THYRA
Drives & Control Systems

CTE
USER MANUAL

V/F CONTROL & OPEN LOOP CONTROL

www.thyradrives.com

PREFACE

THYRA-CTE series is our high reliability, small size, and high-cost performance product, which supports high-performance drive of three-phase asynchronous motor, supports international leading vector control technology and common V/F control mode, supports speed and torque control output mode.

This instruction manual describes how to properly use the THYRA-CTE series. Please be sure to read this instruction manual carefully before using it (installation, operation, maintenance, inspection, etc.). Also, please understand the safety precautions before using the product.

Special emphasis: To ensure the performance of the product, please confirm the setting of the motor nameplate parameters: rated voltage, rated current, rated power, rated frequency, rated speed, and the number of poles and other motor parameters when using the product for the first time.

CAUTIONS

- When using this product, be sure to install the case or cover as specified and follow the instructions.
- The illustrations in this instruction manual are for illustration purposes only and may differ from the product you ordered.
- The contents of this manual are subject to change in a timely manner due to product upgrades or specification changes, as well as to improve the convenience and accuracy of the manual.
- If you need to order an instruction manual due to damage or loss, please contact our regional agents or contact our customer service center directly.
- If you still have some usage problems that are unknown, please contact our customer service center.

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CHAPTER - 1
SAFETY INFORMATION AND PRECAUTIONS

Security Definition

Description of safety markings that may be covered in this manual.

Danger: Failure to operate as required may result in fire or serious injury, or even death.

Note: Moderate injuries or minor injuries may result and equipment damage may occur due to failure to operate as required.

Please read this chapter carefully and be sure to follow the safety precautions required by the contents of this chapter when installing, commissioning and servicing this product. Any injury or loss caused by irregular operation is not the responsibility of our company.

1.1 Safety matters

1.1.1 Before installation

DANGER

- When you find water in the box, please stop the installation.
- Stop the installation if you find visual parts missing or parts damaged.
- If you find that the product nameplate parameters do not correspond to the required product, please stop the installation.

ATTENTION

- Please do your best to protect yourself from injury when handling the product.
- Please be careful during handling to avoid damage to the product.
- Before leaving the factory, the product has done qualified pressure resistance test, please do not carry out pressure resistance check again, so as not to damage the product by irregular operation.

1.1.2 When installing

DANGER

- The product should be installed on metal or other flame retardant objects, otherwise there is a fire hazard.
- Do not unscrew the fixing bolts of the equipment components, especially those marked with red.
- The product must not be installed in an environment containing explosive gases, otherwise there is a risk of explosion.

ATTENTION

- Handle gently, and hold the bottom of the product to prevent foot injury or damage to the product.
- Do not allow wire heads or screws to fall into the product. Otherwise cause damage to the product.
- Please install the product in a place with little vibration and avoid direct sunlight.
- When the product is installed in the cabinet, need to do a good job of heat dissipation, otherwise it may cause product failure or damage.

1.1.3 Wiring

DANGER

- Wiring operations must be performed by professionally qualified personnel, otherwise there is a risk of electric shock or equipment damage.
- There must be a circuit breaker separating the product from the power supply, otherwise a fire may occur.
- Please make sure the power supply is in zero energy state before wiring, otherwise there is a risk of electric shock.
- It is forbidden to connect the braking resistor directly between the DC bus (+) and (-) terminals, otherwise it will cause a fire.
- The product must be covered before powering up, otherwise it may cause electric shock.
- The wiring of all peripheral accessories must comply with the instructions in this manual and be wired correctly in accordance with the circuit connection methods provided in this manual, or else cause an accident.

ATTENTION

- All of our products have been tested for voltage resistance at the factory, so it is forbidden to conduct this test on the products again, otherwise there is a risk of equipment damage.
- The terminal signal line of the product should be wired as far away from the main power line as possible, and the distance cannot be guaranteed in the case of vertical cross distribution, otherwise it will cause interference with the control signal.
- When the motor cable length is greater than 100 meters, it is recommended to use output reactors, otherwise there is a risk of equipment failure.
- The encoder must use a shielded cable and the shield must be properly grounded.

1.1.4 Operation

DANGER

- After the wiring is completed and confirmed, it is necessary to ensure that the cover has been covered before power is applied, and it is strictly prohibited to open the cover after power is applied, otherwise there is a risk of electric shock.
- Do not touch the product and the surrounding circuitry after the product is powered on, no matter what state the product is in, otherwise there is a risk of electric shock.
- During the operation of the product, foreign objects should be avoided to fall into the equipment, otherwise there is a risk of equipment damage.
- Upon failure of the connected power source the ATS will automatically transfer to the load circuit to the other power source (if it is available). At this time, must not touch the product U, V, W terminals or motor terminals, otherwise there is a risk of electric shock.
- Storage time of more than 2 years of products, the application of voltage regulators to gradually step up the power supply before supplying power from the grid, otherwise there is a risk of equipment damage.
- Non-technical professionals are forbidden to test signals in operation, otherwise there is a risk of injury or equipment damage.

ATTENTION

- Check if there is a short circuit in the peripheral circuit connected to the product and if the connection is tight, otherwise it may cause damage to the equipment.
- Before running, please make sure the motor and machinery are within the allowed use range, otherwise the equipment may be damaged.
- Do not touch the fan, heat sink, brake resistor directly, otherwise there is a risk of mechanical damage and burns.
- When performing rotation recognition, please ensure the safety of the surrounding area after the equipment is in operation.

1.1.5 Maintenance

DANGER

- Product maintenance, inspection or replacement of parts must be performed by a professionally qualified engineer.
- It is forbidden to carry out maintenance, inspection or replacement of parts with electricity, otherwise there is a risk of electric shock.
- Wait for at least 10 minutes after power failure to ensure that the residual voltage of the electrolytic capacitor drops below 36V before performing maintenance, inspection or replacement of parts.
- After replacing the product must be set parameters, all pluggable plug-ins must be plugged in the case of power failure.

ATTENTION

- Maintenance, inspection or replacement of parts try not to touch the body of the components, otherwise there is a risk of electrostatic damage to the device.
- All pluggable actions must be carried out in the case of power failure.

1.2 Notes

1.2.1 Motor insulation inspection

Motor insulation inspection should be done before the first use, reuse after a long time and regular inspection to prevent damage to the product due to insulation failure of the motor winding. Insulation inspection must be separated from the motor connecting line from the product, it is recommended to use 500V voltage megohmmeter, should ensure that the measured insulation resistance is not less than 5MΩ.

1.2.2 T hermal protection of the motor

If the motor selected does not match the rated capacity of the product, especially if the rated power of the product is greater than the rated power of the motor, be sure to adjust the value of the parameters related to motor protection in the product or install a thermal relay in front of the motor to protect the motor.

1.2.3 Operation above industrial frequency

This product can provide output frequency from 0Hz to 400Hz. If the customer needs to operate at 50Hz or above, please consider the mechanical device's capacity.

1.2.4 Vibration of mechanical devices

The product may encounter mechanical resonance points of the load device at some output frequencies, which can be avoided by setting the product jump frequency parameter.

1.2.5 About motor heat and noise

Since the output voltage of the product is PWM wave, it contains certain harmonics, so the temperature rise, noise and vibration of the motor will be slightly increased compared with the working frequency operation.

1.2.6 Output side with voltage sensitive devices or capacitors to improve power factor

The output of the product is PWM wave, the output side, such as the installation of capacitors to improve the power factor or lightning protection with varistors, etc., easy to trigger the product instantaneous over-current or even damage the product, please do not use.

1.2.7 Product inputs and outputs used in contactors and other switching devices

If a contactor is installed between the power supply and the product input, it is not allowed to use this contactor to control the start/stop of the product. Frequent charging and discharging tend to reduce the service life of capacitors in the product. If a switch device such as a contactor is installed between the output and the motor, ensure that the product is operated on and off when there is no output, otherwise it is easy to cause damage to the module inside the product.

1.2.8 Use outside the rated voltage value

Use of the THYRA-CTE series outside the allowable operating voltage range specified in the manual is not suitable and may cause damage to the devices in the product. If necessary, please use the appropriate step-up or step-down device to change the voltage.

1.2.9 Three-phase input to two-phase input

Do not change the THYRA-CTE series of three-phase products to two-phase use. Otherwise, it will lead to malfunction or product damage. If the power grid is two-phase input, please consult the manufacturer's maintenance personnel to make sure that the correct product specification model selection is provided.

1.2.10 Lightning surge protection

This series of products are equipped with lightning overcurrent protection device, which has certain self-protection capability for induction lightning. For lightning frequent place customers should also add protection in the front of the product.

1.2.11 Altitude and derating use

In areas where the altitude exceeds 1000m, it is necessary to use the product at a reduced rate because the thin air causes the product to lose heat. Please contact our company for technical consultation in this case.

1.2.12 Attention at the end of the product

The electrolytic capacitors in the main circuit and the electrolytic capacitors on the printed circuit board may explode when they are burned. Toxic gas is generated when the plastic parts are incinerated. Please dispose of them as industrial waste.

1.2.13 About adapted motors

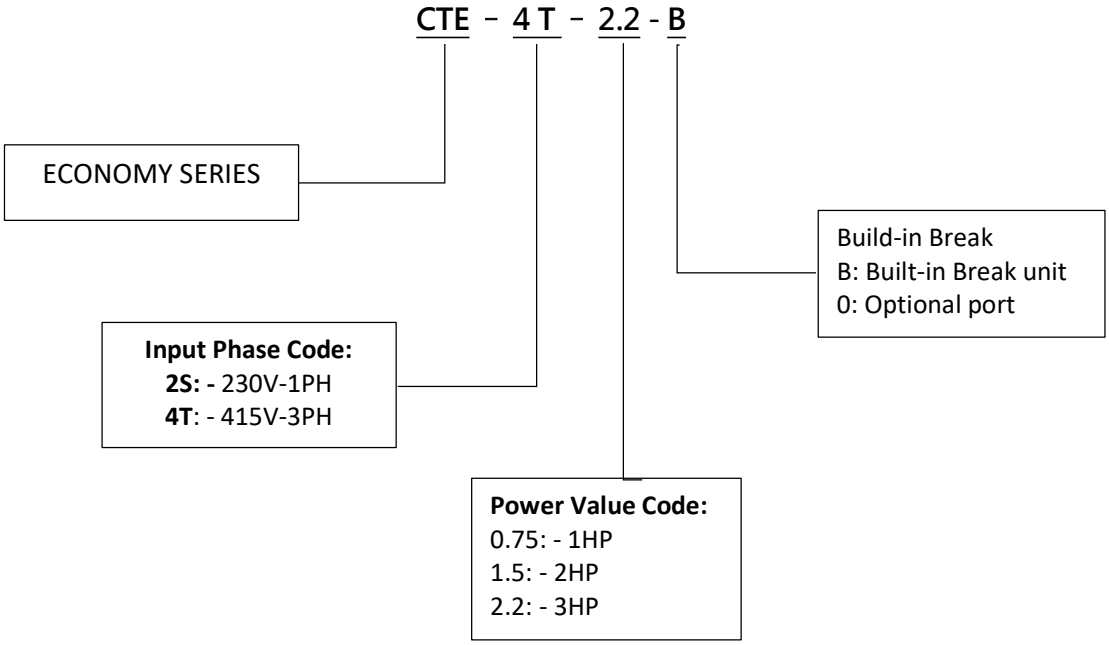
1) The standard adaptable motor is a four-pole squirrel cage induction motor or a permanent magnet synchronous motor. If the motor is not one of the above, please make sure to match the product according to the rated current of the motor.
2) Non-inverter motor cooling fan and rotor shaft is coaxially connected, the cooling effect of the fan decreases when the speed decreases, therefore, the motor overheating occasions should be installed with a strong exhaust fan or replaced with an inverter motor.
3) The product has built-in standard parameters of the adapted motor, according to the actual situation it is necessary to identify the motor parameters or modify the default value to conform to the actual value as far as possible, otherwise it will affect the operation effect and protection performance.
4) A short circuit inside the cable or motor can cause the product to alarm or even blow up. Therefore, please first perform an insulation short circuit test on the motor and cable of the initial installation, and this test should be performed frequently during daily maintenance. Note that this test must be done with the product completely disconnected from the part being tested.

1.3 Initial use

For the first time user of this product, you should read this manual carefully first. If you have doubts about some functions and performance, please consult our technical support staff to get help, which is beneficial to the correct use of this product. Due to the commitment to continuous improvement of our products, the information provided by us is subject to change without notice.

CHAPTER - 2
PRODUCT INFORMATION

2.1 Model Decoding rules



2.2 Product Technical Data.

Product Models and Technical Data

Product number	Input A	Output A	Adapted motor	
	A	A	kW	Braking unit
220V voltage level series products				
CTE-2S-0.4B	5.4	2.8	0.4	built-in
CTE-2S-0.75B	8.2	4.8	0.75	built-in
CTE-2S-1.5B	14.0	8	1.5	built-in
CTE-2S-2.2B	23.0	10	2.2	built-in
380V voltage level series products				
CTE-4T-0.75B	5.3	2.5	0.75	built-in
CTE-4T-1.5B	7.1	4.2	1.5	built-in
CTE-4T-2.2B	9	5.6	2.2	built-in
CTE-4T-4.0B	15	9.4	4.0	built-in
CTE-4T-5.5B	22	13	5.5	built-in

2.3 Name Plate.

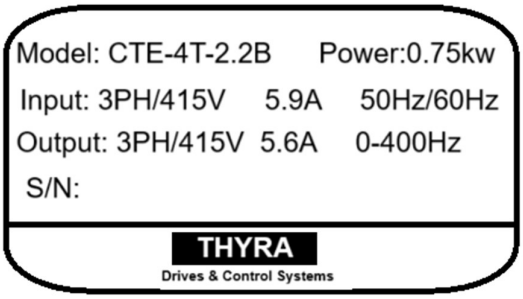


Figure 2-3 THYRA-CTE series Nameplate identification

2.4 Technology Specifications

Input and output character-istics	Rated input voltage	200V voltage level: single/three-phase 220VAC
		400V voltage level: three-phase 380-480VAC voltage, continuous fluctuation ±10%, brief fluctuation -15% to +10%
	Rated input frequency	50Hz/60Hz ±5%
	Output Voltage	3 phases: 0 to rated input voltage, error less than ±3%
	Output Frequency	0.00~600.00Hz, Unit 0.01Hz
	Overload capacity	120% 1 minute 140% 10 seconds 150% 0.5 seconds
Operation control character-istics	Control method	V/f control
	Speed range	1:100 (V/f)
	Speed control accuracy	±0.5% (V/f control)

Operation control character-istics	Speed fluctuations	±0.3%
	Torque Response	<10ms
	Starting torque	0.5Hz: 180% (V/F)
Basic Functions	V/F curve	Three ways: linear; multi-point; Nth order V/F curve
	V/F separation	2 ways: full separation, semi-separation
	Acceleration and Deceleration curves	Straight line or S curve acceleration and deceleration mode; four acceleration and deceleration times; acceleration and deceleration time range 0.0~60000s
	DC brake	DC braking frequency: 0.00Hz~maximum frequency, braking time: 0.0s~30.0s, braking action current value: 0.0%~100.0%
	JOG control	JOG frequency range: 0.00Hz~maximum frequency; pointing acceleration and deceleration time 0.0s~60000s
	Multi-segment operation Programming	Up to 16-speed operation via built-in Programming or control terminal
	Built-in PID	Easy to implement closed-loop control system for process control
	Automatic Voltage Regulation (AVR)	When the grid voltage changes, it can automatically maintain the output voltage constant
	Over-pressure and over-drain speed control	Automatic limitation of current and voltage during operation to prevent frequent over-current and over-voltage tripping
	Fast current limiting function	Minimize overcurrent faults and protect products from normal operation
	Torque limiting and control	Automatic torque limitation during operation to prevent frequent overcurrent tripping
	Input terminals	Six switching input terminals, including X6 for high-speed pulse input. Support active open collector NPN, PNP and dry contact input mode, two analog input terminals, one for voltage and current input optional, one for voltage input

Basic Functions	Output terminals	A high-speed pulse output terminal, 0 ~ 50kHz square wave signal output, can realize the set frequency, output frequency and other physical quantity output, a switch output terminal, a set of relay output terminal
		One analog output terminal, voltage and current output can be selected to realize the output of physical quantities such as set frequency and output frequency
Featured Features	Various main and auxiliary feed and switch, speed search, multiple acceleration and deceleration curves selection, holding brake control, up to 16-segment speed operation (two-segment speed support flexible frequency feed), swing frequency control operation, fixed length control, counting function, over-excitation braking, over-voltage stall, under-voltage stall, power failure restart, jump frequency, frequency binding, four-segment acceleration and deceleration time free switching, motor temperature protection, flexible fan control, process PID control, Programming, sag control, parameter recognition, weak magnetic control, high precision torque limiting, V/f separation control.	
Protection function	Power-on motor short-circuit detection, over-current protection, overvoltage protection, under voltage protection, overheat protection, overload protection, etc.	
Environ-ment	Place of use	Indoor, not exposed to direct sunlight, no dust, corrosive gases, flammable gases, oil mist, water vapor, dripping water or salt, etc.
	Altitude	The rated output current will be derated by 1% for every 100 meters of elevation above 1000 meters.
	Ambient temperature	-10°C~50°C, Above 50°C each temperature rise of 1°C reduce current rating of 1%.
	Humidity	5 ~ 95%, no condensation allowed
	Vibration	Less than 5.9 m/s2 (0.6g)
	Storage temperature	-20°C ~ +60°C
Other	Installation method	Wall-mounted
	Protection level	IP20
	Cooling method	Forced air cooling

2.5 Product appearance drawing, installation Bolting size

2.5.1 Mounting hole Dimensions Figure

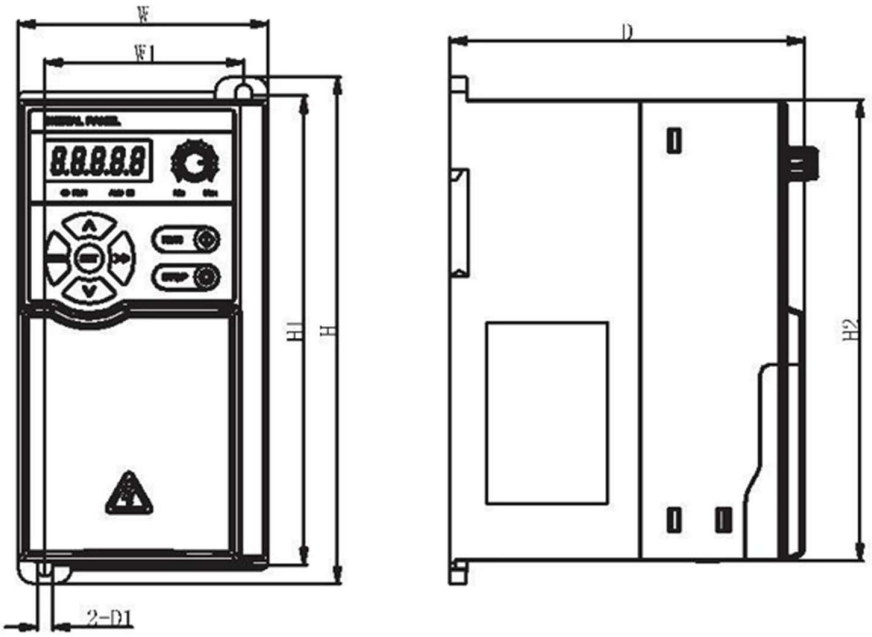


Figure 2-3 THYRA-CTE series plastic case appearance diagram

Model	Outer dimensions (mm)						Fixing hole	weight (kg)
	W1	H1	H	H2	W	D		
CTE-2S-0.4B	67.5	160	170	/	84.5	129	ø4.5	1.0
CTE-2S-0.75B								
CTE-2S-1.5B								
CTE-2S-2.2B								
CTE-4T-0.75B								
CTE-4T-1.5B								
CTE-4T-2.2B								
CTE-2S-3.0B	85	185	194	/	97	143.5	ø5.5	1.4
CTE-2S-4.0B								
CTE-4T-4.0B								
CTE-4T-5.5B								

2.6 Brake component selection guide

Table 2-3 THYRA-CTE series brake components selection table

Product Model	Recommended Power of Braking Resistor (W)	Recommended Resistance Value of Braking Resistor	Brake Unit	Remarks
CTE-2S-0.4B	80	≥100Ω	Standard Built-in	
CTE-2S-0.75B	150	≥100Ω		
C TE-2S-1.5B	200	≥80Ω		
CTE-2S-2.2B	300	≥50Ω		
CTE-4T-0.75B	150	≥100Ω		
CTE-4T-1.5B	200	≥80Ω		
CTE-4T-2.2B	300	≥50Ω		
CTE-2S-4.0B	400	≥40Ω		
CTE-2S-5.5B	600	≥20Ω		
CTE-4T-4.0B	400	≥40Ω		
CTE-4T-5.5B	600	≥20Ω		

Note:

The braking resistor resistance value selection, please strictly follow the above table selection, otherwise, it may lead to damage to the built-in brake unit or resistor damage.

CHAPTER - 3
MECHANICAL AND ELECTRICAL INSTALLATION

3.1 Mechanical installation

3.1.1 Installation Environment and Requirements.

1. Ambient temperature: The product's operating ambient temperature may not exceed the allowable temperature range (-10c ~50c*).
2. Mount the product on the surface of a flame-retardant object with enough space around it to dissipate heat. The product tends to generate a lot of heat when working. And install it vertically on the mounting support with screws.
3. Please install it in a place where vibration is not easy. The vibration should be no more than 0.6G. Special attention should be paid to keeping it away from equipment such as punching machines.
4. Avoid installation in direct sunlight, humidity, and water droplets.
5. Avoid installation in places where there are corrosive, flammable, and explosive gases in the air as well as oil, dust, and metal powder

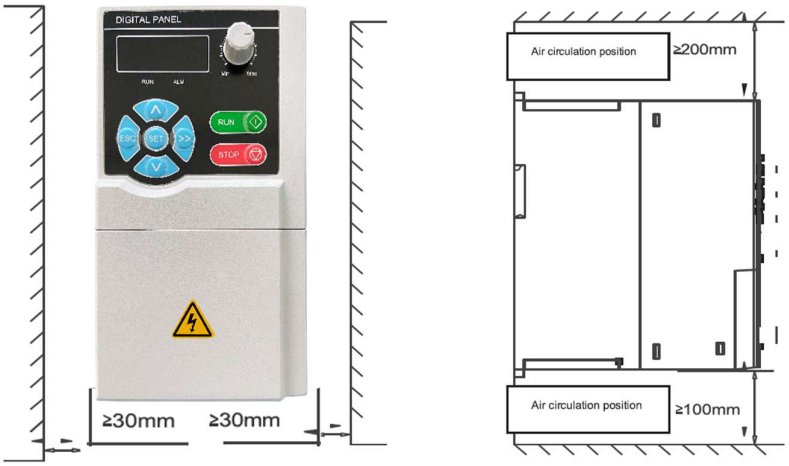


Figure 3-1 Installation diagram of THYRA-CTE series inverter

For top and bottom installation: When the product is installed top and bottom, please install the heat insulation deflector.

Rated current level	Installation Size	
	Vertical height	Horizontal width
≤32A	≥100mm	May not be required
32A-60A	≥200mm	≥50mm

3.2 Electrical Installation

3.2.1 External Wiring

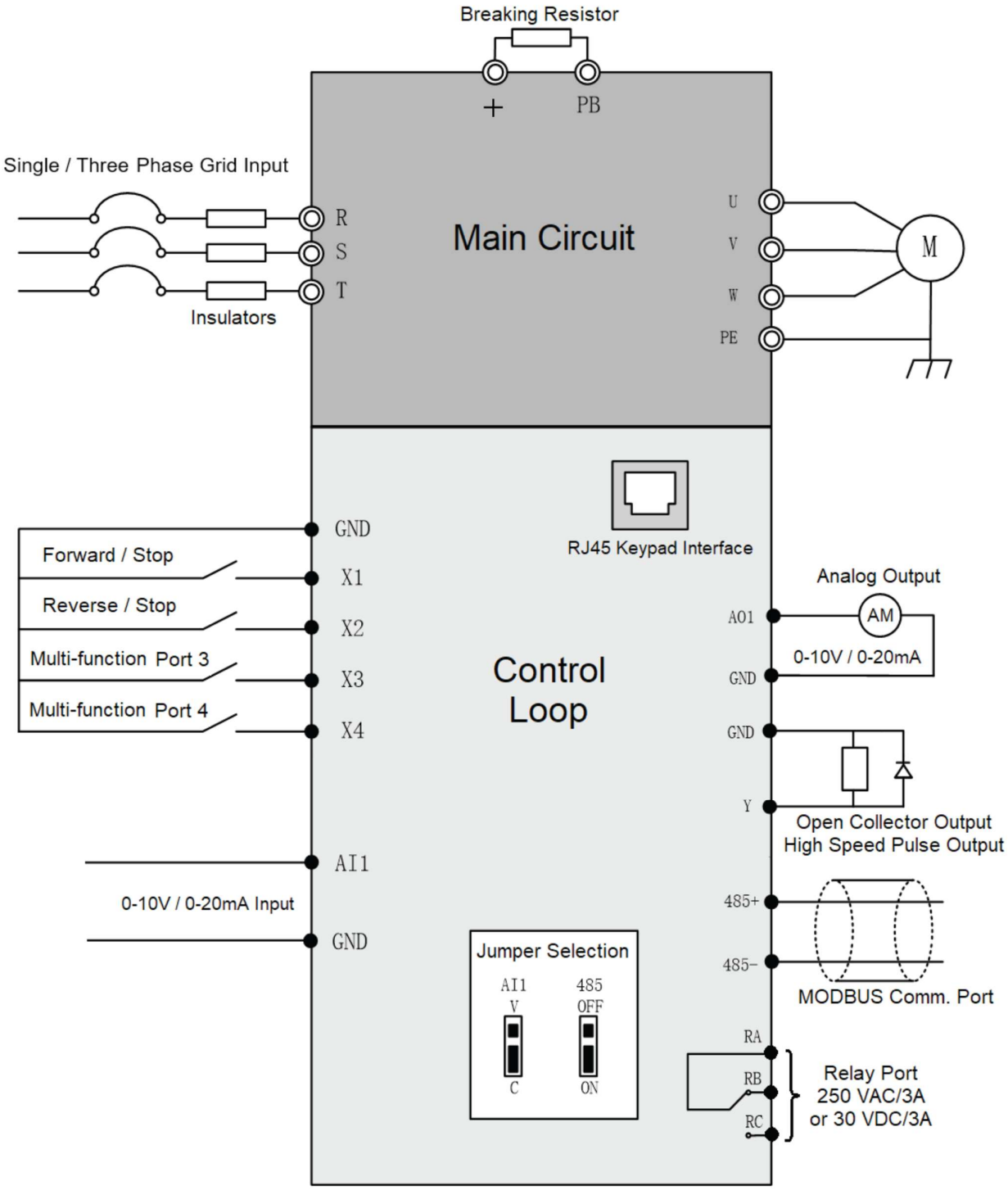


Figure 3-2 Typical wiring diagram of THYRA-CTE Drive

Caution:

1. Terminal ・indicates the main circuit terminal, and ● indicates the control circuit terminal.
2. Built-in brake unit is optional for each model of THYRA-CTE series.
3. The model number followed by “B” indicates that it has a brake unit.
4. The braking resistors are selected according to the user’s needs, see the braking resistor selection guide for details.
5. Signal lines and power lines must be separated, and if the control cable and power cable cross, they should be crossed at an angle of 90 degrees as far as possible. The Analog signal line should preferably be shielded twisted pair and the power cable should be shielded three-core cable (its specification should be one grade larger than the normal motor cable) or follow the user manual of the product.

3.2.2 Main circuit terminals and wiring

DANGER

1. Make sure the power switch is OFF before wiring operation, otherwise an electric shock accident may occur!
2. The wiring personnel must be professionally trained, otherwise it may cause harm to the equipment and the person!
3. Must be reliably grounded, otherwise there is the risk of electric shock or fire!

ATTENTION

1. Make sure the input power is the same as the product’s rating, otherwise damage the product!
2. Make sure the motor and the product are compatible, otherwise the motor may be damaged or cause product protection!
3. It is not possible to connect the power supply to the U, V and W terminals, otherwise the product will be damaged!
4. Do not connect the braking resistor directly to the DC bus (+), (-), otherwise it will cause a fire!

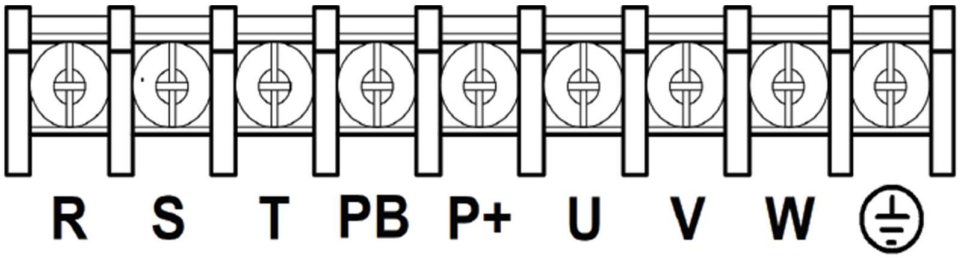


Figure 3-3 THYRA-CTE Series VFD main circuit terminal arrangement

Terminal Marking		
R/S/T	230V/415V series power input terminals	AC input three-phase power connection point single-phase 220V AC power connection point
P+, PB	Brake resistor connection terminal	Connecting the braking resistor
U, V, W	Product output terminals	Connecting three-phase motors
PE	Grounding terminal	Grounding terminal

3.2.3 THYRA-CTE series product main circuit terminal wiring requirements.

3.2.4.1 Wiring operations must be performed by professionally qualified personnel, otherwise there is a risk of electric shock or social security damage.

3.2.4.2 Confirm that the input power is completely disconnected before wiring operations, otherwise there is a risk of electric shock.

3.2.4.3 All wiring and lines shall comply with EMC and safety standards.

3.2.4.4 Terminal wiring screws or bolts must be tightened, otherwise, there is a risk of damage to the equipment.

3.2.4.5 It is prohibited to connect the AC 220VAC voltage level signal to the terminals outside the control terminals RA, RB, and RC.

3.2.4 Control terminals and wiring

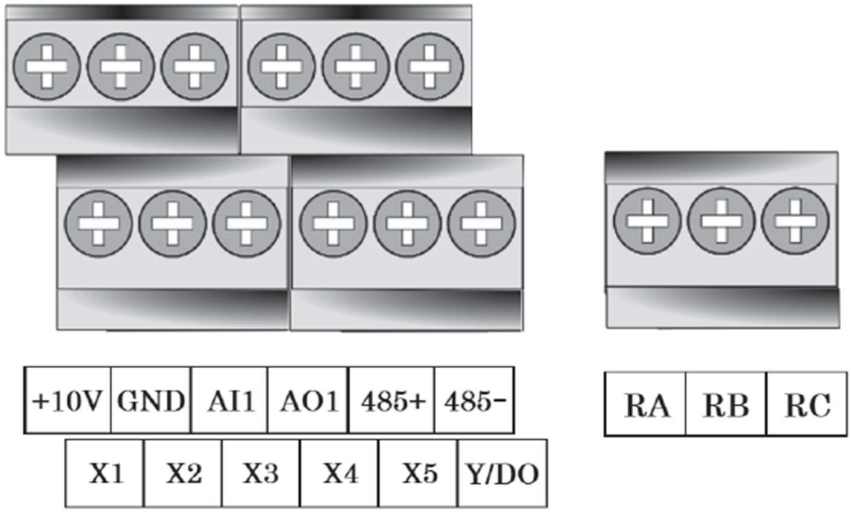


Figure 3-4 THYRA-CTE series inverter control circuit terminal layout

Control terminal function description.

Table 3-2 THYRA-CTE product control terminal function description

Category	Terminal Symbols	Terminal Name	Function Description
R/S/T P+, PB U, V, W	+10V-GND	External +10V power supply	Provide +10V power supply to the outside, maximum output current: 10mA Used as an external potentiometer working power supply, resistance range: 1kΩ~50kΩ
	+24V-COM	External +24V power supply	Provide +24V power supply to the outside, generally used as the working power of digital input and output terminals and external sensor power supply, maximum output current: 200mA
	OP	External power input terminal	Choose to connect to +24V or COM through the metal jumper on the control board terminal, and the factory default is to connect to +24V. When using external signals to drive X1~X6, the OP needs to be connected to an external power supply and the shorting metal tab should be removed.
Model to be Enter	AI1-GND	Analog input terminal 1	1. Input voltage range: DC 0V~10V/ 4mA~20mA, jumper decision. 2. Input impedance: 100kΩ
	AI2-GND	Analog input terminal 2	1. Input range: DC -10V~10V 2. Input impedance: 100kΩ for voltage input and 500Ω for current input.
Number Word Enter	X1- COM	Digital input 1	1. Optical coupled isolation, compatible with bipolar input 2. Input impedance: 4.7kΩ 3. Voltage range at level input: 9V~30V
	X2- COM	Digital input 2	
	X3- COM	Digital input 3	
	X4- COM	Digital input 4	
	X5-COM	Digital input 5	

Category	Terminal Symbols	Terminal Name	Function Description
Simulation Output	AO1-GND	Analog output 1	The voltage or current output is determined by the AO1 jumper selection on the control board. Output voltage range: 0V~10V Output current range: 0mA~20mA
Number Word Enter out	Y/DO-COM	Digital output 1 (compatible with high-speed output)	Optically isolated, bipolar open collector output Output voltage range: 0V~24V Output current range: 0mA~50mA Note: The digital output ground GND is internally isolated from the digital input ground COM.
Relay Output	RA-RB	Normally closed terminal	Contact drive capability. AC250V, 3A; DC 30V, 3A.
	RA-RC	Frequently Open Ends	
Comm. Port	485+/485-	Communi-cation Interface	Transmission rate: 4.8K/9.6K/19.2K/38.4K/57.6K/115.2Kbps Maximum distance of 500 meters (using standard network cable)
Keyboard	CN3	External keyboard interface	The maximum communication distance is 3 meters when connecting the operation panel with standard network cable.

3) Control terminal screws and wiring specifications:

Cable Type	Cable Specification (mm^2)	Screws	Torque (kgf.cm)
Shielded Cable	1.0	M3	5±0.5

3.3 Control board wiring instructions

Instructions for using Analog input and output terminals

The voltage signal of Analog input and output is especially vulnerable to external interference, so generally use shielded cable transmission, and the wiring distance is as short as possible, the shielding layer is well grounded against the inverter end, and the transmission distance should not exceed 20m as far as possible.

The control cable should be kept at a distance of more than 20cm from the main circuit and strong power lines, avoiding parallel placement with strong power lines, and when crossed with strong power lines, vertical wiring is recommended to prevent the inverter from malfunctioning due to interference.

In the case of serious interference with the analog input and output signals, a filtering capacitor or ferrite core is required on the analog signal source side.

Switching input and output terminals uses instructions

Switching input and output signals generally use shielded cable transmission, and wiring distance as short as possible, and the shielding layer against the inverter end of good ground, the transmission distance should not exceed 20m. When elected to use the active mode drive, the power supply crosstalk to take the necessary filtering measures, usually recommended to use dry contact control mode.

When wiring, the control cable should be kept at a distance of more than 20cm from the main circuit and the strong power lines, and avoid parallel placement with the strong power lines. If crossover with the strong power lines cannot be avoided, it is recommended to use vertical wiring to prevent the inverter from malfunctioning due to interference

3.3.1 Instructions for using the switching input terminals

Dry contact method

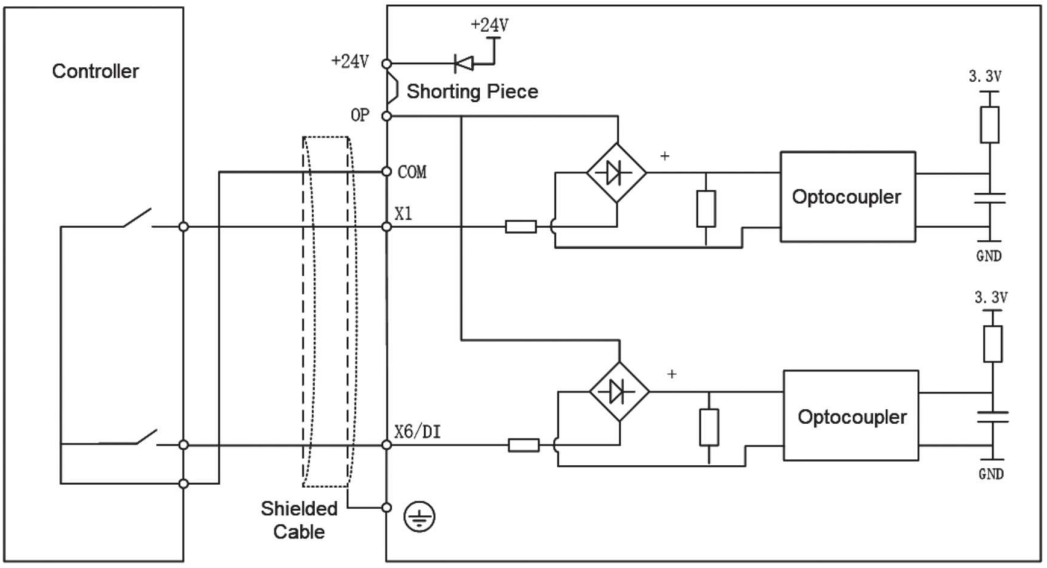


Figure 3-7 Using internal power dry contact method

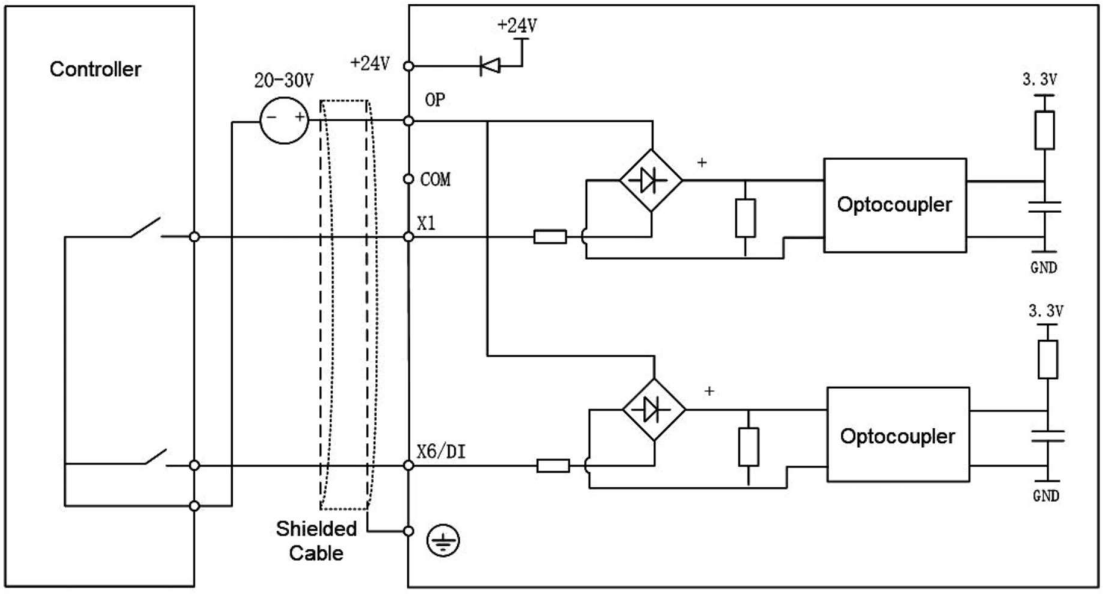


Figure 3-8 Using external power dry contact method

When using external power supply, the short circuit piece between +24V and OP must be removed, otherwise the product will be damaged; the voltage range of external power supply is DC20~30V, otherwise normal operation cannot be guaranteed and may even damage the product.

Open collector NPN wiring method

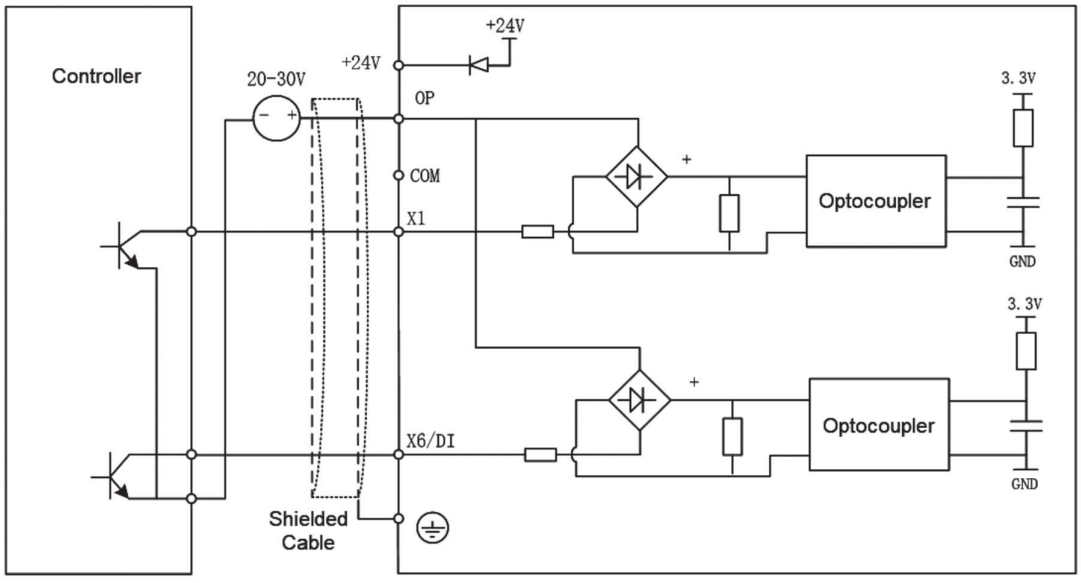


Figure 3-9 Using internal power supply open collector NPN wiring method

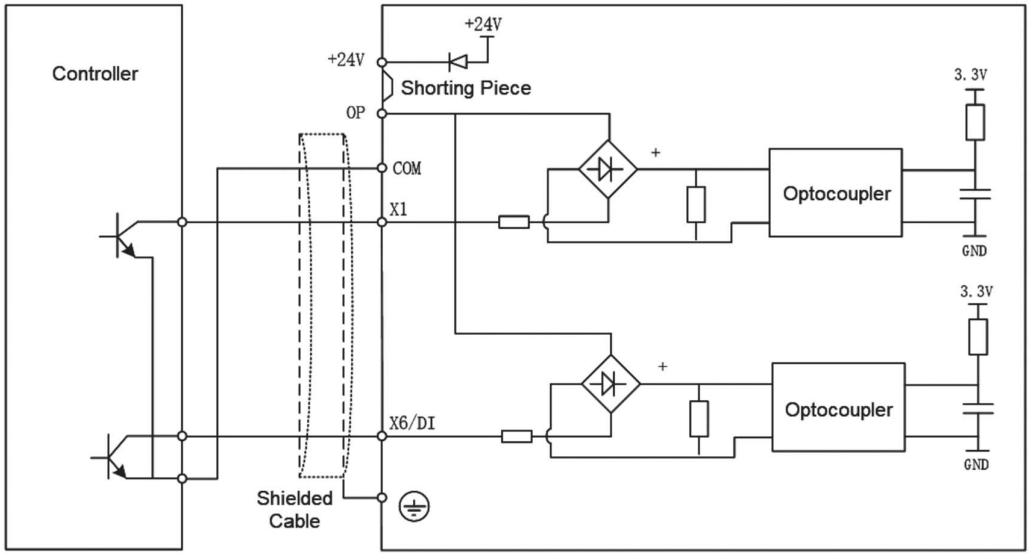


Figure 3-10 Using external power supply open collector NPN wiring method

When using an external power supply, the short circuit piece between +24V and OP must be removed, otherwise, the product will be damaged; the voltage range of the external power supply is DC20~30V, otherwise, normal operation cannot be guaranteed and may even damage the product.

Open collector PNP wiring method

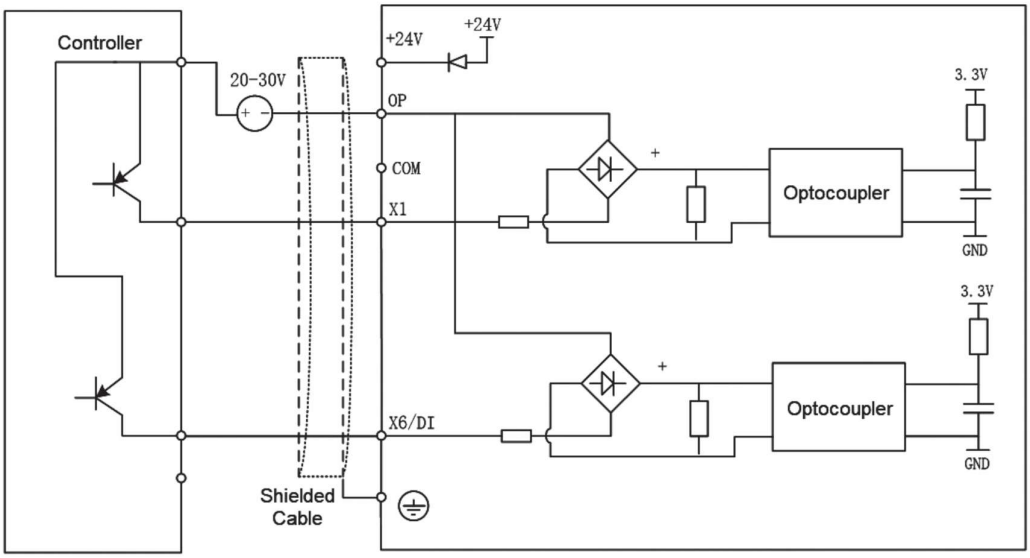


Figure 3-11 Using internal power supply open collector PNP wiring method

When using PNP wiring method, the shorting piece between +24V and OP must be removed and reconnected to between OP and COM, otherwise, it cannot work properly.

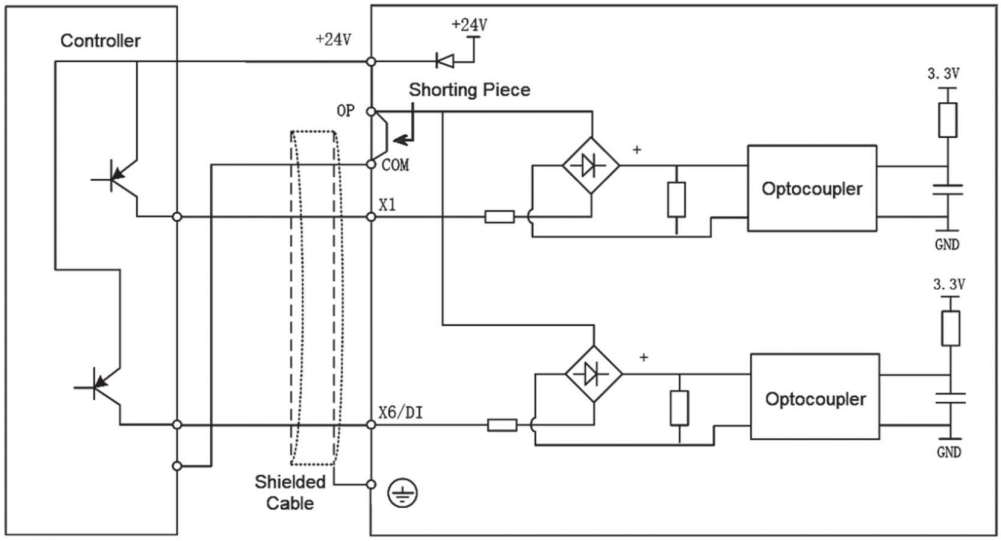
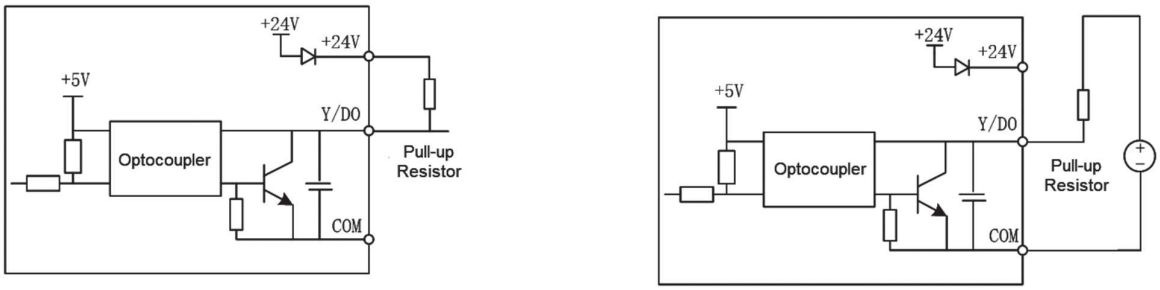


Figure 3-12 Open-collector PNP wiring using external power supply

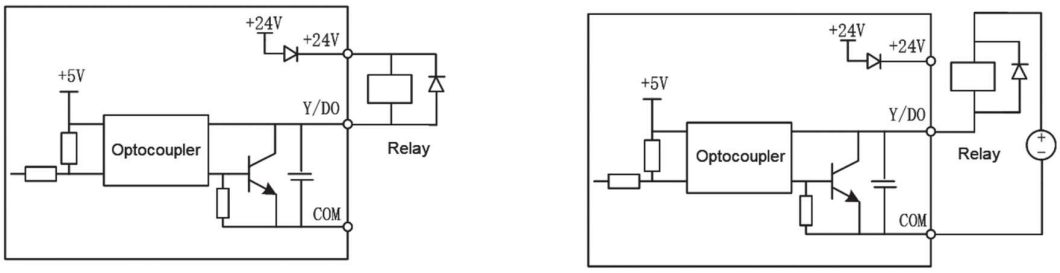
Using internal power supply b) Using external power supply When using the PNP wiring method, the shorting piece between +24V and OP must be removed and reconnected to between OP and COM, otherwise, it cannot work properly. When using an external power supply, the short circuit piece between +24V and OP must be removed, otherwise, the product will be damaged; the voltage range of the external a power supply is DC20~30V, otherwise normal operation cannot be guaranteed and may even damage the product.

3.3.2 Instructions for using the switch output terminal



a) Using internal power supply b) Using external power supply

Figure 3-13 Wiring method when Y/DO terminal is connected to pull-up resistor output



a) Using internal power supply b) Using external power supply

Figure 3-14 Wiring method when Y/DO terminal drives relay

When the Y/DO terminal is set to pulse output, it can output a 0~50kHz pulse signal.

1) When using the relay coil voltage is lower than 24V, it is necessary to add the resistance between the relay and output terminal to divide the voltage according to the coil impedance, relay output terminal wiring instructions.
2) THYRA-CTE series inverter control board has a set of programmable relay dry contact outputs.
3) The relay contacts are RA/RB/RC, where RA and RB are normally closed contacts and RA and RC are normally open contacts, whose function is defined in the function code.
4) If the drive inductive load (such as electromagnetic relays or contactors), should be installed with surge voltage absorption circuit, such as RC absorption circuit (note that its leakage current should be less than the holding current of the controlled contactor or relay), varistor or current-continuing diode (for DC electromagnetic circuit, installation must pay attention to polarity). Absorption circuit components should be installed close to the coil ends of the relay or contactor.

3.3.3 Signal switching jumper switch function description

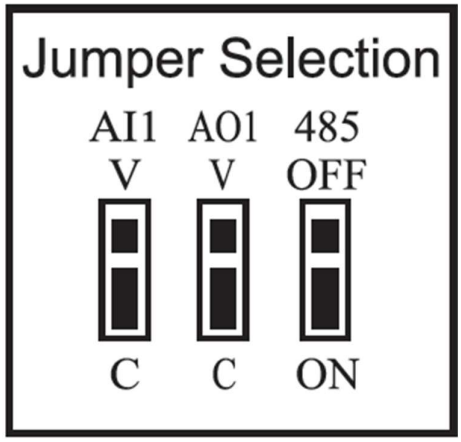


Figure 3-15 Signal switching jumper switch diagram

Category	Terminal Symbols	Terminal Name
485	485 Terminating resistor selection: ON for 100Ω terminating resistor, OFF for no terminating resistor	OFF: No resistance
AI1	AI1 analog type selection: C is current input (0~20mA), V is voltage input (0~10V)	V: 0~10V
AO1	AO1 analog type selection: C is current output (0~20mA), V is voltage output (0~10V)	V: 0~10V

3.4 EMC problems in wiring

The working principle of the inverter determines that it will generate a certain amount of noise, which will affect and interfere with other equipment; at the same time, the weak electrical signals inside the inverter are also susceptible to interference from the inverter itself and other equipment, in order to reduce or eliminate the interference of the inverter to the outside world and the interference of the inverter by the outside world, this section on the suppression of noise, grounding treatment, the suppression of leakage current, the application of power supply filters to make some brief explanations in several aspects This section provides a brief explanation of noise suppression, grounding treatment, leakage current suppression, and power supply filter application.

3.4.1 Noise suppression countermeasures

When the peripheral equipment and inverter share the same system power supply, the noise generated by the inverter will spread to other equipment in the same system through the power line and cause disoperation, the following measures can be taken at this time.

1) Adding an input noise filter to the input of the inverter.
2) Adding a power filter to the power input of the affected equipment.
3) Use isolation transformer to isolate the noise transmission path between other equipment and inverter.

The wiring of the peripheral equipment and the inverter forms a loop, which will cause the equipment to operate by mistake. At this time, if the grounding of the equipment is disconnected, it will reduce the false operation.

1) Easily affected equipment and signal lines should be installed as far away from the inverter as possible.
2) The signal line should use shielded cable and the shield layer is reliably grounded, or the signal line cable can be set into the metal tube, the distance between the metal tube is at least 20cm, and should be as far as possible from the inverter and its peripheral devices and cables, avoid the signal line, power line parallel wiring or bundled with the power line into a bundle wiring. Signal lines should be kept orthogonal to the crossing when they must cross power cables.

3) The motor cable line should be placed in a larger thickness of the barrier, such as the placement of more than 2mm thickness of the pipe or buried in a cement tank, or the power line can be placed in a metal tube and grounded with a shielded cable.
4) Use 4-core motor cable, one of which is grounded at the near end of the inverter, and the other side is connected to the motor housing.
5) The input and output of the inverter are equipped with radio noise filters and linear noise filters such as ferrite common mode chokes to suppress the radiation noise of the power line.

3.4.2 G rounding treatment

Recommend the use of special grounding as follows.

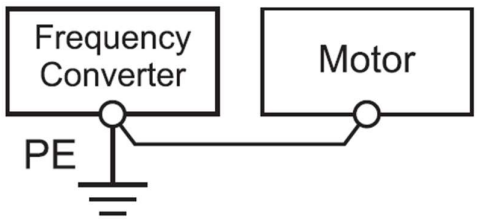


Figure 3-16 Grounding treatment

1. The largest possible standard size of grounding cable should be used to reduce the impedance of the grounding system.
2. The ground wire is as short as possible, and the grounding point is as close as possible to the inverter
3. Four-core motor cable in a wire should be grounded on the inverter side, the other side connected to the motor grounding terminal, if the motor and inverter have a special grounding pole, the effect is better.
4. When the grounding end of each part of the system is connected, the leakage current becomes a noise source and will affect other equipment in the system, so the grounding end of the inverter and other equipment susceptible to interference need to be separated.
5. The arrangement of grounding cables should be far from the noise-sensitive equipment input and output wiring.

3.4.3 Leakage current suppression

The leakage current flows through interline and ground distribution capacitors on the input and output side of the inverter, and its size is related to the capacitance of the distribution capacitor and the carrier frequency. The leakage current is divided into two types: leakage current to ground and leakage current between lines.

1. Leakage current to ground is not only circulating inside the inverter system, it may affect other equipment because of the ground loop, and these leakage currents may cause the leakage protector and other equipment to malfunction. The higher the carrier frequency of the inverter, the greater the leakage current to ground; the longer the motor cable, the greater the parasitic capacitance, the greater the leakage current to ground. Therefore, reducing the carrier frequency and using the shortest possible motor cable is the most direct and effective way to suppress the leakage current to ground.
2. Flowing through the inverter output side of the cable between the interline leakage current, its high harmonics will accelerate the aging of the cable, but also may make other equipment disoperation. The higher the carrier frequency of the inverter, the greater the interline leakage current; the longer the motor cable, the greater the parasitic capacitance, the greater the interline leakage current. Therefore, reducing the carrier frequency and choosing the shortest possible motor cable is the most direct and effective way to suppress the leakage current to the ground. Increasing the output reactor can also effectively suppress the size of the interline leakage current.

3.4.4 The use of power supply filters

A frequency converter belongs to equipment that can produce strong interference and is sensitive to external interference, it is recommended to use a power filter. The following points need to be noted when using.

1. The filter body shell should be reliably grounded.
2. The input and output lines of the filter are as far away from each other as possible to avoid coupling between them.
3. The filter as far as possible against the inverter end, and the filter and inverter must be connected to the same common ground.

CHAPTER - 4
OPERATION AND DISPLAY

4.1 Operation and display interface introduction

With the operation panel, you can modify the functional parameters of the product, monitor the working status of the product and control the operation of the product (start, stop), etc. Its appearance and functional area are shown in the figure below.

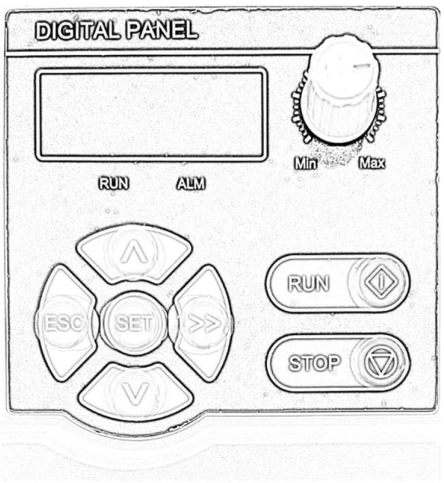


Figure 4-1 Schematic diagram of the operation panel

1. Status indicator light description.
   WD/REV: When stopping, FWD light is on to indicate that the product is in positive rotation command; when running, it indicates positive rotation operation status; when FWD is flashing, it indicates that the product is switching from positive rotation status to reverse rotation status. When stopped, the REV light is on, it means the product reversing command is valid, or reversing the running state, when REV is flashing, it means the product is switching from the reversing state to the forward state.
2. Unit indicator.
   Hz frequency unit; **A** current unit; **V** voltage unit
   RPM (Hz+A) speed unit % **(A+V)** percent
3. Digital display area.
   The 5-digit LED display shows the set frequency, output frequency, various monitoring data alarm codes, etc.
4. Keyboard button description table.

Table 4-1 Keypad Menu

Button	Name	Function
ESC/PRG	Programming Keys	First-level menu entry or exit
SET	Confirm button	Step-by-step access to the menu screen and confirmation of setting parameters
△	Incremental keys	Increment of data or function codes
▽	Decrease key	Decrement of data or function codes
SHIFT (>>)	Shift key	In the stop display interface and the operation display interface, the display parameters can be cyclically selected; when modifying the parameters, the modification bit of the parameters can be selected.
RUN	Run button	For running operations in keyboard operation mode
STOP	Stop/Reset	When running state, press this key can be used to stop running operation; when fault alarm state, it can be used to reset operation, the characteristics of this key are governed by function code F7-16.

4.2 Function code view modification method description

The parameter group of THYRA-CTE series inverter contains a secondary menu structure, which can be modified and set through the operation panel. The steps for setting and modifying the parameters are as follows.

A. In the monitoring state, press the key **"ESC/PRG"** to enter the function code parameter display state.
B. In the parameter code display state, by **"SHIFT(>>)"** button, the parameter function code parameter bit flashes, then the current flashing bit data can be modified.
C. Modify the blink parameter group to modify the target function code by using the / button.
D. "SET" button to enter the parameter function code.
E. Modify to the target parameter value, "SET" button, confirm the modified parameter value.
F. After the parameter modification is completed, the current display function code automatically jumps to the next valid display function code to complete the parameter modification.

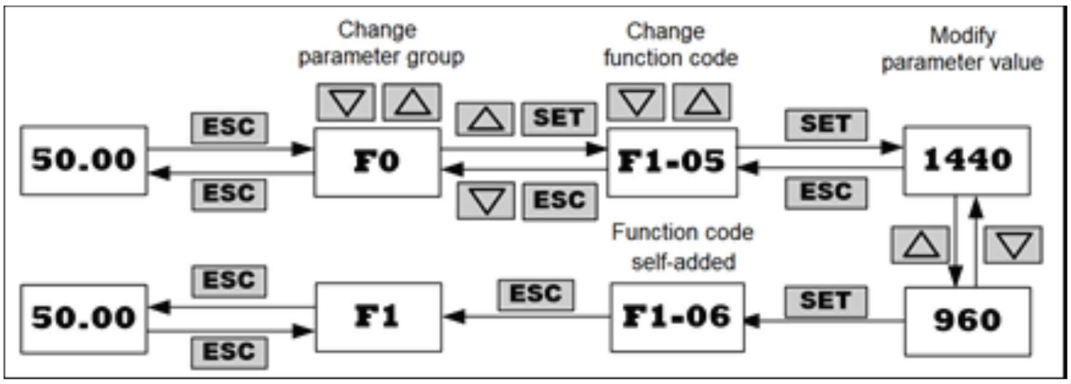


Figure 4-2 Parameter modification flow chart

4.3 Monitoring status display

4.3.1 Monitoring parameter switching in the shutdown state

In the stop state, the set frequency is displayed by default, you can switch to display other parameters by setting F7-05 parameter and "SHIFT (>>)" key. If we want to see the bus voltage in addition to the set frequency in the stop state, we set F7-05=0001 (the setting method refers to the setting method of the function code parameter). By "SHIFT (>>)" key, you can switch the display content in the shutdown state determined by F7-05.

4.3.2 Switching of monitoring parameters in the operating state

In the running state, the default display shows the running frequency high, and when the "SHIFT (>>)" button is pressed, it switches to the display value set by F7-03 and F7-04. If the bus voltage value needs to be monitored during operation, the F7-03-digit BIT2 is set to 1, then it is switched to the bus voltage value by "SHIFT (>>)" during operation.

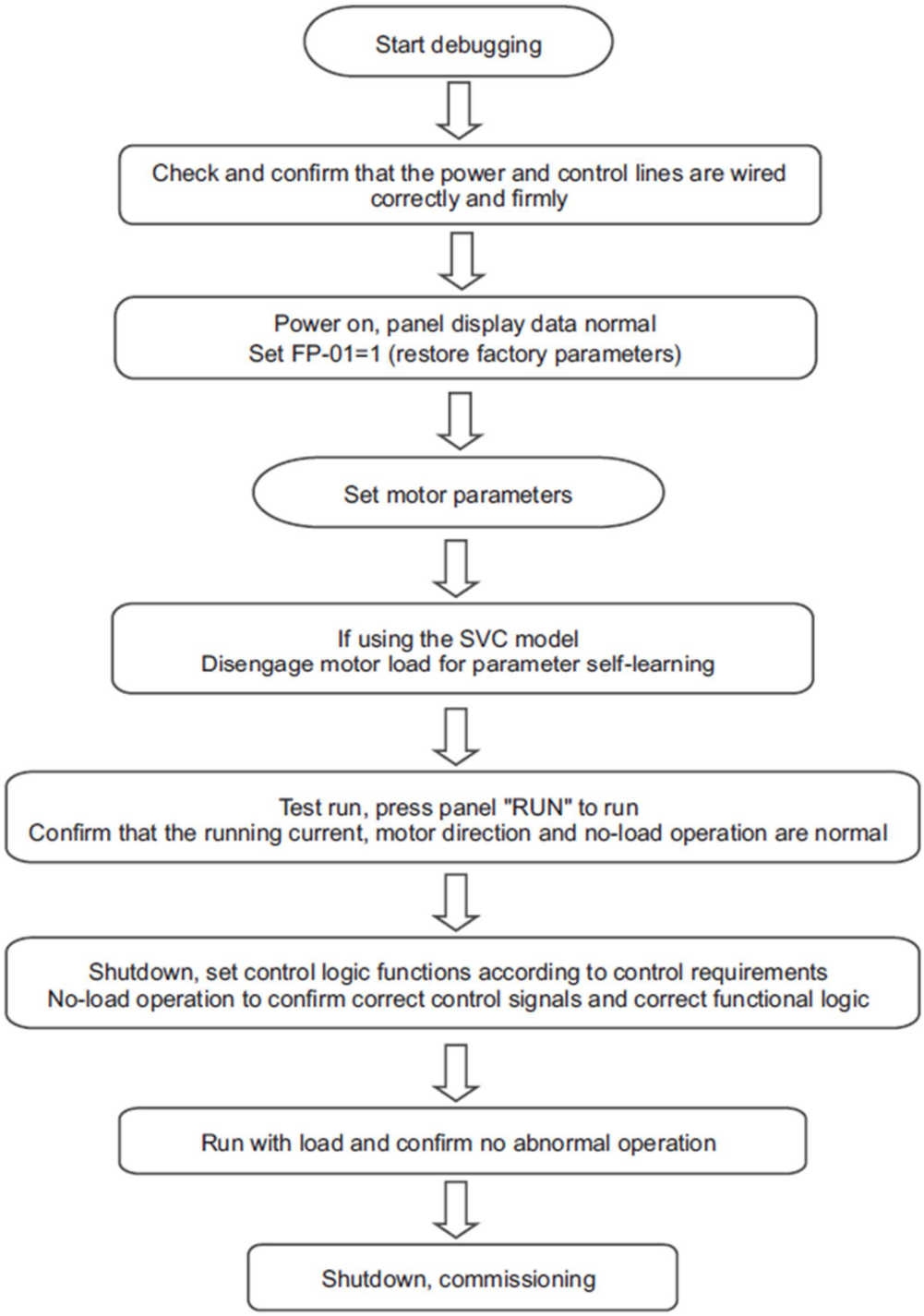
4.3.3 Direct modification of the digital frequency

In the shutdown, fault or operation state, if the digital function terminal UP/ DOWN is valid, or / on the operation panel, it directly enters the digital frequency parameter modification state, and the modified frequency, is directly written into the F0-04 parameter group

CHAPTER - 5
BASIC OPERATION AND COMMISSIONING

The basic commissioning of the inverter mainly includes the frequency command setting of the inverter, the control of start and stop, and the simple commissioning and operation of the inverter-controlled motor can be realized according to the following contents.

5.1 Rapid commissioning process



5.2 Introduction to common functions

5.2.1 Confirmation before power on

Please be sure to check the following items before turning on the power.

Projects	Content
Confirmation of power supply voltage	Please confirm if the power supply voltage is correct: single-phase AC220V 50/60Hz
	Three-phase AC380V~480V 50/60Hz
	Please wire the power input terminals **R/S/T** reliably.
Connection confirmation of inverter output terminal and motor terminal	Make sure the connection between the output terminal **U/V/W** and the motor terminal is secure.
Confirmation of connection with inverter control circuit terminals	Make sure that the control circuit terminals and other control devices are securely connected.
Status confirmation of inverter control terminals	Make sure that the control circuit terminals are all OFF.
Load Confirmation	Please make sure that the motor is not connected to the mechanical system because it is not in the no-load condition.

5.2.2 Display status confirmation after power on

When the power is turned on, the operator in the normal state is displayed as shown below.

Status	Show	Description
Normal time	50.00	Factory default display is digital setting 50.00Hz
In case of failure	Er. XX	The inverter is shut down when the fault occurs, and the type of fault is displayed

5.2.3 Parameter initialization

The settings of the inverter can be restored to the factory settings, and after initialization, the FP-01 parameter values are automatically zeroed.

Parameter initialization		Factory value: 0	Description
FP-01	0	No operation	
	1	Restore factory parameters Motor parameters are not included	Inverter function parameters are restored to factory values, but not including motor parameters
	2	Clear Recorded Information	Clear the inverter fault log information.

5.2.4 Selecting the motor control method

Function Code	Description	Applications
F0-01. Select motor control method	Set to 0: SVC vector control without speed sensor	Open-loop vector control for the usual high-performance control situations.
	Set to 2: V/F control (speed open-loop control)	Suitable for lighter loads.

5.2.5 Selecting the start/stop command channel

Select the input channel for inverter control commands. The control commands include: start, stop, forward, reverse, and jog, etc.

Command selection		Factory value: 0	Description
FO-02	0	Operation Panel	Operation command control by RUN, STOP/RES keys on the operation panel
	1	Connector	Operation command control by multi-function input terminal functions FWD, REV, JOGF, JOGR, etc.
	2	Communication	Operation commands are given by the host computer via communication

CHAPTER - 6
FUNCTIONAL PARAMETERS TABLE

6.1 Summary table of function code groups of THYRA-CTE series inverters.

Classification	Function code sets
Group F: Operation parameter setting	F0: Basic function group F1: Motor parameter setting group F3: V/F control curve parameter setting group F4: Analog/digital signal input setting group F5: Analog/digital signal output setting group F6: Start/stop parameter setting group F7: Display parameter setting group F8: Frequency auxiliary setting parameter group F9: Protection function parameter group FA: PID function parameter group FC: Multi-Segment Instruction Group FD: Communication parameter group FP: Function code management parameter group
P group: industry non-standard parameter setting	P0: Torque control parameter group P5: Control optimization parameter set
Group U: Surveillance	U0: Status monitoring parameter group

6.2 F unction parameter table

Set F7-11 to a value other than 0, that is, the parameter protection password is set. After exiting, press the confirm key, and "0.0.0.0.0." will be displayed to prompt you to enter the user password. You must enter the password correctly before you can enter. Cancel the password, F7-11 needs to be set to 0.

Groups F0-F9, FA, FB, FC, and FD are basic function parameters, and group U0 is monitoring function parameters. The symbols in the function table are explained as follows:

"√": Indicates that the setting value of this parameter can be changed when the inverter is in shutdown or running state;
"×": indicates that the setting value of this parameter cannot be changed when the inverter is running;
"○": Indicates that this parameter is the actual detection record value and cannot be changed;

function code	Name	Predetermined area	Factory	Change
F0 Basic Function Group				
F0-01	Motor control method	2： V/F control	2	×
F0-02	Run command channel selection	0: Operation panel command channel (LED off) 1: Terminal command channel (LED is on) 2: Communication command channel (LED flashing, address 2000H)	0	√
F0-03	Main frequency source A selection	0: Digital setting (preset frequency F0-08, UP/DOWN can be modified, not memorized when the power is off) 1: Digital setting (preset frequency F0-08, UP/DOWN can be modified power-off memory) 2: AI1 3: External potentiometer knob 4: Keyboard potentiometer 6: Multi-segment instructions 7: Simple PLC 8: PID 9: Communication given (address 1000H)	4	×

F0-04	Auxiliary frequency source B selection	0: Digital setting (preset frequency F0-08, UP/DOWN cannot be modified, and will not be remembered after power failure) 1: Digital setting (preset frequency F0-08, UP/DOWN cannot be modified, power-off memory) 2: AI1 3: External potentiometer knob 4: Keyboard potentiometer 6: Multi-segment instructions 7: Simple PLC 8: PID 9: Communication given (address 1000H)	0	×
F0-05	Auxiliary frequency source B during superposition Reference object selection	0: relative to maximum frequency 1: Relative to frequency source A	0	√
F0-06	Superimposed auxiliary frequency source B range	0%～150%	100%	√
F0-07	Frequency source overlay selection	Units digit: frequency source selection 0: Main frequency source A 1: Main and auxiliary operation results (The operation relationship is determined by the tens digit) 2: Switching between main frequency source A and auxiliary frequency source B (terminal function 18) 3: Switching between main frequency source A and main and auxiliary operation results (terminal function 18) 4: Switching between auxiliary frequency source B and main and auxiliary operation results (terminal function 18) Ten's digit: main and auxiliary operation relationship between frequency sources 0: Main + Auxiliary 1: Main-auxiliary 2: The maximum value of the two 3: The minimum value of the two	02	√
F0-08	Preset frequency	0.00Hz～maximum frequency (F0-10)	50.00Hz	√
F0-09	Running direction adjustment	0: Same direction 1: Opposite direction	0	√
F0-10	Maximum frequency	50.00Hz～300.00Hz	50.00Hz	×

F0-11	Upper limit frequency source	0: F0-12 setting 1: AI1 3: Keyboard potentiometer	0	×
F0-12	Upper limit frequency	Lower limit frequency F0-14～maximum frequency F0-10	50.00Hz	√
F0-13	Upper limit frequency offset	0.00Hz～maximum frequency F0-10	0.00Hz	√
F0-14	lower limit frequency	0.00Hz～upper limit frequency F0-12	0.00Hz	√
F0-15	Carrier frequency setting	0.75kHz～14.0kHz (the highest carrier frequency is related to the model)	Model Confirmed	√
F0-16	Carrier adjusts with temperature	0: invalid; 1: Valid	1	√
F0-17	Acceleration time 1	0.00s～32000s	Model Confirmed	√
F0-18	Deceleration time 1	0.00s～32000s	Model Confirmed	√
F0-19	Acceleration and deceleration time unit	1: 0.1 seconds; 2: 0.01 seconds	1	×
F0-22	Frequency command resolution	1：0.1Hz； 2：0.01Hz	2	×
F0-23	Digital setting UFDN frequency shutdown memory selection	0: No memory; 1: Memory	1	√
F0-25	Acceleration and deceleration time base frequency	0: Maximum frequency (F0-10) 1: Set frequency 2: 100Hz	0	×
F0-27	Command source bundled frequency source	Units digit: Operation panel command binding frequency source selection 0: No binding 1: Digital setting frequency 2: AI1 3: External keyboard potentiometer 4: Keyboard potentiometer 6: Multi-speed 7: Simple PLC 8: PID 9: Communication given **Tens digit**: terminal command binding frequency source selection **hundreds digit**: communication command binding frequency source selection **Thousands digit**: Automatically run binding frequency source selection	0000	√

F1 Group Motor 1 Parameters				
F1-00	Motor type selection	0：Ordinary asynchronous motor	0	×
F1-01	Motor rated power	0.1kW～1000.0kW	Model Confirmed	×
F1-02	Motor rated voltage	1V～1000V	Model Confirmed	×
F1-03	Motor rated current	0.01A～320.00A (inverter power <=55kW) 0.1A～3200.0A (inverter power >55kW)	Model Confirmed	×
F1-04	Motor rated frequency	1.00Hz～maximum frequency	50.00Hz	×
F1-05	Motor rated speed	1rpm～32000rpm	1460rpm	×
Group F3 V/F control parameters				
F3-00	VF curve settings	0: Straight line V/F 1: Multi-point V/F (F3-03 to F3-08) 2: Square V/F	0	×
F3-01	Torque boost	0.0%: (automatic torque boost) 0.1%～30.0%	Model Confirmed	√
F3-02	Torque boost cutoff frequency	0.00Hz～maximum frequency	50.00Hz	×
F3-03	Multipoint VF frequency value	0.00Hz～F3-05	5.00Hz	×
F3-04	Multi-point VF voltage value V1	0.0%～100.0%	15.0%	×
F3-05	Multipoint VF frequency value F2	F3-03～F3-07	17.50Hz	
F3-06	Multi-point VF voltage value V2	0.0%～100.0%	45.0%	
F3-07	Multipoint VF frequency value F3	F3-05～Motor rated frequency (F1-04)	35.00Hz	×
F3-08	Multi-point VF voltage value V3	0.0%～100.0%	80.0%	×
F3-09	Multipoint VF frequency value F1	0.0%～200.0%	0.0%	√

F3-10	VF overexcitation gain	0～200	32	√
F3-14	AVR automatic voltage stabilization function selection	0: invalid 1: Valid throughout the process 2: Invalid only when decelerating	0	√
Group F4 input terminal				
F4-00	X1 terminal function selection	0: No function 1: Forward running (FWD) 2: Reverse operation (REV) 3: Three-line operation control 4: Forward jog (FJOG) 5: Reverse jog (RJOG) 6: Terminal UP 7: Terminal DOWN 8: Free parking on all channels 9: Fault reset (RESET) 10: Running paused 11: External fault normally open input 12: Multi-segment command terminal 1 13: Multi-segment command terminal 2 14: Multi-segment command terminal 3 15: Multi-segment command terminal 4 16: Acceleration and deceleration time selection terminal 1 17: Acceleration and deceleration time selection terminal 2 18: Frequency source switching (the ones digit of F0-07 is 2, 3, and 4 valid) 19: UP/DOWN setting clear (terminal, keyboard) 20: Control command switching terminal 1 (F0-02 is the terminal communication channel, switches to keyboard control when closed) 21: Acceleration and deceleration prohibited 22: PID pause 23: PLC status reset 25: Counter input 26: Counter reset 32: Immediate DC braking 33: External fault normally closed input (E-15 emergency stop) 34: Frequency modification prohibited 35: PID action direction is reversed 36: External parking terminal 1 (only keyboard control is valid, this terminal is closed to stop, which is equivalent to STOP on the keyboard key function)	1	×
F4-01	X2 terminal function selection		2	×
F4-02	X3 terminal function selection		9	×
F4-03	X4 terminal function selection		0	×
F4-04	reserve		0	

		37: Control command switching terminal 2 (When F0-02 is terminal control, the terminal is closed and switched to communication control; when F0-02 is communication control, the terminal is closed and switched to terminal control. When F7-01 = 1, the terminal is closed. invalid) 39: Switching between frequency source A and digital frequency (B0.08) 40: Switching between frequency source B and digital frequency (B0.08)		
F4-11	Terminal command mode	0: Two-wire type 1 (Forward rotation terminal operates in forward direction, reverse rotation terminal operates in reverse direction) 1: Two-wire type 2 (Forward rotation terminal controls start and stop, reverse rotation terminal selects direction) 2: Three-wire type 1 (Forward rotation terminal pulse starts forward rotation, reverse rotation terminal pulse starts reverse rotation, and three-wire terminal is normally closed) 3: Three-wire type 2 (Forward rotation terminal pulse start and stop operation, reverse rotation terminal to select direction, three-wire terminal normally closed)	0	×
F4-12	Terminal UP/DOWN change rate	0.01Hz/s～100.00Hz/s	2.00Hz/s	√
F4-13	AI1 minimum input	0.00V～F4-15	0.10V	√
F4-14	AI1 minimum input corresponding setting	-100.0%～+100.0%	0.0%	√
F4-15	AI1 maximum input	F4-13～+10.00V	9.90V	√
F4-16	AI1 maximum input corresponding setting	-100.0%～+100.0%	100.0%	√
F4-17	AI1 filter coefficient	0～20	3	√

F4-17	AI1 filter coefficient	0～20	3	√
F4-34	AI1 is below the minimum input setting selection	0: Corresponds to the minimum input setting 1：0.0%	0	√
F4-35	X1 closing delay time	0.000～6.000s	0	√
F4-36	X1 disconnect delay time	0.000～6.000s	0	√
F4-37	X2 closing delay time	0.000～6.000s	0	√
F4-38	X2 Disconnect delay time	0.000～6.000s	0	√
F4-39	X3 closing delay time	0.000～6.000s	0	√
F4-40	X3 Disconnect delay time	0.000～6.000s	0	√
F4-41	X4 closing delay time	0.000～6.000s	0	√
F4-42	X5 Disconnect delay time	0.000～6.000s	0	√
Group F5 output terminal				
F5-01	open collector Y output function selection (F5-00= 1 valid)	0: No output 1: The inverter is running 2: Fault output (fault shutdown) 3: Frequency level detection FDT1 output 4: Frequency arrival 5: Running at zero speed (no output when stopped) 8: The set count value is reached 9: The specified count value is reached 11: PLC cycle completed 13: Frequency is limited 15: Ready to run 17: Upper limit frequency reached 18: Lower limit frequency reached (related to operation) 19: Undervoltage status output 20: Communication settings (address 2000H) 24: Accumulated power-on time reached 33: Reverse operation in progress 35: Module temperature reaches 36: Output current exceeds limit	0	√
F5-02	Relay RA-RB-RC Function selection		2	√

F5-06	Reserved	0: Operating frequency 1: Set frequency 2: Output current 5: Output voltage	0	√
F5-07	AO1 Output selection		0	
F5-08	Reserved		1	
F5-13	AO1 Maximum Output Voltage	0.00V~10.00V	10.00V	√
F5-14	AO1 Upper limit percent	0.0% ~ 100.0%	100.0%	√
F5-15	AO1 Min output voltage	0.00V~10.00V	0.00v	√
F5-16	AO1 Lower limit percent	0.0% ~ 100.0%	0.0%	√
F5-21	Lower than Lower output limit selection	0: output 0V; 1 output lower limit	1	√
F5-22	Digital output specified value	0: Closed; 1: Open	1	√
F5-23	AO1 output percentage specified value	0.0% ~ 100.0%	0.0%	√
F5-26	Relay on delay		0.0s	√
F5-27	Relay off delay		0.0s	√
F5-32	Digital terminal logic output inverse	unit digit: - Y Open Collector 10 bits: Relay 0: no Inverse; 1: inverse	000	X
F6 Group Start/Stop Control				
F6-00	Start-up method	0: Direct start 1: Reserve 2: DC Brake start	0	√
F6-03	Start-up frequency	0.00Hz~10.00Hz	0.00HZ	√
F6-04	Start frequency hold time	0.0s~100.0s	0.0s	X
F6-05	Start DC braking current	0%~100%	0%	X
F6-06	Start DC braking time	0.0s~100.0s	0.0s	X
F6-10	STOP method	0: Slow down and stop 1: Free stop	0	√
F6-11	Stop DC braking starting frequency	0.00Hz~maximum frequency	0.00Hz	√
F6-12	Stop DC brake waiting time	0.0s~100.0s	0.0s	√

F6-13	Stopping DC braking current	0%~100%	50%	√
F6-14	Stopping DC braking time	0.0s~100.0s	0.0S	√
F6-16	Continued operation enable After Auto reset	0: disable, 1: enable	1	√
F6-18	Tap Stop mode	0: Slow down and stop 1: Free stop	0	√
F7 Group Keyboard and Display				
F7-01	Quick Key function selection	0: keypad invalid 1: Switching between the operation panel command channel and the remote command channel (Terminal command channel or communication command channel) 2: Forward and reverse rotation switching 3: Forward rotation pointing 4: Reverse Rotation pointing	2	X
F7-02	STOP/RESET key function	0: Only in the keyboard operation mode, STOP/RESET key stop function is effective 1: STOP/RESET key stop function is valid under any operation mode (free stop in case of terminal or communication control\) 2: Under any channel it is valid (When the terminal or communication channel EO37 Keyboard stop fault is reported)	0	√
F7-03	LED operation display parameter	00: Operating frequency 01: Set frequency	0	√
F7-05	LED stop display parameter	02: Bus Voltage 03: output voltage 04: output current 07: X Digital input terminal status 08: Y digital output terminal status 09: AI1 Voltage (V) 11: Reserved 12: current value 14: Load speed display 15: PID Setting 16: PID Feedback 17: PLC Stage	1	√
F7-06	Load speed display coefficient	0.001~32.000	1.000	√
F7-07	Inverter module heat sink temperature	0.0C~100.0C	-	0
F7-10	Braking voltage action point	100% ~ 160% Standard bus voltage	128%	√
F7-11	user password	0~32766	0	√
F7-13	accumulated power-up time	0h~32767h	-	0

F8 Group Auxiliary Function				
F8-00	JOG Frequency	0.00Hz～maximum frequency	2.00Hz	√
F8-01	Jog Acc Time	0.0s～3200.0s	20.0s	√
F8-02	Jog Dec Time	0.0s～3200.0s	20.0s	√
F8-03	Acc Time-2	0.0s～3200.0s	Model Confirmed	√
F8-04	Dec Time-2	0.0s～3200.0s	Model Confirmed	√
F8-05	Acc Time-3	0.0s～3200.0s	Model Confirmed	√
F8-06	Dec Time-3	0.0s～3200.0s	Model Confirmed	√
F8-07	Acc Time-4	0.0s～3200.0s	Model Confirmed	√
F8-08	Dec Time-4	0.0s～3200.0s	Model Confirmed	√
F8-12	Forward and reverse dead time	0.0s～3200.0s	0.0s	√
F8-13	Reverse control enabled	0: Allow 1: Forbidden	0	√
F8-14	The set frequency is lower than the lower limit frequency operation mode	0: Operates at the lower frequency limit 1: Standby Operation no voltage output 2: Zero Speed operation with certain DC voltage	0	√
F8-15	sag control	0.00Hz～10.00Hz	0.00Hz	√
F8-16	Set the cumulative power-on arrival time	0h～32000h	0h	√
F8-18	Terminal operation protection selection	Units digit: power-on protection 0: No protection 1: Protection Hundreds digit: running protection after normal power-on 0: No protection 1: Protection	0	×
F8-19	Frequency detection value（FDT1）	0.00Hz～maximum frequency	50.00Hz	√
F8-20	Frequency detection hysteresis value（FDT1）	0.0%～100.0% (FDT1 level)	5.00%	√
F8-21	Frequency reaches detection width	0.0%～100.0% (maximum frequency)	5.00%	√
F8-23	Fan operating mode	0: Always running; 1: The fan runs when the inverter runs.	1	√
F8-36	Output current exceeds a limit value	0.0% (not detected) 0.1%～300.0% (motor rated current)	200.00%	√
F8-37	Output current over-limit detection delay time	0.00s～60.00s	0.00s	√
F8-54	Set count value	1～32000	1000	√
F8-55	Specify count value	1～32000	1000	√

Group F9 Fault and Protection				
F9-00	Motor overload protection selection	0: Forbidden 1: Allowed	1	√
F9-01	Motor overload protection coefficient	20.0%～125.0%	100.0%	√
F9-03	Overvoltage stall gain	0～100	0	√
F9-04	Overvoltage stall protection voltage	115%～150%	135%	√
F9-05	Overcurrent stall gain	0～100	20	√
F9-06	Overcurrent stall protection current	100.0%～210.0%	165.00%	√
F9-09	Number of automatic fault resets	0～20	0	√
F9-10	Fault output terminal action selection during automatic fault reset	0: No action; 1: Action	0	√
F9-11	Automatic fault reset interval	0.100s～32.000s	1.000s	√
F9-14	First fault type	0: No fault 1: IGBT short circuit fault 2: Acceleration overcurrent 3: Deceleration overcurrent 4: Constant speed overcurrent5：加速过电压 6: Deceleration overvoltage 7: Constant speed overvoltage 8: Shutdown overvoltage 9: Under voltage 10: Frequency converter overload 11: Motor overload 14: Module overheating 15: External fault 16: Communication abnormality 21: Parameter reading and writing exception 22: Inverter hardware abnormality (clear latch timeout) 29: Power-on time arrives 31: PID feedback disconnection fault 32: PID feedback is too large (overpressure) fault 37: Keyboard STOP key shutdown failure 41: The number of automatic resets exceeds the limit		○
F9-15	Second fault type			
F9-16	The third (most recent) fault type			

F9-17	Frequency of the third (most recent) failure			○
F9-18	The current during the third (most recent) fault			○
F9-19	Bus voltage at the third (most recent) fault			○
F9-23	Cumulative power-on time for the third (most recent) failure			○
F9-27	The frequency of the second failure			○
F9-28	The current during the second fault			○
F9-29	Bus voltage during the second fault			○
F9-33	Accumulated power-on time during the second fault			○
F9-37	First failure frequency			○
F9-38	Current at first fault			○
F9-39	Bus voltage at first fault			○
F9-43	Accumulated power-on time when the first fault occurred			○

Group FA PID function				
FA-00	PID given source	0: FA-01 setting 1: AI1 3: Keyboard potentiometer 5: Communication given (address 1000H）	0	√
FA-01	PID value given	0.00 kg~FA.04 (When changing the pressure gauge range, it automatically changes to 0)	0 Kilogram	√
FA-02	PID feedback source	0:AI1 2: Keyboard potentiometer	0	√
FA-03	PID action direction	0: positive effect; 1: negative effect	0	√

FA-04	Pressure gauge range	0.00~99.99 kg Pressure gauge 1.0MFA when setting FA-04 = 10.00 kg Pressure gauge 1.6MFA when setting FA-04 = 16.00 kg	16 Kilogram	×
FA-05	proportional gain	0～32000 (the larger the value, the faster the adjustment speed)	800	√
FA-06	integral gain	0～32000 (the larger the value, the faster the adjustment speed)	1500	√
FA-09	PID deviation limit	0.0%～100.0%	0.00%	√
FA-10	Arousal pressure deviation percentage	0.0%～100.0%	80.00%	√
FA-11	Arousal pressure deviation percentage	0.0s～600.0s	2.0s	√
FA-12	sleep frequency	0.00HZ～maximum frequency, 0.00HZ does not sleep; During the operation of the frequency converter, when the operating frequency is less than or equal to the FA-12 sleep frequency, after the FA-13 delay time, the frequency converter enters the sleep state; if the feedback pressure is less than (pressure setting value * FA-10), wake-up timing will be performed , when the wake-up time exceeds the FA.11 wake-up delay time, the inverter exits the sleep state and restarts. Newly start PID frequency adjustment.	0.00HZ	√
FA-13	sleep delay time	0.0s～600.0s	10.0s	√
FA-24	PID Feedback excessive detection value	0.0%～100.0% (100.0% is not detected) When the feedback pressure continues to be higher than FA-24 and the time exceeds FA-25, E032 excessive feedback or overpressure fault will be reported.	100.00%	√
FA-25	PID feedback excessive detection time	0.0s～600.0s	1.0s	√
FA-26	PID feedback disconnection detection value	0.0%: Do not judge feedback loss 0.1%～100.0% When the feedback pressure continues to be lower than FA-26 and the time exceeds FA-27, E031 feedback disconnection fault will be reported.	0.00%	√
FA-27	PID Feedback disconnection detection time	0.0s～600.0s	3.0s	√

FC group multi-segment instructions, simple PLC				
FC-00	Multi-segment instruction 0	-100.0%～100.0%	0.00%	√
FC-01	Multi-segment instruction 1	-100.0%～100.0%	0.00%	√
FC-02	Multi-segment instruction 2	-100.0%～100.0%	0.00%	√
FC-03	multi-segment instructions 3	-100.0%～100.0%	0.00%	√
FC-04	multi-segment instructions 4	-100.0%～100.0%	0.00%	√
FC-05	multi-segment instructions 5	-100.0%～100.0%	0.00%	√
FC-06	multi-segment instructions 6	-100.0%～100.0%	0.00%	√
FC-07	multi-segment instructions 7	-100.0%～100.0%	0.00%	√
FC-08	multi-segment instructions 8	-100.0%～100.0%	0.00%	√
FC-09	multi-segment instructions 9	-100.0%～100.0%	0.00%	√
FC-10	multi-segment instructions 10	-100.0%～100.0%	0.00%	√
FC-11	multi-segment instructions 11	-100.0%～100.0%	0.00%	√
FC-12	multi-segment instructions 12	-100.0%～100.0%	0.00%	√
FC-13	multi-segment instructions 13	-100.0%～100.0%	0.00%	√
FC-14	multi-segment instructions 14	-100.0%～100.0%	0.00%	√
FC-15	multi-segment instructions 15	-100.0%～100.0%	0.00%	√
FC-16	Simple PLC operation mode	0: Shut down after a single run 1: Keep the final value after a single run 2: Keep looping	0	√
FC-17	Simple PLC power-off memory selection	Units digit: memory selection after power failure 0: No memory after power failure; 1: Memory after power failure Tens digit: memory selection during shutdown 0: No memory when shutdown; 1: Memory when shutdown	0	√
FC-18	PLC segment 0 running time	0.0s～3200.0	0	√
FC-19	Section 0 Acceleration and deceleration time selection	0～3	0	√
FC-20	PLC first stage running time	0.0s～3200.0	0	√

FC-21	First segment acceleration and deceleration time selection	0～3	0	√
FC-22	PLC second stage running time	0.0～3200.0	0	√
FC-23	Step 2 Acceleration and deceleration time selection	0～3	0	√
FC-24	PLC 3rd segment running time	0.0s～3200.0	0	√
FC-25	Section 3 acceleration and deceleration time selection	0～3	0	√
FC-26	PLC 4th segment running time	0.0～3200.0	0	√
FC-27	Section 4 acceleration and deceleration time selection	0～3	0	√
FC-28	PLC 5th segment running time	0.0～3200.0	0	√
FC-29	Section 5 acceleration and deceleration time selection	0～3	0	√
FC-30	PLC 6th segment running time	0.0～3200.0	0	√
FC-31	Section 6 acceleration and deceleration time selection	0～3	0	√
FC-32	PLC segment 7 running time	0.0～3200.0	0	√
FC-33	Section 7 acceleration and deceleration time selection	0～3	0	√
FC-34	PLC segment 8 running time	0.0～3200.0	0	√
FC-35	Section 8 acceleration and deceleration time selection	0～3	0	√
FC-34	PLC segment 9 running time	0.0～3200.0	0	√
FC-35	Section 9 acceleration and deceleration time selection	0～3	0	√
FC-34	PLC 10th segment running time	0.0～3200.0	0	√

FC-35	Section 14 acceleration and deceleration time selection	0～3	0	√
FC-34	PLC 15th segment running time	0.0～3200.0	0	√
FC-35	Section 15 acceleration and deceleration time selection	0～3	0	√
FC-50	PLC run time unit	0: s (seconds) 1: h (hour) 2: Min(minute)	0	√
FC-51	Multi-segment instruction 0 given mode	0: Function code FC-00 given 1: AI1 3: Keyboard potentiometer 6: Preset frequency (F0-08) given	0	√

FD group communication parameters				
FD-00	Communication baud rate	4：4800BPS 5：9600BPS 6：19200BPS 7：38400BPS 8：57600BPS	5	√
FD-01	Data Format	0: No verification (8-N-2) 1: Even parity (8-E-1) 2: Odd parity (8-O-1) 3: 8-N-1	0	√
FD-02	local address	0~247, 0 is the broadcast address	1	√
FD-03	response delay	0ms～1000ms	2	√
FD-04	Communication timeout	0.000 (invalid), 0.001s～30.000s	0	√
FD-06	Communication reading current resolution	0：0.01A； 1：0.1A	1	√

PP group function code management				
FP-00	Program Version			○
FP-01	Parameter initialization	0: No operation 1: Restore factory parameters, excluding motor parameters 2: Clear fault records 3: Restore all parameters, including motor parameters	0	×
FP-04	Parameter lock	0: Parameters can be modified 1: Parameters are locked and cannot be modified.	0	√

Group U monitoring parameter table			
Function code	**Name**	**Smallest unit**	**HEX Address**
U0-00	Operating frequency (Hz)	0.01Hz	7000H
U0-01	Set frequency (Hz)	0.01Hz	7001H
U0-02	bus voltage（V）	0.1V	7002H
U0-03	output voltage（V）	1V	7003H
U0-04	Output current（A）	0.1A	7004H
U0-07	X terminal input status (decimal)	1	7007H
U0-08	Y terminal output status (decimal)	1	7008H
U0-09	AI1 voltage (V)	0.01V	7009H
U0-11	Module temperature	0.1℃	700BH
U0-12	count value	1	700CH
U0-14	Motor speed display	1 RPM	700EH
U0-15	PID setting	0.01 kg	700FH
U0-16	PID feedback	0.01 kg	7010H
U0-17	Current PLC stage	1	7011H
U0-19	Feedback speed (unit)	0.01Hz	7013H
U0-21	AO1 output voltage	0.01V	7015H
U0-25	Accumulated power-on time	1h	7019H
U0-28	Communication settings	1%	701CH
U0-32	Current multi-speed	1	7020H
U0-41	X terminal input status		7029H
U0-42	Y terminal output status		702AH

CHAPTER - 7
TROUBLESHOOTING AND ABNORMAL TREATMENT

Fault code list				
Fault Codes	**Fault display**	**Fault name**	**Reason**	**Solution**
2	E002	Accelerated overcurrent	Torque boost value is too large during V/f control	Reduce the torque boost value
			Starting frequency is too high	Reduce the starting frequency
			Acceleration time is too short	Extend the acceleration time
			Overload	Lighten the load
			Inappropriate V/f curve during V/f control	Correctly set the V/f curve
			Output phase short circuit or short circuit to ground	Check the motor wiring and output impedance to ground
3	E003	Deceleration overcurrent	The inertia of the load is too large	Use dynamic braking
			Deceleration time is too short	Extend the deceleration time
			The grid input voltage is too low	Check the grid voltage
			Output phase short circuit or short circuit to ground	Check the motor wiring and output impedance to ground
4	E004	Constant speed overcurrent	Overload	Lighten the load
			The inverter power level is too small	Choose the right inverter power
			The grid input voltage is too low	Check the grid voltage
			Output phase short circuit or short circuit to ground	Check the motor wiring and output impedance to ground
5	E005	Acceleration overvoltage	The inertia of the load is too large	Use dynamic braking
			Abnormal input voltage	Check the grid voltage
			Output phase short circuit or short circuit to ground	Check the motor wiring and output impedance to ground
6	E006	Deceleration overvoltage	The inertia of the load is too large	Use dynamic braking
			Deceleration time is too short	Extend the deceleration time
			Abnormal input voltage	Check the grid voltage
			Output phase short circuit or short circuit to ground	Check the motor wiring and output impedance to ground
7	E007	Constant speed overpressure	Abnormal input voltage	Check the grid voltage
			Load fluctuation is too large	Check the load
			Output phase short circuit or short circuit to ground	Check the motor wiring and output impedance to ground
8	E008	Input power abnormality	The input power voltage is seriously unbalanced.	Check the input grid voltage
			Power input wiring is abnormal	Check the power input wiring
9	E009	The power supply is abnormal during operation.	The DC bus voltage fluctuates too much or loses power during operation.	Check whether the input grid voltage and load are normal.

11	E011	Motor overload	The torque boost value is too large during V/f control	Reduce the torque boost value
			The V/f curve is not suitable for V/f control	Correctly set the V/f curve
			Improper motor parameter settings	Correctly set according to the motor nameplate
			Improper setting of motor overload protection time	Correctly set the motor overload protection time
			The motor is stalled or the load is too sudden.	Check the cause of motor stall or load condition
			Ordinary motors run at low speed and heavy load for a long time	Select variable frequency motor
13	E013	Output phase loss	Motor line connection abnormality	Check the motor connection
			Motor three-phase unbalance	Check the motor or replace it
14	E014	Radiator overheat protection	Fan failure	Replace the fan
			Air duct blockage	Clear the air duct
			Temperature sensor abnormality	Find Service
			The inverter module is installed abnormally	Find Service
16	E016	Port communication abnormality	Communication baud rate setting is incorrect	Correct Setup
			Communication port cable disconnected	Reconnect
			The host computer is not working	Make the host computer work
			The inverter's communication parameters are incorrect.	Correct Setup
26	E026	Continuous running time reached	The continuous running time reached function is set	See F8 group function description
29	E029	Cumulative running time has reached	the function of setting the cumulative running time arrival	See F8 group function description
31	E031	PID feedback lost	PID feedback channel abnormality	Check feedback channel
			PID parameter settings are unreasonable	Correct Setup
45	E045	Temperature is too high	Temperature sampling failure	Check the temperature sampling link
50	E050	Internal communication failure		

CHAPTER - 8
MAINTENANCE AND CARE

DANGER

1. Before carrying out maintenance or repair, please cut off all the equipment power, after cutting off the inverter input power, because there is still residual voltage on the internal DC capacitor of the inverter, please wait at least a few minutes for the power indicator to go out before operation, and when the power is on again, you need to wait for the interval of power on time specified by the inverter.
2. Do not remove the inverter housing, change the wiring, remove the cable or replace the cooling fan while the inverter is in operation, otherwise there is a risk of electric shock.
3. please be sure to ground the grounding terminal of the motor, otherwise there is a risk of electric shock in contact with the motor shell.
4. Do not perform maintenance, servicing and repair if you are not a professional electrician.

ATTENTION

1. If you need to replace the fan, please correctly identify the direction of the fan outlet, if the wrong direction, it will lead to cold but is ineffective and does not provide cooling.
2. Do not disassemble and install the motor when the inverter is running. Otherwise it will cause electric shock and inverter damage.
3. When wiring the control circuit, please use shielded cable and reliable grounding.
4. Do not change the internal circuit of the inverter, otherwise it will cause damage to the inverter.

8.1 Daily inspection items

Users should carry out routine and regular maintenance and repair of the inverter to avoid abnormal aging of the internal components of the inverter due to the influence of temperature, humidity, dust and vibration of the environment, which may lead to an increase in the probability of potential failure of the inverter or reduce the service life of the inverter. Especially for high-temperature environment, frequent starting and stopping occasions, power and load fluctuation conditions, the existence of large vibration or shock environment, the existence of dust / hydrochloric acid corrosive environment should be shortened as appropriate periodic inspection cycle intervals. To ensure that the inverter functions properly and the product is protected from damage, please check the following items daily.

Inspection items	Inspection content	Countermeasures in case of failure
Motor	Whether the motor has abnormal sound and vibration phenomenon	• Confirmation of abnormal mechanical connections.
		• Confirm that the motor is out of phase.
		• Confirm that the motor fixing screws are secure.
Fans	Abnormal use of inverter and motor cooling fan	• Confirm that the inverter cooling fan is operating.
		• Confirmation of abnormalities in the motor-side cooling fan.
		• Confirm that ventilation channels are not blocked.
		• Confirm that the ambient temperature is within the allowable range.
Installation Environment	Is the electrical cabinet and cable trough abnormal	• Confirm that there is no insulation breakage in the incoming and outgoing cables of the inverter.
		• Confirm that the connection cable terminals are not loose or corroded through.
Load	Does the inverter operating current exceed the inverter rating and motor rating for a certain period of time	• Confirm that the motor parameters are set correctly.
		• Confirm that the motor is not overloaded.
		• Check if the mechanical vibration is too large (normal condition <1g).
Input Voltage	Is the power supply voltage between the main circuit and the control circuit abnormal	• Confirmation that the input voltage is within the allowable range.
		• Confirm that there is no large load starting around.

8.2 Periodic inspection items

Please regularly check the places that are difficult to check-in operation. You should always keep the inverter in a clean state, and effectively remove the dust on the upper surface of the inverter, prevent the dust from entering the interior of the inverter, especially the metal dust, and effectively remove the oil from the cooling fan of the inverter.

Inspection items	Inspection content	Countermeasures in case of failure
Complete machine	Whether there is garbage, dirt, dust accumulation on the surface	• Confirm that the inverter cabinet is powered off.
		• Removal of trash or dust by vacuuming to avoid contact with components.
		If surface dirt cannot be removed, wipe with alcohol and allow to dry and evaporate completely.

Wires and Cables	Whether the power cord and connections are discolored.	• Replacement of cables that have cracked.
	Whether the insulation layer is aging or cracked.	• Replace the connection terminal that has been damaged.
Electromag-netic contactor periphery	Whether the action is not firmly sucked or make a strange noise. Whether there is a short circuit, water contamination, expansion, rupture of peripheral devices	• Replace the components that have been abnormal.
Duct Vents	Whether the air duct and heat sink are blocked.	• Sweeping of air ducts.
	Whether the fan is damaged.	• Replace the fan.
Load	Whether the control components have poor contact.	• Cleaning of foreign matter on the surface of control circuits and connection terminals.
	Terminals Whether the screws are loose.	
	Control the cable for insulation cracking.	• Replace broken and corroded control cables.

8.3 Inverter storage.

Frequency converter temporary storage and long-term storage must pay attention to the following points.

(1) Store as much as possible in the original packaging in our boxes.

(2) Do not allow the whole machine to be placed in humid, high temperature, or outdoor exposure for a long time.

(3) Long-time storage will lead to the deterioration of electrolytic capacitors, must ensure that the power is turned on once within 6 months, the power-on time is at least 5 hours, the input voltage must be slowly increased to the rated value with the regulator or consult the technical support of inverter professionals.

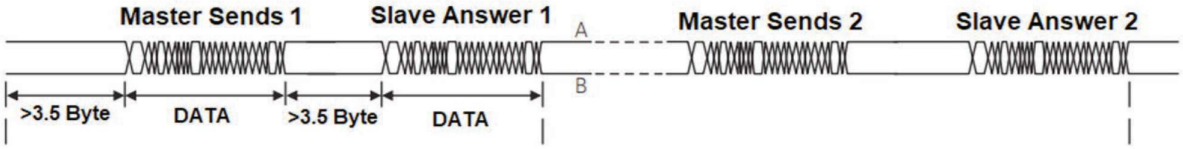
Appendix A - Modbus Communication Protocol

THYRA-CTE series inverter provides an RS485 communication interface and supports Modbus-RTU slave communication protocol. Users can connect the inverter to the "Single master and multiple slave" PC/PLC control network with RS485 bus, and the inverter can be used as a slave to realize centralized control through the PC/PLC host. Through the Modbus communication protocol, you can set the operation command of the inverter, modify or read the function code parameters, read the working status and fault information of the inverter, etc.

This serial communication protocol defines the content of the information transmitted in serial communication and the format used. It includes the host polling (or broadcast) format, the encoding method of the host, the content including the function code of the requested action, the transmitted data and the error checks, etc. The response from the slave uses the same structure, and the content includes action confirmation, return data and error checks, etc. If the slave makes an error in receiving information or fails to complete the action requested by the host, it will organize a fault message as a response back to the host.

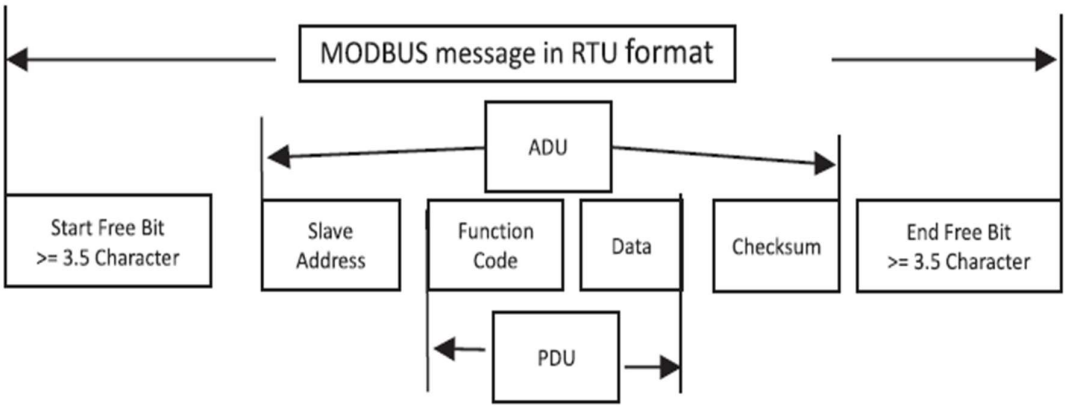
1. Bus structure

1) **Topology**
   Single-Master-Multi-Slave System. Each communication device in the network has a unique slave address. One of the devices acts as the communication host (often a PC host, PLC, HMI, etc.), initiates communication, reads or writes parameters to the slave, and the slave responds to the host's queries or communication operations to this machine. Only one device can send data at the same moment, while the other devices are receiving. The slave addresses are set in the range of 1 to 247, with 0 being the broadcast communication address. All slave addresses in the network must be unique.
2) **Communication transmission method**
   Asynchronous serial, half-duplex transmission method. Data is sent one frame at a time in the form of a telegram during serial asynchronous communication. It is agreed in the MODBUS-RTU protocol that when the idle time without data on the communication data line is greater than 3.5 Byte of transmission time, it indicates the start of a new communication frame.



The built-in communication protocol of THYRA-CTE series inverter is Modbus-RTU slave communication protocol, which can respond to the "query/command" of the host, or make a corresponding action according to the "query/command" of the host, and communicate data response. The host can communicate to a slave individually or broadcast information to all slaves. For the individual access "query/command" from the host, the accessed slave has to return an answer frame; for the broadcast message from the host, the slave does not need to respond back to the host.

2. Communication data format



Attachment 1, RTU data frame format

RTU method.

The idle time between frames in the RTU mode can be set either by function code or by adhering to the Modbus internal convention, which has the following minimum idle time between frames.

1. Frames are defined by bus idle time greater than or equal to 3.5 bytes of time at the head and tail of the frame.
2. The gap between characters must be less than 1.5 characters communication after the start of the frame, otherwise the newly received characters will be treated as the header of a new frame.
3. The data checksum uses CRC-16, the whole message is involved in the checksum, and the high and low bytes of the checksum need to be exchanged and sent. Please refer to the example at the back of the protocol for the specific CRC checksum.

Data frame field description

Frame header START	Greater than 3.5 character transfer time idle
Slave Address ADR	Communication address range: 1 to 247; 0: broadcast address
Command Code CMD	03: Read slave parameters; 06: Write slave parameters
Function code address H	The internal parameter address of the inverter is expressed in hexadecimal system; it is divided into function code type and non-function code type (such as operation status parameter, operation command, etc.) parameters, etc. See the address definition for details.
Function code address L	When transmitting, the high byte comes first and the low byte comes second.
Data H	The data to be answered, or the data to be written, is transmitted with the high byte first and the low byte second.
Data L	

CRC CHK low	Detection value: CRC16 checksum value. When transmitting, the low byte comes first and the high byte comes second.
CRC CHK High	See the description of CRC checksum in this section for details on the calculation method.
END	At 3.5 characters

Function 0x03 Read multiple inverter function code parameters and status words

PDU section content	Data length (bytes)	Scope
Request.		
Function Code	1	0x03
Register start address	2	0x0000 ~ 0xFFFF
Number of registers	2	0x0001 ~ 0x0010
Response.		
Function Code	1	0x03
Number of bytes read	1	2*Number of registers
Read Content	2*Number of registers	

Function code 0x06 Rewrite function code or control parameter

PDU section content	Data length (bytes)	Scope
Request.		
Function Code	1	0x06
Register Address	2	0x0000 ~ 0xFFFF
Register Data	2	0x0000 ~ 0xFFFF
Response.		
Function Code	1	0x06
Register Address	2	0x0000 ~ 0xFFFF
Register Data	2	0x0000 ~ 0xFFFF

THYRA-CTE series inverter supports Modbus-RTU communication protocol. Through these protocols, the host computer can control, monitor and modify the function parameters of the inverter.

THYRA-CTE communication data can be divided into function code data and non-function code data. Non-function code data includes operation command, operation status, operation parameters, fault information, etc.

3. Function code data address definition:- The function code data is an important setting parameter of the inverter, divided into Group F and Group A function parameters, as follows.

Function code data	Group F (read/write)	f0, f1, f2, f3, f4, f5, f6, f7, f8, f9, fa, fc, fd, fe, ff
	P group (read/write)	P0, P5

3.1 Parameter address definition during function code reading.

For F0 ~ FF, P0 ~ PF group function code data, its communication address high sixteen bits directly for the function group number, low sixteen bits directly for the function code in the function group serial number, for example, as follows. FA-17 function parameter, whose communication address is FA11H, where FAH represents the FA group function parameter, 11H represents the function code in the function group serial number 17 in hexadecimal data format. P5-08 functional parameters, whose communication address is A508H, where A5H represents the P5 group functional parameters, 08H represents the function code in the function group serial number 8 in hexadecimal data format.

3.2 Address definition when function code parameters are written.

For frequent EEPROM writes, which can lead to a reduction in the life of the EEPROM device, the inverter differentiates the function code parameter group codes according to the function code preservation needs. For the F0-FF group function code data, the high sixteen bits of the communication address are distinguished as 00-0F or F0-FF according to whether they are written

to EEPROM or not, and the low sixteen bits are directly the function code serial number in the function group, for example, as follows.

--Write function parameters F0-18.
The communication address is 0012H when no EEPROM writing is required.
The communication address is F012H when the EEPROM needs to be written.
For P0 to PF group function code data, the high sixteen bits of its communication address are distinguished as 40 to 4F or A0 to AF according to whether it needs to be written into EEPROM, and the low sixteen bits are directly the function code serial number in the function group, for example, as follows.

--Write functional parameters AC-11.
The communication address is 4C0BH when no EEPROM writing is required.
The communication address is AC0BH when the EEPROM needs to be written.
Note: For the pump industry, the FP parameter group is directly mapped to the P9 parameter group, so the access address and read address are the same as the P9 parameter group. If reading FP-00 parameters, the communication access address is A900H when reading. when writing parameters, the communication address is 4900H when not writing to EEPROM, and the address is A900H when writing to EEPROM.

4. Status parameter reading and control parameter writing

Non-functional code data	Status data (read-only)	U group monitoring parameters, inverter fault description, inverter operation status
	Control parameters (write only)	Control commands, control parameters, parameter initialization, etc.

4.1 Status data reading:

Inverter shutdown operation parameter table (1000H)

Parameter Address	Parameter Description	Parameter Address	Parameter Description
1000H	Communication setpoint	1010H	PID settings
1001H	Operating frequency	1011H	PID feedback
1002H	Bus voltage	1012H	PROGRAMMING steps
1003H	Output Voltage	1013H	PULSE Input pulse frequency in 0.01kHz
1004H	Output Current	1014H	Feedback speed, unit 0.1Hz
1005H	Output power	1015H	Remaining running time
1006H	Output torque	1016H	AI1 voltage before correction
1007H	Running speed	1017H	AI2 voltage before correction
1008H	DI input flag	1019H	Line Speed
1009H	DO output flag	101AH	Current power-up time
100AH	AI1 voltage	101BH	Current running time
100BH	AI2 voltage	101CH	PULSE input pulse frequency in 1Hz
100CH	Reserved	101DH	Communication setpoint
100DH	Counting value input	101EH	Actual feedback speed
100EH	Length value input	101FH	Main frequency X display
100FH	Load speed	1020H	Auxiliary frequency Y display

Note: The communication setting value 1000H parameter value, corresponding to is the percentage of the relative value of the maximum frequency, 10000 corresponds to 100.00%.

4.2 Inverter fault reading 8000H.

When the communication reads the inverter fault description, the communication address is fixed to 8000H.

Parameter Address	Parameter Description	Parameter Description
8000H	0000: No fault	0012: Current detection fault
	0002: Accelerated overcurrent	0013: Motor tuning failure
	0003: Deceleration overcurrent	0015: Parameter read/write exception
	0004: Constant speed overcurrent	0016: Inverter hardware failure
	0005: Accelerated overvoltage	0017: Motor short circuit to ground fault
	0006: Deceleration overvoltage	001A: Runtime arrival
	0007: Constant velocity overvoltage	001D: Power-up time arrival
	0008: Buffer resistor overload fault	001E: Dropped load
	0009: Undervoltage fault	001F: Loss of PID feedback at runtime
	000A: Inverter overload	0028: Fast current limit timeout fault
	000B: Motor overload	0029: Switching motor failure during operation
	000C: Input out of phase	002A: Excessive speed deviation
	000D: Output out of phase	002D: Motor overtemperature
	000E: Module overheating	0047: High Voltage Alarm
	000F: External fault	0048: Low pressure alarm
	0010: Communication anomaly	0049: Water shortage failure
	0011: Contactor abnormalities	004A: Burst pipe alarm

4.3Inverter operation status reading 3000H.

When the communication reads the inverter operation status, the communication address is fixed to **3000H, and the** upper computer can obtain the current inverter operation status information by reading the address data, which is defined as follows.

Inverter operation status address	Read status word definitions
3000H	1: Positive rotation operation
	2: Reverse operation
	3: Shutdown

4.4 Control parameter control command 2000H.

The control parameters are control commands, through which the operation of the inverter is controlled.

When F0-02 (command source) is selected as 2: communication control, the upper computer can realize the start/stop and other related command control of the inverter through this communication address, and the control command is defined as follows.

Control command communication address	Command Functions
2000H	1: Positive rotation operation
	2: Reverse operation
	3: Positive rotation point movement
	4: Reversal of point movement
	5: Free stop
	6: Deceleration stop
	7: Fault reset

4.5 U 0 parameter status monitoring array data reading (7000H).

Reads the inverter value defined by the U0 parameter group at the space starting at 0x7000H, as described below. U0 to UF, whose communication address is 70 to 7F in the high sixteen bits and the serial number of the monitored parameter in the group in the low sixteen bits. An example is U0-11, whose communication address is **700BH**.

Warranty Agreement

1. The product warranty period is eighteen months (subject to the body barcode information), and the warranty period is by the instructions for normal use, If the product fails or is damaged, our company is responsible for free maintenance.
2. During the warranty period, a repair fee will be charged for damage caused by
   A. Damage to the machine caused by errors in use and unauthorized repair or modification by oneself.
   B. Machine damage due to fire, flood, voltage abnormalities, other acts of God, and secondary disasters.
   C. Hardware damage due to man-made drops and transportation after purchase.
   D. Machine damage caused by not operating according to the user manual provided by our company.
   E. Failure and damage caused by obstacles other than the machine (such as external equipment factors).
3. In case of product failure or damage, please fill out the contents of the Product Warranty Card correctly and in detail.
4. Maintenance fees are charged by our newly adjusted "Maintenance Price List".
5. This warranty card will not be reissued under normal circumstances, so please make sure you keep this card and present it to the service personnel at the time of warranty.
6. If you have any questions during the service, please contact our agent or our company in time.
7. The right to interpret this agreement belongs to our company.

: CUSTOMER FEEDBACK FORM :

<table>
<tr><td rowspan="3">Customer Information</td><td colspan="2">Unit address:</td></tr>
<tr><td>Unit Name:</td><td>Contact person:</td></tr>
<tr><td></td><td>Contact number:</td></tr>
<tr><td rowspan="3">Product Information</td><td colspan="2">Product Model:</td></tr>
<tr><td colspan="2">Body barcode (pasted here):</td></tr>
<tr><td colspan="2">Agent Name:</td></tr>
<tr><td rowspan="2">Fault Information</td><td colspan="2">(Time and content of repair)</td></tr>
<tr><td colspan="2">Maintained by:</td></tr>
</table>

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