AFE series

Regenerative Energy Unit
User Manual

Foreword

Thank you for choosing the NIETZ AFE Regenerative energy unit series!

NIETZ Regenerative energy unit (hereinafter referred to as AFE) can be paired with a frequency converter drive controller to complete the three-phase controllable rectification and regenerative braking of the control system. It can not only improve the input power factor and reduce the harmonic content injected into the grid by the control system, but also feed the energy generated during the braking process back to the grid, thereby recovering and utilizing more than 95% of the regenerative electrical energy while meeting the requirements of effective braking of the AFE .

This product features comprehensive over-temperature, over-voltage, and over-current protection, and boasts low noise, low harmonic pollution, and high efficiency.

Features such as power factor.

This manual provides users with information on product selection, installation, parameter setting, on-site commissioning, troubleshooting, and routine maintenance . Notes and Instructions. To ensure the correct use of AFE series products, please read this manual carefully beforehand and keep it safe for future use.

◆ To illustrate product details, illustrations in this manual may sometimes show the product with the outer cover or safety cover removed. When using this product... Please ensure that the outer casing or cover is installed as required, and operate according to the instructions .

◆ The illustrations in this instruction manual are for illustrative purposes only and may differ from the product you ordered .

◆ Due to product upgrades or specification changes, and to improve the convenience and accuracy of the instruction manual, the content of this manual will be updated in a timely manner .

- Unpacking and inspecting the goods

Please carefully check the following when unpacking:

Please check if the model number and controller rating on the machine's nameplate match your order.

The box contains your ordered machine, product certificate, and warranty card.

Check if the product was damaged during transportation; if any omissions or damages are found, please contact our company or your supplier immediately for resolution.

- First time using

For first-time users of this product, please read this manual carefully. If you have any questions regarding functions or performance , please contact us. Our company's technical support personnel are available to assist you in the proper use of this product.

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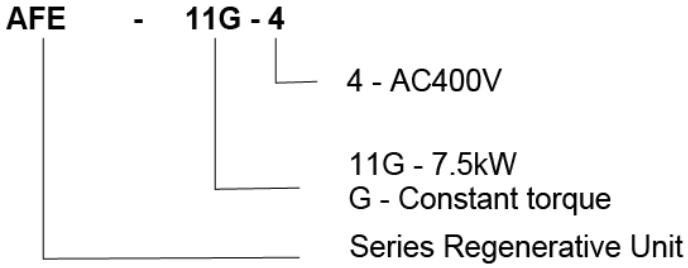
Chapter 1 Product Information

1-1. Comprehensive Technical Characteristics

Specification		
Basic performance parameters	Input voltage	3PH 380V±15%
	Input frequency	50/60Hz
	Output voltage	580Vdc-780Vdc
	Carrier frequency	10kHz
	Controllable rectifier power factor	≥ ±0.98 (under rated load, the mains voltage harmonics ＜ 3%)
	Controllable rectified harmonic current	＜ 5% (under rated load, the grid voltage harmonics ＜ 3%)
	Work efficiency	＞ 97%
	Overload capacity	120% rated current overload for 30 minutes, 150% rated current overload for 1 minute
Personalization features	Feedback power view	The feedback power (active power) is represented by a negative number, and the accuracy error ＜ 5% at rated power.
	Rectification/Feedback Distinction	Distinguish between "rectified current" and "feedback current": the rectification direction is positive, and the feedback direction is negative.
	Measurement of feedback power	For example, it can be set to record and check the amount of energy returned within a certain hour, with an accuracy within ±10%.
Input/Output	Digital input	Route 1 (X1-COM)
	Digital output	1-channel relay (RA-RC)

1-2. Nameplate Description



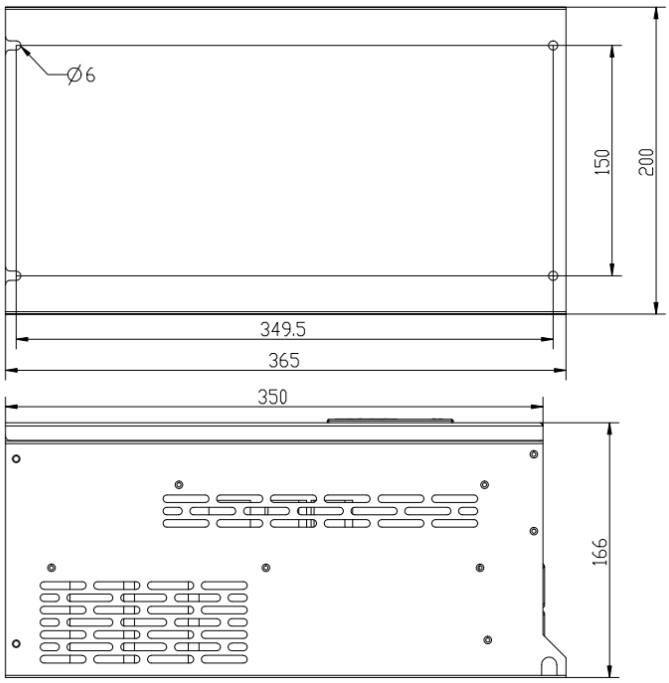
1-3. AFE series models

AFE selection is based solely on motor power, and is unrelated to motor current or inverter power. Details are as follows:

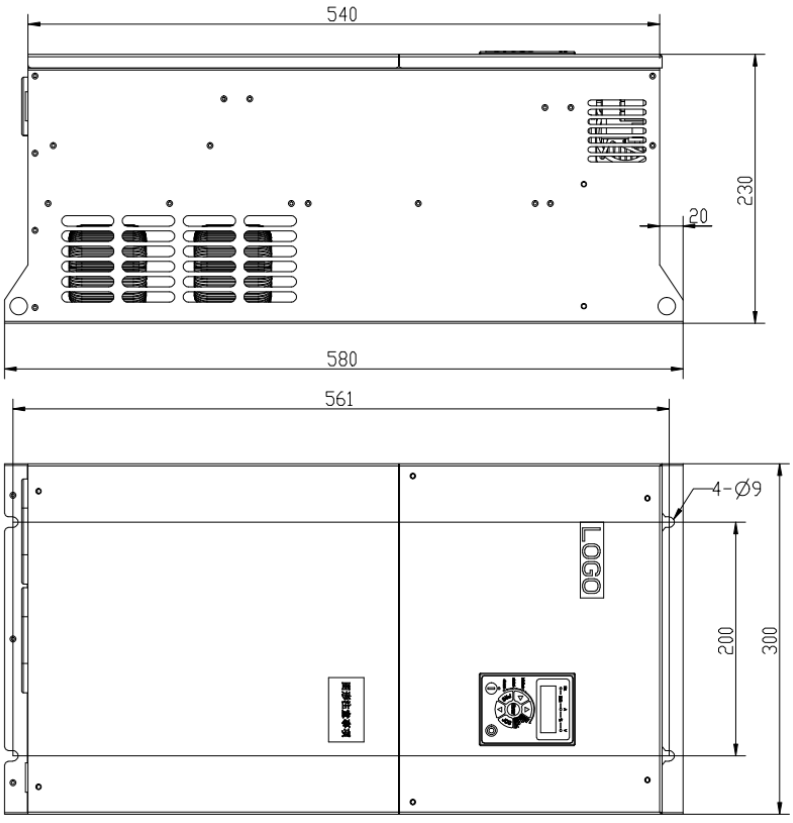
AFE model	Compatible motor/kW
AFE-5R5G-4	5.5
AFE-7R5G-4	7.5
AFE-11G-4	11
AFE-15G-4	15
AFE-18.5-4	18.5
AFE-22G-4	22
AFE-30G-4	30
AFE-37G-4	37
AFE-45G-4	45

1-4. External shape and installation dimensions

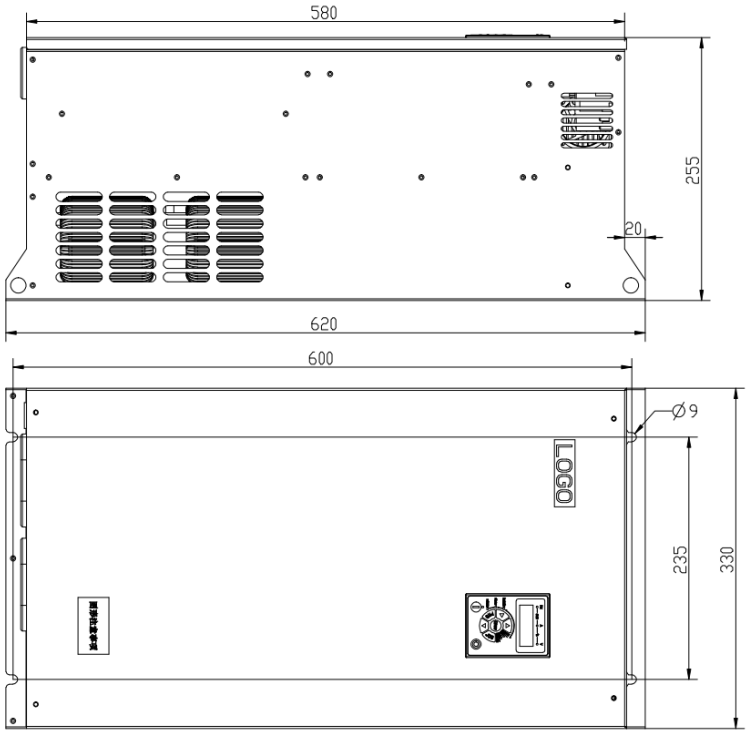
AFE-5.5~11G (5.5KW~11KW)



AFE-15~22G (15KW~22KW)

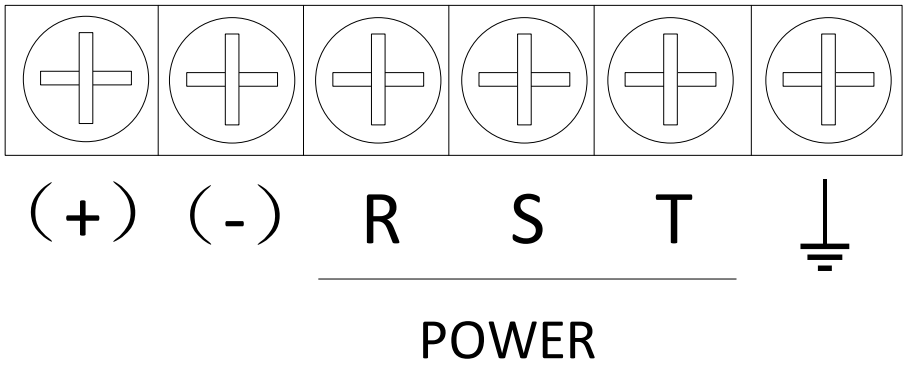


AFE-30~45G (30KW~45KW)


580
255
20
620
600
Ø9
LOGO
235
330

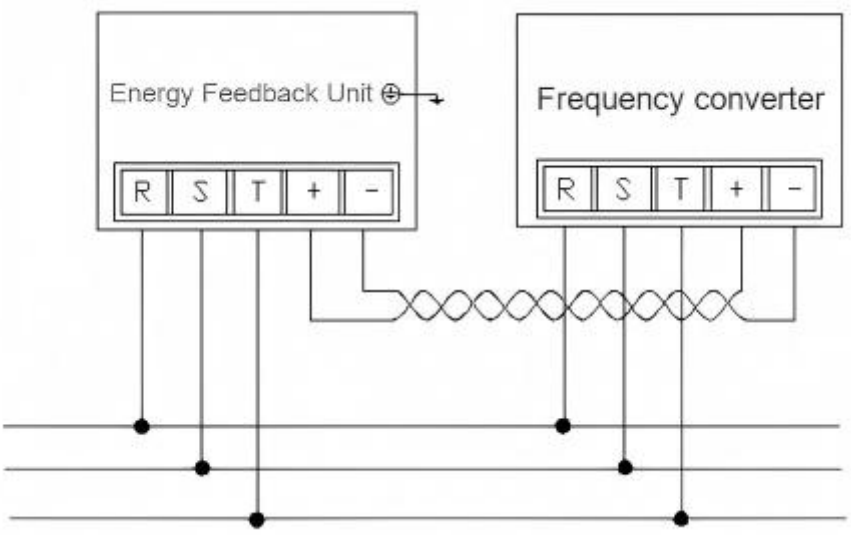
Chapter 2: Installation and Wiring

2-1. Schematic diagram of main circuit terminals

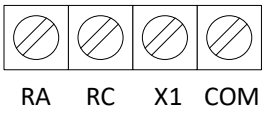


Terminal remark	Name	Illustrate
R, S, T	AC input terminals	AC three-phase power input terminals
(+) 、(−)	DC bus positive and negative terminals	DC bus output point
⏚	Grounding terminal	Ground terminal

The feedback unit terminals are labeled "R , S , T , + , -" and " ⏚ " , respectively . The "R , S , T , + , -" terminals can be connected to the corresponding terminals of the frequency converter after opening the feedback unit cover. The wiring diagram is as follows:



2-2. Control circuit terminals



Classification	Terminal markings	Terminal Function Description	Remark
Relay output	RA -RC	Normally open terminal	Contact driving capability: 250VAC, 3 A / 30VDC, 3A
Digital Input DI	X1	Digital input	1. Input impedance: 4.7K Ω 2. Voltage range for level input: 9V~30V
	COM	Digital input reference	

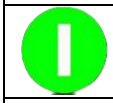
Chapter 3 Operations

3-1. Control Panel Instructions

(1) Schematic diagram of the operation panel.

The control panel is the keyboard.

(2) Key Function Description

Button Name	Name	Function Description
PRG	Programming key	Enter or exit via the first-level menu
ENTER	Confirm button	Enter the menu screen step by step, set the parameters and confirm.
▲	UP increment key	Increment of data or function code
▼	DOWN decrement key	Decreasing of data or function code
▶	shift key	In the shutdown and operation display interfaces, the displayed parameters can be cycled through; when modifying parameters, the modification digits can be selected.
	Run key	In keyboard operation mode, it is used to perform operations.
	Stop/Reset button	When in operation, pressing this key can be used to stop operation, subject to function code P7.02; when in fault alarm state, this key can be used to reset the fault, not subject to function code P7.02.
JOG	Shortcut multi-function key	The function of this key is determined by function code P7.01.
M	Spare key	

(3) Indicator light description

Indicator light name	Indicator light description
Hz	Frequency indicator light
A	Current indicator light
V	Voltage indicator light
FWD/REV	Forward/reverse indicator lights; A light off indicates that the rotation is in the forward direction, and a light on indicates that the rotation is in the reverse direction.
LOCAL/REMOT	Control mode indicator light; An off light indicates keyboard control status, an on light indicates terminal control status, and a flashing light indicates communication control status.
FUNC/ERR	Alarm indicator light; An off light indicates that the AFE is in normal condition; a flashing light indicates that the AFE is in overload pre-alarm condition; and an on light indicates that the AFE is in fault condition.
	Operating status indicator light; When the light is off, it indicates that the AFE is in a stopped state; when the light is flashing, it indicates that the AFE is in a parameter self-learning state; when the light is on, it indicates that the AFE is in a running state.

3-2. Operating Procedures

(1) : Parameter settings

The three-level menus are as follows:

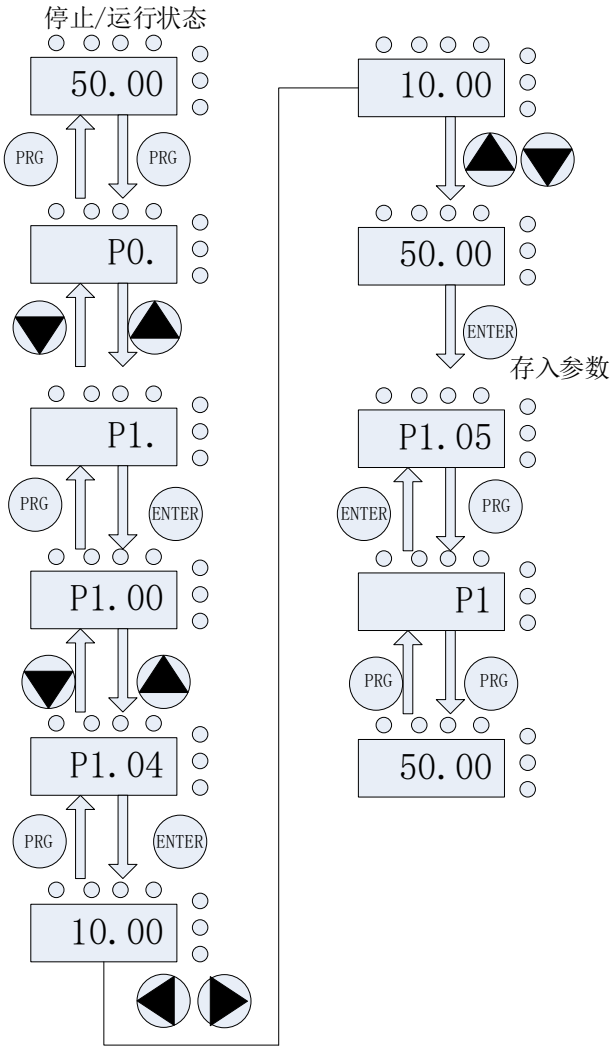
1) Function code group number (first-level menu);

2) Function code number (secondary menu);

3) Function code setting value (three-level menu).

Note: When operating in the third-level menu, you can press PRG or ENTTER to return to the second-level menu. The difference between the two is: pressing ENTER saves the settings to the control panel, then returns to the second-level menu and automatically moves to the next function code; pressing PRG directly returns to the second-level menu, does not save the parameters, and remains on the current function code.

Example: An example of changing function code P1.04 from 00.00 Hz to 50.00 Hz.



Note: In the third-level menu state, if the parameter does not flash, it means that the function code cannot be modified. Possible reasons include:

1) This function code represents a parameter that cannot be modified, such as actual detection parameters or runtime record parameters.

2) This function code cannot be modified while the system is running; it can only be modified after the system is stopped.

(2) : Fault reset

When an AFE malfunctions, it will display relevant fault information. Users can reset the AFE using the STOP key on the keyboard or the terminal function. After a fault reset, the AFE will enter standby mode. If the AFE is in a faulty state and the user does not reset it, the AFE will enter a running protection state and will not operate.

Chapter 4 Functional Parameter Summary Table

Setting P6.00 to a non-zero value means that a parameter protection password has been set, and the parameter menu can only be accessed after the correct password has been entered; to cancel the password, P6.00 must be set to 0.

The symbols in the function parameter table are explained as follows:

“☆”: This indicates that the setting of this parameter can be modified whether the AFE is stopped or running;

“★”: This parameter setting cannot be modified when the AFE is running;

"●": This indicates that the value of this parameter is the actual recorded value and cannot be modified.

P0 group rectifier control parameters				
Function code	Name	Set range	Factory value	operate
P0.00	Command source selection	0: Control Panel 1: Retain 2: X-terminal command 3: Feedback mode automatic operation 4: Automatic operation	0	★
P0.01	System main communication mode selection	0: Core Energy Backend 1: Burning Mode	1	★
P0.02	AFE working mode selection	1: Controllable rectification, energy allows for backflow prevention; 3: Regenerative energy unit mode (only effective for P0.00 setting 3).	1	★
	1: Controllable rectification allows for bidirectional energy flow ; 3: Used in Regenerative energymode, it only starts operating when the downstream inverter is in generator mode, and requires P0.00 setting 3.			★
P0.03	Bus voltage setting value	570～720V	650V	★
P0.04	Regenerative energycontrol voltage hysteresis	0～100V	20V	●
P0.05	Voltage loop regulator proportional gain	0～1000	model	★
P0.06	Voltage loop regulator integral gain	0～1000	model	★
P0.07	Current loop regulator proportional gain	0～1000	model	★
P0.08	Integral gain of current loop regulator	0～1000	model	★

P0.09	Phase-locked loop regulator proportional gain	0～65535	1645	★
P0.10	Phase-locked loop regulator integral gain	0～65535	1633	★
P0.11	upper limit of output current	0%～200.0%	150%	★
P0.12	Downtime delay time	0～100s	10s	●
P0.13	Power supply frequency mode	0: 50Hz 1: 60Hz	50Hz	★
P0.15	Input filter capacitor	100～3000uF	According to model	★
P0.16	Filter suppression enable	0: Invalid 1: Effective	1	★
P0.17	carrier frequency	0.0～10kHz	10	★
P0.18	carrier frequency random adjustment	0: Invalid 1: Effective	0	★
P0.21	Active damping notch coefficient	0～65535	model	★
P0.22	Active damping feedback coefficient	0～65535	model	★
P0.23	Active damping limiting	0～65535	500	★
P0.24	Reverse connection fault enable	0: Invalid 1: Effective	0	★
P1 group input and output parameters				
P1.00	X1 input	0: No function; 1: Normally open input for operation; 3: Normally open input for external fault; 33: Normally closed input for operation; 35: Normally closed input for external fault; the rest are reserved.	0	★
P1.05	RA-RC Output Function Selection	0: No function 1: Operation indication 2: DCBUS command level reached 3: Phase lock completed 4: Fault indication 5: Overheat warning 6: Warning output 7-15 Reserved	0	★
Group P2 Fault and protection parameters				
P2.00	Automatic Fault Reset Count Setting	0～100	0	★
P2.01	Number of automatic fault resets	0～100	0	●
P2.02	Automatic fault reset interval	0～1000s	10.0s	★

F2.03	Automatic fault reset clearing time	0～1000h	1.0h	★
P2.04	Fault enable code 1	0～65535	65535	★
P2.05	Fault enable code 2	0～65535	65535	★
P2.06	Automatic Fault Reset 1	0～65535	49032	★
P2.07	Automatic Fault Reset 2	0～65535	3	★
P2.08	Alarm enable code 1	0～65535	65535	★
P2.09	Alarm enable code 2	0～65535	65535	★
P2.10	Module overheating pre-alarm temperature	0～100℃	100	●
P2.11	Module overheat protection temperature	0～110℃	110	●
P2.14	Busbar undervoltage warning value	0%～100%	85	★
P2.15	Software bus undervoltage protection point	60%～100%	100%	★
P2.16	Software bus overvoltage protection point	0.00～1000V (internal software overvoltage setting)	0.0V	★
P2.17	Grid voltage warning value	100-150%	115%	★
P2.18	Power grid overvoltage protection point	100-150%	120%	★
P2.19	Power grid undervoltage warning value	0～100%	85%	★
P2.20	Power grid undervoltage point	0～100%	75%	★
P2.21	Power grid over-frequency alarm value	0～10Hz	3Hz	★
P2.22	China Network overfrequency point	0～10Hz	5Hz	★
P2.23	Power grid frequency under-frequency warning value	(-10～0)HZ	(-3)Hz	★
P2.24	underfrequency points of power grid	(-10～0)HZ	(-5)Hz	★
P2.25	Power grid voltage imbalance alarm value	0-20%	0.1	★
P2.26	Voltage imbalance in the power grid	0-20%	0.15	★
P2.27	AFE current imbalance	0%～50%	0.1	★
P2.28	Zero-sequence current pre-alarm value	0%～100%	0.25	★
P2.29	Zero-sequence current fault point	0%～100%	0.5	★
	Different systems have different requirements for zero-sequence current, which can be set by changing the above warning values and protection points.			
P3 Group Monitoring parameters				

P3.00	Stop display parameters	bit00: Power saving bit01: Grid frequency bit02: Grid voltage bit03: Bus voltage bit04-bit15: Reserved	65535	☆
P3.01	Run display parameters	bit00: Power saving (/) bit01: Mains frequency (Hz) bit02: Mains voltage (V) bit03: Bus voltage (V) bit04: AFE current (A) bit05: Module NTC temperature bit06: Inductor temperature	65535	☆
P3.02	STOP button function	0: The STOP button function is only available in keyboard control mode.	1	☆
P3.03	Functional software version number	00.00～99.99	0	●
P3.04	Performance software version number	00.00～99.99	0	●
P3.05	Software version number	00.00～99.99	0	●
P3.06	Grid frequency	0.00～100.00H z	00.00Hz	●
P3.07	Grid voltage	0.00～1000V	0.0V	●
P3.08	bus voltage	0.00～1000V	0.0V	●
P3.09	Output current	0.00～100A	0.0A	●
P3.10	Module temperature	0～200℃	0.0℃	●
P3.11	System power	0.00～100.00kW	0	●
P3.12	High electricity consumption	0～65535	0	●
P3.13	Low electricity consumption	0～65535kW/h	0	●
P3.14	High energy saving	0～65535	0	●
P3.15	Low energy saving rate	0～65535kW/h	0	●
P3.16	Degree update time	0～65535	0	●
P3.17	High level of total electricity savings	0～65535	0	●
P3.18	Low total electricity savings	0～65535kW/h	0	●
Group P4 Fault Inquiry				
P4.00	Latest failure	0～65535	0	●
P4.01	Latest primary power grid frequency	0.00～100.00Hz	0.00Hz	●
P4.02	Latest primary grid voltage	0.00～1000V	0.0V	●
P4.03	Latest bus voltage	0.00～1000V	0.0V	●
P4.04	Latest AFE current	0.00～100A	0.00A	●
P4.05	AFE temperature at the time of the latest fault	0～200℃	0℃	●
P4.07	Cumulative uptime since the latest failure	0～65535	0	●

P4.08	The content of the first failure	0～65536	0	●
P4.09	First fault grid frequency	0.00～100.00Hz	0.00Hz	●
P4.10	First fault grid voltage	0.00～1000V	0.0V	●
P4.11	First time the bus voltage was reduced	0.00～1000V	0.0V	●
P4.12	First fault AFE current	0.00～100A	0.00A	●
P4.13	AFE temperature at the first fault	0～200℃	0℃	●
P4.15	Cumulative running time at the first failure	0～65535	0	●
P4.16	The content of the second failure	0～65536	0	●
P4.17	Second fault power grid frequency	0.00～100.00HZ	0.00HZ	●
P4.18	Second fault grid voltage	0.00～1000V	0.0V	●
P4.19	Second fault bus voltage	0.00～1000V	0.0V	●
P4.20	Second fault AFE current	0.00～100A	0.00A	●
P4.21	AFE temperature during the second fault	0～200℃	0℃	●
P4.23	Cumulative running time during the second failure	0～65535	0	●
P4.24	The content of the third failure	0～65536	0	●
P4.25	Third fault power grid frequency	0.00～100.00Hz	0.00Hz	●
P4.26	Third fault grid voltage	0.00～1000V	0.0V	●
P4.27	Third fault bus voltage	0.00～1000V	0.0V	●
P4.28	Third fault AFE DC	0.00～100	0.00A	●
P4.29	AFE temperature during the third fault	0～200℃	0℃	●
P4.31	Cumulative running time during the third failure	0～65535	0	●
P4.32	Contents of the fourth malfunction	0～65536	0	●
P4.33	Frequency command during the fourth fault	0.00～100.00HZ	0.00HZ	●
P4.34	Fourth fault power grid frequency	0.00～100.00HZ	0.00HZ	●
P4.35	Fourth fault grid voltage	0.00～1000	0.0V	●
P4.36	Fourth fault bus voltage	0.00～1000V	0.0V	●
P4.37	Fourth fault AFE current	0.00～100A	0.00A	●
P4.38	AFE temperature during the fourth fault	0～200℃	0℃	●
P4.39	Cumulative running time during the fourth failure	0～65535	0	●
P6 group user parameters				
P6.00	User password	0～65535	0	☆

P6.01	Parameter initialization	0: No operation 1: Restore factory settings 2: Clear log information	0	★

Chapter 5 Fault Diagnosis

The elevator AFE unit has multiple warning messages and protection functions. Once an abnormal fault occurs, the protection functions will activate, the AFE unit will stop outputting, and a fault code will be displayed on the operator interface. Users can follow the prompts in this section to perform self-checks, analyze the cause of the fault, and find solutions.

Fault Name	Panel display	Cause of the fault	Countermeasures
Overcurrent fault	001	1. The AFE or frequency converter has a grounding or short circuit; 2. The parameter settings are unreasonable; 3. The power grid is abnormal, causing output oscillation; 4. There is an internal fault in the machine.	Troubleshoot external faults and restore factory settings.
Overheating fault	002	1. Ambient temperature too high; 2. Fan malfunction; 3. Air duct blockage; 4. Module malfunction ; 5. Detection circuit malfunction.	Lower the ambient temperature, replace the fan, check the air duct, and replace the module.
Busbar undervoltage	004	1: Overload 2: Abnormal bus voltage detection	Reduce the load and check the circuit.
Busbar overvoltage	006	1: Inverter not connected to braking resistor; 2: Input phase loss; 3: Excessive feedback power; 4: Abnormal bus voltage detection; 5: Control failure.	Adding a braking resistor to the frequency converter
Overload	007	1. The AFE is too small. 2. The load power is too large.	Reduce load power, replace with a higher power machine
Overvoltage of power grid	008	1: The mains voltage input is too high. 2: The mains voltage detection circuit is faulty.	Check the power grid, check the circuits
undervoltage of the power grid	009	1. Power outage or low input voltage 2. Fault in the power grid voltage detection circuit	Check the power grid, check the circuits

Fault Name	Panel display	Cause of the fault	Countermeasures
Overfrequency of power grid voltage	0010	1: Input phase loss; 2: Over-frequency mains voltage; 3: Mains voltage detection circuit failure.	Check the power grid, check the circuits
Underfrequency grid voltage	0011	1: Input phase loss; 2: Grid voltage underfrequency; 3: Grid voltage detection circuit fault.	Check the power grid, check the circuits
Voltage imbalance in the power grid	0012	1: Phase loss in the power grid voltage; 2: Fault in the power grid voltage detection circuit.	Check the power grid, check the circuits
Grid voltage phase-locked fault	0013	1: Phase loss during input; 2: Phase-locked loop failure due to grid voltage; 3: Fault in grid voltage detection circuit.	Check the power grid, check the circuits
Current asymmetry	0014	1: Phase loss in the power grid; 2: Internal wiring breakage in the machine; 3: Abnormal current detection circuit.	Check the power grid, check the circuits
Wave-by-wave current limiting fault	0015	1: Overload 2: Control failure 3: Abnormal detection circuit 4: Internal interference	Identify the load and check the circuit.
Zero-sequence current fault	0016	1: Short circuit to ground ; 2: Current detection fault; 3: Whether the range setting is reasonable.	Identify the load and check the circuit.
Current drift fault	0017	Current detection circuit failure	Identify the load and check the circuit.
External input fault	0020	Input point functionality is configured, and an external signal is available.	Check input point function settings and external fault signal input.
Busbar reverse connection fault	0023	In energy mode, the polarity of the AFE and inverter bus is reversed.	Check the busbar wiring and reverse the polarity.