

# Manual of YTB-S2 Series Frequency Converter

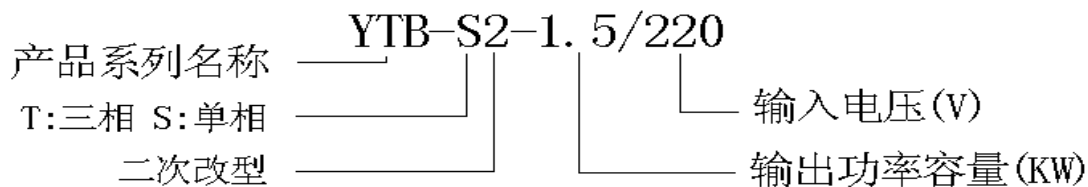
## Overview

YTB-S2 Series Frequency Converter comes from on the base of improving YTB-S1 Frequency Converter produced by our company. It keeps the original merits of YTB-S1 Frequency Converter, improves its operational performances and increases direct current braking and other auxiliary performances. Then it brings users with more reliable speed adjusting and more extensive application. It adopts advanced SMD technology and strict factory quality inspection and can satisfy various application requirements presented by users.

### Notes of Inspection for Delivering Goods

- 1 Affirm whether or not failure in transportation
- 2 Inspect the nameplate of the Frequency Converter and confirm that product in hand is your indented product.
- 3 Check whether or not there are a reality of the Frequency Converter, a share of its operating instruction, a certificate of competency and other shopping goods in the box.

### Model Illustration



### Technical Parameters

Power Rating (KW) Rated Current (A)		S2 Series (Single Phase 220V)	0.4 3	0.75 4	1.5 7.0	T2 Series (Three Phase 380V)	0.75 2.5	1.5 3.7	2.2 5	3.7 8.5	5.5 13	
Requirement for the Power Source		1Φ 220VAC or 3Φ 380VAC , 50HZ/60HZ					Frequency Range	0-120HZ				
Environment	Location	No corrupt gas and electric dirt in room, Ventilation is well.					Frequency Setting	Key Press, External potentiometer, 0-10mA Input				
	Temperature /Humidity	-10℃~+40℃ ,Relative Humidity below 90%, No dew					Point Moving Frequency	0.1-10.0HZ				
	Level/Liberation	Altitude under 1000 meters, Liberation below 0.5G					Braking Performance	Regencies Braking, Dissipating Braking				
Over Loading Ability	150% , 60 秒					Speed up and down time	0.1-120.0 秒					
Display	4 digits Nixie Tube, Display Operating Frequency and Fault Code and etc					Safeguard Performance	Over Voltage, Low Voltage, Over Current, Over Loading, Superheating Protect, Speed Losing Protect and Fuse Protect					
Cooling Mode	Self Cooling/Air Blasting Cooling											
						Attached Performance	Timer/Counting Performance					

Installation and Structure

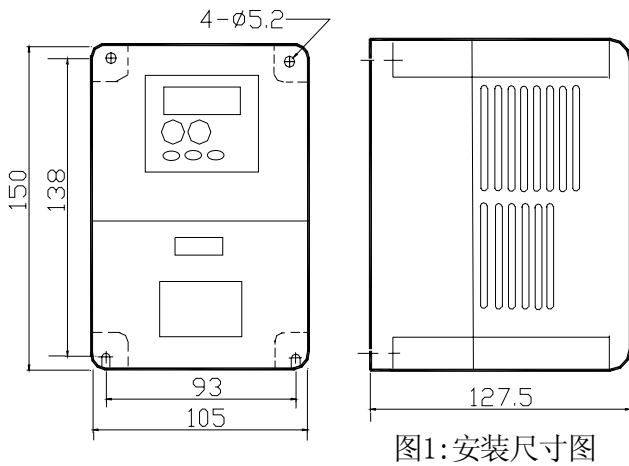


图1: 安装尺寸图

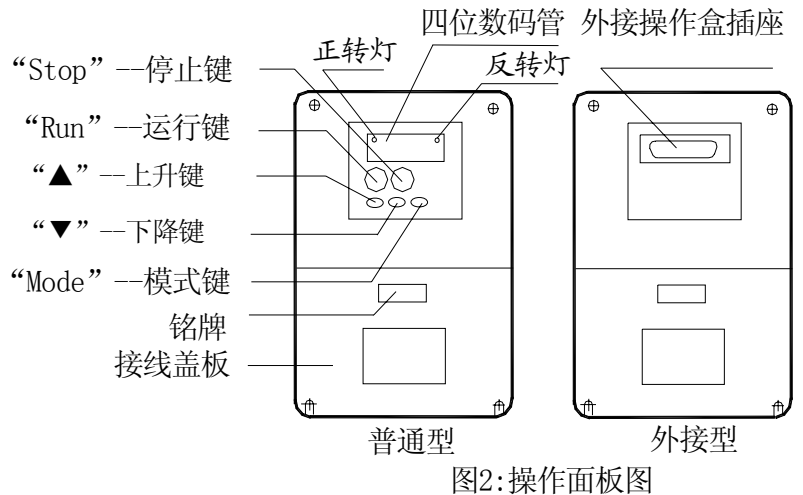


图2: 操作面板图

1. Installation

By way of improving heat dissipation effect, the frequency converter should be installed vertically. The fixing platter should be made of iron or other inflaming retarding and heat resisting materials. At the same time, a sufficient well-ventilated space at least 12 cm far away around is needed.

2. Wiring

Opening the wiring cover platter, can see the main terminals and the terminals for control. The terminals' explanation is shown in Table 2. Their position arrangement is shown in Picture 3 and Picture 4 is a typical case of its wiring diagram.

Table 2

	Mark	Name	Terminal Function's Explanation
Main Terminal's Explanation	R, S, T	A-C Source Input Terminals	Single Phase 220V Input connect to R, S; Three Phase connect to R, S, T.
	U, V, W	Output Terminals of the frequency converter	Connect to three phase motor
	P, PR	Braking resistor Terminals	Connect to Braking resistor
Explanation to the Terminals for control circuit.	X1, X2, X3, X4	Multi-functional External Terminals.	Details are shown in the explanation of parameter's data sheet.
	COM	Common terminal connected to X1, X2, X3, X4	0V, Relative to +5V, +12V
	I+	"+" Terminal for 0-10mA input	Refer to typical wiring diagram
	VR	Input terminal of the external potentiometer (the middle point of the potentiometer)	The other two terminals of potentiometer are 电 connected to 5V and COM.
	+12V	+12V of source output	Can provide to external sensor (Maximum 20mA)
	r1, r2, r3	Contacted points of the Multi-functional relay output	r3 is the middle contacted point of the relay

频率设定方式 开关K 的设置 (模拟信号)	电流输入方式	K在位置1
	外接电位器方式	K在位置2
	面板上的电位器	K在位置3

频率设定方式开关, K\* 1 2 3

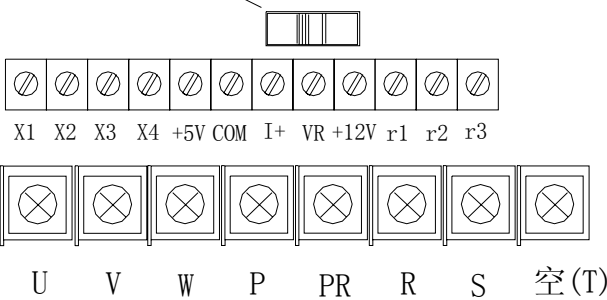


图3

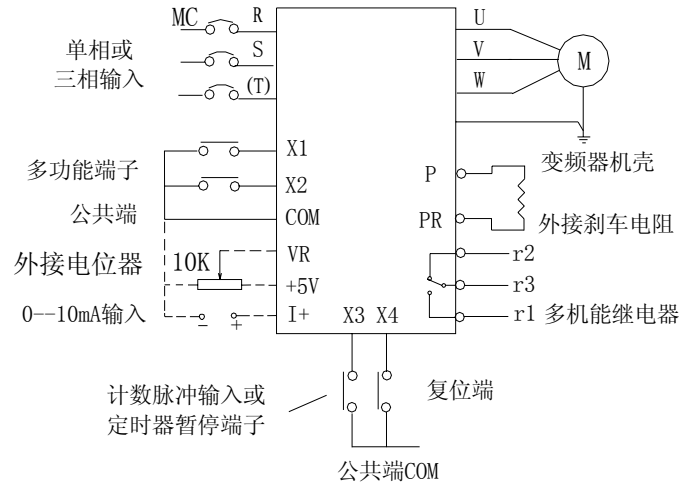


图4

- Safety Items:**
1. The frequency converter only can be applied to industrial three-phase induction machine.
  2. The terminals of advance wire should connect to contactor or air switch in order to cut off power at once in emergency.
  3. The R, S, T terminals and U, V, W terminals cannot connect mistakenly, otherwise the frequency converter shall be spoiled..
  4. The output terminals of the frequency converter (U, V, W) are not allowed to connect relay or compensated capacitor, otherwise the frequency converter shall be spoiled.
  5. The case of the frequency converter should connect to earth for guaranteeing personal surety.

- Notes:**
1. When the product leaves factory, the internal press keys are setting according to the type of default frequency. For other two types of setting (0-10mA input type and external potentiometer type) please refer to the typical wiring diagram, select one of its wiring methods and set the frequency setting type switch K to its corresponding position.
  2. When wiring the external control lines ought to far from power lines and the lines of external potentiometer or current input lines should adopt the shield line, the shield layer of which should connects to COM terminal.
  3. This device has two types that are common type and external connecting type. For the later the main device connects to the external operating box through a D-type socket.
  4. When adopt a single phase (220V) frequency converter to drive the motor with nominal voltage of 380V Y-connection, should change Y connection to delta connection in order to make the motor power to its specified value. Otherwise the device only can be applied in derating state.

## Running and Operating

1. Before power on user needs to check whether the wiring is correct and firm. After power on , the nixie tubes display “ ”, “rating voltage value”, “rating current value” and “presetting running frequency value (twinkle)” in succession。 Pressing the key RUN system will operate and pressing the key STOP system will stop. In running, the nixie tubes display selected indicated value (see the parameters) and pressing increase key or decrease key can increase or decrease output frequency in type of key pressing. Pressing down the key MODE, the current setting frequency value can be conserved in type of key pressing. Under error state, the nixie tubes display the error code.
2. Point operating function: Under the stop state pressing increase key/decrease key can make the system into positive direction point operating/negative direction point operating. At the same time, the direction indicator turns bright (see parameters).
3. Setting of the parameters
  - 3.1 Under stop state, pressing the key MODE (< 3s), the nixie tubes display “ ” (the presetting value of frequency) and its value twinkle in alternation. Pressing the up or down key can update the presetting value of frequency (type of key pressing). After completing the update, pressing the key MODE the nixie tubes display the next parameter “ ” (display selection), can update the parameter with the up or down key in same way. After completing, pressing the key MODE the nixie tubes display the next parameter “ ” to prompt whether save or not. Again pressing the key MODE can save the results of update and the system return to its

supervisor status. Pressing the key STOP during the process of parameters setting, the system also returns to its supervisor status but not save the updated results.

3.2 Under stop state, pressing the key MODE (> 3 s), the nixie tubes display “ ” and the displayed value is twinkle in alternation can make the system turn into setting status of its internal parameters. Pressing the up or down key can update the parameter’s value and pressing key MODE can enter next item, immediately pressing key MODE, the parameter does not change. When the parameters setting is completed the nixie tubes display “ ” to prompt whether or not to save this updating of parameters. Pressing key MODE, save and quit.

3.3 In order to accelerate the manipulated rate, when changing the values of the parameters, pressing the up or down key persistently will accelerate the rate of parameters’ change. When the setting value is maximum (> 1000 or 100), you can adopt the key RUN operating as a shift key. Pressing the shift key, the corresponding digital code will be twinkle and that points out this code is able to update. At that time, pressing the up or down key can update the value with base of 1/10/100/1000.

Note: Parameters have its maximum and minimum limitation.

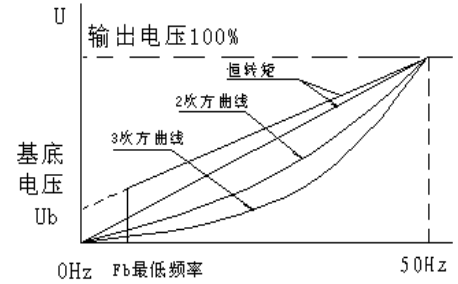
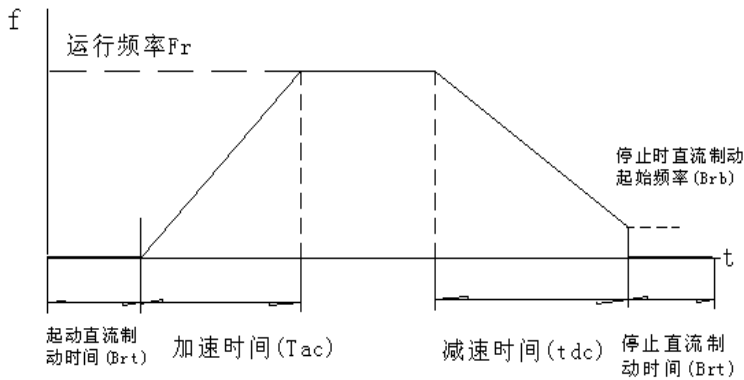
Table 3

Parameter’s Item	Display’s Content	Range of the parameter	Setting by the factory
Rise Time (Tac)		0.1—120.0 S	10 S
Drop-out Time (Tdc)		0.1—120.0 S (Adjust Parking Speed) 0: Express free slide parking	10 S
Type of Frequency Setting		0: (Simulate Setting: Potentiometer /10mAInput) 1: (Setting with Key Pressing)	1
External Terminals X1, X2, X3, X4 Functions (Details can be seen in “ function of the external terminals”)		0: X1 for indicating Operation Direction X2 for Operating Catenation (Normally Open)	0
		1: X1 for indicating Operation Direction X2 for Operating Catenation (Normally Close)	
		2: X1 for Start/Stop (Rotation in positive direction) X2 for Operating Catenation (Normally Close)	
		3: Control for Rotation with positive or negative direction X1 for Positive Direction X2 for Negative Direction	
		4: Functions same as Fun=2, but the key STOP expresses pause	
5: Three Segments Control ( X1/Speed1, X2/Speed 2, X3/ Speed).			
Minimum Frequency’s Limit		0.0--10.0Hz (Limiting frequency too low may cause the motor overheating)	0.1Hz
Basis Voltage		0--20% (Applied for adjusting low frequency output’s exert oneself)	8%
Maximum Frequency		0.1--120Hz	50Hz
Frequency Setting Value (First Segment’s Speed		0.1--120Hz	50Hz
Sond Segment’s Speed		0.1--120Hz	40Hz
Third Segment’s Speed		0.1--120Hz	30Hz
Operating Direction’s Setting (for the type of three segments’ speed)		0~15, Details can be seen in the use of multi-segments speed	0
Selection of Display Content		0: Display Frequency	0
		1: Display value of Timer or Counter, and Display Frequency in the case of CTC no effect.	
		2: Display Rotate Speed.(According to converting from frequency)	
		3: Testing Mode	
Converting Coefficient for Rotate Speed		1—200%	100%

Point Operating Permit		0: Disallow Point Operating 1: Allow positive direction Point Operating with “up” key 2: Allow negative direction Point Operating with “down”key 3: Positive and negative directions Point Operating all are in effect.	0
Point Operating Frequency		0.1—10.0Hz	5Hz
Up and Down Rate of Point Operating		0.1-20.0s	5.0s
Timer/Counter (CTC) Control Enabling (Details can refer to “additional function”)		0: Without Timer/Counter function, Multi-function relay only used to alarming output of skip operation 1: Timer Enabling From relay to point output 2: Frequency Converter Internal control Timer Enabling From relay to point output 3: External Control Timer Enabling From relay to point output	0
Timer/Counter Setting Value		1~9999(Timer) / 1~999.9min (Counter)	9999
Direct Current Braking Enabling		0: Without DC Braking 1: DC Braking at system start 2: DC Braking at system stop 3: DC Braking at system start and stop	0
Start frequency for Braking at System Stop		0 ~25.5Hz	0.1Hz
Direct Current Braking Quantity (Current%)		0~100%	30%
Direct Current Braking Time		0.1~25.5s	0.5s
Multi-function Configuration		Contain parking type, electronic thermal relay enabling and others Configuration (See Notes).	0
Selection of Operating Curve		1: Constant torque. 2: Quadratic Curve 3: Cubic Curve.	1
		Factory Password, User should press key MODE to skip	
		Prompt save data, press key MODE to quit.	

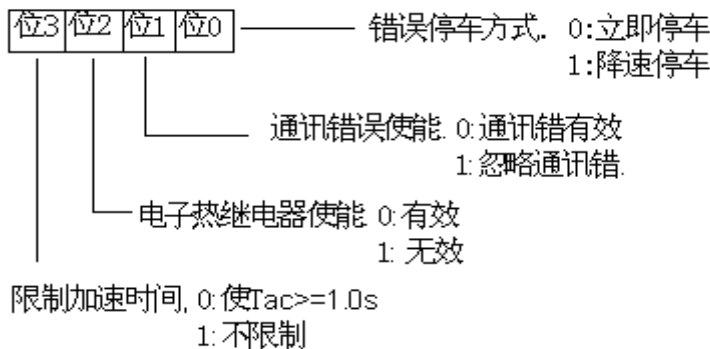
Notes:

- Parameters can be set only in the system Stop status.
- When rotation is in positive direction, the positive rotate indicator is bright and when rotation is in negative direction, the negative rotate indicator is bright and when Timer/Counter is in operation the CTC indicator is bright, (Some Type of device may have not this indicator).
- Increasing parameter can increase low frequency compensation to make the motor with superior force moment at low frequency but  $U_b$  too large may lead to the motor overheating.
- Testing of the \*\*\* can switch the device to display basic frequency, input voltage, output current and instantaneous power in turn for reference in system debugging. The method of switch is pressing the key RUN in operating status and pressing the key STOP in system parking status or after system stop.
- When select to display motor speed,  $Speed = Output\ Frequency * 60 * (Converting\ Coefficient) / 2$ .  
Example: If set the =100%, =50.0Hz, then the nixie tube display 1500 rpm, and if set the =200%, display will be 3000 rpm..
- If set the  $T_{dc}=0$  (stop in freedom), ought to note the time interval for system start again to prevent taking place the phenomenon of over current protect, caused by the motor accelerating in its unstable parking status.
- In the left schematic diagram, the parameters  $T_{ac}$  ( ),  $T_{dc}$  ( )  $Brb$ ( ) and  $Brt$ ( ) are shown. Really,  $T_{ac}$  and  $T_{dc}$  are the needed time for raising and dropping every 50 Hz. The right is the schematic diagram for parameters and the selection of operating curve..



8. Parameters of Multi-function Configuration. A number is constituted by 4 bits of binary bit 4, the meaning of each bit is as follows:

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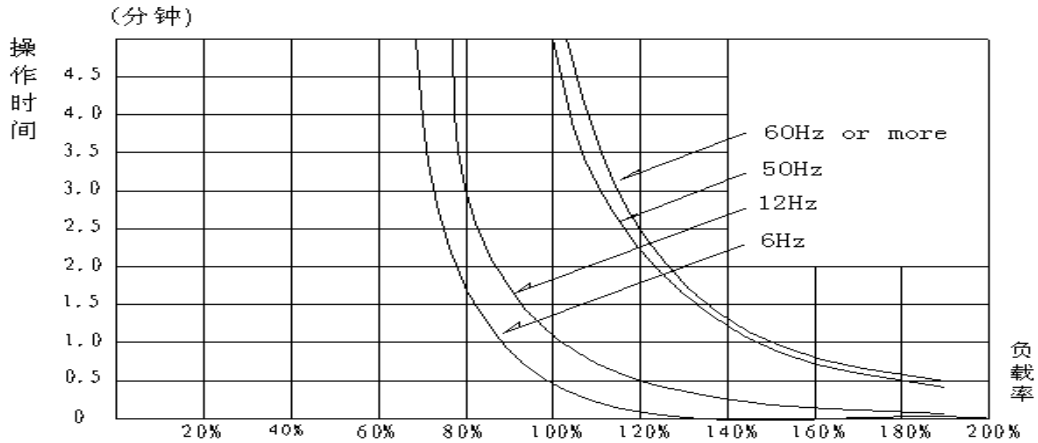
Binary	Decimal	Binary	Decimal
0000	0	1000	8
0001	1	1001	9
0010	2	1010	10
0011	3	1011	11
0100	4	1100	12
0101	5	1101	13
0110	6	1110	14
0111	7	1111	15

As 0001 expresses  $T_{ac} \geq 1s$ , the electronic heating relay is available, communication error is available, that is say, if communication is error the system will stop. Checking the table of Binary-Decimal (0001)=1, then ought to set this parameter =1.

### Operating Characteristics

1. When Over-Current is caused is in the system accelerating, the frequency converter will stop its accelerating automatically. Only until the current is lower than its stall value, the driver continues accelerating.
2. When Over-Voltage is caused is in the system decelerating, the frequency converter will stop its decelerating automatically. Only until the voltage is lower than its stall value, the driver continues decelerating.
3. When the system is operating in its constant speed status, if the current exceeds its stall value, the driver can decrease output frequency to prevent the motor stalls, only the current is lower than its stall value, the driver will accelerate to its setting frequency.
4. Adopting the DC braking function can make the mechanical moving assembly operates accuracy and fix its position quickly. User needs to adjust carefully the parameters from actual condition of the machine load. When use DC braking, the nixie tube would display “- just -”.

2. The diagram of Over Load Protect Characteristic is shown as follows:



If the frequency converter needs to operate in low frequency for long period (the motor speed is vary low), the user may discover motor is very hot. In this moment, although the current does not arrive at its rating value, but the operation of over load protect takes place. That is not caused from the sake of frequency converter and is caused that the fan of the AC motor 'spindle cannot bring good cooling effect in low speed operation. Therefore, that an external cooling fan should be added to decrease the motor temperature is recommended. Under the condition of external cooling, can close electronic heating relay to prevent the phenomenon of Over-Load protect in low frequency operation.

### Function of the External Terminals

1. When Fun=0, can use the key RUN or STOP on the surface panel to start or stop the frequency. The running direction is decided by the status of X1. That is say, if X1 is not connected to COM the running direction is positive otherwise is negative. X2 is the control of operation catenation, is normal open. That is say; if X2 is not connected to COM, the system operation is allowed. Otherwise if X2 is connected to COM, catenation error will come forth and the frequency converter will stop.
2. The function of Fun=1 is as same as the Fun=0, the difference is lay in that X2 is operation catenation (normal close) that is only X2 is connected to COM, the frequency converter can be start.
3. Fun=2 uses external terminal's control: Namely when X1 is connected to COM, immediately start the frequency converter. When X1 is disconnected to COM, the output pause. X2 is operation catenation(normal close), the use method is as same as previous.  
Note: At that time the key RUN and STOP on the surface panel are in invalidity.
4. Fun=3 is the rotation Mode for positive and negative direction, may describe as below table:

X1 Status	X2 Status	Function	Remark
1	1	Stop	0:Express this terminal is connected to COM 1:Express disconnected
1	0	Positive Rotate	
0	1	Negative Rotate	
0	0	Stop/If error come forth in operation, shall Reset.	

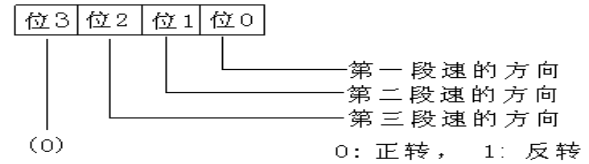
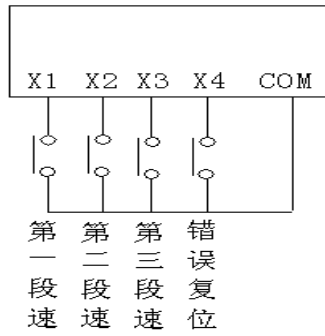
Example: If user change the statuses of X1、X2 from 1 0 to 0 1, the frequency converter decrease speed and stop in advance automatically, then start in the negative direction.

If require quicker translation rate, please put in appropriate braking resistor and set appropriate decrease time(Tdc).

5. When the function Fun=4 is same as Fun=2 and its difference is lay in that X1 is connected to COM, can use the key STOP on the surface panel to act for pause/start to realize two place's control. Once X1 is disconnected to COM, the key STOP is also in invalidity. During pause, on the right upper corner of the nixie tube, a short perpendicular is presented.
6. Fun=5 is the three segments' control mode. X1、X2、X3 is corresponding to the setting value of 、 、 respectively. In running, can use the press key to increase or decrease the corresponding frequency( the potentiometer is in invalidity). Pressing key MODE can save the updated values.

The wiring diagram is shown as the left lower picture. (If have two or more switches close simultaneously, the program take one X status to operate.)

The running direction is set by parameter (DIR), which is also consisted by 4 bits of binary bit, is shown in right lower picture.



如 0100 表示 第一段速为正转  
第二段速为正转  
第三段速为反转  
查二进制--十进制表得 (0100)=4, 即参数 DIR 为 4

7. When FUN=6 and using the key RUN/STOP on the surface panel to start/stop the frequency converter, the running direction is decided by the status of X1 before start, that is say if X1 is not connected to COM the running direction is positive otherwise is negative. X2 is for pause: In running if X2 is connected to COM, the frequency converter pause (the speed decelerates to zero according to the rate Tac). Once X2 is disconnected to COM, the device start again to its original frequency.
  - When the catenation error come forth, can still press key MODE to modify parameter Fun.
  - Security: When control with external terminals, need to note that when after Power cut or put on Power again, the frequency would start automatically depending on the statuses of terminals X.

### Additional Functions

The frequency converter is added by Timer/Counter functions to facilitate the user to constitute simple control system.

1. Decide parameter =1 as Count Mode, The Counter Value is set by parameter . Its maximum setting value is 9999, Counting pulse is negative pulse which is inputted from terminal X3 and COM. The minimum pulse width is larger than 50ms(10 times/s). When counting value reaches its setting value, the multi-functional relay puts on but the Counter counts sequentially. The terminal X4 is used to reset the counter.
2. Setting parameter =2 is the internal Timer mode, the timer value is set by the parameter and its maximum setting value is 999.9min (about 16 hours) . In the case of the frequency converter starting, the indicator of running direction turns to be bright and the Timer is open. After the frequency converter stopped, the Timer also pauses. In the status of frequency converter stopping press the key STOP will reset the Timer (X4 connected to COM also can reset the Timer). If start the frequency converter again after its stopping, the Timer will accumulated from its original timer value. When the Timer reaches a fixed time the relay is put on and the Timer will stop.
3. Setting parameter =3 is the external control Timer mode, its timer value can be set as previous. When X3 is disconnected to COM, the Timer operates normally. When X3 is connected to COM the Timer pauses. X4 is used to reset the Timer (connecting X4 to COM also reset the timer.) When the Timer reaches its fixed time, the multi-functional relay is put on and the Timer Stop

Notes:

- (1) When use the Fun=5, because the X3 and X4 have changed to multi-segments' speed control the Counter/Timer is unavailable and the multi-functional relay only can be used as output of fault alarming.
  - (2) This Counter/Timer has no function of keeping Data. When the frequency converter occur error, the Counter/Timer shall reset simultaneously.
- If this Counter/Timer cannot satisfy your requirement, please select the JC/TC series Counter/Timer produced by our company.

### Usage of the Braking Resistor

The braking resistor is mainly used in the places of frequently manipulation of rapidly decreasing speed and stops or used to shorten the deceleration time for the large inertia load.

Users may purchase it from our company according to their requirement or purchase the appropriate resistors in market by themselves. The table below can be referred.

Motor Power (220V)	0.75KW	1.5KW	2.2KW	3.7KW	5.5KW
Braking Resistor	80W-200 Ω	150W-100 Ω	200W-75 Ω	400W-40 Ω	500W-30 Ω



Motor Power (380V)	0.75Kw	1.5KW	2.2KW	3.7KW	5.5KW
Braking Resistor	80W-750 Ω	150W-400 Ω	250W-250 Ω	400W-150 Ω	500W-100 Ω

For the users who have no the braking requirement can use the frequency converter without braking resistor. But They ought to note adjusting Tdc(the drop-out time) unable too short for preventing the alarming caused by emergent utmost protect and over-voltage and over-current protects and etc. Besides, ought to note strictly prohibiting the terminals P and Pr short circuit. Otherwise the discharge transistor in the frequency converter will be burned up.

### Abnormity Protect and its Treatment

When the frequency converter present itself malfunctions, the device will stop automatically. The alarming relay puts on (when =0) .At that time the nixie tubes display err code and the user can refer the code table and adopt corresponding measure. The code table is shown as follows:

Code Displayed	Code Meaning	Processing Method
	Emergent Utmost Protect	Check whether or not short circuit and rotation block up and when the motor has not stopped stably but start up with high speed. In the case of motor rotating, adopt higher and quicker frequency to point operating. (Refer below the reasons of over-voltage and over-current)
	Over-Voltage and Over-Current	Generally, accrue in the time of urgent brake. Ought to adjust the Tdc value
	Over-Current	Inspect if the motor has some sudden loading or accelerating and decelerating too quickly (ought to increase the values of Tac and Tdc)
	Over-Voltage	Inspect if the input voltage is too high, or pump up voltage is too high for the motor has large inertia load and decelerating or parking is too quick. (Can increase the parameter the Tdc value)
	Over-heating	Inspect if the ambient temperature is too high and the heat elimination of the frequency converter is all right.
	Under-Voltage	Inspect if the input voltage is too low and the line voltage drop is too high for the over-loading.
	Data Transmission error	1. Inspect if the line of the external control box is in bad contact or the distance between control cable and disturb source is too near. 2. Internal data transmission error in the frequency converter.
	Over-Loading	Inspect if the motor power exceeds the power of frequency converter and external load is out of the way
	Operating Catenation Break	Inspect if the terminals X2 and X4 are in the status of catenation break.

The error messages during power on and off all belong normal protected measures. Ordinary faults presented in the running process can be reset by pressing the key STOP and test again. When the E—O appears, ought to cut off the power and inspect the faults carefully. Only after the faults are excluded, then the power can be put on again.

Attached: The external dimension diagrams for the A mode, B mode and C mode of external control box