650V～750V	720V	×
b1-20	Auto restart when power up again after power loss	0: disabled 1: enabled	0	×
b1-21	Time delay of auto restart when power up again	0.0s～10.0s	0.0s	△
b1-22	Flying start mode	Ones place: first -time power up search frequency 0: Search from zero frequency 1: Search from the set frequency	00	×

Param.	Designation	Scope	Factory Default	Attr
		2: Search from the maximum frequency Tens place: Search from the opposite direction enabled 0: search from one direction 1: Search from two directions		
Group b2: Accel/Decel Parameters				
b2-00	Accel/Decel time resolution	0: 0.01s 1: 0.1s 2: 1s	1	×
b2-01	Accel time 1	0s～600.00s/6000.0s/60000s (6.0s for 15kW and below, 20.0s for 18.5kW and above)	Model dependent	△
b2-02	Decel time 1			△
b2-03	Accel time 2	0.0～600.00 s/ 6000.0 s/60000 s	6.0s	△
b2-04	Decel time 2	0.0～600.00 s/ 6000.0 s/60000 s	6.0s	△
b2-05	Accel time 3	0.0～600.00 s/ 6000.0 s/60000 s	6.0s	△
b2-06	Decel time 3	0.0～600.00 s/ 6000.0 s/60000 s	6.0s	△
b2-07	Accel time 4	0.0～600.00 s/ 6000.0 s/60000 s	6.0s	△
b2-08	Decel time 4	0.0～600.00 s/ 6000.0 s/60000 s	6.0s	△
b2-09	Decel time for emergency stop	0.0～600.00 s/ 6000.0 s/60000 s	6.0s	△
b2-10	Jog Accel time	0.0～600.00 s/ 6000.0 s/60000 s	6.0s	△
b2-11	Jog Decel time	0.0～600.00 s/ 6000.0 s/60000 s	6.0s	△
b2-12	Accel/Decel curve	0: Linear Accel/Decel 1: Broken-line Accel/Decel 2: S-curve Accel/Decel A 3: S-curve Accel/Decel B	0	×
b2-13	Accel time switching FREQ of broken-line Accel/Decel	0.00Hz ~ Maximum	0.00Hz	△

Param.	Designation	Scope	Factory Default	Attr
b2-14	Decel time switching FREQ of broken-line Accel/Decel	0.00Hz ~ maximum frequency	0.00Hz	△
b2-15	Time of Accel S-curve first segment	0.00s～60.00s (S-curve A)	0.20s	△
b2-16	Time of Accel S-curve last segment	0.00s～60.00s (S-curve A)	0.20s	△
b2-17	Time of Decel S-curve first segment	0.00s～60.00s (S-curve A)	0.20s	△
b2-18	Time of Decel S-curve last segment	0.00s～60.00s (S-curve A)	0.20s	△
b2-19	Proportion of Accel S-curve first segment	0.0%～100.0% (S-curve B)	20.0%	△
b2-20	Proportion of Accel S-curve last segment	0.0%～100.0% (S-curve B)	20.0%	△
b2-21	Proportion of Decel S-curve first segment	0.0%～100.0% (S-curve B)	20.0%	△
b2-22	Proportion of Decel S-curve last segment	0.0%～100.0% (S-curve B)	20.0%	△
Group C: Input & Output Terminals				
Group C0: Digital Input				

Param.	Designation	Scope	Factory Default	Attr
C0-00	Enabled condition of run command terminals when power up	This function is only for digital terminals with parameter value 1~4 (forward/reverse jog, and forward/reverse run), and also is only for initial run after power up 0: Trigger edge detected + ON detected When run command is controlled by terminals, the drive will start to run when it detects that the terminal electric level jumps from OFF to ON and is kept ON after power up. 1: ON detected When run command is controlled by terminals, the drive will start to run when detecting the command terminal at ON state after power up.	0	×
C0-01	Function of terminal X1	0: No function 1: JOG forward 2: JOG reverse 3: Running forward (FWD) 4: Running reverse (REV) 5: Three-wire control 6: Running suspended 7: External stop 8: Emergency stop 9: DC injection brake stop 1 10: DC injection braking stop 2 11: Coast to stop	3	×
C0-02	Function of terminal X2		4	×
C0-03	Function of terminal X3		1	×
C0-04	Function of terminal X4		23	×
C0-05	Function of terminal X5		0	×
C0-06	Function of terminal X6 (on extension IO board)		0	×
C0-07	Function of terminal X7 (on extension IO board)		0	×

Param.	Designation	Scope	Factory Default	Attr
C0-08	Function of terminal X8 (on extension IO board)	12: Terminal UP 13: Terminal DOWN 14: UP/DOWN (including ∧/∨ key) adjustment clear 15: Multi-step frequency terminal 1 16: Multi-step frequency terminal 2 17: Multi-step frequency terminal 3 18: Multi-step frequency terminal 4 19: Accel/Decel time determinant 1 20: Accel/Decel time determinant 2 21: Accel/Decel disabled 22: External fault input 23: Fault reset (RESET) 24: Pulse input (valid only for X5) 25: Motor 1/2 switchover 26: Speed/Torque control switch 27: Run command switched to control panel control 28: Run command switched to terminal control 29: Run command switched to communication control 30: FREQ reference mode shift 31: Master FREQ reference switched to digital setting b0-02 32: Auxiliary FREQ reference switched to digital setting b0-04 33: PID adjustment direction 34: PID paused	0	×
C0-09	Function of terminal X9 (on extension IO board)		0	×
C0-10	Function of terminal X10 (on extension IO board)		0	×
C0-11	Function of terminal AI1 (Digital enabled)		0	×
C0-12	Function of terminal AI2 (Digital enabled)		0	×
C0-13	Function of terminal AI3 (Digital enabled)		0	×
C0-14	Function of terminal AI4 (Digital enabled)		0	×

Param.	Designation	Scope	Factory Default	Attr
		35: PID integration paused 36: PID parameter switch 37: Count input 38: Count clear 39-62: Reserved 63: PLC paused 64: PLC disabled 65: PLC stop memory clear 66-67: Reserved 68: Running prohibited 69: DC injection brake when running 70: Analog input curve switchover 71-72: Reserved 73: Analog signal gain switch 74-79: Reserved		
C0-15	Filtering time of digital input terminal	0.000～1.000s	0.010s	△
C0-16	Delay time of terminal X1	0.0s～3600.0s	0.0s	△
C0-17	Delay time of terminal X2	0.0s～3600.0s	0.0s	△
C0-18	Digital input terminal enabled status setting 1	Ones place: X1 0: Positive logic 1: Negative logic Tens place: X2 (same as ones place) Hundreds place: X3 (same as ones place) Thousands place: X4 (same as ones place)	0000	△

Param.	Designation	Scope	Factory Default	Attr
C0-19	Digital input terminal enabled status setting 2	Ones place: X5 0: Positive logic 1: Negative logic Tens place: X6 (same as ones place) Hundreds place: X7 (same as ones place) Thousands place: X8 (same as ones place)	0000	△
C0-20	Digital input terminal enabled status setting 3	Ones place: X9 ((on extension IO board) 0: Positive logic 1: Negative logic Tens place: X10 ((on extension IO board) Hundreds place: AI1 Thousands place: AI2	0000	△
C0-21	Digital input terminal enabled status setting 4	Ones place: AI3 ((on extension IO board) 0: Positive logic 1: Negative logic Tens place: AI4 (on extension IO board) 0: Positive logic 1: Negative logic Hundreds place: Reserved Thousands place: Reserved	00	△
C0-22	Terminal UP/DOWN frequency adjustment control	Ones place: action when stop 0: Clear 1: Holding	0000	△

Param.	Designation	Scope	Factory Default	Attr
		Tens place: action on power loss 0: Clear 1: Holding Hundreds place: integral function 0: No integral function 1: Integral function enabled Thousands place: run direction 0: Unable to change the direction 1: Enable to change the direction		
C0-23	Terminal UP/DOWN frequency change step size	0.00Hz/s～100.00Hz/s	0.03 Hz/s	△
C0-24	FWD/REV terminal control mode	0: Two-wire mode 1 1: Two-wire mode 2 2: Three-wire mode 1 3: Three-wire mode 2	0	×
C0-25	Option of virtual input terminal	000~3FFF 0: Actual terminal in effect 1: Virtual terminal in effect Ones place: BIT0~BIT3: X1~X4 Tens place: BIT4~BIT6: X5~X8, Hundreds place: BIT0~BIT3: X9~X10,AI1,AI2 Thousands place: BIT0～BIT1: AI3, AI4 (Note: X6-X10, AI3-AI4 are on the extension IO board)	0000	×
C0-26	Enabled condition of run command terminal after fault reset	0: Trigger edge detected + ON detected 1: ON detected	0	△

Param.	Designation	Scope	Factory Default	Attr
Group C1: Digital Output				
C1-00	HDO output function	0: No output 1: Drive undervoltage 2: Drive run preparation completed 3: Drive is running 4: Drive in 0Hz running (no output at stop) 5: Drive in 0Hz running (output at stop) 6: Run direction 7: Frequency attained 8: Upper limit frequency attained 9: Lower limit frequency attained 10: Frequency higher than FDT 1 11: Frequency higher than FDT 2 12: Speed being restricted (torque control mode) 13: Torque being restricted (speed control mode) 14: Fault output 15: Alarm output 16: Drive (motor) overloaded alarm 17: Drive thermal alarm 18: Zero current detection 19: X1 20: X2 21: Motor 1/ 2 indication 22-24: Reserved 25: Consecutive run time attained 26: Accumulative run time attained	0	△
C1-01	DO1 output function		0	△
C1-02	DO2 output function (on extension IO board)		0	△
C1-03	DO3 output function (on extension IO board)		0	△
C1-04	DO4 output function (on extension IO board)		0	△
C1-05	Relay output function selection on default IO board		14	△
C1-06	Relay output function selection on extension IO board		15	△

Param.	Designation	Scope	Factory Default	Attr
		27-29: Reserved 30: PLC step completed 31: PLC cycle completed 32: Reserved 33: The upper/lower limit of set frequency obtained 34-99: Reserved		
C1-07	HOD output delay time	0.0～3600.0s	0.0s	△
C1-08	DO1 output delay time	0.0～3600.0s	0.0s	△
C1-09	DO2 output delay time (on extension IO board)	0.0～3600.0s	0.0s	△
C1-10	DO3 output delay time (on extension IO board)	0.0～3600.0s	0.0s	△
C1-11	DO4 output delay time (on extension IO board)	0.0～3600.0s	0.0s	△
C1-12	Relay output delay time of default IO board	0.0～3600.0s	0.0s	△
C1-13	Relay output delay time of extension board	0.0～3600.0s	0.0s	△
C1-14	Digital output terminal enabled status setting 1	Ones place: HDO 0: Positive logic 1: Negative logic Tens place: Relay output R1 on default IO board (Same as ones place) Hundreds place: Relay output R2 (Same as ones place) Thousands place: Reserved	0000	×
C1-15	Digital output terminal enabled status setting 2	Ones place: DO1 0: Positive logic	0000	×

Param.	Designation	Scope	Factory Default	Attr
		1: Negative logic Tens place: DO2 (Same as ones place) Hundreds place: DO3 (Same as ones place) Thousands place: DO4 (Same as ones place)		
C1-16	Detective object of frequency doubling technology (FDT)	Ones place: FDT1 detective object 0: Set value of speed (frequency after Accel/Decel) 1: Detected speed value Tens place: FDT2 detective object 0: Set value of speed (frequency after Accel/Decel) 1: Detected speed value	00	△
C1-17	FDT1 upper value	0.00Hz～b0-08	50.00Hz	△
C1-18	FDT1 lower value	0.00Hz～b0-08	49.00Hz	△
C1-19	FDT2 upper value	0.00Hz～b0-08	25.00Hz	△
C1-20	FDT2 lower value	0.00Hz～b0-08	24.00Hz	△
C1-21	Detection width of frequency attained	0.00Hz～b0-08	2.50Hz	△
C1-22	Zero current detection level	0.0%～50.0%	5.0%	△
C1-23	Zero current detection time	0.01s～50.00s	0.50s	△
Group C2: Analog and Pulse Input				
C2-00	Analog input curve	Ones place: AI1 input curve 0: Curve 1 (2 points) 1: Curve 2 (4 points)	2210	×

Param.	Designation	Scope	Factory Default	Attr
		2: Curve 3 (4 points) 3: AI Curve X terminal switchover Tens place: AI2 input curve (same as ones place) Hundreds place: AI3 input curve (same as ones place, IO option board) Thousands place: AI4 input curve (same as ones place, IO option board)		
C2-01	Curve 1 maximum input	Curve 1 minimum input ~ 110.0%	100.0%	△
C2-02	Corresponding set value of curve 1 maximum input	-100.0%～100.0%	100.0%	△
C2-03	Curve 1 minimum input	-110.0%～ Curve 1 maximum input	0.0%	△
C2-04	Corresponding set value of curve 1 minimum input	-100.0%～100.0%	0.0%	△
C2-05	Curve 2 maximum input	Range: input of curve 2 inflection point A~110.0%	100.0%	△
C2-06	Corresponding set value of curve 2 maximum input	-100.0%～100.0%	100.0%	△
C2-07	Input of curve 2 inflection point A	input of curve 2 inflection point B ~ maximum input of curve 2	0.0%	△
C2-08	Set value corresponding to input of curve 2 inflection point A	-100.0%～100.0%	0.0%	△
C2-09	Input of curve 2 inflection point B	minimum input of curve 2~input of curve 2 inflection point A	0.0%	△

Param.	Designation	Scope	Factory Default	Attr
C2-10	Set value corresponding to input of curve 2 inflection point B	-100.0%～100.0%	0.0%	△
C2-11	Curve 2 minimum input	-110.0%～input of curve 2 inflection point B	-100.0%	△
C2-12	Set value corresponding to curve 2 minimum input	-100.0%～100.0%	-100.0%	△
C2-13	Curve 3 maximum input	input of curve 3 inflection point A～110.0%	100.0%	△
C2-14	Set value corresponding to curve 3 maximum input	-100.0%～100.0%	100.0%	△
C2-15	Input of curve 3 inflection point A	input of curve 3 inflection point B～maximum input of curve 3	0.0%	△
C2-16	Set value corresponding to input of curve 3 inflection point A	-100.0%～100.0%	0.0%	△
C2-17	Input of curve 3 inflection point B	minimum input of curve 3~input of curve 3 inflection point A	0.0%	△
C2-18	Set value corresponding to input of curve 3 inflection point B	-100.0%～100.0%	0.0%	△
C2-19	Curve 3 minimum input	-110.0%～input of curve 3 inflection point B	0.0%	△
C2-20	Set value corresponding to curve 3 minimum input	-100.0%～100.0%	0.0%	△
C2-21	AI1 terminal filtering time	0.000s～10.000s	0.100s	△
C2-22	AI2 terminal filtering time	0.000s～10.000s	0.100s	△

Param.	Designation	Scope	Factory Default	Attr
C2-23	AI3 terminal filtering time (on extension IO board)	0.000s～10.000s	0.100s	△
C2-24	AI4 terminal filtering time (on extension IO board)	0.000s～10.000s	0.100s	△
C2-25	X5 maximum input	X5 minimum input～50.0kHz	50.0kHz	△
C2-26	Set value corresponding to X5 maximum input	-100.0%～100.0%	100.0%	△
C2-27	X5 minimum input	0.0 kHz～X5 maximum input	0.0kHz	△
C2-28	Set value corresponding to X5 minimum input	-100.0%～100.0%	0.0%	△
C2-29	X5 filtering time	0.000s～1.000s	0.001s	△
C2-30	Analog gain switchover value	0.0%～100.0%	100.0%	△
Group C3: Analog and Pulse Output				
C3-00	AO1 output function	0: No output 1: FREQ reference 2: Output frequency 3: Output current (relative to freq. rated value) 4: Output torque (absolute value) 5: Output voltage 6: Output power 7: Bus voltage 8: Torque command 9: Torque current 10: Magnetic flux current 11: AI1 12: AI2 13: AI3 14: AI4 15: X5 16: Communication input percentage 17: Output frequency before compensation 18: Output current (relative to motor rated current)	2	△
C3-01	AO2 output function		1	△
C3-02	HDO output function		0	△

Param.	Designation	Scope	Factory Default	Attr
		19: Output torque (direction hinted) 20: Set torque (direction hinted) 21~99: Reserved		
C3-03	AO1 offset	-100.0%～100.0%	0.0%	△
C3-04	AO1 gain	-2.000～2.000	1.000	△
C3-05	AO1 filtering time	0.0s～10.0s	0.0s	△
C3-06	AO2 offset (on extension IO board)	-100.0%～100.0%	0.0%	△
C3-07	AO2 gain (on extension IO board)	-2.000～2.000	1.000	△
C3-08	AO2 filtering time (on extension IO board)	0.0s～10.0s	0.0s	△
C3-09	HDO maximum output pulse frequency	0.1KHz～50.0KHz	50.0kHz	△
C3-10	HDO output center point	0: No center point 1: Center point is (C3-09)/2, and the corresponding parameter value is positive when frequency is higher than center point. 2: Center point is (C3-09)/2, and the corresponding parameter value is positive when frequency is lower than center point	0	×
C3-11	HDO output filtering time	0.00s～10.00s	0.00s	△
Group C4: Automatic Correction of Analog Input				
C4-00	Analog corrected channel	0: No correction 1: Correct AI1 2: Correct AI2 3: Correct AI3 4: Correct AI4	0	×

Param.	Designation	Scope	Factory Default	Attr
C4-01	Sampling value of AI1 calibration point 1	0.00V～10.00V	1.00V	◎
C4-02	Input value of AI1 calibration point 1	0.00V～10.00V	1.00V	×
C4-03	Sampling value of AI1 calibration point 2	0.00V～10.00V	9.00V	◎
C4-04	Input value of AI1 calibration point 2	0.00V～10.00V	9.00V	×
C4-05	Sampling value of AI2 calibration point 1	0.00V～10.00V	1.00V	◎
C4-06	Input value of AI2 calibration point 1	0.00V～10.00V	1.00V	×
C4-07	Sampling value of AI2 calibration point 2	0.00V～10.00V	9.00V	◎
C4-08	Input value of AI2 calibration point 2	0.00V～10.00V	9.00V	×
C4-09	Sampling value of AI3 calibration point 1	0.00V～10.00V	1.00V	◎
C4-10	Input value of AI3 calibration point 1	0.00V～10.00V	1.00V	×
C4-11	Sampling value of AI3 calibration point 2	0.00V～10.00V	9.00V	◎
C4-12	Input value of AI3 calibration point 2	0.00V～10.00V	9.00V	×
C4-13	Sampling value of AI4 calibration point 1	-10.00V～10.00V	1.00V	◎
C4-14	Input value of AI4 calibration point 1	-10.00V～10.00V	1.00V	×

Param.	Designation	Scope	Factory Default	Attr
C4-15	Sampling value of AI4 calibration point 2	-10.00V～10.00V	9.00V	◎
C4-16	Input value of AI4 calibration point 2	-10.00V～10.00V	9.00V	×
Group d Motor and Control Parameters				
Group d0: Parameters of Motor 1				
d0-00	Type of motor 1	0: Ordinary ACIM 1: Variable frequency ACIM	1	×
d0-01	Power rating of motor 1	0.4KW～6553.5KW	Model dependent	×
d0-02	Rated voltage of motor 1	0V～480V(for drives 380V level)	380V	×
d0-03	Rated current of motor 1	0.0A～6553.5A	Model dependent	×
d0-04	Rated frequency of motor 1	0.00Hz～600.00Hz	50.00Hz	×
d0-05	Pole number of motor 1	1～400	4	×
d0-06	Rated speed of motor 1	0r/min～65535r/min	Model dependent	×
d0-07	Stator resistance R1 of async motor 1	0.001Ω～65.535Ω	Model dependent	×
d0-08	Leakage inductance L1 of async motor 1	0.1mH～6553.5mH	Model dependent	×
d0-09	Rotor resistance R2 of async motor 1	0.001Ω～65.535Ω	Model dependent	×
d0-10	Mutual inductance L2 of async motor 1	0.1mH～6553.5mH	Model dependent	×
d0-11	No-load current of async motor 1	0.0A～6553.5A	Model dependent	×
d0-12	Flux weakening coeff 1 of async motor 1	0.001～1.000	0.880	×

Param.	Designation	Scope	Factory Default	Attr
d0-22	Autotune of motor 1	0: No autotune 1: Static autotune 2: Rotary autotune	0	×
d0-23	Overload protection mode of motor 1	0: No protection 1: Judged by motor current 2: Judged by temperature transducer	1	×
d0-24	Overload protection detection time of motor 1	0.1～15.0min	5.0min	×
d0-25	Temperature transducer signal input of motor 1	Ones place: sensor channel 0: No sampling 1: Analog input TEMP (on extension PG board) 2: Analog input AI3 (on extension IO board) Tens place: sensor type: 0: PT100 1: PT1000 2: KTY84 3: NTC	00	×
d0-26	Thermal protection threshold of motor 1 temperature transducer	0~200.0℃	120.0℃	×
d0-38	Motor temperature coefficient	0.000～2.000	1.000	△
Group d1: V/f Control Parameters of Motor 1				
d1-00	V/f curve setting	0: Linear V/f 1: Multi-step V/f (d1-01~d1-08) 2: 1.2nd power 3: 1.4th power	0	×

Param.	Designation	Scope	Factory Default	Attr
		4: 1.6th power 5: 1.8th power 6: 2.0nd power 7: V/F separation method 1 8: V/F separation method 2		
d1-01	V/f frequency value f3	0.00Hz~rated frequency of motor	50.00Hz	×
d1-02	V/f voltage value V3	0.0%~100.0%;	100.0%	×
d1-03	V/f frequency value f2	d1-05～d1-01	0.00Hz	×
d1-04	V/f voltage value V2	0.0%～100.0%	0.0%	×
d1-05	V/f frequency value f1	d1-07～d1-03	0.00Hz	×
d1-06	V/f voltage value V1	0.0%～100.0%	0.0%	×
d1-07	V/f frequency value f0	0.00Hz～d1-05	0.00Hz	×
d1-08	V/f voltage value V0	0.0%～100.0%	0.0%	×
d1-09	Torque boost	0.0%~30.0%; 0.0% is automatic torque boost	0.0%	△
d1-10	Slip compensation gain	0.0%～400.0%	100.0%	△
d1-11	Droop control	0.00Hz～maximum frequency	0.00Hz	△
d1-12	Current limitation mode	0: Disabled 1: Set by d1-13 2: Set by AI1 3: Set by AI2 4: Set by AI3 5. Set by AI4 6: Set by X5	1	×
d1-13	Digital setting of current limit value	20.0%～200.0%	120.0%	△
d1-14	Current limit coeff on flux weakening	0.001～1.000	0.500	△

Param.	Designation	Scope	Factory Default	Attr
d1-15	Energy saving percentage	0%～40.0%	0.0%	△
d1-16	V/f oscillation suppression gain 1	0～3000	38	△
d1-17	V/f oscillation suppression gain 2	0～3000	0	△
d1-18	Voltage setting on V/f separated pattern	0: by D1-19 digital setting 1: by AI1 2: by AI2 3: by AI3 4: by AI4 5: by process PID output 6: by AI1+ process PID output	0	×
d1-19	Digital set voltage on V/f separated pattern	0.0%～ 100.0%	0.0%	△
d1-20	Voltage variation time on V/f separated pattern	0.00S ～ 600.00s	0.01s	△
Group d2: Vector Control Parameters of Motor 1				
d2-00	Speed/torque control	0: speed control 1: torque control	0	×
d2-01	ASR high-speed proportional gain Kp1	0.0～20.0	1.0	△
d2-02	ASR high-speed integration time Ti1	0.000s～8.000s	0.200s	△
d2-03	ASR low-speed proportional gain Kp2	0.0～20.0	1.0	△
d2-04	ASR low-speed integration time Ti2	0.000s～8.000s	0.200s	△

Param.	Designation	Scope	Factory Default	Attr
d2-05	ASR switching frequency 1	0.00Hz～d2-06	5.00Hz	△
d2-06	ASR switching frequency 2	d2-05~upper limit frequency	10.00Hz	△
d2-07	ASR input filtering time	0.0ms～500.0ms	0.3ms	△
d2-08	ASR output filtering time	0.0ms～500.0ms	0.0ms	△
d2-09	D-axis ACR proportion coefficient Kp	0.000～8.000	1.000	△
d2-10	D-axis ACR integration coefficient Ki	0.000～8.000	1.000	△
d2-11	Pre-excitation time	0.000s～5.000s	0.200s	△
d2-12	Driven torque restriction source	0: d2-14 digital setting 1: AI1 2: AI2 3: AI3 4: AI4 5: X5 pulse input 6. Communication	0	×
d2-13	Braking torque restriction source	0: d2-15 digital setting 1: AI1 2: AI2 3: AI3 4: AI4 5: X5 pulse input 6: Communication	0	×
d2-14	Digital setting of driven torque limit value	0.0%～200.0%	120.0%	△

Param.	Designation	Scope	Factory Default	Attr
d2-15	Digital setting of braking torque limit value	0.0%～200.0%	120.0%	△
d2-16	Torque limit coefficient in flux weakening	0.0%～100.0%	50.0%	△
d2-17	Driven slip compensation gain	10.0%~300.0%	100.0%	△
d2-18	Brake slip compensation gain	10.0%~300.0%	100.0%	△
d2-19	Torque reference source	0: Set by d2-20 1: AI1 2: AI2 3: AI3 4: AI4 5: X5 pulse input 6: Communication	0	×
d2-20	Digital setting of torque	-200.0%～200.0%	0.0%	△
d2-21	Forward speed limitation source under torque control	0: Set by d2-23 1: AI1 2: AI2 3: AI3 4: AI4 5: X5 pulse input 6: Communication	0	×
d2-22	Reverse speed limitation source under torque control	0: Set by d2-24 1: AI1 2: AI2 3: AI3 4: AI4 5: X5 pulse input	0	×

Param.	Designation	Scope	Factory Default	Attr
		6: Communication		
d2-23	Forward speed limited value under torque control	0.00Hz ~b0-08	50.00Hz	△
d2-24	Reverse speed limited value under torque control	0.00Hz～b0-08	50.00Hz	△
d2-25	Set torque accel/decel time	0.00s～120.00s	0.10s	△
d2-26	Energy saving percentage for ACIM	0%～100.0%	100.0%	△
d2-27	Starting point of energy-saving torque	0~4096	0	△
d2-28	Ending point of energy-saving torque	0~4096	1100	△
d2-29	Q-axis ACR proportion coefficient Kp	0.000～8.000	1.000	△
d2-30	Q-axis ACR integration coefficient Ki	0.000～8.000	1.000	△
d2-31	D axis decoupling coefficient	0~65.535	1.000	△
d2-32	Q axis decoupling coefficient	0~65.535	1.000	△

Param.	Designation	Scope	Factory Default	Attr
d2-33	Maximum voltage utilization rate	0~110.0%	100.0%	△
d2-36	Weak magnetic loop coefficient	0～65535	200	△
d2-40	MTPV mode	0: Disable 1: Enable	0	△
d2.42	MTPV proportion coefficient	0~65535	100	△
d2.43	MTPV integration coefficient	0~65535	10	△
d2-44	Vector adjustment variable	Ones place: Asynchronous motor feedback enabled Tens place: Reserved Hundreds place: Integral separation of speed loop enabled	101	△
d2-45	Waveform delay compensation coefficient	0~8.000	0.500	△
d2-47	Speed loop desaturation coefficient	0~65535	10	△
Group d3: Parameters of Motor 2				
d3-00	Type of motor 2	0: Ordinary ACIM 1: Variable frequency ACIM	1	×
d3-01	Power rating of motor 2	0.4KW～6553.5KW	Model dependent	×
d3-02	Rated voltage of motor 2	0V～480V (for 380V model)	380V	×
d3-03	Rated current of motor 2	0.0A～6553.5A	Model dependent	×
d3-04	Rated frequency of motor 2	0.00Hz～600.00Hz	50.00Hz	×
d3-05	Pole number of motor 2	1～400	4	×

Param.	Designation	Scope	Factory Default	Attr
d3-06	Rated speed of motor 2	0rpm～65535rpm	Model dependent	×
d3-07	Stator resistance R1 of async motor 2	0.001ohms～65.535ohms	Model dependent	×
d3-08	Leakage inductance L1 of async motor 2	0.1mH～6553.5mH	Model dependent	×
d3-09	Rotor resistance R2 of async motor 2	0.001ohms～65.535ohms	Model dependent	×
d3-10	Mutual inductance L2 of asynchronous motor 2	0.1mH～6553.5mH	Model dependent	×
d3-11	No-load current of async motor 2	0.0A～6553.5A	Model dependent	×
d3-12	Power factor of async motor 2	0.001~1.000	0.880	×
d3-22	Autotune of motor 2	0: No autotune 1: Static autotune 2: Rotary autotune	0	×
d3-23	Overload protection mode of motor 2	0: No protection 1: Judged by motor current 2: Judged by temperature transducer	1	×
d3-24	Overload protection detection time of motor 2	0.1～15.0min	5.0min	×
d3-25	Temperature transducer signal input of motor 2	Ones place: 0: No. (no sampling) 1: AI TEMP (on PG extension board) 2: EAI (on extension IO board) Tens place: Sensor type: 0: PT100 1: PT1000 2: KTY84	00	×

Param.	Designation	Scope	Factory Default	Attr
		3: NTC		
d3-26	Thermal protection threshold of motor 2 temperature transducer	0~200.0℃	120.0℃	×
d3-38	Motor temperature coefficient	0.000～2.000	1.000	×
Group d4: V/f Control Parameters of Motor 2				
d4-00	V/f curve setting	0: Linear V/f 1: Multi-step V/f (d1-01~d1-08) 2: 1.2nd power 3: 1.4th power 4: 1.6th power 5: 1.8th power 6: 2.0nd power 7: V/F separation method 1 8: V/F separation method 2	0	×
d4-01	V/f frequency value f3	0.00Hz~rated frequency of motor	50.00Hz	×
d4-02	V/f voltage value V3	0.0%~100.0%	100.0%	×
d4-03	V/f frequency value f2	d4-05～d4-01	0.00Hz	×
d4-04	V/f voltage value V2	0.0%～100.0%	0.0%	×
d4-05	V/f frequency value f1	d4-07～d4-03	0.00Hz	×
d4-06	V/f voltage value V1	0.0%～100.0%	0.0%	×
d4-07	V/f frequency value f0	0.00Hz～d4-05	0.00Hz	×
d4-08	V/f voltage value V0	0.0%～100.0%	0.0%	×
d4-09	Torque boost	0.0%~30.0%; 0.0% means auto torque boost	0.0%	△
d4-10	Slip compensation gain	0.0%～400.0%	100.0%	△
d4-11	Droop control	0.00Hz～10.00Hz	0.00Hz	△

Param.	Designation	Scope	Factory Default	Attr
d4-12	Current limitation mode	0: Disabled 1: Set by d4-13 2: Set by AI1 3: Set by AI2 4: Set by AI3 5: Set by AI4 6: X5	1	×
d4-13	Digital set current limit value	20.0%～200.0%	120.0%	△
d4-14	Current limit coeff on flux weakening	0.001～1.000	0.500	△
d4-15	Energy saving percentage	0%～40.0%	0.0%	△
d4-16	V/f oscillation suppression gain 1	0～3000	38	△
d4-17	V/f oscillation suppression gain 2	0～3000	0	△
d4-18	Voltage setting on V/f separated pattern	0: by D1-19 digital setting 1: by AI1 2: by AI2 3: by AI3 4: by AI4 5: by process PID output 6: by AI1+ process PID output	0	×
d4-19	Digital set voltage on V/f separated pattern	0.0%～ 100.0%	0.0%	△
d4-20	Voltage variation time on V/f separated pattern	0.00S ～ 600.00s	0.01s	△
Group d5: Vector Control Parameters of Motor 2				

Param.	Designation	Scope	Factory Default	Attr
d5-00	Speed/torque control	0: speed control 1: torque control	0	×
d5-01	ASR high-speed proportional gain Kp1	0.0～20.0	1.0	△
d5-02	ASR high-speed integration time Ti1	0.000s～8.000s	0.200	△
d5-03	ASR low-speed proportional gain Kp2	0.0～20.0	1.0	△
d5-04	ASR low-speed integration time Ti2	0.000s～8.000s	0.200	△
d5-05	ASR switching frequency 1	0.00Hz～d5-06	5.00Hz	△
d5-06	ASR switching frequency 2	d5-05～upper limit	10.00Hz	△
d5-07	ASR input filtering time	0.0ms～500.0ms	0.3ms	△
d5-08	ASR output filtering time	0.0ms～500.0ms	0.0ms	△
d5-09	ACR proportion coeff Kp	0.000～8.000	1.000	△
d5-10	ACR integration coeff Ki	0.000～8.000	1.000	△
d5-11	Pre-excitation time	0.000s～5.000s	0.200s	△
d5-12	Driven torque restriction source	0: d5-14 digital setting 1: AI1 2: AI2 3: AI3 4: AI4 5: X5 pulse input 6: Communication	0	×

Param.	Designation	Scope	Factory Default	Attr
d5-13	Braking torque restriction source	0: d5-15 digital setting 1: AI1 2: AI2 3: AI3 4: AI4 5: X5 pulse input 6: Communication	0	×
d5-14	Digital setting of driven torque limit value	0.0%～200.0%	120.0%	△
d5-15	Digital setting of braking torque limit value	0.0%～200.0%	120.0%	△
d5-16	Torque limit coefficient in flux weakening	0.0%～100.0%	50.0%	△
d5-17	Driven slip compensation gain	10.0%～300.0%	100.0%	△
d5-18	Brake slip compensation gain	10.0%～300.0%	100.0%	△
d5-19	Torque reference source	0: Set by d5-20 1: AI1 2: AI2 3: AI3 4: AI4 5: X5 pulse input 6: Communication	0	×
d5-20	Digital setting of torque	-200.0%～200.0%	0.0%	△

Param.	Designation	Scope	Factory Default	Attr
d5-21	Forward speed limitation source	0: Set by d5-23 1: AI1 2: AI2 3: AI3 4: AI4 5: X5 pulse input 6: Communication	0	×
d5-22	Reverse speed limitation source	0: Set by d5-24 1: AI1 2: AI2 3: AI3 4: AI4 5: X5 pulse input 6: Communication	0	×
d5-23	Forward speed limited value	0.00Hz～b0-08	50.00Hz	△
d5-24	Reverse speed limited value	0.00Hz～b0-08	50.00Hz	△
d5-25	Set torque accel/decel time	0.00s～120.00s	0.10s	△
d5-26	Energy saving percentage for ACIM	0%～100.0%	100.0%	△
d5-27	Starting point of energy-saving torque	0~4096	0	△
d5-28	Ending point of energy-saving torque	0~4096	1100	△
d5-29	Q-axis ACR proportion coefficient Kp	0.000～8.000	1.000	△

Param.	Designation	Scope	Factory Default	Attr
d5-30	Q-axis ACR integration coefficient Ki	0.000～8.000	1.000	△
d5-31	D axis decoupling coefficient	0~65.535	1.000	△
d5-32	Q axis decoupling coefficient	0~65.535	1.000	△
d5-33	Maximum voltage utilization rate	0~110.0%	100.0%	△
d5-36	Weak magnetic loop coefficient	0~65535	200	△
d5-40	MTPV mode	0: Disable 1: Enable	0	△
d5-42	MTPV ratio coefficient	0~65535	100	△
d5-43	MTPV integral coefficient	0~65535	10	△
d5-44	Vector adjustment variable	Ones place: Asynchronous motor feedback enabled Tens place: Reserved Hundreds Place: Integral separation of speed loop enabled	101	△
d5-45	Waveform delay compensation coefficient	0~8.000	0.500	△
d5-47	Speed loop desaturation coefficient	0~65535	10	△
Group E: Enhanced Function and Protection Parameters				
Group E0: Enhanced function				

Param.	Designation	Scope	Factory Default	Attr
E0-00	Switching FREQ	Range: 0.8KHz～16.0KHz ≤30kW: factory default: 6.0KHz 37KW～45KW: factory default: 5.0 kHz 55kW~75kW: factory default: 4.0 kHz ≥90kW: factory default: 3.0KHz	Model dependent	△
E0-01	PWM optimization	Ones place: switching FREQ adjusted with temperature 0: Self-adaption 1: No adjustment Tens place: PWM modulation mode 0: Five-segment and seven-segment automatic switchover 1: Five-segment mode 2: Seven-segment mode Hundreds place: over-modulation adjustment 0: Disabled 1: Enabled 2: Deep over-modulation Thousands place: PWM switching frequency relation with output frequency 0: Self-adaption 1: No adaption	0110	×

Param.	Designation	Scope	Factory Default	Attr
E0-02	Action when run time attained	Ones place: action when consecutive run time attained: 0: Run continued 1: Stop and fault reported Tens place: action when accumulative run time attained: 0: Run continued 1: Stop and fault reported Hundreds place: unit of run time 0: Second 1: Hour	000	×
E0-03	Consecutive run time setting	0.0～6000.0s (h)	0.0s (h)	△
E0-04	Accumulative run time setting	0.0～6000.0s (h)	0.0s (h)	△
E0-12	Random switch frequency adjustment coefficient	0~100	0	△
Group E1: Protection Parameters				
E1-00	Overvoltage stall	O: Prohibited 1: Allowed 2: Only valid for decel	0	×
E1-01	Overvoltage stall protection voltage	120%~150%	130%	△
E1-02	Undervoltage stall	0: Disabled 1: Enabled	0	×
E1-03	Overload alarm	Ones place: detection option: 0: Always detect 1: Detect at constant speed only	000	×

Param.	Designation	Scope	Factory Default	Attr
		Tens place: compared with 0: Motor rated current 1: Drive rated current Hundreds place: drive action 0: Alarm but run continued 1: Alarm and coast to stop		
E1-04	Overload alarm threshold	20.0%～200.0%	180.0%	△
E1-05	Overload alarm detecting time	0.1s～60.0s	5.0s	△
E1-06	Protection action 1	Ones place:encoder disconnected(CLL)/PG board abnormal 0: Alarm and coast to stop 1: CLL alarms but run continued 2: PGE alarms but run continued 3: CLL and PGE alarm but run continued Tens place: PIM temperature measurement circuit fault (oH3) 0: Alarm and coast to stop 1: Alarm but run continued Hundreds place: abnormal EEPROM (Epr) 0: Alarm and coast to stop 1: Alarm but run continued Thousands place: abnormal terminal communication (TrC) 0: Alarm and coast to stop 1: Alarm but run continued	0000	×

Param.	Designation	Scope	Factory Default	Attr
E1-07	Protection action 2	Ones place: abnormal power supply when running (SUE) 0: Alarm and coast to stop 1: Shield the fault Tens place: current detection circuit failed (CtC) 0: Alarm and coast to stop 1: Alarm but run continued Hundreds place: abnormal contactor (CCL): 0: Alarm and coast to stop 1: Alarm but run continued Thousands place: input/output phase loss (ISF, oPL): 0: Protection for neither input supply fault nor output phase loss 1: No protection for input phase loss, protection enabled for output phase loss 2: Protection enabled for input phase loss, no protection for output phase loss 3: Protection enabled for both input phase loss and output phase loss	3001	×
E1-08	Fault memory after power loss	0: Not memorized after power loss 1: Memorized after power loss	0	×
E1-09	Fault auto-reset times	0～20	0	×
E1-10	Auto-reset interval	2.0s～20.0s	2.0s	×

Param.	Designation	Scope	Factory Default	Attr
E1-11	Relay action on drive fault	Ones place: when undervoltage fault occurs 0: No action 1: Action enabled Tens place: when fault locked 0: No action 1: Action enabled Hundreds place: auto-reset interval 0: No action 1: Action enabled	010	×
E1-12	Cooling fan control	0: Auto run (Based on inverter bridge temperature) 1: Always run after power up	0	△
E1-13	Drive overheat alarm threshold	0.0℃~100.0℃	80.0℃	△
E1-14	Protection action 3	0 ~ FFFF The first F from the right: Bit0: Not shield GDP fault 0 , shield 1 Bit1 ~ 3: Reserved The second F from the right: Bit0: Not shield AIP fault 0, shield 1 Bit1: Not shield OL3 fault 0, shield 1 Bit2 ~ 3: Reserved The third F from the right: Bit0: Not shield fault 0 of extension IO board, shield 1 Bit1 ~ 3: Reserved The fourth F from the right:	0000	×

Param.	Designation	Scope	Factory Default	Attr
		Bit0: fault 0 of brake tube is not shielded, shield 1 Bit1 ~ 3: Reserved		
E1-15	Single -phase current overload point	0.0%～400.0%	150.0%	△
E1-16	Single -phase current overload time	0.000s～50.000s	1.000s	△
E1-17	Over speed/excessive speed difference	Ones place: Over speed (OS) action selection 0: Coast to stop and report the fault 1: Continue to run Tens place: Excessive speed deviation (DEV) action selection 0: Coast to stop and report the fault 1: Continue to run	00	×
E1-18	Over speed (OS) detection value	0.0%～108.0%	105.0%	△
E1-19	Over speed (OS) detection time	0.0S～20.00S	1.00s	△
E1-20	Detection value of excessive speed difference	0.0%～50.0%	20.0%	△
E1-21	Detection time of excessive speed difference	0.0S～20.00S	5.00s	△
E1-23	Sampling delay settings	0~500	100	×
E1-24	Five -stage frequency threshold	0~65535	8.00Hz	△

Param.	Designation	Scope	Factory Default	Attr
E1-25	Overvoltage stall coefficient	0~200	30	△
Group E2: Enhanced Functions of Motor Control				
E2-00	Observer Kp for ACIM in SVC2	0～65535	200	△
E2-01	Observer Ki for ACIM in SVC2	0～65535	2000	△
E2-02	Observer Ki2 for ACIM in SVC2	0～65535	2000	△
E2-03	Observer model compensation 1 for ACIM in SVC2 (change after auto-tuning)	-9999～9999	0	×
E2-04	Observer model compensation 2 for ACIM in SVC2 (change after auto-tuning)	-9999～9999	8	△
E2-05	Observer coefficient K1 for ACIM in SVC2	-9999～9999	0	△
E2-06	Observer coefficient K2 for ACIM in SVC2	-9999～9999	-1	△
E2-07	Observer coefficient K3 for ACIM in SVC2	0~65535	0	△
E2-08	Observer coefficient K4 for ACIM in SVC2	0~65535	0	△
E2-09	Observer feedback mode 2 for ACIM in SVC2	0~65535	3000	△
E2-10	Observer feedback mode for ACIM in SVC2	0~1	0	△

Param.	Designation	Scope	Factory Default	Attr
E2-11	Observer amplitude limit for ACIM in SVC2	0～65535	100	△
E2-12	Observer compensation Kp for ACIM in SVC2	0～65535	1000	△
E2-13	Observer compensation Ki for ACIM in SVC2	0～65535	20	△
E2-14	Observer compensation coefficient for ACIM in SVC2	0.000～65.535	0.500	△
E2-15	Sync speed threshold for ACIM in SVC2	0.00Hz～600.00Hz	0.30Hz	△
E2-16	Motor feedback frequency filtering	0.0ms～500.0ms	0.3ms	△
E2-17	Torque closed-loop selection	0: Disable 1: Enable	1	△
E2-18	Torque loop Kp	0~65535	1000	△
E2-19	Torque loop Ki	0~65535	50	△
E2-20	Active damping proportion coefficient	0~65535	0	△
E2-21	Active damping amplitude limit adjustment	0~65535	512	△
Group F Application Parameters				
Group F0: Process PID				

Param.	Designation	Scope	Factory Default	Attr
F0-00	PID reference	0: F0-01 digital setting 1: AI1 2: AI2 3: AI3 4: AI4 5: X5 pulse input 6: Communication	0	×
F0-01	PID digital setting	0.0%~100.0%	50.0%	△
F0-02	PID feedback	0: AI1 1: AI2 2: AI3 (on extension IO board) 3: AI4 (on extension IO board) 4: AI1+AI2 5: AI1-AI2 6: Max {AI1, AI2} 7: Min {AI1, AI2} 8: X5 pulse input 9: Communication	0	×
F0-03	PID adjustment	Ones place: output frequency 0: Must be the same direction as the set run direction 1: Opposite direction allowed Tens place: integration selection 0: Integral continued when FREQ attains upper/lower limit 1: Integral stopped when FREQ attains upper/lower limit	10	×
F0-04	PID positive and negative adjustment	0: Positive adjustment 1: Negative adjustment	0	×

Param.	Designation	Scope	Factory Default	Attr
F0-05	Filtering time of PID reference	0.0s～60.00s	0.00s	△
F0-06	Filtering time of PID feedback	0.0s～60.00s	0.00s	△
F0-07	Filtering time of PID output	0.0s～60.00s	0.00s	△
F0-08	Proportional gain Kp1	0.0～200.0	50.0	△
F0-09	Integration time Ti1	0.000s～50.000s	0.500s	△
F0-10	Derivative time Td1	0.0s～100.0s	0.000s	△
F0-11	Proportional gain Kp2	0.0～200.0	50.0	△
F0-12	Integration time Ti2	0.000s～50.000s	0.500s	△
F0-13	Derivative time Td2	0.0s～50.000s	0.000s	△
F0-14	PID parameter switch	0: No switch, determined by parameters Kp1, Ti1 and Td1 1: Auto-switched on the basis of input offset (F0-15) 2: Switched by input terminal	0	×
F0-15	Input offset under PID auto switch	0.0%～100.0%	20.0%	△
F0-16	Sampling period T	0.001s～50.000s	0.002s	△
F0-17	PID offset limit	0.0%～100.0%	0.0%	△
F0-18	PID derivative limit	0.0%～100.0%	0.5%	△
F0-19	PID initial value	0.0%～100.0%	0.0%	×
F0-20	PID initial value holding time	0.0s～3600.0s	0.0s	△
F0-21	PID feedback loss detection value	0.0%~100.0% (no detection when set to 0%)	0.0%	△

Param.	Designation	Scope	Factory Default	Attr
F0-22	PID feedback loss detection time	0.0s～30.0s	1.0s	△
F0-23	Cutoff FREQ when opposite to rotary set direction	0.00Hz~b0-08	50.00Hz	△
F0-24	PID computation option	0: No computation in stop status 1: Computation continued in stop status	0	△
Group F1: Multi-step Frequency				
F1-00	FREQ set source of multi-step 0	0: Digital setting F1-02 1: Digital setting b0-02 + control panel ∧/∨ adjustment 2: Digital setting b0-02 + terminal UP/DOWN adjustment 3: AI1 4: AI2 5: AI3 (on extension IO board) 6: AI4 (on extension IO board) 7: X5 pulse input 8: Process PID output 9: Communication	0	×

Param.	Designation	Scope	Factory Default	Attr
F1-01	FREQ set source of multi-step 1	0: Digital setting F1-03 1: Digital setting b0-04 + control panel ∧/∨ adjustment 2: Digital setting b0-04 + terminal UP/DOWN 3: AI1 4: AI2 5: AI3 (on extension IO board) 6: AI4 (on extension IO board) 7: X5 pulse input 8: Process PID output 9: Communication	0	×
F1-02 ～ F1-17	Multi-step FREQ 0-15	Lower limit~upper limit (-100.0%～100.0%) Percentage relative to the upper limit frequency in b0-09	0.0%	△
Group F2: Simple PLC				
F2-00	Simple PLC run mode	Ones place: PLC run mode 0: Stop after a single cycle 1: Continue to run with the last FREQ after a single cycle 2: Cycle repeated Tens place: power loss memory 0: No memory on power loss 1: Memorized on power loss Hundreds place: start mode 0: Run from the first step “multi-step frequency 0”	0000	×

Param.	Designation	Scope	Factory Default	Attr
		1: Continue to run from the step of stop (or fault) 2: Continue to run from the step and FREQ at which the running stopped (or fault occurred) Thousands place: unit of simple PLC run time 0: Second (s) 1: Minute (min)		
F2-01	Setting of multi-step 0	Ones place: FREQ reference 0: Multi-step FREQ 0 (F1-02) 1: AI1 2: AI2 3: AI3 (on extension IO board) 4: AI4 (on extension IO board) 5: X5 pulse input 6: Process PID output 7: Multi-step FREQ 8: Communication Tens place: run direction 0: Forward 1: Reverse 2: Determined by run command Hundreds place: Accel/Decel time 0: Accel/Decel time 1 1: Accel/Decel time 2 2: Accel/Decel time 3 3: Accel/Decel time 4	000	×
F2-02	Run time of step 0	0.0～6000.0 s (min)	0.0s	△

Param.	Designation	Scope	Factory Default	Attr
F2-03	Setting of step 1	Ones place: FREQ reference 0: Multi-step FREQ 1 (F1-03) 1~7: Same as F2-01 Tens place: run direction (same as F2-01) Hundreds place: Accel/Decel time option (same as F2-01)	000	×
F2-04	Run time of step 1	0.0～6000.0 s (min)	0.0s	△
F2-05	Setting of step 2	Ones place: FREQ reference 0: Multi-step FREQ 2 (F1-04) 1~7: Same as F2-01 Tens place: run direction (same as F2-01) Hundreds place: Accel/Decel time option (same as F2-01)	000	×
F2-06	Run time of step 2	0.0～6000.0 s (min)	0.0s	△
F2-07	Setting of step 3	Ones place: FREQ reference 0: Multi-step FREQ 3 (F1-05) 1~7: Same as F2-01 Tens place: run direction (same as F2-01) Hundreds place: Accel/Decel time option (same as F2-01)	000	×
F2-08	Run time of step 3	0.0～6000.0 s (min)	0.0s	△
F2-09	Setting of step 4	Ones place: FREQ reference 0: Multi-step FREQ 4 (F1-06) 1~7: Same as F2-01 Tens place: run direction (same as F2-01)	000	×

Param.	Designation	Scope	Factory Default	Attr
		Hundreds place: Accel/Decel time option (same as F2-01)		
F2-10	Run time of step 4	0.0～6000.0 s (min)	0.0s	△
F2-11	Setting of step 5	Ones place: FREQ reference 0: Multi-step FREQ 5 (F1-07) 1~7: Same as F2-01 Tens place: run direction (same as F2-01) Hundreds place: Accel/Decel time option (same as F2-01)	000	×
F2-12	Run time of step 5	0.0～6000.0 s (min)	0.0s	△
F2-13	Setting of step 6	Ones place: FREQ reference 0: Multi-step FREQ 6 (F1-08) 1~7: Same as F2-01 Tens place: run direction (same as F2-01) Hundreds place: Accel/Decel time option (same as F2-01)	000	×
F2-14	Run time of step 6	0.0～6000.0 s (min)	0.0s	△
F2-15	Setting of step 7	Ones place: FREQ reference 0: Multi-step FREQ 7 (F1-09) 1~7: Same as F2-01 Tens place: run direction (same as F2-01) Hundreds place: Accel/Decel time option (same as F2-01)	000	×
F2-16	Run time of step 7	0.0～6000.0 s (min)	0.0s	△
F2-17	Setting of step 8	Ones place: FREQ reference 0: Multi-step FREQ 8 (F1-10)	000	×

Param.	Designation	Scope	Factory Default	Attr
		1~7: Same as F2-01 Tens place: run direction (same as F2-01) Hundreds place: Accel/Decel time option (same as F2-01)		
F2-18	Run time of step 8	0.0～6000.0 s (min)	0.0s	△
F2-19	Setting of step 9	Ones place: FREQ reference 0: Multi-step FREQ 9 (F1-11) 1~7: Same as F2-01 Tens place: run direction (same as F2-01) Hundreds place: ACC/DEC time option (same as F2-01)	000	×
F2-20	Run time of step 9	0.0～6000.0 s (min)	0.0s	△
F2-21	Setting of step 10	Ones place: FREQ reference 0: multi-step FREQ 10 (F1-12) 1~7: same as F2-01 Tens place: run direction (same as F2-01) Hundreds place: Accel/Decel time option (same as F2-01)	000	×
F2-22	Run time of step 10	0.0～6000.0 s (min)	0.0s	△
F2-23	Setting of step 11	Ones place: FREQ reference 0: Multi-step FREQ 11 (F1-13) 1~7: Same as F2-01 Tens place: run direction (same as F2-01) Hundreds place: Accel/Decel time option (same as F2-01)	000	×

Param.	Designation	Scope	Factory Default	Attr
F2-24	Run time of step 11	0.0～6000.0 s (min)	0.0s	△
F2-25	Setting of step 12	Ones place: FREQ reference 0: Multi-step FREQ 12 (F1-14) 1~7: Same as F2-01 Tens place: run direction (same as F2-01) Hundreds place: Accel/Decel time option (same as F2-01)	000	×
F2-26	Run time of step 12	0.0～6000.0 s (min)	0.0s	△
F2-27	Setting of step 13	Ones place: FREQ reference 0: Multi-step FREQ 13 (F1-15) 1~7: Same as F2-01 Tens place: run direction (same as F2-01) Hundreds place: Accel/Decel time option (same as F2-01)	000	×
F2-28	Run time of step 13	0.0～6000.0 s (min)	0.0s	△
F2-29	Setting of step 14	Ones place: FREQ reference 0: Multi-step FREQ 14 (F1-16) 1~7: Same as F2-01 Tens place: run direction (same as F2-01) Hundreds place: Accel/Decel time option (same as F2-01)	000	×
F2-30	Run time of step 14	0.0～6000.0 s (min)	0.0s	△

Param.	Designation	Scope	Factory Default	Attr
F2-31	Setting of step 15	Ones place: FREQ reference 0: Multi-step FREQ 15 (F1-17) 1~7: Same as F2-01 Tens place: run direction (same as F2-01) Hundreds place: Accel/Decel time option (same as F2-01)	000	×
F2-32	Run time of step 15	0.0～6000.0 s (min)	0.0s	△
Group H: Communication Parameters				
Group H0: MODBUS Communication Parameters				
H0-00	SCI port selection	0: No communication 1: Local 485 port 2: PN/MTP/DEV 3: ECT 4: CAN 5: M3 (After changing communication method, the AC drive should be restarted)	0	×
H0-01	SCI port communication configuration	Ones place: baud rate 0: 4800bps 1: 9600bps 2: 19200bps 3: 38400bps 4: 57600bps 5: 125000bps Tens place: data format 0: 1-8-2-N format, RTU 1: 1-8-1-E format, RTU	0001	×

Param.	Designation	Scope	Factory Default	Attr
		2: 1-8-1-O Format, RTU Hundreds place: connection type 0: Direct cable connection (232/485) 1: MODEM (232) Thousands place: saving method 0: Not saved at power loss 1: Saved at power loss		
H0-02	Local address of 485 port communication	0~247, 0 is broadcast address	1	×
H0-03	Time out detection of 485 port communication	0.0s～1000.0s	0.0s	×
H0-04	Time delay of 485 port communication	0ms～1000ms	0ms	×
H0-05	Master/Slave option	0: PC controls this drive 1: As master 2: As slave	0	×
H0-06	Parameter store address when this drive working as master	0: b0-02 1: F0-01	0	×
H0-07	Proportional factor of received FREQ	0～1000.0	100.0	△
H0-08	485 Automatic reset enable	0: disable 1: enable	0	×

Param.	Designation	Scope	Factory Default	Attr
Group L Keys and Display of Control panel				
Group L0: Keys of Control panel				
L0-00	MF key setting	0: No function 1: Forward jog 2: Reverse jog 3: Forward/reverse switchover 4: Emergency stop 1 (set Decel time by b2-09) 5: Emergency stop 2 (coast to stop) 6: Run command sources shifted	0	△
L0-01	Keys locked option	0: Not locked 1: All locked 2: Keys locked except RUN, STOP/RESET 3: Keys locked except STOP/RESET 4: Keys locked except >>	0	△
L0-02	Function of STOP key	0: STOP key activated only at control panel control 1: STOP key activated under any run command source	0	△

Param.	Designation	Scope	Factory Default	Attr
L0-03	FREQ adjustment through keys ∧/∨	Ones place Bit0:option on ramp to stop 0: zeroing the adjustment value 1: holding the adjustment value Ones place Bit1: option at master & auxiliary frequency reference 0: zeroing the adjustment value 1: holding the adjustment value Tens Place: option on power loss 0: zeroing the adjustment value 1: holding the adjustment value Hundreds Place: integrating option 0: Integrating disabled 1: Integrating enabled Thousands place: run direction 0: Direction changing prohibited 1: Direction changing permitted	0100	△
L0-04	Step size of FREQ adjustment through keys ∧/∨	0.00Hz/s～10.00Hz/s	0.10 Hz/s	△

Param.	Designation	Scope	Factory Default	Attr
Group L1 Control Panel Display Setting				
L1-00	Display parameter setting 1 on run status	Binary system setting: 0: No Display 1: Display Ones place: BIT0: Run FREQ (Hz) BIT1: FREQ reference (Hz) BIT2: Bus voltage (V) BIT3: Output current (A) Tens place: BIT0: Output torque (%) BIT1: Output power (kW) BIT2: Output voltage (V) BIT3: Motor speed (r/min) Hundreds place: BIT0: AI1 (V) BIT1: AI2 (V) BIT2: AI3 (V) BIT3: AI4 (V) Thousands place: BIT0: running FREQ 2 (Hz) BIT1: X5 BIT2: External count value BIT3: Reserved Note: when this parameter is set to 0000, run FREQ (Hz) would be displayed as default	108F	△

Param.	Designation	Scope	Factory Default	Attr
L1-01	Display parameter setting 2 on run status	Binary system setting: 0: No Display 1: Display Ones place: BIT0: Run linear speed (m/s) BIT1: Set linear speed (m/s) BIT2: Input terminal status BIT3: Output terminal status Tens place: BIT0: PID reference (%) BIT1: PID feedback (%) BIT2: Reserved BIT3: Reserved Hundreds place: BIT0: Torque reference (%) BIT1: Reserved BIT2: Reserved BIT3: Reserved Thousands place: reserved BIT1: Reserved BIT2: Reserved BIT3: Reserved	0000	△

Param.	Designation	Scope	Factory Default	Attr
L1-02	Display parameter setting on stop status	Binary system setting: 0: No Display 1: Display Ones place: BIT0: FREQ reference (Hz) BIT1: Bus voltage (V) BIT2: Input terminal status BIT3: Output terminal status Tens place: BIT0: AI1 (V) BIT1: AI2 (V) BIT2: AI3 (V) BIT3: AI4 (V) Hundreds place: BIT0: PID reference (%) BIT1: PID feedback (%) BIT2: Reserved BIT3: Reserved Thousands place: BIT0: Run linear speed (m/s) BIT1: Set linear speed (m/s) BIT2: External count value BIT3: X5 Note: when this function code is set to 0000, the FREQ reference would be displayed as default (Hz)	0003	△
L1-03	Linear speed coeff	0.1~999.9%	100.0%	△

Param.	Designation	Scope	Factory Default	Attr
Group U Monitoring				
Group U0 Status Monitoring				
U0-00	Run frequency	0.00Hz～600.00Hz	0.00Hz	◎
U0-01	Set frequency	0.00Hz～600.00Hz	0.00Hz	◎
U0-02	Bus voltage	0V～65535V	0V	◎
U0-03	Output voltage	0V～65535V	0V	◎
U0-04	Output current	0.0A～6553.5A	0.0A	◎
U0-05	Output torque	-300.0%～300.0%	0.0%	◎
U0-06	Output power	0.0%~300.0%	0.0%	◎
U0-07	Master FREQ reference source	0: Digital setting + adjustment through ∧/∨ on control panel 1: Digital setting + terminal UP/DOWN adjustment 2: Analog input AI1 3: Analog input AI2 4: Analog input AI3 (on extension IO board) 5. Analog input AI4 (on extension IO board) 6: X5 pulse input 7: Process PID output 8: PLC 9: Multi-step FREQ 10: Communication 11: PA/PB input	00	◎

Param.	Designation	Scope	Factory Default	Attr
U0-08	Auxiliary FREQ reference source	0: No set 1: Digital setting + adjustment through ∧/∨ on control panel 2: Digital setting + terminal UP/DOWN adjustment 3: Analog input AI1 4: Analog input AI2 5: Analog input AI3 (on extension IO board) 6: Analog input AI4 (on extension IO board) 7: X5 pulse input 8: Process PID output 9: PLC 10: Multi-step FREQ 11: Communication	00	◎
U0-09	Master FREQ reference	0.00Hz～600.00Hz	0.00Hz	◎
U0-10	Auxiliary FREQ reference	0.00Hz～600.00Hz	0.00Hz	◎
U0-11	Drive status	Ones place: run status 0: Accelerating 1: Decelerating 2: Constant speed running Tens place: drive status 0: Stop 1: Running 2: Autotune	00	◎
U0-12	AI1 input voltage	0.00V～10.00V	0.00V	◎
U0-13	AI2 input voltage	0.00V～10.00V	0.00V	◎

Param.	Designation	Scope	Factory Default	Attr
U0-14	AI3 input voltage (on extension IO board)	0.00V～10.00V	0.00V	◎
U0-15	AI4 input voltage (on extension IO board)	-10.00V～10.00V	0.00V	◎
U0-16	AO1 output	0.0%～100.0%	0.0%	◎
U0-17	AO2 output (on extension IO board)	0.0%～100.0%	0.0%	◎
U0-18	X5 high-frequency pulse input frequency	0.0KHz～50.0KHz	0.0kHz	◎
U0-19	Digital input terminal status	Range: 0000～3FFF Note: 1) 0 means invalid, 1 means valid; 2) bit0~bit13: X1,X2,…,X10,AI1,AI2,AI3,AI4	0000	◎
U0-20	Digital output terminal status	Range: 00～FF Note: 1) 0 means open, 1 means closed; 2) BIT0 ~ Bit7: DO1,DO2,DO3,DO4, HDO Reserved, R1, R2	00	◎
U0-21	PID set	0.0%～100.0%	0.0%	◎
U0-22	PID feedback	0.0%～100.0%	0.0%	◎
U0-23	PID input offset	-100.0%～100.0%	0.0%	◎
U0-24	PLC step	0～15	0	◎
U0-25	V/F separated target voltage	0.0%～ 100.0%	0.0%	◎
U0-26	V/F separated actual output voltage	0.0%～ 100.0%	0.0%	◎
U0-27	Frequency before speed search stop	0～600.00Hz	0.00Hz	◎

Param.	Designation	Scope	Factory Default	Attr
U0-30	Torque reference value	0.0%～300.0%	0.0%	◎
U0-31	Cumulative power-up time	0～65535h	0h	◎
U0-32	Cumulative run time	0～65535h	0h	◎
U0-33	Environment temperature	-40.0℃～200.0℃	0.0℃	◎
U0-34	Inverter bridge temperature	-40.0℃～200.0℃	0.0℃	◎
U0-35	Motor temperature	-40.0℃~200.0℃	0.0℃	◎
U0-36	Terminal count value	0~65535	0	◎
U0-37	Run command log at LoU	0~1	0	◎
U0-38	Fault code log at LoU	0~100	0	◎
U0-39	Code execution time	0~65535	0	◎
U0-40	CtC fault source	0: No fault 1: V phase 2: W phase 3: U phase	0	◎
U0-43	Higher-bit numbers of control panel ∧/∨ stored value	-1～1	0	◎
U0-44	Lower-bit numbers of control panel ∧/∨ stored value	0.00～655.35	0.00Hz	◎
U0-45	Higher-bit numbers of terminal UP/DOWN stored value	-1～1	0	◎

Param.	Designation	Scope	Factory Default	Attr
U0-46	Lower-bit numbers of terminal UP/DOWN stored value	0.00～655.55	0.00Hz	◎
U0-62	Communication status of PN communication board	0～65535	0	◎
U0-64	CPU load rate	0～100.0%	0.0%	◎
U0-65	PG interruption error accumulated	0~65535	0	◎
U0-66	PG interruption cycle	0~65535	0	◎
U0-67	Communication error accumulated of PG board	0~65535	0	◎
Group U1 Fault history				
U1-00	History fault 1 (latest)	0: No fault 1: Accel overcurrent (oC1) 2: Const-speed overcurrent (oC2) 3: Decel overcurrent (oC3) 4: Accel overvoltage (ou1) 5: Const-speed overvoltage (ou2) 6: Decel overvoltage (ou3) 7: Module protection (FAL) 8: Autotune failed (tUN) 9: Drive overloaded (oL1) 10: Motor overloaded (oL2) 11: Current detection circuit failed (CtC) 12: Output ground short-circuit protection (GdP) 13: Input power supply fault (ISF)	0	◎

Param.	Designation	Scope	Factory Default	Attr
		14: Output phase loss (oPL) 15: Inverter module overload protection (oL3) 16: Module (IGBT) thermal protection (oH1) 17: Motor (PTC) thermal protection (oH2) 18: PIM temperature measurement circuit fault (oH3) 19: Encoder disconnected (CLL) 20: STO 1 circuit abnormal (ST1) 21: STO 2 circuit abnormal (ST2) 22: Safety Torque Off (ST0) 23: Extension IO board connection abnormal (I0E) 24: External equipment error (PEr) 25: Consecutive run time set by the agent reached (to1) 26: Consecutive run time attained (to2) 27: Cumulative run time attained (to3) 28: Abnormal power supply at run (SUE) 29: EEPROM read/write fault (EPr) 30: Abnormal contactor (CCL) 31: Abnormal port communication (TrC) 32: Control panel communication abnormal (PdC) 33: Parameter copy failure (CPHDO)		

Param.	Designation	Scope	Factory Default	Attr
		34: Reserved 35: Software version compatibility failure (SFt) 36: Hardware overcurrent fault (oC4) 37: Hardware overvoltage fault (ou4) 38: PG board connection fault (PGE) 39: Reserved 40: AI input out-of-limit (AIP) 41: Undervoltage protection (LoU) 42: Over-speed (oSP) 43: Speed bias is large (SPL) 44: DC inject brake short-circuit fault (bCF) 45: PID feedback lost (PIo) 46: Communication abnormal (CbE) 47: PG board software version abnormal (PGu)		
U1-01	Run FREQ at fault 1	0.00Hz～600.00Hz	0.00Hz	◎
U1-02	Output current at fault 1	0.0A～6553.5A	0.0A	◎
U1-03	Bus voltage at fault 1	0V～10000V	0V	◎
U1-04	Ambient temperature at fault 1	-40.0℃～100.0℃	0.0℃	◎
U1-05	Inverter bridge temperature at fault 1	-40.0℃～100.0℃	0.0℃	◎
U1-06	Input terminal status at fault 1	0000～FFFF	0000	◎

Param.	Designation	Scope	Factory Default	Attr
U1-07	Output terminal status at fault 1	0000～FFFF	0000	◎
U1-08	Cumulative run time at fault 1	0～65535h	0h	◎
U1-09	Code of fault 2	Same as U1-00	0	◎
U1-10	Run FREQ at fault 2	0.00Hz～600.00Hz	0.00Hz	◎
U1-11	Output current at fault 2	0.0A～6553.5A	0.0A	◎
U1-12	Bus voltage w at fault 2	0V～10000V	0V	◎
U1-13	Temperature 1 of heat sink at fault 2	-40.0℃～100.0℃	0.0℃	◎
U1-14	Temperature 2 of heat sink at fault 2	-40.0℃～100.0℃	0.0℃	◎
U1-15	Input terminal status at fault 2	0～FFFF	0000	◎
U1-16	Output terminal status at fault 2	0～FFFF	0000	◎
U1-17	Cumulative run time at fault 2	0～65535h	0h	◎
U1-18	Code of fault 3	Same as U1-00	0	◎
U1-19	Run FREQ at fault 3	0.00Hz～600.00Hz	0.00Hz	◎
U1-20	Output current at fault 3	0.0A～6553.5A	0.0A	◎
U1-21	Bus voltage w at fault 3	0V～10000V	0V	◎
U1-22	Temperature 1 of heat sink at fault 3	-40.0℃～100.0℃	0.0℃	◎

Param.	Designation	Scope	Factory Default	Attr
U1-23	Temperature 2 of heat sink at fault 3	-40.0℃～100.0℃	0.0℃	◎
U1-24	Input terminal status at fault 3	0000～FFFF	0000	◎
U1-25	Output terminal status at fault 3	0000～FFFF	0000	◎
U1-26	Cumulative run time at fault 3	0～65535h	0h	◎
Group U2 Version Information				
U2-00	InvertListNo	0000～0xFFFF	Model dependent	◎
U2-01	SoftVer	0000～0xFFFF	Model dependent	◎
U2-02	SoftNonStandarVer	0000～0xFFFF	Model dependent	◎
U2-03	KeyPadSoftVer	0000～0xFFFF	Model dependent	◎
U2-04	HardWareVer	0000～0xFFFF	Model dependent	◎
U2-05	TypeCodeHigh	0～9999	0	◎
U2-06	TypeCodeLow	0～65535	0	◎
U2-07	FactoryYearMonth	0～65535	0	◎
U2-08	BatchNo	0～65535	0	◎
U2-09	SerialNo	0～65535	0	◎
U2-10	Communication board hardware version	0000～0xFFFF	0	◎
U2-11	PG board software version number	0000～0xFFFF	0	◎
U2-12	PG board dedicated software version number	0000～0xFFFF	0	◎

Param.	Designation	Scope	Factory Default	Attr
U2-13	I/O board hardware version	0000～0x000F	0	◎
U2-14	I/O board software version	0000～0xFFFF	0	◎
U2-15	Communication board software version number	0000～0xFFFF	0	◎
U2-16	Communication board dedicated software version number	0000～0xFFFF	0	◎

Chapter 6 Troubleshooting

6.1 Fault Causes and Troubleshooting

Once drive fault occurs, please identify the causes of fault carefully and make a detailed record of fault symptom. To seek services, please contact the dealer. Parameters U1-00, U1-09 and U1-18 are used to view the records of fault 1, fault 2 and fault 3. Faults are recorded with numeric codes (1~46), while the fault information that corresponds to each numeric fault code is specified in the table below.

Table of Fault Codes

Fault code	Fault display	Fault description	Causes	Solutions
1	oC1	Accel overcurrent	Torque boost is too big under V/f control	Reduce torque boost value
			Start frequency is too high	Drop start frequency
			Accel time is too short	Prolong the Accel time
			Motor parameters are improperly set	Set the parameters correctly according to motor nameplate
			Overload is too heavy	Reduce the load
			Inappropriate V/f curve under V/f control	Set V/f curve correctly
			Restart the rotating motor	Reduce current limited value or flying start
			Output short circuit (phase-to-phase short circuit or output ground short circuit)	Check motor connection and output ground impedance
2	oC2	Const-speed overcurrent	Overload is too heavy	Reduce the load
			Power rating of the drive is relatively small	Select appropriate drive power rating
			Input voltage is too low	Check power grid voltage
			Output short circuit (phase-to-phase short circuit or output ground short circuit)	Check motor connection and output ground impedance

Fault code	Fault display	Fault description	Causes	Solutions
3	oC3	Decel overcurrent	Load inertia is too big	Use dynamic brake
			Decel time is too short	Prolong the Decel time
			Input voltage is too low	Check power grid voltage
			Output short circuit (phase-to-phase short circuit or output ground short circuit)	Check motor connection and output ground impedance
4	ou1	Accel overvoltage	Load inertia is too big	Use dynamic brake
			Abnormal input volt	Check power grid voltage
			Output short circuit (phase-to-phase short circuit or output ground short circuit)	Check motor connection and output ground impedance
5	ou2	Const-speed overvoltage	Improper parameter setting of regulator under SVC control	Properly set regulator parameters
			Abnormal input voltage	Check power grid voltage
			Load variation is too big	Check the load
			Output short circuit (phase-to-phase short circuit or output ground short circuit)	Check motor connection and output ground impedance
6	ou3	Decel overvoltage	Load inertia is too big	Use dynamic braking
			Decel time is too short	Prolong the Decel time
			Abnormal input voltage	Check power grid voltage
			Improper parameter setting of regulator under SVC control	Properly set regulator parameters
			Output short circuit (phase-to-phase short circuit or output ground short circuit)	Check motor connection and output ground impedance

Fault code	Fault display	Fault description	Causes	Solutions
7	FAL	Module protection	Overvoltage or overcurrent	Refer to the solutions of overvoltage or overcurrent
			Output short circuit (phase-to-phase short circuit or output ground short circuit)	Check motor connection and output ground impedance
			Loose connection of control board	Pull out and reinsert the cables of control board
			Direct connection of inverter module	Seek services
			Control board abnormal	Seek services
			Switching mode power supply (SMPS) failed	Seek services
8	tUN	Autotune failed	Bad motor connection	Check motor connection
			Autotune during rotation of the motor	Autotune in stationary status of the motor
			Big error between real motor parameters and the setting	Set the parameters correctly according to motor nameplate
9	oL1	Drive overloaded	Torque boost is too big under V/f control	Reduce torque boost value
			Start FREQ is too high	Drop start frequency
			Accel/Decel time is too short	Prolong the Accel/Decel time
			Motor parameters are improperly set	Set the parameters correctly according to motor nameplate
			Load is too heavy	Reduce the load
			Inappropriate V/f curve under V/f control	Set V/f curve correctly
			Restart the rotary motor	Reduce current limited value or flying start
			Output short circuit (phase-to-phase short circuit and output ground short circuit)	Check motor connection and output ground impedance

Fault code	Fault display	Fault description	Causes	Solutions
10	oL2	Motor overloaded	Torque boost is too big under V/f control	Reduce torque boost value
			Inappropriate V/f curve under V/f control	Set V/f curve correctly
			Motor parameters are improperly set	Set the parameters correctly according to motor nameplate
			Improper setting of motor overloaded protection time	Properly set the motor overloaded protection time
			Motor stalled or sharp variation of load	Identify the causes of motor stalling or check the load condition
			Long-time running of ordinary motor at low speed with heavy load	Select variable frequency motor
11	CtC	Current detection circuit failed	Abnormal connection between control board and drive board	Check and re-connection
			Abnormal current detection circuit of control board	Seek services
			Abnormal current detection circuit of drive board	Seek services
			Current sensor failed	Seek services
			SMPS failed	Seek services
12	GdP	Output ground short-circuit protection	Output connection ground short circuit	Check motor connection and output ground impedance
			Motor insulation abnormal	Check the motor
			Inverter module abnormal	Seek services
			Output ground leakage current is too big	Seek services

Fault code	Fault display	Fault description	Causes	Solutions
13	ISF	Input power supply fault	Severe voltage imbalance among power supply phases	Check power grid voltage
			Abnormal input wiring of power supply	Check power supply input wiring
			Abnormal bus capacitance	Seek services
14	oPL	Output phase loss	Motor cable connection abnormal	Check motor connection
			Imbalance among motor three phases	Check or replace the motor
			Incorrect setting of vector control parameters	Correctly set vector control parameters
15	oL3	Inverter module overload protection	Overcurrent	Handle it with the methods for overcurrent
			Input power supply abnormal	Check input power grid voltage
			Motor output abnormal	Check the motor or motor connection
			Inverter module abnormal	Seek services
16	oH1	Module (IGBT) thermal protection	Ambient temperature is too high	Drop ambient temperature
			Fan failed	Replace the fan
			Air duct blocked	Clear air duct
			Temperature sensor abnormal	Seek services
			Inverter module mounting abnormal	Seek services
17	oH2	Motor (PTC) thermal protection	Ambient temperature is too high	Drop ambient temperature
			Improper setting of motor thermal protection point	Correctly set motor thermal protection point
			Thermal detection circuit failed	Seek services

Fault code	Fault display	Fault description	Causes	Solutions
18	oH3	PIM temperature measurement circuit fault	Temperature sensor not well connected with socket	Pull out and re-insert
			Ambient temperature is too low	Raise ambient temperature
			Module detection circuit failed	Seek services
			Thermistor failed	Seek services
19	CLL	Encoder disconnected	No signal or lack of signal	Check if encoder is damaged, and/or there is some abnormity with the encoder power supply
			Lines disconnected	Reconnect encoder lines
			Wrong disconnection	Reconnect encoder lines
20	ST1	STO 1 circuit abnormal	Extension board of safety torque circuit damaged	Seek services
			Switch of STO 1 circuit abnormal	Check STO switch
21	ST2	STO 2 circuit abnormal	Extension board of STO circuit damaged	Seek services
			Switch of STO 2 circuit abnormal	Check STO switch
22	STO	Safety Torque Off	Improper connection to the switch of STO	Connect to STO switch after ensuring safety
23	I0E	Extension IO board connection abnormal	Extension IO board damaged	Seek services
			Extension IO board not inserted into the groove properly	Insert the extension IO board again
24	PEr	External equipment error	External fault terminal is enabled	Check the status of external fault terminal
			Stall condition lasts too long	Check if the load is abnormal
25	to1	Consecutive run time set by the agent reached	“Consecutive run time set by the agent reached” enabled	Seek services
26	to2	Consecutive run time	“Consecutive run time attained" enabled	See specification of Group E0

Fault code	Fault display	Fault description	Causes	Solutions
		attained		
27	to3	Cumulative run time attained	“Cumulative run time attained" enabled	See specification of Group E0
28	SUE	Abnormal power supply at run	DC bus voltage fluctuation is too big or the power is lost	Check input power grid voltage and load
29	EPr	EEPROM read/write fault	Parameter read/write abnormal at control board	Seek services
30	CCL	Current detection circuit failed	Power supply voltage abnormal	Check grid power supply voltage
			Abnormal contactor feedback circuit at drive board	Seek services
			Contactor failed	Seek services
			Buffer resistance failed	Seek services
			Abnormal SMPS	Seek services
31	TrC	Abnormal port communication	Improper setting of baud rate	Set properly
			Communication port disconnected	Reconnected
			Upper computer/device does not work	Make upper computer/device work
			Drive communication parameter error	Set properly
32	PdC	Control panel communication abnormal	Control panel disconnected	Reconnected
			Severe EMI	Check peripheral equipment or seek services
33	CPy	Parameter copy failure	Parameter uploading or downloading abnormal	Seek services
			No parameters stored at control panel	Seek services

Fault code	Fault display	Fault description	Causes	Solutions
35	SFt	Software version compatibility failure	Version of control panel is not consistent with that of control board	Seek services
36	oC4	Hardware overcurrent fault	The hardware overcurrent threshold is triggered, the cause is the same as fault 1~3	Solve this issue according to solutions of fault codes 1 to 3
37	ou4	Hardware overvoltage fault	The hardware overvoltage threshold is triggered, the cause is the same as fault 4~6	Solve this issue according to solutions of fault codes 4 to 6
38	PGE	PG board connection fault	PG board damaged	Seek services
			PG board not inserted to the groove properly	Insert the PG board again
			PG board not connected to the closed loop control	Set the control mode properly
40	AIP	AI input out-of-limit	Control board failed	Seek services
			AI input is too high or low	Set AI input within correct range
41	LoU	Undervoltage protection	DC bus voltage is too low	Check input voltage if it is too low or the drive is the process of power loss
42	oSP	Over-speed	Set value of over-speed is too small	Set over-speed value correctly
			Big fluctuation of load	Stabilize the load
			Unreasonable vector control parameter setting	Set correctly
43	SPL	Speed bias is large	Speed bias setting value is too small	Set speed bias reasonably
			Big fluctuation of load	Stabilize the load
			Unreasonable vector control parameter setting	Set correctly

Fault code	Fault display	Fault description	Causes	Solutions
44	bCF	Brake pipe short-circuit fault	DC brake pipe damaged	Seek services
45	Plo	PID feedback lost	Abnormal PID feedback channel abnormal	Check the feedback channel
			Inappropriate setting of PID parameters	Set properly
46	CbE	Communication abnormal	Abnormal communication wire	Reconnect the wire
			Too much interference on site	Check peripheral equipment or seek services
47	PGu	PG board abnormal	PG board software version not match	Seek services
46	CbE	Communication abnormal	Abnormal communication wire	Reconnect the wire
			Too much interference on site	Check peripheral equipment or seek services
47	PGu	PG board abnormal	PG board software version does not match	Seek services

ATTENTION:

When a fault occurs, please identify the causes and seek solutions according the guidance in the table. If the fault fails to be solved, do not apply power to the drive again. Contact the supplier for service in time.

Chapter 7 Maintenance

Ambient temperature, humidity, salt mist, dust, vibration, aging and wear of internal components may result in drive faults. Routine maintenance shall be performed during the use and storage.

ATTENTION:

Please make sure the power supply of the drive has been cut off, and DC bus voltage has discharged to 0V before the maintenance.

7.1 Routine Inspection

Please use the drive in the environment recommended by this manual, and perform routine inspection in accordance with the table below.

Inspection items	Inspection aspects	Inspection methods	Criteria
Operating environment	Temperature	Thermometer	-10℃~40℃
	Humidity	Hygrometer	5%~95%, condensation not allowed
	Dust, oil stains, moisture and water-drop	Visual inspection	No filthy mud, oil stains and water drop
	Vibration	Observation	Smooth running. No abnormal vibration
	Gas	Smell, visual inspection	No peculiar smell and abnormal smoke
Drive	Noise	Listen	No abnormal noise
	Gas	Smell, visual inspection	No peculiar smell and abnormal smoke
	Appearance	Visual inspection	No defect and deformation
	Heat dissipation and temperature rise	Visual inspection	No dust and/or fiber particles in air duct, normal working of fans, normal air speed and volume, no abnormal temperature rise

Inspection items	Inspection aspects	Inspection methods	Criteria
Motor	Thermal status	Smell	No abnormal heating and scorching smell
	Noise	Listen	No abnormal noise
	Vibration	Observe, listen	No abnormal vibration and sound
Run status parameters	Power supply input current	Ammeter	In the range of requirement
	Power supply input voltage	Voltmeter	In the range of requirement
	Drive output current	Ammeter	In the range of requirement
	Drive output voltage	Voltmeter	In the range of requirement
	Temperature	Thermometer	The difference between U0-33 displayed temperature and ambient temperature does not exceed 40℃

7.2 Regular Maintenance

Users should perform regular inspection of the drive every 3~6 months, so as to eliminate the potential faults.

ATTENTION:

Please make sure power supply of the drive has been cut off, and DC bus voltage has been discharged to 0V prior to maintenance. Never leave screws, gaskets, conductors, tools and other metal articles inside the drive. Failure to comply may result in equipment damage. Never modify the interior components of the drive in any condition. Failure to comply may result in equipment damage.

Inspection items	Measures
Check if control terminal screws are loose	Tighten
Check if main circuit terminal screws are loose	Tighten
Check if ground terminal screws are loose	Tighten

Inspection items	Measures
Check if copper bar screws are loose	Tighten
Check if drive mounting screws are loose	Tighten
Check if there are defect on power cables and control cables	Replace the cables
Check if there is dust on circuit board	Clear it up
Check if air duct is blocked	Clear it up
Check if the fan works normally	Replace the fan
Check if the contactor is abnormal	Whether contactor is activated enough and there is abnormal noise, if so, replace the contactor
Check if drive insulation is failed	Test the ground terminal with 500V megameter after all input and output terminals are short-circuited via conductors. Ground test on individual terminals is strictly prohibited since this may cause damage to inverter.
Check if motor insulation is failed	Remove input terminals U/V/W of motor from drive and test the motor alone with 500V megameter. Failure to comply may result in drive failure.
Check if the storage period of the drive is over two years	Carry out power-on test, during which, the voltage should be boosted to rated value gradually using a voltage regulator; be sure to run at no load for more than 5 hours.

7.3 Replacement of Vulnerable Parts

Vulnerable parts of drive include cooling fan, electrolytic capacitor, relay or contactor etc. The service lives of these parts are subject to environment and working conditions. To maintain a favorable operating environment is conducive to improving the service life of parts and components; routine inspection and maintenance also contributes to effective improvement of parts' service life. To prolong the service life of entire drive, the cooling fan, electrolytic capacitor, relay or contactor and other vulnerable parts should be subjected to routine inspection according to the table below. Please replace the abnormal parts (if any) in time.

Vulnerable parts	Service life	Cause of damage	Criteria
Fan	30,000~40,000h	Wear of bearing and aging of blade	Check if fan blades have cracks Check if there is abnormal vibration and noise on working
Electrolytic capacitor	40,000~50,000h	Excessively high ambient temperature and excessively low air pressure result in electrolyte volatilization; aging of electrolyte capacitor	Check if there is liquid leakage Check if safety valve projects Check if capacitance value is out of allowable range Check if insulation resistance is abnormal
Relay/contactor	50,000~100,000 times	Corrosion and dust impairs the contacting effect of contact; excessively frequent contact action	Open/close failure False alarm of CCL fault

7.4 Storage

Storage environment should meet the requirements as set forth in the table below.

Items	Requirements	Recommended storage method and environment
Storage temperature	-40~+70℃	In case of long-term storage, areas with an ambient temperature of less than 30℃ are recommended Avoid the storage in areas where temperature shock may result in condensation and freezing
Storage humidity	5~95%	Product could be sealed with plastic film and desiccant
Storage environment	A space with low vibration and low content of salt where there is no direct exposure to sunlight, dust, no corrosive or flammable gas, oil stain, vapor and water drop	Product could be sealed with plastic film and desiccant

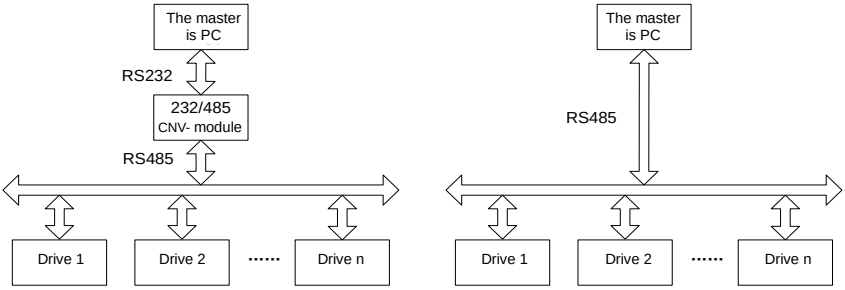
ATTENTION:

Since long-term storage may lead to the deterioration of electrolytic capacitor, the drive must be powered up once in case storage period exceeds half a year. After applying the power, input voltage must be boosted to rated value gradually using a voltage regulator, and be sure to have the inverter operated at no load for more than 5 hours.

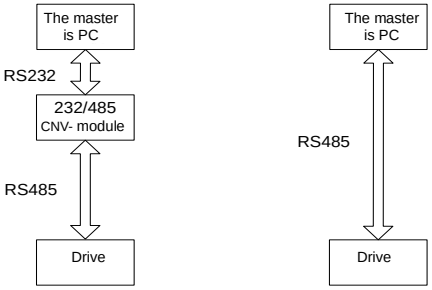
Appendix 1 Communication Protocol

1. Networking Model

The drives have two networking modes, single master/multiple slaves networking and single master/single slave networking.



Single master/multiple slaves networking diagram



Single master/single slave networking diagram

2. Interface Mode

RS485 or RS232 interface: asynchronous, half-duplex. Default data format: 8-N-2 (8 data bits, no check, two stop bits), 9600 bps. See parameters of Group H0 for parameter setting.

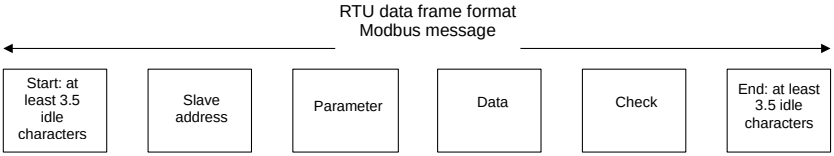
3. Communication Mode

1) Drive is used as a slave for master-slave station-to-station communication. When master sends commands using broadcast address, the slave does not respond;

2) Native address, baud rate and data format of inverter are set through slave operating panel or serial communication;
3) Slave reports the current fault information in the latest response frame for master polling;
4) Please refer to Chapter 3 about the explanation of communication extension board for the communication interface.

4. Protocol Format

Modbus protocol supports RTU.
RTU data frame format is shown as the figure below:



RTU:
In RTU mode, idle time between frames can be set through function code or comply with Modbus internal convention, for which the minimum inter-frame idle is as follows:

1) Frame header and end define the frame by making bus idle time equal to or longer than 3.5-byte time;
2) After the start of frame, the clearance between characters must be less than 1.5-character communication time, or the newly received characters will be treated as the header of the new frame;
3) Data check employs CRC-16 and the whole information participates in the check; the high and low bytes of check sum shall be sent after exchange. Please refer to examples at the end of protocol for details of CRC check;
4) The bus idle time of at least 3.5 characters (or set minimum bus idle time) shall be maintained between frames and needs not to accumulate the starting and ending idle time.

The data frame of which the request frame is "reading parameter value of b0-02 from slave 0x01" is as below:

Appendix Table 1

Address	Function code	Register address	Read words	Check sum
01	03	02 02	00 01	24 72

Response frame of slave 0x01 is as below:

Appendix Table 2

Address	Function code	Register address	Read words	Check sum
01	03	02	13 88	B5 12

5. Protocol Function

The uppermost function of Modbus is to read and write parameters, and different parameters determine different operation requests. Parameters operations supported by inverter Modbus protocol are as shown in the table below:

Appendix Table 3 Parameters

Parameter	Meaning of parameter
0x03	Read drive functional parameters and run status parameters
0x06	Over-write individual drive functional parameters or control parameters, which are not saved on power loss
0x08	Line diagnosis
0x10	Over-write multiple drive functional parameters or control parameters, which are not saved on power loss
0x41	Write individual drive functional parameters or control parameters, and save them to non-volatile storage unit
0x42	Parameter management

Functional parameters, control parameters and status parameters of the drive are all mapped to read-write register of Modbus. Read-write characteristics and range of parameters comply with the instructions of user manual of the drive. Group numbers of drive parameters are mapped as high byte of register address, while in-group indexes are mapped as low byte of register address. Drive control parameters and status parameters are all virtualized as drive parameter groups. The corresponding relations between parameter group numbers and their high bytes of register address are as shown in table below:

Appendix Table 4 High-byte register addresses mapped from parameter group numbers

Parameter group	Mapping register address, high byte	Parameter group	Mapping register address, high byte
A0	0x00	E2	0x12
A1	0x01	F0	0x13
b0	0x02	F1	0x14

Parameter group	Mapping register address, high byte	Parameter group	Mapping register address, high byte
b1	0x03	F2	0x15
b2	0x04	F3	0x16
C0	0x05	F4	0x17
C1	0x06	F5	0x18
C2	0x07	F6	0x19
C3	0x08	H0	0x1A
C4	0x09	H1	0x1B
d0	0x0A	H2	0x1C
d1	0x0B	L0	0x1D
d2	0x0C	L1	0x1E
d3	0x0D	U0	0x1F
d4	0x0E	U1	0x20
d5	0x0F	U2	0x21
E0	0x10	Drive control parameter group	0x62
E1	0x11	Drive status parameter group	0x63

For example, the register address of drive parameter b0-02 is 0x0202 while that of E0-07 is 0x1107.

In the following paragraphs, we present the formats and meanings of Modbus protocol parameters and data portion hereafter, i.e. to introduce the "parameter" and "data" related contents in above-noted data frame format. These two parts constitute the application layer protocol data unit of Modbus. The application layer protocol data unit mentioned below refers to these two parts. We take RTU mode for example to describe frame format below.

Application layer protocol data units of various parameters are as follows:
Parameter 0x03: read register content
Request format is shown in appendix table 5.

Appendix Table 5

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x03
Register address	2	0x0000~0xFFFF
Number of registers	12	0x0001~0x000C

Check	LRC or CRC	

Response format is shown in appendix table 6.

Appendix Table 6

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x03
Number of read bytes	1	2* number of registers
Register content	2* number of registers	
Check	LRC or CRC	

Parameter 0x06(0x41): write register content (0x41 saved at power loss)
Request format is shown in appendix table 7.

Appendix Table 7

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x06
Register address	2	0x0000~0xFFFF
Register content	2	0x0000~0xFFFF
Check	LRC or CRC	

Response format is shown in appendix table 8.

Appendix Table 8

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x06
Register address	2	0x0000~0xFFFF
Register content	2	0x0000~0xFFFF
Check	LRC or CRC	

Some parameters of the drive are reserved and cannot be modified by communication setting.

The list of these parameters is shown in appendix table 9.

Appendix Table 9

	Parameters	Remarks
(Autotune)	d0-22 d3-22	Communication not operable
(Parameter passing)	A0-05	Communication not operable
(User password)	A0-00	User password can not be set by communication, but the user password set by control panel can be unlocked by writing the same password from upper computer/device communication. Upper computer/device can view and modify parameters.

Parameter 0x08: communication line diagnosis.

Request format is shown in appendix table 10.

Appendix Table 10

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x08
Sub-parameter	2	0x0000~0x0030
Data	2	0x0000~0xFFFF
Check	LRC or CRC	

Response format is shown in appendix table 11.

Appendix Table 11

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x08
Sub-parameter	2	0x0000~0x0030
Data	2	0x0000~0xFFFF
Check	LRC or CRC	

Sub-parameters supported by line diagnosis are as set forth in the table below.

Appendix Table 12 Line diagnosis sub-parameter

Sub-PARA	Data (request)	Data (response)	Meaning of subfunction
0x0001	0x0000	0x0000	Reinitialize communication: make no-response mode disable.
	0xFF00	0xFF00	Reinitialize communication: make no-response mode disable.
0x0003	“New frame end” 00	“New frame end” 00	Set the frame end of ASCII mode and this "new frame end" will replace the original line feed symbol.(Note: new frame end shall not be greater than 0x7F and shall not be equal to 0x3A)
0x0004	0x0000	No response	Set no-response mode. Only response to reinitialization communication request. This is mainly used for isolating faulty equipment.
0x0030	0x0000	0x0000	Make slave no-response to invalid command and error command
	0x0001	0x0001	Make slave response to invalid command and error command

Parameter 0x10: write parameters continuously

Request format is shown in appendix table 13.

Appendix Table 13

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x10
Register address	2	0x0000~0xFFFF
Number of registers	2	0x0001~0x0004
Number of bytes of register content	1	2* number of operation registers
Register content	2* number of operation registers	
Check	LRC or CRC	

Response format is shown in appendix table 14.

Appendix Table 14

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x10
Register address	2	0x0000~0xFFFF
Number of registers	2	0x0001~0x0004
Check	LRC or CRC	

Parameter 0x42: parameter management

Request format is shown in appendix table 15.

Appendix Table 15

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x42
Sub-parameter	2	0x0000~0x0007
Data	2 (high byte is parameter group number, while low byte is parameter in-group index)	
Check	LRC or CRC	

Response format is shown in appendix table 16.

Appendix Table 16

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x42
Sub-parameter	2	0x0000~0x0007
Data	2	0x0000~0xFFFF
Check	LRC or CRC	

Sub-parameters supported by parameter management are set forth in the table 17.

Appendix Table 17 Parameter management sub-parameters

Sub-PARA	Data (request)	Data (response)	Meaning of sub-function
0x0000	Parameter group number and in-group index respectively possess high and low bytes	Upper limit of parameter	Read the upper limit of parameter
0x0001	Parameter group number and in-group index respectively possess high and low bytes	Lower limit of parameter	Read the lower limit of parameter
0x0002	Parameter group number and in-group index respectively possess high and low bytes	See specification below for details of parameter characteristics	Read the characteristics of parameter
0x0003	Parameter group number possesses high byte, while the lower byte is 0.	Maximum value of in-group index	Read the maximum value of in-group index
0x0004	Parameter group number possesses high byte, while the lower byte is 0.	The next parameter group number possesses high byte, while the lower byte is 0.	Read the next parameter group number
0x0005	Parameter group number possesses high byte, while the lower byte is 0.	The previous parameter group number possesses high byte, while the lower byte is 0.	Read the previous parameter group number

Status parameter group should not be modified and does not support the reading of upper and lower limits. Parameter characteristic is 2-byte long, and the bit definition is shown in the table below:

Appendix Table 18 Parameter characteristics

Characteristic parameter (BIT)	Value	Meaning
BIT1~BIT0	00B	Changeable in run
	01B	Not changeable in run, but changeable in stop
	10B	Read only
	11B	Factory parameters
BIT4~BIT2	000B	Accuracy: 1
	001B	Accuracy: 0.1
	010B	Accuracy: 0.01
	011B	Accuracy: 0.001
	100B	Accuracy: 0.0001
	Others	Reserved
BIT7~BIT5	000B	The unit is A
	001B	The unit is Hz
	010B	The unit is Ω
	011B	The unit is r/min
	100B	The unit is S
	101B	The unit is V
	110B	The unit is %
	111B	No unit
BIT8	0: decimal; 1: hexadecimal	Display format
BIT9	0: non-quick menu; 1: quick menu	Quick menu or not
BIT10	0: not uploaded; 1: uploaded	Uploaded to control panel or not
BIT13~BIT11	001B	Data width: 1
	010B	Data width: 2
	011B	Data width: 3
	100B	Data width: 4
	101B	Data width: 5
	110B	Data width: 6
	111B	Data width: 7
BIT14	Number of symbols available/not available	0: unsigned number; 1: directed number
BIT15	Reserved	Reserved

The response format is shown as table 19 when an error occurs.

Appendix Table 19

Application layer protocol data unit	Data length (number of bytes)	Range
Parameter	1	0x80 + parameter
Error code	1	
Check	LRC or CRC	

Error codes supported by Modbus protocol are listed in the table below:

Appendix Table 20 Error codes

Error codes	Meanings of error codes
0x01	Illegal parameter
0x02	Illegal register address
0x03	Data error, i.e. data are out of upper limit or lower limit
0x04	Slave operation failed, including errors caused by invalid data although there are in the range
0x05	Command is valid and being processed, mainly used for storing data to non-volatile storage
0x06	Slave is busy, please try again later; mainly used for storing data into non-volatile storage
0x18	Message frame error: including message length error and check error
0x20	Parameter is not changeable
0x21	Parameter is not changeable during the running
0x22	Parameter is under password protection

Drive control parameters are used for start, stop and run frequency setting. By detecting drive status parameters, run status and run mode can be obtained. Drive control parameters and status parameters are shown in appendix table 21.

Appendix Table 21 Control parameters

Register address	Parameter name	Save at power loss
0x6200	Control command word	No
0x6201	Master frequency setting	Yes
0x6202	Auxiliary frequency setting	Yes
0x6203	Master frequency reference	No
0x6204	Auxiliary frequency reference	No

Register address	Parameter name	Save at power loss
0x6205	Multi-step frequency reference	No
0x6206	Simple PLC frequency reference	No
0x6207	PID digital setting percentage (0~100.0%)	No
0x6208	PID feedback percentage (0~100.0%)	No
0x6209	Driven torque limit (0~200.0%)	No
0x620A	Brake torque limit (0~200.0%)	No
0x620B	Torque setting (-200.0% to 200.0%)	No
0x620C	Torque control forward speed limit (0 to 200.0%)	No
0x620D	Torque control reverse speed limit (0 to 200.0%)	No
0x620E	Analog AO1 source setting	No
0x620F	Analog AO2 source setting	No
0x6210	Digital DO output source setting	No
0x6211	Setting of slave frequency setting proportion (0~100.0%)	No
0x6212	Virtual terminal communication reference	No
0x6213	Accel time 1	Yes
0x6214	Decel time 1	Yes

Appendix Table 22 Status parameters

Register address	Parameter name
0x6300	Run status word 1
0x6301	Current run frequency
0x6302	Output current
0x6303	Output voltage
0x6304	Output power
0x6305	Rotary speed
0x6306	Bus voltage
0x6307	Output torque
0x6308	External counter
0x6309	High-bit words of actual length

Register address	Parameter name
0x630A	Low-bit words of actual length
0x630B	Status of digital input terminal
0x630C	Status of digital output terminal
0x630D	Setting of run frequency
0x630E	PID setting
0x630F	PID feedback
0x6310	Set Accel time 1
0x6311	Set Decel time 1
0x6312	AI1 (Unit:0.01V) (Range: 0.00V-10.00V)
0x6313	AI2 (Unit:0.01V) (Range: 0.00V-10.00V)
0x6314	AI3 (Unit:0.01V) (Range: 0.00V-10.00V)
0x6315	AI4 (Unit:0.01V) (Range: -10.00V-10.00V)
0x6316	X5 (unit: kHz)
0x6317	Fault 1 (the latest)
0x6318	Fault 2
0x6319	Fault 3
0x631A	Run display parameter
0x631B	Stop display parameter
0x631C	Setting of drive control mode
0x631D	Frequency reference mode
0x631E	Master frequency reference
0x631F	Digital setting of master frequency reference
0x6320	Auxiliary frequency reference
0x6321	Digital setting of auxiliary frequency reference
0x6322	Drive status word 2
0x6323	Current drive fault

Drive control bits are defined as below table 23.

Appendix Table 23 Control bits

Control bit	Value	Meaning	Function description
BIT0	0	Run command disabled	Stop the drive
	1	Run command enabled	Start the drive
BIT1	1	Reverse	

Control bit	Value	Meaning	Function description
	0	Forward	Set the run direction when run command enabled
BIT2	1	Jog	
	0	Jog disabled	
BIT3	1	Reset command enabled	
	0	Reset command disabled	
BIT4	1	Coast to stop enabled	
	0	Coast to stop disabled	
BIT15~BIT5	000000B	Reserved	

ATTENTION:

When BIT0 and BIT2 coexist, jog takes precedence.

Drive status bits are shown in appendix table 24.

Appendix Table 24 Status word 1 bits

Status bit	Value	Meaning	Remarks
BIT0	1	Run	
	0	Stop	
BIT1	1	Reverse	
	0	Forward	
BIT3~BIT2	00B	Constant speed	
	01B	Accel	
	10B	Decel	
BIT4	0	Main setting not attained	
	1	Main setting attained	
BIT7~BIT5	Reserved		
BIT15~BIT8	0x00~0xFF	Fault code	0: drive normal. Non-0: drive at fault; Refer to relative specification of the fault codes in Chapter 7 in this user manual

Appendix Table 25 Status word 2 bits

Status bit	Value	Meaning	Remarks
BIT0	1	Jog	
	0	Non-jog	
BIT1	1	PID run	
	0	Non-PID run	
BIT2	1	PLC run	
	0	Non-PLC run	
BIT3	1	Run at multi-step frequency	
	0	Run at non-multi step frequency	
BIT4	1	Ordinary run	
	0	Non-ordinary run	
BIT5	1	Wobble frequency	
	0	Non-wobble frequency	
BIT6	1	Undervoltage	
	0	Normal voltage	
BIT7	1	Sensor-less vector control	
	0	Non-sensor-less vector control	
BIT8	1	Reserved	
	0	Reserved	
BIT9	1	Reserved	
	0	Reserved	
BIT10	1	Autotune	
	0	Non-autotune	
Others	0	Reserved	

6. Operation Instructions

0x03 reads multiple (including one) registers (default address is 0x01). Master enquiry:

Appendix Table 26

Address	Parameter	Register address	Number of registers	Check code
01	03	XX XX	000X	XX XX

Slave response:

Appendix Table 27

Address	Parameter	Total number of bytes	Data	Check code
01	03	2* number of registers	Bn~B0	XX XX

Register address: 0x00 00~0x63 22;

Number of registers: 0x00 01~0x00 0C;

Data: n is equal to (2 x the number of registers -1).

Application example:

Note: before using communication controlling drive, please check if hardware is properly connected; in addition, be sure to properly set the communication data format, baud rate and address.

Parameter 0x03 is used here to read values of 0x01 slave's control parameters b0-00, b0-01, b0-02 and b0-03. At this moment, b0-00 = 0, b0-01 = 0, b0-02 = 50.00, b0-03 = 0.

Appendix Table 28

	Address	PARAM	Register address	Number of registers	Number of data bytes	Data	Check sum
Request	01	03	02 00	00 04	None	None	44 B1
Response	01	03	None	None	08	0000,0000, 1388, 000B	11 79

Management of parameter 42H

Master enquiry:

Appendix Table 29

Address	Parameter	Sub-parameter	Data	Check code
01	42	XX XX	XX XX	XX XX

Slave response:

Appendix Table 30

Address	Parameter	Sub-parameter	Data	Check code
01	42	XX XX	B1~B0	XX XX

Register address: 0x00 00~0x21 06 and 0x62 00~0x63 22.
Sub-parameter: refer to the table of parameter managing sub-parameter.
Data: refer to the values of data as set forth in the table of parameter managing sub-parameter.
Example:
Parameter 0x42 is used here to read the upper limit value of 0x01 slave's control parameter b0-02 which is 600.00:

Appendix Table 31

	Address	Parameter	Sub-PARA	Data	Check sum
Request	01	42	00 00	02 02	F9 64
Response	01	42	00 00	EA 60	36 8D

0x06 (0x41 data storage) writes that individual parameter data is not saved.
Master enquiry:

Appendix Table 32

Address	Parameter	Register address	Data	Check code
01	06	62 00	B1 B0	XX XX

Slave response:

Appendix Table 33

Address	Parameter	Register address	Data	Check code
01	06	62 00	B1 B0	XX XX

Example:
Parameter 0x06 is used here to write 0x01 slave's control command (forward), i.e. to write 1 to register address 0x6200:

Appendix Table 34

	Address	Parameter	Register address	Number of registers	Number of data bytes	Data	Check sum
Request	01	06	62 00	None	None	00 01	57 B2
Response	01	06	62 00	None	None	00 01	57 B2

10H writes that the data of multiple registers are not saved.
Master enquiry:

Appendix Table 35

Address	Parameter	Register address	Number of registers	Number of data bytes	Data	Check code
01	10	XX XX	0001~0004	Number of 2* registers	XX XX	XX XX

Slave response:

Appendix Table 36

Address	Parameter	Register address	Number of registers	Check code
01	10	XX XX	Number of 2* registers	XX XX

Register address: 0x00 00~0x1E 04, 0x62 00~0x62 14
Number of registers: 0x00 01~0x00 04
Number of data bytes: 0x02~0x08
Data: n is equal to (2 x the number of registers -1).

Example:
Parameter 0x10 is used here to write the corresponding write data 1, 6 and 0 in control registers 0x6200, 0x6201 and 0x6202 of slave 0x01:

Appendix Table 37

	Address	Parameter	Register address	Number of registers	Number of data bytes	Data	Check sum
Request	01	10	62 00	00 03	06	0001,0006,0000	CE F8
Response	01	10	62 00	00 03	None	None	9F B0

0x08: communication line diagnosis
Master enquiry:

Appendix Table 38

Address	Parameter	Sub-parameter	Data	Check code
01	08	XX XX	XX XX	XX XX

Slave response:

Appendix Table 39

Address	Function code	Subfunction code	Data	Check code
01	08	XX XX	Bn~B0	XX XX

Sub-parameter: table of line diagnosis sub-parameter.

Example:
Parameter 0x08 is used here to set the communication no-response mode of 0x01 slave:

Appendix Table 40

	Address	Parameter	Sub-PARA	Data	Check sum
Request	01	08	00 04	00 00	A1 CA
Response	01	08	00 04	00 00	A1 CA

Read error or warning
In case illegal parameter, illegal register address, data errors and other anomalies are detected during communication, slave response communication anomaly will occur. In such a case, the slave response will be in the following formats:
Slave response:

Appendix Table 41

Address	Parameter	Data	Check code
01	0x80+parameter	Error code	XX XX

Example:
Parameter 0x10 is used here to write the corresponding write data 1, 11, 4 and 100.00 in control registers 0x6200, 0x6201, 0x6202 and 0x6203 of 0x01 slave:

Appendix Table 42

	Address	Parameter	Register address	Number of registers	Number of data bytes	Data	Check sum
Request	01	10	62 00	00 04	08	0001,000B 0004 2710	DE 64
Response	01	90	None	None	None	20	0C 01

7. LRC/CRC Generation

In consideration of the demand for speed improvement, CRC-16 is usually realized in form mode. C-language source codes for realization of CRC-16 are given below. Please note that the high and low bytes have been exchanged in final result, that is to say, the result is the CRC check sum to be sent:

```
/* The function of CRC16*/
Uint16 CRC16(const Uint16 *data, Uint16 len)
{
    Uint16 crcValue = 0xffff;
    Uint16 i;
    while (len--)
    {
        crcValue ^= *data++;
        for (i = 0; i <= 7; i++)
        {
            if (crcValue & 0x0001)
            {
                crcValue = (crcValue >> 1) ^ 0xa001;
            }
            else
            {
                crcValue = crcValue >> 1;
            }
        }
    }
    return (crcValue);
}
```

Appendix 2 Option Board Information

(Refer to user manuals of each option board for details.)

Type	Name	Description
Default IO board	EPC-TM31	5 digital inputs (one of which supports high-speed input); 2 analog inputs; 2 digital outputs (one of which supports high -speed output); 1 analog output; 1 relay output
Extension IO board	EPC-TM32	5 digital inputs; 2 analog inputs; 2 STO inputs; 1 leakage current detection input; 3 digital outputs; 1 analog output; 1 relay output
	EPC-TM33	Three-phase voltage detection; 1 bus current detection; 1 temperature detection
	EPC-TM34	2 differential battery voltage detections; 1 bus current detection; 1 temperature detection
	EPC-TM36	4 digital inputs; 1 analog input; 2 STO inputs; 3 digital outputs; 1 analog output; 1 relay output;

		1 CAN communication
	EPC-TM37	24V expansion power; 1 digital input; 2 STO inputs; 1 relay output
Communication board	EPC-CM31A	485 communication board-dual RJ45 interface-compatible with GK610 pin definition
	EPC-CM31B	485 communication board-3 PIN terminal block
	EPC-CM32	CAN communication board-dual RJ45 interface
	EPC-CM32A	CAN communication board-3 PIN terminal block
	EPC-CM33	MIII communication board-dual RJ45 interface
	EPC-CM34	EtherCAT communication board-dual RJ45 interface
	EPC-CM35	Profinet communication board-dual RJ45 interface
	EPC-CM36	CANopen communication board-dual RJ45 interface
	EPC-CM37	PROFIBUS-DP communication board- DB9 interface
	EPC-CM39	Modbus_Tcp communication board- dual RJ45 interface
Encoder option board	EPC-PG31	Non-isolated dual closed-loop PG board, supports: 2 differential A/B/Z signal inputs; 1 differential PA/PB pulse reference; 1 A/B/Z differential division frequency output; 1 motor temperature sampling; can directly support UVW encoder, with a maximum input 2MHz. Dual-port D-sub connectors are adopted.

	EPC-PG32	Single-channel isolated PG board, supports: 1 differential A/B/Z input; 1 differential PA/PB pulse reference; 1 A/B/Z open collector division frequency output; 1 motor temperature sampling; Maximum input: 500kHz. Dual-port D-sub connectors are adopted.
	EPC-PG32A	Single-channel isolated PG board, supports: 1 12V digital A/B/Z input; 1 24V digital PA/PB pulse reference; 1 A/B/Z open collector division frequency output; 1 motor temperature sampling; Maximum input: 500kHz. Dual-port D-sub connectors are adopted.
	EPC-PG32B	Single-channel isolated PG board, supports: 1 differential A/B/Z input; 1 24V digital PA/PB pulse reference; 1 A/B/Z open collector division frequency output; 1 motor temperature sampling; Maximum input: 500kHz. Dual-port D-sub connectors are adopted.
	EPC-PG33	Rotary decoding PG board, supports: 1 rotary decoding; 1 differential PA/PB pulse reference; 1 A/B/Z open collector division frequency output or 1 A/B/Z differential division frequency output; 1 motor temperature sampling; Maximum input: 300kHz. Dual-port D-sub connectors are adopted.

	EPC-PG34	SINCOS decoding board, supports: 1 SINCOS decoding; 1 differential PA/PB pulse reference; 1 A/B/Z differential division frequency output; 1 motor temperature sampling; Dual-port D-sub connectors are adopted.
	EPC-PG35	Absolute encoder board, supports protocol formats such as SSI, ENDAT, BISS and so on. Dual-port D-sub connectors are adopted.
	EPC-PG36	Single-channel isolated PG board, supports: 1 differential A/B/Z signal input; 1 differential PA/PB pulse reference; 1 A/B/Z differential division frequency output; Maximum input: 500kHz; 18-pin terminal blocks are adopted, replacing PG39 Dual-port D-sub connectors.
	EPC-PG37A	Single-channel isolated PG board, supports: 1 12V digital A/B/Z input; 1 12V digital PA/PB pulse reference; 1 A/B/Z open collector division frequency output; 1 motor temperature sampling; Maximum input: 500kHZ; 18-pin terminal blocks are adopted, replacing PG32A Dual-port D-sub connectors.
	EPC-PG37B	Single-channel isolated PG board, supports: 1 differential A/B/Z input; 1 24V digital PA/PB pulse reference; 1 A/B/Z open collector division frequency output; 1 motor temperature sampling; Maximum input: 500kHz;

		18-pin terminal blocks are adopted, replacing PG32B Dual-port D-sub connectors.
	EPC-PG39	Single-channel isolated PG board, supports: 1 differential A/B/Z input; 1 differential PA/PB pulse reference; 1 A/B/Z differential frequency division output; 1 motor temperature sampling; Maximum input: 500kHz; Dual-port D-sub connectors are adopted, replacing PG31 in single closed-loop applications.