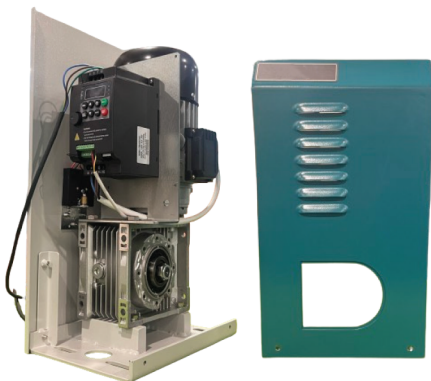


# E5 INVERTER HEAVY DUTY INDUSTRIAL MOTOR V300 SERIES INVERTER USER/S MANUAL



**When installing, please pay special attention to:**

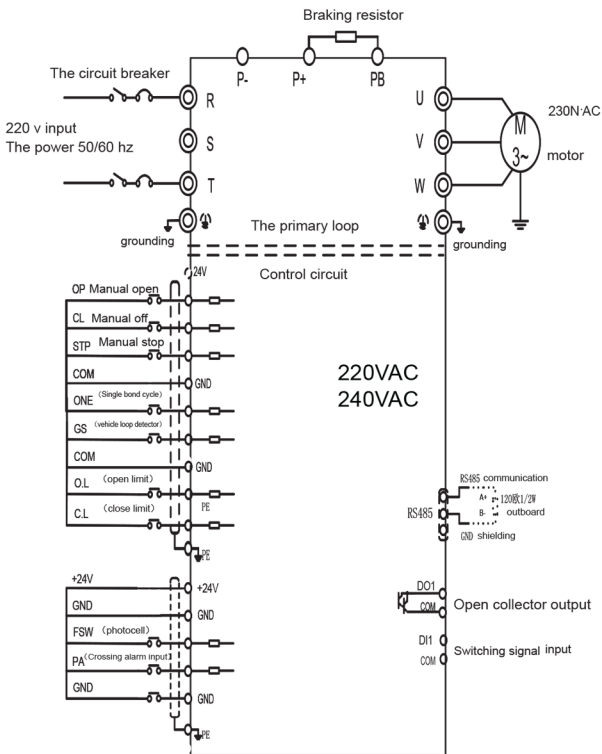
220V asynchronous motor must remove the capacitor on the motor, otherwise it will cause damage to the convertor!

The motor is connected to the U of the frequency converter, and the direction line is connected to the V and W of the frequency converter



## SINGLE PHASE

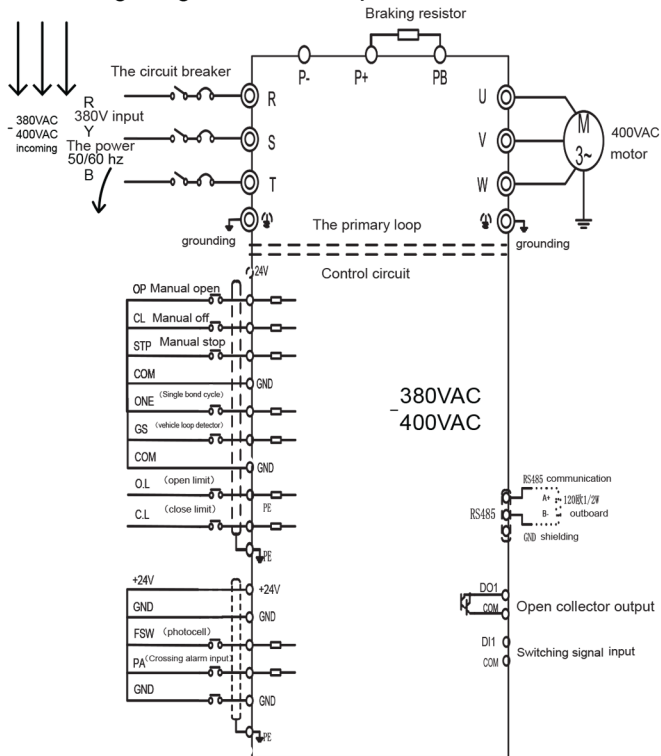
### Wiring diagram of single-phase 220V converter





## THREE - PHASE

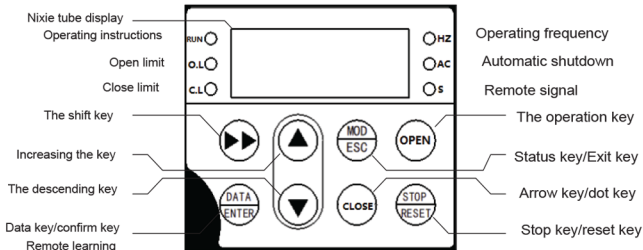
### Wiring diagram of three-phase 380V converter





## Introduction to keyboard Interface

The keyboard can be used to modify the function parameters of the converter, monitor the working state of the converter and control the operation (starting and stopping) of the converter. Its appearance and functional areas are shown as follows:



## Operation panel function description

MOD/ESC	Programming key * Level 1 menu entry or exit
> >	The shift key * Under the stop display interface and running display interface, display parameters can be selected circularly; When modifying a parameter, you can select the parameter modification bit
DATA/ENTER	Confirm button, remote control learning * Step by step enter the menu screen to set parameter confirmation
▲	Increasing the key * Increment of data or function code
▼	The descending key *Decrement of data or function code
OPEN	The operation key * Used to run operations in keyboard mode
STOP/RESET	Stop/reset * When running, press this key to stop running operation; In the fault alarm state, it can be used for multiple bit operation. The characteristics of this key are restricted by function code P7.02
CLOSE	Close the door key * Used to run operations in keyboard mode



Remote control increase: hold the DATAENTER key for three seconds, after 55 words appear, immediately let go, and then press the stop button on the remote control, the number of remote control increase on the screen is learning success.

Delete remote control: Hold down the DATA/ENTER key for 8 seconds. The number of remote controls is 0 on the screen.

Slow time setting: when the door is in the closing position, press the shift key >> for more than 6 seconds, let go when hearing the sound, the door will first open until the trip stops, and then perform the closing action to stop after the closing position, the setting is complete. The slow position is set to F.14 and F.15, and the default is 1.5 seconds.

△:F.25 When set to 4, the current menu item cannot be changed.

★: door trip count cache, manual learning trip data is zero can not be menu repair Change this data.

☒ : Set the ratio between high speed and low speed. The default value is 1. For example, set to 2: High speed = Low speed x 2:

Set to 0.5: high-speed operation = low-speed operation \*0.5(this value can be adjusted for high-speed operation period after learning stroke).

### Table 1 Menu description

code	Description/ digital display	Set the range		The factory value
F. 1	Remote control mode	Remote control with three keys	0	0
		Remote single key control	1	
F. 2	Half-open setting	Close the ajar	0	0
		Half-open distance setting (maximum door travel)	**	
F. 3	Automatic closing time	Turn off the automatic closing function	0	0
		Set time (maximum 255 seconds)	***	
F. 4	Slow Speed function	Disable the slow function	0	1
		Turn on the slow function	1	
F. 5	Calculation method of stroke	Time calculation mode	0	0
		Counter input calculation method (incomplete)	1	



# DFT

## AUTOGATE OPERATOR

F. 6	Setting the Communications Address	Close communication	0	1
		Default slave address	1	
		Other address (0x55/0x66 address unavailable)	***	
F. 7	Rebound function when blocked	Close the blocked	0	0
		Sensitivity adjustment (Max. 100)	***	
F. 8	Resistance adjustment	Minimum strength	0.1	0
		Efforts to regulate	***	
F. 9	Setting of motor direction	Default positive direction	0	0
		reverse	1	
F. 10	Travel is normally open and normally closed	Normally closed travel limit	0	1
		Normally open line limit	1	
F. 11	High Speed Operating speed	Data setting (0-70Hz)	**	50
F. 12	Slow door opening in place	The menu cannot be changed when the knob is set uniformly ▲	**	-
F. 13	Closing the door slowly in place	The menu cannot be changed when the knob is set uniformly ▲	**	-
F. 14	Slow driving time	Slow running time, in seconds ★	**	1.5
F. 15	Slow shutdown time	Slow running time, unit seconds ★	**	1.5
F. 16	Start Slow speed	The menu cannot be changed when the knob is set uniformly ▲	**	-
F. 17	Slow startup time	Slow running time, unit seconds ★	**	1.5
F. 18	Setting of acceleration time	Unit s	**	2.0
F. 19	Setting deceleration time	Unit s	**	2.0
F. 20	Motor protection time	Unit s ★	**	20
F. 21	door travel count	Set according to F.5 value (time calculation method)	**	0
F. 22	Travel adjustment base	Fine stroke count base ■	**	1.00
F. 23	Voice output Settings are used with the independent voice module	Disabling voice Output	0	1
		Chinese speech output	1	
		English voice output	2	
F. 24	Check the number of remote controls	Displays the number of remote controls learned by the system	**	-
F. 25	Panel knob function	Turn off the knob function	0	4
		Slow speed setting before door opening in place	1	
		Close door in place slow forward speed setting	2	
		Enable slow speed setting	3	
		Set all slow speeds together	4	
F. 26	Alarm and anti-crawl output	Turn off anti-crawl detection	0	0
		Open detection, alarm time after triggering	***	
F. 27	Sensitivity of the anti-crawl interface	The default sensitivity level is highest	1	1
		X *x*100=? Ms (100 x)	***	
F. 28	Infrared normally open and normally closed	Infrared normally closed	0	1
		Infrared normally open	1	
F. 29	Setting the buzzer sound	All closed	00	111
		When there is infrared input, the onboard buzzer sounds and alarms	xx1	
		When ground sensor input, the onboard buzzer sounds and alarms	x1x	
		Automatic closing timer buzzer on board	1xx	



F.30	Communication Control mode	485 Communication control special (default)(single motor)	0	0
		AB door connection control special (two motors)	1	
		Special for dual-machine connection control (see Table 4) (two motors)	2	
		Double machine AB door function (four motors)	3	
F.31	Fan mode	0 The fan keeps running on the system no matter what the temperature is	0	25
		** The fan stops when the temperature is lower than the current value	**	
F. 32	Restore factory Settings	0, the default	0	0
		1 Set the value to 1 and press ok to start recovery	1	
	Acceleration and deceleration time, motor direction Settings do not restore initialization, remote control data will not be deleted			
F. 33	Enter the confirm password and enter the super menu		*	0
F.34	Viewing debugging data	See Table 2 for details	*	-

Table 2 Debugging data viewing description

The code shown	instructions	unit
SH-00	Current operating current of motor	A
SH-01	The self-learning program counts the value cache	-
SH-02	Reference value indication of open count	-
SH-03	Reference value indication of closing count	-
SH-04	Displays the remote control keys receive	-
SH-05	Potentiometer current value shows slow speed	Hz
SH-07	View the current software version date	-
SH-08	SH-08 View the current software version	-

Table 3 Description of digital display

According to	instructions
SS.xxx	Learning remote control display, XXX is the number of remote controls learned by the current system
77.000	Delete remote Display
0.00	Blink at an interval of one second, indicating the current shutdown state (unit: Hz), and the running indicator is off
LOC	Remote control after pressing the lock on/off external input invalid display
OPEN	There is input to the door external port
CLOSE	There is input to the door external port
STOP	Stop the external port has input
ONE	Single key external port has input
POTO	The infrared external port has input
C.L	Open door stroke in place input port has input
O.L	Closing stroke in place input port has input
INRF	The ground sensor external port has input
PA	The anti-crawl external port has input
F.xx	Level 1 menu item, xx is the menu directory
SH.xxx	Level 2 displays debugging data menu items, XXX is the displayed corresponding data (see Table 2)



Table 4 Menu description of two-node cluster communication

The code shown	Description/digital display	The factory value
CTSET	Set to zero and default to slave (menu F.30 is 02)	00
	Set the opening sequence time (Max. 99 in seconds)	**
OTSET	Set to zero default slave (menu F30 is 02)	00
	Set the closing sequence time (maximum 99 in seconds)	**

### Some functions:

1. The value of panel rotation will be displayed only when it is not displayed in the menu. The slow speed set by the panel knob will be real-time applied to the motor running speed only when the motor is running under manual or automatic stroke setting.

2. When setting the communication address of the two-controller system, there is no need to set the communication address, just set f. 30 2 and press "Confirm" to enter the special menu of the two-controller system to set the value of opening delay and closing delay. After setting one (or both) of the two values, the controller serves as the two-controller communication host. Two values of zero are used as slave machines (users need to set one of the two controllers as the host, otherwise the two-machine communication cannot work normally).

3. The default communication mode of the controller is slave 485 communication (P.30 is 0). You only need to set (P.6) to the corresponding address and send fixed commands (see Appendix 1 for commands) to control the slave corresponding to this address in the network.

4. The two controllers are used as AB doors. Set P.30 to 1.

5.2 Set of double doors function as AB doors, set P.30 to 3

First, connect the two inverters in a door through 485 ports, and operate the other door in the same way. Then use three lines to connect the inverters in the two doors as the main control according to the following wiring

A COM-----B COM  
DO1 of A ----- DI1 of B  
DI1 of A ----- DO1 of B

6. After remotely pressing the lock, the physical external input port (on, off, stop, single key input) of the controller is closed, but the operation of the panel operation button is not affected.

7, the controller is triggered in the stop of ground sense, ground sense without input after the controller automatically closes the door, the ground feeling controller stops running after the reverse door for 20 seconds to stop, ground feeling without input after the control door closing, the ground feeling continues to open the door for 20 seconds to stop, ground feeling without input after the control door closing.

8. In the shutdown state, long press [OK/Save] button and wait for the indicator to display 55\*\*\*, then continue to press and hold for 8 seconds, and the indicator will change to display 77.\*\*\* \* then release the button.



## Fault alarm and countermeasures

Frequency converter has a number of warning information and protection functions, one day failure occurs when the protection function action, frequency converter stop output, Frequency converter fault relay action, and display the fault code on the frequency converter display panel. Before seeking services, you can follow the instructions in this section to perform self-check, analyze the cause, and find solutions. If the cause is described in the dry form, please seek service. Contact the agent or contact us directly.

The fault name	Inverter unit protection
Operation panel display	Fault No. 1= E.igbt
Troubleshooting Cause	<ol style="list-style-type: none"> <li>1 Inverter output circuit is short</li> <li>2. The wiring of motor and frequency converter is too long</li> <li>3 Module Overheating</li> <li>4 The internal cables of the converter are loose</li> <li>5 The main control board is abnormal</li> <li>6 The driver is abnormal</li> <li>7 The inverter module is abnormal</li> </ol>
Troubleshooting Measures	<ol style="list-style-type: none"> <li>1 Remove peripheral faults</li> <li>2. Add reactor or output filter</li> <li>3, check whether the air duct is blocked, whether the fan is working normally and eliminate problems</li> <li>4 Insert all cables</li> <li>5 Seek technical support</li> </ol>

The fault name	Accelerated overcurrent
Operation panel display	Fault no. 2= E.occ
Troubleshooting Cause	<ol style="list-style-type: none"> <li>1.The acceleration time is too short</li> <li>2. Manual torque lifting or V/F curve is not suitable</li> <li>3. Low voltage</li> <li>4 The output loop of the converter is grounded or short-circuited</li> <li>5. The control mode is vector and no parameter identification is carried out</li> <li>6 Start the motor that is rotating</li> <li>7 Sudden loading during acceleration</li> <li>8 Converter selection is too small</li> </ol>
Troubleshooting Measures	<ol style="list-style-type: none"> <li>1. increase the acceleration time</li> <li>2.Adjust manual lifting torque or V/F curve</li> <li>3 Adjust the voltage to the normal range</li> <li>4 Troubleshoot peripheral faults</li> </ol>



	5. Identification of motor parameters 6. Choose speed tracking to start or wait for the motor to stop before starting 7. cancel the sudden loading 8. Choose frequency converter with higher power grade
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The fault name	Retarding overcurrent
Operation panel display	Fault number 3=E. oCdE
Troubleshooting Cause	1. There is grounding or short circuit in the output loop of the frequency converter 2. The control mode is vector and no parameter identification is carried out 3. deceleration time is too short 4. Low voltage 5. Load is added in the process of deceleration 6. no brake unit and brake resistance
Troubleshooting Measures	1. Remove peripheral faults 2. Identification of motor parameters 3. increase the deceleration time 4. Adjust the voltage to the normal range 5. cancel the sudden loading 6. add brake unit and resistance

The fault name	Constant speed overcurrent
Operation panel display	Fault no. 4= E.occo
Troubleshooting Cause	1 The output loop of the converter is grounded or short-circuited 2. The control mode is vector and no parameter identification is carried out 3. Low voltage 4. Whether there is sudden loading in operation 5. converter selection is small
Troubleshooting Measures	1. Remove peripheral faults 2. Identification of motor parameters 3. Adjust the voltage to the normal range 4. cancel the sudden loading 5. Choose frequency converter with higher power grade

The fault name	Accelerated overvoltage
Operation panel display	Fault No. 5=E. UAC
Troubleshooting Cause	1, no brake unit and brake resistance 2. The input voltage is high 3, in the process of acceleration, there is external force to drag the motor to run 4. The acceleration time is too short
Troubleshooting Measures	1, add brake unit and resistance 2. Adjust the voltage to the normal range 3, cancel the additional power or add brake resistance 4. Increase the acceleration time
The fault name	Retarding overvoltage



Operation panel display	Fault no. 6=EoUdE
Troubleshooting Cause	<ol style="list-style-type: none"> <li>1. The input voltage is high</li> <li>2. in the process of deceleration, there is external force to drag the motor to run</li> <li>3. The deceleration time is too short</li> <li>4. no brake unit and brake resistance</li> </ol>
Troubleshooting Measures	<ol style="list-style-type: none"> <li>1. Adjust the voltage to the normal range</li> <li>2. cancel the additional power or add brake resistance</li> <li>3. increase the deceleration time</li> <li>4. Add brake unit and power limit</li> </ol>

The fault name	Constant speed overvoltage
Operation panel display	Fault no. 7= E.uco
Troubleshooting Cause	<ol style="list-style-type: none"> <li>1, there is a force drag motor operation in the process</li> <li>2. The input voltage is high</li> </ol>
Troubleshooting Measures	<ol style="list-style-type: none"> <li>1, in addition to the power or add brake resistance</li> <li>2. Adjust the grid voltage to normal range</li> </ol>

The fault name	Control power failure
Operation panel display	Fault Number 8=ECPF
Troubleshooting Cause	1. The input voltage is not within the range specified in the specification
Troubleshooting Measures	1. Adjust the pressure to the range required by the specification

The fault name	Under-voltage fault
Operation panel display	Fault no. 9= E.lu
Troubleshooting Cause	<ol style="list-style-type: none"> <li>1, when the power failure</li> <li>2. The input voltage of the frequency stabilizer is not within the range required by the regulations</li> <li>3. Bus voltage is abnormal</li> <li>4, the flow is positive</li> <li>5. The driver board is abnormal</li> <li>6. The control board is abnormal</li> </ol>
Troubleshooting Measures	<ol style="list-style-type: none"> <li>1. Reset the fault</li> <li>2, adjust the voltage to the normal range</li> <li>3. Ask for technical support</li> </ol>

The fault name	Inverter overload
Operation panel display	So follow serial number 10= e.l
Troubleshooting Cause	<ol style="list-style-type: none"> <li>1. Converter selection is small</li> <li>2. Whether the load is too large or the motor is blocked</li> </ol>
Troubleshooting Measures	<ol style="list-style-type: none"> <li>1. Choose frequency converter with higher power level</li> <li>2. Reduce the load and check the motor and engine city</li> </ol>

The fault name	Motor overload
Operation panel display	Fault no. 11= E.lt



Troubleshooting Cause	<ol style="list-style-type: none"> <li>1. Converter selection is small</li> <li>2. Whether the motor protection parameter P9.01 is set properly</li> <li>3. Whether the load is too large or the motor is blocked</li> </ol>
Troubleshooting Measures	<ol style="list-style-type: none"> <li>1. Choose frequency converter with higher power grade</li> <li>2. Set this parameter correctly</li> <li>3. Reduce load and check motor and mechanical condition</li> </ol>

The fault name	The input phase
Operation panel display	Fault number 12=EILF
Troubleshooting Cause	<ol style="list-style-type: none"> <li>1. The driver board is abnormal</li> <li>2. The surge protection board is abnormal</li> <li>3. The main control board is abnormal</li> <li>4. Three-phase input power is abnormal</li> </ol>
Troubleshooting Measures	<ol style="list-style-type: none"> <li>1, replace the drive, power board or contactor</li> <li>2. Seek technical support</li> <li>3, check and eliminate problems in the peripheral line</li> </ol>

The fault name	The output phase
Operation panel display	Fault no. 13= E.If
Troubleshooting Cause	<ol style="list-style-type: none"> <li>1. The lead wire from the frequency converter to the motor is abnormal</li> <li>2. Inverter three-phase output is unbalanced when the motor is running</li> <li>3. The driver board is abnormal</li> <li>4. The module is abnormal</li> </ol>
Troubleshooting Measures	<ol style="list-style-type: none"> <li>1. Remove peripheral faults</li> <li>2. Check whether the three-phase winding of the motor is normal and troubleshoot</li> <li>3. Seek technical support</li> </ol>

The fault name	Module is overheating
Operation panel display	Fault number 14= E.oh1
Troubleshooting Cause	<ol style="list-style-type: none"> <li>1. Air duct is blocked</li> <li>2. The fan is damaged</li> <li>3. The ambient temperature is too high</li> <li>4. Thermistor of the module is damaged</li> <li>5. The inverter module is damaged</li> </ol>
Troubleshooting Measures	<ol style="list-style-type: none"> <li>1, clean up the air duct</li> <li>2. Replace the fan</li> <li>3, reduce the ambient temperature</li> <li>4, replace the thermistor</li> <li>5. Replace the inverter module</li> </ol>

The fault name	External device failure
Operation panel display	Fault no. 15= E.lof
Troubleshooting Cause	<ol style="list-style-type: none"> <li>1. Input external fault signals through the multi-function terminal DI</li> <li>2. Input external fault signals through the virtual function</li> </ol>



Troubleshooting Measures	1. Reset operation
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The fault name	Communication failures
Operation panel display	Fault number 16=E.cof1
Troubleshooting Cause	1. The communication line is abnormal 2. The P0.28 of the communication expansion card is incorrectly set 3. The PD group of communication parameters is incorrectly set 4. The upper computer does not work normally
Troubleshooting Measures	1. check the communication connection line 2. Set the communication expansion card type correctly 3. Set communication parameters correctly 4. Check the connection of the upper computer

The fault name	Contactor failure
Operation panel display	Fault number 17=ErECF
Troubleshooting Cause	1. the input phase is missing 2. drive board, contactor is not normal
Troubleshooting Measures	1. check and eliminate problems in the peripheral line 2. replace the drive, power board or contactor

The fault name	Current detection fault
Operation panel display	Fault no. 18=E. Hall
Troubleshooting Cause	1. Check the abnormality of Hall device 2. The driver board is abnormal
Troubleshooting Measures	1. Replace the drive board 2. Replace hall devices

The fault name	Motor tuning failure
Operation panel display	Fault no. 19= E. tune
Troubleshooting Cause	2. Parameter identification timed out 1. Motor parameters are not set according to the nameplate
Troubleshooting Measures	2. Check the lead from the converter to the motor 1. Set motor parameters correctly according to the nameplate

The fault name	Encoder failure
Operation panel display	Fault number 20=EPG1
Troubleshooting Cause	1. The encoder is damaged 2. The PG card is abnormal 3. The encoder model does not match 4. The encoder connection is wrong
Troubleshooting Measures	1. Replace the encoder 2. Replace the PG card 3. Set the encoder type correctly according to the actual situation



	4 Troubleshoot the line fault
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The fault name	EEPROM read/write faults
Operation panel display	Fault no. 21= E.ep
Troubleshooting Cause	1. The EEPROM chip is damaged
Troubleshooting Measures	1. Replace the main control

The fault name	Inverter hardware failure
Operation panel display	Fault no. 22=EHArđ
Troubleshooting Cause	1. There is overpressure 2. Overflow exists
Troubleshooting Measures	1. Press troubleshooting 2. Handle the overcurrent fault

The fault name	Short circuit to ground fault
Operation panel display	Fault number 23= E.hot
Troubleshooting Cause	1. Short circuit of the motor to the ground
Troubleshooting Measures	1. Replace the cable or motor

The fault name	The accumulated running time reaches a fault
Operation panel display	Fault no. 26= E.ra
Troubleshooting Cause	1. The accumulated running time reaches the set value
Troubleshooting Measures	1. Use the parameter initialization function to clear record information

The fault name	User-defined fault 1
Operation panel display	Fault number 27= E.st1
Troubleshooting Cause	1. Input user-defined fault 1 signals through the multi-function terminal DI 2. Use the virtual I/O function to enter user-defined signals of fault 1
Troubleshooting Measures	1. Reset operation

The fault name	User-defined fault 2
Operation panel display	Fault number 28= E.st2
Troubleshooting Cause	1. Input user-defined fault 2 signals through the multi-function terminal DI 2. Use the virtual I/O function to input user-defined fault 2 signals
Troubleshooting Measures	1. Reset operation

The fault name	The total power-on time reaches the fault
Operation panel display	Fault number 29= E.APa
Troubleshooting Cause	1. The accumulated power-on time reaches the set value
Troubleshooting Measures	1. Use the parameter initialization function to clear record information



The fault name	Off load fault
Operation panel display	Fault no. 30= E.LF
Troubleshooting Cause	1. The running current of the converter is less than P9.64
Troubleshooting Measures	1. Confirm whether the load is detached or whether the parameter Settings of P9.64 P9.65 conform to the actual operating conditions

The fault name	PID feedback is lost during runtime
Operation panel display	Fault ID 31= E.id
Troubleshooting Cause	1. PID feedback is less than the set value of PA.26
Troubleshooting Measures	1. Check the PID feedback signal or set PA26 as an appropriate value

The fault name	Current limiting fault by wave
Operation panel display	Fault number 40=ECbC
Troubleshooting Cause	1. Whether the load is too large or the motor is blocked 2. Converter selection is small
Troubleshooting Measures	1. Reduce the load and check the motor and machinery 2. Choose frequency converter with higher power grade

The fault name	Failure of switching motor during operation
Operation panel display	Fault number 41=EISr
Troubleshooting Cause	1. Change the current motor selection through the terminal during the operation of the converter
Troubleshooting Measures	1. Switch the motor after the inverter stops

The fault name	Excessive speed deviation fault
Operation panel display	Fault number 42= E.sdi
Troubleshooting Cause	1. Excessive speed deviation Detection parameter P9.69P9.60 is set improperly 2. The encoder parameters are incorrectly set. 3
Troubleshooting Measures	1. Set detection parameters reasonably according to the actual situation 2. Set the encoder parameters correctly 3. Identification of motor parameters

The fault name	Motor overspeed fault
Operation panel display	Fault number 43=EoSF
Troubleshooting Cause	1. No parameter identification was carried out 2. The encoder parameters are incorrectly set 3 Motor overspeed detection parameter P9.69P9.60 is improperly set
Troubleshooting Measures	1. Identification of motor parameters 2. Set the encoder parameters correctly 3. Set detection parameters reasonably according to the actual situation



The fault name	Motor overheat failure
Operation panel display	Fault number 45= E.oht
Troubleshooting Cause	1. Cables to the temperature sensor are loose 2. Motor temperature is too high
Troubleshooting Measures	1. Check the temperature sensor wiring and troubleshoot 2. Reduce carrier frequency or take other heat dissipation measures to heat the motor

The fault name	Wrong initial position
Operation panel display	Fault no. 51=E. puff
Troubleshooting Cause	1. motor parameters and the actual deviation is too large
Troubleshooting Measures	1. Reconfirm whether the motor parameters are correct, focusing on whether the rated current is set too small

## Appendix I: Brake accessories

When the inverter is braking, it is necessary to consume the energy fed back to the DC bus when the motor is braking through the brake resistance.

If you need to brake, please choose a suitable brake resistance according to the frequency converter capacity.

The specification and selection reference for 220V grade are as follows:

Frequency converter capacity	The braking unit		Recommended brake resistance (100% brake torque)	
	specifications	Quantity (PCS)	Equivalent resistance/power	Quantity (sheet-parallel)
0.4G	built-in	1	200Ω/80W	1
0.75G		1	150Ω/80W	1
1.5G		1	100Ω/100W	1
2.2G		1	70Ω/200W	1

The specification and selection reference for 380V grade are as follows:

Frequency converter capacity	The braking unit		Recommended brake resistance (100% brake torque)	
	specifications	Quantity (PCS)	Equivalent resistance/power	Quantity (sheet-parallel)
0.75P/1.5G	built-in	1	750Ω/120W	1
1.5G/2.2P		1	400Ω/300W	1
2.2G/3.7P		1	250Ω/300W	1
3.7G/5.5P		1	150Ω/500W	1
5.5G/7.5P		1	100Ω/500W	1