



# USER'S MANUAL

## VTS Series Universal Variable Speed AC Drives



# Foreword

First of all, thank you for purchasing the VTS series products of SHENZHEN V&T TECHNOLOGIES CO., LTD.

VTS series products support control a variety of motors, support connect a variety of encoders, and support multiple communications. VTS series product is divided into the following models:

VTS400: Multi-functional AC Drive

VTS300: High Performance Universal AC drive

VTS30: Economic Universal AC Drive

This manual is to be used for the model selection, installation, parameter setting, commissioning and fault diagnosis of the AC drive.

To guarantee safe operation of the equipment, please read this manual carefully before connecting power to the AC drive. Keep this manual at hand and distribute to all users for reference.

When using the drive together with optional products, also read the manuals for those products. Note that this manual and the manual for each optional product to be used should be delivered to the end user.

If you have any questions, please consult our technical support personnel or distributor for help.

Due to continuous improvement of products, the information provided by the company is subject to change without notice.

## Abundant and Flexible Function

### ■ System control mode

- ◆ Position control
- ◆ Speed control
- ◆ Torque control

### ■ Speed reference source

- ◆ Modbus communication
- ◆ Keypad
- ◆ Analog
- ◆ Multi-step speed reference
- ◆ External digital inputs UP/DN
- ◆ Process close loop PID reference
- ◆ Main speed reference and auxiliary speed reference calculation
- ◆ Simple PLC
- ◆ High speed pulse
- ◆ CAN, PROFIBUS DP, PROFINET, EtherCAT

### ■ Run command reference source

- ◆ Modbus communication
- ◆ Keypad
- ◆ External digital input
- ◆ CAN, PROFIBUS DP, PROFINET, EtherCAT

### ■ Pulse input

- ◆ Orthogonal pulse
- ◆ Pulse + Direction
- ◆ Direction + Pulse

### ■ LED Keypad and LCD Keypad

- ◆ Modbus-RTU communication
- ◆ The Keypad and control board can be connected by standard network cable
- ◆ The Keypad can be used to upload and download parameters, convenient for commissioning
- ◆ The keypad can be set a password and/or the keypad keys can be locked to avoid the non-professional personnel from changing the parameters by mistake

### ■ Communication mode

- ◆ Modbus-RTU, CAN, PROFIBUS DP, PROFINET, EtherCAT
- ◆ Host computer can be used to upload and download parameters

## Safety Precautions



**DANGER: Dangerous warning** warns of high voltage which can cause physical injury and/or damage to the equipment, even could be lethal. Extreme care is necessary at all times when working with or adjacent to the drive.



**WARNING: General warning** warns about conditions, other than those caused by electricity, which can result in physical injury and/or damage to the product.

### ■ USE



#### DANGER

- This series of drives is used to control the operation of three-phase motors. It cannot be used to control single-phase motors or for other purposes, otherwise it may cause drive fault or fire.
- This series of drives cannot be easily applied to applications such as medical devices that are directly related to personal safety.
- This series of drives is manufactured under a strict quality management system. If a drive fault occurs, it can cause a major accident or loss. Safety measures such as redundancy or bypass need to be set, just in case.

### ■ Arrival Inspection



#### WARNING

- The drive cannot be installed if is damaged or lack of parts, otherwise an accident may occur.

### ■ Installation



#### WARNING

- When handling and installing, please hold the bottom of the product. Do not hold the enclosure only, Otherwise, your feet may be injured and/or the drive may be damaged.
- The drive should be mounted on the fire-retardant surface such as metal, and keep away from flammable objects and keep away from heat producer.
- Do not drop drilling residue into the drive during installation work. Otherwise drive fault may occurs.
- When the drive is installed in the electrical control cabinet, the electrical control cabinet shall be equipped with fan and ventilation port. And air-cooling duct shall be constructed in the cabinet to facilitate heat dissipation.

## ■ Wiring



### DANGER

- Wiring must be performed by a qualified electrical engineer, otherwise there is a risk of electric shock or damage to the drive.
- Make sure that the power is off before wiring, otherwise there is a danger of electric shock or fire.
- The grounding terminal PE must be grounded reliably, otherwise, the drive enclosure may become live.
- Do not touch the main circuit terminals. The main circuit terminals wiring of the drive must not be contacted to the enclosure, otherwise, risk of electric shock may occur.
- The connection terminals of the brake resistor are "+P" and "PB". Do not connect terminals other than these, otherwise, risk of fire may occur.
- The leakage current of the drive is greater than 3.5mA, and the specific value is determined by the conditions of use. For safety reasons, the drive and motor must be grounded.



### WARNING

- The three-phase power supply cannot be connected to the output terminals U, V, W, otherwise the drive will be damaged.
- It is absolutely prohibited to connect a capacitor or phase lead LC/RC noise filter to the output terminal of the drive, otherwise the internal components of the drive will be damaged.
- Please confirm the number of power phases and rated input voltage match the nameplate, otherwise the drive may be damaged.
- The withstand voltage test cannot be performed on the drive, otherwise the drive may be damaged.
- The main circuit terminal wiring and control circuit terminal wiring of the drive should be arranged separately or vertically, otherwise the control signal will be interfered.
- For the wiring cable of the main circuit terminal, use the cable lug with an insulating sleeve.
- The sectional area of input and output cables should be selected according to the drive power.
- When the cable length between the drive and the motor exceeds 100 meters, it is recommended to use an output reactor to avoid over-current fault caused by excessive distributed capacitance.
- The terminal connection of the main circuit must be reliable, otherwise it may cause fire and/or short circuit.

## ■ Operation



### DANGER

- Only after the drive wiring is completed and the cover is installed, it can be powered. It is forbidden to remove the cover when the power is on, otherwise there is danger of electric shock.
- Before running, confirm that the mechanical installation is reliable, otherwise, it may cause physical injury and/or damage to the equipment.
- Before running, must confirm all personnel are in a safe position, otherwise, it may cause physical injury and/or damage to the equipment.
- If automatic fault reset or automatic start after power ON is set, safety isolation measures should be taken for mechanical equipment, otherwise, it may cause physical injury and/or damage to the equipment.
- After the drive is powered on, even if it is in the stop status, the terminals of the drive are still charged. It is forbidden to touch, otherwise it may cause electric shock.
- It can only be reset after confirming the run command has been cut off, otherwise it may cause physical injury and/or damage to the equipment.



### WARNING

- Do not start or stop the drive by turning the power supply on or off. Otherwise, the drive may be damaged.
- Before start to RUN, please confirm whether the motor and machinery are within the allowable range of use, otherwise the equipment may be damaged.
- Before start to RUN, please set the motor parameters correctly and start motor parameters auto tune, otherwise, if the default parameter values are not match the motor will cause over-current fault or motor vibration, even damage to the equipment.
- Do not touch heat sink and brake resistor, otherwise there is a danger of burns and/or electric shock.
- When using on a lifting device, such as crane, escalator, elevator, please also configure the mechanical brake.
- Do not change the drive parameters at will. Most of the drive's default value can meet the operation requirements. Just change some necessary parameters value, and arbitrarily modify the parameters may cause damage to the mechanical equipment. Only some necessary parameters need to be set. Modifying the parameters at will may result in damage to the mechanical equipment.

## ■ Maintenance and Inspection



### **DANGER**

- Do not touch the terminals of the drive while the power is on, otherwise there is a danger of electric shock.
- Make sure turn off the power before remove the cover.
- Wait at least 10 minutes after turn off the power, or confirm that the charging CHARGE indicator is off before performing maintenance and inspection to prevent the residual voltage of the main circuit electrolytic capacitor from injuring people.
- Please designate qualified electrical engineers to do the maintenance, inspection or replacement of parts.



### **WARNING**

- There are CMOS large-scale integrated circuits on the circuit board. Do not touch them with your hands to prevent static electricity from damaging the circuit board.

## ■ Others



### **DANGER**

- It is forbidden to modify the drive by yourself, otherwise it will cause personal injury.
- It is forbidden to use the screws not provided by the manufacturer or specified by the manufacturer, otherwise the structural parts of the drive or the circuit will be damaged due to factors such as too long or too large screws.

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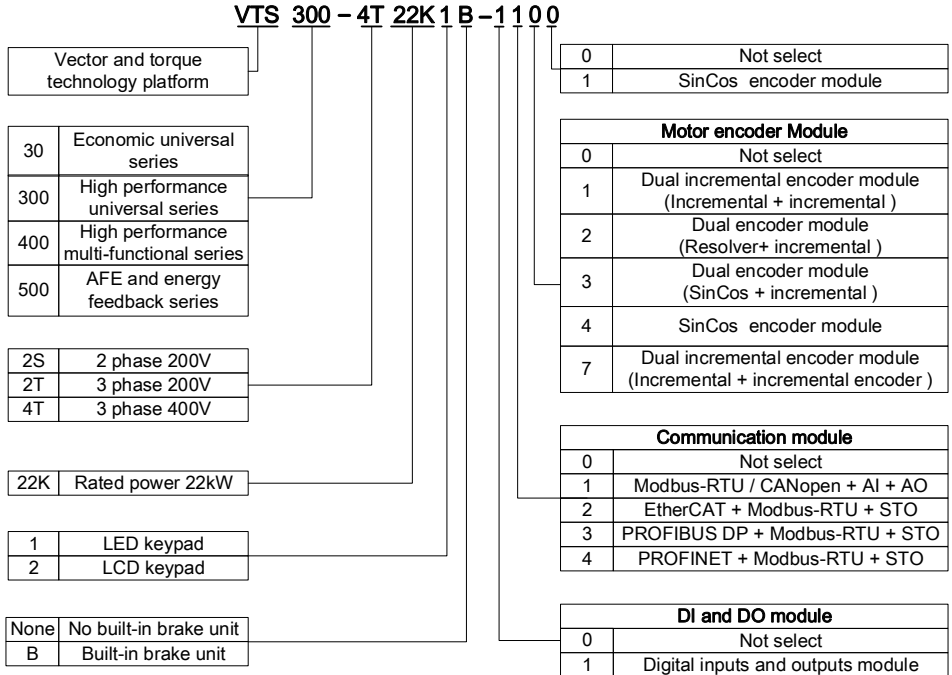




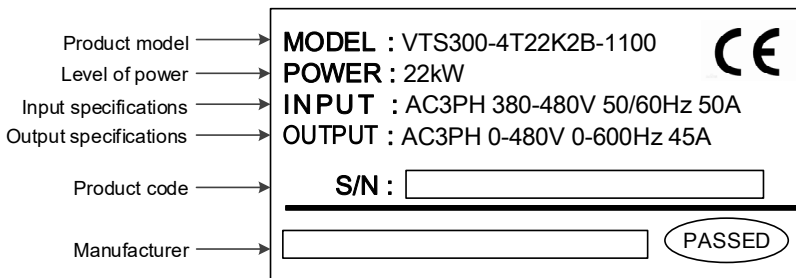
## Chapter 1 Product Information

### 1.1 Model Description

The model field on the drive nameplate uses numbers and letters to indicate information such as product series, input voltage, power, software versions and hardware versions.



### 1.2 Nameplate Description



### 1.3 Ratings

■ VTS□□□-4T□□K□□-□□□□

Rated Power (kW)		5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110
Applicable motor (kW)		5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110
Output	Voltage (V)	Three-phase 0 to rated input voltage												
	Rated current (A)	13	17	24	30	39	45	60	75	91	112	150	176	210
	Maximum current (A)	23	31	43	54	70	81	108	135	164	202	270	317	378
	Overload capability	150% for 60s, 180% for 10s, 200% for 0.5s, interval: 10 minutes (Inverse time characteristic)												
Input	Rated voltage / frequency	Three-phase 380V/480V; 50Hz/60Hz												
	Allowable voltage	323V ~ 528V; voltage imbalance ≤3%; allowable frequency fluctuation: ±5%												
	Rated current (A)	15	19	26	33	37	42	57	69	89	106	139	164	196
DC reactor		DC reactor is not built-in				DC reactor is built-in			DC reactor is built-in					
Brake unit		Built-in as standard						Built-in as optional						
Protection level		IP20												
Cooling mode		Force air cooling												

Rated Power (kW)		132	160	185	200	220	250	280	315	355	400	450	500
Applicable motor (kW)		132	160	185	200	220	250	280	315	355	400	450	500
Output	Voltage (V)	Three-phase 0 to rated input voltage											
	Rated current (A)	253	304	350	380	426	470	520	600	650	690	775	860
	Maximum current (A)	455	547	630	684	765	846	936	1080	1170	1242	1395	1548
	Overload capability	150% for 60s, 180% for 10s, 200% for 0.5s, interval: 10 minutes (Inverse time characteristic)											
Input	Rated voltage / frequency	Three-phase 380V/480V; 50Hz/60Hz											
	Allowable voltage	323V ~ 528V; voltage imbalance ≤3%; allowable frequency fluctuation: ±5%											
	Rated current (A)	240	287	326	352	385	437	491	580	624	670	775	840
DC reactor		DC reactor is built-in											
Brake unit		External											
Protection level		IP20											
Cooling mode		Force air cooling											

## 1.4 Technical Specifications

Control characteristics	Control mode	Sensor-less control	Sensor control
	Applicable motor type	Synchronous motor Asynchronous motor	Synchronous motor Asynchronous motor
	Starting torque	<ul style="list-style-type: none"> <li>Asynchronous motor: 200% of rated torque at 0.25Hz</li> <li>Synchronous motor: 150% of rated torque at 1.5% of rated speed</li> </ul>	200% of rated torque at 0 speed
	Speed regulation range	1:200	1:5000
	Steady speed precision	± 0.5%	± 0.02%
	Maximum speed	VF control: 600Hz Vector control: 600 Hz <b>Note:</b> Higher frequency products can be customized	600Hz <b>Note:</b> Higher frequency products can be customized
	Torque control	Y	Y
	Torque control precision	±5%	±3%
	Torque response time	<20ms	<10ms
	Positioning control	N	Y
Positioning precision	N	±1 pulse	
Product function	Key function	Torque limit, speed control, positioning control, motor auto tune, deep flux-weakening control, current limit control, over-voltage control, under-voltage control, motor speed tracing function, droop control, oscillation suppression, random carrier frequency, inertia auto-tune, etc.	
	Speed reference source	Modbus communication, Keypad, external digital input, analog AI1/AI2/AI3, high speed pulse input, simple PLC, PID, CAN, PROFIBUS DP, PROFINET, EtherCAT, etc.	
	Dynamic brake	Brake unit action voltage: 650 ~ 750V. The brake unit can be built-in for 110kW and below equipment <ul style="list-style-type: none"> <li>5.5~30kW: brake unit is built- in as standard.</li> <li>37~110kW: brake unit is built- in as optional.</li> </ul>	
	Communication	Built-in modbus-RTU communication, the maximum distance up to 500 meters. It can switch to CAN by jumper. EtherCAT, PROFIBUS DP and PROFINET are optional.	
	Keypad	LED Keypad and LCD Keypad are optional the Keypad can be used as remote-control box via straight-through wired cable.	
	Common DC bus	75kW~160kW: required pre-charge circuit to realized common DC bus Other power level drive: support common DC bus directly	
	Independent air duct	All series product adopts independent duct design	

Protection function	Power supply under-voltage, over-current protection, over-voltage protection, auto-tune fault, module protection, heat-sink overtemperature protection, drive overload protection, motor overload protection, peripheral protection, current abnormal detection, output short-circuit to ground protection, EEPROM abnormal detection, temperature sampling disconnection, encoder disconnection, analog input abnormal detection, motor overtemperature, communication fault, hardware overload protection, etc.	
Efficiency	At rating condition: <ul style="list-style-type: none"> <li>● 0.75kW to 7.5kW: ≥93%</li> <li>● 11kW to 45kW: ≥95%</li> <li>● 55kW and higher power class: ≥98%</li> </ul>	
Environment	Operating site	<ul style="list-style-type: none"> <li>● Install vertically in a well-ventilated electrical cabinet. Horizontal or other installation methods are not allowed.</li> <li>● The cooling medium is air.</li> <li>● Installed in an environment free from direct sunlight, dust, corrosive gases, flammable gases, no oil mist, no steam, no dripping.</li> </ul>
	Ambient temperature	<ul style="list-style-type: none"> <li>● -10~+40℃</li> <li>● Derating use when the temperature between 40 to 50℃, the rated output current is reduced by 1% for every 1℃ increasing.</li> </ul>
	Humidity	5~95%, no condensation is allowed.
	Altitude	<ul style="list-style-type: none"> <li>● 0~2000 meters</li> <li>● Derating use when the altitude over 1000 meters, the rated output current is reduced by 1% for every 100-meter rising.</li> </ul>
	Vibration	<ul style="list-style-type: none"> <li>● 3.5 m/s<sup>2</sup>, 2~9Hz</li> <li>● 10 m/s<sup>2</sup>, 9~200Hz</li> <li>● 15 m/s<sup>2</sup>, 200~500Hz</li> </ul>
	Storage temperature	-40~+70℃.

## 1.5 Brake Resistor

Drive model	Brake unit	Brake resistor		
		Power (kW) (10% ED)	Resistance value(Ω)	Minimum resistance (Ω)
VTS□□□-4T5.5K	Built-in as standard	1.1	50	45
VTS□□□-4T7.5K		1.5	40	30
VTS□□□-4T11K		2.2	35	25
VTS□□□-4T15K		3.0	35	25
VTS□□□-4T18.5K		4.0	35	25
VTS□□□-4T22K		4.8	30	20
VTS□□□-4T30K		6.0	25	15
VTS□□□-4T37K	Built-in as optional	9.6	25	15
VTS□□□-4T45K		9.6	25	15
VTS□□□-4T55K		12.0	25	15
VTS□□□-4T75K		15.0	12	7.5
VTS□□□-4T90K		18.0	12	7.5
VTS□□□-4T110K		22.0	12	7.5
VTS□□□-4T132K	Need external brake unit	The power is about 20% of drive rated power	Determine the resistance value should according the external brake unit	
VTS□□□-4T160K				
VTS□□□-4T185K				
VTS□□□-4T200K				
VTS□□□-4T220K				
VTS□□□-4T250K				
VTS□□□-4T280K				
VTS□□□-4T315K				
VTS□□□-4T355K				
VTS□□□-4T400K				
VTS□□□-4T450K				
VTS□□□-4T500K				

**Note:**

- ◆ The resistance value of brake resistor must be higher than the minimum resistance value of the above table, otherwise the built-in brake unit will be damaged.
- ◆ The higher power of the brake resistor, the better. The brake resistor power in the table is calculated with the braking duration within 30s. If the braking duration is longer, the brake resistor power must be larger. Please determine the appropriate brake resistor power according to the actual situation.
- ◆ The selection of brake resistor and brake unit is related to system inertia, deceleration time, descent distance, time (i.e. potential energy). To select the model according to the actual situation. If the system inertia is larger, the deceleration time is shorter, and the braking is more frequent, the brake resistor needs higher power and smaller resistance value.
- ◆ It is require external brake unit for the drive power higher than 132kW.

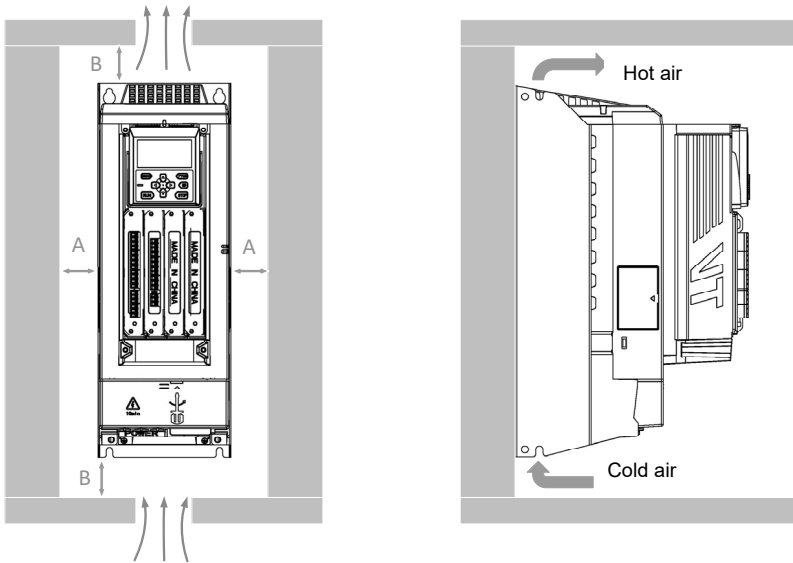
## Chapter 2 Mechanical Installation

### 2.1 Installation Environment

- Avoid installing in areas with oil mist, metal dust and dust.
- Avoid installing in areas with harmful gases, liquids, corrosive, flammable or explosive gases.
- Avoid installing in places with a lot of salt.
- Do not install in direct sunlight.
- Do not install on flammable objects such as wood.
- Never leave drilling residues inside the drive during installation work.
- Please install it vertically in the electric control cabinet, and install a cooling fan or cooling air conditioner to prevent the ambient temperature from rising above 45 °C.
- For the harsh installing environment, it is recommended to install a heat sink outside the cabinet.

### 2.2 Installation Direction and Space

In order not to reduce the cooling effect, be sure to install it vertically, as shown below, and make sure that there is some space.

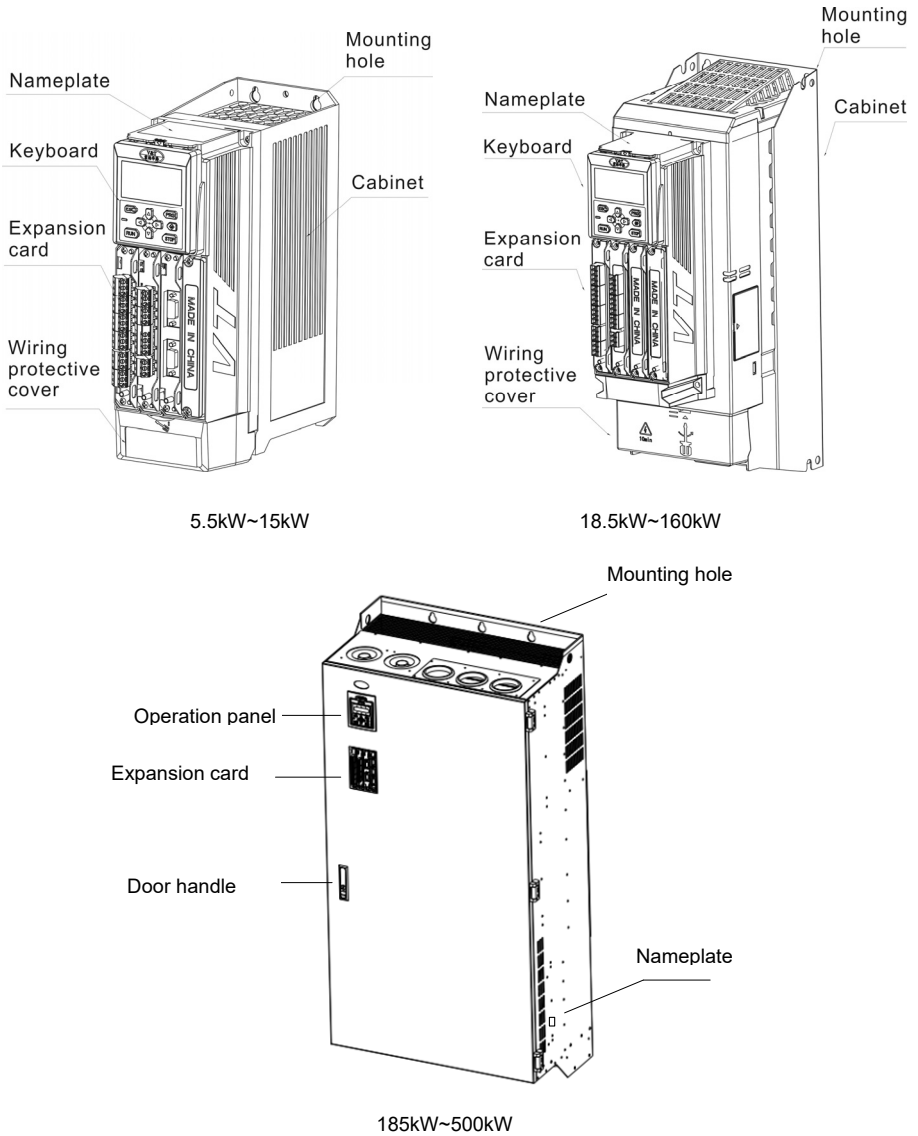


Power	Dimension A	Dimension B
5. 5~7. 5kW	$A \geq 30\text{mm}$	$B \geq 150\text{mm}$
$\geq 11\text{kW}$	$A \geq 100\text{mm}$	$B \geq 200\text{mm}$

Figure 2-1 Mounting direction and space

## 2.3 Outline and Mounting Dimension

■ Product outline



**Figure 2-2** Product outline and component name



■ Mounting Dimension

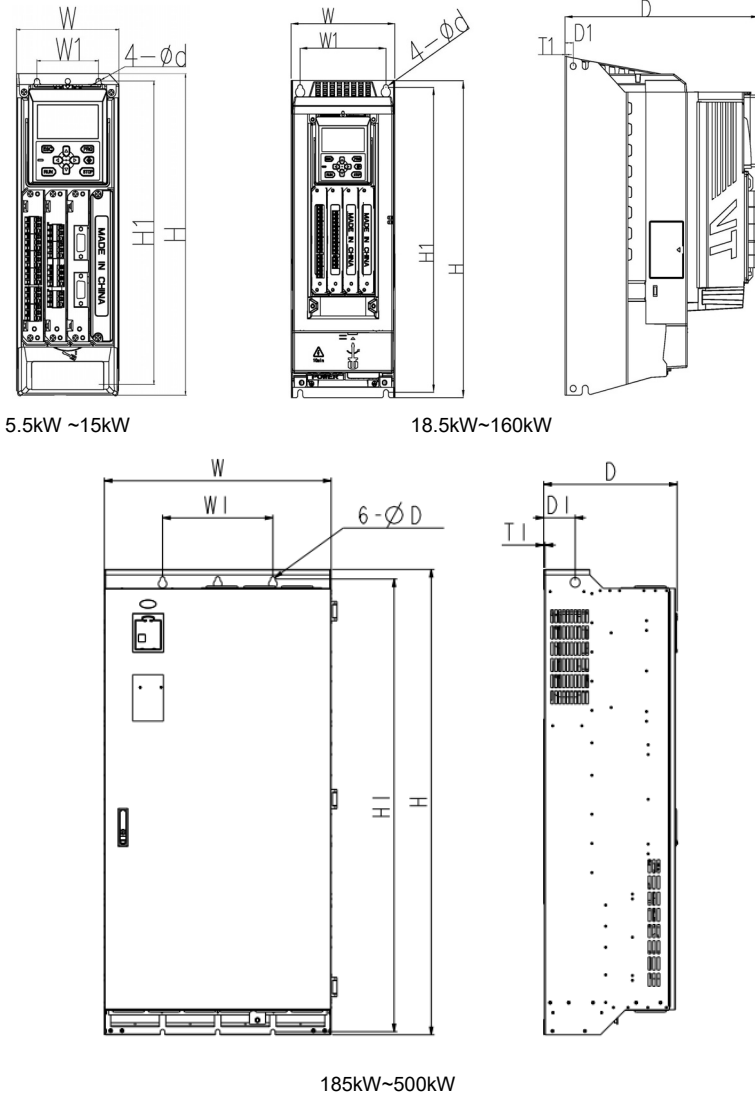


Figure 2-3 Mounting dimension

Product mounting dimensions

Voltage	Model	Outline and mounting dimension (mm)							Weight (KG)
		W	H	D	W1	H1	T1	ød	
400V	VTS□□□-4T5.5K	100	291	220	60	275	4.5	5	3.5
	VTS□□□-4T7.5K								
	VTS□□□-4T11K								
	VTS□□□-4T15K								
	VTS□□□-4T18.5K	145	412	260	120	396	1.0	7	9.5
	VTS□□□-4T22K								
	VTS□□□-4T30K								
	VTS□□□-4T37K	210	498	290	150	478	3.0	10	20.5
	VTS□□□-4T45K								
	VTS□□□-4T55K								
	VTS□□□-4T75K	290	705	285	240	683	3.0	10	48.5
	VTS□□□-4T90K								
	VTS□□□-4T110K								
	VTS□□□-4T132K	315	970	325	250	946	3.0	12	78.2
	VTS□□□-4T160K								
	VTS□□□-4T185K								
	VTS□□□-4T200K	420	1080	325	340	1050	3.5	14	99
	VTS□□□-4T220K								
	VTS□□□-4T250K								
	VTS□□□-4T280K	512	1320	355	376	1286	4	16	The base can be customized with different weights
VTS□□□-4T315K									
VTS□□□-4T355K									
VTS□□□-4T400K	699	1432	407	340	1395	4	14		
VTS□□□-4T450K									
VTS□□□-4T500K									

■ The base dimensions for VTS□□□-4T250K to VTS□□□-4T315K (The base is optional)

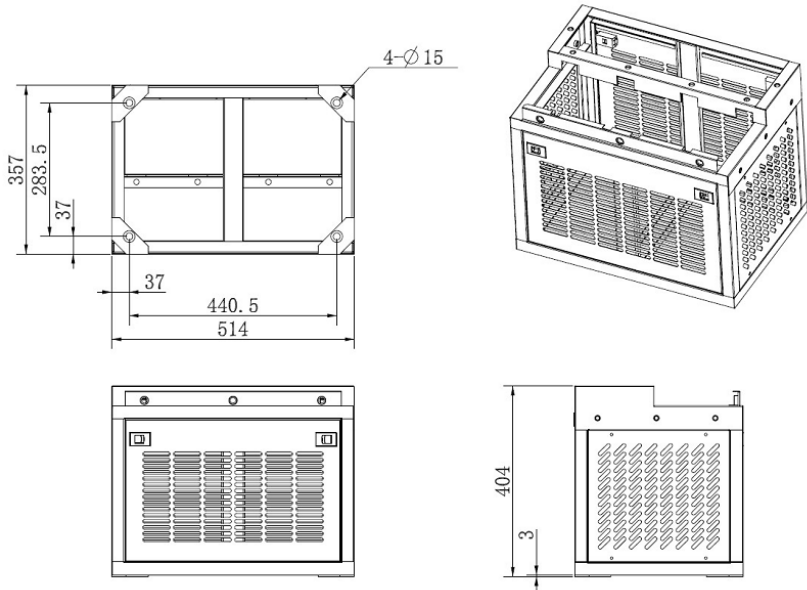


Figure 2-4 Base dimensions (from 250kW to 315kW)

■ The base dimensions for VTS□□□-4T355K to VTS□□□-4T500K (The base is optional)

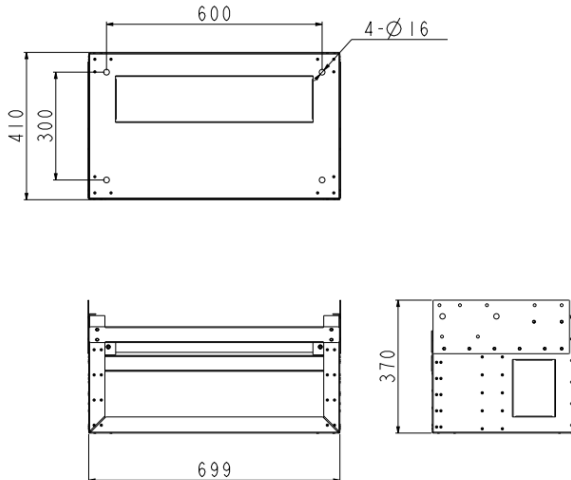


Figure 2-5 Base dimensions (from 355kW to 500kW)

## 2.4 Keypad Outline Dimension

### ■ Keypad outline dimension

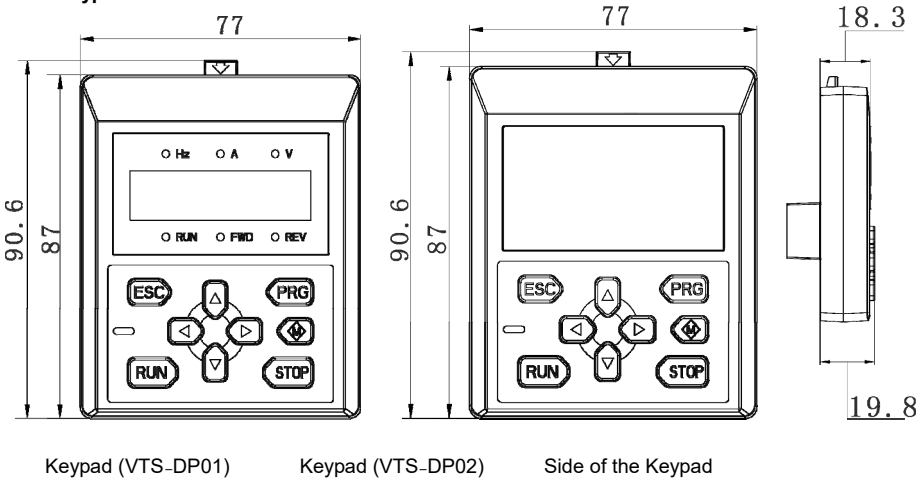


Figure 2-6 Keypad outline dimension

### ■ Direct install a Keypad to an external electric control cabinet

The Keypad can be led to an external electric control cabinet directly for installation. The back-mounting dimensions of the Keypad are as follows:

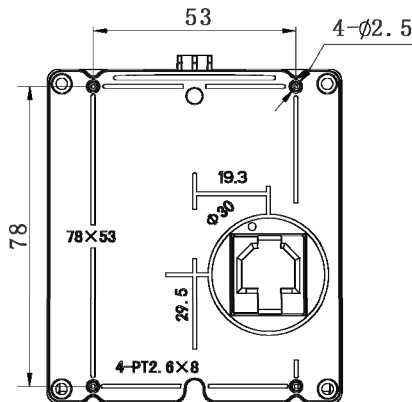
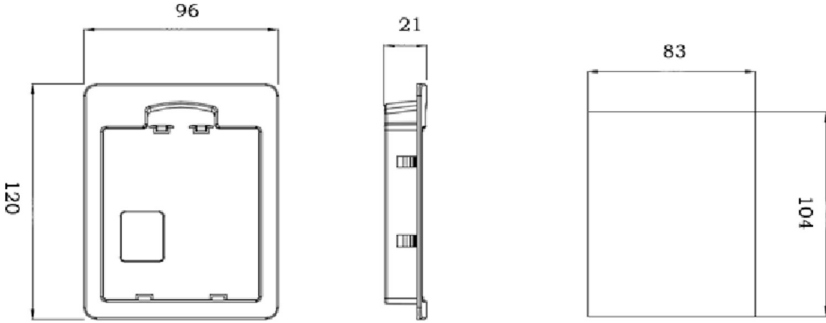


Figure 2-7 Appearance of backside and installation dimensions

■ **Install a Keypad pallet to an external electric control cabinet**

The Keypad pallet can be installed to an external electric control cabinet for keypad external installation. The dimensions of the Keypad pallet are as follows:



**Figure 2-8** Keypad pallet outline and mounting dimension

**2.5 Keypad and Drive Installation**

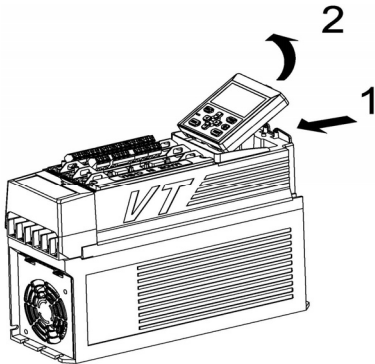
■ **Remove the Keypad**

Press the hook of Keypad according to the direction of arrow in the figure, then lift the Keypad body outward.

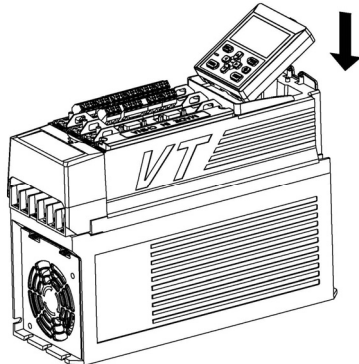
■ **Mount the Keypad**

Align the Keypad with the lower snap-in of the card slot, and then press the Keypad from the top of the Keypad until you hear a click.

Do not install the Keypad from any other direction as this will result in poor contact of the Keypad.



**Figure 2-9** Remove the Keypad



**Figure 2-10** Mount the Keypad

■ Remove the extension module

Loosen and remove the fixing screws at both ends of the expansion module, and pull out to remove the expansion module.

■ Mount the expansion module

Align the expansion module pin header to the slot below then press in. It is installed correctly and tighten the fixing screws at both ends.

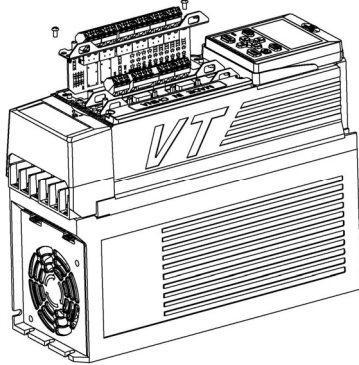


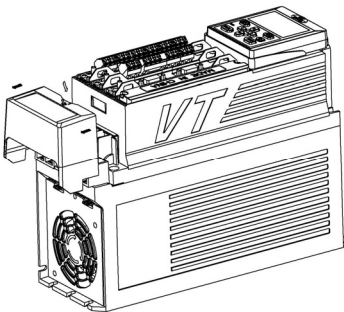
Figure 2-11 Remove and mount the expansion module

■ Remove the safety cover

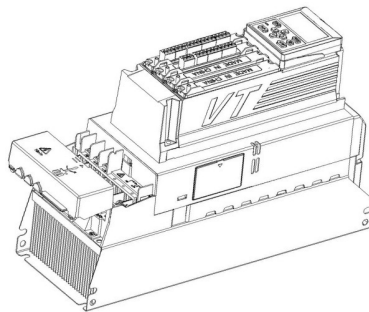
When the main circuit terminal wiring is required, open at the gap above the safety cover and move the safety cover forward. Then the safety cover is removed.

■ Mount the safety cover

When finish the wiring, align the safety cover with the enclosure guide rail slot and press it down.



5.5kW~15kW



18.5kW~55kW

Figure 2-12 Remove and mount the safety cover

## Chapter 3 Electrical Installation

### 3.1 Peripheral Devices Connection

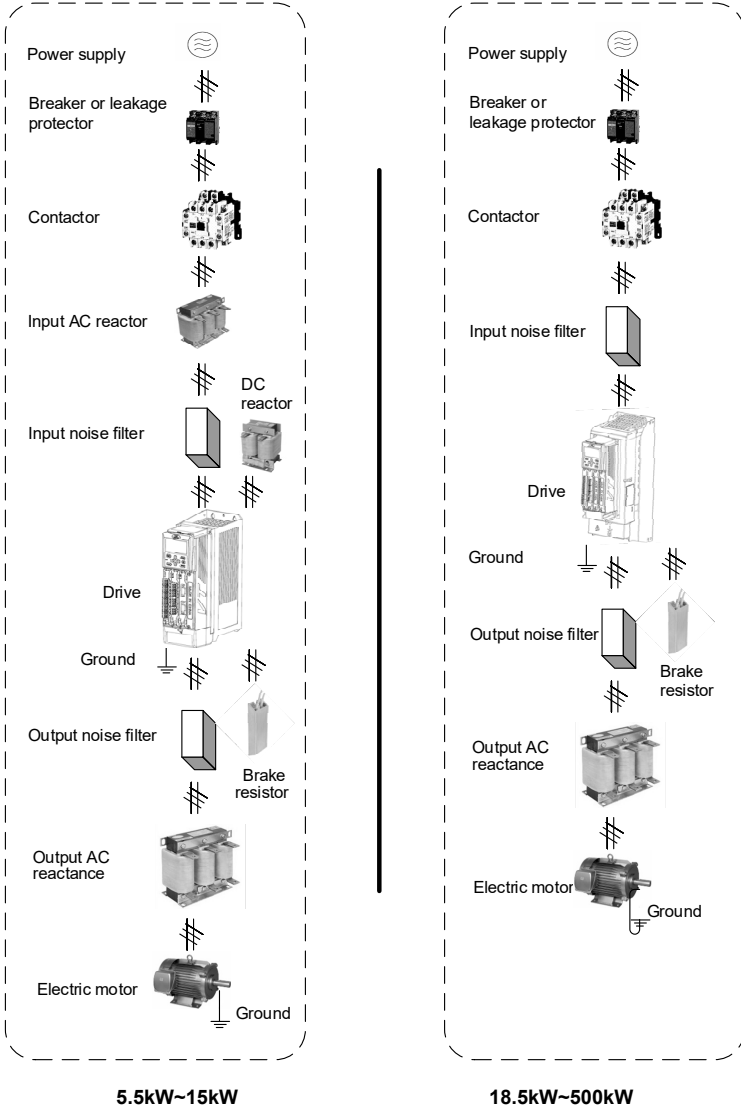


Figure 3-1 Connection diagram of the product and peripheral devices

### 3.2 Peripheral Devices Description

Device	Model selection reference
Circuit breaker	The circuit breaker capacity should be 1.5 to 2 times of the drive rated current. The time characteristics of the circuit breaker must fully consider the time characteristics of the drive overload protection.
RCCB (Residual current circuit breaker)	The drive output is high-frequency pulse so as generates leakage currents to ground. When installing the RCCB at the input end, please use the specialized RCCB. It is suggested to choose type B RCCB, and set the leakage current value to 300mA.
Contactor	Frequent contactor action will cause drive failure, so the highest frequency for the open and close the contactor shall not exceed 10 times/min. When brake resistor is used, to avoid the over-temperature damage of the brake resistor, a thermal protection relay with brake resistor over-temperature detection should be installed to disconnect the contactor of power supply.
Input AC reactor or DC reactor	<ol style="list-style-type: none"> <li>The power supply capacity is more than 600kVA or 10 times of the drive capacity.</li> <li>If there is a switch-type reactive compensation capacitor or a thyristor phase-controlled load on the same power supply node. There will be a large peak current flowing into the input power circuit, which will cause damage to the rectifier.</li> <li>When the voltage imbalance of drive's three-phase power supply exceeds 3%, it may cause interference to the system or cause damage to the rectifier.</li> <li>The input power factor of the drive is required to be higher than 90%, and the input AC reactor can improve the power factor of the input side.</li> <li>Improve the input side of the high-order harmonic, prevent damage to other equipment caused by distortion of the voltage waveform.</li> <li>Improve the influence of input side higher harmonics on the drive, and reduce external conduction and radiation interference.</li> </ol> <p>When exists the above situations, the AC reactor at the drive input side or DC reactor should be installed.</p>
Input noise filter	It can reduce the interference from power supply to the drive and improve the anti-interference ability of the drive. It can reduce the external conduction and radiation interference of the drive.
Thermal protection relay	Although the drive has its own motor overload protection function, when one drive drives two or more motors or drives a multi-poles motor, it is recommended to install a thermal protection relay between the drive and every motor.
Output noise filter	It can reduce the external conduction and radiation interference of the drive.
Output AC reactor	When the cable from the drive to the motor exceeds 100 meters, it is recommended to install an AC output reactor that can suppress high-frequency oscillation to avoid motor insulation damage, excessive leakage current and drive protection.



### 3.3 Peripheral Devices Models

Drive model	Circuit breaker (A)	Contactor (A)	R、S、T、+P、-N、PB、U、V、W			PE $\oplus$		
			Terminal screw	Tightening torque (N·m)	Wire specification (mm <sup>2</sup> )	Terminal screw	Tightening torque (N·m)	Wire specification (mm <sup>2</sup> )
VTS□□□-4T5.5K	32	25	M5	2.5~3.0	6	M5	2.5~3.0	6
VTS□□□-4T7.5K	40	16						
VTS□□□-4T11K	63	25						
VTS□□□-4T15K	63	32						
VTS□□□-4T18.5K	100	63	M6	4.0~5.0	10	M6	4.0~5.0	10
VTS□□□-4T22K	100	100			16			16
VTS□□□-4T30K	125	100			25			25
VTS□□□-4T37K	160	100	M8	9.0~10.0	25	M6	4.0~5.0	16
VTS□□□-4T45K	200	125			35			16
VTS□□□-4T55K	315	250			50			25
VTS□□□-4T75K	315	250	M8	9.0~10.0	50	M8	9.0~10.0	25
VTS□□□-4T90K	350	330			70			35
VTS□□□-4T110K	350	330			100			50
VTS□□□-4T132K	400	330	M10	17.6~22.5	150	M8	9.0~10.0	75
VTS□□□-4T160K	500	400			185			100
VTS□□□-4T185K	630	500	M12	31.4~39.2	240	M8	9.0~10.0	60x2
VTS□□□-4T200K	630	500			240			60x2
VTS□□□-4T220K	800	630			150x2			75x2
VTS□□□-4T250K	1000	630	M12	31.4~39.2	185x2	M10	17.6~22.5	100x2
VTS□□□-4T280K	1000	630			185x2			100x2
VTS□□□-4T315K	1000	800			250x2			125x2
VTS□□□-4T355K	1200	800	M16	61.0~80.0	325x2	M10	17.6~22.5	150x2
VTS□□□-4T400K	1500	1000			325x2			150x2
VTS□□□-4T450K	2000	1500			350x2			175x2
VTS□□□-4T500K	2000	1500			350x2			175x2

### 3.4 Terminal Configuration

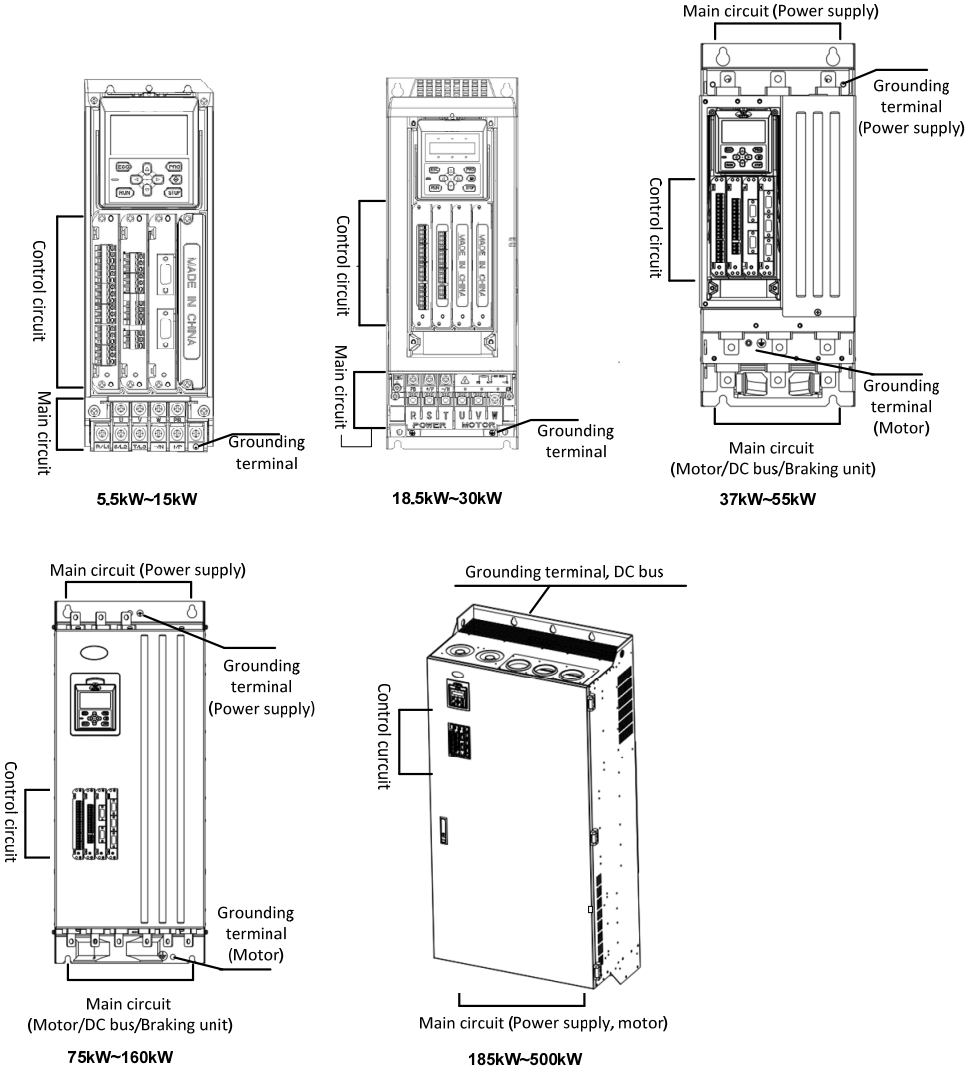
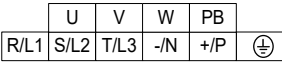


Figure 3-2 Terminal configuration

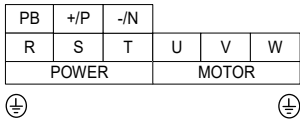
### 3.5 Main Circuit Description and Wiring

- ◆ 5.5~15kW, brake unit is built-in as standard



Terminal symbol	Terminal name and function description
R、S、T	Three-phase AC power supply input terminal
+P、PB	Brake resistor connection terminal
+P、-/N	DC power input terminal DC input terminal of external brake unit
U、V、W	Three-phase AC output terminal, motor wiring side
⊕	Grounding terminal PE

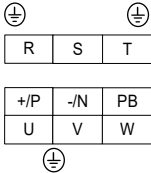
- ◆ 18.5~30 kW, brake unit is built-in as optional



Terminal symbol	Terminal name and function description
R、S、T	Three-phase AC power supply input terminal
+P、PB	Brake resistor connection terminal
+P、-/N	DC power input terminal DC input terminal of external brake unit
U、V、W	Three-phase AC output terminal, motor wiring side
⊕	Grounding terminal PE

- ◆ 37~110kW, brake unit is built-in as optional.

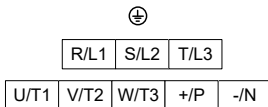
**Note:** The drive power from 75kW to 160kW cannot common DC bus directly, external pre-charge circuit is required.



Terminal symbol	Terminal name and function description
R、S、T	Three-phase AC power supply input terminal
+P、PB	Braking resistor connection terminal
+P、-/N	DC power input terminal DC input terminal of external brake unit
U、V、W	Three-phase AC output terminal, motor wiring side
⊕	Grounding terminal PE

- ◆ 132~160kW, brake unit cannot be built-in. If a brake unit is required, select an external brake unit.

**Note:** The drive power from 75kW to 160kW cannot common DC bus directly, external pre-charge circuit is required.



Terminal symbol	Terminal name and function description
R/L1、S/L2、T/L3	Three-phase AC power supply input terminal
+P、-/N	DC power input terminal DC input terminal of external brake unit
U/T1、V/T2、W/T3	Three-phase AC output terminal, motor wiring side
⊕	Grounding terminal PE

- ◆ 185~500kW, brake unit cannot be built-in. If a brake unit is required, select an external brake unit.

Terminal symbol	Terminal name and function description
R/L1, S/L2, T/L3	Three-phase AC power supply input terminal
+P, -N	DC power input terminal DC input terminal of external braking unit
U/T1, V/T2, W/T3	Three-phase AC output terminal, motor wiring side
⊕	Grounding terminal PE

R/L1	S/L2	T/L3	U/T1	V/T2	W/T3
------	------	------	------	------	------

⊕	+P	-N
---	----	----

◆ Main circuit terminal wiring diagram

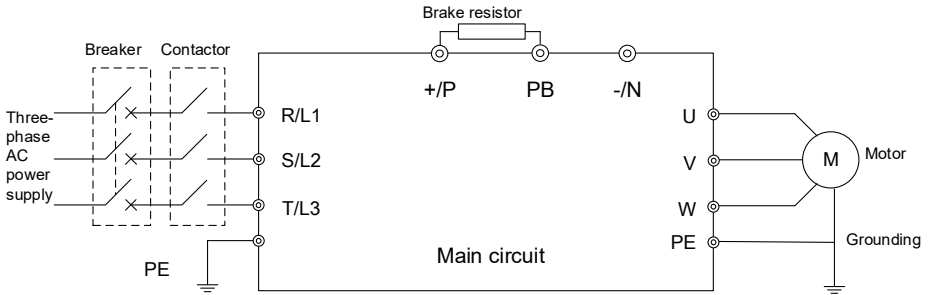


Figure 3-3 Main circuit terminal wiring diagram

**Note:** For the power higher than 132kW products cannot built-in brake unit and without “PB” terminal.

## 3.6 Attention for Main Circuit Wiring

### 3.6.1 Power Supply

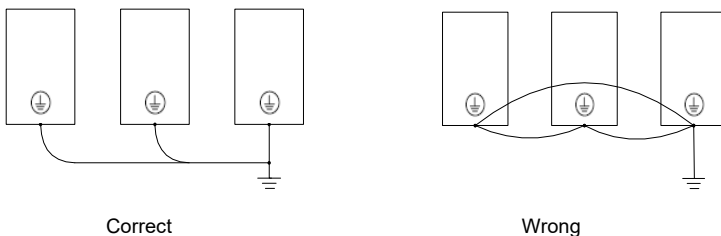
- ◆ Do not connect the power supply cable to the output terminal, as this will result in damage to the internal components of the drive.
- ◆ For input side over-current protection and maintenance conveniently, the drive should be connected to the power supply through breaker or RCCB and contactor.
- ◆ Please confirm whether the number of power phases and rated voltage correspond with the nameplate of the product, otherwise the drive may be damaged.

### 3.6.2 Motor

- ◆ Short circuit or grounding of the drive output terminals is prohibited. Otherwise, it will cause damage to the internal components of the drive.
- ◆ Avoid output cables (U/V/W) short circuit or short circuit to enclosure, otherwise there is a risk of electric shock.
- ◆ It is strictly forbidden to connect a capacitor or phase lead LC/RC noise filter to the output of the drive, otherwise the drive will be damaged.
- ◆ When a contactor is installed between the drive and the motor, the switching action of the output contactor cannot be performed during the operation of the drive, otherwise a large current will flow into the drive to and the drive will report fault information.
- ◆ Cable length between drive and motor: When the cable between the drive and the motor is too long, the high-order harmonic leakage current at the output will adversely affect the drive and peripheral devices. It is recommended to install a output AC reactor when the motor cable exceeds 100 meters, and contact the manufacturer to inquire whether the carrier frequency needs to be modified.

### 3.6.3 Grounding

- ◆ The drive generates leakage current, and the larger the carrier frequency, the more the leakage current. The leakage current of the drive is higher than 3.5mA. The leakage current is determined by the conditions of use. To ensure safety, the drive and motor must be grounded.
- ◆ The grounding resistance should be less than  $10\ \Omega$ . For the wire diameter requirements of the grounding cable, please refer to "3.3 Peripheral Devices Models".
- ◆ Do not share the grounding wire with welding machines and other power equipment.
- ◆ When using two or more drives, the grounding wire should not form a loop.



**Figure 3-4** Grounding wiring

3.6.4 Countermeasures for Conduction and Radiation Interference

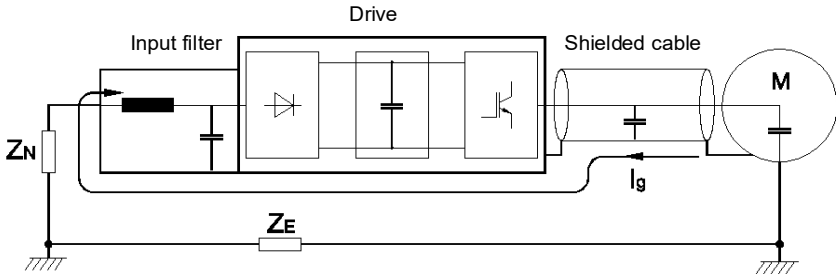


Figure3-5 Noise current illustration

- ◆ When installing an input noise filter, the wiring from the filter to the input power supply of the drive should be as short as possible.
- ◆ The outer casing of the filter and the mounting cabinet should be reliably connected over a large area to reduce the return impedance of the noise current  $I_g$ .
- ◆ The wiring distance between the drive and the motor should be as short as possible, and the 4-core cable should be used for the motor cable. One end of the ground wire is grounded on the drive side, the other end is connected to the motor enclosure, and the motor cable is inserted into the metal tube.
- ◆ The input power cable and output motor cable should be as far away as possible.
- ◆ The susceptible equipment and signal cables should be installed as far away as possible from the drive.
- ◆ Critical signal cables should use shielded cables. It is recommended that the shield layer be grounded by a 360-degree grounding method and inserted into the metal tube. Keep away from the input power cable and output motor cable. If a signal cable must cross the input power cable or the output motor cable, they should be orthogonal.
- ◆ When frequency reference source is analog input (voltage or current signal), use a double-stranded shielded cable and connect the shield layer to the grounding terminal PE of the drive. The signal cable length must less than 50 meters.
- ◆ The wiring of the control circuit relay output signal and other control circuit signal should be separate.
- ◆ It is strictly forbidden to short-circuit the shield layer with other signal cables and equipment.
- ◆ When the drive is connected to an inductive load device (magnetic contactor, relay, solenoid valve, etc.), be sure to use a surge suppressor on the load device coil as shown below.

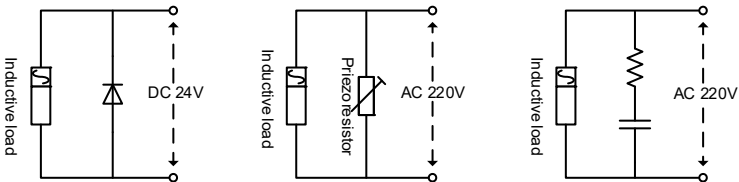


Figure 3-6 Application of inductive load surge suppressor

### 3.7 Control Circuit Description

The VTS series drive has 4 slots:

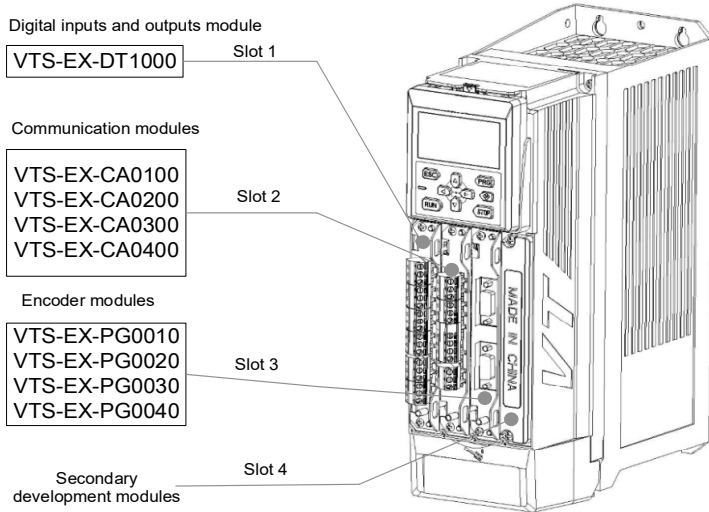
The slot 1 supports digital inputs and digital outputs modules;

The slot 2 supports the communication modules;

The slot 3 supports the encoder modules;

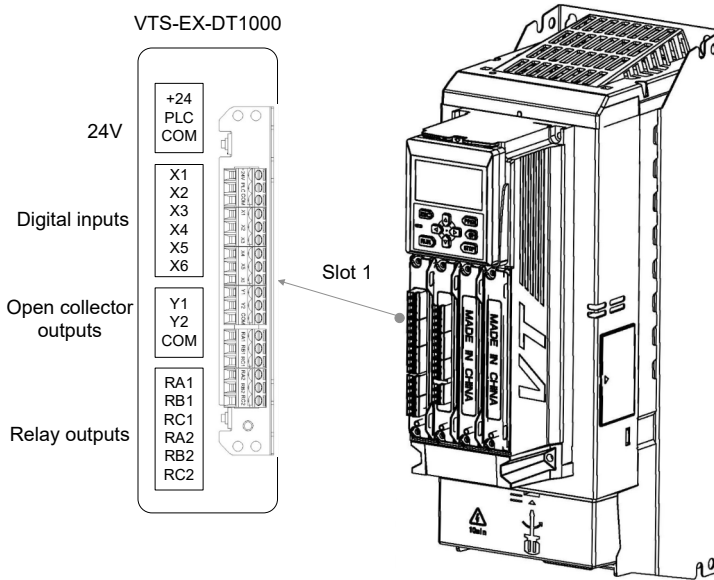
The slot 4 supports the secondary development modules.

The location of slots is shown as below.



**Figure 3-7** Control circuit slot location

### 3.8 Digital Inputs and Outputs Module



**Figure 3-8** Digital inputs and outputs module

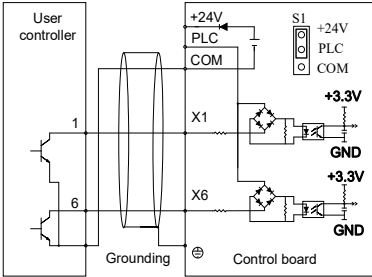
#### 3.8.1 Description

Terminal	Symbol	Function description	Technical specifications
<b>Digital inputs and outputs module: VTS-EX-DT1000</b>			
Digital inputs	+24V	+24V	24V±10%, internal isolated with GND Maximum output current: 200mA
	PLC	Power supply of digital inputs	Short to +24V on the circuit board by default
	X1~X6	Digital inputs 1~6	Input specification: 24VDC, 5mA Frequency range: 0-1KHz Voltage range: 24V ± 20%
	COM	Digital inputs common	The interior isolated from GND
Digital outputs	Y1	Open collector output 1	Voltage range: 24V ± 20%
	Y2	Open collector output 2	Maximum output current: 50mA
	COM	Y1 and Y2 common	The interior isolated from GND
Relay outputs	RA1/RB1/RC1	Relay output 1	RA1—RB1: Normally closed RA1—RC1: Normally open Contact capacity: 250VAC/1A, 30VDC/1A
	RA2/RB2/RC2	Relay output 2	RA2—RB2: Normally closed RA2—RC2: Normally open Contact capacity: 250VAC/1A, 30VDC/1A

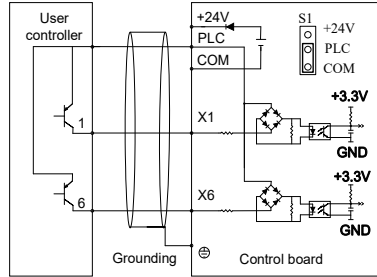


### 3.8.2 Digital Inputs Wiring

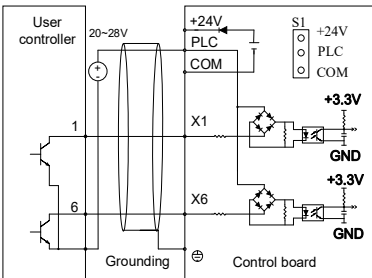
- Use internal +24V power supply  
NPN type sink current wiring method  
**Note:** The jumper S1 short-circuit +24V and PLC



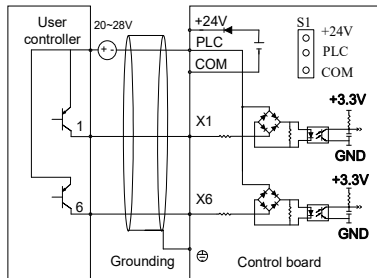
- Use internal +24V power supply  
PNP type sourcing current wiring method  
**Note:** The jumper S1 short-circuit COM and PLC



- Use external +24V power supply  
NPN type sink current wiring method  
**Note:** Remove the jumper S1 short-circuit stick

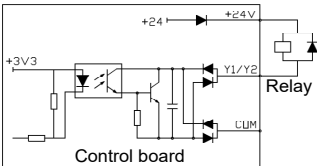


- Use external +24V power supply  
PNP type sourcing current wiring method  
**Note:** Remove the jumper S1 short-circuit stick

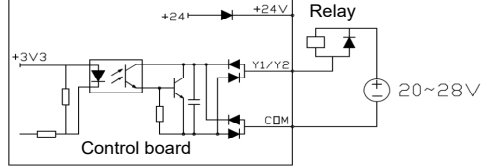


### 3.8.3 Digital Outputs Wiring

- Y1,Y2 use internal +24V power supply

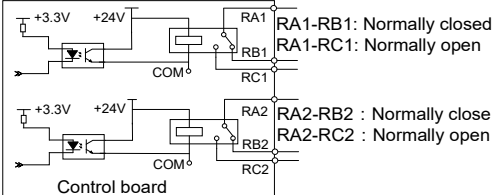


- Y1,Y2 use external power supply

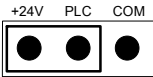
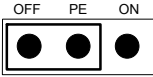
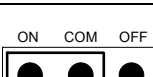


**Note:**Please make sure that the polarity of the external diode is correct.

- Wiring mode of relay



### 3.8.4 Jumper

Module	Jumper	Pin symbol	Function description	Default jumper position
VTS-EX-DT1000	S1	24V	+24V-PLC: user internal +24V power supply COM-PLC: PLC pulls low level	
		PLC		
		COM		
	S2	OFF	OFF-PE: Grounding ON-PE: Not grounding Generally, the default is OFF to prevent crosstalk	
		PE		
		ON		
	S3	ON	ON-COM: Digital input common end (COM) and digital output common end (COM) are connected together OFF-COM: Digital input common end (COM) and digital output common end (COM) are disconnected.	
		COM		
		OFF		

### 3.9 Communication Module

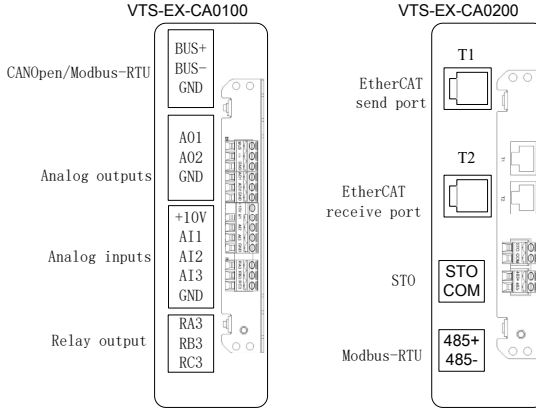


Figure 3-9 Communication module

#### 3.9.1 Description

Terminal	Symbol	Function description	Technical specifications
<b>Communication Module: VTS-EX-CA0100</b>			
Modbus /CAN	BUS+	RS485+ or CANH	Select Modbus or CAN by jumper. Modbus: <ul style="list-style-type: none"> <li>●Baud rate: 4800/9600/19200/38400/57600/57600bps</li> <li>●Up to 32 units are connected in parallel.</li> <li>●If more than 32 units are used, repeaters are required.</li> <li>●Max. distance is 500m with shielded twisted pair cable</li> </ul> CAN: Maximum speed 1Mbps
	BUS-	RS485- or CANL	
	GND	Modbus/CAN GND	Internal isolated with COM
Analog Inputs	+10V	Analog input reference voltage	10V ±3%, internal isolated with COM Maximum output current: 10mA
	AI1	Analog input 1	-10V~10V: Input impedance 20kΩ, max. voltage: ±15V 0~20mA: Input impedance 500Ω, max. current: 30mA Resolution: 12 bits (0.025%)
	AI2	Analog input 2	
	AI3	Analog input 3	
GND	Analog GND	The interior isolated from COM	
Analog outputs	AO1	Analog output 1	Select analog or current output by jumper
	AO2	Analog output 2	0~20mA: Output allowable impedance 200 to 500 Ω 0~10V: Output allowable impedance ≥10kΩ
	GND	Analog GND	The interior isolated from COM
Relay output	RA3/RB3/RC3	Relay output 3	RA3—RB3: Normally closed RA3—RC3: Normally open Contact capacity: 250VAC/1A,30VDC/1A

Terminal	Symbol	Function description	Technical specifications
<b>Communication Module: VTS-EX-CA0200</b>			
EtherCAT	T1	EtherCAT send port	Transmission speed: 2*100Mbit/S (High Speed Ethernet, full duplex mode) Each EtherCAT segment can accommodate 65,535 nodes
	T2	EtherCAT receive port	
STO	STO	Safe torque off	When STO function is used, connect the Opto-Coupler of this input circuit to OFF.
	COM		The STO function works within 5ms after input, and the motor output torque is turned off.
Modbus	485+	RS485 positive end	<ul style="list-style-type: none"> <li>● Baud rate: 4800/9600/19200/38400/57600/57600bps</li> <li>● Up to 32 units are connected in parallel</li> <li>● If more than 32 units are used, repeaters are required</li> <li>● Max. distance is 500m with shielded twisted pair cable</li> </ul>
	485-	RS485 negative end	
<b>Communication Module: VTS-EX-CA0300</b>			
Modbus	485+	RS485 positive end	<ul style="list-style-type: none"> <li>● Baud rate: 4800/9600/19200/38400/57600/57600bps</li> <li>● Up to 32 units are connected in parallel.</li> <li>● If more than 32 units are used, repeaters are required.</li> <li>● Max. distance is 500m with shielded twisted pair cable</li> </ul>
	485-	RS485 negative end	
	GND	Modbus gnd	
STO	STO	Safe torque off	When STO function is used, connect the Opto-Coupler of this input circuit to OFF.
	CM		The STO function works within 5ms after input, and the motor output torque is turned off.
PROFIBUS DP	Refer to the PROFIBUS DP description	Data A	Data positive +
		RTS	Request to send
		GND	5V power supply GND
		+5V	5V power supply
		Data B	Data negative -

### 3.9.2 AI, AO and Relay Wiring

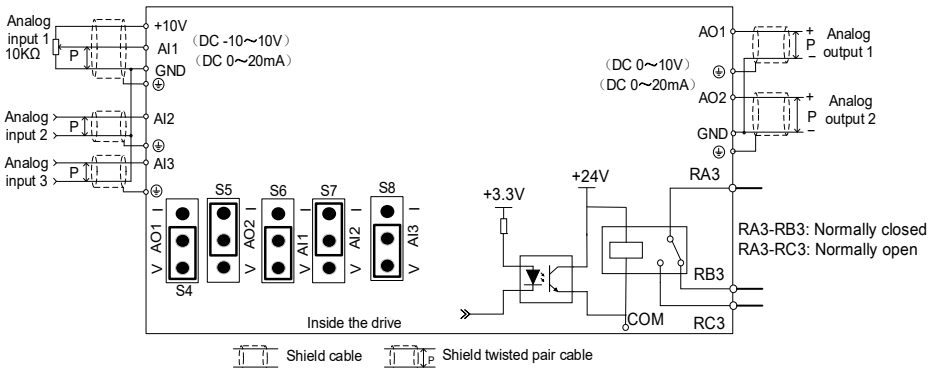


Figure 3-10 AI, AO and Relay Wiring

### 3.9.3 Modbus/CAN Communication Networking

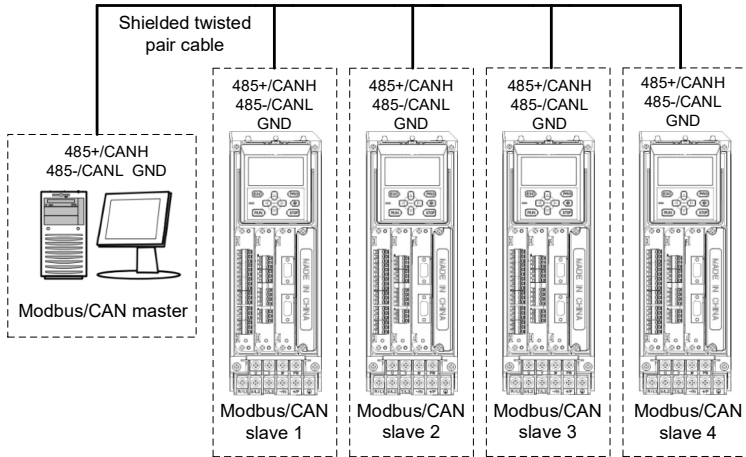


Figure 3-11 Modbus/CAN network connection mode

### 3.9.4 EtherCAT Communication Networking

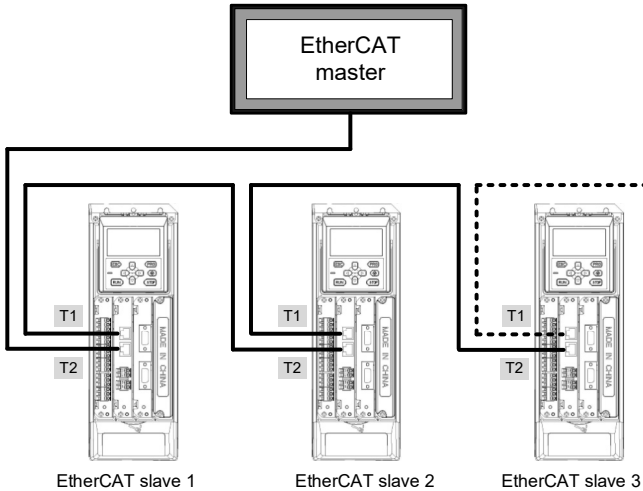




















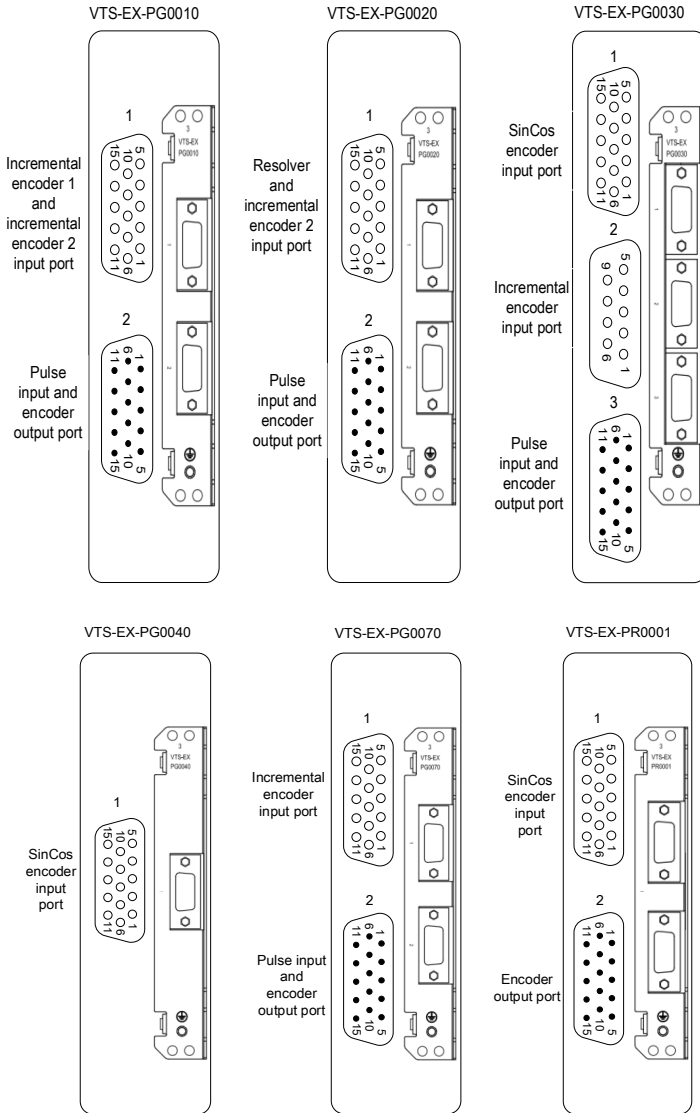
Figure 3-12 EtherCAT network connection mode

3.9.5 Jumper

Communication Module	Jumper	Pin Symbol	Function description	Default jumper position
VTS-EX-CA0100	S1	CAN	CAN-BUS+: CAN communication 485-BUS+: Modbus communication	485 BUS+ CAN 
		BUS+		
		485		
	S2	CAN	CAN-BUS-: CAN communication 485-BUS-: Modbus communication	485 BUS- CAN 
		BUS-		
		485		
	S3	ON	485-ON: Connect the termination resistor(100Ω) 485-OFF: Disconnect the termination resistor	OFF 485 ON 
		485		
		OFF		
	S4	V	V-AO1: AO1 output is voltage (0~10V) I-AO1: AO1 output is current (0~20mA)	V AO1 I 
		AO1		
		I		
	S5	V	V-AO2: AO2 output is voltage (0~10V) I-AO2: AO2 output is current (0~20mA)	V AO2 I 
		AO2		
		I		
	S6	V	V-AI1: AI1 input is voltage (-10~10V) I-AI1: AI1 input is current (0/4mA ~20mA)	V AI1 I 
		AI1		
		I		
	S7	V	V-AI2: AI2 input is voltage (-10~10V) I-AI2: AI2 input is current (0/4mA ~20mA)	V AI2 I 
		AI2		
		I		
	S8	V	V-AI3: AI3 input is voltage (-10~10V) I-AI3: AI3 input is current (0/4mA ~20mA)	V AI3 I 
		AI3		
		I		
S9	OFF	OFF-PE: Not grounding ON-PE: Grounding	OFF PE ON 	
	PE			
	ON			
VTS-EX-CA0200	S1	OFF	OFF-PE: Not grounding ON-PE: Grounding Generally, the default is OFF to prevent crosstalk	OFF PE ON 
		PE		
		ON		
	S2	OFF	485-ON: Connect the termination resistor(100Ω) 485-OFF: Disconnect the termination resistor	OFF 485 ON 
		485		
		ON		

<b>VTS-EX-CA0300</b>	S1	ON	DP-ON: Connect the termination resistor(220Ω) DP-OFF: Disconnect the termination resistor	OFF DP ON		
		DP		OFF PE ON		
		OFF				
	S2	ON	OFF-PE: Not grounding ON-PE: Grounding Generally, the default is OFF to prevent crosstalk	OFF 485 ON		
		485				
		OFF				
	S3	ON	485-ON: Connect the termination resistor(100Ω) 485-OFF: Disconnect the termination resistor	OFF TX ON		
		TX				
		OFF				
	S4	ON	TX -ON: TX is connected to drive control board TX -OFF: TX is connected to extension board	OFF RX ON		
		RX				
		OFF				
	S5	ON	RX -ON: RX is connected to drive control board RX -OFF: RX is connected to extension board	ON		
		OFF		ON: 1    OFF: 0		
	S6	ON	OFF-PE: Not grounding ON-PE: Grounding Generally, the default is OFF to prevent crosstalk	OFF PE ON		
		PE				
		OFF				
	S7	ON	OFF-PE: Not grounding ON-PE: Grounding Generally, the default is OFF to prevent crosstalk			
		PE				
		OFF				

### 3.10 Encoder Module



**Figure 3-13** Encoder module



3.10.1 Description

Port classification	Terminal No.	Terminal name	Technical specifications
<b>Encoder Module: VTS-EX-PG0010</b>			
Port 1: Dual incremental encoder input port (15pin female)	1	A1+	Encoder 1 signal input A+
	2	A1-	Encoder 1 signal input A-
	3	A2+	Encoder 2 signal input A+
	4	A2-	Encoder 2 signal input A-
	5	+5V	+5V power supply
	6	B1+	Encoder 1 signal input B+
	7	B1-	Encoder 1 signal input B-
	8	B2+	Encoder 2 signal input B+
	9	Z2+	Encoder 2 signal input Z+
	10	(PT100&KTY84) / T	Temperature sensor signal input
	11	Z1-	Encoder 1 signal input Z-
	12	Z1+	Encoder 1 signal input Z+
	13	B2-	Encoder 2 signal input B-
	14	Z2-	Encoder 2 signal input Z-
	15	GND	Gnd of power supply
Port 2: Pulse input and encoder output port (15pin male)	1	RA+	Pulse input A+ / Direction input A+
	2	RA-	Pulse input A- / Direction input A-
	3	+5V	+5V power supply
	4	GND	Gnd of power supply
	5	OA+	Encoder feedback output OA+
	6	RB-	Pulse input B- / Direction input B-
	7	RB+	Pulse input B+ / Direction input B+
	8	R+24V	24Vpower supply
	9	NC	/
	10	OB+	Encoder feedback output OB+
	11	RZ-	Z signal input negative end
	12	RZ+	Z signal input positive end
	13	NC	/
	14	OB-	Encoder feedback output OB-
	15	OA-	Encoder feedback output OA-

Port classification	Terminal No.	Terminal name	Technical specifications
<b>Encoder Module: VTS-EX-PG0020</b>			
Port 1: Resolver and incremental encoder input port (15pin female)	1	SIN+	Resolver signal input SIN+
	2	SIN-	Resolver signal input SIN-
	3	A2+	Encoder 2 signal input A+
	4	A2-	Encoder 2 signal input A-
	5	+5V1	+5V power supply
	6	COS+	Resolver signal input COS+
	7	REF+	Resolver signal input REF+
	8	B2+	Encoder 2 signal input B+
	9	Z2+	Encoder 2 signal input Z+
	10	(PT100&KTY84) / T	Temperature sensor signal input
	11	COS-	Resolver signal input COS-
	12	REF-	Resolver signal input REF-
	13	B2-	Encoder 2 signal input B-
	14	Z2-	Encoder 2 signal input Z-
	15	GND	+5V power supply
Port 2: Pulse input and encoder output port (15pin male)	1	RA+	Pulse input A+ / Direction input A+
	2	RA-	Pulse input A- / Direction input A-
	3	+5V1	+5V power supply
	4	GND	Gnd of power supply
	5	OA+	Encoder feedback output OA+
	6	RB-	Pulse input B- / Direction input B-
	7	RB+	Pulse input B+ / Direction input B+
	8	R+24V	+24 power supply
	9	NC	/
	10	OB+	Encoder feedback output OB+
	11	RZ-	Z signal input negative end
	12	RZ+	signal input positive end
	13	NC	/
	14	OB-	Encoder feedback output OB-
	15	OA-	Encoder feedback output OA-

Port classification	Terminal No.	Terminal name	Technical specifications
<b>Encoder Module: VTS-EX-PG0030</b>			
Port 1: SinCos encoder signal input port (15pin, female)	1	SA-	SinCos encoder signal SA-
	2	SA+	SinCos encoder signal SA+
	3	SB-	SinCos encoder signal SB-
	4	SB+	SinCos encoder signal SB+
	5	+5V1	+5Vpower supply
	6	SC-	SinCos encoder signal SC-
	7	SD-	SinCos encoder signal SD-
	8	/	/
	9	/	/
	10	(PT100&KTY84) / T	Temperature sensor signal input
	11	SC+	SinCos encoder signal SC+
	12	SD+	SinCos encoder signal SD+
	13	/	/
	14	/	/
	15	GND	Gnd of +5V
Port 2: Incremental encoder signal input port (9pin, female)	1	A2+	Encoder 2 signal input A+
	2	B2+	Encoder 2 signal input B+
	3	Z2+	Encoder 2 signal input Z+
	4	+5V	+5V power
	5	/	/
	6	A2-	Encoder 2 signal input A-
	7	B2-	Encoder 2 signal input B-
	8	Z2-	Encoder 2 signal input Z-
	9	GND	Gnd of power supply
Port 3: Pulse input and encoder output port (15pin male)	1	RA+	Pulse input A+ / Direction input A+
	2	RA-	Pulse input A- / Direction input A-
	3	+5V	+5Vpower supply
	4	GND	Gnd of power supply
	5	OA+	Encoder feedback output OA+
	6	RB-	Pulse input B- / Direction input B-
	7	RB+	Pulse input B+ / Direction input B+
	8	R+24V	+24Vpower supply
	9	/	/
	10	OB+	Encoder feedback output OB+
	11	RZ-	Z signal input negative end
	12	RZ+	Z signal input positive end
	13	/	/
	14	OB-	Encoder feedback output OB-
	15	OA-	Encoder feedback output OA-

Port classification	Terminal No.	Terminal name	Technical specifications
<b>VTS-EX-PG0040</b>			
Port 1: SinCos encoder input port (15pin female)	1	SA-	SinCos encoder signal SA-
	2	SA+	SinCos encoder signal SA+
	3	SB-	SinCos encoder signal SB-
	4	SB+	SinCos encoder signal SB+
	5	+5V	+5V power supply
	6	SC-	SinCos encoder signal SC-
	7	SD-	SinCos encoder signal SD-
	8	NC	/
	9	NC	/
	10	(PT100&KTY84)/T	Temperature sensor interface
	11	SC+	SinCos encoder signal SC+
	12	SD+	SinCos encoder signal SD+
	13	NC	/
	14	NC	/
	15	GND	Gnd of power supply

Port classification	Terminal No.	Terminal name	Technical specifications
<b>VTS-EX-PG0070</b>			
Port 1: Dual incremental encoder input port (15pin female)	1	A1+	Encoder 1 signal input A+
	2	A1-	Encoder 1 signal input A-
	3	A2+	Encoder 2 signal input A+
	4	A2-	Encoder 2 signal input A-
	5	+5V	+5V power supply
	6	B1+	Encoder 1 signal input B+
	7	B1-	Encoder 1 signal input B-
	8	B2+	Encoder 2 signal input B+
	9	Z2+	Encoder 2 signal input Z+
	10	(PT100&KTY84)/T	Temperature sensor signal input
	11	Z1-	Encoder 1 signal input Z-
	12	Z1+	Encoder 1 signal input Z+
	13	B2-	Encoder 2 signal input B-
	14	Z2-	Encoder 2 signal input Z-
	15	GND	Gnd of power supply
Port 2: Pulse input and encoder output port (15pin male)	1	RA+	Pulse input A+ /direction input A+
	2	RA-	Pulse input A- / direction input A-
	3	+5V	+5V power supply
	4	GND	Gnd of power supply
	5	OA+	Encoder feedback output OA+
	6	RB-	Pulse input B- / direction input B-
	7	RB+	Pulse input B+ / direction input B+
	8	R+24V	24Vpower supply
	9	OZ+	Encoder feedback output OZ+
	10	OB+	Encoder feedback output OB+
	11	RZ-	Z signal input negative end
	12	RZ+	Z signal input positive end
	13	OZ-	Encoder feedback output OZ-
	14	OB-	Encoder feedback output OB-
	15	OA-	Encoder feedback output OA-

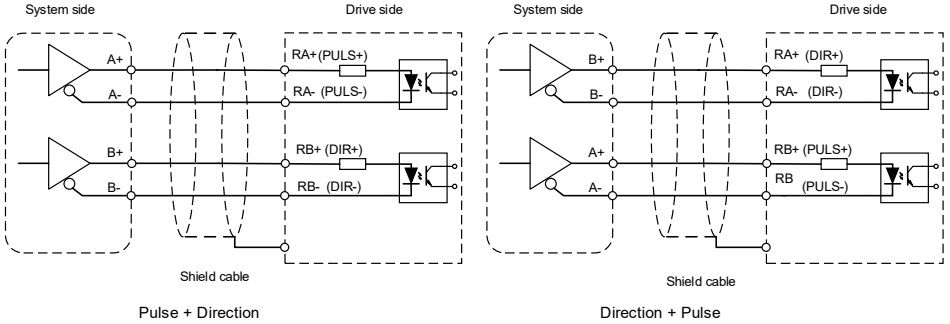
Port classification	Terminal No.	Terminal name	Technical specifications
<b>VTS-EX-PR0001</b>			
Port 1: SinCos encoder input port (15pin female)	1	SA-	SinCos encoder signal SA-
	2	SA+	SinCos encoder signal SA+
	3	SB-	SinCos encoder signal SB-
	4	SB+	SinCos encoder signal SB+
	5	+5V1	+5V power supply
	6	SC-	SinCos encoder signal SC-
	7	/	/
	8	/	/
	9	/	/
	10	/	/
	11	SC+	SinCos encoder signal SC+
	12	/	/
	13	/	/
	14	/	/
	15	GND	+5V power supply
Port 2: Encoder output port (15pin male)	1	/	/
	2	/	/
	3	+5V	+5V power supply
	4	GND	Gnd of power suppl
	5	OA+	Encoder feedback output OA+
	6	/	/
	7	/	/
	8	/	/
	9	OZ+	Encoder feedback output OZ+
	10	OB+	Encoder feedback output OB+
	11	/	/
	12	/	/
	13	OZ-	Encoder feedback output OZ-
	14	OB-	Encoder feedback output OB-
	15	OA-	Encoder feedback output OA-

**Note:** When users use double encoder modules PG0010, PG0020 or PG0070 for dual closed-loop applications, user can order dual encoder one port to two port cable.

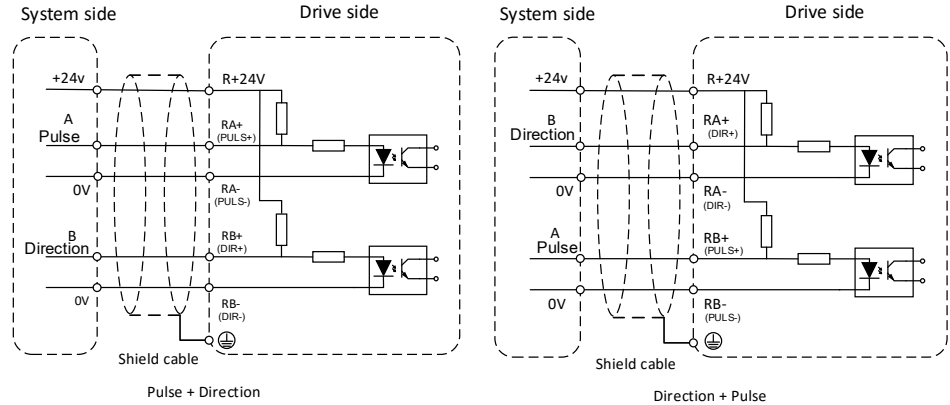
**Note:** when using the above encoder modules, please use appropriate shielded twisted pair cable and grounding. The grounding wire must be connected to the grounding terminal on the modules upper side. It is forbidden to ground on the self-tapping screw use for fixing module.

### 3.10.2 Encoder Module Wiring

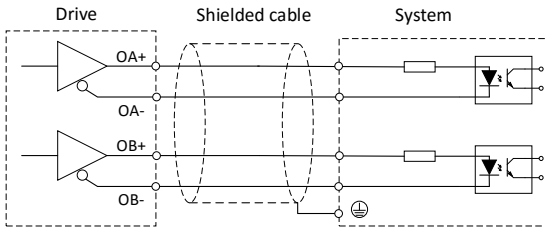
- Differential pulse drive mode, A+, A- are pulse input, and B+,B- is direction input.



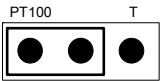
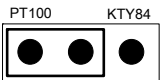
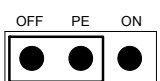
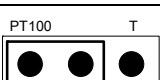
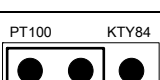
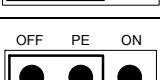
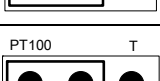
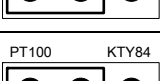
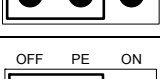
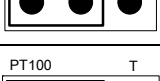
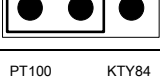

- Single phase pulse drive mode



- Encoder output wiring mode



3.10.3 Jumper

Encoder Module	Jumper	Pin symbol	Function description	Default position
VTS-EX-PG0010	S1	PT100&KTY84	(PT100&KTY84)—/ : select PT100or KTY84 temperature sensor	
		/ (None)	T-/: select T type temperature sensor	
		T		
	S2	PT100	PT100—/: select PT100 temperature sensor	
		/	KTY84—/: select KTY84 temperature sensor	
		KTY84		
S3	OFF	OFF-PE: Grounding		
	PE	ON-PE: Not grounding		
	ON	Generally, the default is off to prevent crosstalk		
VTS-EX-PG0020	S1	PT100&KTY84	(PT100&KTY84)—/ : select PT100or KTY84 temperature sensor	
		/	T-/: select T type temperature sensor	
		T		
	S2	KTY84	PT100—/: select PT100 temperature sensor	
		/	KTY84—/: select KTY84 temperature sensor	
		PT100		
S3	OFF	OFF-PE: Grounding		
	PE	ON-PE: Not grounding		
	ON	Generally, the default is off to prevent crosstalk		
VTS-EX-PG0030	S1	PT100&KTY84	(PT100&KTY84)—/ : select PT100or KTY84 temperature sensor	
		/	T-/: select T type temperature sensor	
		T		
	S2	PT100	PT100—/: select PT100 temperature sensor	
		/	KTY84—/: select KTY84 temperature sensor	
		KTY84		
S3	OFF	OFF-PE: Grounding		
	PE	ON-PE: Not grounding		
	ON	Generally, the default is off to prevent crosstalk		
VTS-EX-PG0040	S1	PT100&KTY84	(PT100&KTY84)—/ : select PT100or KTY84 temperature sensor	
		/	T-/: select T type temperature sensor	
		T		
	S2	KTY84	PT100—/: select PT100 temperature sensor	
		/	KTY84—/: select KTY84 temperature sensor	
		PT100		
S3	ON	OFF-PE: Grounding		
	PE	ON-PE: Not grounding		
	OFF	Generally, the default is off to prevent crosstalk		

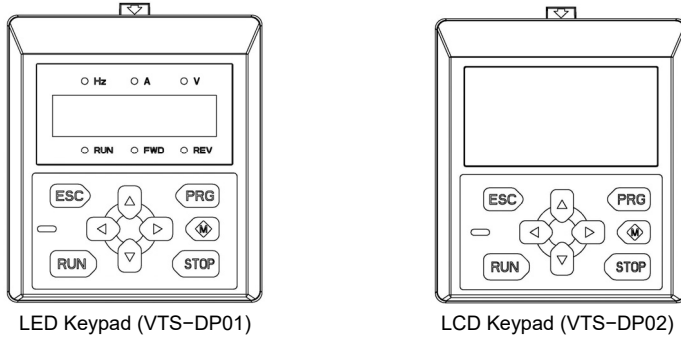


<b>VTS-EX-PG0070</b>	S1	A1+	A1+—OA+: Output encoder 1 signal A1+	
		OA+	A2+—OA+: Output encoder 2 signal A2+	
		A2+	OA+ signal corresponding to DB head pin 5	
	S2	A1-	A1—OA-: Output encoder 1 signal A1-	
		OA-	A2—OA-: Output encoder 2 signal A2-	
		A2-	OA- signal corresponding to DB head pin 15	
	S3	B1+	B1+—OB+: Output encoder 1 signal B1+	
		OB+	B2+—OB+: Output encoder 2 signal B2+	
		B2+	OB+ signal corresponding to DB head pin 10	
	S4	B1-	B1—OB-: Output encoder 1 signal B1-	
		OB-	B2—OB-: Output encoder 2 signal B2-	
		B2-	OB- signal corresponding to DB head pin 14	
	S5	Z1+	Z1+—OZ+: Output encoder 1 signal Z1+	
		OZ+	Z2+—OZ+: Output encoder 2 signal Z2+	
		Z2+	OZ+ signal corresponding to DB head pin 9	
	S6	Z1-	Z1—OZ-: Output encoder 1 signal Z1-	
		OZ-	Z2—OZ-: Output encoder 2 signal Z2-	
		Z2-	OZ- signal corresponding to DB head pin 13	
	S7	PT100&KTY84	(PT100&KTY84)—/: select PT100 or KTY84 temperature sensor	
		/		
		PTC		
S8	KTY84	PT100—/: select PT100 temperature sensor		
	/			
	PT100			KTY84—/: select KTY84 temperature sensor
S9	OFF	OFF-PE: Not grounding		
	PE	ON-PE: Grounding		
	ON	Generally, the default is off to prevent crosstalk		

## Chapter 4 Keypad Operation

### 4.1 Keypad Model

Use a Keypad to start/stop the drive, read status data and change parameters values. The drive works with either of two different Keypad types.










**Figure4-1** Keypad model

The Keypad has the following features:

- Setting parameters - the parameters can be change by Keypad.
- Motor parameters auto-tune - use the Keypad to set the motor parameters auto-tune mode and start auto-tune.
- Monitoring function - use the Keypad to monitor the parameters value, running state, fault record, etc.
- Start and stop the drive when the run command source is Keypad.
- Reset faults after fault report.
- Copy function - parameters value can be copied to the Keypad memory for later transfer to other drives or for backup.
- The Keypad can be used to reset all the parameters to default values.
- Check which parameters are different from the default values, it is convenient to check whether the parameters are changed correctly.
- Remote control box - the Keypad can be used as remote-control box functions via straight-through wired cable.
- External installing pallet - external installing pallet is available; it is convenient to install a Keypad to an external electrical cabinet.
- The Keypad and drive can be disconnected and connected at any time.
- Language selection for the LCD Keypad.

## 4.2 Keypad Keys

Key	Name	Function
	Program Key	<ol style="list-style-type: none"> <li>1. Enter the sub-menu.</li> <li>2. Enter the parameter setting menu.</li> <li>3. Data storage confirmation.</li> </ol>
	Escape Key	<ol style="list-style-type: none"> <li>1. Return to the previous menu.</li> <li>2. Abandon the modification of the data.</li> </ol>
	Increase / Decrease Key	<ol style="list-style-type: none"> <li>1. Change the speed reference in monitoring state and when speed reference channel is Keypad.</li> <li>2. Change the parameter group number or parameter number in parameters display menu.</li> <li>3. Change the parameter's value in parameter's value setting menu.</li> </ol>
	Shift Right / Shift Left Key	<ol style="list-style-type: none"> <li>1. Switch display monitored value in turn in monitoring menu.</li> <li>2. Change the parameter group No. or parameter No. in parameters display menu.</li> <li>3. Change the current edit bit in parameter's value setting menu.</li> </ol>
	Run Key	<ol style="list-style-type: none"> <li>1. Press RUN key to start the motor when run command is Keypad.</li> <li>2. Press RUN key to start motor data identification after setting motor data identification function.</li> </ol>
	Stop / Reset Key	<ol style="list-style-type: none"> <li>1. Press STOP key to stop the motor when run command is Keypad.</li> <li>2. Press STOP key to reset the fault when the drive has fault.</li> <li>3. Press M key and STOP key at the same time can stop the drive by coast to stop immediately.</li> </ol>
	Multifunctional Key	<ol style="list-style-type: none"> <li>1. Press M key and STOP key at the same time can stop the drive by coast to stop immediately.</li> </ol>

### 4.3 Keypad Indicator

VTS-DP01 indicator description:

Indicator status		Color	Description
Unit indicator	Hz	Frequency indicator	Green On: Current displayed parameter is running frequency Flash: Current displayed parameter is setting frequency
	A	Current indicator	Green On: Current displayed parameter is output current
	V	Voltage indicator	Green On: Current displayed parameter is voltage
	HZ+A	Rotating speed indicator	Green On: Current displayed parameter is rotating speed Flash: Current displayed parameter is setting rotating speed
	HZ+V	Percentage % indicator	Green On: The current display parameter is percentage
	A+V	Time indicator	Green On: The current display parameter is time
Status indicator	RUN	Running indicator	Red On: Running status Off: Stop status
	FWD	Forward indicator	Red On: In stop status, receive a run forward command In running status, in forward running status OFF: Changing from forward to reverse running or in stop status.
	REV	Reverse indicator	Red ON: In stop status, receive a run reverse command In running status, in reverse running status OFF: Changing from reverse to forward running or in stop status.
	/	Fault indicator	/ All the status indicators are in flash: Fault status

VTS-DP02 indicator description: VTS-DP02 with a status indicator to indicate the drive in running status, stop status, or fault status.

Indicator status	Description
OFF	Stop state
Green, keep on	Running state
Red, keep on	Fault state

### 4.4 LCD Keypad Interface

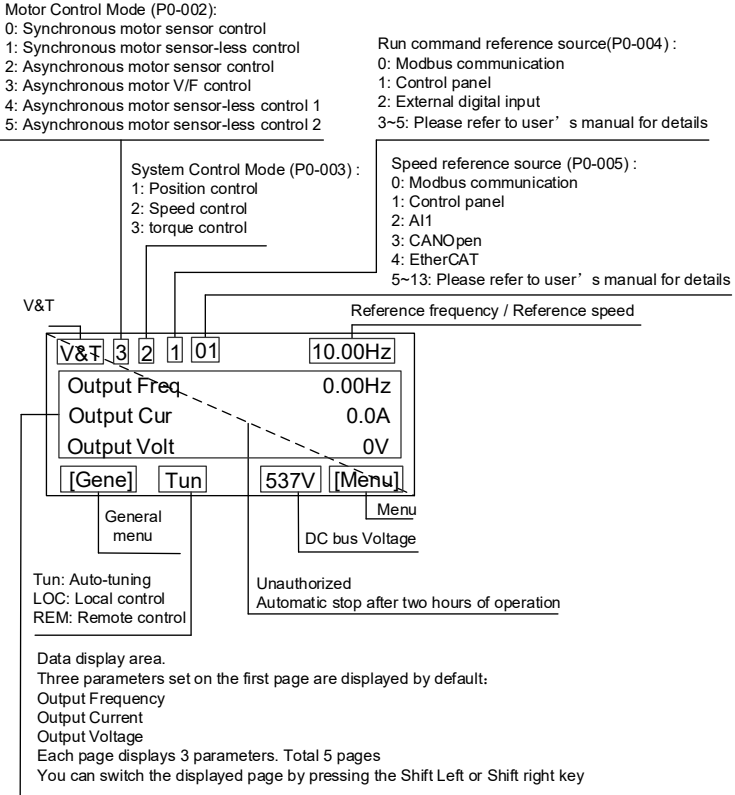


Figure 4–2 Description of LCD Keypad display interface

## 4.5 Keypad Operation

### 4.5.1 Display Status Classification

The Keypad display status is divided into five types:

No.	Name of status	Meaning
1	Parameter display status	The default display interface during standby. The display parameters can be switched by the left shift key "◀" or the right shift key "▶".
2	Fault and alarm display status	This state is entered directly when the drive has a fault alarm.
3	First level menu display status	Press the PRG key in the first menu state to enter directly.
4	Secondary menu editing status	Press the PRG key to enter in the first menu display state.
5	Modify parameter status	After entering the current user parameters, when the current edit bit is flashing, you can use the ▲, ▼ keys to modify the parameter value.

### 4.5.2 Display Status and Operation Process

Automatic switching of status

After 30 seconds without key operation, it automatically returns to the stop parameter display state or the operation parameter display state.

After 1 minute without key operation, clear the PX-YZ menu editing status and return to P0-00.

If there is password setting or key lock setting, the password protection and Keypad lock status will be automatically entered after 5 minutes without button operation.

Display status and operation flow

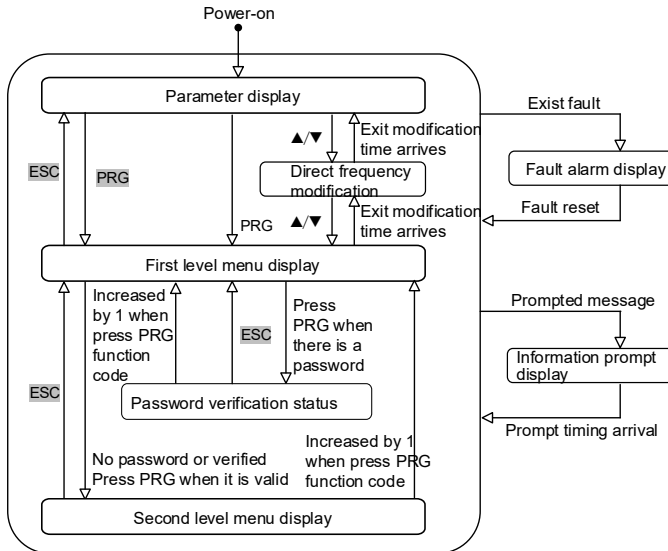
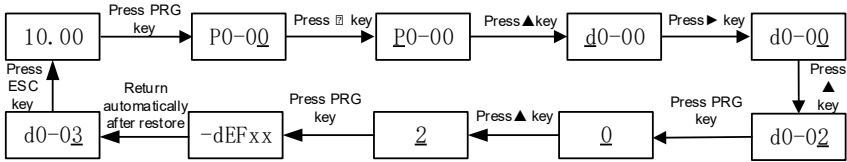


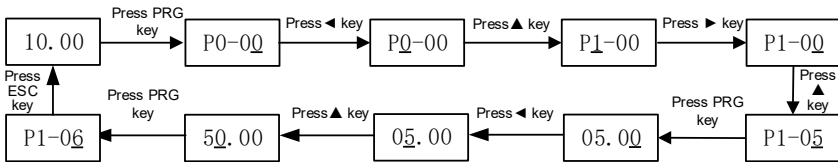
Figure 4-3 Status Display and Operation Flow

### 4.5.3 LED Keypad Operation

■ **Reset to Default Value, Set d0-02 to 2**

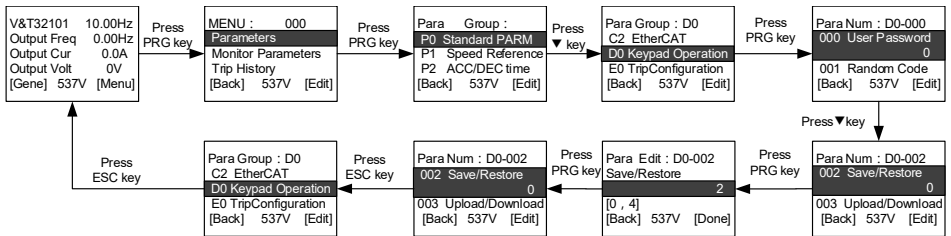


■ **Change parameter: set P1-05 to 50.00.**

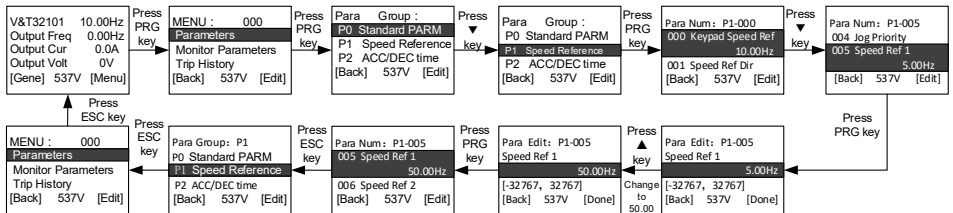


### 4.5.4 LCD Keypad Operation

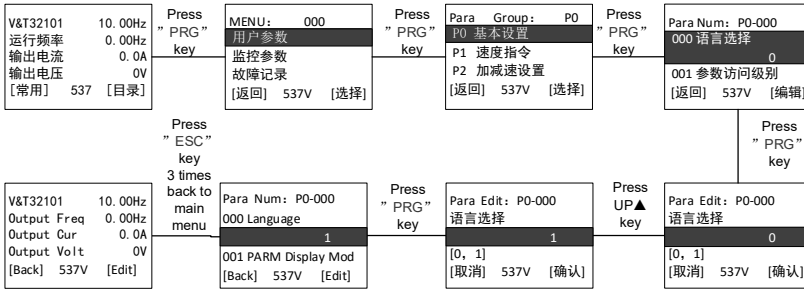
■ **Reset to Default Value, Set D0-002 to 2.**



■ **Change a parameter, set P1-005 to 50.00.**



■ Set English as menu language, set P0-000 to 1.



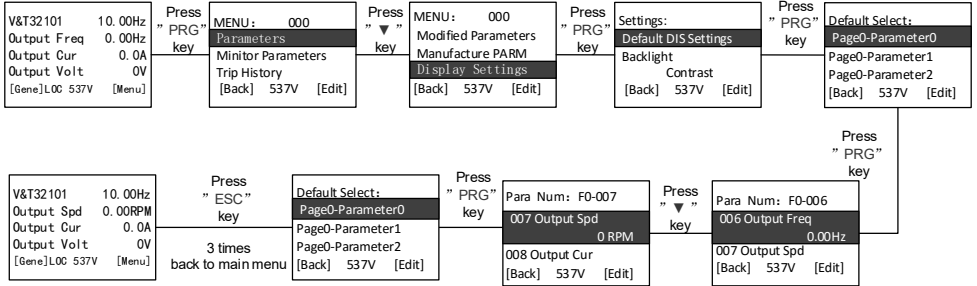
■ Change the monitored parameters in default pages?

There are 5-pages can be display on the main menu mode.

There are three parameters can be displayed on every page.

Each page can be switchover by right key (▶) or left key (◀) on the keypad.

For example, if I want to display output speed on the first position of first page:





## 4.6 Password Setting

- ◆ Set password

Enter d0.00 and set the same parameters (non-zero values) twice in succession. After "P-SET" is displayed, the password is set successfully

- ◆ Verify password

Press ESC+▶+▼ at the same time till the Keypad display unLoC to unlock .

Enter d0.00, enter the password correctly, all parameters can be seen.

- ◆ Clear password

After the verification password is passed, enter d0-000 and set 00000 twice in succession. After the display of "P-CLA", the password is successfully cleared

- ◆ The method to make password protection effective

You can choose one of three ways:

- (1). Press the ESC+PRG +▲ key at the same time to display "P-LoC", then the Keypad is locked.
- (2). No key operation for 5 minutes.
- (3). Power on again.

## 4.7 Keypad Keys Lock and Unlock

- ◆ If you also want to lock the keys on the Keypad, you can set the parameter d0-007.

0: The keys on the Keypad are not locked, and all keys are available.

1: Lock all keys, all keys are not available.

2: All keys except the RUN and STOP keys are not available.

- ◆ You can choose one of three ways to activate the function:

1. Press the ESC+PRG +▲ key at the same time to display "loc-1"(select to lock all keys) or "Loc-1" (RUN, STOP is not locked, other keys are locked), and the operation panel is locked.

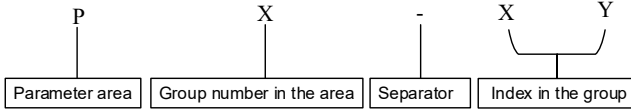
2. No key operation for 5 minutes and the operation panel is locked automatically.

- ◆ You can press ESC+▶+▼ at the same time to unlock the keys function.

## 4.8 Menu Mode

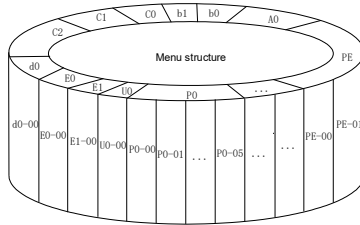
Two level menu style is adopted in menu display. The first level menu is parameter index, and the second level menu is parameter value.

### 4.8.1 First Level Menu



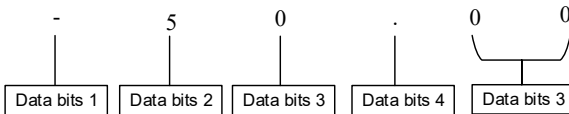
**Figure 4-4** The Format of the First Level Menu

- ◆ The structure of the first level menu



**Figure 4-5** The structure of the first level menu

### 4.8.2 The Second Level Menu



**Figure 4-6** The Format of the second level menu

- ◆ Format of second level menu data display / setting

Decimalism display/setting:

The data bits 1 - 5 can be displayed/set with symbols of 0, 1, ...9

When the display data is greater than 5 digits, the truncation method is used.

For example, when the data is -12345, the operation panel displays "-1234."

Hexadecimal display/setting:

The data bits 1 - 4 can be displayed/set with symbols of 0, 1, ...9,A, B, C, D, E, F.

### 4.8.3 Parameter Access Level

Parameter access level	Option	Parameter visible range
0	Basic menu	Show all parameters
1	Non-factory value menu	Only show modified and read-only parameters

### 4.8.4 LED Keypad Display Symbols



































In addition to the parameter the first and second level menus, some prompt characters will also be displayed in the operation panel in the table below:

Symbol	Meaning	Symbol	Meaning
8.8.8.8.8.	When the drive is powered on, it will display instantly.	-DEFT	Restore default value operation
E-XXX	The beginning of E- means that a fault or alarm has occurred.	DEFXX	Restoring default value, XX represents progress, display from 00-99
--dc-	Drive DC braking	P-CLA	Password has cleared
ATUnE	Auto-tune	P-SEt	The password has been set successfully
LodXX	Parameters are uploaded to the Keypad XX stands for progress, showing from 00-99	P-LoC	Password protection has taken effect
CPyXX	Parameters are downloaded to the drive XX stands for progress, showing from 00-99	unLoc	Keypad has unlocked
pGood	Successful copy of parameters	Loc-1	Keys fully locked
EWRFH	Parameter failed to upload to Keypad	Loc-2	Only run and stop are unlocked, the other keys are locked
EEFSH	Parameter failed to download to drive		
E-CPy	Parameter download to drive out of range		
CoErr	Communication error of Keypad and drive		

If you see the prompts that are not listed in the table, please contact your local distributors or get contact with the manufacturer directly

### 4.8.5 Recognition of LED display symbols

The corresponding relationship between LED display symbols and characters/numbers are shown in below:

LED display	Meaning	LED display	Meaning	LED display	Meaning	LED display	Meaning
	0		9		H		T
	1		A		J		t
	2		B		j		U
	3		C		L		u
	4		c		N		y
	5		d		n		-
	6		E		o		.
	7		F		p		
	8		G		r		

### 4.9 First Commissioning and Auto Tune

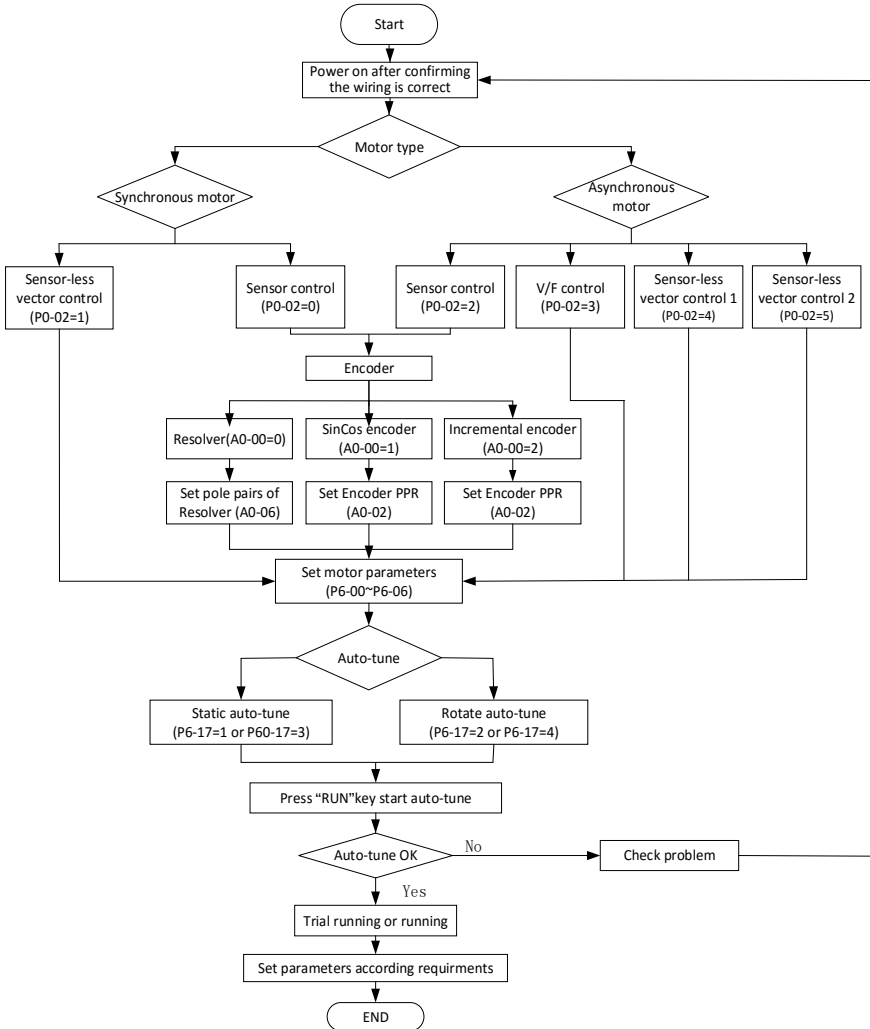
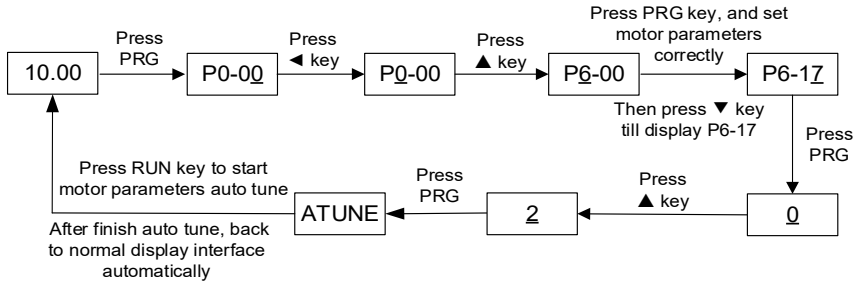


Figure 4-7 Auto-tune for the first time

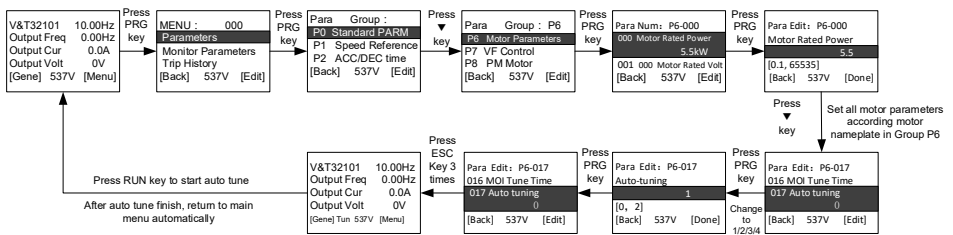
Auto-tune selection:

P6-17	Asynchronous motor	Synchronous motor
0	Auto tune is disabled	Disables auto tune
1	Static auto tune	Static auto tune 1
2	Rotate auto tune	Rotate auto tune 1
3		Static auto tune 2
4		Rotate auto tune 2

LED keypad auto tune steps:



LCD keypad auto tune steps:



Note:

- If the auto tune error is displayed after the auto tune, it means that the auto tune has failed. It is necessary to re check the wiring and parameter settings and analyze the cause of failure before start auto tune again.
- When start motor rotate tune, the motor speed will accelerate to 70% of rated speed, please pay attention to safety.
- When start motor rotate tune, the acceleration and deceleration time should be appropriately prolonged.
- Must set to rotate tune for sensor control, and the encoder wiring and relative parameters must set correctly.

## Chapter 5 Parameters list

### Parameter groups

Group area	Group	Group description
Group P	P0	Basic parameters
	P1	Speed reference
	P2	Acceleration and deceleration time
	P3	Digital input and output
	P4	Analog input and output
	P5	Start and stop
	P6	Motor parameters
	P7	V/F control
	P8	Synchronous motor sensor-less control
	P9	Vector control
	PA	Torque control
	Pb	Advanced control parameters
	PC	PID control parameters

Group area	Group	Group description
Group A	A0	Encode parameters
Group B (b)	B0 (b0)	Position control
	B1 (b1)	Pulse input and output
Group C	C0	Modbus
	C1	CAN
	C2	EtherCAT
Group D (d)	D0 (d0)	Keypad parameters
Group E	E0	Protection configuration
Group F	F0	Monitored parameters
	F1	Software version
	F2	Product bar code
	F3	Fault history

### Description of each meaning in the parameter list

Item	Explanation
Parameter	Indicates the code of the parameter, such as P0-00. <b>Note:</b> The parameter display on LED Keypad is 4 digits, such as P1-23, the manual defaults to the 4-digit parameter. The parameter number on the LCD Keypad is 5 digits, and a "0" is added before the index in the group, such as P1-023.
Name	The name of the parameter, explaining the function of the parameter.
Default	The parameter value after reset the default value
Setting Range	Allowable set parameter value form minimum to maximum
Unit	V: voltage; A: current; °C: degrees Celsius; Ω: ohm; rpm: rev/min; %: percentage; bps: baud rate; Hz, kHz: frequency; mH: milli-henry; kW: power; ms, s, min, h, kh: time; /: no unit.
Attribute	o: This parameter can be changed while the drive is running; x: This parameter can only be changed in stop status; *: This parameter is a read-only parameter and cannot be modified. <u>Text with shadow and underlined means that this function is not supported.</u>
Description	Describe the parameters and values

## 5.1 Basic Parameters (P0)

Parameter	Name	Default	Setting Range	Unit	Attribute
P0-00	<b>Language</b>	0	0~1	/	×
	0: 中文 1: English				
P0-01	<b>Parameters display mode</b>	0	0~5	/	○
	0: Display all the parameters 1: Display the parameters different from the default value 2~5: Reserved				
P0-02	<b>Motor control mode</b>	3	0~5	/	×
	0: Synchronous motor sensor vector control 1: Synchronous motor sensor-less vector control 2: Asynchronous motor sensor vector control 3: Asynchronous motor V/F control 4: Asynchronous motor sensor-less vector control 1 5: Asynchronous motor sensor-less vector control 2				
P0-03	<b>System control mode</b>	2	1~3	/	×
	1: Position control 2: Speed control 3: Torque control				
P0-04	<b>Run command selection</b>	1	0~5	/	×
	0: Modbus 1: Keypad 2: External digital input terminal 3: EtherCAT 4: CAN 5: PROFIBUS DP				
P0-05	<b>Speed reference selection</b>	1	0~11	/	×
	0: Modbus 1: Keypad 2: AI1 3: CAN 4: EtherCAT 5: PID 6: AI2 7: AI3 8: Simple PLC 9: Multi-step frequency reference 10: Digital input terminal UP/DN				



Parameter	Name	Default	Setting Range	Unit	Attribute
	11: Pulse input 12: Pulse input 2 (Reserved) 13: PROFIBUS DP				
P0-06	<b>Speed unit</b>	0	0~1	/	×
	0: Hz 1: rpm				
P0-07	<b>Frequency precision</b>	0	0~2	/	×
	0: 0.01Hz 1: 0.1Hz 2: 1Hz				
P0-08	<b>Forward running speed limit selection</b>	0	0~3	/	×
	0: Parameter setting (P0-10) 1: AI1 2: AI2 3: AI3				
P0-09	<b>Reverse running speed limit selection</b>	0	0~3	/	×
	0: Parameter setting (P0-11) 1: AI1 2: AI2 3: AI3				
P0-10	<b>Forward running speed limit</b>	100.0	0.0~100.0	%	○
	Effective when P0-08 = 0 100% corresponds to the maximum speed P0-12				
P0-11	<b>Reverse running speed limit</b>	100.0	0.0~100.0	%	○
	Effective when P0-09 = 0 100% corresponds to the maximum speed P0-12				
P0-12	<b>Maximum speed</b>	50.00	0~655.35	Hz	×
		1500	0~65535	rpm	
The unit is determined by the speed unit P0-06 Effective in speed control, torque control, and position control					
P0-13	<b>Minimum speed</b>	0.00	0~655.35	Hz	×
		0	0~65535	rpm	
The unit is determined by the speed unit P0-06 Effective in speed control, torque control, and position control					
P0-14	<b>Forward running current limit selection</b>	0	0~3	/	×
	Selects the forward running current limit source 0: Parameter setting (P0-16) 1: AI1				

Parameter	Name	Default	Setting Range	Unit	Attribute
	2: AI2 3: AI3				
<b>P0-15</b>	<b>Reverse running current limit selection</b>	0	0~3	/	×
	Selects the reverse running current limit source 0: Parameter setting (P0-17) 1: AI1 2: AI2 3: AI3				
<b>P0-16</b>	<b>Forward running current limit</b>	150.0	0.0~300.0	%	○
	100% corresponds to the motor rated current				
<b>P0-17</b>	<b>Reverse running current limit</b>	150.0	0.0~300.0	%	○
	100% corresponds to the motor rated current				
<b>P0-18</b>	<b>Special machine code</b>	0	0~2	/	×
	0: Universal 1~2: Specify customer machine code				
<b>P0-19</b>	<b>Forward running torque limit</b>	180.0	-300.0~300.0	%	○
	100% corresponds to the motor rated torque				
<b>P0-20</b>	<b>Reverse running torque limit</b>	180.0	-300.0~300.0	%	○
	100% corresponds to the motor rated torque				

## 5.2 Speed Reference (P1)

Parameter	Name	Default	Setting Range	Unit	Attribute
P1-00	Keypad speed reference	10.00	-327.67~327.67	Hz	○
		300	-32767~32767	rpm	
The speed reference when P0-05 = 1 The range is limited by the maximum speed P0-12 The unit is determined by the speed unit P0-06					
P1-01	Speed reference direction	0	0~1	/	×
	0: Forward 1: Reverse				
P1-02	RUN reverse selection	0	0~1	/	×
	0: Run reverse is allowed 1: Run reverse is not allow				
P1-03	Jog speed reference	5.00	0.00~655.35	Hz	×
		150	0~65535	rpm	
The range is limited by the maximum speed P0-12 The unit is determined by the speed unit P0-06					
P1-04	Reserved	0	0~1	/	×
P1-05	Multi-step speed reference 1	5.00	-327.67~327.67	Hz	○
		150	-32767~32767	rpm	○
P1-06	Multi-step speed reference 2	8.00	-327.67~327.67	Hz	○
		240	-32767~32767	rpm	○
P1-07	Multi-step speed reference 3	10.00	-327.67~327.67	Hz	○
		300	-32767~32767	rpm	○
P1-08	Multi-step speed reference 4	15.00	-327.67~327.67	Hz	○
		450	-32767~32767	rpm	○
P1-09	Multi-step speed reference 5	18.00	-327.67~327.67	Hz	○
		540	-32767~32767	rpm	○
P1-10	Multi-step speed reference 6	20.00	-327.67~327.67	Hz	○
		600	-32767~32767	rpm	○
P1-11	Multi-step speed reference 7	25.00	-327.67~327.67	Hz	○
		750	-32767~32767	rpm	○
P1-12	Multi-step speed reference 8	28.00	-327.67~327.67	Hz	○
		840	-32767~32767	rpm	○
P1-13	Multi-step speed reference 9	30.00	-327.67~327.67	Hz	○
		900	-32767~32767	rpm	○
P1-14	Multi-step speed reference 10	35.00	-327.67~327.67	Hz	○
		1050	-32767~32767	rpm	○

Parameter	Name	Default	Setting Range	Unit	Attribute
P1-15	Multi-step speed reference 11	38.00	-327.67~327.67	Hz	○
		1140	-32767~32767	rpm	○
P1-16	Multi-step speed reference 12	40.00	-327.67~327.67	Hz	○
		1200	-32767~32767	rpm	○
P1-17	Multi-step speed reference 13	42.00	-327.67~327.67	Hz	○
		1260	-32767~32767	rpm	○
P1-18	Multi-step speed reference 14	45.00	-327.67~327.67	Hz	○
		1350	-32767~32767	rpm	○
P1-19	Multi-step speed reference 15	48.00	-327.67~327.67	Hz	○
		1440	-32767~32767	rpm	○
P1-20	Multi-step speed reference 16	50.00	-327.67~327.67	Hz	○
		1500	-32767~32767	rpm	○
Parameter from P1-05 to P1-20 for the speed reference when P0-05 = 9 The range is limited by the maximum speed P0-12 The unit is determined by the speed unit P0-06					
P1-21	UP/DN function selection	0000	0000~FFFF	/	○
The parameter is used to set the UP/DN function bit0~bit1: UP/DN mode selection 00: Common use mode 01: Triggered valid mode 10: Signal UP signal mode bit2~bit3: Reserved bit4: UP/DN initial value selection 0: P1-22 1: A11 bit5~bit7: Reserved bit8~bit9: Min. adjustable speed 00: Zero speed 01: UP/DN minimum adjustable speed 10: Can adjust to reverse direction bit10~bit11: Reserved bit12~bit13: Save in stop state 00: Clear adjusted value in stop state, UP/DN adjust is disabled 01: Keep the adjusted value in stop state, UP/DN adjust is disabled 10: Keep the adjusted value in stop state, UP/DN adjust is enabled bit14: Save after power off 0: Clear adjusted value after power off 1: Save adjusted value after power off bit15: Reserved					

Parameter	Name	Default	Setting Range	Unit	Attribute
P1-22	UP/DN initial value	10.00	0.00~655.35	Hz	○
		300	0~65535	rpm	
The range is limited by the maximum speed P0-12 The unit is determined by the speed unit P0-06					
P1-23	UP/DN min. adjustable speed	5.00	0.00~655.35	Hz	○
		UP/DN adjustable minimum speed. UP/DN cannot adjust the frequency to less than this value.			
P1-24	UP/DN adjustable step length	1.00	0.00~655.35	Hz	○
		30	0~65535	rpm	
The range is limited by the maximum speed P0-12 The unit is determined by the speed unit P0-06					
P1-25	UP/DN adjustment rate	0.100	0.000~32.000	s	○
P1-26	Keypad UP/DN adjustable step length	1.00	0.00~655.35	Hz	○
		30	0~65535	rpm	○
The range is limited by the maximum speed P0-12 The unit is determined by the speed unit P0-06					
P1-27	Keypad UP/DN min. adjustable speed	0	0~2	/	×
1: Zero speed 2: UP/DN minimum adjustable speed 0: Keypad UP/DN can adjust to reverse direction					
P1-28	Speed reference selection 2	1	0~13	/	×
The digital input terminal can be used to change the speed reference source. If this digital input terminal function is set to "49" When this digital input terminal is "OFF", the speed reference source is determined by P0-05 When this digital input terminal is "ON", the speed reference source is determined by P1-28 0: Modbus 1: Keypad 2: AI1 3: CAN 4: EtherCAT 5: PID 6: AI2 7: AI3 8: Simple PLC 9: Multi-step frequency reference 10: Digital input terminal UP/DN 11: Pulse input 12: Pulse input 2 (Reserved) 13: PROFIBUS DP					

Parameter	Name	Default	Setting Range	Unit	Attribute
P1-29	Jump frequency 1	0.00	0.00~655.35	Hz	x
P1-30	Jump frequency 2	0.00	0.00~655.35	Hz	x
P1-31	Jump frequency 3	0.00	0.00~655.35	Hz	x
P1-32	Jump frequency band	0.00	0.00~655.35	Hz	x
P1-29, P1-30, P1.31 are used to set the center value of the specific frequency band to jump. P1-32 is used to set the specific frequency band to jump.					
P1-33	<b>Simple PLC operation mode</b>	0	0~3	/	x
	0: Stop after finish a signal operation 1: Keep the final speed running after a single operation 2: Continuous operation 3: Limited number operation				
P1-34	<b>Simple PLC power-off memory selection</b>	0000	0000~FFFF	/	x
	One position: Power-off save selection 0: Will not save after power off 1: Save after power off Tens position: Stop status save selection 0: Will not save after stop 1: Save in stop state				
P1-35	<b>The 1st step speed reference selection</b>	0	0~5	/	x
	0: Multi-step speed reference1 1: Modbus 2: Parameter setting 3: AI1 4: AI2 5: AI3				
P1-36	<b>The 1st step run time</b>	0.0	0.0~6553.5	s(h)	o
P1-37	<b>The 1st step ACC/DEC time selection</b>	0	0~3	/	x
P1-38	<b>The 2nd step run time</b>	0.0	0.0~6553.5	s(h)	o
P1-39	<b>The 2nd step ACC/DEC time selection</b>	0	0~3	/	x
P1-40	<b>The 3rd step run time</b>	0.0	0.0~6553.5	s(h)	o
P1-41	<b>The 3rd step ACC/DEC time selection</b>	0	0~3	/	x
P1-42	<b>The 4th step run time</b>	0.0	0.0~6553.5	s(h)	o
P1-43	<b>The 4th step ACC/DEC time selection</b>	0	0~3	/	x
P1-44	<b>The 5th step run time</b>	0.0	0.0~6553.5	s(h)	o
P1-45	<b>The 5th step ACC/DEC time selection</b>	0	0~3	/	x
P1-46	<b>The 6th step run time</b>	0.0	0.0~6553.5	s(h)	o
P1-47	<b>The 6th step ACC/DEC time selection</b>	0	0~3	/	x
P1-48	<b>The 7th step run time</b>	0.0	0.0~6553.5	s(h)	o

Parameter	Name	Default	Setting Range	Unit	Attribute
P1-49	The 7th step ACC/DEC time selection	0	0~3	/	×
P1-50	The 8th step run time	0.0	0.0~6553.5	s(h)	○
P1-51	The 8th step ACC/DEC time selection	0	0~3	/	×
P1-52	The 9th step run time	0.0	0.0~6553.5	s(h)	○
P1-53	The 9th step ACC/DEC selection	0	0~3	/	×
P1-54	The 10th step run time	0.0	0.0~6553.5	s(h)	○
P1-55	The 10th step ACC/DEC time selection	0	0~3	/	×
P1-56	The 11th step run time	0.0	0.0~6553.5	s(h)	○
P1-57	The 11th step ACC/DEC time selection	0	0~3	/	×
P1-58	The 12th step run time	0.0	0.0~6553.5	s(h)	○
P1-59	The 12th step ACC/DEC time selection	0	0~3	/	×
P1-60	The 13th step run time	0.0	0.0~6553.5	s(h)	○
P1-61	The 13th step ACC/DEC time selection	0	0~3	/	×
P1-62	The 14th step run time	0.0	0.0~6553.5	s(h)	○
P1-63	The 14th step ACC/DEC time selection	0	0~3	/	×
P1-64	The 15th step run time	0.0	0.0~6553.5	s(h)	○
P1-65	The 15th step ACC/DEC time selection	0	0~3	/	×
P1-66	The 16th step run time	0.0	0.0~6553.5	s(h)	○
P1-67	The 16th step ACC/DEC time selection	0	0~3	/	×
<p>Run time setting from 1st step to 15th step:</p> <p>If the simple PLC running time unit is 0, the run time unit is s (seconds)</p> <p>If the simple PLC running time unit is 1, the run time unit is h (hours)</p> <p>The acceleration and deceleration time selection of the 1st to the 15th steps:</p> <p>0: Acceleration and deceleration time 0 (P2-01, P2-02)</p> <p>1: Acceleration and deceleration time 1 (P2-03, P2-04)</p> <p>2: Acceleration and deceleration time 2 (P2-05, P2-06)</p> <p>3: Acceleration and deceleration time 3 (P2-07, P2-08)</p>					
P1-68	<b>Simple PLC run time unit</b>	0	0~1	/	×
	0: s 1: h				
P1-69	<b>Simple PLC cycle times</b>	1	1~65535	/	×
	When "P1-33 = 3, Limited number operation" is selected, stop after running this number of times				

### 5.3 ACC/DEC Time (P2)

Parameter	Name	Default	Setting Range	Unit	Attribute
P2-00	<b>ACC and DEC mode selection</b>	0	0~2	/	×
	0: One step 1: Two steps 2: S curve				
P2-01	<b>Acceleration time 0</b>	Model dependent	0.00~655.35	s	○
P2-02	<b>Deceleration time 0</b>	Model dependent	0.00~655.35	s	○
P2-03	<b>Acceleration time 1</b>	Model dependent	0.00~655.35	s	○
P2-04	<b>Deceleration time 1</b>	Model dependent	0.00~655.35	s	○
P2-05	<b>Acceleration time 2</b>	Model dependent	0.00~655.35	s	○
P2-06	<b>Deceleration time 2</b>	Model dependent	0.00~655.35	s	○
P2-07	<b>Acceleration time 3</b>	Model dependent	0.00~655.35	s	○
P2-08	<b>Deceleration time 3</b>	Model dependent	0.00~655.35	s	○
P2-09	<b>S-curve time at acceleration start</b>	Model dependent	0.00~655.35	s	○
P2-10	<b>S-curve time at acceleration end</b>	Model dependent	0.00~655.35	s	○
P2-11	<b>S-curve time at deceleration start</b>	Model dependent	0.00~655.35	s	○
P2-12	<b>S-curve time at deceleration end</b>	Model dependent	0.00~655.35	s	○
P2-13	<b>Acceleration and deceleration time multiple</b>	0	0~2	/	×
	0: *1 1: *10 2: *0.1 <b>Note:</b> The acceleration and deceleration value are multiplied by the multiple				
P2-14	<b>Emergency stop deceleration time</b>	Model dependent	0.00~655.35	s	○
	When a digital input terminal is set as "emergency stop" and the digital input is "ON"				
P2-15	<b>Jog operation acceleration time</b>	Model dependent	0.00~655.35	s	○
P2-16	<b>Jog operation deceleration time</b>	Model dependent	0.00~655.35	s	○
P2-17	<b>2-steps ACC/DEC time switching speed</b>	0.00	0~655.35	Hz	×
		0	0~65535	rpm	
If P2-00 = 1, Running speed < value of P2.17: The acceleration time is P2-01, The deceleration time is P2-02					
Run speed ≥ value of P2.17: The acceleration time is P2-03, The deceleration time is P2-04					
The default acceleration time and deceleration time depend on the power: 5.5~15kW: 5.0s      18.5~30kW: 10.0s      37kW: 15.0s      45kW: 25.0s 55kW: 30.0s      75~93kW: 40.0s      110kW: 45.0s      132~250kW: 50.0s 280~400kW: 60.0s      450~560kW: 70.0s      630kW: 80.0s					



## 5.4 Digital Inputs and Outputs (P3)

Parameter	Name	Default	Setting Range	Unit	Attribute
P3-00	Digital input filter time	10	0~1000	ms	○
P3-01	X1 input function	3	0~63	/	×
P3-02	X2 input function	4	0~63	/	×
P3-03	X3 input function	0	0~63	/	×
P3-04	X4 input function	0	0~63	/	×
P3-05	X5 input function	0	0~63	/	×
P3-06	X6 input function	0	0~63	/	×
P3-07	Reserved	0	0~63	/	×

The parameters from P3-01 to P3-06 are used to set the digital inputs functions.

0: No function

1: RUN

2: Reverse RUN direction

3: Forward

4: Reverse

5: External fault input

6: Fault reset

7: Spindle positioning

8: Switch to position control

9: Enabling zero servo function

10: Clear input pulse

11: Run command change to Modbus communication

12: Run command change to Keypad

13: Run command change to digital input

14: Reserved

15: Emergency stop

16: Multi-step speed reference input 1

17: Multi-step speed reference input 2

18: Multi-step speed reference input 3

19: Multi-step speed reference input 4

20: Clear the accumulated time of Simple PLC

21: Reset Simple PLC step

22: Multi-step ACC/DEC time input 1

23: Multi-step ACC/DEC time input 2

24: Process PID integral pause

25: Process PID terminal switching

26: Process PID forced speed switching

27: UP, speed reference increase command

28: DN, speed reference decrease command

29: Clear the terminal UP/DN adjusted speed

30: UP/DN cannot adjust to reverse direction

Parameter	Name	Default	Setting Range	Unit	Attribute																																				
	31: Jog forward input																																								
	32: Jog reverse input																																								
	33: Three-wire control mode																																								
	34: Orientation position capture mode																																								
	35: Orientation position reference 1																																								
	36: Orientation position reference 2																																								
	37: Orientation position reference 3																																								
	38: Run is prohibited																																								
	39: Orientation encoder change to encoder 2																																								
	40: Switch over of speed control and torque control																																								
	41: Orientation after receive stop command																																								
	42~48: Reserved																																								
	49: Speed reference selection change to P1.28 setting																																								
	50: Acceleration and deceleration is prohibited																																								
	51: Speed reference change to maximum speed																																								
	52: Speed reference change to jog speed																																								
	53: Speed reference change to multi-step speed reference 1																																								
	54: Speed reference change to AI1																																								
	55: Speed reference change to AI2																																								
	56: Speed reference change to AI3																																								
	57: Run is prohibited 1																																								
	58: Run forward is prohibited 1																																								
	59: Run reverse is prohibited 1																																								
	60: Run is prohibited 2																																								
	61: Run forward is prohibited 2																																								
	62: Run reverse is prohibited 2																																								
	63: Reserved																																								
<b>P3-08</b>	<b>Digital input invert</b>	0000	0000~03FF	/	×																																				
	The parameter is used to activate the inversion of digital inputs.																																								
	<table border="1"> <thead> <tr> <th>Item</th> <th>Reserved</th> <th>AI3</th> <th>AI2</th> <th>AI1</th> <th>/</th> <th>X6</th> <th>X5</th> <th>X4</th> <th>X3</th> <th>X2</th> <th>X1</th> </tr> </thead> <tbody> <tr> <td>Default</td> <td>0000 00</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>bit</td> <td>bit15 to bit10</td> <td>bit9</td> <td>bit8</td> <td>bit7</td> <td>bit6</td> <td>bit5</td> <td>bit4</td> <td>bit3</td> <td>bit2</td> <td>bit1</td> <td>bit0</td> </tr> </tbody> </table>					Item	Reserved	AI3	AI2	AI1	/	X6	X5	X4	X3	X2	X1	Default	0000 00	0	0	0	0	0	0	0	0	0	0	bit	bit15 to bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Item	Reserved	AI3	AI2	AI1	/	X6	X5	X4	X3	X2	X1																														
Default	0000 00	0	0	0	0	0	0	0	0	0	0																														
bit	bit15 to bit10	bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0																														
	0: No inversion																																								
	1: Inversion active																																								
<b>P3-09</b>	<b>XI / VXI effectiveness selection</b>	0	0~2	/	×																																				
	0: Only the actual terminal XI is valid																																								
	1: Both actual terminal XI and virtual terminal VXI are valid																																								
	2: Only virtual terminal VXI is valid																																								
<b>P3-10</b>	<b>VXI virtual terminal reference</b>	0000	0000~001F	/	×																																				
	<table border="1"> <thead> <tr> <th>Item</th> <th>Reserved</th> <th>X5</th> <th>X4</th> <th>X3</th> <th>X2</th> <th>X1</th> </tr> </thead> <tbody> <tr> <td>Default</td> <td>0000 0000 000</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>Bit</td> <td>bit15 to bit5</td> <td>bit4</td> <td>bit3</td> <td>bit2</td> <td>bit1</td> <td>bit0</td> </tr> </tbody> </table>					Item	Reserved	X5	X4	X3	X2	X1	Default	0000 0000 000	0	0	0	0	0	Bit	bit15 to bit5	bit4	bit3	bit2	bit1	bit0															
Item	Reserved	X5	X4	X3	X2	X1																																			
Default	0000 0000 000	0	0	0	0	0																																			
Bit	bit15 to bit5	bit4	bit3	bit2	bit1	bit0																																			

Parameter	Name	Default	Setting Range	Unit	Attribute
	0: Virtual terminal is invalid 1: Virtual terminal is valid				
P3-11	Virtual terminal VX1 function selection	0	0~63	/	×
P3-12	Virtual terminal VX2 function selection	0	0~63	/	×
P3-13	Virtual terminal VX3 function selection	0	0~63	/	×
P3-14	Virtual terminal VX4 function selection	0	0~63	/	×
P3-15	Virtual terminal VX5 function selection	0	0~63	/	×
P3-16	Two-wire / three-wire control mode selection	0	0~3	/	×
	0: Two wire control 1 1: Two wire control 2 2: Three wire control 1 3: Three wire control 2				
P3-17	Reserved	0	0~65535	/	×
P3-18	Reserved	0	0~65535	/	×
P3-19	Digital output terminal filter time	0	0~500	ms	×
P3-20	Y1 terminal output function selection	3	0~99	/	○
P3-21	Y2 terminal output function selection	9	0~99	/	○
P3-22	Relay 1 output function selection	15	0~99	/	○
P3-23	Relay 2 output function selection	0	0~99	/	○
P3-24	Relay 3 output function selection	0	0~99	/	○
	0: No function 1: Ready 2: Pre-charge OK 3: RUN 4: Speed reach maximum speed 5: Speed reach minimum speed 6: Acceleration 7: Deceleration 8: Zero speed 9: Speed reach reference speed 10: Position reach reference position 11: Orientation position complete 12: Brake unit working 13: Authorized 14: Application fault output 15: Fault output 16: Communication control 17: Simple PLC every step operation has been completed 18: Simple PLC all steps operation has been completed 19: Reserved 20: RUN output except jog RUN 21: Stop status output continuously for a period of time				

Parameter	Name	Default	Setting Range	Unit	Attribute																					
22~50: Reserved 51: Frequency reach output (FAR) 52: Frequency level detection 1 output (FDT1) 53: Frequency level detection 2 output (FDT2) 54: No fault output 55: Torque reach output 56: Current reach output 57: Motor pre-overload output 58~99: Reserved																										
P3-25	<b>Digital output invert</b>	0000	0000~001F	/	×																					
	<table border="1"> <thead> <tr> <th>Item</th> <th>Reserved</th> <th>RA3</th> <th>RA3</th> <th>RA1</th> <th>Y2</th> <th>Y1</th> </tr> </thead> <tbody> <tr> <td>Default</td> <td>0000 0000 000</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>Bit</td> <td>bit15 to bit5</td> <td>bit4</td> <td>bit3</td> <td>bit2</td> <td>bit1</td> <td>bit0</td> </tr> </tbody> </table>					Item	Reserved	RA3	RA3	RA1	Y2	Y1	Default	0000 0000 000	0	0	0	0	0	Bit	bit15 to bit5	bit4	bit3	bit2	bit1	bit0
	Item	Reserved	RA3	RA3	RA1	Y2	Y1																			
Default	0000 0000 000	0	0	0	0	0																				
Bit	bit15 to bit5	bit4	bit3	bit2	bit1	bit0																				
0: Output Invert OFF 1: Output Invert ON																										
P3-26	<b>Virtual terminal output reference</b>	0000	0000~001F	/	×																					
	<table border="1"> <thead> <tr> <th>Item</th> <th>Reserved</th> <th>RA3</th> <th>RA3</th> <th>RA1</th> <th>Y2</th> <th>Y1</th> </tr> </thead> <tbody> <tr> <td>Default</td> <td>0000 0000 000</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>Bit</td> <td>bit15 to bit5</td> <td>bit4</td> <td>bit3</td> <td>bit2</td> <td>bit1</td> <td>bit0</td> </tr> </tbody> </table>					Item	Reserved	RA3	RA3	RA1	Y2	Y1	Default	0000 0000 000	0	0	0	0	0	Bit	bit15 to bit5	bit4	bit3	bit2	bit1	bit0
	Item	Reserved	RA3	RA3	RA1	Y2	Y1																			
Default	0000 0000 000	0	0	0	0	0																				
Bit	bit15 to bit5	bit4	bit3	bit2	bit1	bit0																				
0: Virtual terminal output is OFF 1: Virtual terminal output is ON																										
P3-27	<b>Frequency reach detect width</b>	2.00	0.00~655.35	Hz	○																					
P3-28	<b>Speed reach detection width</b>	5	1~65535	rpm	○																					
P3-29	<b>FDT1 upper limit</b>	3.00	0.00~655.35	Hz	○																					
P3-30	<b>FDT1 lower limit</b>	2.50	0.00~655.35	Hz	○																					
P3-31	<b>FDT2 upper limit</b>	3.50	0.00~655.35	Hz	○																					
P3-32	<b>FDT2 lower limit</b>	3.00	0.00~655.35	Hz	○																					
P3-33	<b>Stop status output continuous time</b>	2.00	0.00~655.35	s	○																					
P3-34	<b>Torque reach detection value</b>	0.0	0.0~6553.5	%	○																					
P3-35	<b>Torque reach detection delay time</b>	0.010	0.000~65.535	s	○																					
P3-36	<b>Torque reach detection range</b>	0.0	0.0~6553.5	%	○																					
P3-37	<b>Current reach detection value</b>	0.0	0.0~6553.5	A	○																					
P3-38	<b>Current reach detection delay time</b>	0.010	0.000~65.535	s	○																					
P3-39	<b>Current reach detection range</b>	0.0	0.0~6553.5	%	○																					
P3-40	<b>Fault output signal type</b>	0000	0x0000~0x0111	/	○																					

## 5.5 Analog Input and Output (P4)

Parameter	Name	Default	Setting Range	Unit	Attribute
P4-00	AI1 filter time coefficient	20.0	0.0~1000.0	ms	○
P4-01	AI1 zero offset	0.00	-200.00~200.00	%	○
P4-02	AI1 gain	100.00	0.00~200.00	%	○
P4-03	AI2 filter time coefficient	20.0	0.0~1000.0	ms	○
P4-04	AI2 zero offset	0.00	-200.00~200.00	%	○
P4-05	AI2 gain	100.00	0.00~200.00	%	○
P4-06	AI3 filter time coefficient	20.0	0.0~1000.0	ms	○
P4-07	AI3 zero offset	0.00	-200.00~200.00	%	○
P4-08	AI3 gain	100.00	0.00~200.00	%	○
P4-09	<b>Analog input curve selection</b> One position: AI1 curve selection 0: Point-slope mode (P4-01 to P4-02) 1: Multi-point mode (P4-10 to P4-17) Tens position: AI2 curve selection 0: Point-slope mode (P4-04 to P4-05) 1: Multi-point mode (P4-18 to P4-25) Hundreds position: AI3 curve selection 0: Point-slope mode (P4-07 to P4-08) 1: Multi-point mode (P4-26 to P4-33)	0	0~999	/	×
P4-10	AI1 min. input value	0.00	-10.00~10.00	V	×
P4-11	Percentage corresponding to AI1 min. input	0.00	-100.00~100.00	%	×
P4-12	AI1 max. input value	10.00	-10.00~10.00	V	×
P4-13	Percentage corresponding to AI1 max. input	100.00	-100.00~100.00	%	×
P4-14	AI1 inflection 1 input	2.00	-10.00~10.00	V	×
P4-15	Percentage corresponding to AI1 inflection 1 input	40.00	-100.00~100.00	%	×
P4-16	AI1 inflection 2 input	8.00	-10.00~10.00	V	×
P4-17	Percentage corresponding to AI1 inflection 2 input	60.00	-100.00~100.00	%	×
P4-18	AI2 min. input value	0.00	-10.00~10.00	V	×
P4-19	Percentage corresponding to AI2 min. input	0.00	-100.00~100.00	%	×
P4-20	AI2 max. input value	10.00	-10.00~10.00	V	×
P4-21	Percentage corresponding to AI2 max. input	100.00	-100.00~100.00	%	×
P4-22	AI2 inflection 1 input	2.00	-10.00~10.00	V	×
P4-23	Percentage corresponding to AI2 inflection 1 input	40.00	-100.00~100.00	%	×
P4-24	AI2 inflection 2 input	8.00	-10.00~10.00	V	×
P4-25	Percentage corresponding to AI2 inflection 2 input	60.00	-100.00~100.00	%	×
P4-26	AI3 min. input value	0.00	-10.00~10.00	V	×
P4-27	Percentage corresponding to AI3 min. input	0.00	-100.00~100.00	%	×

Parameter	Name	Default	Setting Range	Unit	Attribute
P4-28	AI3 max. input value	10.00	-10.00~10.00	V	×
P4-29	Percentage corresponding to AI3 max. input	100.00	-100.00~100.00	%	×
P4-30	AI3 inflection 1 input	2.00	-10.00~10.00	V	×
P4-31	Percentage corresponding to AI3 inflection 1 input	40.00	-100.00~100.00	%	×
P4-32	AI3 inflection 2 input	8.00	-10.00~10.00	V	×
P4-33	Percentage corresponding to AI3 inflection 2 input	60.00	-100.00~100.00	%	×
P4-34	<b>Analog input AI1 to AI3 as digital input enable</b> One position: AI1 as digital input enable 0: AI1 as analog input 1: AI1 as digital input Tens position: AI2 as digital input enable 0: AI2 as analog input 1: AI2 as digital input Hundreds position: AI3 as digital input enable 0: AI3 as analog input 1: AI3 as digital input	0	0~999	/	×
P4-35	AI1 as digital input function selection	0	0~63	/	×
P4-36	AI2 as digital input function selection	0	0~63	/	×
P4-37	AI3 as digital input function selection	0	0~63	/	×
When analog input AI1 / AI2 / AI3 are used as digital input, the functions are set as X1~X6. It is ON when the analog input voltage greater than 7V and it is OFF when the analog input voltage less than 3V. Analog input >7V: ON Analog input <3V: OFF					
P4-38	AO1 analog output function selection	0	0~15	/	○
P4-39	AO1 zero offset	0.00	-100.00~100.00	%	○
P4-40	AO1 gain	100.00	0.00~200.00	%	○
P4-41	AO2 analog output function selection	0	0~15	/	○
P4-42	AO2 zero offset	0.00	-100.00~100.00	%	○
P4-43	AO2 gain	100.00	0.00~200.00	%	○
The parameter P4-38 / P4-41 are used to set the AO1 / AO2 output function. 0: Reference speed 1: Running speed 2: Reserved 3: Current 4: DC bus voltage 5: Reserved 6: Ramp speed 7: Communication output 8: Motor temperature (Use with parameters P4-48 and P4-49) 9: Output AI1 10: Output AI2 11: Output AI3					

Parameter	Name	Default	Setting Range	Unit	Attribute
12: Torque 13~15: Reserved					
P4-44	AI disconnection detection value	1.500	0.000~10.000	V	○
P4-45	AI out of range detection value	12.000	0.000~15.000	V	○
P4-46	AI disconnection detection value	3	0~65535	S	○
P4-47	AI disconnection and out of range detection enable	0	0~3	/	○
0: AI1 ~ AI3 disconnection and out of range detection are prohibited 1: Enables AI1 disconnection and out of range detection 2: Enables AI2 disconnection and out of range detection 3: Enables AI3 disconnection and out of range detection					
P4-48	AO output temperature start value	0	-40~140	℃	○
P4-49	AO output temperature end value	130	0~140	℃	○
P4-50	Analog input correction	0	0~65535	/	○
One position: AI1 1: AI1 zero correction 2: AI1 10V correction Tens position: AI2 1: AI2 zero correction 2: AI2 10V correction Hundreds position: AI3 1: AI3 zero correction 2: AI3 10V correction					
P4-51	AO output current min. frequency	0.0	0.0~50.0	Hz	○
P4-52	AO output current delay time	0	0~2000	ms	○

## 5.6 Start and Stop (P5)

Parameter	Name	Default	Setting Range	Unit	Attribute
P5-00	<b>Asynchronous motor sensor-less control start mode</b>	0	0~2	/	×
	0: Normal start 1: Start after DC injection 2: Flying start <b>Note:</b> Synchronous motor sensor-less control start mode is set by parameter P8-00				
P5-01	<b>Start frequency</b>	0.50	0.00~30.00	Hz	×
	Asynchronous motor V/F control is valid				
P5-02	<b>Start frequency holding time</b>	0.0	0.0~300.0	s	○
P5-03	<b>Pre-excitation time</b>	0.3	0.0~300.0	s	○
	Vector control is valid				
P5-04	<b>DC injection current</b>	50.0	0.0~120.0	%	○
	Asynchronous motor V/F control is valid				
	100% corresponds to the motor rated current				
P5-05	<b>DC injection active time</b>	0.0	0.0~300.0	s	○
	Asynchronous motor V/F control is valid				
P5-06	<b>Flying start measurement current</b>	4.5	1.0~6553.5	A	×
	Flying start measurement current				
P5-07	<b>Flying start starting direction</b>	0	0~2	/	×
	0: Flying start from forward motor rotation direction 1: Flying start from reverse motor rotation direction 2: Flying start from motor rotation direction				
P5-08	<b>Stop mode</b>	0	0~2	/	×
	0: Deceleration to stop 1: Coast to stop 2: Deceleration to stop + DC braking, asynchronous motor V/F and sensor-less vector control is valid				
P5-09	<b>DC braking start frequency</b>	0.50	0.00~30.00	Hz	×
P5-10	<b>DC braking current</b>	50.0	0.0~120.0	%	○
P5-11	<b>DC braking active time</b>	5.0	0.0~300.0	s	○
P5-12	<b>DC current ramp-up time</b>	500	0~65535	ms	○
P5-13	<b>Stop output speed</b>	60	1~65535	rpm	○
P5-14	<b>Stop output delay time</b>	0.5	0.0~60.0	S	○
	If P5-08 = 0, when the actual motor speed is less than the value of "P5-13" and last time reach the value of "P5-14", the drive will stop output to the motor completely.				



## 5.7 Motor Parameters (P6)

Parameter	Name	Default	Setting Range	Unit	Attribute
P6-00	Motor rated power	Model dependent	0.1~6553.5	kW	x
P6-01	Motor rated voltage	380	1~65535	V	x
P6-02	Motor rated frequency	50.0	0.1~6553.5	Hz	x
	Note: The parameter is only used for asynchronous motor				
P6-03	Motor rated speed	Model dependent	0~65535	rpm	x
P6-04	Motor rated current	Model dependent	0.0~6553.5	A	x
P6-05	Motor pole pairs	2	1~200	/	x
P6-06	Motor inertia	Model dependent	0.001~65.535	kg. m <sup>2</sup> *10	x
P6-07	Motor No-load current	Auto-tune	0.0~6553.5	A	x
	Note: The parameter is only used for asynchronous motor				
P6-08	Stator resistance	Auto-tune	0.000~65.535	Ω	x
P6-09	Rotor resistance	Auto-tune	0.000~65.535	Ω	x
	Note: The parameter is only used for asynchronous motor				
P6-10	D-axis inductance (PMSM) Stator leakage inductance (ACIM)	Auto-tune	0.00~655.35	mH	x
	For synchronous motor is D-axis inductance, for asynchronous motor is stator leakage inductance				
P6-11	Q-axis inductance (PMSM) Mutual inductance (ACIM)	Auto-tune	0.00~655.35	mH	x
	Note: For synchronous motor is Q-axis inductance, for asynchronous motor is mutual inductance				
P6-12	Motor flux linkage	Auto-tune	0.000~65.535	mWb	x
	Note: The parameter is only used for synchronous motor				
P6-13	Maximum D-axis current	Auto-tune	0.0~6553.5	A	x
	Note: The parameter is only used for synchronous motor				
P6-14	Inertia auto tune selection	0	0~1	/	x
	Inertia auto tune function only enabled for sensor vector control, it can't be realized under sensor-less control 0: No action 1: Inertia tune				
P6-15	No. of motor rotation for inertia auto tune	1	1~10	/	x
P6-16	Inertia auto tune time	0.1	0.1~300.0	s	x
P6-17	Motor parameters auto tune selection	0	0~2 / 0~4	/	x
	For asynchronous motor: 0: No action 1: Static tune 2: Rotate tune For synchronous motor: 0: No action 1: Static tune 1 2: Rotate tune 1 3: Static tune 2 4: Rotate tune 2				

**Note:**

- The static auto-tune can be used when the motor is loaded and it is not possible to remove the load from the motor shaft.
- The motor must be free from load for the rotate auto-tune. A rotating auto-tune first performs a static auto-tune, before rotating the motor at 70% of rated speed in the forward direction for several seconds, please be careful.

## 5.8 V/F Control (P7)

Parameter	Name	Default	Setting Range	Unit	Attribute
P7-00	<b>V/F curve selection</b>	0	0~2	/	×
	0: Linear V/F curve 1: Multi-point V/F curve 2: Power of 2 V/F curve				
P7-01	<b>Low frequency torque boost</b>	0.0	0.0~30.0	%	×
	The parameter is valid only in V/F control (P0-03 = 3) The parameter is use to set at a required value for the motor to run reliably at low speed. But excessive value can cause the motor over-current and/or overheat. 100% corresponds to the motor rated voltage 0: Auto torque boost 0.1~30.0: Manual torque boost				
P7-02	<b>Torque boost cut-off frequency</b>	10.0	1.0~50.0	Hz	×
P7-03	<b>V/F control slip compensation gain</b>	100.0	0.0~300.0	%	○
P7-04	<b>Multi-point V/F frequency 1</b>	10.0	0.1~6553.5	Hz	×
P7-05	<b>Multi-point V/F voltage 1</b>	20.0	0.1~100.0	%	×
P7-06	<b>Multi-point V/F frequency 2</b>	20.0	0.1~6553.5	Hz	×
P7-07	<b>Multi-point V/F voltage 2</b>	40.0	0.1~100.0	%	×
P7-08	<b>Multi-point V/F frequency 3</b>	30.0	0.1~6553.5	Hz	×
P7-09	<b>Multi-point V/F voltage 3</b>	60.0	0.1~100.0	%	×
P7-10	<b>Multi-point V/F frequency 4</b>	50.0	0.1~6553.5	Hz	×
P7-11	<b>Multi-point V/F voltage 4</b>	100.0	0.1~100.0	%	×
<u>P7-12</u> ≡ <u>P7-16</u>	<u>Reserved</u>	<u>0</u>	<u>0~65535</u>	<u>L</u>	<u>×</u>
P7-17	<b>Oscillation suppression enable</b>	1	0~1	/	×
	0: Oscillation suppression is disabled 1: Oscillation suppression is enabled				
P7-18	<b>Oscillation suppression mode selection</b>	0	0~2	/	×
	0: Mode 0 1: Mode 1 2: Mode 2				
P7-19	<b>Oscillation suppression factor</b>	40	0~200	/	×
P7-20	<b>Oscillation suppression gain</b>	100	0~500	%	○
P7-21	<b>Slip compensation under regeneration</b>	1	0~1	/	○
	0: Slip compensation under regeneration is not effective 1: Slip compensation under regeneration is effective				
P7-22	<b>Torque boost coefficient</b>	100	0~600	%	○
	The parameter is used with Low frequency torque boost (P7-01) 100% corresponds to the setting value of P7-01				

## 5.9 PMSM Sensor-less Control (P8)

Parameter	Name	Default	Setting Range	Unit	Attribute
P8-00	<b>Synchronous motor sensor-less control start mode</b>	0	0~2	/	×
	The parameter is used to set the start mode of synchronous motor sensor-less control 0: Start from zero speed 1: Flying start 2: High frequency injection start <b>Note:</b> About the start mode of asynchronous motor sensor-less control, refer to the parameter P5.00 for details				
P8-01	<b>Synchronous motor torque boost coefficient</b>	30.0	0.0~50.0	%	×
	100% corresponds to motor rated current				
P8-02	<b>High frequency voltage injection gain</b>	3.00	0.10~60.00	%	×
	The parameter is only valid when P8.00 is set to 2 When started the high frequency injection to the synchronous motor, the higher the high frequency injection voltage gain setting, the greater the high frequency injection intensity.				
P8-03	<b>Synchronous motor start compensation coefficient</b>	1.5	0.0~3.0	%	×
P8-04	<b>MTPA enable</b>	0	0~1	/	×
	Maximum torque per ampere 0: Disable, disables MTPA function 1: Enable, enables MTPA function				
P8-05	<b>Inductance tune pulse width</b>	0	0~65535	/	○
	This parameter is obtained by auto-tune and does not need to be modified manually				

## 5.10 Vector Control (P9)

Parameter	Name	Default	Setting Range	Unit	Attribute
P9-00	Speed regulator Kp 1	40.0	0.0~6553.5	Hz	○
P9-01	Speed regulator Ki 1	60.0	0.0~6553.5	ms	○
P9-02	Speed regulator Kp 2	40.0	0.0~6553.5	Hz	○
P9-03	Speed regulator Ki 2	60.0	0.0~6553.5	ms	○
P9-04	ASR switch frequency 0	5.0	0.0~6553.5	Hz	○
P9-05	Speed regulator output filter coefficient	1.0	0.0~5.0	/	○
P9-06	Current regulator Kp	0,10	0.00~655.35	V/A	○
P9-07	Current regulator Ki	10.0	0.0~6553.5	ms	○
P9-08	High speed current regulator Kp	0,10	0.00~655.35	V/A	○
P9-09	High speed current regulator Ki	10.0	0.0~6553.5	ms	○
P9-10	High speed current regulator PI switch enable	1	0~1	/	○
	0: Disables high speed current regulator PI switch 1: Enables high speed current regulator PI switch				
P9-11	High speed current regulator PI coefficient	100	50~200	%	○
P9-12	Asynchronous motor slip compensation gain	100.0	0.0~300.0	%	○
	Only valid under sensor/sensor-less vector control				
P9-13	ACI slip limit (motoring status)	600	0~900	rpm	×
P9-14	ACI slip limit (regenerating status)	300	0~900	rpm	×
P9-15	Field weakening gain	300	0~1000	/	×
P9-16	U phase current zero offset	5086	-32768~32767	/	×
P9-17	V phase current zero offset	5092	-32768~32767	/	×
P9-18	Speed regulator Kp 3	40.0	0.0~6553.5	Hz	○
P9-19	Speed regulator Ki 3	60.0	0.0~6553.5	/	○
P9-20	Speed regulator Kp 4	40.0	0.0~6553.5	Hz	○
P9-21	Speed regulator Ki 4	60.0	0.0~6553.5	/	○
P9-22	ASR switch frequency 1	0	0~65535	rpm	○
P9-23	ASR switch frequency 2	0	0~65535	rpm	○
P9-24	ASR switch frequency 3	0	0~65535	rpm	○
P9-25	ASR switch enable	0	0~1	/	×
P9-26	Current regulator decoupling gain	0	0~100	%	○

### 5.11 Torque Control (PA)

Parameter	Name	Default	Setting Range	Unit	Attribute
PA-00	<b>Torque reference and direction selection</b>	0000	0000~0047	/	×
	One position: Torque reference selection 0: Modbus 1: Parameter setting (PA-02) 2: CAN 3: EtherCAT 4: AI1 5: AI2 6: AI3 7: PROFIBUS DP  Tens position: Torque direction selection 0: Follow the torque reference direction 1: Opposite to the torque reference direction 2: Follow the RUN command direction When RUN command is digital input, take X1 and X2 as an example, P3-01 = 03 and P3-02 = 04: If X1 is ON and X2 is OFF, torque direction is positive If X1 is OFF and X2 is ON, torque direction is negative 3: Opposite to the RUN command direction. When RUN command is digital input, take X1 and X2 as an example, P3-01 = 03 and P3-02 = 04: If X1 is ON and X2 is OFF, torque direction is negative If X1 is OFF and X2 is ON, torque direction is positive 4: Determine by RUN command direction and torque reference direction. When RUN command is digital input, take X1 and X2 as an example, P3-01 = 03 and P3-02 = 04: If X1 is ON and X2 is OFF, torque reference direction is positive, then torque direction is positive. If X1 is ON and X2 is OFF, torque reference direction is negative, then torque direction is negative. If X1 is OFF and X2 is ON, torque reference direction is positive, then torque direction is negative. If X1 is OFF and X2 is ON, torque reference direction is negative, then torque direction is positive.				
PA-01	<b>AI max. input corresponding torque</b>	100.0	-300.0~300.0	%	○
	100.0% corresponds to 100.0% of motor rated torque				
PA-02	<b>Torque reference value</b>	0.0	-300.0~300.0	%	○
	100.0% corresponds to 100.0% of motor rated torque				
PA-03	<b>Torque acceleration time</b>	0.00	0.00~655.35	s	○
	Torque acceleration time: The accelerate time that the torque from zero accelerate to maximum torque <b>Note:</b> Only valid under torque control				
PA-04	<b>Torque deceleration time</b>	0.00	0.00~655.35	s	○
	Torque deceleration time: The decelerate time that the torque from maximum torque decelerate to zero <b>Note:</b> Only valid under torque control				
PA-05	<b>Torque control forward max. speed selection</b>	0	0~3	/	○
	0: Parameter setting (PA-07) 1: AI1 2: AI2 3: AI3				

Parameter	Name	Default	Setting Range	Unit	Attribute
PA-06	<b>Torque control reverse max. speed selection</b>	0	0~3	/	○
	0: Parameter setting (PA-08) 1: AI1 2: AI2 3: AI3				
PA-07	<b>Torque control forward max. speed</b>	100.0	0.0~100.0	%	○
PA-08	<b>Torque control reverse max. speed</b>	100.0	0.0~100.0	%	○
	100% corresponds to the maximum speed P0-12				
PA-09	<b>Torque control stop mode</b>	0	0~2	/	×
	0: Coast to stop 1~2: Reserved				
PA-10	<b>Torque control start compensation</b>	5.0	0.0~10.0	/	○
	<b>Note:</b> Only valid when motor control mode is asynchronous motor sensor-less vector control 2 (P0-02=5)				
PA-11	<b>Speed control torque feed forward enable</b>	0	0~1	/	○
	0: Disable 1: Enable  The drive operates under speed control, but a torque value may be added to the output of the speed controller. This can be used to improve the regulation of systems where the speed loop gains need to be low for stability.				

## 5.12 Advanced Parameter (Pb)

Parameter	Name	Default	Setting Range	Unit	Attribute
Pb-00	<b>Carrier frequency</b>	Model dependent	1~16	kHz	×
	The default value depending on the model. Warning: Generally, users are not recommended to change this parameter, as it may cause accidental damage.				
Pb-01	<b>Carrier frequency automatic adjustment</b>	0	0~2	/	×
	0: Carrier frequency automatic adjustment function is not enabled 1: Carrier frequency automatic adjustment according to temperature 2: Random carrier frequency Note: Carrier frequency automatic adjustment mode is only valid in V/F control mode				
Pb-02	<b>Carrier frequency random depth</b>	0	0~10	/	×
	0: No adjustment 1~10: Carrier frequency random depth				
Pb-03	<b>Voltage utilization</b>	100	50~120	%	○
	The maximum allowed voltage utilization for the Motor Control. Do not change this value without consulting Technical Support. Higher values may result in control instability or over-current faults.				
Pb-04	<b>DC over voltage control enable</b>	1	0~1	/	×
	0: Disable 1: Enable If a brake unit or a brake resistor is connected to the drive, this parameter value must be set to 0(DISABLE) to ensure proper operation of the brake unit.				
Pb-05	<b>DC over voltage control voltage</b>	700	300~800	V	×
Pb-06	<b>DC over voltage control Kp</b>	200	0~65535	/	×
Pb-07	<b>DC over voltage control Ki</b>	1000	0~65535	/	×
Pb-08	<b>Dynamic braking enables</b>	0	0~1	/	×
	0: Disable 1: Enable				
Pb-09	<b>Dynamic braking voltage</b>	680	300~760	V	×
Pb-10	<b>Flux braking enable</b>	1	0~1	/	×
	0: Disable 1: Enable				
Pb-11	<b>Flux braking control Kp</b>	100	0~65535	%	○
Pb-12	<b>Flux braking control Ki</b>	50	0~65535	/	×
Pb-13	<b>DC under voltage control</b>	0	0~1	/	○
	0: Disable 1: Enable				
Pb-14	<b>DC under voltage control voltage</b>	460	0~65535	V	○

Parameter	Name	Default	Setting Range	Unit	Attribute
Pb-15	DC under voltage control Kp	200	0~65535	/	○
Pb-16	DC under voltage control Ki	1000	0~65535	/	○
Pb-17	Automatic restart	0	0~1	/	×
	0: Disable 1: Enable <b>Warning:</b> Generally, users are not recommended to select the automatic restart function. Because after the function is enabled, if the running command is valid at power-on, the motor will start running automatically after power-on. If the device is not ready or other unqualified operators are unclear about the situation, it may cause an accident.				
Pb-18	Automatic restart delay time	0	0~65535	s	×
Pb-19	Output voltage correction factor	2000	100~65535	/	×
Pb-20	Maximum sampling output voltage	115	115~65535	/	×
Pb-21	UV line voltage zero offset	12187	0~32767	/	×
Pb-22	UW line voltage zero offset	12222	0~32767	/	×
Pb-23	Load type	0	0~1	/	×
	0: G type, constant torque/heavy load application 1: L type, variable torque/light load application				
Pb-24	Dead-time compensation prediction	1200	0~65535	/	
Pb-25	Dead-time compensation	100	0~200	%	
Pb-26	Reserved				
Pb-27	Reserved				
Pb-28	Reserved				
Pb-29	Reserved				
Pb-30	Drooping rate	0.00	0.00~100.00	%	



### 5.13 Process PID Control (PC)

Parameter	Name	Default	Setting Range	Unit	Attribute
PC-00	<b>Process open loop and process close loop calculation formula</b>	0	0~3	/	×
	0: Frequency reference is open loop main reference and auxiliary reference calculation 1: Frequency reference is PID 2: Frequency reference is open loop main reference and auxiliary reference calculation + PID 3: Frequency reference is open loop main reference and auxiliary reference calculation - PID				
PC-01	<b>Open loop main reference selection</b>	0	0~11	/	○
	0: Modbus 1: Keypad 2: AI1 3: CAN 4: EtherCAT 5: PID 6: AI2 7: AI3 8: Simple PLC 9: Multi-steps frequency reference 10: Digital input terminal UP/DN 11: Pulse input				
PC-02	<b>Open loop auxiliary reference selection</b>	0000	0000~0013	/	○
	Ones position: Auxiliary reference channel selection: 0: None 1: AI1 2: AI2 3: AI3 Tens position: Auxiliary reference max. limited selection 0: 0 - 100% corresponds to 0 - maximum speed 1: 0 - 100% corresponds to 0 - 100% of the main reference				
PC-03	<b>Open loop main reference and auxiliary reference calculation formula</b>	0	0~5	/	○
	0: Main + Auxiliary 1: Main - Auxiliary 2: Auxiliary-50% 3: Main + Auxiliary-50% 4: Take max. value 5: Take min. value				
PC-04	<b>PID main reference selection</b>	1	0~3	/	○
	0: Parameter setting (PC-10) 1: AI1 2: AI2 3: AI3				
PC-05	<b>PID auxiliary reference selection</b>	0	0~3	/	○
	0: None 1: AI1 2: AI2 3: AI3				
PC-06	<b>PID main reference and auxiliary reference calculation formula</b>	0	0~5	/	○
	0: Main + Auxiliary 1: Main - Auxiliary 2: Auxiliary-50% 3: Main + Auxiliary-50%				

Parameter	Name	Default	Setting Range	Unit	Attribute
	4: Take max. value                      5: Take min. value				
PC-07	<b>PID main feedback selection</b>	2	0~3	/	○
	0: None                                      1: AI1 2: AI2                                      3: AI3				
PC-08	<b>PID auxiliary feedback selection</b>	0	0~3	/	○
	0: None                                      1: AI1 2: AI2                                      3: AI3				
PC-09	<b>PID main feedback and auxiliary feedback calculation formula</b>	0	0~5	/	○
	0: Main + Auxiliary                      1: Main - Auxiliary 2: Auxiliary-50%                      3: Main + Auxiliary-50% 4: Take max. value                      5: Take min. value				
PC-10	<b>PID reference</b>	20.00	-100.00~100.00	%	○
	100.00% corresponds to 100.00% of the feedback value				
PC-11	<b>Proportional gain P1</b>	10.00	0.00~655.35	/	○
PC-12	<b>Integration time I1</b>	5.00	0.00~655.35	s	○
PC-13	<b>Derivative time D1</b>	0.00	0.00~655.35	s	○
PC-14	<b>Sampling time</b>	1	1~65535	2ms	○
PC-15	<b>PID deviation limit</b>	0.10	0.00~655.35	%	○
PC-16	<b>PID adjustment polarity selection</b>	0	0~1	/	×
	0: Positive polarity 1: Negative polarity				
PC-17	<b>PID output upper limit</b>	100.00	PC-18~100.00	%	○
PC-18	<b>PID output lower limit</b>	0.00	-100.00~PC-17	%	○
PC-19	<b>PID feedback disconnection detection threshold</b>	0.00	0.00~100.00	%	○
	0.00: Disables, if set to 0, PID feedback disconnection detection is disabled.				
PC-20	<b>PID feedback disconnection detection time</b>	0.0	0.0~6553.5	s	○
PC-21	<b>PID adjustment selection</b>	0	000~111	/	×
	Ones position: Integration pause XI terminal control 0: Invalid 1: Valid Tens position: Whether to stop the integration when the output reaches the limit value 0: Stop 1: Do not stop Hundreds position: Whether the output is allowed to reverse 0: Not allowed 1: Allowed				
PC-22	<b>PID reference feedback range</b>	1000	1~65535	/	×

Parameter	Name	Default	Setting Range	Unit	Attribute
PC-23	Differential limitation	5.00	0.00~100.00	%	○
PC-24	PID reference change time	0.00	0.00~655.35	s	○
PC-25	PID feedback filter time	0.00	0.00~655.35	s	○
PC-26	PID output filter time	0.00	0.00~655.35	s	○
PC-27	Proportional gain P2	20.00	0.00~655.35	/	○
PC-28	Integration time I2	1.00	0.00~655.35	s	○
PC-29	Differential time D2	0.00	0.00~655.35	s	○
PC-30	PID parameter switching condition	0	0~2	/	○
	0: Do not switch 1: Switched through the multi-function digital input terminal 2: Automatic switching according to deviation				
PC-31	PID parameter switching deviation 1	20.00	0.00~100.00	%	○
PC-32	PID parameter switching deviation 2	80.00	0.00~100.00	%	○
PC-33	PID initial value	0.00	0.00~100.00	%	○
PC-34	PID initial value hold time	0.00	0.00~655.35	s	○
PC-35	Output deviation FWD max. value	20.00	0.01~100.00	%	○
PC-36	Output deviation REV max. value	20.00	0.01~100.00	%	○
PC-37	PID operation in stop status	0	0~1	/	×
	0: PID stop operation in stop status 1: PID continues to operate in stop status				
PC-38	PID feedback over limit detection threshold	100.00	50.00~100.00	%	○
PC-39	PID feedback over limit detection time	0	0~65535	s	○
	0: PID feedback over limit detection is disabled				
PC-40	PID switching speed	0.00	0.00~100.00	%	○

5.14 Encoder Parameters (A0)

Parameter	Name	Default	Setting Range	Unit	Attribute
A0-00	<b>Encoder type selection</b>	2	0~2	/	×
	0: Resolver 1: SinCos encoder 2: Incremental encoder				
A0-01	<b>Speed feedback filter coefficient</b>	20	1~100	/	×
A0-02	<b>Encoder 1 pulses per revolution</b>	1024	1~65535	ppr	×
	For Incremental encoder and SinCos encoder				
A0-03	<b>Encoder 1 direction</b>	0	0~1	/	×
	This value can be obtained by motor parameters rotate auto-tune.				
A0-04	<b>Encoder 1 electronic gear ratio numerator</b>	1	1~65535	/	×
	For Incremental encoder and SinCos encoder				
A0-05	<b>Encoder 1 electronic gear ratio denominator</b>	1	1~65535	/	×
	For Incremental encoder and SinCos encoder				
A0-06	<b>Resolver pole pairs</b>	1	1~65535	/	×
A0-07	<b>SinCos encoder signal alarm threshold</b>	10000	0~65535	/	×
A0-08	<b>SinCos encoder type</b>	0	0~1	/	×
	0: No CD signal 1: With CD signal				
A0-09	<b>Incremental encoder start mode</b>	0	0~1	/	×
	0: Open loop start 1: Start with initial position identification				
A0-10	<b>SinCos compensation coefficient</b>	4000	4000~12000	/	×
A0-11	<b>Synchronous motor initial angle</b>	0	0~65535	/	×
A0-12	<b>Sine signal zero offset</b>	0	-32768~32767	/	×
A0-13	<b>Cosine signal zero offset</b>	0	-32768~32767	/	×
A0-14	<b>Sine cosine signal amplitude correction</b>	16384	0~65535	/	×
A0-15	<b>Resolver excitation amplitude coefficient</b>	6999	3499~8399	/	×
A0-16	<b>C signal zero offset</b>	0	-32768~32767	/	×
A0-17	<b>D signal zero offset</b>	0	-32768~32767	/	×
A0-18	<b>CD signal amplitude correction</b>	16384	0~65535	/	×
A0-19	<b>CD signal phase</b>	0	0~1	/	×
A0-20	<b>Encoder 2 pulses per revolution</b>	1024	1~65535	ppr	×
A0-21	<b>Encoder 2 direction</b>	0	0~1	/	×
	This value can be obtained by motor parameters rotate auto-tune.				
A0-22	<b>PM motor incremental encoder find Z signal frequency</b>	1.0	0.1~5.0	/	×
	PM motor incremental encoder find Z signal frequency				

A0-23	<b>Encoder input filter setting</b>	0007	0000~0FFF	/	×
	bit0: Filtering of B signal bit1: Filtering of A signal bit2: Filtering of Z signal				
A0-24	<b>SinCos encoder decoding switch enable</b>	0	0~1	/	×
	0: Not switch 1: Switch				

### 5.15 Position Controller (b0)

Parameter	Name	Default	Setting Range	Unit	Attribute
b0-00	<b>Position control encoder selection</b>	0	0~1	/	×
	0: Encoder 1 (Motor shaft) 1: Encoder 2 (Spindle shaft)				
b0-01	<b>Position control reference selection</b>	0	0~1	/	×
	0: Pulse input 1: EtherCAT				
b0-02	<b>Position control gain P 1</b>	5.0	0.0~6553.5	1/s	○
b0-03	<b>Position control max. speed</b>	1500	0~65535	rpm	×
b0-04	<b>Position control acceleration time</b>	0.00	0.00~655.35	s	×
b0-05	<b>Position control deceleration time</b>	0.00	0.00~655.35	s	×
b0-06	<b>Position control gear ratio numerator 1</b>	1	1~65535	/	×
b0-07	<b>Position control gear ratio denominator 1</b>	1	1~65535	/	×
b0-08	<b>Position control feed-forward gain</b>	0.00	0.00~200.00	%	○
b0-09	<b>Position control feed-forward filter Time</b>	0.000	0.000~2.000	s	○
b0-10	<b>Position control reference filter</b>	0	0~65535	/	×
b0-11	<b>Position reach detection width</b>	50	0~65535	pulse	○
	When the deviation between the actual position and the reference position is less than b0-11 (Position Reach Detection Width) and continues to reach the set time of b0-29 (Position reach detection time), the Position reach signal is output.				
b0-12	<b>Position control speed feed-forward gain</b>	0.00	0.00~250.00	%	○
b0-13	<b>Position control speed feed-forward filter time</b>	0.00	0.00~100.00	s	○
b0-14	<b>Change to Position control during running status</b>	0	0~1	/	×
	0: Cannot change to position control during running status 1: Can change to position control during running status				
b0-15	<b>The speed of speed control change to position control</b>	0	0~1	/	○
	0: Switch to position control after decelerating to the threshold (P3-28 setting) 1: Switch to position control at current speed directly				
b0-16	<b>Orientation position references 1</b>	0	0~65535	pulse	○
b0-17	<b>Orientation start speed</b>	300	0~65535	rpm	○

Parameter	Name	Default	Setting Range	Unit	Attribute																																				
	0: Direct orientation, orientation at current speed 1~65535: Orientation after the speed decelerate to Orientation start speed																																								
b0-18	Orientation deceleration time	2.00	0.00~655.35	s	○																																				
b0-19	Orientation gain	5.0	0.0~6553.5	/	○																																				
b0-20	Direct orientation enable speed	500	0~1500	rpm	○																																				
	If a motor running speed is less than the value of b0-20, the Direct Orientation function is enabled and allow obtaining shortest distance traveled.																																								
b0-21	Orientation direction	0	0~2	/	○																																				
	0: Motor running rotation 1: Forward 2: Reverse																																								
b0-22	Orientation position references 2	0	0~65535	pulse	○																																				
b0-23	Orientation position references 3	0	0~65535	pulse	○																																				
b0-24	Orientation position references 4	0	0~65535	pulse	○																																				
b0-25	Orientation position references 5	0	0~65535	pulse	○																																				
b0-26	Orientation position references 6	0	0~65535	pulse	○																																				
b0-27	Orientation position references 7	0	0~65535	pulse	○																																				
b0-28	Orientation position references 8	0	0~65535	pulse	○																																				
<p>The orientation position references are determinate by the parameters b0-16, b0-22 to b0-28 and select by digital inputs, take X4, X5, X6 as example. Set P3-04 = 35, P3-05 = 36, P3-06 = 37</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Orientation position reference</th> <th>X6</th> <th>X5</th> <th>X4</th> </tr> </thead> <tbody> <tr> <td>Orientation position reference 1 (b0-16)</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>Orientation position reference 2 (b0-22)</td> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>Orientation position reference 3 (b0-23)</td> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>Orientation position reference 4 (b0-24)</td> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>Orientation position reference 5 (b0-25)</td> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>Orientation position reference 6 (b0-26)</td> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>Orientation position reference 7 (b0-27)</td> <td>1</td> <td>1</td> <td>0</td> </tr> <tr> <td>Orientation position reference 8 (b0-28)</td> <td>1</td> <td>1</td> <td>1</td> </tr> </tbody> </table> <p><b>Note:</b> The setting range of b0-16, b0-22 to b0-28 are limited by the encoder PPR of position control.</p>						Orientation position reference	X6	X5	X4	Orientation position reference 1 (b0-16)	0	0	0	Orientation position reference 2 (b0-22)	0	0	1	Orientation position reference 3 (b0-23)	0	1	0	Orientation position reference 4 (b0-24)	0	1	1	Orientation position reference 5 (b0-25)	1	0	0	Orientation position reference 6 (b0-26)	1	0	1	Orientation position reference 7 (b0-27)	1	1	0	Orientation position reference 8 (b0-28)	1	1	1
Orientation position reference	X6	X5	X4																																						
Orientation position reference 1 (b0-16)	0	0	0																																						
Orientation position reference 2 (b0-22)	0	0	1																																						
Orientation position reference 3 (b0-23)	0	1	0																																						
Orientation position reference 4 (b0-24)	0	1	1																																						
Orientation position reference 5 (b0-25)	1	0	0																																						
Orientation position reference 6 (b0-26)	1	0	1																																						
Orientation position reference 7 (b0-27)	1	1	0																																						
Orientation position reference 8 (b0-28)	1	1	1																																						
b0-29	Position reach detection time	1	0~65535	ms	×																																				
	When the deviation between the actual position and the reference position is less than b0-11 (Position reach detection width) and continues to reach the set time of b0-29 (Position reach detection time), the position reach signal is output.																																								
b0-30	Transmission ratio filter coefficient	5	1~65535	/	○																																				
	The parameter is valid for use two encoders																																								
b0-31	Position control gear ratio numerator 2	1	1~65535	/	×																																				
b0-32	Position control gear ratio denominator 2	1	1~65535	/	×																																				

Parameter	Name	Default	Setting Range	Unit	Attribute
b0-33	<b>Auto switch position control gain P</b>	0	0~1		
	0: Auto switch position control gain P is not allowed 1: Auto switch position control gain P is allowed				
b0-34	<b>Position control gain P2</b>	5.0	0.0~6553.5		
b0-35	<b>Auto switch position control gain start value</b>	0	1~65535		
b0-36	<b>Auto switch position control gain end value</b>	0	1~65535		
b0-37	<b>Auto switch encoder</b>	0	0~1		
	0: Auto switch encoder is not allowed 1: Auto switch encoder is allowed				

## 5.16 Pulse Input and Output (b1)

Parameter	Name	Default	Setting Range	Unit	Attribute															
b1-00	<b>Pulse input mode</b>	0	0~2	/	×															
	0: Quadrature pulse 1: A pulse + B direction 2: B pulse + A direction																			
b1-01	<b>Pulse input direction invert</b>	0	0~1	/	×															
	0: OFF 1: ON																			
b1-02	<b>Speed control pulse input gear ratio numerator</b>	1	1~65535	/	○															
b1-03	<b>Speed control pulse input gear ratio denominator</b>	1	1~65535	/	○															
b1-04	<b>Speed control pulse input filter</b>	10	0~65535	/	○															
b1-05	<b>Encoder output pulses per revolution</b>	1024	4~65535	ppr	×															
b1-06	<b>Reserved</b>	0	0~65535	/	×															
b1-07	<b>Encoder selection for output</b>	0	0~1	/	×															
	Determine which encoder is used for output 0: Encoder 1 (Motor shaft) 1: Encoder 2 (Spindle shaft)																			
b1-08	<b>Pulse input filter configuration</b>	0	0~002F	/	×															
	<p>The sampling frequency of T11 input and the bandwidth of the digital filter applicable to T11 can be defined. The digital filter is composed of an event counter, and every N event are regarded as a valid edge.</p> <table> <tr> <td>0000: No filter, sampling according to f<sub>DTS</sub> frequency</td> <td>0001: f<sub>SAMPLING</sub>=f<sub>CK_INT</sub>, N=2</td> </tr> <tr> <td>0010: f<sub>SAMPLING</sub>=f<sub>CK_INT</sub>, N=4</td> <td>0011: f<sub>SAMPLING</sub>=f<sub>CK_INT</sub>, N=8</td> </tr> <tr> <td>0100: f<sub>SAMPLING</sub>=f<sub>DTS</sub>/2, N=6</td> <td>0101: f<sub>SAMPLING</sub>=f<sub>DTS</sub>/2, N=8</td> </tr> <tr> <td>0110: f<sub>SAMPLING</sub>=f<sub>DTS</sub>/4, N=6</td> <td>0111: f<sub>SAMPLING</sub>=f<sub>DTS</sub>/4, N=8</td> </tr> <tr> <td>1000: f<sub>SAMPLING</sub>=f<sub>DTS</sub>/8, N=6</td> <td>1001: f<sub>SAMPLING</sub>=f<sub>DTS</sub>/8, N=8</td> </tr> <tr> <td>1010: f<sub>SAMPLING</sub>=f<sub>DTS</sub>/16, N=5</td> <td>1011: f<sub>SAMPLING</sub>=f<sub>DTS</sub>/16, N=6</td> </tr> <tr> <td>1100: f<sub>SAMPLING</sub>=f<sub>DTS</sub>/16, N=8</td> <td>1101: f<sub>SAMPLING</sub>=f<sub>DTS</sub>/32, N=5</td> </tr> <tr> <td>1110: f<sub>SAMPLING</sub>=f<sub>DTS</sub>/32, N=6</td> <td>1111: f<sub>SAMPLING</sub>=f<sub>DTS</sub>/32, N=8</td> </tr> </table>					0000: No filter, sampling according to f <sub>DTS</sub> frequency	0001: f <sub>SAMPLING</sub> =f <sub>CK_INT</sub> , N=2	0010: f <sub>SAMPLING</sub> =f <sub>CK_INT</sub> , N=4	0011: f <sub>SAMPLING</sub> =f <sub>CK_INT</sub> , N=8	0100: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /2, N=6	0101: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /2, N=8	0110: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /4, N=6	0111: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /4, N=8	1000: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /8, N=6	1001: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /8, N=8	1010: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /16, N=5	1011: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /16, N=6	1100: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /16, N=8	1101: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /32, N=5	1110: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /32, N=6
0000: No filter, sampling according to f <sub>DTS</sub> frequency	0001: f <sub>SAMPLING</sub> =f <sub>CK_INT</sub> , N=2																			
0010: f <sub>SAMPLING</sub> =f <sub>CK_INT</sub> , N=4	0011: f <sub>SAMPLING</sub> =f <sub>CK_INT</sub> , N=8																			
0100: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /2, N=6	0101: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /2, N=8																			
0110: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /4, N=6	0111: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /4, N=8																			
1000: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /8, N=6	1001: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /8, N=8																			
1010: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /16, N=5	1011: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /16, N=6																			
1100: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /16, N=8	1101: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /32, N=5																			
1110: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /32, N=6	1111: f <sub>SAMPLING</sub> =f <sub>DTS</sub> /32, N=8																			

## 5.17 Modbus (C0)

Parameter	Name	Default	Setting Range	Unit	Attribute
C0-00	Modbus address	1	1~255	/	○
C0-01	Modbus baud rate	3	0~5	/	○
	0: 4800bps 1: 9600 bps 2: 19200 bps 3: 38400 bps 4: 57600 bps 5: 115200 bps				
C0-02	Modbus-RTU data format	0000	0000~0121	/	○
	One position: Data bits 0: 8 data bits 1: 7ata bits Tens position: Parity 0: No parity 1: Odd parity 2: Even parity Hundreds position: stop bit (s) 0: 1stops bit 1: 2 stops bits				
C0-03	Communication response delay	0	0~65535	/	○
C0-04	Communication timeout	0	0~65535	/	○
C0-05	Modbus communication save to EEPROM	0	0~1	/	○
	0: Not Save to EEPROM 1: Save to EEPROM				
C0-06	Reserved	0	0~65535	/	○
C0-07	User address 0	0000	0000~FFFF	/	○
C0-08	Mapping address 0	0000	0000~FFFF	/	○
C0-09	User address 1	0000	0000~FFFF	/	○
C0-10	Mapping address 1	0000	0000~FFFF	/	○
C0-11	User address 2	0000	0000~FFFF	/	○
C0-12	Mapping address 2	0000	0000~FFFF	/	○
C0-13	User address 3	0000	0000~FFFF	/	○
C0-14	Mapping address 3	0000	0000~FFFF	/	○
C0-15	User address 4	0000	0000~FFFF	/	○
C0-16	Mapping address 4	0000	0000~FFFF	/	○
C0-17	User address 5	0000	0000~FFFF	/	○
C0-18	Mapping address 5	0000	0000~FFFF	/	○
C0-19	User address 6	0000	0000~FFFF	/	○
C0-20	Mapping address 6	0000	0000~FFFF	/	○



Parameter	Name	Default	Setting Range	Unit	Attribute
C0-21	User address 7	0000	0000~FFFF	/	○
C0-22	Mapping address 7	0000	0000~FFFF	/	○
C0-23	User address 8	0000	0000~FFFF	/	○
C0-24	Mapping address 8	0000	0000~FFFF	/	○
C0-25	User address 9	0000	0000~FFFF	/	○
C0-26	Mapping address 9	0000	0000~FFFF	/	○
C0-27	User address 10	0000	0000~FFFF	/	○
C0-28	Mapping address 10	0000	0000~FFFF	/	○
C0-29	User address 11	0000	0000~FFFF	/	○
C0-30	Mapping address 11	0000	0000~FFFF	/	○
C0-31	User address 12	0000	0000~FFFF	/	○
C0-32	Mapping address 12	0000	0000~FFFF	/	○
C0-33	User address 13	0000	0000~FFFF	/	○
C0-34	Mapping address 13	0000	0000~FFFF	/	○
C0-35	User address 14	0000	0000~FFFF	/	○
C0-36	Mapping address 14	0000	0000~FFFF	/	○
C0-37	Communication frequency reference ratio numerator	1	1~65535	/	○
C0-38	Communication frequency reference ratio denominator	1	1~65535	/	○
C0-39	Master slave mode selection	0000	0x0000~0x1005	/	○
C0-40	Slave follow proportional gain	0.100	0.000~60.000	/	○
C0-41	Slave follow integral time	0.010	0.000~60.000	s	○
C0-42	Slave follow adjustable upper limit	100	0~400	rpm	○
C0-43	Slave follow torque offset	0.00	-50.00~50.00	%	○
C0-44	Send / Receive frequency	0	-32767~32767	Rpm	*
C0-45	Send / Receive torque	0.00	-300.00~300.00	%	*
C0-46	Send / Receive flag	0x0000	0x0000~0xFFFF	/	*

## 5.18 CAN (C1)

Parameter	Name	Default	Setting Range	Unit	Attribute
C1-00	CAN communication address	2	0~127	/	○
C1-01	CAN baud rate	0	0~4	/	○
	0: CAN is disabled 1: 125kbps 2: 250kbps 3: 500kbps 4: 1000kbps				
C1-02	CAN communication fault detection time	2.0	0.0~6553.5	s	×
C1-03	CAN command smoothing cycle	5000	1~65535	us	×
C1-04	Reserved	0	0~65535	/	×
C1-05	Reserved	0	0~65535	/	×
C1-06	Slave number	0	0~30	/	×
	When C1-00=1 and C1-08 = 2, the parameter is valid				
C1-07	PROFIBUS DP and PROFINET selection	0	0~1	/	×
	0: Disable 1: PROFIBUS DP is enabled 2: PROFINET is enabled 3: PROFINET is enabled and convert to CAN.				
C1-08	CANopen selection	0	0~1	/	×
	0: CANopen 1: CAN bus 2: CAN bus, and receive the command from PROFINET convert to CAN <b>Note:</b> A Controller Area Network (CAN) refers to a network of independent controllers. It is a serial communications protocol that efficiently supports distributed real-time control with a very high level of security. CANopen is an application layer protocol based on CAN-BUS. CANopen defines a set of rules on the basis of CAN-Bus, the information exchanged is transmitted on the CAN bus. The CAN-Bus defines the physical layer and link layer, while CANopen defines the application layer on the basis of can-bus, and specifies the conventions used by users, software and network terminals for information exchange.				
C1-09	CAN message frame format	0	0~1	/	×
	0: Standard frame 1: Extended frame				
C1-10	Send message ID1 low order byte	100	0000~FFFF	/	×
C1-11	Send message ID1 high order byte	0	0000~1FFF	/	×
C1-12	Send message ID2 low order byte	200	0000~FFFF	/	×

C1-13	Send message ID2 high order byte	0	0000~1FFF	/	x
C1-14	Send message ID3 low order byte	300	0000~FFFF	/	x
C1-15	Send message ID3 high order byte	0	0000~1FFF	/	x
C1-16	Receive message ID1 low order byte	180	0000~FFFF	/	x
C1-17	Receive message ID1 high order byte	0	0000~1FFF	/	x
C1-18	Receive message ID2 low order byte	280	0000~FFFF	/	x
C1-19	Receive message ID2 high order byte	0	0000~1FFF	/	x
C1-20	Receive message enable	1	0~11	/	x
Ones position: 0: Disables receive message 1 1: Enables receive message 1 Tens position: 0: Disables receive message 2 1: Enables receive message 2					
C1-21	Send message 1 period	50	0~65535	/	x
The parameter is used to set the sending period of message 1, zero disables message 1 sending function.					
C1-22	Send message 2 period	100	0~65535	/	x
The parameter is used to set the sending period of message 2, zero disables message 2 sending function.					
C1-23	Send message 3 period	0	0~65535	/	x
The parameter is used to set the sending period of message 3, zero disables message 3 sending function.					
C1-24	Send message 1 parameter 3 address	6008	0000~FFFF	/	x
C1-25	Send message 1 parameter 4 address	6005	0000~FFFF	/	x
C1-26	Send message 2 parameter 1 address	6007	0000~FFFF	/	x
C1-27	Send message 2 parameter 2 address	600A	0000~FFFF	/	x
C1-28	Send message 2 parameter 3 address	6009	0000~FFFF	/	x
C1-29	Send message 2 parameter 4 address	6016	0000~FFFF	/	x
C1-30	Send message 3 parameter 1 address	0	0000~FFFF	/	x
C1-31	Send message 3 parameter 2 address	0	0000~FFFF	/	x
C1-32	Send message 3 parameter 3 address	0	0000~FFFF	/	x
C1-33	Send message 3 parameter 4 address	0	0000~FFFF	/	x
C1-34	Receive message 1 parameter 3 address	0A02	0000~FFFF	/	x
C1-35	Receive message 1 parameter 4 address	0	0000~FFFF	/	x
C1-36	Receive message 2 parameter 1 address	0	0000~FFFF	/	x
C1-37	Receive message 2 parameter 2 address	0	0000~FFFF	/	x
C1-38	Receive message 2 parameter 3 address	0	0000~FFFF	/	x
C1-39	Receive message 2 parameter 4 address	0	0000~FFFF	/	x

## 5.19 EtherCAT (C2)

Parameter	Name	Default	Setting Range	Unit	Attribute
C2-00	<b>EtherCAT speed reference unit</b>	1	0~1	/	○
	0: rpm 1: pulse/s				
C2-01	<b>EtherCAT position reference smoothing cycle</b>	1000	1~65535	us	×
C2-02	<b>The EtherCAT clock is synchronized with the drive</b>	0	0~1	/	○
	0: Synchronization not allowed 1: Synchronization allowed				
C2-03	<b>EtherCAT pulse input gear ratio numerator (speed control)</b>	1	1~65535	/	×
C2-04	<b>EtherCAT pulse input gear ratio denominator (speed control)</b>	1	1~65535	/	×
C2-05	<b>EtherCAT communication enable</b>	0	0~1	/	○
	0: EtherCAT Communication is Disabled 1: EtherCAT Communication is Enabled				
C2-06	<b>EtherCAT speed feedback selection</b>	0	0~3	/	○
	0: Position control encoder. The EtherCAT speed feedback is the speed of the position control encoder, and the selection of the position control encoder is determined by b0-00 and A0-00				
	1: Current control mode encoder. When the system control mode is speed control or torque control, the feedback is the encoder of speed control determined by A0-00. When the system control mode is position control, the feedback is a position control encoder determined by b0-00 and A0-00.				
	2: Encoder 1 3: Encoder 2				
C2-07	<b>Reserved</b>	0	0~65535	/	○
C2-08	<b>Transfer parameter address 1</b>	0	0~99	/	×
	Used to select the content of object 0x210B				
C2-09	<b>Transfer parameter address 2</b>	0	0~99	/	×
	Used to select the content of object 0x210C				
C2-10	<b>Transfer parameter address 3</b>	0	0~99	/	×
	Used to select the content of object 0x210D				
C2-11	<b>Transfer parameter address 4</b>	0	0~99	/	×
	Used to select the content of object 0x210E				
C2-12	<b>Transfer parameter address 5</b>	0	0~99	/	×
	Used to select the content of object 0x210F				
C2-13	<b>EtherCAT position feedback compensation mode</b>	0	0~2	/	×
	0: Compensate EtherCAT position feedback by counter				
	1: Compensate EtherCAT position feedback by time duty cycle 2: No compensation				

## 5.20 Keypad Parameters (d0)

Parameter	Name	Default	Setting Range	Unit	Attribute
d0-00	User password	0	0~65535	/	○
d0-01	Random code	0	0~10000	/	×
d0-02	Parameter restore	0	0~4	/	×
0: Disabled 1: Saving parameters (RAM to ROM) 2: All parameter values are restored to default values. 3: All parameter values are restored to default values except Motor Parameters (Group P6) Monitor Parameters (Group F) 4: All parameter values are restored to default values except Monitor Parameters (Group F)					
d0-03	Parameters upload and download enable	0	0~11	/	×
Ones position: Upload parameters to keypad 0: Enabled 1: Disabled Tens position: Download parameters to drive 0: Enabled 1: Disabled					
d0-04	Parameters upload and download	0	0~20	/	×
00: No action 01: The parameter values are uploaded from drive to keypad. After the upload is completed, this parameter value is restored to 0 automatically. 11: The parameter values are downloaded from keypad to drive. After the download is completed, this parameter value is restored to 0 automatically. <b>Note:</b> Valid only when using LED keypad. For LCD refer to the "Chapter 4 Keypad Operation" for details.					
d0-05	M Key function selection	0000	0000~FFFF	/	×
d0-06	Reserved	0	0~65535	/	×
d0-07	Keypad lock Key function selection	0	0~2	/	○
0: Unlock 1: Lock all keys 2: Lock all keys except RUN key and STOP key					
d0-08	Password protection range	0	0~2	/	×
0: All editable parameters are hidden 1: Reserved 2: Reserved					
d0-09	Reserved	0000	0000~FFFF	/	×
d0-10	Reserved	0000	0000~FFFF	/	×
d0-11	LCD backlight setting	0	0~2	/	×
0: Turn off the backlight after 30s of inactivity 1: Always turn on the backlight 2: Always turn off the backlight					
d0-12	LCD contrast setting	24	14~34	/	×

Parameter	Name	Default	Setting Range	Unit	Attribute	
d0-13	<b>Keypad default display setting 0</b>		0806	0000~FFFF	/	○
	LED	Tens position and Ones position	The 1st display parameter			
		Thousands position and Hundreds position	The 2nd display parameter			
	LCD	Tens position and Ones position	The 1st page the 1st display parameter			
Thousands position and Hundreds position		The 1st page the 2nd display parameter				
d0-14	<b>Keypad default display setting 1</b>		000A	0000~FFFF	/	○
	LED	Tens position and Ones position	The 3rd display parameter			
		Thousands position and Hundreds position	The 4th display parameter			
	LCD	Tens position and Ones position	The 1st page the 3rd display parameter			
Thousands position and Hundreds position		The 2nd page the 1st display parameter				
d0-15	<b>Keypad default display setting 2</b>		0705	0000~FFFF	/	○
	LED	Tens position and Ones position	The 5th display parameter			
		Thousands position and Hundreds position	Reserved			
	LCD	Tens position and Ones position	The 2nd page the 2nd display parameter			
Thousands position and Hundreds position		The 2nd page the 3rd display parameter				
d0-16	<b>Keypad default display setting 3</b>		1514	0000~FFFF	/	○
	LCD	Tens position and Ones position	The 3rd page the 1st display parameter			
Thousands position and Hundreds position		The 3rd page the 2nd display parameter				
d0-17	<b>Keypad default display setting 4</b>		1716	0000~FFFF	/	○
	LCD	Tens position and Ones position	The 3rd page the 3rd display parameter			
Thousands position and Hundreds position		The 4th page the 1st display parameter				
d0-18	<b>Keypad default display setting 5</b>		1918	0000~FFFF	/	○
	LCD	Tens position and Ones position	The 4th page the 2nd display parameter			
Thousands position and Hundreds position		The 4th page the 3rd display parameter				
d0-19	<b>Keypad default display setting 6</b>		1211	0000~FFFF	/	○
	LCD	Tens position and Ones position	The 5th page the 1st display parameter			
Thousands position and Hundreds position		The 5th page the 2nd display parameter				
d0-20	<b>Keypad default display setting 7</b>		0013	0000~FFFF	/	○
	LCD	Tens position and Ones position	The 5th page the 3rd display parameter			
Thousands position and Hundreds position		Reserved				
<p>Each status monitoring parameter in Group F0 has a unique keypad display address. We set these addresses to select which parameters are displayed in the monitoring mode.</p> <p>The keypad display address is two digits, every "Keypad Default Display Setting" is 4 digitals, so every parameter can set 2 monitoring values.</p> <p>The parameters of d0-13 to d0-15 are used to select which parameters are displayed on the LED keypad.</p> <p>The parameters of d0-13 to d0-20 are used to select which parameters are displayed on the LCD keypad.</p>						

Parameter	Name	Default	Setting Range	Unit	Attribute
d0-21	Calibration coefficient	100.0	50.0~150.0	%	○
d0-22	User-define display parameter selection	0	0~75	/	○
d0-23	User-define display parameter percentage	100.0	0.0~200.0	%	○
d0-24	Power correction factor	100	30~200	%	○

## 5.21 Protection Configuration (E0)

Parameter	Name	Default	Setting Range	Unit	Attribute
E0-00	Fault configuration 1	0000	0000~FFFF	/	×
E0-01	Fault configuration 2	0000	0000~FFFF	/	×
E0-02	Fault display configuration 1	0000	0000~FFFF	/	×
E0-03	Fault display configuration 2	0000	0000~FFFF	/	×
E0-04	Fault lock configuration 1	FDFE	0000~FFFF	/	×
E0.05	Fault lock configuration 2	FFFF	0000~FFFF	/	×
	bit0 to bit 16 0: Fault Lock is disabled 1: Fault Lock is enabled				
E0-06	Fault free stop configuration 1	0DE0	0000~FFFF	/	×
E0-07	Fault free stop configuration 2	0DE0	0000~FFFF	/	×
E0-08	No. of automatic reset attempts	0	0~65535	/	×
	Defines the maximum number of automatic resets				
E0-09	Automatic reset delay time	10.0	5.0~6553.5	s	×
	Defines the time that the drive will wait after a fault (or a previous reset attempt) before attempting an automatic reset.				
E0-10	Motor overload protection mode	0	0~65535	/	×
E0-11	Motor overload protection coefficient	1.0	0.5~3.0	/	×
E0-12	Motor temperature sensor	0	0~6	/	×
	0: No motor temperature sensor 1: PT100 2: KTY84-130 3: PTC 4: AI2 use as KTY84 signal input (reserved) 5: AI3 use as PT100 signal input 6: AI3 use as KTY84-130 input <b>Note:</b> VTS30 not supported below 4KW, others are optional.				
E0-13	Over speed fault detect value	0.0	0.0~200.0	%	×
E0-14	Over speed fault detect delay time	0.100	0.000~30.000	s	○
E0-15	Speed error fault detect value	0.00	0.00~650.00	Hz	×
E0-16	Speed error fault detect delay time	0.100	0.000~30.000	s	○
E0-17	Zero current fault detect value	0.0	0.0~200.0	%	×
E0-18	Zero current fault detect delay time	1.000	0.000~30.000	s	○

Parameter	Name	Default	Setting Range	Unit	Attribute
E0-19	Motor over temperature value	140	0~140	°C	×
E0-20	Motor temperature correction value	0	-200~200	°C	×
E0-21	Fan control selection	0	0~2	/	○
	0: Turn on the fan during operation 1: Always turn on the fan 2: Always turn off the fan <b>Note:</b> No matter which mode is selected; the fan is controlled by the temperature of the module. The module temperature is higher than 40°C to turn on and below 35°C to turn off.				
E0-22	Automatic reset configuration 1	0000	0000~FFFF	/	○
E0-23	Automatic reset configuration 2	0000	0000~FFFF	/	○
E0-24	Automatic reset enables	0	0~1	/	×
	0: Disables automatic reset 1: Enables automatic reset				
E0-25	Continuous fault detection time	0	0~65535	/	○
E0-26	Hardware version	1	0~1	/	○
	Only factory technicians can modify				
E0-27	Stall protection enable	0	0~1	/	×
	0: Stall protection is disabled 1: Stall protection is enabled				
E0-28	Stall frequency limit	0.5	0.5~50.0	Hz	×
E0-29	Stall time	1	0~3000	s	×
E0-30	Fault retention after power-off	0	0~1	/	○
E0-31	Motor pre-overload selection	0x0000	0x0000~0x0111	/	○
E0-32	Motor pre-overload detection value	120.00	0.05~600.00	%	○
E0-33	Motor pre-overload detection time	10	1~65530	S	○



## 5.22 Monitor Parameters (F0)

Parameter	Name	Default	Setting Range	Unit	Attribute
F0-00	<b>Reference frequency</b>	0.00	-327.67~327.67	Hz	*
	Keypad display address: 00 Modbus address: 0x6000				
F0-01	<b>Reference speed</b>	0	-32767~32767	rpm	*
	Keypad display address: 01 Modbus address: 0x6001				
F0-02	<b>Reference torque</b>	0.0	-6553.5~6553.5	%	*
	Keypad display address: 02 Modbus address: 0x6002				
F0-03	<b>Reference position high order byte</b>	0	0~65535	pulse	*
	Keypad display address: 03 Modbus address: 0x6003				
F0-04	<b>Reference position low order byte</b>	0	0~65535	pulse	*
	Keypad display address: 04 Modbus address: 0x6004				
F0-05	<b>DC bus voltage</b>	0	0~65535	V	*
	Keypad display address: 05 Modbus address: 0x6005				
F0-06	<b>Running frequency</b>	0.00	-327.67~327.67	Hz	*
	Keypad display address: 06 Modbus address: 0x6006				
F0-07	<b>Running speed</b>	0	-32767~32767	rpm	*
	Keypad display address: 07 Modbus address: 0x6007				
F0-08	<b>Output current</b>	0.0	-3276.7~3276.7	A	*
	Keypad display address: 08 Modbus address: 0x6008				
F0-09	<b>Output torque</b>	0.0	0.0~6553.5	%	*
	Keypad display address: 09 Modbus address: 0x6009				
F0-10	<b>Output voltage</b>	0	0~65535	V	*
	Keypad display address: 0A Modbus address: 0x600A				
F0-11	<b>Output power</b>	0.0	-3276.8~3276.7	kW	*
	Keypad display address: 0B Modbus address: 0x600B				

Parameter	Name	Default	Setting Range	Unit	Attribute
F0-12	<b>Drive status</b>	0000	0000~FFFF	/	*
	Keypad display address: 0C Modbus address: 0x600C				
F0-13	<b>Drive fault display 1</b>	0000	0000~FFFF	/	*
	Keypad display address: 0D Modbus address: 0x600D				
F0-14	<b>Drive fault display 2</b>	0000	0000~FFFF	/	*
	Keypad display address: 0E Modbus address: 0x600E				
F0-15	<b>Drive fault Code</b>	0	0~65535	/	*
	Keypad display address: 0F Modbus address: 0x600F				
F0-16	<b>Current position high order byte</b>	0	0~65535	pulse	*
	Keypad display address: 10 Modbus address: 0x6010				
F0-17	<b>Current position low order byte</b>	0	0~65535	pulse	*
	Keypad display address: 11 Modbus address: 0x6011				
F0-18	<b>Position following error</b>	0	-32768~32767	pulse	*
	Keypad display address: 12 Modbus address: 0x6012				
F0-19	<b>Mechanical position 1</b>	0	0~65535	pulse	*
	Keypad display address: 13 Modbus address: 0x6013				
F0-20	<b>Digital inputs status</b>	0000	0000~FFFF	/	*
	Keypad display address: 14 Modbus address: 0x6014				
F0-21	<b>Digital output status</b>	0000	0000~FFFF	/	*
	Keypad display address: 15 Modbus address: 0x6015				
F0-22	<b>IGBT temperature</b>	0	-1000~10000	℃	*
	Keypad display address: 16 Modbus address: 0x6016				
F0-23	<b>AI1 input value</b>	0.000	-32.767~32.767	V	*
	Keypad display address: 17 Modbus address: 0x6017				

Parameter	Name	Default	Setting Range	Unit	Attribute
F0-24	<b>AI2 input value</b>	0.000	-32.767~32.767	V	*
	Keypad display address: 18 Modbus address: 0x6018				
F0-25	<b>AI3 input value</b>	0.000	-32.767~32.767	V	*
	Keypad display address: 19 Modbus address: 0x6019				
F0-26	<b>PID reference</b>	0.00	0.00~655.35	%	*
	Keypad display address: 1A Modbus address: 0x601A				
F0-27	<b>PID feedback</b>	0.00	0.00~655.35	%	*
	Keypad display address: 1B Modbus address: 0x601B				
F0-28	<b>Simple PLC_T1</b>	0	0~65535	s	*
	Keypad display address: 1C Modbus address: 0x601C				
F0-29	<b>Simple PLC_T2</b>	0.0	0.0~6553.5	s	*
	Keypad display address: 1D Modbus address: 0x601D				
F0-30	<b>Simple PLC cycle times</b>	0	0~65535	/	*
	Keypad display address: 1E Modbus address: 0x601E				
F0-31	<b>Simple PLC current steps</b>	0	0~65535	/	*
	Keypad display address: 1F Modbus address: 0x601F				
F0-32	<b>Keypad UP/DN adjustment value</b>	0.00	-327.67~32767	Hz	*
		0	-32767~32767	rpm	
	Keypad display address: 20 Modbus address: 0x6020				
F0-33	<b>Terminal UP/DN adjustment value</b>	0.00	-327.67~32767	Hz	*
		0	-32767~32767	rpm	
	Keypad display address: 21 Modbus address: 0x6021				
F0-34	<b>Accumulative power-on time (hours)</b>	0	0~65535	h	*
	Keypad display address: 22 Modbus address: 0x6022				
F0-35	<b>Accumulative power -on time (minutes)</b>	0	0~65535	min	*
	Keypad display address: 23 Modbus address: 0x6023				

Parameter	Name	Default	Setting Range	Unit	Attribute
F0-36	<b>Accumulative running time (minutes)</b>	0	0~65535	h	*
	Keypad display address: 24 Modbus address: 0x6024				
F0-37	<b>Accumulative running time (minutes)</b>	0	0~65535	min	*
	Keypad display address: 25 Modbus address: 0x6025				
F0-38	<b>CPU utilization</b>	0.0	0.0~6553.5	%	*
	Keypad display address: 26 Modbus address: 0x6026				
F0-39	<b>Pulse input low order byte</b>	0	-32767~32767	pulse	*
	Keypad display address: 27 Modbus address: 0x6027				
F0-40	<b>Pulse input high order byte</b>	0	-32767~32767	pulse	*
	Keypad display address: 28 Modbus address: 0x6028				
F0-41	<b>Motor temperature</b>	0	-40~140	℃	*
	Keypad display address: 29 Modbus address: 0x6029				
F0-42	<b>EtherCAT control word</b>	0	0000~FFFF	/	*
	Keypad display address: 2A Modbus address: 0x602A				
F0-43	<b>EtherCAT status word</b>	0	0000~FFFF	/	*
	Keypad display address: 2B Modbus address: 0x602B				
F0-44	<b>EtherCAT Operation mode</b>	0	0000~FFFF	/	*
	Keypad display address: 2C Modbus address: 0x602C				
F0-45	<b>EtherCAT synchronization cycle number</b>	0	0~65535	/	*
	Keypad display address: 2D Modbus address: 0x602D				
F0-46	<b>Positing Z position</b>	0	0~65535	/	*
	Keypad display address: 2E Modbus address: 0x602E				
F0-47	<b>Reserved</b>	0	0~65535	/	*
	Keypad display address: 2F Modbus address: 0x602F				
F0-48	<b>AI1 sampling value</b>	0.000	-32.767~32.767	V	*

Parameter	Name	Default	Setting Range	Unit	Attribute
	Keypad display address: 30 Modbus address: 0x6030				
F0-49	<b>AI2 sampling value</b>	0.000	-32.767~32.767	V	*
	Keypad display address: 31 Modbus address: 0x6031				
F0-50	<b>AI3 sampling value</b>	0.000	-32.767~32.767	V	*
	Keypad display address: 32 Modbus address: 0x6032				
F0-51	<b>User define display value</b>	0	0~65535	/	*
	Keypad display address: 33 Modbus address: 0x6033				
F0-52	<b>Accumulative power consumption low order byte</b>	0.0	0.0~6553.5	kW.h	*
	Keypad display address: 34 Modbus address: 0x6034				
F0-53	<b>Accumulative power consumption high order byte</b>	0	0~65535	kW.h	*
	Keypad display address: 35 Modbus address: 0x6035				
F0-54	<b>Accumulative power generation low order byte</b>	0	0~6553.5	kW.h	*
	Keypad display address: 36 Modbus address: 0x6036				
F0-55	<b>Accumulative power generation high order byte</b>	0	0~65535	kW.h	*
	Keypad display address: 37 Modbus address: 0x6037				
F0-56	<b>Home position 1</b>	0	0~65535	/	*
	Keypad display address: 38 Modbus address: 0x6038				
F0-57	<b>Home position 2</b>	0	0~65535	/	*
	Keypad display address: 39 Modbus address: 0x6039				
F0-58	<b>Mechanical position 2</b>	0	0~65535	/	*
	Keypad display address: 3A Modbus address: 0x603A				
F0-59	<b>Encoder 2 corresponds to motor rotation speed</b>	0	-32767~32767	/	*
	Keypad display address: 3B Modbus address: 0x603B				
F0-60	<b>System status 1</b>	0	0~65535	/	*
	Keypad display address: 3C Modbus address: 0x603C				

Parameter	Name	Default	Setting Range	Unit	Attribute
F0-61	<b>Communication reference</b>	0	-32767~32767	/	*
	Keypad display address: 3D Modbus address: 0x603D				
F0-62	<b>Encoder 2 corresponds to motor rotation speed</b>	0	-32767~32767	/	*
	Keypad display address: 3E Modbus address: 0x603E				
F0-63	<b>Application fault</b>	0	0~65535	/	*
	Keypad display address: 3F Modbus address: 0x603F				
F0-64	<b>Running frequency</b>	0.00	0~655.35	Hz	*
	Keypad display address: 40 Modbus address: 0x6040				
F0-65	<b>Running speed</b>	0	0~65535	rpm	*
	Keypad display address: 41 Modbus address: 0x6041				
F0-66	<b>Output current</b>	0.0	-3276.8~3276.7	A	*
	Keypad display address: 42 Modbus address: 0x6042				
F0-67	<b>Output voltage</b>	0	0~65535	V	*
	Keypad display address: 43 Modbus address: 0x6043				
F0-68	<b>Output power</b>	0.0	0.0~6553.5	kW	*
	Keypad display address: 44 Modbus address: 0x6044				
F0-69	<b>ECT SPI communication time</b>	0	0~65535	/	*
	Keypad display address: 45 Modbus address: 0x6045				
F0-70	<b>ECT position reference high order byte</b>	0	0~FFFF	/	*
	Keypad display address: 46 Modbus address: 0x6046				
F0-71	<b>ECT position reference low order byte</b>	0	0~FFFF	/	*
	Keypad display address: 47 Modbus address: 0x6047				
F0-72	<b>ECT Switch position high order byte</b>	0	0~FFFF	/	*
	Keypad display address: 48 Modbus address: 0x6048				
F0-73	<b>ECT Switch position low order byte</b>	0	0~FFFF	/	*
	Keypad display address: 49				

Parameter	Name	Default	Setting Range	Unit	Attribute
	Modbus address: 0x6049				
F0-74	<b>Encoder 1 Z signal position</b>	0	0~65535	/	*
	Keypad display address: 4A Modbus address: 0x604A				
F0-75	<b>SinCos encoder amplitude</b>	0	0~65535	/	*
	Keypad display address: 4B Modbus address: 0x604B				
F0-76	<b>Transmission ratio coefficient</b>	0.000	0.000~65.535	/	*
	Keypad display address: 4C Modbus address: 0x604C				
F0-77	<b>Encoder 2 Z signal position</b>	0	0~65535	/	*
	Keypad display address: 4D Modbus address: 0x604D				
F0-78	<b>CAN control word</b>	0	0~FFFF	/	*
	Keypad display address: 4E Modbus address: 0x604E				
F0-79	<b>CAN status word</b>	0	0~FFFF	/	*
	Keypad display address: 4F Modbus address: 0x604F				
F0-80	<b>CAN mode status</b>	0	0~FFFF	/	*
	Keypad display address: 50 Modbus address: 0x6050				
F0-81	<b>CAN error counter</b>	0	0~FFFF	/	*
	Keypad display address: 51 Modbus address: 0x6051				
F0-82	<b>CAN error status</b>	0	0~FFFF	/	*
	Keypad display address: 52 Modbus address: 0x6052				
F0-83	<b>PROFIBUS DP communication status</b>	0	0~FFFF	/	*
	Keypad display address: 53 Modbus address: 0x6053				
F0-84	<b>PROFIBUS DP communication counter</b>	0	0~65535	/	*
	Keypad display address: 54 Modbus address: 0x6054				
F0-85	<b>Output current</b>	0	0~6553.5	/	*
	Keypad display address: 55 Modbus address: 0x6055				
F0-86	<b>Fault code before power failure</b>	0	0~65535	/	*

Parameter	Name	Default	Setting Range	Unit	Attribute
	Keypad display address: 56 Modbus address: 0x6056				
<b>F0-87</b>	<b>Total number of parameters</b>	0	0~65535	/	*
	Keypad display address: 57 Modbus address: 0x6057				
<b>F0-88</b>	<b>Speed controller output torque</b>	0.0	0~6553.5	%	*
	Keypad display address: 58 Modbus address: 0x6058				
<b>F0-89</b>	<b>Electrical angle</b>	0	0~65535	/	*
	Keypad display address: 59 Modbus address: 0x6059				
<b>F0-90</b>	<b>ECT communication abnormal code</b>	0	0~65535	/	*
	Keypad display address: 5A Modbus address: 0x605A				

### 5.23 Software Version (F1, F2)

Parameter	Name	Default	Setting Range	Unit	Attribute
<b>F1-00</b>	<b>Software version 1</b>	0000	0000~FFFF	/	*
<b>F1-01</b>	<b>Software version 2</b>	0000	0000~FFFF	/	*
<b>F1-02</b>	<b>Software version 3</b>	0000	0000~FFFF	/	*
<b>F1-03</b>	<b>Software version 4</b>	0000	0000~65535	/	*
<b>F1-04</b>	<b>Keypad ID</b>	0000	0000~65535	/	*
<b>F1-05</b>	<b>Reserved</b>	0000	0000~65535	/	*
<b>F1-06</b>	<b>Y</b>	0000	0000~65535	/	*
<b>F1-07</b>	<b>D</b>	0000	0000~65535	/	*
<b>F1-08</b>	<b>T</b>	0000	0000~65535	/	*
<b>F1-09</b>	<b>Drive power</b>	0.0	0.0~6553.5	kW	*
<b>F1-10</b>	<b>Prompt code</b>	0000	0000~65535	/	*
<b>F2-00</b>	<b>Barcode information 0</b>	0000	0000~FFFF	/	*
<b>F2-01</b>	<b>Barcode information 1</b>	0000	0000~FFFF	/	*
<b>F2-02</b>	<b>Barcode information 2</b>	0000	0000~FFFF	/	*
<b>F2-03</b>	<b>Barcode information 3</b>	0000	0000~FFFF	/	*



## 5.24 Fault History (F3)

Parameter	Name	Default	Setting Range	Unit	Attribute
F3-00	Fault 0 code	0	0~65000	/	*
F3-01	Fault 0 running frequency	0.00	0.00~650.00	Hz	*
F3-02	Fault 0 reference frequency	0.00	0.00~650.00	Hz	*
F3-03	Fault 0 DC BUS voltage	0	0~60000	V	*
F3-04	Fault 0 output current	0.0	0.0~6553.5	A	*
F3-05	Fault 0 digital inputs status	0000	0000~FFFF	/	*
F3-06	Fault 0 digital output status	0000	0000~FFFF	/	*
F3-07	Fault 0 heatsink temperature	0	0~200	℃	*
F3-08	Fault 0 accumulative power-ON Time	0	0~65000	h	*
F3-09	Fault 0 accumulative running Time	0	0~65000	h	*
F3-10	Fault 1 code	0	0~65000	/	*
F3-11	Fault 1 running frequency	0.00	0.00~650.00	Hz	*
F3-12	Fault 1 reference frequency	0.00	0.00~650.00	Hz	*
F3-13	Fault 1 DC BUS voltage	0	0~60000	V	*
F3-14	Fault 1 output current	0.0	0.0~6553.5	A	*
F3-15	Fault 1 digital inputs status	0000	0000~FFFF	/	*
F3-16	Fault 1 digital output status	0000	0000~FFFF	/	*
F3-17	Fault 1 heatsink temperature	0	0~200	℃	*
F3-18	Fault 1 accumulative power-ON Time	0	0~65000	h	*
F3-19	Fault 1 accumulative running Time	0	0~65000	h	*
F3-20	Fault 2 code	0	0~65000	/	*
F3-21	Fault 2 running frequency	0.00	0.00~650.00	Hz	*
F3-22	Fault 2 reference frequency	0.00	0.00~650.00	Hz	*
F3-23	Fault 2 DC BUS voltage	0	0~60000	V	*
F3-24	Fault 2 output current	0.0	0.0~6553.5	A	*
F3-25	Fault 2 digital inputs status	0000	0000~FFFF	/	*
F3-26	Fault 2 digital output status	0000	0000~FFFF	/	*
F3-27	Fault 2 heatsink temperature	0	0~200	℃	*
F3-28	Fault 2 accumulative power-ON Time	0	0~65000	h	*
F3-29	Fault 2 accumulative running Time	0	0~65000	h	*
F3-30	Fault 3 code	0	0~65000	/	*
F3-31	Fault 3 running frequency	0.00	0.00~650.00	Hz	*
F3-32	Fault 3 reference frequency	0.00	0.00~650.00	Hz	*
F3-33	Fault 3 DC BUS voltage	0	0~60000	V	*
F3-34	Fault 3 output current	0.0	0.0~6553.5	A	*
F3-35	Fault 3 digital inputs status	0000	0000~FFFF	/	*
F3-36	Fault 3 digital output status	0000	0000~FFFF	/	*

Parameter	Name	Default	Setting Range	Unit	Attribute
F3-37	Fault 3 heatsink temperature	0	0~200	°C	*
F3-38	Fault 3 accumulative power-ON Time	0	0~65000	h	*
F3-39	Fault 3 accumulative running Time	0	0~65000	h	*
F3-40	Fault 4 code	0	0~65000	/	*
F3-41	Fault 4 running frequency	0.00	0.00~650.00	Hz	*
F3-42	Fault 4 reference frequency	0.00	0.00~650.00	Hz	*
F3-43	Fault 4 DC BUS voltage	0	0~60000	V	*
F3-44	Fault 4 output current	0.0	0.0~6553.5	A	*
F3-45	Fault 4 digital inputs status	0000	0000~FFFF	/	*
F3-46	Fault 4 digital output status	0000	0000~FFFF	/	*
F3-47	Fault 4 heatsink temperature	0	0~200	°C	*
F3-48	Fault 4 accumulative power-ON Time	0	0~65000	h	*
F3-49	Fault 4 accumulative running Time	0	0~65000	h	*
F3-50	Current application fault code	0	0~65535	/	*

## Chapter 6 Diagnostics

### 6.1 Fault Indications

This chapter lists all the faults messages including the possible causes and corrective actions. If the drive faults, the drive output is disabled so that the drive stops controlling the motor, and the following fault code will be displayed on the keypad, the fault contact output operates too.

Even if a fault is the same, they are displayed differently on LCD keypad and LED keypad. These are all explained in the below table.

For details, refer to the following table to identify and correct the cause of the fault.

For damages on units or questions that can't be resolved, please contact with local distributors/agents, service centers or manufacturer for solutions.

LCD keypad	LED keypad	F0-15 value	Fault Name	Possible causes	Corrective actions
Err-01	E-PEr	1	External fault	Digital input fault is "ON"	Check the corresponding digital input
Err-02	E-oL1	2	Drive overload	Power supply voltage too low	Check the power supply voltage
				Start when the motor is spinning	Restart after the motor at standstill
				Overloading for a long time	Reduce overload time and reduce load
				Drive power selection is too small	Replace with a suitable drive
Err-03	E-oL2	3	Motor overload	Power supply voltage too low	Check the power supply voltage
				Motor stall or load suddenly changed	Check motor load and drive ratings
				V/F curve setting are not correct	Adjust V/F curve and torque boost
Err-04	E-oH1	4	IGBT over temperature	Ambient over-temperature	Check ambient conditions
				Fan failure	Check air flow and fan operation
				Blockage of air duct	Check heatsink fins for dust pick-up
				Output current too high	Check the load and parameter Check motor power and drive power
				Temperature detect circuit failure	Seek for technical support
Err-05	E-oH2	5	Motor over temperature	Motor temperature too high	Improve ventilation and heat dissipation
				Thermistor resistance is bnormal	Check the thermistor
				Setting motor sensor protection threshold is improper	Check the parameter seting
Err-06	E-dL1	6	Encoder fault	Encoder connection is incorrect	Change encoder wiring
				The encoder has no signal output	Check the encoder and power supply
				Encoder parameters are not correctly	Check the encoder parameters
Err-07	E-oC-	7	Over current	Power supply too low	Check the power supply voltage
				Load inertia is too high	Extended acceleration time
				Motor parameters are not correctly	Set motor parameters correctly
				Ramp-up time was set too short	Extended acceleration time
				The drive power mismatch	Replace with a suitable drive
				Current controller not correctly set	Set current controller parameters correctly

LCD keypad	LED keypad	F0-15 value	Fault Name	Possible causes	Corrective actions
Err-08	E-FAL	8	Module protection	Module failure	Seek for technical support
				U、V、W short-circuited to ground	Check whether the output wiring is short-circuited to ground
				DC bus voltage under voltage ( $\geq 75kW$ )	Check the input power supply
				Built-in brake unit abnormal ( $\geq 75kW$ )	Seek for technical support
				Rectifier or module overheated ( $\geq 75kW$ )	Seek for technical support
				The pre-charged contactor closes abnormally ( $\geq 185kW$ )	Check the input power supply
				Poor contact of the internal connectors	Ask professional technicians for maintenance
Err-09	E-oU-	9	Over voltage	Motor short circuit to ground	Check the motor and motor wiring
				Start when the motor is spinning	Restart after the motor at standstill
				Load inertia is too large	Use appropriate dynamic braking unit
				Deceleration time is too short	Extend the deceleration time
				The input voltage is too high	Check the input power supply
Err-10	E-LU-	10	Under voltage	The input voltage is too low	Check the input power supply
				Abnormal switching power supply	Seek for technical support
Err-11	E-IPF	11	Encoder lost CD phase	CD signal connection is abnormal	Check the encoder and wiring
Err-12	E-oPF	12	Output phase loss	Motor failure	Replace a new motor
				Motor cable is broken	Replace a new motor cable
				Thermal relay failure (if is used)	Check thermal relay
				Output detection circuit failure	Seek for technical support
Err-13	E-EPr	13	EEPROM abnormal	EEPROM read/write abnormal	Seek for technical support
Err-14	E-LIC	14	Unauthorized	Unauthorized	Seek for technical support
Err-15	E-LoS	15	PID feedback disconnection	PID feedback disconnection detection setting is wrong or PID feedback disconnection	Check PID feedback disconnection value and detection time. Check the PID feedback cable
Err-16	E-oUt	16	PID feedback has exceeded upper limit	PID feedback exceeds the allowable range	Check whether the actual feedback value exceeds the set allowable range
Err-17	E-ECT	17	ECT communication failed	ET1100 communication failed	Seek for technical support
Err-18	E-CAN	18	CAN Communication failed	CAN communication failed	Seek for technical support

LCD keypad	LED keypad	F0-15 value	Fault Name	Possible causes	Corrective actions
Err-19	E-ETE	19	EtherCAT is disabled	EtherCAT is disabled	Seek for technical support
Err-20	E-DPE	20	PROFIBUS DP communication failed	PROFIBUS DP Communication failed	Check PROFIBUS DP wiring and related parameter settings
Err-21	E-unk	21	Reserved		
Err-22	E-ES-	22	Modbus communication time out	Incorrect baud rate setting	Set the baud rate correctly
				The read and write parameter address is incorrect or the sending and receiving time interval is not suitable	Check the parameter address and check the read and write time interval
				Communication timeout setting is inappropriate	Check the Modbus timeout time
				Modbus communication disconnection	Check the communication wiring
				Poor contact of Keypad	Check the keypad port
Err-23	E-OSE	23	Encoder 1 direction is opposite to encoder 2	Encoder 1 direction is opposite to encoder 2	Check the encoder 1 direction and encoder 2 direction
Err-24	E-AIU	24	Analog input disconnection	The analog disconnection function is turned on, and the analog input value is less than the analog disconnection value	Check the analog input voltage is normal Check the analog disconnection value setting Check the analog gain and other related parameters setting
Err-25	E-AIO	25	Analog input has exceeded upper limit	The analog alarm function is turned on, and the analog input value is greater than the upper value	Check whether the analog input voltage is normal Check whether the analog upper limit is set properly Check whether the analog gain and other related parameters are set properly
Err-26	E-CUr	26	Current detection abnormal	The current detection abnormal	Seek for technical support
Err-27	E-Z1r	27	Encoder 1 phase Z capture failed	Abnormal z-phase pulse capture of the encoder 1	Check the encoder 1 Z phase wiring
Err-28	E-STL	28	Motor stall	Motor stall	Check the motor actual speed and load Check motor parameters setting Check the motor stall parameter setting
Err-29	E-unk	29	Reserved		
Err-30	E-unk	30	Reserved		
Err-31	E-APF	31	Application fault	Check F3-50	Check F3-50 and below Table for details

When the drive has application fault "E-APF", the fault code can be read in parameter F3-50, the fault messages are listed in the below Table.

F3-50	Fault name	Possible causes	Corrective actions
1	Over speed	The current running speed of the motor exceeds the over-speed detection value	Check the over-speed detection value setting Check the motor actual speed Check the motor load
2	Speed error	The deviation between the current running speed and the reference speed exceeds the speed error detection value	Check the speed error detection value setting Check the motor load Check the motor speed whether is stable Check the encoder PPR and wiring
3	Zero current detection	The output current less than the zero current detection value	Check the zero current detection value setting Check the wiring between the motor and the drive

**Note:** The fault code is also displayed in the F0-13 and F0-14. We can use the two parameters to check if there are multiple faults at the same time. The relationships are shown as follows:

bit of F0-13	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	= 1	= 1	= 1	= 1	=1	=1	=1	=1	=1	=1	=1	=1	=1	=1	=1	=1
Value of F0-15	= 16	= 15	= 14	= 13	= 12	= 11	= 10	= 9	= 8	= 7	= 6	= 5	= 4	= 3	= 2	= 1
bit of F0-14	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	=1	=1	=1	=1	=1	=1	=1	=1	=1	=1	=1	=1	=1	=1	=1	=1
Value of F0-15	= 32	= 31	= 30	= 29	= 28	= 27	= 26	=25	= 24	= 23	= 22	= 21	= 20	= 19	= 18	= 17

## Appendix A Modbus Communication

### 1 Support Protocol

Support Modbus protocol, RTU format, Broadcast address is 0, slave address is "1-247", and "248-255" for reservation.

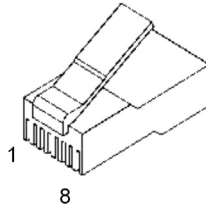
### 2 Interface Mode

RS485: Asynchronous, half duplex, LSB sending priority. Low byte is after the high byte.

Communication port A (RJ45) default data format: 8-N-1, 38400 bps

Communication port B (terminal RS485+/-) default data format: 8-N-1,19200 bps.

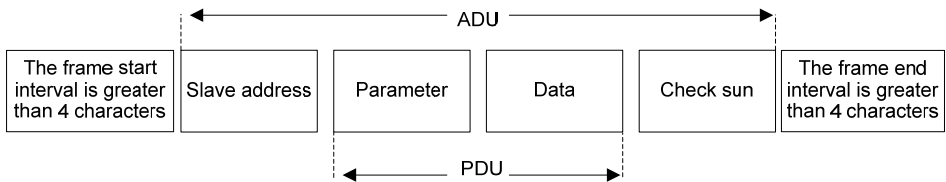
It is recommended to adopt EIA/TIA T568B, the lead of port A is defined as:



**Attached Figure 1** RJ45 interface

Port A pin	1	2	3	4	5	6	7	8
Port A signal	+5V	GND	485+	485-	485+	485-	GND	+5V
EIA/TIA T568A	White green	Green	White orange	Blue	White blue	Orange	White brown	Brown
EIA/TIA T568B	White orange	Orange	White green	Blue	White blue	Green	White brown	Brown

### 3 Protocol Format



**Attached Figure 2** Protocol format

The ADU (Application Data Unit) check sum is the CRC16 checksum of the first three parts of the ADU obtained by exchanging the high and low bytes.

## 4 Function Interpretation

■ Function **0x03 reads parameters.**


PDU Part Contents	Data Length (Byte)	Range
<b>Request:</b>		
Function code	1	0x03
Register start address	2	0x0000 ~ 0xFFFF
Registers No.	2	0x0001 ~ 0x0010
<b>Response:</b>		
Function code	1	0x03
Read bytes	1	2* Registers No.
Read contents	2* Registers No.	


■ Function **0x06 writes single parameter** or control word

PDU Part Contents	Data Length (Byte)	Range
<b>Request:</b>		
Function code	1	0x06
Register address	2	0x0000 ~ 0xFFFF
Register data	2	0x0000 ~ 0xFFFF
<b>Response:</b>		
Function code	1	0x06
Register address	2	0x0000~ 0xFFFF
Register data	2	0x0000 ~ 0xFFFF

■ Function **0x10 writes multiple parameters** or control word

PDU Part Contents	Data Length (Byte)	Range
<b>Request:</b>		
Function code	1	0x10
Register start address	2	0x0000~0xFFFF
Registers No.	2	0x0001~0x0010
Bytes of register contents	1	2* Registers No.
Register contents	2* Registers No.	
<b>Response:</b>		
Function code	1	0x10
Register start address	2	0x0000~0xFFFF
Registers No.	2	0x0001~0x0100

 **Note:** Function 0x10 can write up to 16 consecutive address parameters at a time

 **Note:** During communication, parameter value is written to RAM instead of ROM. The parameter data will not be saved after power-off.



## 5 Register Address

Address Space	Meaning
Control word register	0x8000
Speed reference register	0x8001
Status word	Parameter from F0-00 to F0-99: address from 0x6000 to 0x6063 The Modbus address of monitoring parameters are listed in the parameters list in chapter 5.
Parameters address	<p>The calculation method of the register address corresponding to the parameter: the high byte is the parameter group number, and the low byte is the serial number in the group, both expressed in hexadecimal.</p> <div style="text-align: center;"> </div> <p>High byte: P0~PF: 0x00~0x0F                      A0: 0x10                      b0~b1: 0x20~0x21                      C0~C2: 0x30~0x32                      d0: 0x40                      E0: 0x50                      F0~F3: 0x60~0x63</p> <p>Low byte: 00~99: 0x00~0x63</p> <p>Example: The Modbus operation address of parameter Pb-23:                      (0x0b&lt;8) +23=0x0b17</p>

### ■ Control Word Register (Address: 0x8000)

bit	Meaning	bit	Meaning
0	0: Stop command    1: Running command	8	0: Relay1 - OFF            1: Relay1 - ON
1	Reserved	9	0: Relay2 - OFF            1: Relay2 - ON
2	0: Reset disabled    1: Reset enabled	10	0: Relay3 - OFF            1: Relay3 - ON
3	Reserved	11	0: Disables PID switch speed 1: Enables PID switch speed
4	Reserved	12	Reserved
5	Reserved	13	Reserved
6	0: Y1 - OFF            1: Y1 - ON	14	Reserved
7	0: Y2 - OFF            1: Y2 - ON	15	Reserved

## 6 CRC16 Function

```

unsigned int crc16 (unsigned char *data, unsigned char length)
{
    unsigned int i, crc_result=0xffff;
    while (length--)
    {
        crc_result^=*data++;
        for (i=0;i<8;i++)
        {
            if (crc_result&0x01)
                crc_result= (crc_result>>1)^0xa001;
            else
                crc_result=crc_result>>1;
        }
    }
    return (crc_result= ((crc_result&0xff)<<8)|(crc_result>>8)); //交换 CRC16 校验和高低字节
}
    
```

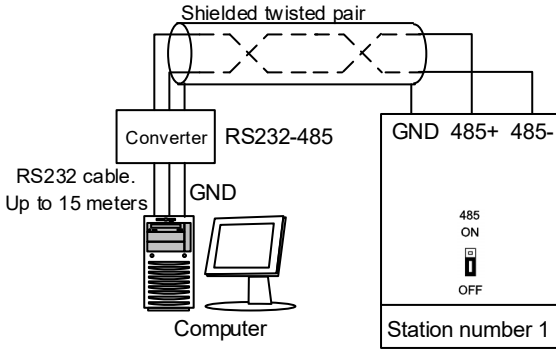
## 7 Modbus Communication Example

Run:							
	Address	Function code	Register address	Register contents	Checksum		
Request	0x01	0x06	0x8000	0x0001	0x61CA		
Response	0x01	0x06	0x8000	0x0001	0x61CA		
Stop:							
	Address	Function code	Register address	Register contents	Checksum		
Request	0x01	0x06	0x8000	0x0000	0xA00A		
Response	0x01	0x06	0x8000	0x0000	0xA00A		
Run and set speed reference to 50.00Hz							
	Address	Function code	Register address	Number	Bytes	Register contents	Check sum
Request	0x01	0x10	0x8000	0x0002	0x04	0x0001,0x1388	0xCEFF
Response	0x01	0x10	0x8000	0x0004	None	None	0xE80A

☞ **Note:** The parameters modified by communication will not be saved after the power off. If you need to save them, perform a save operation (d0-02=1) before power off.

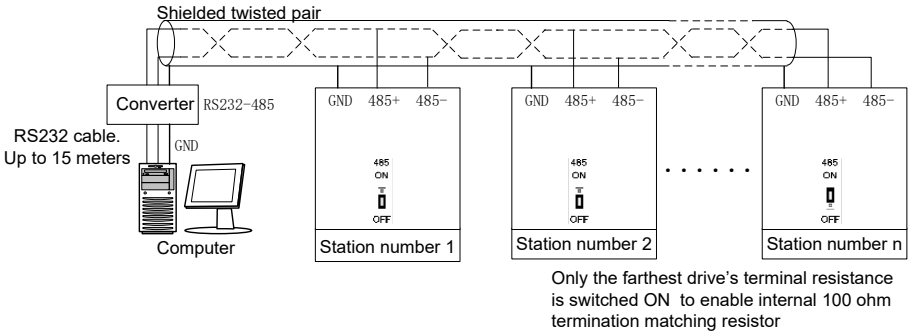
## 8 Communication Network Construction

- ◆ The connection of one drive and one host computer



**Appendix Figure 3** The connection of one drive and one computer

- ◆ The connection of multiple drives and one host computer



**Appendix Figure 4** The connection of multiple drives and one computer

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