

# FT50 series General Purpose Frequency Converter User Manual



A&TS TECHNOLOGY CORPORATION LIMITED

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# 1 Fundamental Safety Instructions

**CAUTION**

To have a thorough understanding, please read this manual carefully and follow all the safety instructions and warning before moving, installing, operating and maintaining the frequency converter. Make sure the warning sign is placed in the conspicuous position.

This manual provides guidance on safety precautions, product specifications, installation and wiring, keyboard operation, parameter settings, alarms, trouble-shooting, routine maintenance etc. It doesn't include all the security matters or considerations.

All the local laws, regulations, and codes of practice should be obeyed first, besides the instructions in the manual.

For any injury or loss caused by improper operation, the A&TS technology will not take the responsibility. The A&TS technology is not legally bound in any manner either.

## Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described.

Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

## 1.1 Alarm Sign and Description

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger. If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Dangers might not be recognized if warning labels are missing or illegible. Unrecognized dangers may cause accidents resulting in serious injury or death.

- ◆ Check that the warning labels are complete based on the documentation.
- ◆ Attach any missing warning labels to the components, where necessary in the national language.
- ◆ Replace illegible warning labels.

**DANGER**

The danger sign indicates that death or severe personal injury **will** result if proper precautions are not taken.

**WARNING**

The warning sign indicates that death or severe personal injury **may** result if proper precautions are not taken.

**CAUTION**

The caution sign indicates that minor or moderate personal injury **can** result if proper precautions are not taken.

**NOTICE**

The notice sign indicates that property damage **can** result if proper precautions are not taken.

**PROMPT**

The prompt sign indicates that undesirable results or conditions **may** occur if the user does not pay attention to the prompt message.

**EXPLICATION**

The explication sign indicates the important information about the product, and the parts in bold are points that require special attention.


**Qualified Personnel**

The product/system described in this documentation may be operated only by personnel qualified for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions.

Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems. And he/she should also be trained in first aid.



- ◆ PE: Protective Earthing by the grounding conductor. The cross-sectional size of the grounding conductor should be able to ensure that the voltage of the earth point does not exceed 50 volts when the PE ground point is short connected to the ground bus. Usually, this point is used for the earth point of the frequency converter.

- ◆  – The earth point. The voltage reference of the earth point can reach the same as the ground voltage. Usually, this point is used to ground the motor.

## 1.2 Safety Instructions

When working with FT50 series frequency converter and related systems, the **Warning**, **Caution**, **Notice** and **Prompt** listed in this section are usually involved.

The special **Warning**, **Caution**, **Notice** and **Prompt** are suitable for special operations. They are placed at the beginning of the related chapter, and repeated or supplemented where necessary in the chapter.

Please read these **Warning**, **Caution**, **Notice** and **Prompt** carefully. They provide you with guidelines for the protection of personal safety and help to extend the service life of the FT50 series frequency converter and the equipment connected to it.

Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.



### WARNING

- ◆ This equipment carries dangerous voltage, and it controls potentially dangerous rotating parts. If you do not follow the Warning regulations, or do not operate in accordance with the requirements of this manual, it may cause death, serious personal injury or major property damage.
- ◆ **Only qualified professionals are allowed to operate this equipment**, and before using the equipment, be familiar with all the safety instructions and regulations on installation, operation and maintenance in this manual.
- ◆ **Pay attention to the risk of electric shock**. Even if the power supply has been cut off, there is still dangerous voltage on the DC circuit capacitor of the frequency converter. Therefore, **it is only allowed to open the device 10 minutes later after the power supply is turned off**.
- ◆ Even when the frequency converter is not working, the following terminals may carry dangerous voltage:
  - Power supply terminal R, S, T
  - Motor connection terminal U, V, W
  - Depends on the frame size, terminal +, -, BR



### CAUTION

- ◆ Prevent children and the public from touching or approaching this device.
- ◆ This equipment can only be used for the purpose specified by the manufacturer. Unauthorized modification or use parts and accessories not sold or recommended by the manufacturer of this equipment may cause fire, electric shock and other injuries.

**PROMPT**

- ◆ Please put this manual in an easy-to-find place near the frequency converter to ensure that it is convenient for all users.
- ◆ Before installing and debugging the frequency converter, please read these safety rules and warnings carefully, as well as all warning signs on the equipment. Ensure that warning signs are placed in a prominent place, and replace signs that have fallen off or are damaged.

**About transportation and storage****CAUTION**

- ◆ During transportation and storage, it is necessary to ensure that the frequency converter is not subjected to physical shock or vibration, and it must be protected from rain and not placed in a place where the ambient temperature is too high.

**About commissioning****WARNING**

- ◆ The input power cord can only be permanently tightly connected. The equipment must be grounded (in accordance with IEC 536 Class 1, NEC and other applicable standards).
- ◆ Even when the frequency converter is not working, the following terminals may carry dangerous voltage:
  - Power supply terminal R, S, T
  - Motor connection terminal U, V, W
  - Depends on the frame size, terminal +, -, BR
- ◆ This equipment cannot be used as an emergency shutdown device. (refer to EN 60204, 9.2.5.4)

**CAUTION**

- ◆ The power cables, motor cables and control cables connected to the frequency converter must be connected in a standardized manner to avoid inductive and capacitive interference caused by the frequency converter.

**About operation****WARNING**

- ◆ FT50 series frequency converter operates under high voltage.
- ◆ Dangerous voltage exists on some parts of the electrical equipment during operation.
- ◆ According to the EN60204/IEC204 (VDE0113), the emergency shutdown device must maintain controllability in all working modes of the control equipment. No matter how the emergency shutdown device stops operating, it cannot cause uncontrollable or unexpected restarts.
- ◆ No matter where the fault occurs in the control equipment, it may cause major





equipment damage or even serious personal injury (that is, there is a potentially dangerous failure). Therefore, additional external precautions must be taken or additional devices used to ensure safe operation must be installed, even when a failure occurs (for example, install the independent current limit switch, mechanical interlock, etc.)

- ◆ After the input power is interrupted and powered on again, certain parameter settings may cause the frequency converter to restart automatically.
- ◆ In order to ensure that the motor overload protection operates correctly, the motor parameters input to the frequency converter must be completely consistent with the motor actually connected.
- ◆ In order to ensure that the motor  $I^2t$  over temperature protection operates correctly, the motor parameters input to the frequency converter must be completely consistent with the motor actually connected.
- ◆ The motor over temperature protection function is provided in the frequency converter. As per the P0426.M parameter setting, the  $I^2t$  over temperature protection function is activated by default. By setting the parameter P0426.M to 2-4, the motor over temperature protection function can also be performed by using the external PTC via the IO expansion board temperature detection input. Or it can be achieved by comparing the actual temperature measured by the KTY84 sensor with the fault temperature set by the parameter P0428.M.
- ◆ This equipment cannot be used as an emergency shutdown device. (refer to EN 60204, 9.2.5.4)

#### About maintenance



##### **WARNING**

- ◆ Any faulty parts and devices must be replaced with corresponding spare parts.
- ◆ Before opening the equipment for maintenance, make sure to disconnect all the power supplies, and wait for 10 min.

#### About disassembly and waste disposal



##### **NOTICE**

- ◆ The packaging box of the frequency converter can be reused. Please keep the packaging box for future use or return it to the supplier.
- ◆ Easy removable screws and quick connectors are parts that facilitate you to disassemble the device. You can recycle these disassembled parts and dispose of them according to the requirements of local authorities, or return them to the supplier.

## 1.3 Special Warnings



### **DANGER**

Electric shock and danger to life due to other energy sources.

- ◆ Touching live components can result in death or severe injury.  
Only work on electrical devices when you are qualified for this job.  
Always observe the country-specific safety rules.
- ◆ Generally, the following steps apply when establishing safety:
  1. Prepare for disconnection. Notify all those who will be affected by the procedure.
  2. Isolate the drive system from the power supply and take measures to prevent it being switched back on again.
  3. Wait until the discharge time specified on the warning labels has elapsed.
  4. Check that there is no voltage between any of the power connections, and between any of the power connections and the protective conductor connection.
  5. Check whether the existing auxiliary supply circuits are de-energized.
  6. Ensure that the motors cannot move.
  7. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water. Switch the energy sources to a safe state.
  8. Check that the correct drive system is completely locked.After you have completed the work, restore the operational readiness in the inverse sequence.



### **DANGER**

Risk of electric shock and fire from supply networks with an excessively high impedance.

- ◆ Excessively low short-circuit currents can lead to the protective devices not tripping or tripping too late, and thus causing electric shock or a fire.
- ◆ In the case of a conductor-conductor or conductor-ground short-circuit, ensure that the short-circuit current at the point where the converter is connected to the line supply at least meets the minimum requirements for the response of the protective device used.
- ◆ You must use an additional residual-current device (RCD) if a conductor-ground short circuit does not reach the short-circuit current required for the protective device to respond. The required short-circuit current can be too low, especially for TT supply systems.

Risk of electric shock and fire from supply networks with an excessively low impedance.

- ◆ Excessively high short-circuit currents can lead to the protective devices not being able to interrupt these short-circuit currents and being destroyed, and thus causing electric shock or a fire.
- ◆ Ensure that the prospective short-circuit current at the line terminal of the

frequency converter does not exceed the breaking capacity (SCCR or Icc) of the protective device used.

### **DANGER**

Electric shock if there is no ground connection

- ◆ For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.
- ◆ Ground the device in compliance with the applicable regulations.

Electric shock due to connection to an unsuitable power supply

- ◆ When equipment is connected to an unsuitable power supply, exposed components may carry a hazardous voltage. Contact with hazardous voltage can result in severe injury or death.
- ◆ Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.

Electric shock due to equipment damage

- ◆ Improper handling may cause damage to equipment. For damaged devices, hazardous voltages can be present at the enclosure or at exposed components. If touched, this can result in death or severe injury.
- ◆ Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
- ◆ Do not use any damaged devices.

Electric shock due to unconnected cable shield

- ◆ Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.
- ◆ As a minimum, connect cable shields and the conductors of power cables that are not used (e.g. brake cores) at one end at the grounded housing potential.

Arcing when a plug connection is opened during operation

- ◆ Opening a plug connection when a system is operation can result in arcing that may cause serious injury or death.
- ◆ Only open plug connections when the equipment is in a voltage-free state, unless it has been explicitly stated that they can be opened in operation.

Electric shock due to residual charges in power components

- ◆ Because of the capacitors, a hazardous voltage is present for up to 10 minutes after the power supply has been switched off. Contact with live parts can result in death or serious injury.
- ◆ Wait for 10 minutes before you check that the unit really is in a no-voltage condition and start work.



### **WARNING**

Property damage due to loose power connections

- ◆ Insufficient tightening torques or vibration can result in loose power connections. This can result in damage due to fire, device defects or



malfunctions.

- ◆ Tighten all power connections to the prescribed torque.
- ◆ Check all power connections at regular intervals, particularly after equipment has been transported.

Spread of fire from built-in devices

- ◆ In the event of fire outbreak, the enclosures of built-in devices cannot prevent the escape of fire and smoke. This can result in serious personal injury or property damage.
- ◆ Install built-in units in a suitable metal cabinet in such a way that personnel are protected against fire and smoke, or take other appropriate measures to protect personnel.
- ◆ Ensure that smoke can only escape via controlled and monitored paths.

Active implant malfunctions due to electromagnetic fields

- ◆ Frequency converters generate electromagnetic fields (EMF) in operation. Electromagnetic fields may interfere with active implants, e.g. pacemakers. People with active implants in the immediate vicinity of a converter are at risk.
- ◆ As the operator of an EMF-emitting installation, assess the individual risks of persons with active implants.

Unexpected movement of machines caused by radio devices or mobile phones

- ◆ Using radio devices or mobile telephones in the immediate vicinity of the components can result in equipment malfunction. Malfunctions may impair the functional safety of machines and can therefore put people in danger or lead to property damage.
- ◆ Therefore, if you move closer than 20 cm to the components, be sure to switch off radio devices or mobile telephones.

Damage to motor insulation due to excessive voltages

- ◆ When operated on systems with grounded line conductor or in the event of a ground fault in the IT system, the motor insulation can be damaged by the higher voltage to ground. If the user uses a motor that have insulation that is not designed for operation with grounded line conductors, the user must perform the following measures:
  - IT system: Use a ground fault monitor and eliminate the fault as quickly as possible.
  - TN or TT systems with grounded line conductor: Use an isolating transformer on the line side.

Fire due to inadequate ventilation clearances

- ◆ Inadequate ventilation clearances can cause overheating of components with subsequent fire and smoke. This can cause severe injury or even death. This can also result in increased downtime and reduced service lives for devices/systems.
- ◆ Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component.

Malfunctions of the machine as a result of incorrect or changed parameter settings

- ◆ As a result of incorrect or changed parameterization, machines can



malfunction, which in turn can lead to injuries or death.

- ◆ Protect the parameterization against unauthorized access.
- ◆ Handle possible malfunctions by taking suitable measures, e.g. emergency stop or emergency off.

Electrostatic sensitive devices (ESD) are individual components, integrated circuits, modules or devices that may be damaged by either electric fields or electrostatic discharge.

- ◆ Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g. conductive foam rubber or aluminum foil.
- ◆ Only touch components, modules and devices when the user are grounded by one of the following methods:
  - Wearing an ESD wrist strap.
  - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring.
- ◆ Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

## 2 Product Profile

The FT series frequency converter is provided by A&TS Technology Co., Ltd. in China.

They are FT70, FT50 and FT30 series. Power range is from 2.2kW to 355kW.

The FT50 is a standard general purpose frequency converter. It supports V/f control, flux vector control with and without encoder (Including the speed and torque control). It is widely used in many industries, such as Metallurgy, Paper making, Textile, Lifting, Chemical, Cable manufacture, Glass, Printing, Packaging, Food, Pharmaceuticals etc., with high reliability.

The FT30 is an economical general purpose frequency converter. It supports V/f control. It is also widely used in many industries, such as Construction hoist, Ceramic, Glass, Textile, Chemical, Rubber, Food, Pharmaceuticals, Fan/Pump, also with high reliability.

### 2.1 FT50 series Frequency Converter Features and

#### Advantages

- 1) Control modes: Closed loop speed control, closed loop torque control, Open loop speed control, Open loop torque control, V/f Control.
- 2) Reliable EMC and safety design.
- 3) Wide range of parameter settings.
- 4) Easier power supply cable connection.
- 5) Standard configuration: 2 analog input (AI) channels, 0 - 10V/0 - 20mA. 1 analog output (AO) channel, 0 - 10V/0 - 20mA.
- 6) Standard configuration: 6 bipolar digital (on-off) input (DI) channels, 2 digital (on-off) output (DO) channels, 2 relay output channels.
- 7) Multiple application macros and powerful programmable function, to meet the needs of different users.
- 8) Encoder expansion board supports different output types such as HTL and TTL.
- 9) Upper machine connection based on RJ45 interface.
- 10) With analog input and output, digital input and output, built-in PLC, built-in PID regulator, wobble frequency function, droop control, multi-segment speed function etc.
- 11) With comprehensive frequency converter and motor protection functions.
- 12) With a variety of expansion boards, IO expansion board to support relay output and DI/DO/AI/AO, communication expansion boards to support PROFIBUS-DP, PROFINET, and Modbus RTU/ASCII, Drive to drive through optical fiber, etc.

## 2.2 Order Number

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
F	T	5	0	4	T	0	1	5	0	G	B	L	X	X
[ 1-2 ] Product Name				[ 5 ] Voltage							[ 12 ] Braking Unit			
FT		FT Series Frequency Converter		4		380V					X		With the Standard Configuration	
[ 3-4 ] Product Series				[ 6 ] Phase							[ 13 ] U/V/W Terminal Type			
50		Standard Frequency Converter		T		Three Phase					B		With the Optional Built-in Braking Unit (30KW-75KW)	
30		Economical Frequency Converter		[ 7-10 ] Rated Power							[ 14-15 ] Reserved			
				0022		2.2KW					X		Standard U/V/W Terminal	
				0150		15KW					L		Extended U/V/W Terminal	
				[ 11 ] Type/Mode										
				G		High Overload/Constant Torque								
				P		Low Overload/Variable Torque								

Diagram 2-1 FT50 series Frequency Converter Order Number

## 2.3 Technical Data

Table 2-1 Technical data of the FT50 series Frequency Converter

Type	Item	Specifications
Rated input	Input voltage	3AC 380V (±20%)
	Frequency	50Hz/60Hz, fluctuation range ± 5%
Rated output	Output voltage	3AC 0 – U <sub>supply</sub> (the input voltage)
	Maximum output frequency	500Hz
Operational control features	Control modes	V/f , Flux vector control with and without encoder ( Including the speed and torque control )
	Speed range	1:200 (vector control without encoder) 1:1000 (vector control with encoder)
	Speed control accuracy	±0.5% (vector control without encoder) ±0.02% (vector control with encoder)
	Torque response	<15ms (vector control with encoder)
	Torque control accuracy	±3% (vector control with encoder) >10Hz, ±5% (vector control without encoder)
	Starting torque	0.25Hz 150% (vector control without encoder) 0Hz 180% (vector control with encoder)
	V/F curve	Linear, Square law, Multi-point
	Acc/Dec curve	Linear or S shape Acceleration-Deceleration curve
	Acc/Dec time	0 - 1200s
	Automatic voltage regulation ( AVR )	Keep the output voltage stable, when the power grid voltage fluctuates.
	Efficiency	≥96%

Overload capacity	Continuous current allowing 150% of the rated current for 60s every 300s. Continuous current allowing 180% of the rated current for 5s every 300s.
Carrier frequency	1kHz - 8kHz
Frequency resolution setting	Digital Setting: 0.01Hz Analog Setting: Maximum Frequency*0.025%
Analog input	Standard configuration: 2 analog input channels, 0-10V/0-20mA, equipped with +10V, 50mA auxiliary power supply. Extended configuration: 1 analog input channel, 0-10V/0-20mA, 1 channel supports PT100/PT1000/KTY84 sensor for Motor over temperature protection.
Analog output	Standard configuration: 1 analog output channel, 0 - 10V/0 - 20mA. Extended configuration: 1 analog output channel, 0 - 10V/0 - 20mA.
Digital (on-off) input	Standard configuration: 6 bipolar digital (on-off) input channels, compatible with active PNP or passive NPN input. One of them can be used as high-speed pulse input, the input frequency is up to 100kHz. Extended configuration: 5 digital (on-off) input channels
Digital (on-off) output	Standard configuration: 1 high-speed pulse output (optional to be open collector output), 0 - 100kHz square signal output, 1 digital (on-off) output channel, maximum output 50mA/24V DC. Extended configuration: 1 digital (on-off) output channel, maximum output 50mA/24V DC.
Relay output	Standard configuration: 2 relay output channels, 1A/30V DC, 3A/250V AC Extended configuration: 1 relay output channels, 1A/30V DC, 3A/250V AC
Encoder interface	Supports differential signal, open collector signal, push-pull signal, etc.
Communication	PROFIBUS-DP, PROFINET-IO, Modbus RTU, Drive to drive through optical fiber, etc.
Protective function	Over/Under voltage protection, Over current protection, overload protection, Phase-failure protection (Input and output), Short circuit protection, Motor over temperature protection, Motor overspeed protection, No load protection, Short-circuit braking protection, Braking resistor short-circuit detection, External DC24V short circuit protection, etc.



	EMC standard	The EMI complies with IEC 61800-3, Category C3 The EMS complies with IEC 61800-3, Class A
Special function	Programmable function	With built-in logic function blocks, and gate, or gate, not gate, adder subtracter, multiplier-divider, selector, delayer, RS flip-flop, etc.
	Macro program function	With 6 built-in Application Macros: Standard Macro, Hand/Auto Macro, Fan/Pump Macro, PID control Macro, Hoist Macro, Crane Macro
	Built-in PID regulator	PID process closed loop control
	Wobble frequency function	Triangular wave frequency control function for the textile industry
	Droop control	Softens the motor mechanical characteristics, mainly used in occasions where several frequency converters drive the same load together.
	Other functions	Restart after power failure, Speed tracking, Immunity to momentary power failure, Multi-segment speed, Built-in PLC, Slip compensation, Parameter auto-tuning, Torque limitation, Phase sequence transformation, Frequency hopping, Torque and speed control mode switching, DC braking, etc.
Others	Operating ambient temperature	-10°C - +50°C +40°C to +50°C, with derating of 1.5% / 1°C
	Storage temperature	-40°C - +70°C
	Relative humidity	5% - 95%, No condensation of moisture, No frost allowed
	Installation altitude	0 to 1000 m, without derating 1000m to 3000 m, with derating of 1% / 100 m
	IP Grade	IP20
	Certification	CE
	Cooling	Forced air cooling

## 2.4 Dimension Specification

### 2.4.1 Overall Dimensions

There are a total of 10 size specification of the FT50 series frequency converter.

Table 2-2 FT50 Series Frequency Converter Model and Dimension

Model	G Type			Dimension H*W*D ( mm )
	Power ( kW )	Input current ( A )	Output current ( A )	

FT50-4T0022G-XX	2.2	6.7	5.4	209*130*193
FT50-4T0030G-XX	3	9	7.2	
FT50-4T0037G-XX	3.7	12.4	9.8	
FT50-4T0055G-XX	5.5	16.7	13	260*140*186
FT50-4T0075G-XX	7.5	24.2	18.8	
FT50-4T0110G-XX	11	32.2	25	350*210*192
FT50-4T0150G-XX	15	35	32	
FT50-4T0185G-XX	18.5	36	37	
FT50-4T0220G-XX	22	43	45	400*267*220
FT50-4T0300G-XX	30	57	60	
FT50-4T0300G-BX	30	57	60	
FT50-4T0370G-XX	37	69	75	
FT50-4T0370G-BX	37	69	75	542*300*270
FT50-4T0450G-XX	45	89	91	
FT50-4T0450G-BX	45	89	91	
FT50-4T0550G-XX	55	106	112	
FT50-4T0550G-BX	55	106	112	580*338*310
FT50-4T0750G-XX	75	139	150	
FT50-4T0750G-BX	75	139	150	
FT50-4T0900G-XX	90	164	176	
FT50-4T1100G-XX	110	196	210	915*400*315
FT50-4T1320G-XX	132	240	253	
FT50-4T1600G-XX	160	287	304	
FT50-4T2000G-XX	200	365	377	1072*300*500
FT50-4T2000G-XL	200	365	377	
FT50-4T2200G-XX	220	410	426	
FT50-4T2200G-XL	220	410	426	
FT50-4T2500G-XX	250	441	465	1224*330*545
FT50-4T2500G-XL	250	441	465	
FT50-4T2800G-XX	280	495	520	
FT50-4T2500G-XL	280	495	520	
FT50-4T3150G-XX	315	565	585	1343*343*545
FT50-4T3150G-XL	315	565	585	
FT50-4T3550G-XX	355	617	650	
FT50-4T3550G-XL	355	617	650	

### 2.4.2 Outline Dimensional Drawing

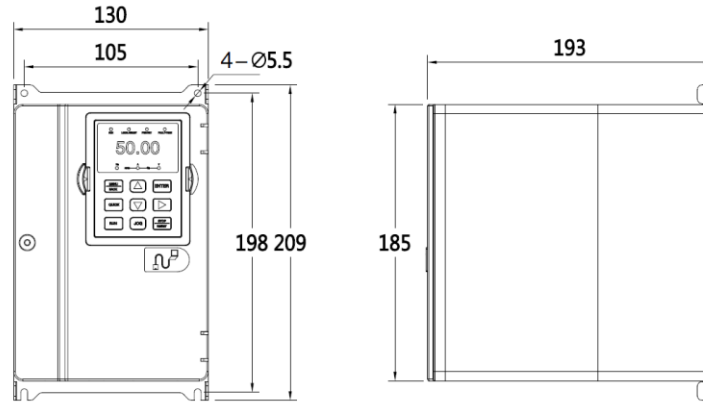


Figure 2-1 Models 2.2kW - 5.5kW

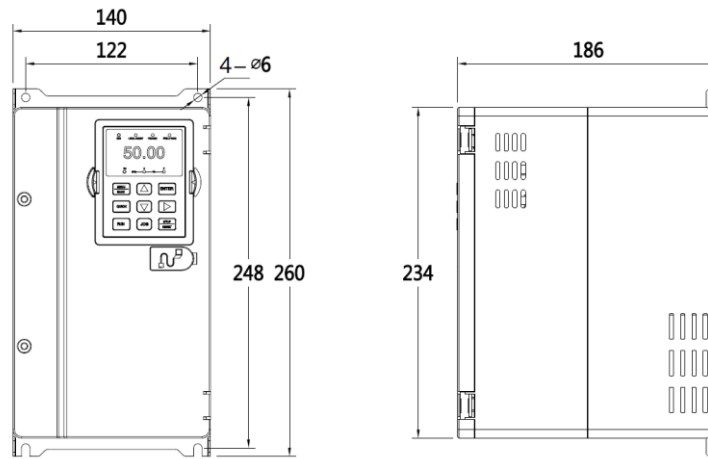


Figure 2-2 Models 7.5kW - 11kW

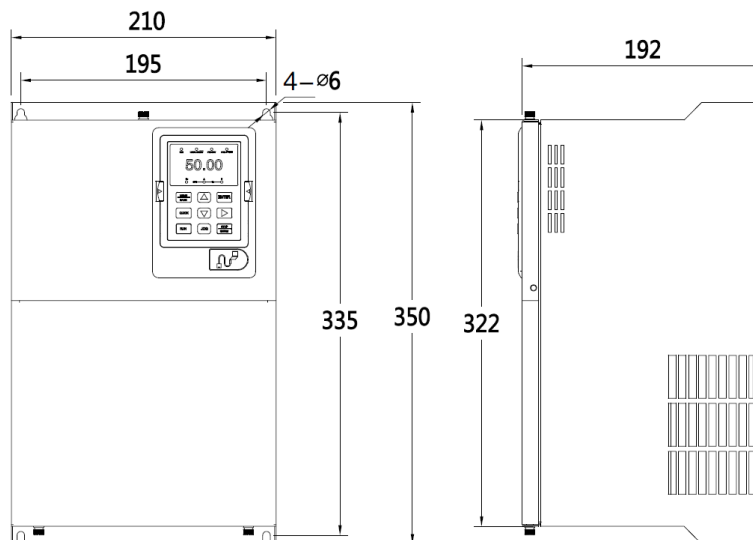


Figure 2-3 Models 15kW - 22kW

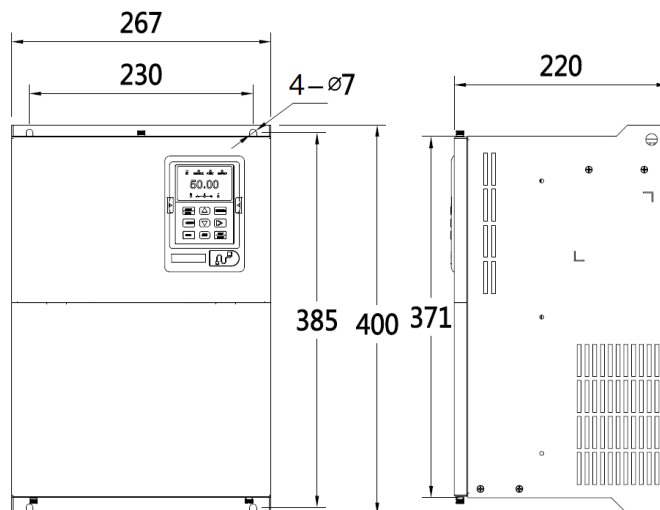


Figure 2-4 Models 30kW - 37kW

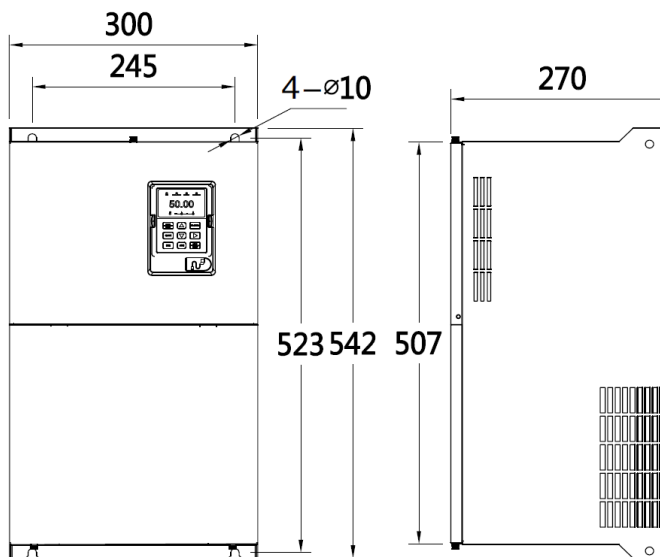


Figure 2-5 Models 45kW - 55kW

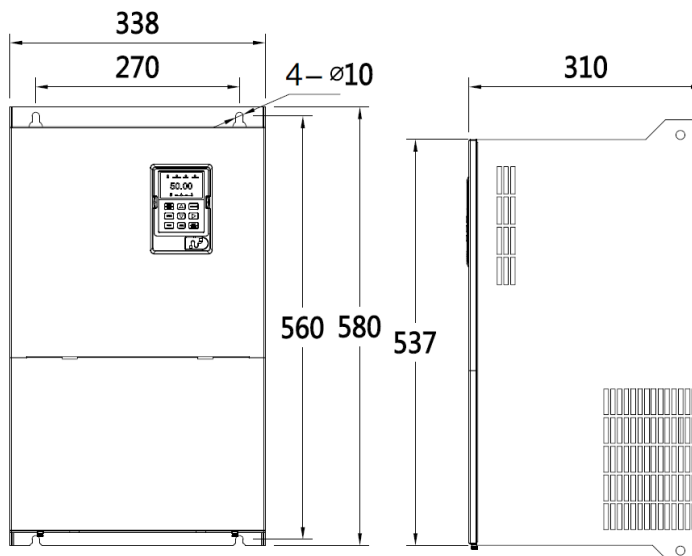


Figure 2-6 Models 75kW - 100kW

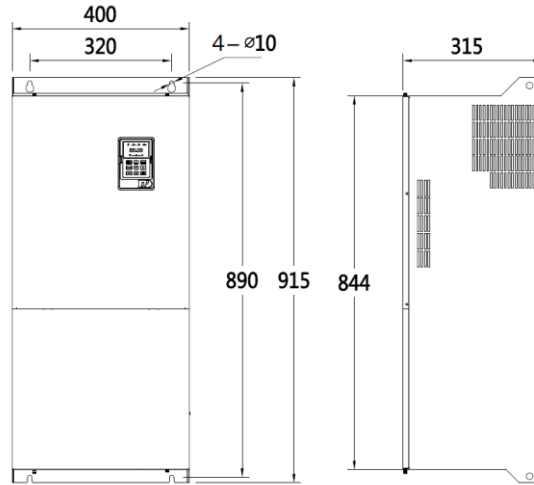


Figure 2-7 Models 132kW - 160kW

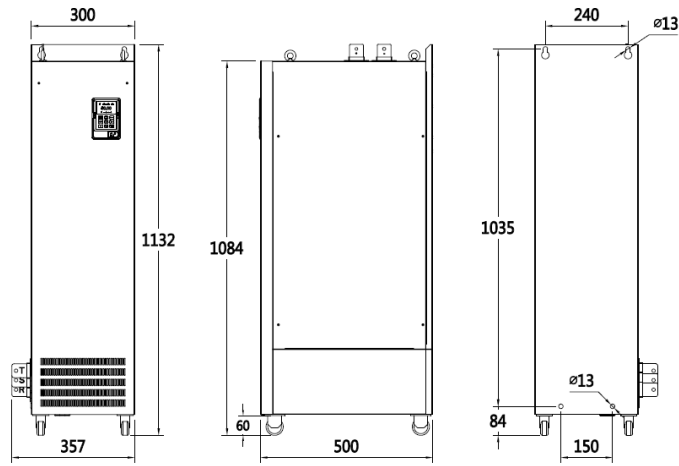


Figure 2-8 Models 200kW - 220kW

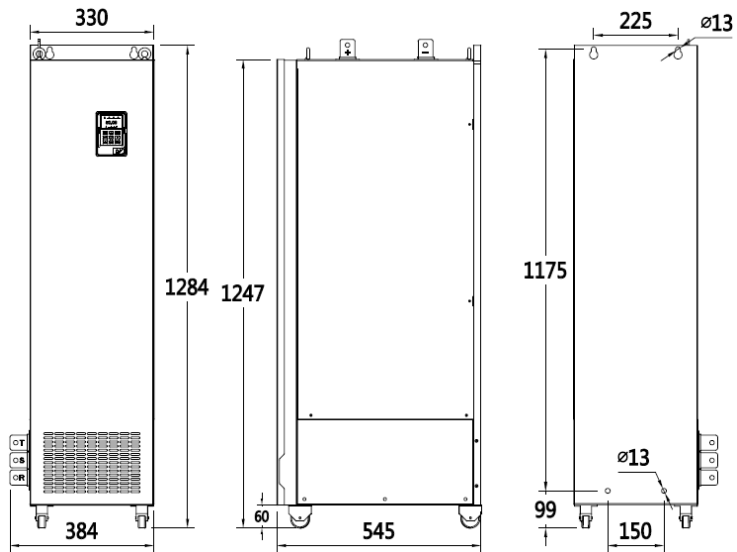


Figure 2-9 Models 250kW - 280kW

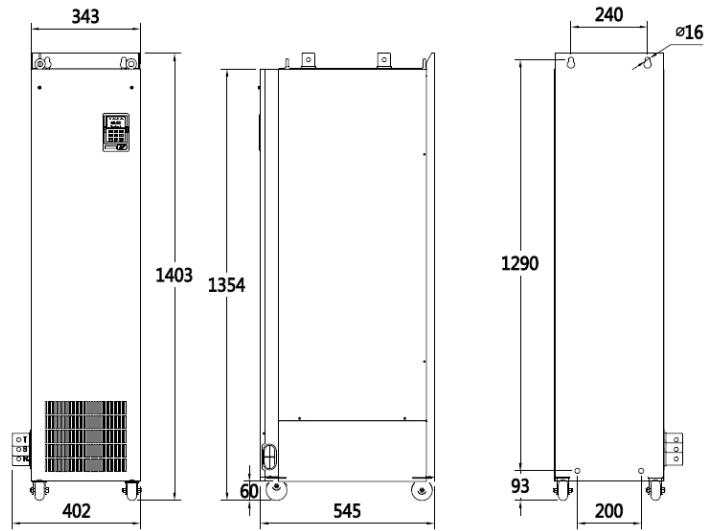


Figure 2-10 Models 315kW - 355kW

### 2.4.3 Flange Mounting Dimension, for models from 15kW to 160kW

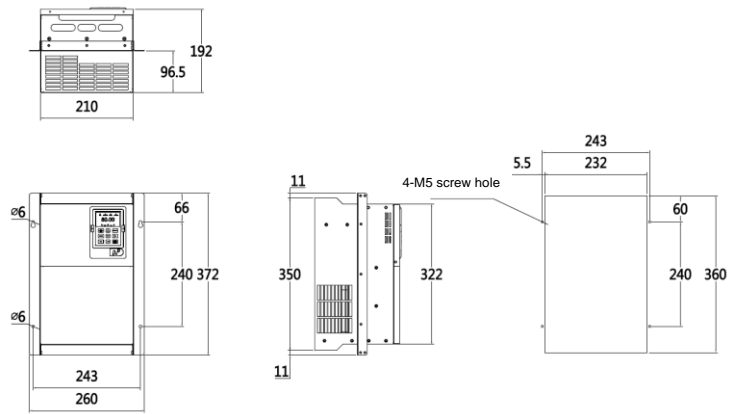


Figure 2-11 Mounting bracket and hole size for models from 15kW to 22kW

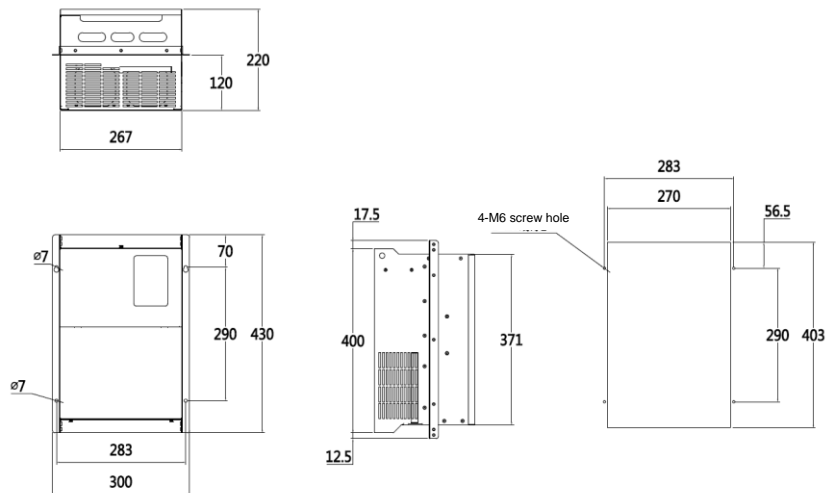


Figure 2-12 Mounting bracket and hole size for models from 30kW to 37kW

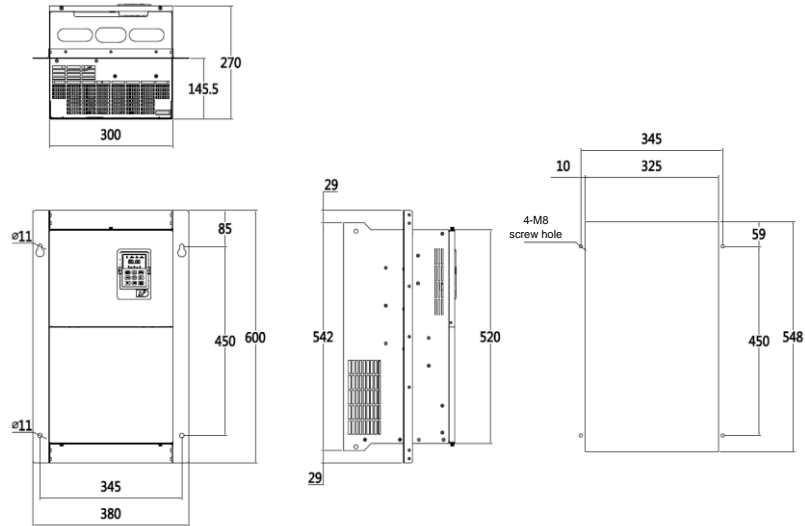


Figure 2-13 Mounting bracket and hole size for models from 45kW to 55kW

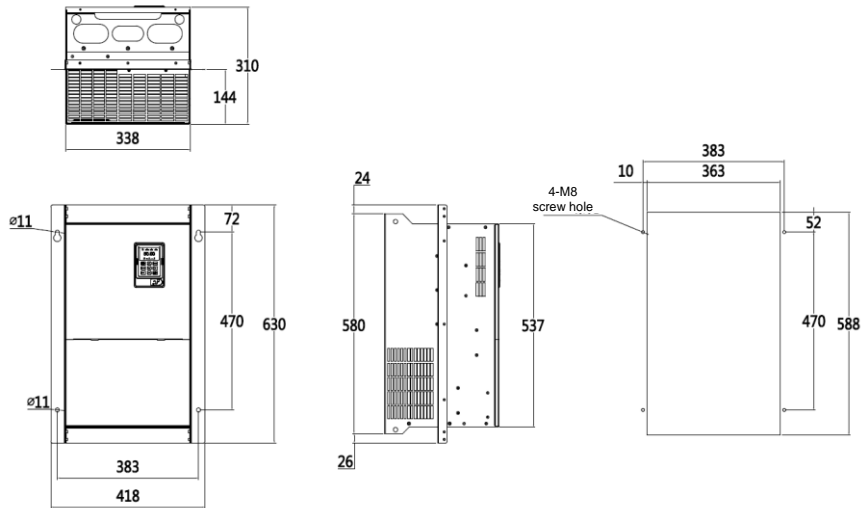


Figure 2-14 Mounting bracket and hole size for models from 75kW to 110kW

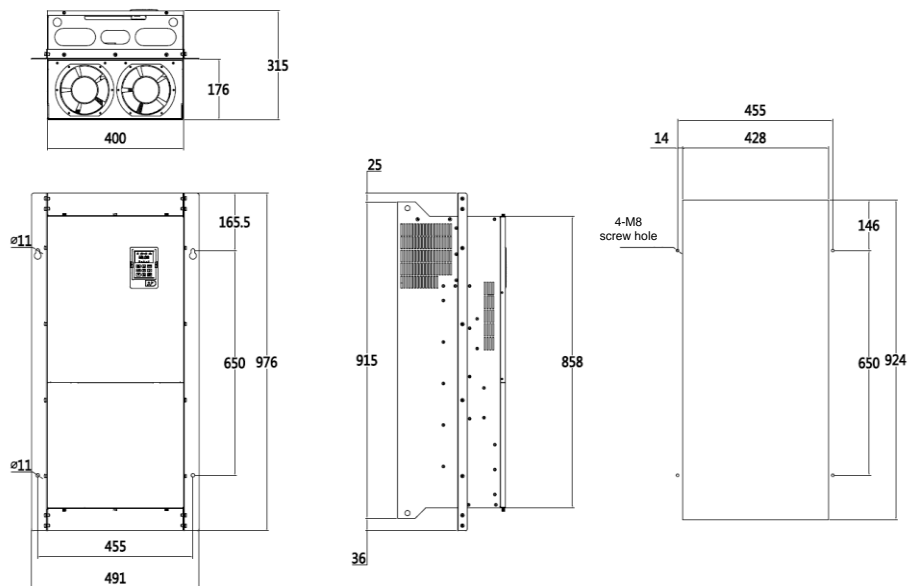


Figure 2-15 Mounting bracket and hole size for models from 132kW to 160kW

### 2.4.4 Bottom Mounting Bracket Dimension

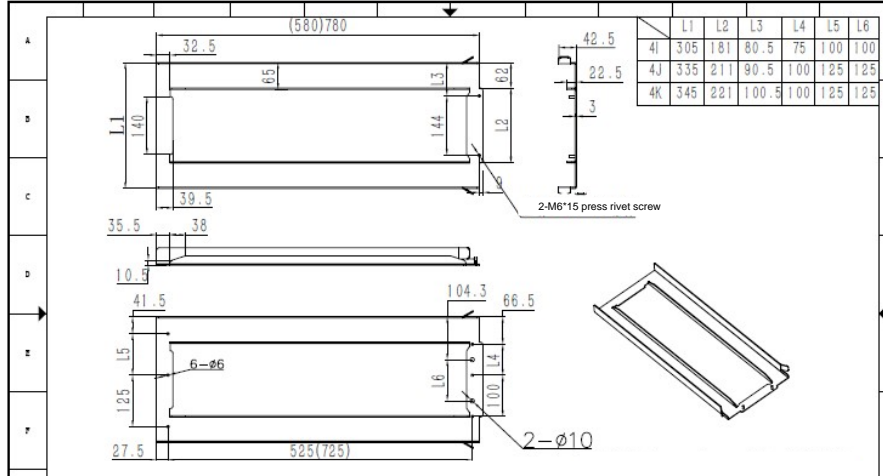


Figure 2-16 Bottom mounting bracket dimension

(Appropriate for a standard cabinet with a depth of 600mm or 800mm)

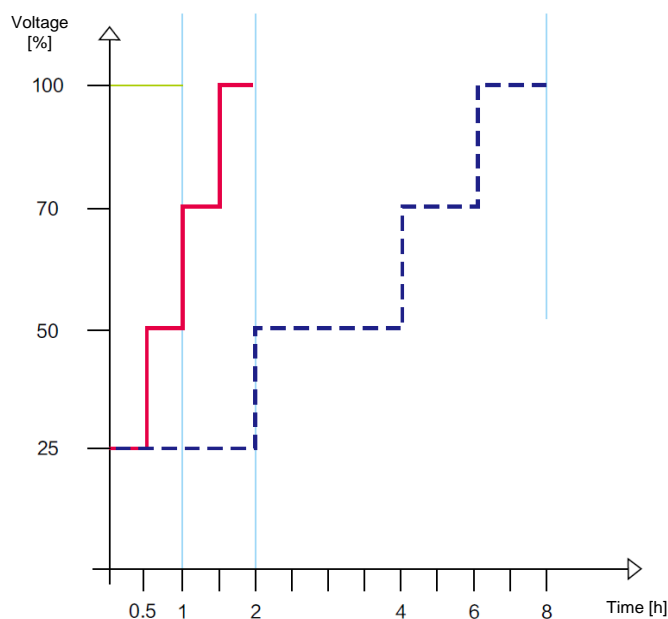


## 3 Installation and Wiring

### 3.1 Installation Condition

#### 3.1.1 Use the Frequency Converter after Long-term Storage

If the storage time of the frequency converter is more than 1 year, then before installing and using it, the capacitor in it must be re-applied with voltage.



- If the storage time is less than 1 year, no additional treatment is required.
- If the storage time is 1-2 years, before use, reapply voltage to the capacitor for 1 hour and use 100% voltage.
- If the storage time is 2-3 years, before use, reapply voltage to the capacitor for 2 hours. First, use 25% voltage for 0.5 hour, next 50% voltage for 0.5 hour, then 75% voltage for 0.5 hour, and 100% voltage for 0.5 hour.
- If the storage time is more than 3 years, before use, reapply voltage to the capacitor for 8 hours. First, use 25% voltage for 2 hours, next 50% voltage for 2 hours, then 75% voltage for 2 hours, and 100% voltage for 2 hours.

#### 3.1.2 Installation Environment

1) Ambient temperature: The ambient temperature has a great influence on the service life of the frequency converter. The operating environment temperature of the frequency converter should not be out of the allowable temperature range (-10°C - 50°C).

2) To install the frequency converter on the surface of a flame-retardant base, please refer to the chapter related to reserve enough space for heat dissipation. When the frequency converter works, it is likely to generate a lot of heat. And install it vertically on the mounting base with screws.

3) Please install the frequency converter in a place with small vibration. The vibration should

be less than 0.6G. Make sure to stay away from the punching machine and such equipment.

4) Do not install the frequency converter in a place with direct sunlight, high humidity, or water drop.

5) Do not install the frequency converter in a place with corrosive, flammable, or explosive gas in the air.

6) Don't install the frequency converter in a place with greasy dirt and dust.

### 3.1.3 Installation Space

To ensure the normal operation of the frequency converter, enough space must be reserved before installation to ensure good heat dissipation. For single machine installation, please refer to Figure 3-1, 3-2 and Table 3-1, 3-2 to reserve the space around the frequency converter.

Table 3-1 Single machine installation space requirement (2.2kW-160kW)

Power Level (kW)	Space Requirement (mm)		
	A1	B1	C1
2.2-22	≥10	≥200	≥40
30-37	≥50	≥200	≥40
45-55	≥50	≥300	≥40
75-110	≥50	≥300	≥40
132-160	≥50	≥300	≥40

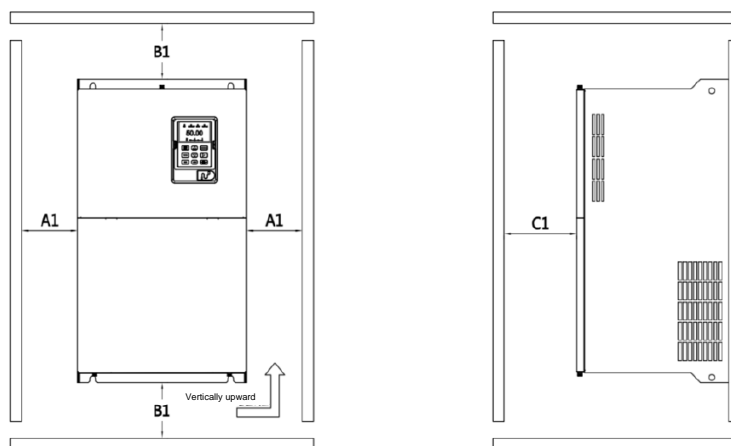


Figure 3-1 Single machine installation space requirement (2.2kW-160kW)

Table 3-2 Single machine installation space requirement (200kW-355kW)

Power Level (kW)	Space Requirement (mm)				
	A2	B1	B2	C2	D
200-220	≥10	≥350	≥250	≥20	≥20
250-280	≥10	≥400	≥250	≥20	≥20
315-355	≥10	≥450	≥250	≥20	≥20

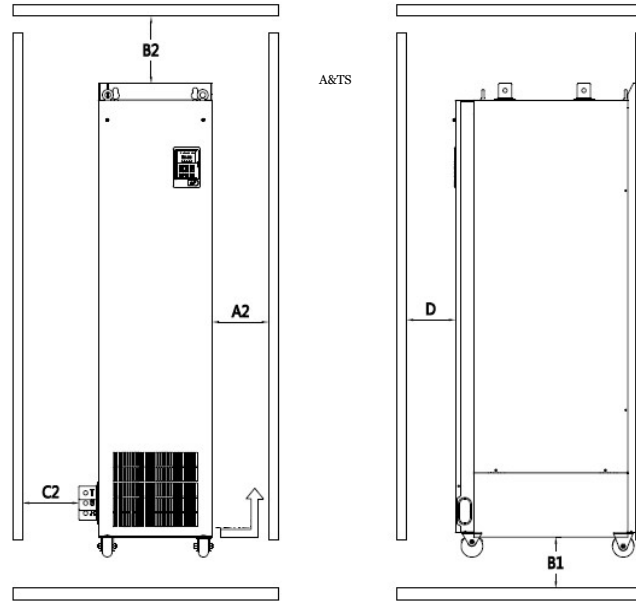


Figure 3-2 Single machine installation space requirement (200kW-355kW)

For the double machine parallel installation, please refer to Table 3-3 and Figure 3-3 to reserve the space between the frequency converters.

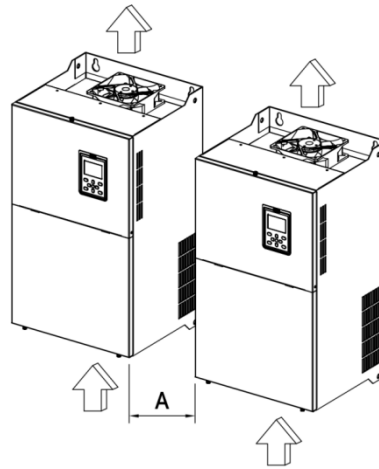


Figure 3-3 Double machine parallel installation diagram

Table 3-3 Double machine parallel installation space requirement (2.2kW-160kW)

Power Level (kW)	Parallel Installation Space Requirement A (mm)
2.2-22	≥10
30-37	≥50
45-55	≥50
75-110	≥50
132-160	≥50

For the double machine vertical installation, please refer to Figure 3-4 and the single machine installation space requirement to reserve the space between the frequency converters. Install

a heat-insulation baffle between the upper and lower frequency converter to ensure that the heat of the lower machine does not affect the heat dissipation of the upper machine.

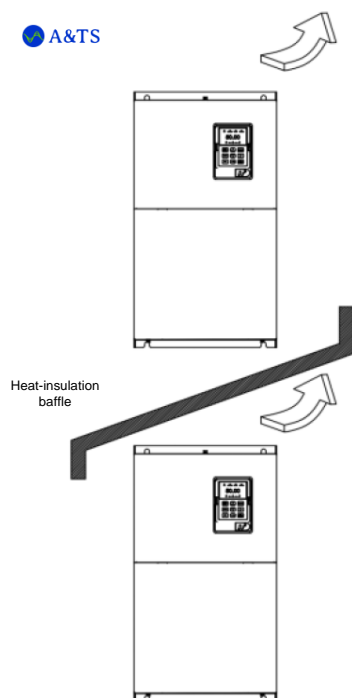


Figure 3-4 Double machine vertical installation diagram

### 3.2 Installation Guide

There are a total of 10 size specification for the dimension of the FT50 series frequency converter.

For models from 2.2kW to 160kW, the wall-mounted installation is generally adopted.

For models from 15kW to 160kW, the flange installation can be also used.

For models from 200kW to 355kW, the cabinet installation is normally applied.

The dimension specification of the FT50 series frequency converter, please refer to chapter 2.4.



#### CAUTION

- When installing the frequency converter, please install it in a vertically upward direction, which is good for heat dissipation. It is forbidden to install it in other directions such as lying down position, side lying position, or upside down.
- Please ensure that there is enough space for heat dissipation in accordance with the requirements in chapter 3.1.3. Please consider the heat dissipation of other components in the cabinet when reserving the space.

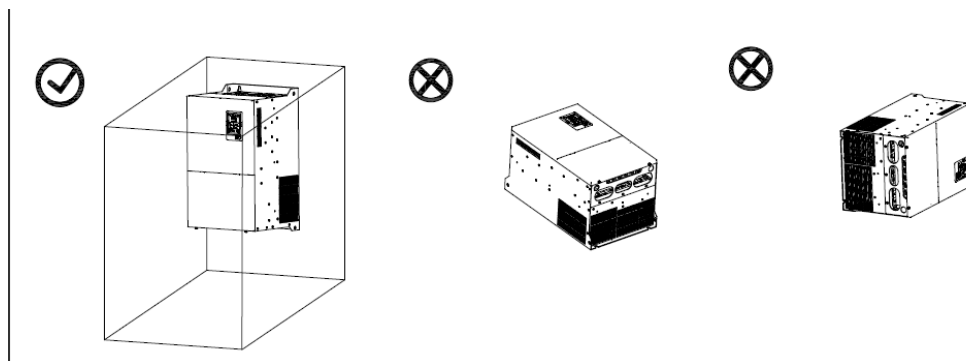


Figure 3-5 Installation direction diagram

### 3.2.1 Wall-mounted Installation

1) The frequency converter must be fixed reliably. Please drill the mounting holes beforehand according to Table 3-4 and Figure 3-6, and use the specified fasteners as per Table 3-4.

Table 3-4 Wall-mounted installation requirements (2.2kW-160kW)

Power Level (kW)	Size A (mm)	Size B (mm)	Fastener Specification	Tightening Torque (N·m)
2.2-5.5	105	198	Grade 8.8 4-M5	6.4
7.5-11	122	248	Grade 8.8 4-M5	6.4
15-22	195	335	Grade 8.8 4-M5	6.4
30-37	230	385	Grade 8.8 4-M6	10.8
45-55	245	523	Grade 8.8 4-M8	28.1
75-110	270	560	Grade 8.8 4-M8	28.1
132-160	320	890	Grade 8.8 4-M8	28.1

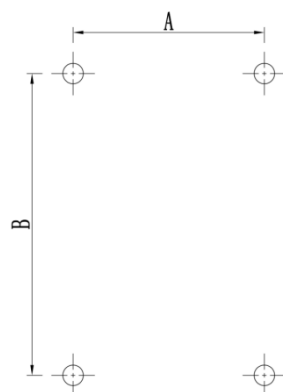


Figure 3-6 Mounting holes diagram (2.2kW-160kW)

2) For models from 2.2kW to 11kW, the frequency converter can be lifted by hand directly. Align the mounting holes on the back with the mounting holes on the base, and use fasteners to fix the frequency converter according to the specifications in the Table 3-4.

For models from 15kW to 160kW, the holes for hoist on the top of the frequency converter can be used, to align the mounting holes on the back with the mounting holes on the base. And use fasteners to fix the frequency converter according to the specifications in the Table 3-4.

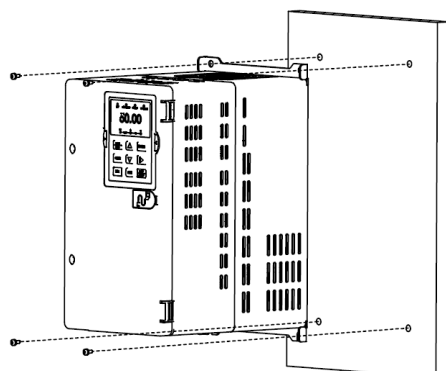


Figure 3-7 Wall-mounted installation diagram  
(2.2kW - 11kW)

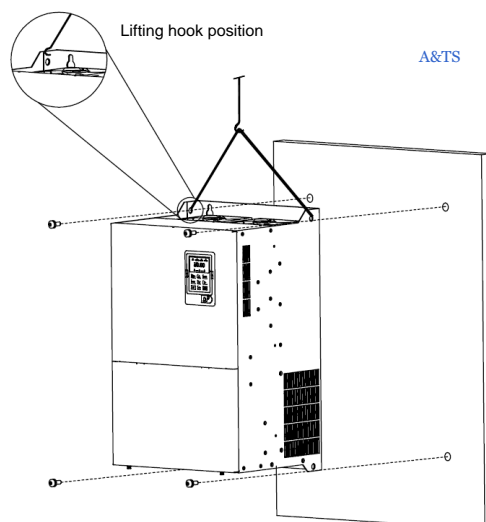


Figure 3-8 Wall-mounted installation diagram  
(15kW - 160kW)



### CAUTION

- In the wall-mounted installation mode, it is prohibited to only fix the two mounting screw on the upper end of the frequency converter. Otherwise, the frequency converter may fall off and be damaged during the long-term operation.

### 3.2.2 Flange Mounting

The flange mounting can only be used for models from 15kW to 160kW. Installation steps as follows.

- (1) Put the four brackets on the top, bottom, left and right onto the frequency converter body, and tighten the bracket fixing screws on the top, bottom, left, and right sides of the frequency converter body.
- (2) Lift the frequency converter with the bracket installed so that the mounting holes of the flange bracket are aligned with the mounting holes of the installation base, and then fix it on the mounting surface of the base. (To hoist the models from 45kW to 160kW, use the holes for hoist on the top of the frequency converter.)

For the flange mounting bracket and hole size of the models from 15kW to 160kW, please refer to the chapter 2.4.3.

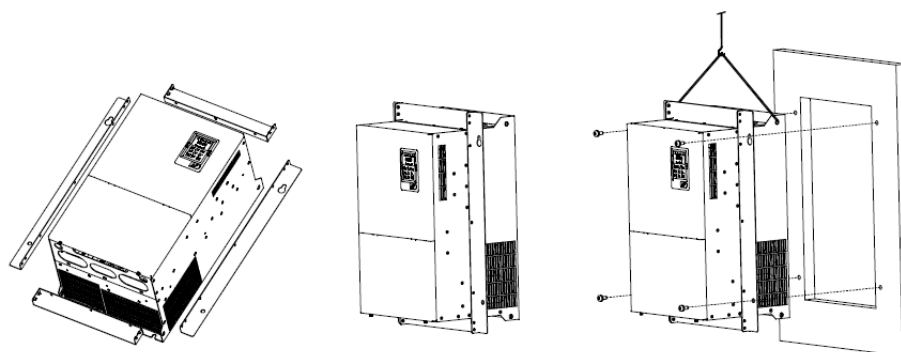


Figure 3-9 Flange mounting diagram (15kW-160kW)

### 3.2.3 Cabinet Installation

When selecting an installing cabinet for frequency converter models from 200kW to 355kW, the following requirements are required.

1. It is recommended to choose a cabinet with a depth of 800mm.
2. When the frequency converter (200kW-355kW) is installed in a 600mm deep cabinet, the installation beam must be bent inward, using the space of the upright column. When it is installed in a standard cabinet with a depth of 800mm or more, there is no such requirement.

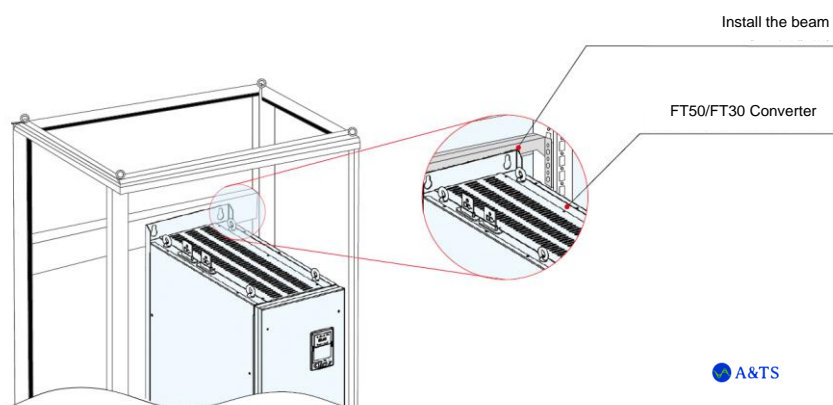


Figure 3-10 Cabinet installation diagram (200kW-355kW)



#### CAUTION

- If the cabinet is with front door and back door, the frequency converter models (200kW-355kW) cannot be installed in a 600mm deep standard cabinet.
- To ensure the normal operation of the frequency converter, it needs to be fixed reliably. Please drill the fixing holes in advance according to Table 3-5 and Figure 3-11, and use the specified fasteners as per Table 3-5.

Table 3-5 Cabinet installation requirements (200kW-355kW)

Power Level (kW)	Size A (mm)	Size B (mm)	Size C (mm)	Fastener Specification	Tightening Torque (N·m)
200-220	240	1035	150	Grade 8.8 4-M10	52
250-280	225	1175	150	Grade 8.8 4-M10	52
315-355	240	1290	200	Grade 8.8 4-M12	90.6

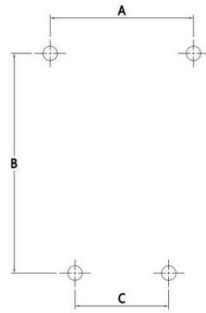


Figure 3-11 Installation fixing holes diagram (200kW-355kW)

There are two ways to install the frequency converter (200kW-355kW) cabinet. One is installation without casters, and the other is installation with casters.

#### 1. Installation without casters

If install the frequency converter without the casters, besides installing the beam on the top, the beam on the base of the cabinet frame also need to be installed for bearing. Drill holes for fixing, according to the installation holes at the bottom of the frequency converter.



#### NOTICE

When fixing models (200kW-355kW) in the cabinet, please refer to chapter 3.1.3 to reserve the wiring and air inlet space at the bottom of the frequency converter.

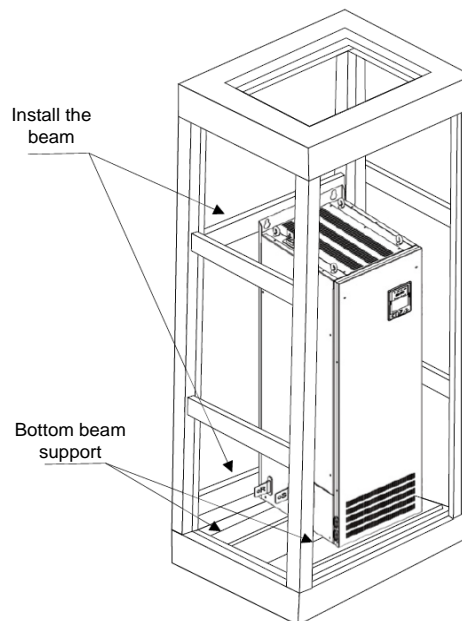


Figure 3-12 Installation without casters frequency converter

#### 2. Installation with casters

Models from 200kW-355kW can be equipped with 4 caster. Install casters to facilitate moving or carrying the frequency converter. And, the frequency converter can be pushed into the cabinet through the bottom mounting bracket for installation.

- ① Install the 4 casters at the bottom of the frequency converter



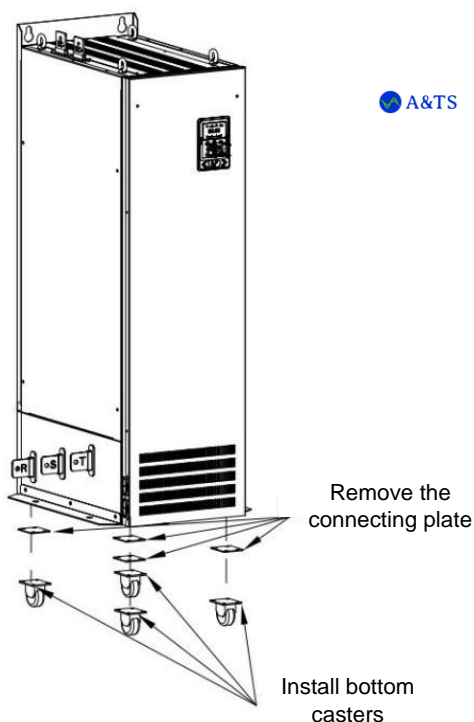


Figure 3-13 Caster installation diagram (200kW-355kW)

- ② Use 6 M5 self-tapping screws to fix the bottom mounting bracket onto the cabinet frame base, as shown in Figure 3-14. (refer to section 2.4.4 for the bottom mounting bracket dimensions)

Notice: When fixing models (200kW-355kW) in the cabinet, please refer to chapter 3.1.3 to reserve the wiring and air inlet space at the bottom of the frequency converter.

- ③ The fixing holes of the mounting bracket at the bottom of the cabinet need to be drilled and assembled on site.

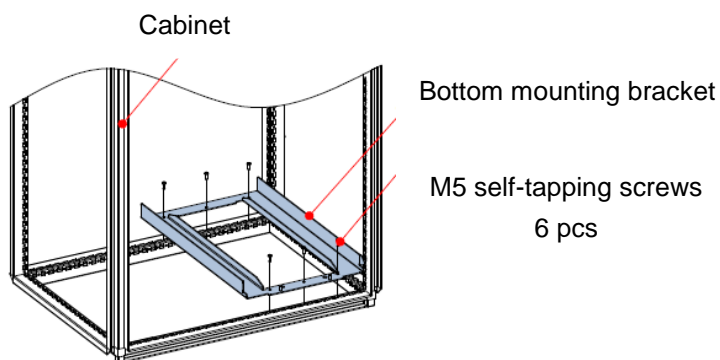


Figure 3-14 Bottom mounting bracket installation diagram

- ④ Use the lifting eye bolt on the top of the frequency converter for lifting and moving. Align the casters with the bottom mounting bracket and slowly push it into the cabinet until the back plate of the frequency converter is close to the mounting beam on the back of the cabinet. Then align the four fixing holes on the back of the frequency converter with the cross beam on the back of the cabinet and lock them with screws.

**NOTICE**

1) Please use the lifting eye bolt on the top of the frequency converter for lifting and moving. If the frequency converter needs to be laid flat, please use the lifting parts on the top and bottom of the product when lifting it again. No force is allowed on the copper wiring terminal. It is forbidden to pull the copper wiring terminal of the frequency converter.

2) If the frequency converter needs to be placed vertically, please avoid stress on the side of the machine or place it on an inclined surface. Due to the large volume and heavy weight of the frequency converter, if the angle of inclination exceeds 5°, it may topple over and cause damage.

**3.2.4 Cover Plate Uninstallation and Installation**

For FT50 series frequency converter, the front cover needs to be removed to do the main circuit and control circuit wiring.

**CAUTION**

- Before removing the cover, make sure that the frequency converter is **powered off** for more than 10 minutes.
- When removing the cover, prevent it from **falling off**, which may cause damage to the equipment and injury to personnel.

## 1) Cover plate uninstallation and installation (Models from 2.2kW to 11kW)

Unscrew the hand screw and open the cover in the direction of the arrow.

Close the cover in the direction of the arrow and tighten the hand screw.

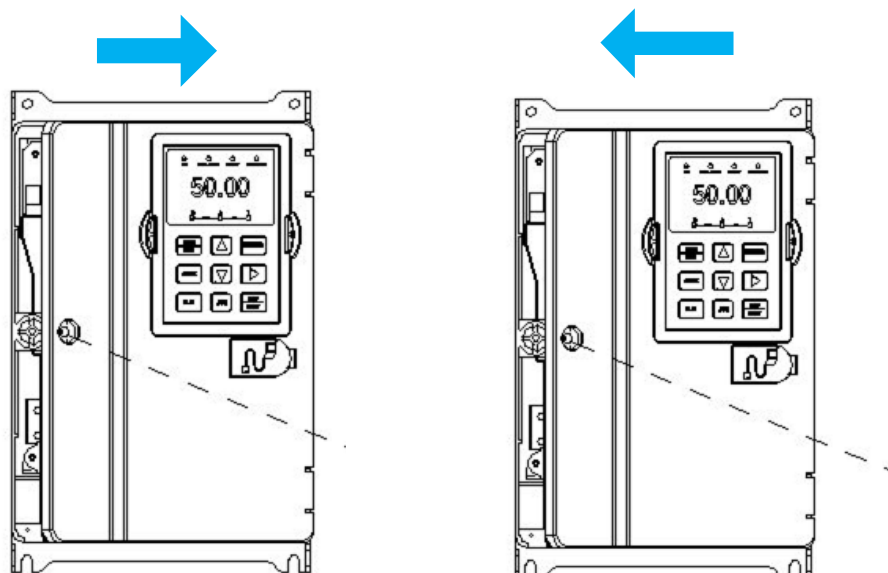


Figure 3-15 Cover plate uninstallation and installation diagram (Models from 2.2kW to 11kW)

## 2) Cover plate uninstallation and installation (Models from 15kW to 160kW)

Unscrew the hand screw and pull out the cover downward.

Close the cover upwards and tighten the hand screws.

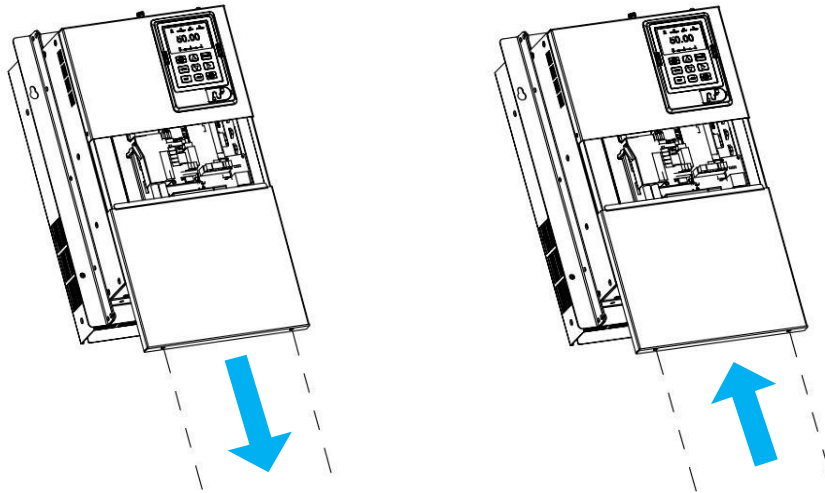


Figure 3-16 Cover plate uninstallation and installation diagram (Models from 15kW to 160kW)

3) Cover plate uninstallation and installation (Models from 200kW to 355kW)

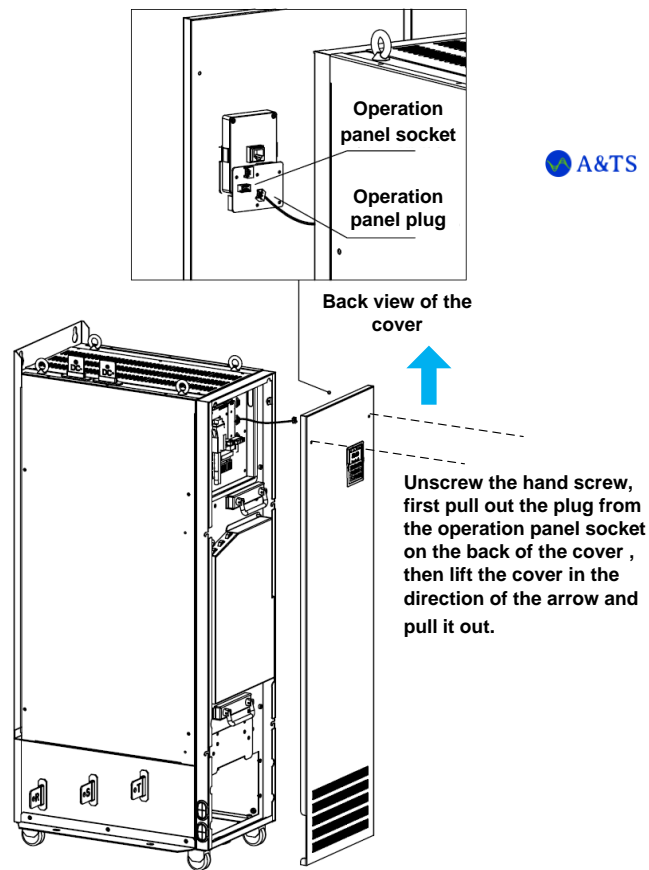


Figure 3-17 Cover plate uninstallation diagram (Models from 200kW to 355kW)

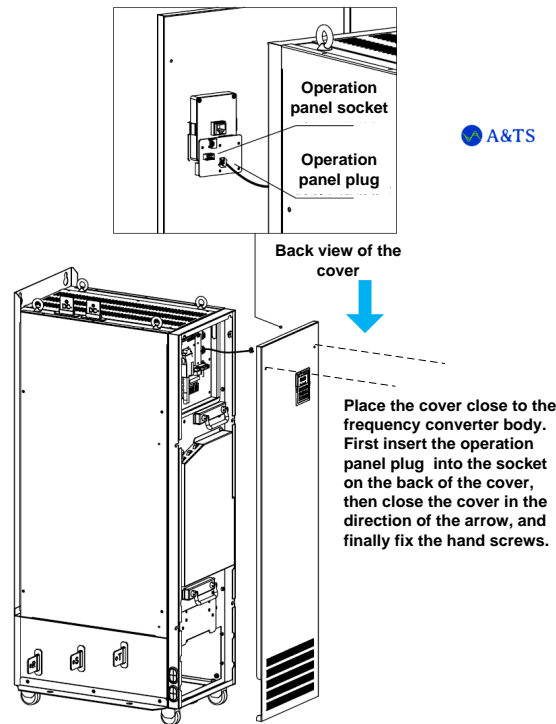


Figure 3-18 Cover plate installation diagram (Models from 200kW to 355kW)

### 3.2.5 The Operation Panel Installation

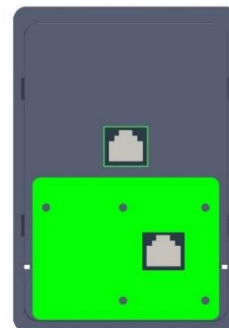
When installing the operation panel on the cabinet door, the panel installation accessories need to be configured (there are two types of operation panel extension cables to choose, 3m or 5m , used to connect the operation panel to the cabinet door.)

#### 1) Operation panel components

- a. Keyboard tray is installed on the cabinet door. It is used to put the operation panel. By factory default configuration, the keyboard tray has been installed, as shown in Figure 3-19.
- b. Panel signal transfer board and mounting screws.
- c. Operation panel connection cable 2\*5pin.
- d. Internet cable 3m or 5m.



Front of the keyboard tray (Operation panel installed)



Back of the keyboard tray

Figure 3-19 the keyboard tray diagram

## 2) Operation panel installation steps

- a. Remove the operation panel from the frequency converter body, as per the figure 3-20.

**First press the button on both sides of the operation panel, and then take out the operation panel vertically**

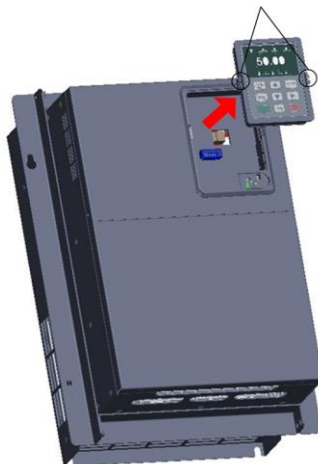


Figure 3-20 Operation panel uninstallation diagram

- b. Panel signal transfer board installation

After removing the operation panel, install the panel signal transfer board in the default position, using the screws of the cabinet door installation components. For different models of the frequency converter, the installation position of the panel signal transfer board is slightly different.

- ① For models from 2.2kW to 11kW, the panel signal transfer board is installed on the back of the cabinet door, as shown in the Figure 3-21.
- ② For models from 15kW to 355kW, the panel signal transfer board is installed on the mount plate of the control board, as shown in Figure 3-22.

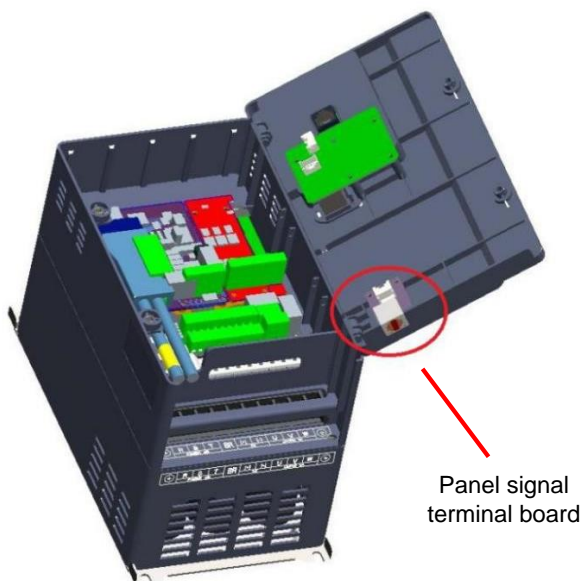


Figure 3-21 Panel signal terminal board installation diagram (models from 2.2kW to 11kW)

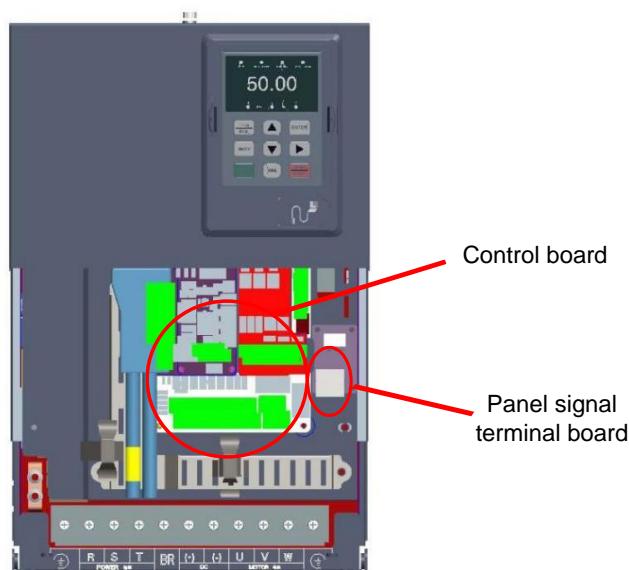


Figure 3-22 Panel signal terminal board installation diagram (models from 15kW to 355kW)

### 3) Panel signal transfer board wiring

Unplug the 2\*5pin cable connecting the control board debugging interface and the keyboard tray backplane interface of the operation panel. Then use the 2\*5pin cable to connect the panel signal transfer board with the debugging interface of the control board, as shown in Figure 3-23.

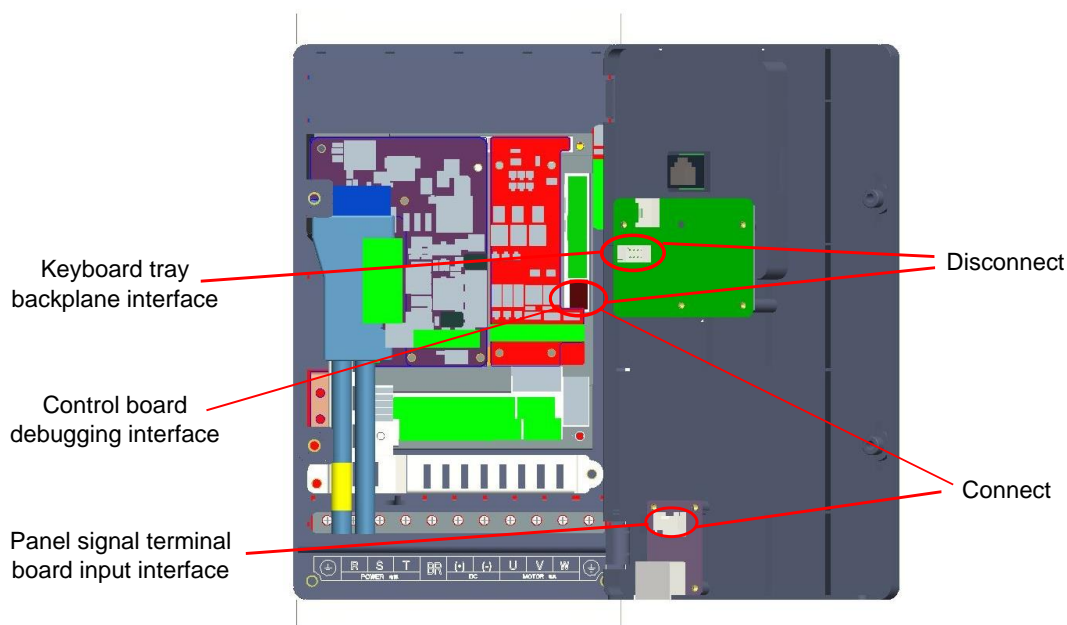


Figure 3-23 Panel signal terminal board connection diagram

### 4) Panel keyboard tray installation

First, drill holes on the cabinet door according to Figure 3-24. Then buckle the keyboard tray into the opening of the cabinet door, and use the side buckle of the keyboard tray to fix it on the cabinet door. Finally, buckle the operation panel into the keyboard tray of the cabinet door.

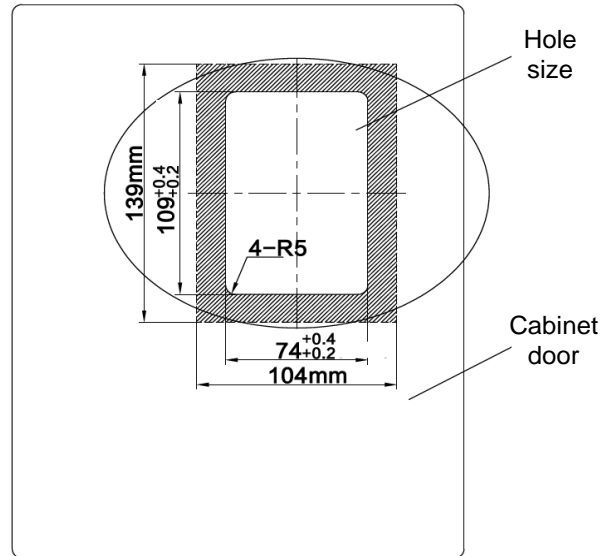


Figure 3-24 Keyboard installation, dimension drawing of the opening in the cabinet door

#### 5) Keyboard tray connection

Use the network cable in the cabinet door installation components to connect the keyboard tray backplane and the frequency converter. First connect one end of the network cable to the RJ45 network port on the back panel of the keyboard tray, as shown in Figure 3-25. Then connect the other end of the network cable to the RJ45 network port on the panel signal transfer board. Finally, buckle the operation panel on the cabinet door.

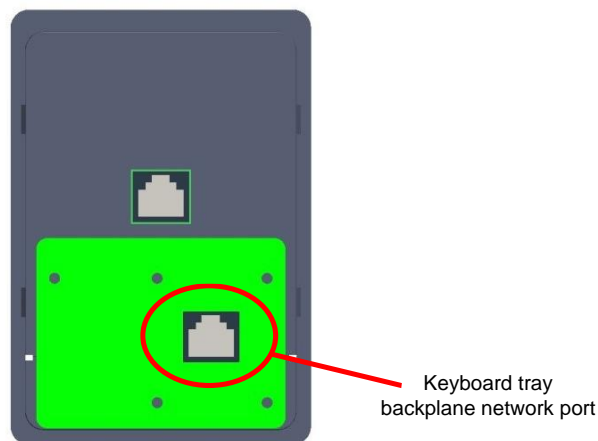


Figure 3-25 Keyboard tray backplane network port diagram

For models from 2.2kW to 11kW, the network cable can be directly put downwards from the network port of the signal transfer board on the bottom of the frequency converter.

For models from 15kW to 355kW, remove the panel first, connect the network port of the panel signal transfer board with the network cable, and put the network cable from the bottom of the frequency converter vertically downwards. Then install the panel, as shown in Figure 3-26.

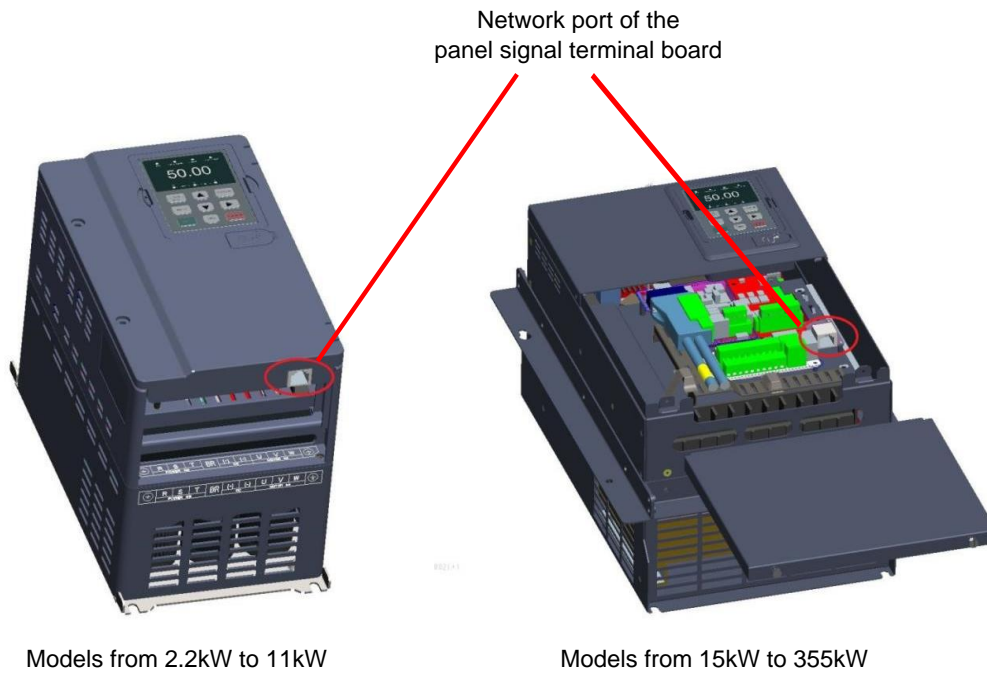


Figure 3-26 The position diagram of the network port on the panel signal terminal board

## 3.3 Terminals and Wiring

### 3.3.1 Standard Wiring Diagram

The typical wiring is shown in the Figure 3-27 below. Please notice that the wiring part of the 2.2kW-75kW model and the 90kW-355kW model is different at the double arrow in the figure.

#### **EXPLICATION**

All DI/DO and AI/AO terminal functions can be customized through the parameter interconnection function. The wiring method and terminal function definition shown in the figure are only a recommended wiring method and terminal definition.



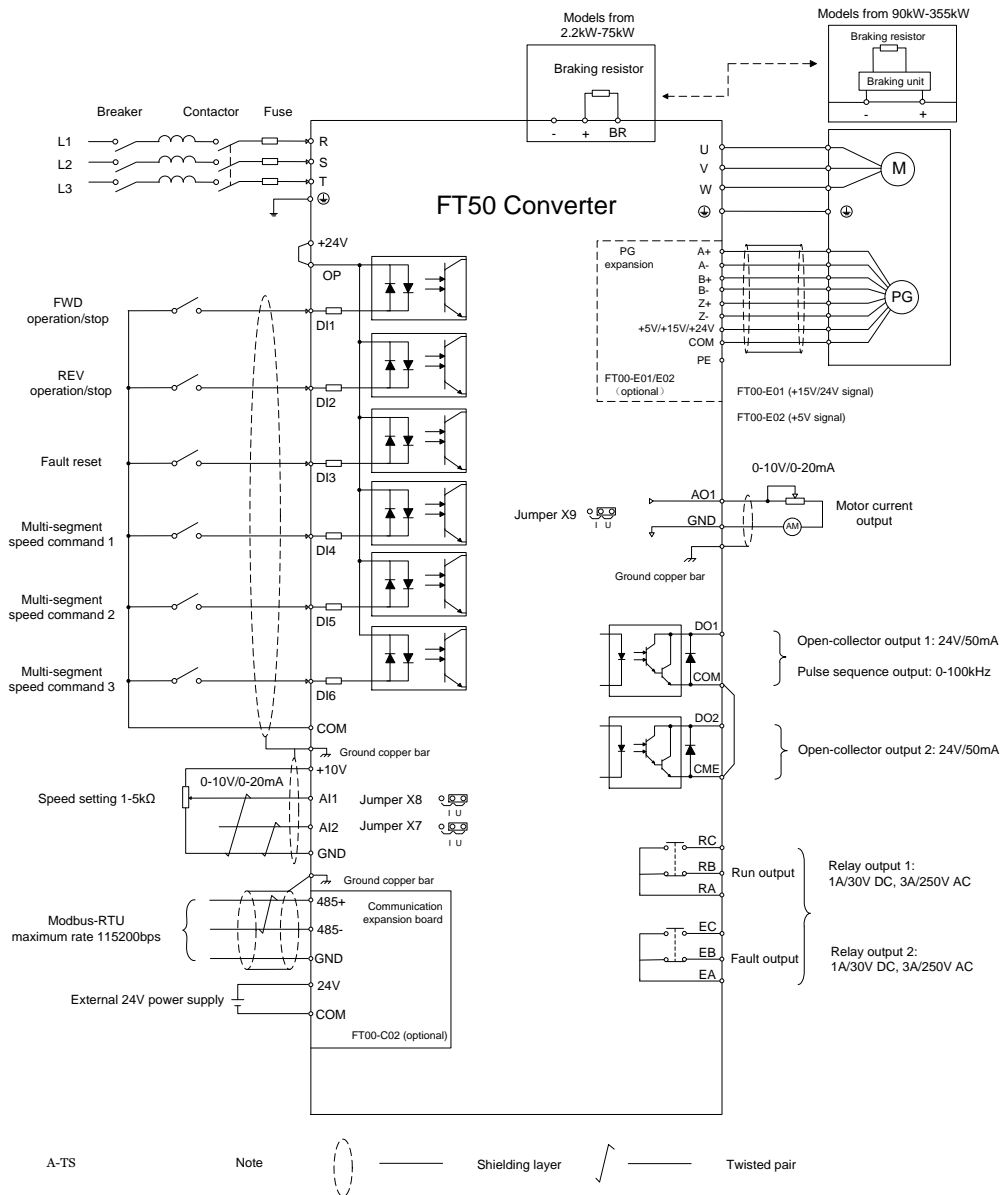


Figure 3-27 FT50 series frequency converter standard wiring diagram

### 3.3.2 Main Circuit Terminal Function Description

FT50 series frequency converter adopts industry general terminal design, with input three-phase terminals R/S/T, output three-phase terminals U/V/W, DC positive and negative terminals (+/-) and brake terminal BR. For details, refer to Figure 3-28, Figure 3-29, and Table 3-6.

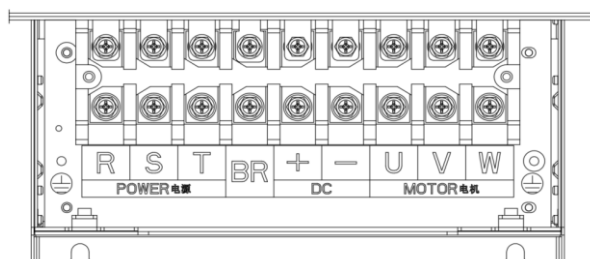


Figure 3-28 Main circuit terminal diagram (2.2kW-160kW)

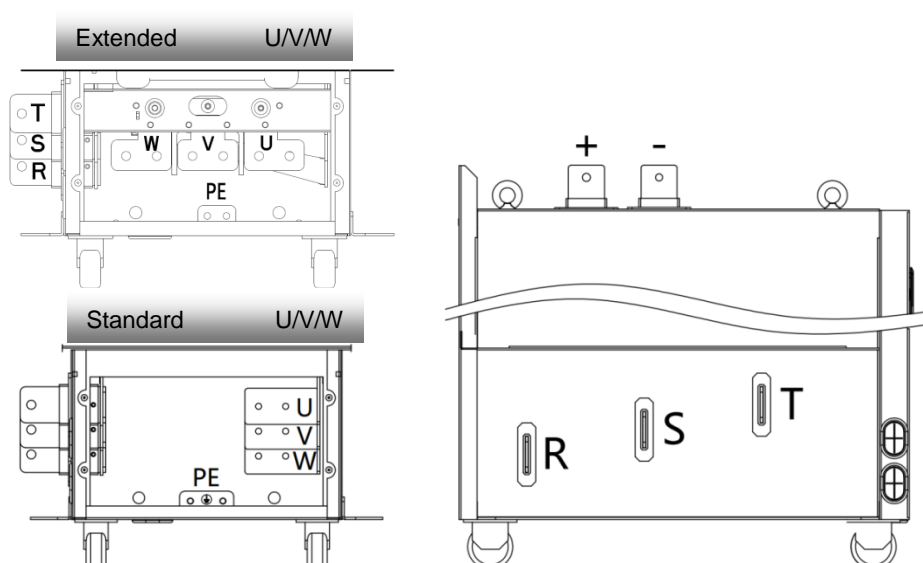


Figure 3-29 Main circuit terminal diagram (200kW-355kW)

Table 3-6 Main Circuit Terminal Function Description

Terminal	Name	Function Description
R / S / T	Three-phase power supply input terminal	AC input three-phase power connection point
+ / -	DC bus positive and negative terminals	Common DC bus input point. It is forbidden to directly use this terminal as the DC output of the rectifier.
+ / BR	Braking resistor connection terminal	Connect to both ends of the braking resistor
U / V / W	Frequency converter output terminal	Connect to a three-phase motor
PE	Protective earth terminal	Protective grounding

**(1) Power supply R/S/T**

- For the input side wiring of the frequency converter, no phase sequence requirement.
- The specifications and installation of the external main circuit wiring must comply with local regulations and relevant IEC standards.
- For the selection of the input side cable, please select the copper cable according to the recommended specification in the Peripheral Equipment Selection Guidelines table in Chapter 9.5.
- The filter should be installed close to the input terminal of the frequency converter, and the length of connecting cable between them should be less than 30cm. The ground terminal of the filter and the frequency converter should be connected together, and make sure that the filter and the frequency converter is installed on the same conductive installation plane, which is connected to the main grounding terminal of the cabinet.

## **(2) DC bus (+) / (-)**

- Please notice that there is residual voltage at the (+) and (-) terminals of the DC bus after power off. Wait 10 minutes after power off, use a multimeter to measure and confirm that the voltage is below the 36V safety voltage before wiring operations. Otherwise there is a danger of electric shock.
- When using external braking equipment for models with a power of 90kW and above, please notice that the (+) and (-) terminals can not be reversed, otherwise the frequency converter and braking equipment will be damaged, or even a fire will be caused.
- The cable length of the brake unit should not be above 10m. Twisted-pair cable or tight two-wire parallel wiring should be used.
- Do not connect the braking resistor to the DC bus directly, which may damage the frequency converter or even cause a fire.

## **(3) Braking resistor connection terminal (+) / BR**

- The braking resistor connection terminal is effective only for models of 75kW power and below with a built-in braking unit.
- For the selection of braking resistor, please refer to the recommended value and the cable length should be less than 5m, otherwise the frequency converter may be damaged.
- Notice that there should be no combustibles around the braking resistor, to avoid high-temperature braking resistors from igniting surrounding objects.
- After connecting the braking resistor, for models with a power below 75kW and a built-in braking unit, set the starting voltage parameters of the braking unit reasonably according to the actual load.

## **(4) Frequency converter output terminals U/V/W**

- The output terminals U, V, W of the frequency converter are connected to the input terminals U, V, W of the motor. For the selection of the output side cable, please select the copper cable according to the recommended specification in the FT50 series Frequency Converter Peripheral Equipment Selection Guidelines table in Chapter 9.5.
- During the operation, please confirm whether the motor rotates clockwise when the clockwise rotation command is input. If the motor rotates counterclockwise, please interchange any two cables connected to the frequency converter output terminals U, V, W.
- Never connect the power supply cable to the output terminal. Applying voltage to the output terminals will damage the internal components of the frequency converter.
- Do not touch the output terminals of the frequency converter directly, or short-circuit the output cables with the housing/shell of the frequency converter. Otherwise there is a danger of electric shock and short circuit. Also, do not short-circuit the output cables.

## **(5) PE Terminals**

- The grounding terminal must be reliably grounded, and the grounding resistance must be less than 10Ω. Otherwise, the frequency converter will work abnormally or even be damaged.
- Do not share the neutral wire terminal of the power supply and the ground terminal.
- For the selection of the protective grounding cable, please select the copper cable

according to the recommended specification in the FT50 series Frequency Converter Peripheral Equipment Selection Guidelines table in Chapter 9.5.

- The protective grounding conductor shall be a yellow-green cable, or comply with the local regulation.
- It can be used as the grounding position of the shielding layer of the main circuit.
- The frequency converter is recommended to be installed on a conductive metal mounting surface to ensure that the entire conductive bottom of the frequency converter is well connected to the mounting surface.
- It is recommended that the filter and the frequency converter is installed on the same mounting surface to ensure the performance of the filter.

## 4 Operation Panel

### 4.1 Operation panel description

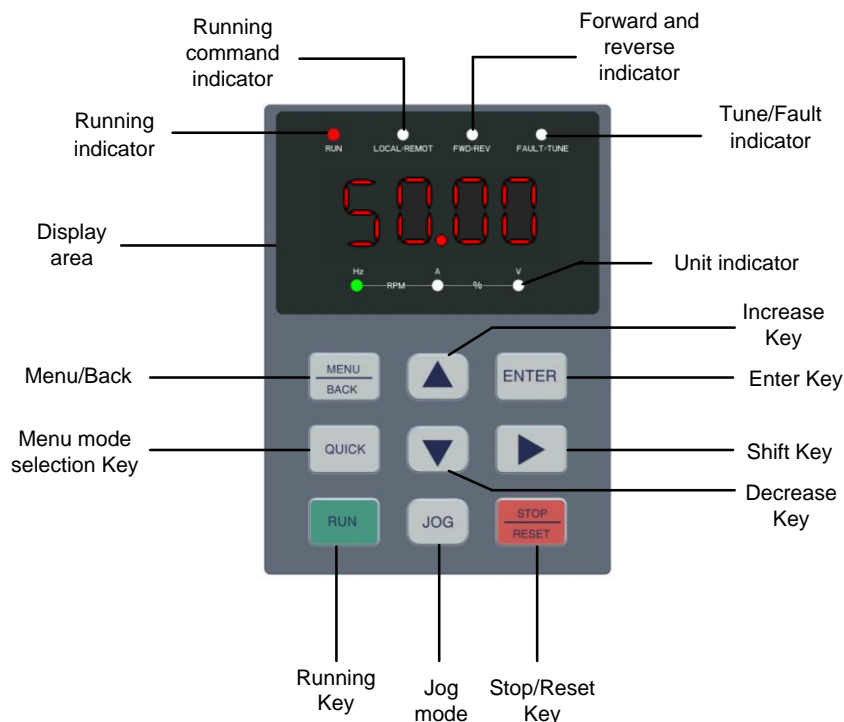




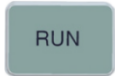



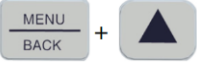
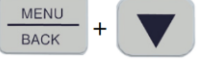
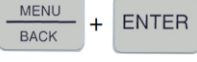

Figure 4-1 Operation panel diagram

### 4.2 LED Operation Panel

#### 4.2.1 Panel Keys


Table 4-1 Operation panel key function table

KEY	Name	Function
	MENU/BACK	Enter or exit the first level menu
	Enter Key	Enter the menu level by level and confirm the setting parameters.
	Increase Key	1. Increase and decrease data or function code 2. In the state of the parameter display interface, when the main frequency setting is set as a percentage input (P1801.W=W0020), short pressing the increase key or the decrease key will

	Decrease Key	display the frequency setting of the frequency converter. If continue to long press the increase key or the decrease key to increase or decrease the frequency setting, as the time of the long press becomes longer, the increment or decrement of the frequency setting will also accelerate.
	Shift Key	1. In the display interface of stopped state or running state, the display parameters can be selected cyclically. 2. When modifying the parameter, the modified bit of the parameter can be selected.
	Running Key	Run command key
	Stop/Reset	Stop command key 1. When receiving a stop command, no matter whether the frequency converter is currently running or stopped, the frequency converter will carry out the STOP command. 2. When a fault alarm occurs, press the Stop/Reset key to reset.
	Jog key	Jog command key
	Menu mode selection key	Switch between different menu modes (the default setting is a menu mode)
	Combination key 1	Parameter upload
	Combination key 2	Parameter download
	Combination key 3	Lock the machine. It is effective when the user has set the keyboard lock password.
	Combination key 4	Reverse jog

## 4.2.2 Indicator Light

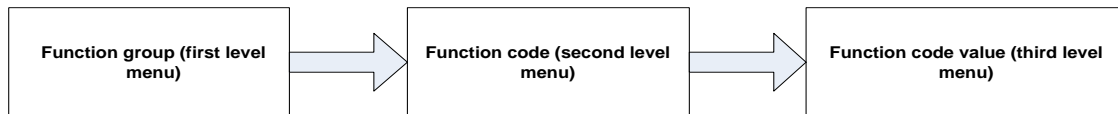
Table 4-2 Operation panel indicator light description

Indicator light	State description
	Light on: Running Light flicker: Running in torque mode Light off: Stopped

● LOCAL	Light on: Other control modes Light off: Start-stop simulation key is valid
● REV	Light on: Reverse Light off: Forward
● FAULT	Light on: There is malfunction. Light flicker: PI tuning or parameter identification is in progress Light off: No fault
Hz ●	Light on: Unit of Frequency Hz
A ●	Light on: Unit of current A
V ●	Light on: Unit of voltage V
● — RPM — ●	Hz+A, both lights are on at the same time, rotation speed RPM
● — % — ●	A+V, Both lights are on at the same time: Percentage %

### 4.2.3 Check and modify the parameter function code

A three-level menu structure is adopted in the LED operation panel of the FT50 series frequency converter to perform operations such as viewing and modifying parameters.



After entering each level of the menu, when the display bit is flickering, press the  $\triangle$  key,  $\nabla$  key, or  $\triangleright$  key to modify.

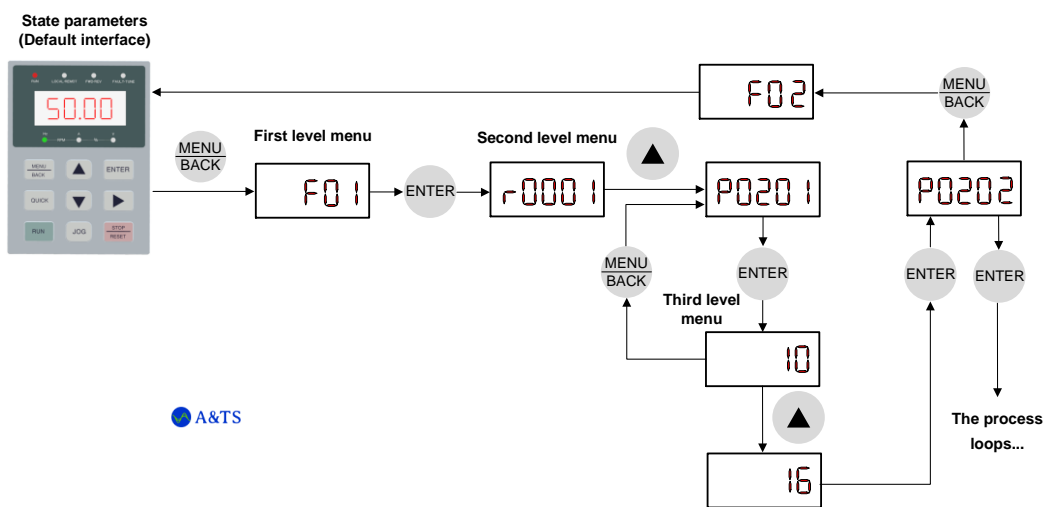


Figure 4-2 Three-level menu operation flowchart

1) When operating the third-level menu, the user can press **MENU/BACK** or **ENTER** key to

return to the second level menu. The difference between the two is as follows. Press the **ENTER** key to save the setup parameters, return to the second level menu, and switch to the next parameter function code automatically. Press the **MENU/BACK** key to abandon the current parameter modification and return to the current parameter function code second level menu directly.

- 2) When operating the third level menu, if there is no flicker bit in the parameter, it means that the parameter function code cannot be modified. The possible reasons are as below.
  - a. The parameter function code is not modifiable, such as a read-only parameter.
  - b. The parameter function code cannot be modified when frequency converter is running, and can be modified after it's stopped only.
  - c. The keyboard is locked. Enter the correct keyboard password, and then modify it.

### 4.2.4 Check Parameter Function Code

There are many parameter function codes in FT50 series frequency converter, and four modes to check parameter function codes are provided. The default setting is the basic viewing mode (All parameter function code groups can be viewed, F01 means parameter function code group 1). In addition, three quick ways to check the parameter function codes are provided for convenience.

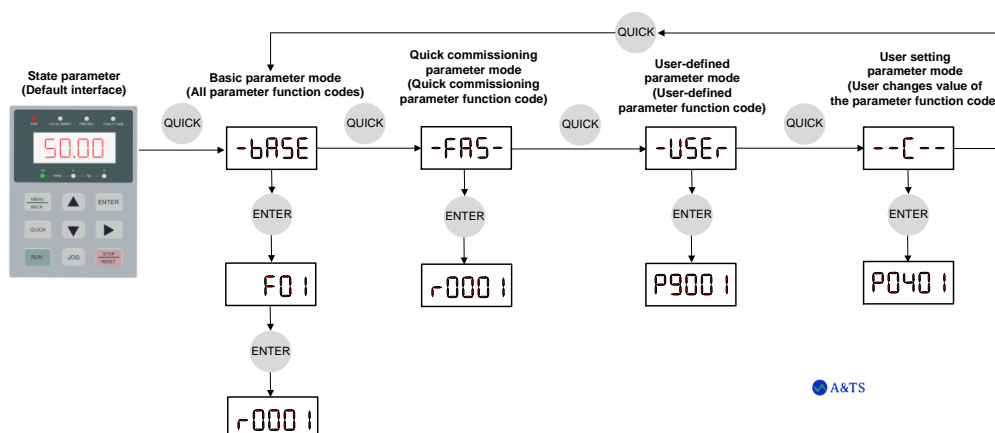


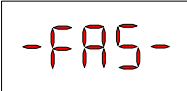

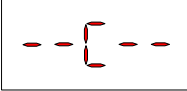
Figure 4-3 Parameter function code flowchart

In the each menu mode in the figure above, the display format of the parameters is the same. The method of modifying the parameter is the same as normal.

Table 4-3 Modes of checking the parameter function codes

Parameter function code checking method	Display	Description
Basic parameter mode	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">-bASE</div>	Check all parameter function codes Note: For parameter function code details, please refer to Chapter 6.3 Parameter List



Quick commissioning parameter mode		Check the parameter function code of the quick commissioning group
User-defined parameter mode		Check user-defined parameter function codes
User setting parameter mode		Check the parameter function code that is different from the factory default

### 1) Basic parameter mode

In the basic parameter mode, all parameter function codes of the frequency converter can be checked. It can be checked or modified as per the introduction in Chapter 4.2.3. The three display modes of parameter function codes are switched by the **QUICK** key on the panel. After entering the display mode, the method of viewing or modifying the each group of parameter function code is the same as the description in chapter 4.2.3.

### 2) Quick checking modes

#### ● Check quick commissioning parameter function code

Press the **QUICK** key on the panel to enter the Quick commissioning parameter mode, and check the parameter function code of the quick commissioning group. In this mode, it is convenient for the user to set the matching and basic control parameters of the frequency converter and the motor, so as to complete the quick commissioning of the frequency converter.

#### ● Check user defined parameter function codes group

Press the **QUICK** key on the panel to enter the user defined parameter mode, and check the user defined parameter function codes.

User-defined parameter function code: The user can define the commonly used parameter function codes by setting 29 groups (P9001-P9030) of codes. Up to 30 groups of function codes can be self-defined. There are 29 groups of function codes can be self-defined by default, and there is 1 group custom parameter function code (P9001). The user can also modify the default parameter function codes according to the specific needs. If the set value of a parameter function code in the 29 groups is 0, it means that the parameter function code is not defined. If NULL is displayed when the user presses **QUICK** key to enter the menu, it means that the self-defined menu is empty.

#### ● Check the parameter function code that has been set by the user

Press the **QUICK** key on the panel to enter the user setting parameter mode, and check the parameter function code that is different from the factory default. In this mode, it is convenient for users to access the modified parameter function codes quickly. In the user setting parameter function code group, the codes that have been set by the user are listed, in which the current set value of the code is different from the factory default value. The parameter function code list is generated by the frequency converter automatically.

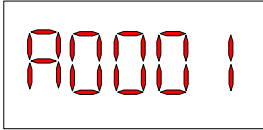
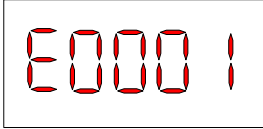
## 4.2.6 Fault and Alarm Display

Fault and alarm display rules.

- 1) Display fault code when fault and alarm exist at the same time.
- 2) When there is no fault but there are several alarms, the alarm codes will be displayed cyclically.
- 3) Display current parameters when there is no fault or alarm.

For fault codes and alarm codes of the FT50 series frequency converter, please refer to the Chapter 7. The fault and alarm display description is as follows.

Table 4-5 Fault and alarm display description

State	Display	Description
When an alarm occurs		When an alarm occurs, the frequency converter can operate normally, and the last two digits display the alarm code (the figure on the left shows an example, alarm No.1 )
When a fault occurs		When a fault occurs, the frequency converter is in the stopped state, and the last two digits display the fault code (the figure on the left shows an example, fault No.1 )

## 4.2.7 Keyboard Password Lock Function

This function is used to lock the keyboard to prevent the keyboard from being operated by unauthorized personnel or the parameters are set incorrectly. When the password is set, the user must enter the correct password before setting the parameters, otherwise the user can only check the parameters.

- 1) Set initial password for keypad lock

When using this function for the first time, the user sets the value of parameter P3346.F as the keyboard lock password. The user must remember the password when setting the keyboard lock password, otherwise the operation panel cannot be unlocked easily.



### NOTICE

When the user forgets the set keyboard lock password and cannot unlock the operation panel, please contact the A&TS technology for technical support.

- 2) Keyboard lock settings

If the user needs to lock the keyboard after setting the password, the user can press the MENU/BACK+ ENTER key combination or set the parameter value to 0. If the password has been set, the user needs to enter the correct password each time the keyboard is locked or power on again before setting the parameters. If the password is correct, the password can be modified by entering the new password.

**NOTICE**

If the keyboard password lock has been set, only the function of fault reset key is effective. Other key functions (such as start, stop, jog, up/down keys to modify frequency, parameter upload/download etc.) are only available after the keyboard lock is unlocked.

#### 4.2.8 Parameter Upload and Download Function

The user can carry out the parameter upload function by pressing the **MENU/BACK+Δ** combination key on the keyboard, and the parameter download function can be performed by pressing the **MENU/BACK+∇** combination key. During the upload/download, the keyboard will display the upload/download progress, showed as a percentage number (the percentage number increases gradually). When the percentage number increases to 100%, it means that the upload/download progress is done, and the parameter upload/download operation is completed. During upload and download, all the keys are invalid.

#### 4.2.9 Remote Operation of the Operation Panel

First disassemble the operation panel as per the Section 3.2.5. Then use the network cable to connect the user port of the keyboard tray and the network port on the back of the operation panel to realize the remote operation of the operation panel.

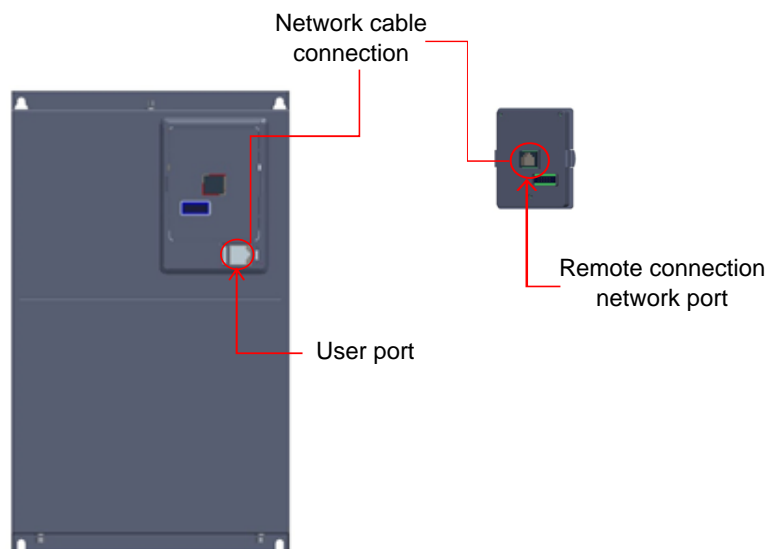


Figure 4-4 The connection method diagram for the remote operation of operation panel

## 5 Commissioning Guide

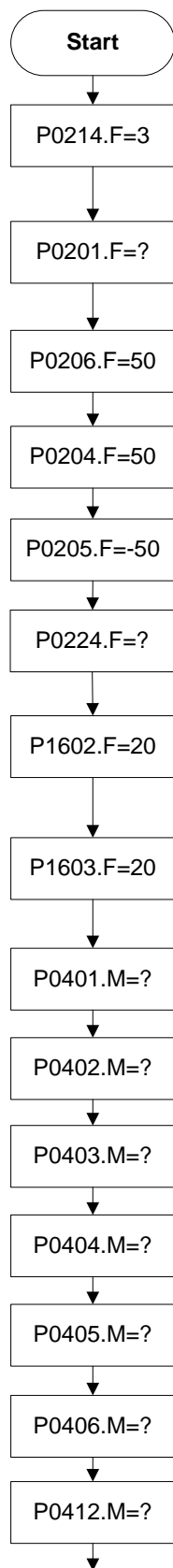
### 5.1 Quick Commissioning Guide

The quick commissioning function mainly includes the matching of the frequency converter and the motor, the motor parameter identification and the configuration of other basic control function parameters. For some typical applications, the user can set parameters quickly through the application macro. Quick commissioning can be carried out through the operation panel.

After the quick commissioning, the basic commissioning of the motor and frequency converter is completed. The user must prepare the following data before commissioning, or have input them into the frequency converter.

- Frequency converter model (Before leaving the factory, the model parameter of the frequency converter has been set to the default value according to the complete machine, and the user does not need to modify it.)
- Motor nameplate data
- Command/set value source
- Upper frequency limit / lower frequency limit and acceleration/deceleration ramp time
- Frequency converter control mode
- Motor parameter identification

During quick commissioning, the user can set the correlation parameters in sequence according to the following flowchart. Some parameters are available for the FT50 series frequency converter only, but not in the FT30 series.



### Start quick commissioning

#### Access level

0: User level      1: Standard level  
2: Advanced level    3: Expert level

#### Frequency converter model

Before leaving the factory, the model parameter of the frequency converter has been set to the default value according to the complete machine, and the user does not need to modify it. Set value range: 6(2.2kw) - 29(355kw)

#### Reference frequency (Hz)

Set the benchmark for both internal calculation and percentage of the given frequency, generally set it to 50Hz.

#### Upper frequency limit(Hz)

Set the upper output frequency limit of the frequency converter.  
Set value range: P0205.F-P0206.F\*2

#### Lower frequency limit (Hz)

Set the lower output frequency limit of the frequency converter.  
Set value range: -(P0206.F)\*2-P0204.F\*2

#### Load type selection

0: High overload  
1: Low overload

#### Acceleration time (s)

It defines the time required for the ramp function to accelerate from 0Hz to the frequency converter reference frequency (P0206.F).  
Setting value range: 0.0-1200.0s

#### Deceleration time (s)

It defines the time required for the ramp function to decelerate from the frequency converter reference frequency (P0206.F) to 0Hz.  
Setting value range: 0.0-1200.0s

#### Motor rated power (kW)

Set as per the motor rated power on the nameplate

#### Motor rated voltage (V)

Set as per the motor rated voltage on the nameplate

#### Motor rated current (A)

Set as per the motor rated current on the nameplate

#### Motor rated frequency(Hz)

Set as per the motor rated frequency on the nameplate

#### Motor rated speed (rpm)

Set as per the motor rated speed on the nameplate

#### Number of motor pole pairs

Set the number of motor pole pairs.  
For example, the number of pole pairs of a 4-pole motor is 2.

#### Motor power factor

Set as per the motor power factor on the nameplate

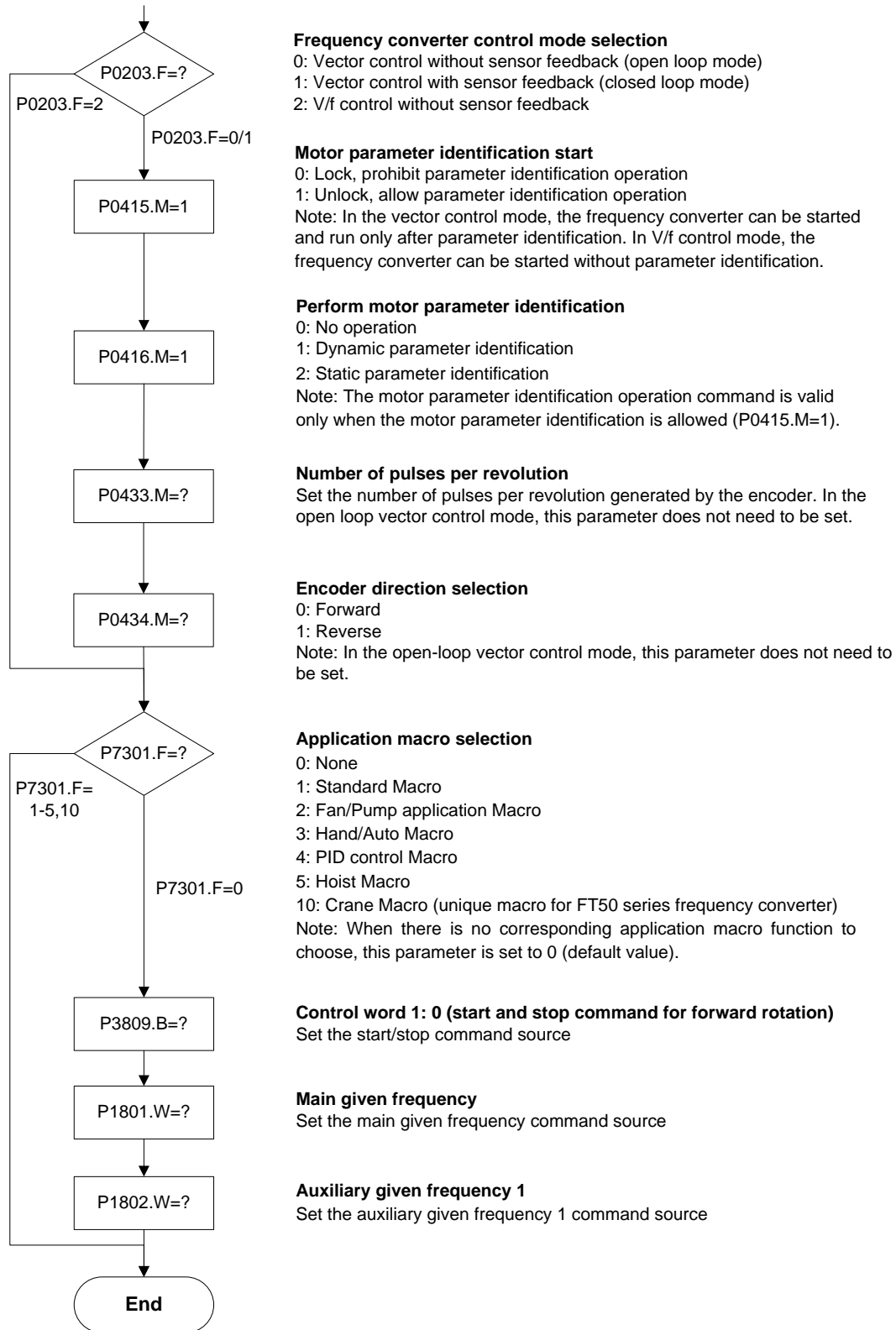


Figure 5-1 Quick commissioning flowchart

## 5.2 Power On

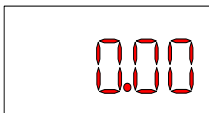
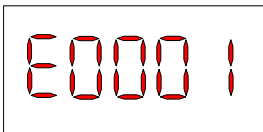
Make sure to confirm the following items before power on.

Table 5-1 Items to be confirmed before power on

Item	Contents
Confirm the power supply voltage	Confirm that the power supply voltage is correct. AC380±20% 50/60Hz
	Please connect the power input terminal (R/S/T) reliably.
	Confirm that the frequency converter and the motor are grounded properly.
Confirm the connection between the frequency converter output terminal and the motor terminal	Please confirm that the frequency converter output terminal (U/V/W) and the motor terminal have been firmly connected.
Confirm the connection with the control circuit terminal of the frequency converter	Please confirm that the control circuit terminals of the frequency converter and other control devices have been firmly connected.
Confirm the state of the control terminals	Please confirm that the control circuit terminals of the frequency converter are all in the OFF state. (the frequency converter is in the state without start command)
Confirm the load	Please confirm that the motor is in no load state and not connected to the mechanical system.

After power on, under normal state, the LED operation panel displays as shown in the table below.

Table 5-2 The display status of the operation panel after power on

State	Display	Description
Normal state		The display is frequency setting 0.00Hz by factory default.
Fault state		When the fault occurs, the frequency converter is in the stop state, and the last four digits display the fault code (the figure shows the error 1 as an example)

## 5.3 Parameter Initialization

The configuration of the frequency converter can be restored to the factory configuration by setting P0210.F. After the factory default value is restored, the value of P0210.F will be

returned to zero automatically.

Table 5-3 Parameter initialization description

Setting	Description
1: Restore to factory default	After setting P0210.F=1, most of the frequency converter parameters are restored to the factory default. But the P0201.F (frequency converter model), fault record information, running time (r0010), and some factory parameters are not restored.
2: Restore to factory default, excluding motor parameters	After setting P0210.F=2, most of the frequency converter parameters are restored to the factory default. But the P0201.F (frequency converter model), motor parameters, fault record information, running time (r0010), and some factory parameters are not restored.

## 5.4 Motor Control Mode Selection

Table 5-4 Motor control mode selection description

Function code	Description	Application scenarios
P0203.F: frequency converter control mode selection	Set it to 0: vector control without sensor (PG) feedback. Open loop vector control mode	It is suitable for general high performance control scenarios, such as machine tools (CNC), centrifuges, wire drawing machines, injection molding machines and other loads.
	Set it to 1: vector control with sensor (PG) feedback Closed loop vector control mode	The motor must be equipped with an encoder, and the frequency converter must be equipped with an encoder expansion board of the same type as the motor encoder. It is suitable for high precision speed control or torque control scenarios. One frequency converter can only drive one motor.
	Set it to 2: V/f control without sensor (PG) feedback	It is suitable for scenarios where the requirement of the load accuracy is not high, or one frequency converter drives multiple motors. For example, fan and pump applications.

## 5.5 Start and Stop Commands

Frequency converter control commands include: start, stop, forward, reverse, jog, etc. It is mainly set by the following parameter function codes. These parameter function codes are all interconnected. The start/stop command source can be set to any bit connector, including operation panel, terminal, communication, etc.



Table 5-5 Control command selection description

Function code	Name	Factory default	Function description	Examples
P3809.B	Control word 1:0 (Forward rotation start/stop command)	B0028:start/stop control simulation key	When the value of this function code is changed from 0 to 1 (valid at rising edge), it means there is a forward rotation start command. When it is 0, it means there is a forward rotation stop command.	B0028:Start-stop control simulation key (operation panel start-stop)  B0012: DI1 B0014: DI2 B0016: DI3 B0018: DI4 B0020: DI5 B0022: DI6
P3824.B	Control word 1:15 (Reverse rotation start/stop command)	B0000: constant 0	When the value of this function code is changed from 0 to 1 (valid at rising edge), it means there is a reverse rotation start command. When it is 0, it means there is a reverse rotation stop command.	B3000 - B4515: PROFIBUS-DP communication receiving bit connector
P3811.B	Control word 1:2 (Reverse rotation command)	B0000: constant 0	When the value of this function code is 1, it means there is a reverse rotation command. When it is 0, it means there is no reverse rotation command.	B5064 - B5127: Drive to drive communication control receiving bit connector  B5192 - B5255: Modbus communication receiving bit connector
P3812.B	Control word 1:3 (Jog command)	B0129: Jog simulation key	When the value of this function code is 1, it means there is a jog start command. When it is 0, it means there is a jog stop command.	For details, please refer to Chapter 6.2.3 Connector Description

**Explication:**

There are 4 start/stop control modes available for the frequency converter. Two-wire mode 1 and 2, three-wire mode 1 and 2.

1. Two-wire mode 1. This mode is the most frequently used. The parameters P3809.B and P3824.B are used to control the forward and reverse rotation of the motor.

In this control mode:

When the value of P3809.B (start/stop forward rotation) is changed from 0 to 1 (valid at rising edge), frequency converter performs forward rotation.

When the value of P3809.B (start/stop forward rotation) is 0, frequency converter stops running.

When the value of P3824.B (start/stop reverse rotation) is changed from 0 to 1 (valid at rising edge), frequency converter performs reverse rotation.

When the value of P3824.B (start/stop reverse rotation) is 0, frequency converter stops running.

The running direction of the frequency converter is subject to the parameter set first among these two parameters.

Table 5-6 Two-wire mode 1 function description

P3809.B	P3824.B	Running command
0→1	0	Forward rotation
0	0→1	Reverse rotation
0	0	Stop

2. Two-wire mode 2. The parameters P3809.B and P3811.B are used to control the forward and reverse rotation of the motor.

In this control mode:

When the value of P3809.B (start/stop forward rotation) is changed from 0 to 1 (valid at rising edge), and the value of P3811.B (reverse rotation command) is 0, frequency converter performs forward rotation.

When the value of P3809.B (start/stop forward rotation) is changed from 0 to 1 (valid at rising edge), and the value of P3811.B (reverse rotation command) is 1, frequency converter performs reverse rotation.

When the value of P3809.B (start/stop forward rotation) is 0, frequency converter stops running.

The running direction of the frequency converter is subject to the parameter P3811.B (reverse rotation command).

Table 5-7 Two-wire mode 2 function description

P3809.B	P3811.B	Running command
0→1	0	Forward rotation
0→1	1	Reverse rotation
0	0	Stop
0	1	Stop

3. Three-wire mode 1. The parameters P3809.B, P3824.B and P3845.B are used to control the forward and reverse rotation of the motor, enable and disable the running.

In this control mode:

When the parameter P3845.B (frequency converter running prohibited) is 0, the frequency converter stops. During the start and operation of the frequency converter, the value of parameter P3845.B (frequency converter running prohibited) must be kept at 1. The

parameters P3809.B (start/stop forward rotation) and P3824.B (start/stop reverse rotation) are effective when they are changed from 0 to 1 (valid at rising edge). The running direction of the frequency converter is subject to the parameter set first among these two parameters.

Table 5-8 Three-wire mode 1 function description

P3809.B	P3824.B	P3845.B	Running command
0→1	0	1	Forward rotation
0	0→1	1	Reverse rotation
0	0	1	Stop
0/1	0/1	0	Stop

4. Three-wire mode 2. The parameters P3809.B, P3811.B and P3845.B are used to control the forward and reverse rotation of the motor, enable and disable the running.

In this control mode:

When the parameter P3845.B (frequency converter running prohibited) is 0, the frequency converter stops. During the start and operation of the frequency converter, the value of parameter P3845.B (frequency converter running prohibited) must be kept at 1. The parameters P3809.B (start/stop forward rotation) is effective when they are changed from 0 to 1 (valid at rising edge). The running direction of the frequency converter is subject to the parameter P3811.B (reverse rotation command).

Table 5-9 Three-wire mode 2 function description

P3809.B	P3811.B	P3845.B	Running command
0→1	0	1	Forward rotation
0→1	1	1	Reverse rotation
0	0/1	1	Stop
0/1	0/1	0	Stop

## 6 System Parameters

### 6.1 Parameter Description

The parameters of the frequency converter can be modified by the operation panel or the upper machine.

It is an intervention point set up to match the application of the function block. It can be used to connect function blocks and examine internal signals through digital (on-off) connectors and word connectors.

Parameter type:

- ◆ Function parameters (readable and writable)
- ◆ Motor parameters (readable and writable)
- ◆ Interconnection parameters (readable and writable)
- ◆ Read-only parameter (readable only)

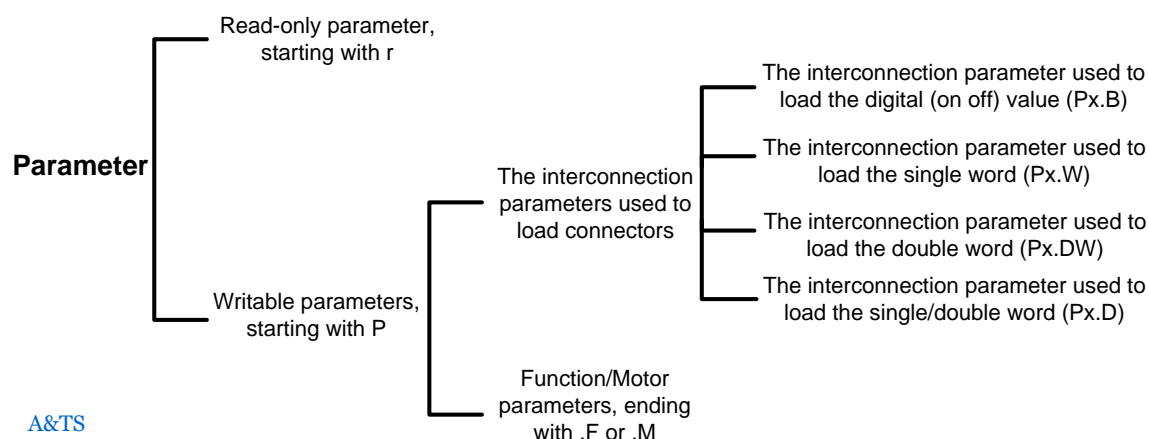


Figure 6-1 Parameter type

**(1) Function parameter** The response of the function block is determined by the function parameters. Function parameters can be labeled, and the meaning of the parameter values stored in different labels depends on the definition of each parameter.

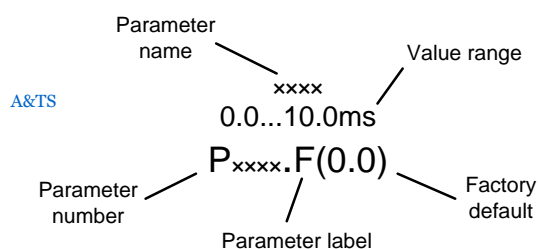


Figure 6-2 Function parameter label definition description

**(2) Motor parameter** Motor parameters are used to match the frequency converter with the connected motor, and can also support open-loop and closed-loop control modes. Typical examples of motor parameters are:

- ◆ Motor rating data from the motor nameplate
- ◆ Specifications of the connected encoder

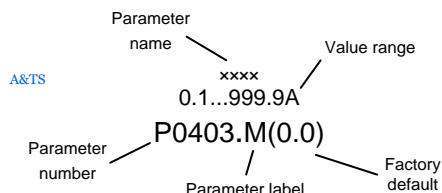


Figure 6-3 Motor parameter label definition description

**(3) Interconnection parameter** The interconnection parameters are used to determine the input signal source of a function block. For each interconnection parameter, there is an input signal with a certain format. There are following labels in the interconnection parameters.

- ◆ B is used in the connector parameters connected to the digital (on-off) connector
- ◆ W is used in the connector parameters connected to the single word (16-bit) connector
- ◆ DW is used in the connector parameters connected to the double word (32-bit)

connector

- ◆ D is used in the connector parameters connected to the single/double word (16/32-bit)

connector

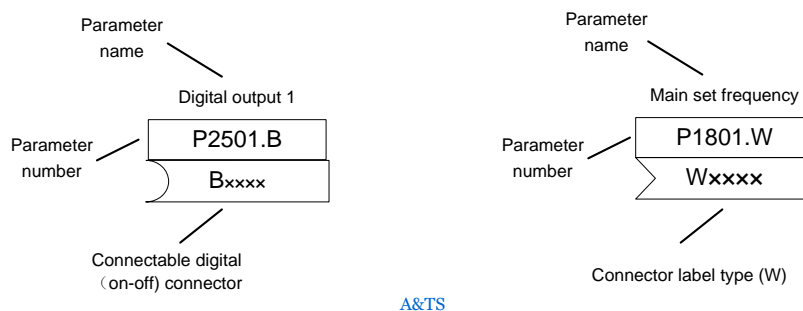


Figure 6-4 Interconnection parameter label definition description

**(4) Read-only parameter** Read-only parameters are used to display internal values (such as the output current of the frequency converter). These parameters can only be displayed and cannot be changed. To distinguish it from other parameters, the parameter number is marked with a lowercase letter r.

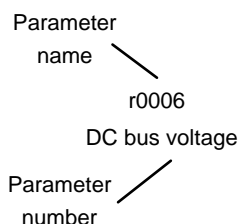


Figure 6-5 Read-only parameter label definition description

## 6.2 Interconnection Parameter Function

The interconnection parameter function is a flexible setting method that combines the input and output functions.

### 6.2.1 Interconnection Parameter Setting Method

Using interconnection parameters, an interconnection relationship can be established between input (digital input, analog value, communication, etc.) and output (frequency of the frequency converter, analog output, digital (on-off) output, etc.).

Example 1:

Use the state of digital input 1 to control relay output 1.

Set P2505.B=B0012, that is, interconnect the relay output 1 and the digital input 1. And then the state of the digital input 1 can be expressed through the relay output 1.

Example 2:

Use analog input 1 as the main frequency setting.

Set P1801.W=W0021, that is, interconnect the main frequency setting and analog input 1. The analog input 1 can be used as the main frequency setting.

### 6.2.2 Interconnection Parameter Control Word and Status Word

The control function of the FT50 series frequency converter is set by the control word, and the running state is expressed by the status word.

Each bit of the control word can be interconnected with a bit connector, so that the corresponding function can be realized by the value of the connector.

Example:

Set P2501.B = B0078, that is, interconnect the digital output 1 and the status word 2:3 fault. Then the digital output 1 indicates the fault state of the frequency converter.

Then the switch output 1 indicates the fault status of the inverter

Set P3809.B = B0012, that is, interconnect the Control Word 1:0 (start/stop command) with the digital input 1. The start/stop of the frequency converter is controlled by the state of digital input 1.

## 6.3 Parameter List

### 1) Code

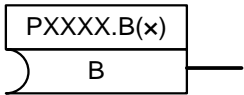
Code stands for the function code. It refers to the parameter number. The parameter number is represented by 4 digits from 0000 to 9999. When there is a lowercase letter r in front of the parameter number, it means that the parameter is a read-only parameter. It displays a specific parameter value and cannot be changed to a different value.

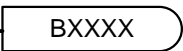
All other parameter numbers are preceded by a capital letter P. The values of these

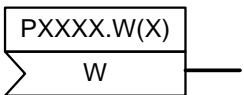
parameters can be modified within the range of the minimum and maximum.

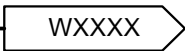
## 2) Name

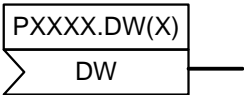
It refers to the parameter name. Some parameter names are preceded by the following abbreviations: BI, BO, WI, WO, DWI, and DWO, followed by a colon. The meaning of these abbreviation is as follows:


**BI** =  Bit connector interconnection input. It means that the input bit connector signal source can be selected and set through this parameter.

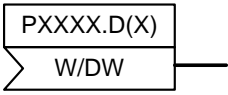
**BO** =  Bit connector interconnection output.

**WI** =  Word connector interconnection input. It means that the input word connector signal source can be selected and set through this parameter.

**WO** =  Word connector interconnection output.

**DWI** =  Double word connector interconnection input. It means that the input double word connector signal source can be selected and set through this parameter.

**DWO** =  Double word connector interconnection output.

**WI/DWI** =  Word/Double word connector interconnection Input.

It means that the input word/double word connector signal source can be selected and set through this parameter.

## 3) Setting range

The upper and lower limits of the parameter can be set.

## 4) Factory default

Factory default setting

## 5) Access permission

The parameters can be accessed and changed on the operation panel or the upper machine software. The parameter with r indicates that it is a read-only parameter, and the parameter with P indicates that it is modifiable. The frequency converter parameters are with two important authority attributes: access permission and modification permission.

Access permission:

There are four access levels for the frequency converter parameters. They are user access level, standard access level, extended access level and expert access level. The access level is selected by parameter P0214.F (Refer to Chapter 6.3 Parameter List). For most application objects, it is enough to access parameters with the standard level (P0214=1) and extended level (P0214=2).

The user selects his/her own access level by setting the parameter P0214.F. When the user sets his/her own level to be relatively low, the parameters with higher level cannot be accessed. If the user finds that the parameter cannot be accessed on the operation panel (the parameter value cannot be checked), he/she can increase his/her access level by setting the P0214.F parameter.

If the user finds that the parameter that needs to be accessed on the operation panel cannot be accessed (the parameter value cannot be checked), he/she can improve his/her access level by setting the P0214.F parameter.

## 6) M column

There are three modification levels for the frequency converter parameters.

0. Parameters that can never be modified.
1. Parameters that can be modified at any time.
2. Parameters that cannot be modified during running time.

Actually, the parameter that can never be modified is the parameter with r (read-only). It is 0 in the M column.

Some parameters (such as percentage input) that are modified while the motor is running will not seriously affect the dynamic performance of the motor are classified as the level 1 parameters. It is 1 in the M column.

The rest of the parameters, modified while the motor is running, that may degrade the running performance or even cause danger (such as the frequency converter carrier frequency), are classified as level 2 parameters. It is 2 in the M column.

The modification permission of all parameters has been fixed in the factory, and the user cannot change it.



## 7 Fault Diagnosis and Handling

### 7.1 Safety Precautions



#### **DANGER**

- ◆ **Pay attention to the risk of electric shock.** It is strictly forbidden to do the wiring when the power is on. Even if the power supply has been cut off, there is still dangerous voltage on the capacitor of the frequency converter. **Therefore, the device should not be opened until 10 minutes after the power has been switched off.**



#### **WARNING**

- ◆ No matter where the fault occurs in the control equipment, it may cause major equipment damage or even serious personal injury (that is, there is a potentially dangerous fault). Therefore, additional external precautions must be taken or additional devices used to ensure safe operation must be installed, even in the event of a fault (for example, installation of independent current limit switch, mechanical interlock, etc.).
- ◆ Do not disassemble the shell or touch the internal circuit after the frequency converter is electrified, otherwise there will be a risk of electric shock.
- ◆ When installing the frequency converter in a closed cabinet or enclosure, please use a cooling fan or a cooling air conditioner for cooling.
- ◆ Please confirm that the input voltage of the product is within the rated voltage range of the nameplate.
- ◆ Do not place flammable and explosive materials near the frequency converter.
- ◆ Prevent children and the unauthorized person from touching or approaching the frequency converter.
- ◆ This equipment can only be used for the purpose specified by the manufacturer. Unauthorized modification or use of parts and accessories not sold or recommended by the manufacturer of this equipment may cause fire, electric shock and other injuries.

### 7.2 Adjustment Guide before the Test Run

#### (1) Open loop vector control mode (P0207.F=0 factory default) ☆

The open-loop vector control mode is applicable to FT50 series frequency converter. It is used in scenarios where the motor is without the encoder speed feedback. In this control mode, it requires self-learning of motor parameters to complete motor parameter identification.

Problems and fault	Fault description and trouble shooting
Frequency converter overcurrent	<p>The output current of the frequency converter is too large, over the overcurrent point set by the software parameter, or the output current reaches the maximum value of the frequency converter hardware design range.</p> <p>Check and trouble shoot</p> <ul style="list-style-type: none"> <li>➤ The power of the motor does not match the power of the frequency converter</li> <li>➤ Acceleration time is too short</li> <li>➤ Motor overload</li> <li>➤ The output circuit of the frequency converter is grounded or short-circuited</li> <li>➤ Motor parameters have not been identified</li> </ul>
High frequency torque or slow speed response, motor vibration	<p>When the frequency is higher than the speed regulator coefficient switching frequency P0706.F, the user can improve the torque and speed response by adjusting the parameters P0702.F speed regulator proportional gain 1 and P0703.F speed regulator integral time 1, to strengthen the speed loop proportional adjustment or reduce the speed loop integral time.</p> <p>If vibration occurs, the values of P0702.F and P0703.F need to be reduced.</p>
Low frequency torque or speed response is slow, motor vibration	<p>When the frequency is lower than the speed regulator coefficient switching frequency P0706.F, the user can improve the torque and speed response by adjusting the parameters P0704.F speed regulator proportional gain 2 and P0705.F speed regulator integral time 2, to strengthen the speed loop proportional adjustment or reduce the speed loop integral time.</p> <p>If vibration occurs, the values of P0704.F and P0705.F need to be reduced.</p>
Low speed accuracy	<p>When the load speed deviation of the motor is too large, the slip compensation gain P0711.F can be adjusted appropriately.</p>
The motor is noisy	<p>Appropriately increase the value of carrier frequency (P0202.F).</p> <p>Notice that increasing the carrier frequency will increase the leakage current, and increase the temperature rise of the frequency converter. Needs to consider the frequency converter derating.</p>
Insufficient motor torque or insufficient output	<p>Check whether the upper limit of torque is restricted.</p> <p>Increase the upper limit of torque in speed mode.</p> <p>Increase torque command in torque mode.</p>

## (2) Closed loop vector control mode (P0207.F=1) ☆

The closed-loop vector control mode is only applicable to FT50 series frequency converter. It is used in scenarios where the motor is with the encoder speed feedback. In this control mode, it

needs to correctly set the parameters such as the number of pulses per revolution of the encoder and the direction of the encoder, and to perform parameter self-learning on the motor to complete the motor parameter identification.

Problems and fault	Fault description and trouble shooting
Frequency converter overcurrent	<p>The output current of the frequency converter is too large, over the overcurrent point set by the software parameter, or the output current reaches the maximum value of the frequency converter hardware design range.</p> <p>Check and trouble shoot</p> <ul style="list-style-type: none"> <li>➤ The power of the motor does not match the power of the frequency converter</li> <li>➤ Acceleration time is too short</li> <li>➤ Motor overload</li> <li>➤ The output circuit of the frequency converter is grounded or short-circuited</li> <li>➤ Motor parameters have not been identified</li> <li>➤ Improper setting of encoder parameters</li> </ul>
High frequency torque or slow speed response, motor vibration	<p>When the frequency is higher than the speed regulator coefficient switching frequency P0706.F, the user can improve the torque and speed response by adjusting the parameters P0702.F speed regulator proportional gain 1 and P0703.F speed regulator integral time 1, to strengthen the speed loop proportional adjustment or reduce the speed loop integral time.</p> <p>If vibration occurs, the values of P0702.F and P0703.F need to be reduced.</p>
Low frequency torque or speed response is slow, motor vibration	<p>When the frequency is lower than the speed regulator coefficient switching frequency P0706.F, the user can improve the torque and speed response by adjusting the parameters P0704.F speed regulator proportional gain 2 and P0705.F speed regulator integral time 2, to strengthen the speed loop proportional adjustment or reduce the speed loop integral time.</p> <p>If vibration occurs, the values of P0704.F and P0705.F need to be reduced.</p>
The motor is noisy	<p>Appropriately increase the value of carrier frequency (P0202.F).</p> <p>Notice that increasing the carrier frequency will increase the leakage current, and increase the temperature rise of the frequency converter. Needs to consider the frequency converter derating.</p>
Insufficient motor torque or insufficient output	<p>Check whether the upper limit of torque is restricted.</p> <p>Increase the upper limit of torque in speed mode.</p> <p>Increase torque command in torque mode.</p>

### (3) V/F control mode (P0207.F=2)

Without PG feedback, the V/F control mode is applied to the scenario where the motor is without encoder speed feedback. In this control mode, only the rated parameters of the motor need to be set correctly.

Problems and failures	Fault description and trouble shooting
Frequency converter overcurrent	<p>The output current of the frequency converter is too large, over the overcurrent point set by the software parameter, or the output current reaches the maximum value of the frequency converter hardware design range.</p> <p>Check and trouble shoot</p> <ul style="list-style-type: none"> <li>➤ The power of the motor does not match the power of the frequency converter</li> <li>➤ Acceleration time is too short</li> <li>➤ Motor overload</li> <li>➤ The output circuit of the frequency converter is grounded or short-circuited</li> <li>➤ Motor parameters have not been set correctly</li> <li>➤ Reduce the torque boost (P1103.F), and adjust in 0.5% units</li> </ul>
The motor is noisy	<p>Appropriately increase the value of carrier frequency (P0202.F). Notice that increasing the carrier frequency will increase the leakage current, and increase the temperature rise of the frequency converter. Needs to consider the frequency converter derating.</p>
Suddenly unload heavy load, report overvoltage, and report overvoltage when decelerating	<p>Confirm that P4924.F overvoltage speed out of control protection is set to 1, and confirm whether the setting of overvoltage speed out of control point is reasonable.</p>
Suddenly increase the load, report overcurrent, and report overcurrent when accelerating	<p>Confirm whether the settings of overcurrent speed out of control point P4926.F-P4927.F and overcurrent speed out of control detection time P4928.F are reasonable.</p>

### 7.3 Restart the Frequency Converter after a Fault

Table 7-1 restart the frequency converter after a fault

Stage	Trouble shooting
When a failure occurs	Use the upper machine or the operation panel to view the latest eight fault state through the parameters r4935-r4966.
Before fault reset	When the fault occurs, get the fault code and related information through the upper machine or the operation panel, find the cause of the fault and trouble

	shooting, and reset the frequency converter after the fault is removed. Refer to Chapter 7 for details.
Method of fault reset	After the trouble shooting, reset the fault through the upper computer.
	After the trouble shooting, click the reset key on the operation panel to reset.
	After the trouble shooting, the required signal source can be selected through P3813.B control word 1:4 (Fault reset). When the signal is changed from 0 to 1, the reset is triggered.
	The frequency converter will be automatically reset after power on again. Cut off the power of the main circuit temporarily, and turn on the power again after the display on the operation panel disappears.

## 7.4 Common Faults and Trouble Shooting

Table 7-2 Common faults and trouble shooting

No.	Fault phenomenon	Possible cause	Trouble shooting
1	No display after power-on	The power supply has no voltage or the voltage is too low	Check input power supply
		Switching power supply failure on the drive board of the frequency converter	Check bus voltage
		The connection between the control board and the drive board and the operation panel is disconnected	After power off, unplug and reconnect the connection cable
		The frequency converter buffer resistance is damaged	Consult A&TS technical support
		Control panel and operation panel failure	
The rectifier bridge is damaged			
2	After power on, it always shows undervoltage, in standby	The power supply on the input side is too low	Check input power
		Power supply phase loss	
		The rectifier bridge is abnormal	Consult A&TS technical support
3	Inverter/rectifier module overheat is frequently reported	The carrier frequency is set too high	Appropriately reduce the carrier frequency (P0202.F)
		The fan is not working normally	Check the fan-related wiring or replace the fan
		The internal components of the frequency converter are damaged	Consult A&TS technical support

4	The motor does not rotate after the frequency converter is running	The motor or the motor connection cable is abnormal	Confirm that the connection between the frequency converter and the motor is correct
		Incorrect setting of frequency converter parameters	<ol style="list-style-type: none"> <li>1. Restore the factory default, reset the parameter group that needs to be used.</li> <li>2. Check the related parameters of the motor and encoder, and set them correctly</li> <li>3. Check the frequency converter model P0201.F and control mode selection P0203.F, and set them correctly</li> <li>4. When using vector control mode, motor parameter identification needs to be completed</li> <li>5. In V/F mode, the torque boost P1103.F parameter can be adjusted appropriately</li> </ol>
		The connection cable between the drive board and the control board is in poor contact	Consult A&TS technical support
		The drive board is faulty	
5	DI terminal failure	The parameter setting is wrong	Check whether the digital input module enable P2508.F is set to 1
		There is an error in the external wiring	Check whether the control board wiring is good
		24V power supply is abnormal	Check whether the DI input 24V power supply is normal
		IO expansion board failure	Consult A&TS technical support
		Control board failure	
6	DO terminal failure	The parameter setting is wrong	Check whether the digital output module enable P2500.F is set to 1
		There is an error in the external wiring	Check whether the control board wiring is good
		IO expansion board failure	Consult A&TS technical support
		Control board failure	
7	Overcurrent or overvoltage faults are frequently	Improper parameter setting	<ol style="list-style-type: none"> <li>1. Check the related parameters of the motor and encoder, and set them correctly</li> </ol>

	reported in the frequency converter		2. Check the frequency converter model P0201.F and control mode selection 3. When using vector control mode, motor parameter identification needs to be completed
		Improper setting of acceleration and deceleration time	Set acceleration time P1602.F and deceleration time P1603.F to appropriate values
		Load fluctuation	Consult A&TS technical support
		The models of the motor and the frequency converter do not match	
8	Closed loop, motor speed cannot be increased	Encoder parameter setting is improper	Set the encoder parameters correctly
		Encoder failure, wrong connection or bad connection of encoder wire	Replace the encoder (code disc) and reconfirm the wiring
		Drive board failure	Consult A&TS technical support
		Encoder board failure	
9	After power on, the contactor is reported to be abnormal	The contactor is not closed	Consult A&TS technical support
10	During the acceleration and deceleration of the frequency converter, the motor speed is constant. That is, the actual acceleration and deceleration time is greater than the set acceleration and deceleration time	Overvoltage speed out of control protection takes effective	Change parameter P4924.F overvoltage speed out of control protection to 0: disable, turn off the protection function or adjust parameter P4925.F overvoltage speed out of control point appropriately
		Overcurrent speed out of control protection takes effective	Properly adjust the parameters P4926.F overcurrent speed out of control point 1 and P4927.F overcurrent speed out of control point 2

## 8 Routine Maintenance

### 8.1 Routine Maintenance

Due to the influence of environmental temperature, humidity, dust and vibration, the internal components of the frequency converter will age, leading to potential failures of the frequency converter and reducing the service life. Therefore, it is necessary to implement daily and regular maintenance of the frequency converter.

Daily inspection items:

- Whether the sound changes abnormally during the operation of the motor?
- Whether there is vibration during the operation of the motor?
- Whether the installation environment of the frequency converter has been changed?
- Whether the cooling fan of the frequency converter works normally?
- Whether the frequency converter is overheated?

Daily cleaning:

- Always keep the frequency converter in a clean state.
- Clean the dust on the surface of the frequency converter. Prevent dust from entering the frequency converter, especially the metal dust.
- Remove the greasy dirt on the cooling fan of the frequency converter.

### 8.2 Regular Inspection

Please regularly check the places that are difficult to check during operation.

Regular inspection items:

- Check the air duct and clean it regularly.
- Check whether the fan is damaged.
- Check whether the screws are loose.
- Check whether the frequency converter is corroded.
- Check whether there are arc traces on the wiring terminals.
- Main circuit insulation test.

#### **PROMPT**

When measuring insulation resistance with a megger (please use a DC 500V megger), disconnect the main circuit cable from the frequency converter. Do not use an insulation resistance meter to test the insulation of the control circuit. High voltage test is not necessary, as it's completed at the factory.



## 8.3 Fan Replacement

The cooling fan is a wearing part, and its service life is closely related to the environment and maintenance. The general service life time is:

Device name	Designed service life
Fan	4 - 5 years

### EXPLICATION

The designed service life is the time when the fan is used under the following conditions. The user can calculate the time the fan needs to be replaced based on the operating conditions.

- Ambient temperature: The annual average temperature is about 30° C.
- Load rate: 80% or less
- Operation rate: 20 hours or less / day
- Possible reasons for damage: bearing wear, blade aging
- Replacement criteria: Whether there are cracks in fan blades, etc. Does the sound vibrate abnormally when the machine is turned on?

Fan replacement method as below.

1) Fan replacement, for models from 2.2kW to 11kW

a. Disassemble the fan

Press the buckle on the fan cover to remove the fan cover, then lift the fan upwards, and unplug the power cord from the socket to complete the disassembly.

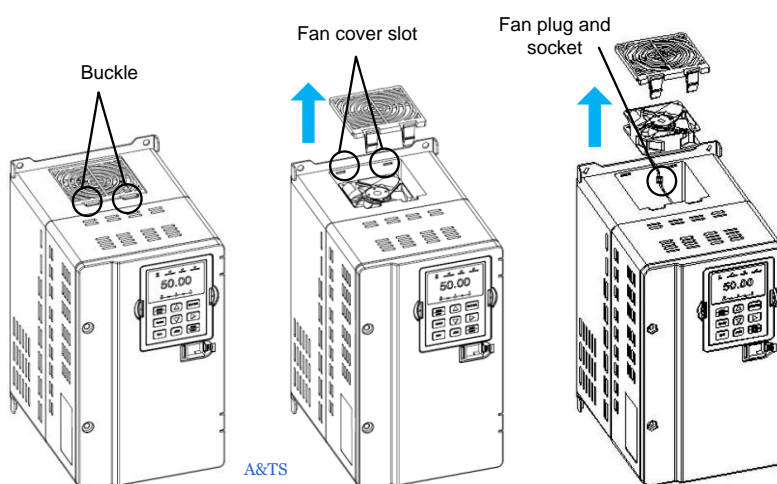


Figure 8-1 Fan disassembly (2.2kW to 11kW)

b. Fan installation

Please follow the reverse steps of disassembly to install: insert the fan power cord plug into the socket, and then put the fan into the body installation part (pay attention to distinguish the positive and negative directions of the fan). When putting it in, be careful to align the four fixing holes at the bottom of the fan with the positioning posts, and finally insert the buckle on the fan cover into the slot of the body, and press the fixing buckle to complete the installation. After

replacing the fan, make sure that the correct direction of the fan is blowing upwards.

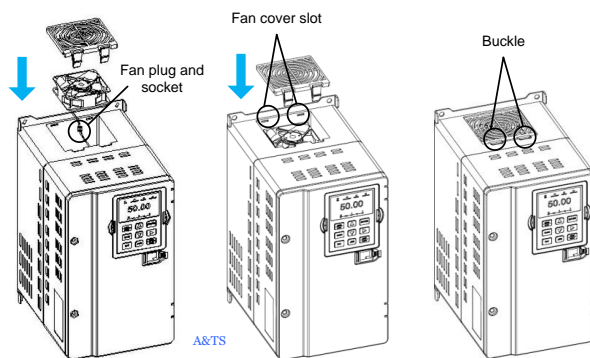


Figure 8-2 Fan installation (2.2kW to 11kW)

## 2) Fan replacement, for models from 15kW to 160kW

### a. Disassemble the fan

Unplug the power cord from the socket, use a screwdriver to remove the four fixing screws on the fan cover, then remove the fan cover and the fan to complete the disassembly.

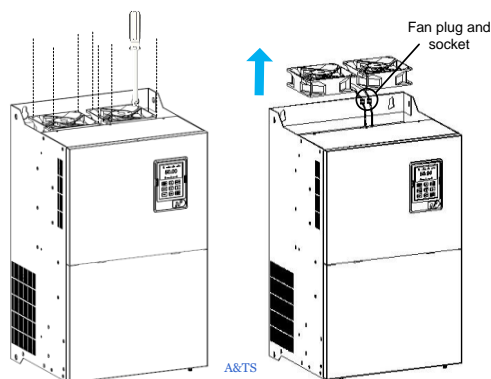


Figure 8-3 Fan disassembly (15kW to 160kW)

### b. Fan installation

Please follow the reverse steps of disassembly to install: insert the fan power cord plug into the socket, and then put the fan cover and fan into the body installation part (please pay attention to distinguish the positive direction of the fan). When putting it in, be sure to align the fan cover with the four fixing holes at the bottom of the fan, and finally use a screwdriver to tighten the fan fixing screws to complete the installation. After replacing the fan, make sure that the correct direction of the fan is blowing upwards.

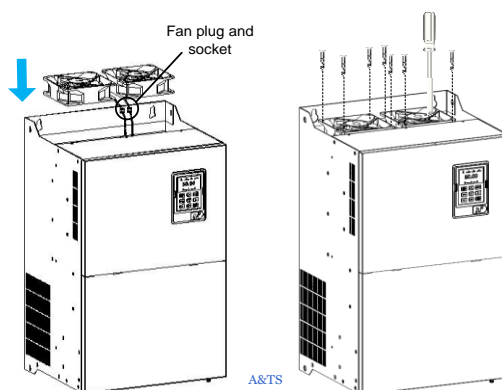


Figure 8-4 Fan installation (15kW to 160kW)

## 3) Fan replacement, for models from 200kW to 355kW

## a. Disassemble the fan

Remove the 6 fixing screws on the cover of the frequency converter. Hold the cover with both hands, lift it up about 2cm, and then take down the cover in the direction of the arrow. Then unplug the fan power cord from the socket, then use a screwdriver to remove the fixing screws on the fan box, and take the fan box out in the direction of the arrow. Finally, use the screwdriver to remove the four fixing screws on the fan and remove the fan to complete the disassembly.

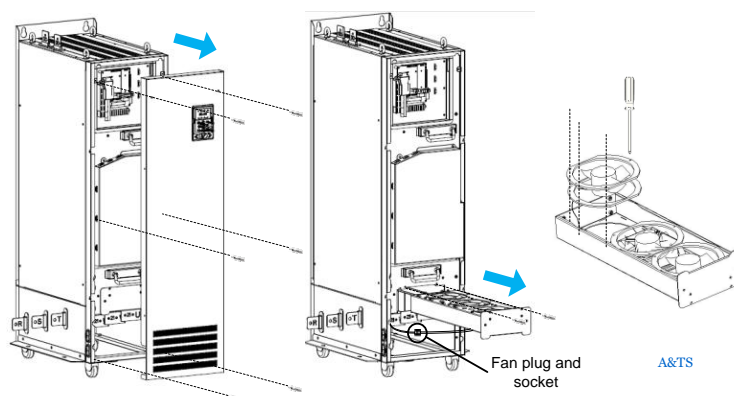


Figure 8-5 Fan disassembly (200kW to 355kW)

## b. Fan installation

Please follow the reverse steps of disassembly to install: Use a screwdriver to install the fan on the fan box and to tighten the four fixing screws (pay attention to distinguish the positive direction of the fan). Then insert the plug of the fan box power cord into the socket, then align the fan box with the mounting rail in the direction of the arrow, push into the fan box and tighten the fixing screws with the screwdriver. Finally, move the cover close to the frequency converter cabinet in the direction of the arrow, then align the side positioning posts in the cover with the buckle, push it down to expose the screws, and use the screwdriver to lock the 6 fixing screws on the cover. After replacing the fan, make sure that the correct direction of the fan is blowing upwards.

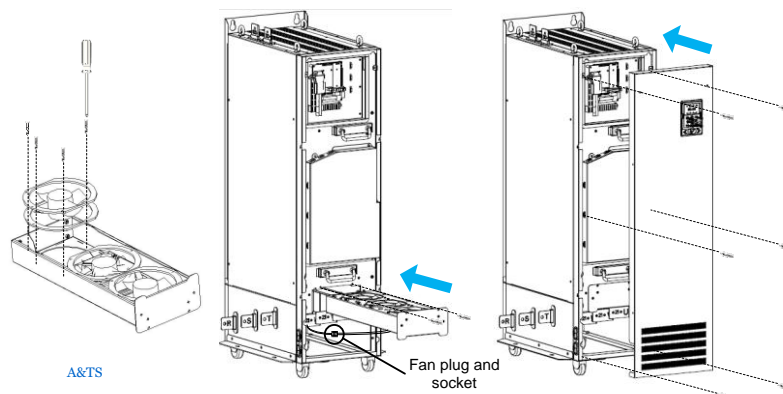


Figure 8-6 Fan installation (200kW to 355kW)

## 8.4 Storage and the Maintenance

### 8.4.1 Storage

After purchasing the frequency converter, users should pay attention to the following points when storing it.

- (1) When storing, please try to put the frequency converter in the original packaging box according to the original packaging.
- (2) Long-term storage will cause the deterioration of the electrolytic capacitor, and it must be energized once within 2 years. The input voltage must be slowly increased to the rated value with a voltage regulator. For details, please refer to chapter 3.1.1. It is generally recommended to power on for more than 5 hours.

### 8.4.2 Maintenance

Under normal use, if the frequency converter fails or is damaged, the A&TS company is responsible for a 12-months warranty (from the date of delivery, subject to the date displayed on the bar code on the frequency converter body). If it has been more than 12 months, a reasonable maintenance fee will be charged.

The warranty only covers the frequency converter itself.

Within 12 months, if the following situations occur, a certain maintenance fee shall be charged.

- (1) The user did not follow the regulations in the manual, causing damage to the frequency converter.
- (2) Frequency converter damage caused by force majeure, including but not limited to fire, flood, abnormal voltage, etc.
- (3) Damage caused when the frequency converter is used for abnormal functions.

## 9 System Device Selection

### 9.1 FT50 series Frequency Converter Connection Diagram

When using the FT50 series frequency converter to control an asynchronous motor, it is necessary to install various electrical components on the input and output sides of the frequency converter to ensure the safety and stability of the system. The system configuration is shown in the Figure 9-1.

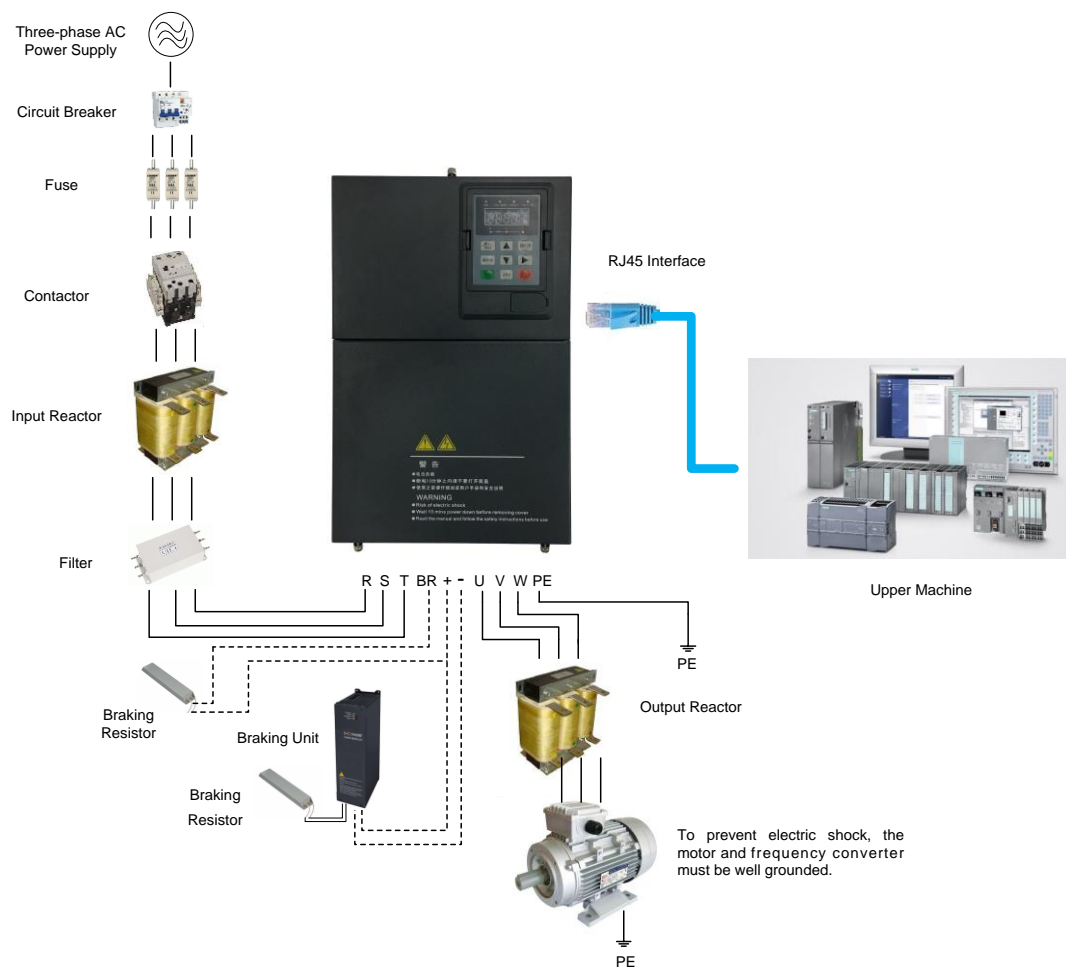


Figure 9-1 FT50 series frequency converter connection diagram

Table 9-1 Electrical components description

Name	Installation description	Function description
Contactor	Between the circuit breaker and the input side of the frequency converter	When powering on and off the frequency converter, avoid frequent power-on and power-off operations on the frequency converter through the contactor (the interval is not less than one hour), or directly the operation to start it.

DC reactor	The frequency converter above 18.5kW is equipped with DC reactor by default	Improve the power factor of the input side. Improve the efficiency and thermal stability of the frequency converter. Effectively eliminate the influence of higher harmonics on the input side on the frequency converter, and reduce external conduction and radiation interference.
Brake unit	Models of 22kW and below are equipped with built-in braking unit. Models of 30-75kW can be equipped with built-in braking unit optionally. Models of 90kW and above can be equipped with external braking unit optionally.	Please refer to the recommended braking resistor corresponding to the selected braking unit. The regenerative energy is consumed by the motor through the braking resistor when it decelerates.
Braking resistor	During braking, the regenerative energy is consumed on the braking resistor through the braking unit.	Please refer to the recommended braking resistor corresponding to the selected braking unit. The regenerative energy is consumed by the motor through the braking resistor when it decelerates.
Output AC reactor	Installed between the output side of the frequency converter and the motor, close to the frequency converter	Generally, when the distance between the frequency converter and the motor is greater than 100m, it is recommended to install an output AC reactor.

## 9.2 Optional Devices List

The optional device of FT50 series frequency converter include IO expansion board, communication expansion board, encoder expansion board, cabinet door installation components, mounting rail, bottom mounting bracket and flange mounting bracket. If the following optional accessories are needed, please order them according to the corresponding model.

Table 9-2 FT50 series frequency converter optional device list

Name	Model	Function description
IO expansion board	FT00-IO	5 digital inputs channels 1 digital output channel 1 analog input channel 1 analog output channel 1 relay output channel 1 channel supports PT100/PT1000/KTY84 motor

		thermal protection terminal <b>Explication:</b> Since the IO expansion board and the communication expansion board are installed in the same option slot, only one of them can be installed at most.
Communication expansion board	FT00-C01	Support Profibus-DP communication, support external DC 24V power supply
	FT00-C02	RS485 interface, support Modbus RTU communication, support external DC 24V power supply
	FT00-C03	Support Profinet communication, support external DC 24V power supply
	FT00-C04	Support drive-to-drive optical fiber communication
Encoder expansion board	FT00-E01	Support 15V/24V differential signal, open collector signal, push-pull signal, etc.
	FT00-E02	Support 5V differential signal
Cabinet door installation components	FT00-P03-3M	Support 3m communication extension cable
	FT00-P03-5M	Support 5m communication extension cable
Flange mounting bracket	FT00-T03-D	Flange mounting bracket for 15-22kW frequency converter
	FT00-T03-E	Flange mounting bracket for 30-37kW frequency converter
	FT00-T03-F	Flange mounting bracket for 45-55kW frequency converter
	FT00-T03-G	Flange mounting bracket for 75-110kW frequency converter
	FT00-T03-H	Flange mounting bracket for 132-160kW frequency converter

The cabinet door installation component is used to lead the operation panel from outside to the cabinet door for installation.

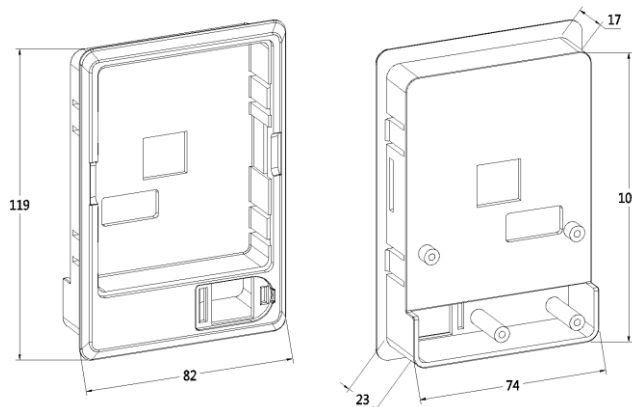


Figure 9-2 Installation dimensions of cabinet door components

## 9.3 Brake Component Selection Instructions

### 9.3.1 Brake Components for Models of 75kW and below

Models from 2.2kW to 22kW are equipped with built-in braking unit by default. Models from 30kW to 75kW can be equipped with built-in braking unit optionally. When dynamic braking, only the braking resistor needs to be configured externally. The recommended braking resistor parameters for FT50 series frequency converter are shown in the following table:

Table 9-3 Brake components selection table for FT50 models of 75kW and below

Frequency converter model	Frequency converter power	Recommended braking resistor power	Minimum resistance of braking resistor	Applicable brake unit model
FT50-4T0022G-XX	2.2 kW	1 kW	90 Ω	Built-in
FT50-4T0030G-XX	3 kW	1.5 kW	90 Ω	Built-in
FT50-4T0037G-XX	3.7 kW	2 kW	90 Ω	Built-in
FT50-4T0055G-XX	5.5 kW	3 kW	60 Ω	Built-in
FT50-4T0075G-XX	7.5 kW	4 kW	60 Ω	Built-in
FT50-4T0110G-XX	11 kW	6 kW	44 Ω	Built-in
FT50-4T0150G-XX	15 kW	7 kW	30 Ω	Built-in
FT50-4T0185G-XX	18.5 kW	9 kW	30 Ω	Built-in
FT50-4T0220G-XX	22 kW	11 kW	24 Ω	Built-in
FT50-4T0300G-BX	30 kW	15 kW	15 Ω	Built-in
FT50-4T0370G-BX	37 kW	18.5 kW	15 Ω	Built-in
FT50-4T0450G-BX	45 kW	23 kW	13 Ω	Built-in
FT50-4T0550G-BX	55 kW	28 kW	10 Ω	Built-in
FT50-4T0750G-BX	75 kW	38.5 kW	6.8 Ω	Built-in

## 9.4 Motor Selection Guidelines

(1) The standard adapted motor is a four-pole squirrel cage asynchronous induction motor. If it is not the type of motor as above, please select the frequency converter according to the rated current of the motor.

(2) The cooling fan of the non-variable frequency motor is coaxially connected with the rotor shaft, and the cooling effect of the fan decreases when the speed decreases. Therefore, when the motor is overheated, a strong exhaust fan should be installed or replaced with a variable frequency motor.

(3) The standard parameters of the adapted motor have been configured in the frequency converter. However according to the actual situation, it is necessary to identify the motor parameters or modify the default value to meet the actual situation as much as possible, otherwise it will affect the running effect and protection performance.



(4) If there is a short circuit inside the cable or the motor, it will cause the alarm or even the explosion in the frequency converter. Therefore, please perform an insulation short-circuit test on the initially installed motor and cable first, and this test should also be performed frequently during routine maintenance. Please notice that when doing this kind of test, the frequency converter must be completely disconnected from the tested part.

Table 9-4 FT50 series frequency converter adapted motor selection table

Frequency converter model	Power supply capacity (kVA)	Input current (A)	Output current (A)	Adapted motor		Heating power consumption (kW)
				kW	HP	
Three-phase power supply 380V, 50/60Hz						
FT50-4T0022G-XX	4	6.7	5.4	2.2	3	/
FT50-4T0030G-XX	5	9	7.2	3	4	/
FT50-4T0037G-XX	5.9	12.4	9.8	3.7	5	/
FT50-4T0055G-XX	8.9	16.7	13	5.5	7.5	/
FT50-4T0075G-XX	11	24.2	18.8	7.5	10	/
FT50-4T0110G-XX	17	32.2	25	11	15	/
FT50-4T0150G-XX	21	35	32	15	20	/
FT50-4T0185G-XX	45	36	37	18.5	25	0.478
FT50-4T0220G-XX	54	43	45	22	30	0.551
FT50-4T0300G-XX	52	57	60	30	40	0.694
FT50-4T0370G-XX	63	69	75	37	50	0.815
FT50-4T0450G-XX	81	89	91	45	60	1.01
FT50-4T0550G-XX	97	106	112	55	75	1.21
FT50-4T0750G-XX	127	139	150	75	100	1.57
FT50-4T0900G-XX	150	164	176	90	125	1.81
FT50-4T1100G-XX	179	196	210	110	150	2.14
FT50-4T1320G-XX	220	240	253	132	180	2.85
FT50-4T1600G-XX	263	287	304	160	220	3.56
FT50-4T2000G-XX	334	365	377	200	275	4.15
FT50-4T2200G-XX	375	410	426	220	300	4.55
FT50-4T2500G-XX	404	441	465	250	340	5.06
FT50-4T2800G-XX	453	495	520	280	380	5.33
FT50-4T3150G-XX	517	565	585	315	430	5.69
FT50-4T3550G-XX	565	617	650	355	485	6.31

## 9.5 Peripheral Equipment Selection Guidelines

9-5 The cable, circuit breaker and contactor selection table

FT50 Series Models	Recommended IEC cable specifications on the input side (mm <sup>2</sup> )	Recommended IEC ground cable specifications (mm <sup>2</sup> )	Recommended IEC cable specifications on the output side (mm <sup>2</sup> )	Frequency converter power terminal width (mm)	Screw specifications	Recommended fuse		Contactor recommended specifications	Circuit breaker recommended specifications
						Bussmann Complied with UL certification			
						Rated current (A)	Fuse Model	Rated current (A)	Rated current (A)
Three-phase power supply 380 - 480V, 50/60Hz									
FT50-4T0022G-XX	3x4	4	3x4	7	M3.5	15	FWP-15B	12	16
FT50-4T0030G-XX	3x4	4	3x4	7	M3.5	20	FWH-20B	18	16
FT50-4T0037G-XX	3x4	4	3x4	7	M3.5	25	FWH-25B	25	25
FT50-4T0055G-XX	3x4	4	3x4	7	M3.5	35	FWH-35B	32	32
FT50-4T0075G-XX	3x6	6	3x6	8	M4	50	FWH-50B	40	50
FT50-4T0110G-XX	3x6	6	3x6	8	M4	60	FWH-60B	50	63
FT50-4T0150G-XX	3x10	10	3x10	8	M4	80	FWH-80B	65	80
FT50-4T0185G-XX	3x10	10	3x10	12	M5	80	FWH-80B	65	80
FT50-4T0220G-XX	3x16	16	3x16	12	M5	100	FWH-100B	65	80
FT50-4T0300G-XX	3x16	16	3x16	16	M6	100	FWH-100B	65	80
FT50-4T0370G-XX	3x16	16	3x16	16	M6	125	FWH-125B	80	100
FT50-4T0450G-XX	3x25	16	3x25	20	M8	150	FWH-150B	95	160
FT50-4T0550G-XX	3x50	25	3x50	20	M8	200	FWH-200B	115	160
FT50-4T0750G-XX	3x70	35	3x70	24.5	M8	250	FWH-250B	150	250
FT50-4T0900G-XX	3x95	50	3x95	24.5	M8	275	FWH-275B	170	250
FT50-4T1100G-XX	3x120	70	3x120	24.5	M8	325	FWH-325B	205	400
FT50-4T1320G-XX	3x150	70	3x150	37	M10	400	FWH-400B	245	400
FT50-4T1600G-XX	3x185	95	3x185	37	M10	500	FWH-500B	300	400
FT50-4T2000G-XX	2x(3x95)	95	2x(3x95)	*	M10 (input side) 2*M8 (output side)	600	FWH-600B	410	500

FT50-4T2200G-XX	2x(3x120)	120	2x(3x120)	*	M10 (input side) 2*M8 (output side)	700	FWH-700B	410	630
FT50-4T2500G-XX	2x(3x120)	120	2x(3x120)	*	M12 (input side) 2*M10 (output side)	800	FWH-800B	475	630
FT50-4T2800G-XX	2x(3x150)	150	2x(3x150)	*	M12 (input side) 2*M10 (output side)	800	FWH-800B	620	700
FT50-4T3150G-XX	2x(3x185)	185	2x(3x185)	*	M12 (input side) 2*M10 (output side)	1000	170M5016	620	800
FT50-4T3550G-XX	2x(3x185)	185	2x(3x185)	*	M12 (input side) 2*M10 (output side)	1000	170M5016	620	800

**Explication:** As per the standard used in the above table, 3×10 represents one 3-core wire, and 2×(3×95) represents two 3-core wires.

## 10 Expansion Boards

Through the expansion board, the FT50 series frequency converter supports more control functions. The types of expansion boards include IO expansion boards, communication expansion boards (Profibus-DP, Modbus, Profinet, etc.), encoder expansion boards, etc. Except for the encoder expansion board, all expansion boards are compatible with FT50 and FT30 series frequency converter. Only FT50 series frequency converter supports the use of encoder expansion board. The expansion boards are the same for all models of FT50 series frequency converters.

### 10.1 Expansion Board Installation

FT50 series frequency converter supports IO expansion board, communication expansion board (Profibus-DP, Modbus, Profinet, and drive-to-drive through optical fiber communication) and encoder expansion board, etc.

Among them, the IO expansion board and the communication expansion board belong to the function expansion board. Both of them can be installed on the interface of the function expansion board. But not at the same time on the same frequency converter. The encoder expansion board can be installed on the corresponding interface. As shown in the figure below.

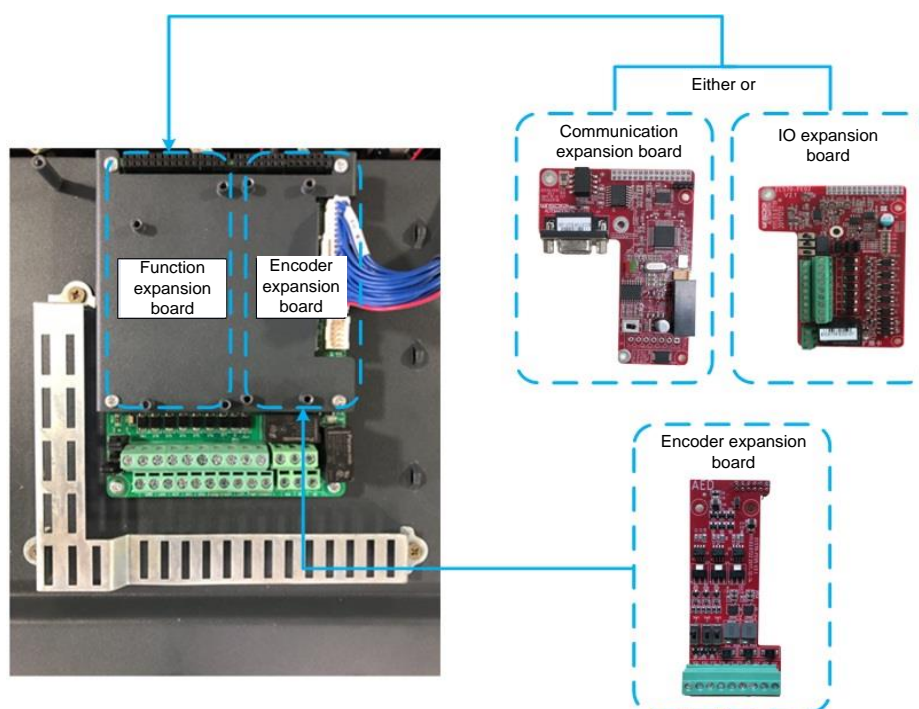


Figure 10-1 Expansion board installation diagram

## 10.2 Expansion Board Function Description

Table 10-1 Expansion Board Function Description

Model	Name	Function description
FT00-IO	IO expansion board	5 digital inputs channels 1 digital output channel 1 analog input channel 1 analog output channel 1 relay output channel 1 channel supports PT100/PT1000/KTY84 motor thermal protection terminal
FT00-C01	Profibus-DP communication expansion board	Support Profibus-DP communication, support external DC 24V power supply
FT00-C02	Modbus communication expansion board	RS485 interface, support Modbus RTU communication, external DC 24V power supply
FT00-C03	Profinet communication expansion board	Support Profinet-IO communication
FT00-C04	Drive-to-drive optical fiber communication expansion board	Support drive-to-drive optical fiber communication
FT00-E01	15V/24V encoder expansion board	Support 15V/24V differential signal, open collector signal, push-pull signal, etc.
FT00-E02	5V differential encoder expansion board	Support 5V differential signal

## Appendix

### List of Abbreviations

AC	Alternating Current
AI	Analog Input
AO	Analog Output
BI	Binary Interconnection Input
BO	Binary Interconnection Output
CI	Interconnected Connection Input
CO	Interconnected Connection Output
DC	Direct Current
DI	Digital (on-off) input
DO	Digital (on-off) output
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
HTL	High-voltage Threshold Logic
I/O	Input/Output
IGBT	Insulated Gate Bipolar Transistor
KTY84	KTY84 Temperature Sensor
LED	Light Emitting Diode
FT50	FT50 series Frequency Converter
FT30	FT30 series Frequency Converter
NPN	NPN type triode
PID	PID controller (proportion, integral, differential)
PLC	Programmable Logic Controller
PNP	PNP type triode
PTC	Positive Temperature Coefficient
PWM	Pulse Width Modulation
RPM	Revolutions Per Minute
TTL	Transistor-Transistor Logic
VC	Vector Control
V/f	Constant Voltage/frequency ratio control

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## The End

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