CP Automation
Keeping industry
in motion

CPFA/E Power Regeneration Units

User & Installation Manual

For correct use of the product, read this manual thoroughly and retain for easy reference, inspection, and maintenance

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Introduction

The CPFA/E power feedback device is a low-noise energy-saving product that uses advanced algorithms to achieve complete sine wave current rectification and feedback. The regenerative energy generated during the inverter speed regulation process is fed back to the power grid to avoid energy loss caused by conventional braking resistors, resulting in significant savings in energy consumption.

The CPFA/E power feedback device includes reactors and noise filtering and can be directly connected to the power grid without causing interference to the power grid and surrounding electrical equipment.

This manual provides guidance for product installation, commissioning and maintenance. To ensure proper installation and operation of this product, please read this manual carefully before installation.

Chapter 1 General Precautions

1.1 Installation and wiring precautions

Danger	1. Wiring must be carried out by authorised personnel to avoid electric shock risk or damage due to incorrect wiring. 2. When installing and wiring, it is necessary to turn off the power to this device and other devices connected to it, such as the frequency converter, and wait for 5-10 minutes, to confirm that the electricity stored on the internal capacitors of each related device has been discharged before proceeding with the operation to ensure personal safety. 3. The grounding terminal of this device must be reliably grounded, otherwise there may be a risk of electric shock.
Warning	1. Correctly distinguish the R/S/T grid input terminal, R1/S1/T1 three-phase reactor input terminal (for units 75kW and above), and DC bus voltage terminals of this device. Failing to connect them correctly will prevent the device from operating and may even cause damage to the device itself, or related devices, and cause a risk of fire. 2. Install this device in a well-ventilated area, otherwise the device may overheat and be damaged.

1.2 Precautions for use

Danger	After being powered on, the internal components of this device carry dangerous high voltage. Non-authorised personnel should not touch the internal components of the device without permission, otherwise they may be at risk of electric shock.
Warning	Do not drop metal items such as screws and washers into the interior of this device, as there is a risk of damage to the device. During use, ensure that the chassis cover is properly closed.

1.3 Others

Warning	1. Product disposal should be treated as industrial waste and incineration is strictly prohibited, otherwise there is a risk of explosion. 2. Do not install CPFA/E power feedback devices that are damaged or missing components.

Chapter 2 Checks upon receipt

2.1 Unpacking inspection

The CPFA/E power feedback device supplied by CP Automation Ltd. has passed strict testing and quality inspection before leaving the factory. Before opening the box, please carefully inspect the product packaging for damage caused during transportation, and check for any signs of damage to the packaging. If any issues exist, please contact CP Automation or your supplier in a timely manner.

2.2 Product acceptance

After opening the packaging, please confirm the following:

1. Confirm whether the model on the product label is the product model you ordered.
2. Check for parts damage, detachment, and signs of damage to the front cover or body caused during transportation.

Table 1 - Product Information Description

Item	AC Voltage	Power Rating
CPFA-3P7-400-50/60-0	280Vac～480Vac	3.7KW
Hint	For more product information, please refer to Chapter 3 Models and Specifications.	

Danger	1. Do not install CPFA/E rectifier feedback devices that are damaged or missing components, to avoid risk of further damage or personal safety when powered on. 2. If there are signs of damage to packaging or the supplied product, please contact CP Automation or your supplier in a timely manner.

Chapter 3 Models and Specifications

3.1 Part Numbering

Table 2 - Part Number Breakdown

CPFx	−xx	−400	-50/60	−0
①	②	③	④	⑤

①：Item	CPFA	Active Front End Regenerative Braking Unit
	CPFE	Regenerative Braking Unit
②：Power Rating	3P7	3.7kW
	7P5	7.5kW
	11	11kW
	15	15kW
	18	18kW
	18P5	18.5kW
	22	22kW
	30	30kW
	37	37kW
	45	45kW
	55	55kW
	75	75kW
	90	90kW
	110	110kW
	132	132kW
	160	160kW
③：AC Supply	400	280Vac～480Vac
④：AC Supply frequency	50/60	50/60Hz
⑤：reserved	0	Reserved for future use

3.2 Technical specifications

Table 3 - Product Technical Specifications

Item		Specification
Power grid	Grid voltage	Three phase 280Vac~480Vac
	Grid frequency	40Hz～70Hz
Control	Current control mode	Space vector control, current and voltage THD<5% @ 100% load
	Output control mode	Intelligent predictive control of DC bus voltage
	Rectification feedback/feedback Action voltage	600Vdc (380Vac level) ± 200Vdc adjustable
	Fan control	43 °C on, 40 °C off or programmable control mode
	noise	＜70dB
	Power factor	＞0.99 @ 100% Load
	Device Protection	Overcurrent protection, overload protection, current limiting protection, DC short circuit protection, DC overvoltage protection, DC undervoltage protection, overheating protection, grid amplitude fault protection, grid frequency fault protection, grid phase fault protection, AC short circuit protection, external EXT terminal input fault protection, etc
Display	Status indication	Power indication, monitoring indication, enabling operation indication, fault indication, parameter modification indication, rectification feedback/feedback status indication, keyboard data display, etc
Installation environment	Installation site	Inside a cabinet or wall mounted, with an altitude not exceeding 1000m (a 10% reduction is required for every 1000m increase in altitude), without direct sunlight, conductive dust, and corrosive gases
	Ambient temperature	-10～40 °C, with good ventilation
	Environmental humidity	90％RH Below (without condensation)
	Vibration	Below 0.5G
	Air environment	No dust, direct sunlight, corrosive gases, flammable gases, oil mist, steam, water, etc., without too much salt content
	Installation method	Wall mounted, protection level IP20
Storage environment	Ambient temperature	-40～70 °C
	Environmental humidity	5～95％RH
	Air environment	No dust, direct sunlight, corrosive gases, flammable gases, oil mist, steam, water, etc., without too much salt content

3.3 Product selection instructions

- Rated current refers to the input current that the model operates at under the rated power load for a continuous period.
- Peak current refers to the maximum input current allowed for operation, which can last for 3 seconds.
- Overload current refers to 0.75 times the peak current, and when it exceeds this value, the overload time is calculated, with a maximum of 1 minute.
- All CPFA and CPFE models below 75kW have internal reactors. Models 75kW and above use external reactors.

Table 4 - Product Selection Table

3.3.1 CPFA

Item	Nominal Voltage	Power Rating	Rated Current	Peak Current (3s)	Chassis
CPFA-3P7-400-50/60-0	400VAC	3.7KW	8A	16A	C2
CPFA-7P5-400-50/60-0		5.5KW～7.5KW	15A	22.5A	C2
CPFA-11-400-50/60-0		11KW	17A	32A	C2
CPFA-15-400-50/60-0		15KW	23A	45A	C2
CPFA-18P5-400-50/60-0		18.5KW	28A	55A	C2
CPFA-22-400-50/60-0		22KW	41A	75A	C3
CPFA-30-400-50/60-0		30KW	50A	90A	C3
CPFA-37-400-50/60-0		37KW	60A	110A	C3
CPFA-45-400-50/60-0		45KW	90A	160A	C4
CPFA-55-400-50/60-0		55KW	105A	185A	C4
CPFA-75-400-50/60-0		75KW	132A	220A	C5
CPFA-90-400-50/60-0		90KW	160A	250A	C5
CPFA-110-400-50/60-0		110KW	185A	280A	C5
CPFA-132-400-50/60-0		132KW	250A	355A	C6
CPFA-160-400-50/60-0		160KW	280A	400A	C6

3.3.2 CPFE

Item	Nominal Voltage	Power Rating	Rated Current	Peak Current (3s)	Chassis
CPFE-5P5-400-50/60-0	400VAC	5.5KW	12A	16A	C2
CPFE-11-400-50/60-0		11KW	16.5A	22.5A	C2
CPFE-18-400-50/60-0		18KW	24A	32A	C2
CPFE-30-400-50/60-0		30KW	33A	45A	C2
CPFE-45-400-50/60-0		45KW	41A	55A	C3

Note: The overload time is calculated starting from 0.75 times the peak current. The maximum overload time is 1 minute and the minimum is 3 seconds.

3.5 Product and Installation dimensions

Table 5 - Dimensions Table

Chassis	W (mm)	H (mm)	A (mm)	B (mm)	C (mm)	D (mm)	Packed weight
C2	165	400	130	385	¢ 7	191	13.5KG（Including built-in reactor）
C3	200	562	130	545	¢ 7	300	35KG（Including built-in reactor）
C4	220	658	130	640	¢ 9	400	58KG（Including built-in reactor）
C5	220	700	130	680	¢ 9	490	166KG（Including external reactors IPC-PF-150/0.7MH-L）
C6	530	800	400	770	¢ 9	280	242KG（Including external reactors IPC-PF-300/0.7MH-L）

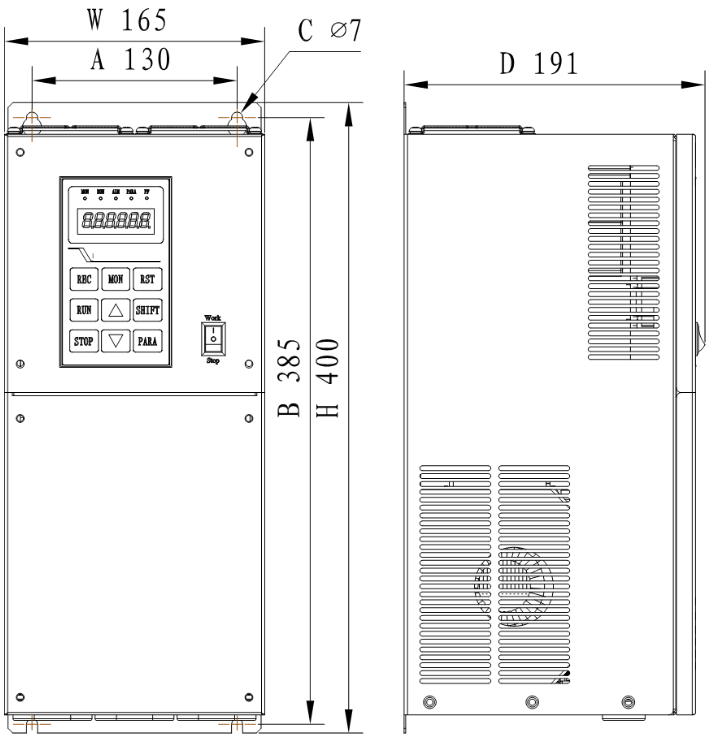

Figure 1 - C2 Chassis Dimensions

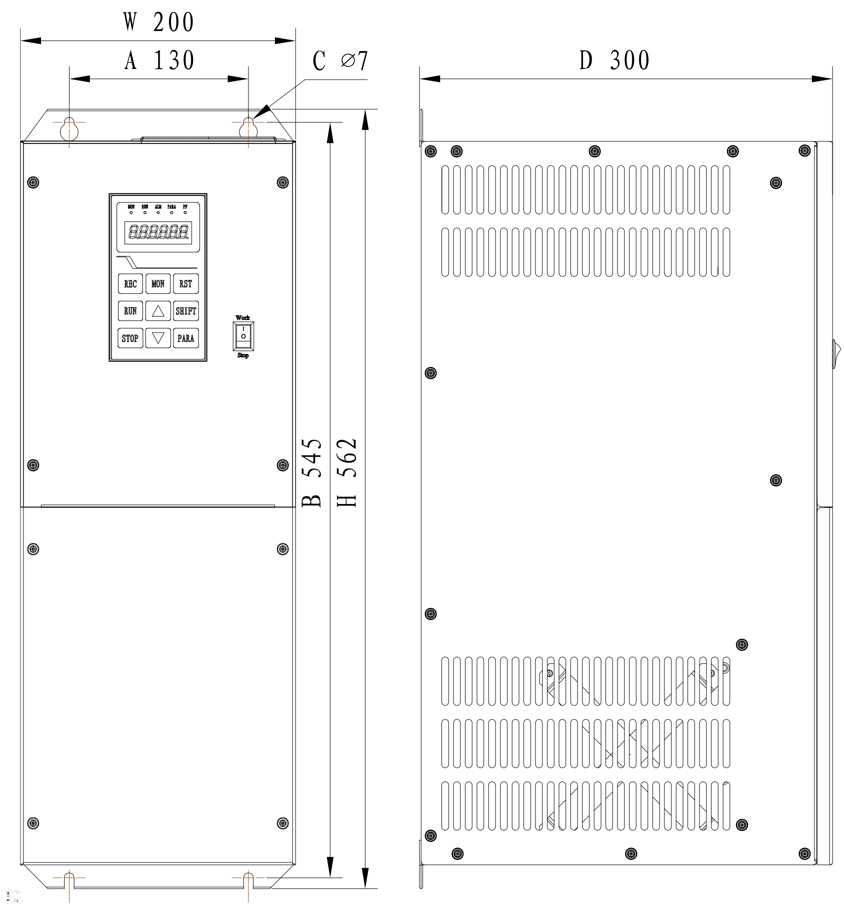

Figure 2 - C3 Chassis Dimensions

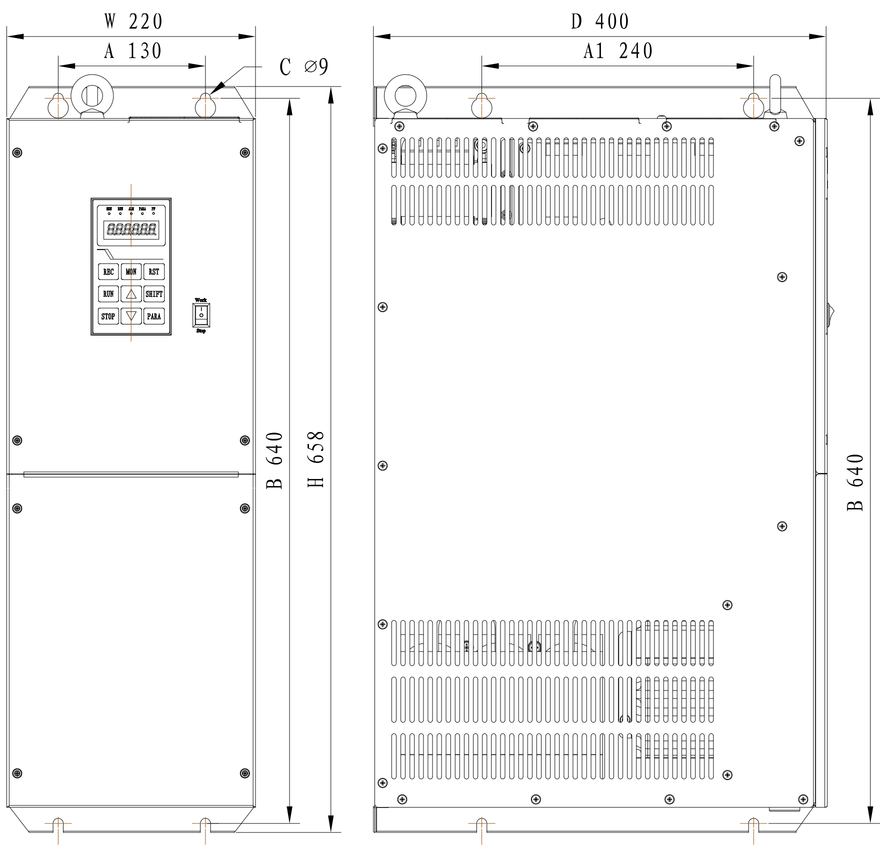

Figure 3 - C4 Chassis Dimensions

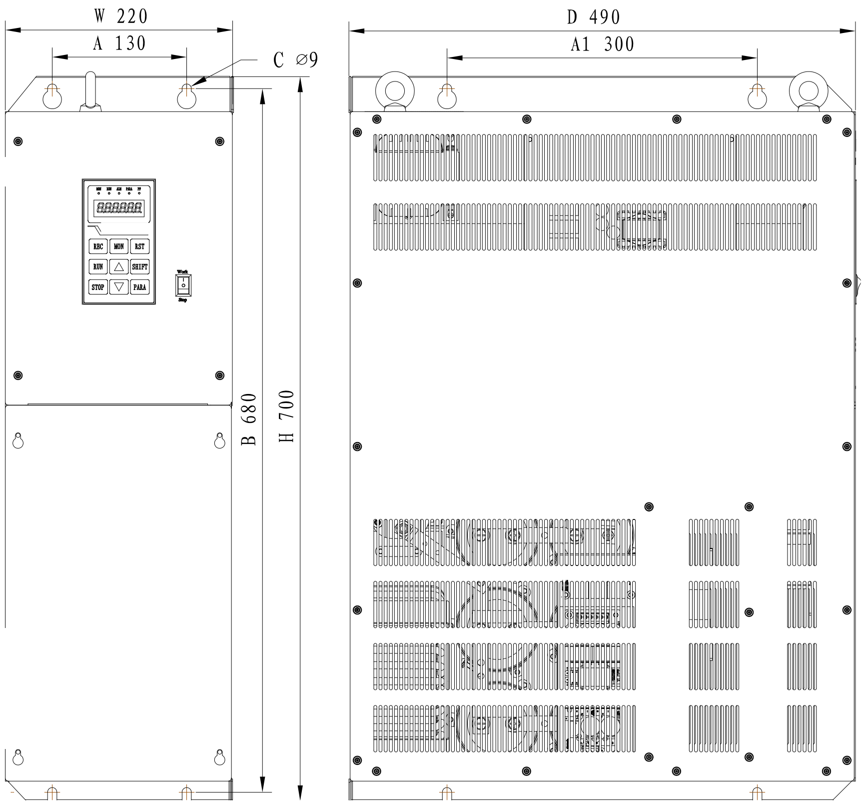

Figure 4 - C5 Chassis Dimensions

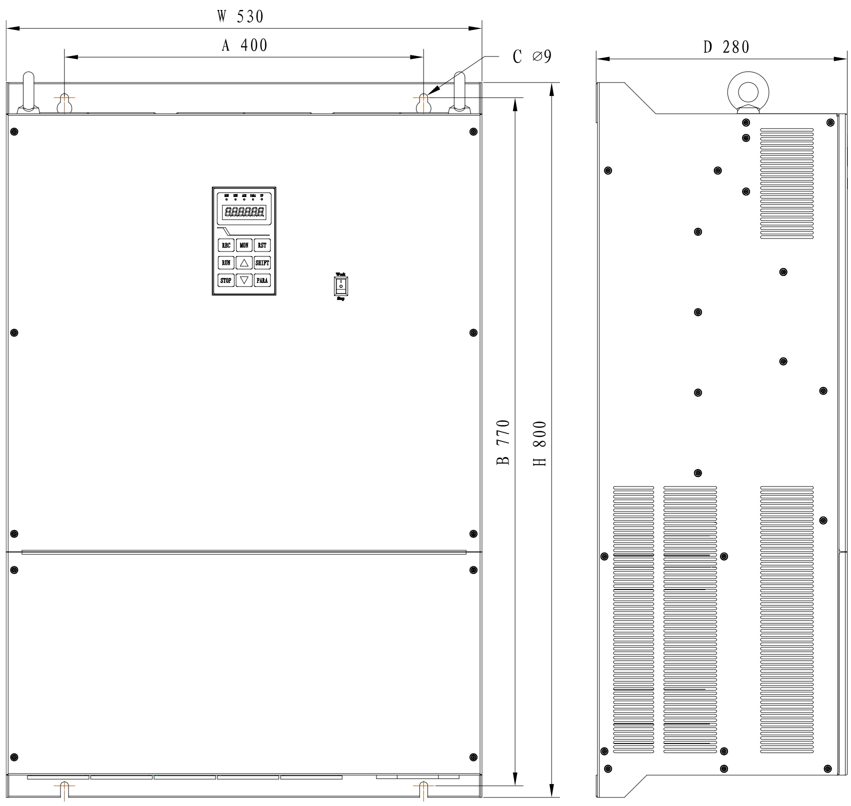

Figure 5 - C6 Chassis Dimensions

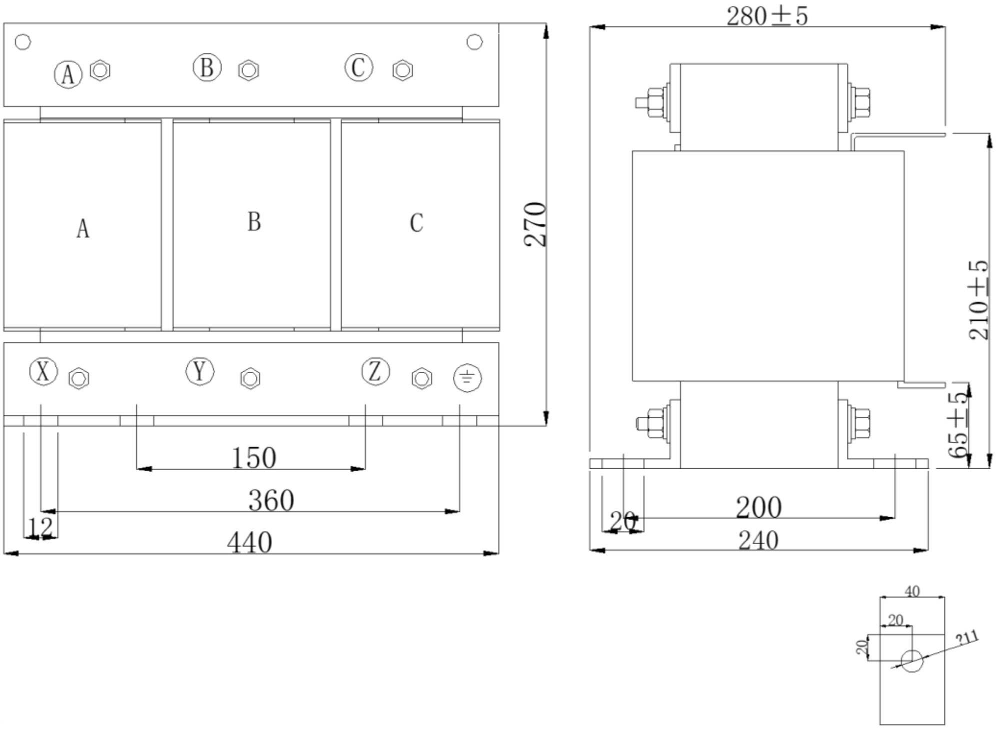

Figure 6 - External Reactor IPC-PF-150/0.7MH-L Dimensions

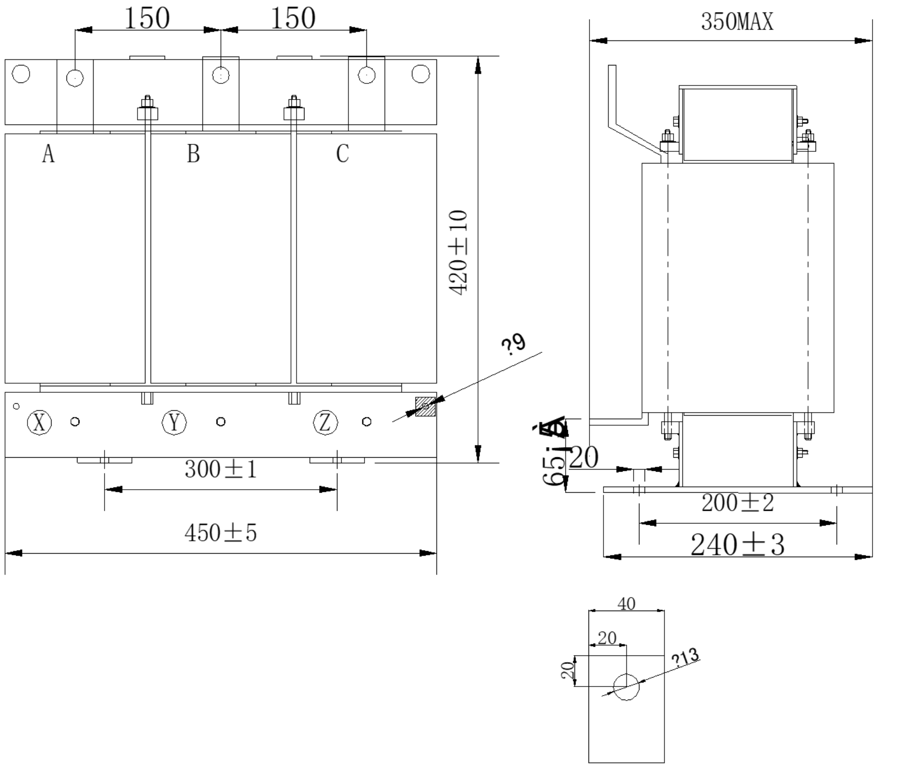

Figure 7 - External Reactor IPC-PF-300/0.7MH-L Dimensions

Hint	C5 chassis models require an external reactor IPC-PF-150/0.7MH-L, connected to R1/S1/T1 terminal
	C6 chassis models require an external reactor IPC-PF-300/0.7MH-L, connected to R1/S1/T1 terminal

Chapter 4 Installation Guide

4.1 Main circuit wiring

The main circuit is wired in the form of terminals. Open the terminal cover of the chassis and connect according to the identified terminal markings.

Figure 8 - Terminal identification for the main circuit of C2, C3, and C4 chassis models

Table 6 - Wiring instructions for the main circuit of C2, C3, and C4 chassis models

(Please refer to Figure 10 for the connection method)

Terminal identification	Function Description
R、S、T	Input terminals for three-phase power grid.
⏚	Device grounding terminal, used for shell grounding. Prevents electrical leakage in the chassis from causing harm to the human body.
DC（+)	DC output wiring terminals. Connected to the positive terminal of the inverter DC bus.
DC（-)	DC output wiring terminals. Connected to the negative terminal of the inverter DC bus.

Figure 9 - Terminal identification for the main circuit of C5 and C6 chassis models

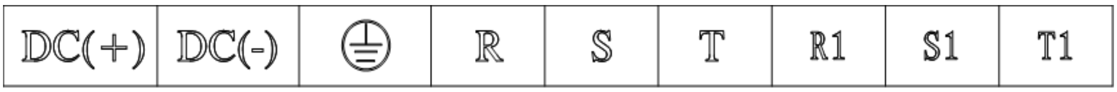

Table 7 – Wiring instructions for the Main Circuit of C5 and C6 chassis models

(Please refer to Figure 11 for the connection method)

Terminal identification	Function Description
R、S、T	Synchronous signal wiring terminals for three-phase power grids.
R1、S1、T1	Input wiring terminals for three-phase reactors.
⏚	Device grounding terminal, used for shell grounding. Prevent electrical leakage in the chassis from causing harm to the human body.
DC（+)	DC output wiring terminals. Connected to the positive terminal of the inverter DC bus.
DC（-)	DC output wiring terminals. Connected to the negative terminal of the inverter DC bus.

4.2 CPFA Schematic diagram

The wiring of the CPFA power feedback device and inverter main circuit is shown in Figure 10 and Figure 11.

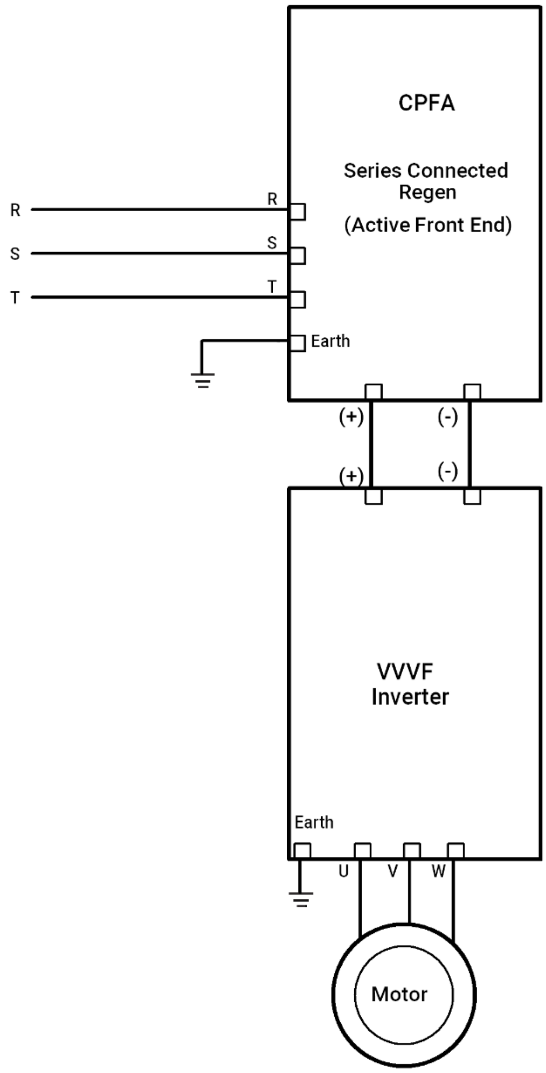

Figure 10 - CPFA and inverter main circuit wiring for C2, C3, and C4 chassis models

<table>
<tr><td rowspan="9">Hint</td><td colspan="5">The input terminal of the three-phase power grid in the C2 chassis is equipped with fast acting fuses</td></tr>
<tr><td colspan="5">C3 and C4 chassis three-phase power grid input terminals do not have internal fast acting fuses. External fuses should be used according to the table below.</td></tr>
<tr><td colspan="5">CPFA AC terminal fuse selection Chart (400V AC)</td></tr>
<tr><td>item</td><td>Chassis</td><td>3-phase AC Terminal fuse</td><td>Qty needed</td><td>Power (kW)</td></tr>
<tr><td>CPFA-22-40050/60-0</td><td>C3</td><td>RSG4-690V/80A</td><td>3</td><td>22</td></tr>
<tr><td>CPFA-30-40050/60-0</td><td>C3</td><td>RSG4-690V/100A</td><td>3</td><td>30</td></tr>
<tr><td>CPFA-37-40050/60-0</td><td>C3</td><td>RSG4-690V/110A</td><td>3</td><td>37</td></tr>
<tr><td>CPFA-45-40050/60-0</td><td>C4</td><td>RSG4-690V/160A</td><td>3</td><td>45</td></tr>
<tr><td>CPFA-55-40050/60-0</td><td>C4</td><td>RSG4-690V/200A</td><td>3</td><td>55</td></tr>
</table>

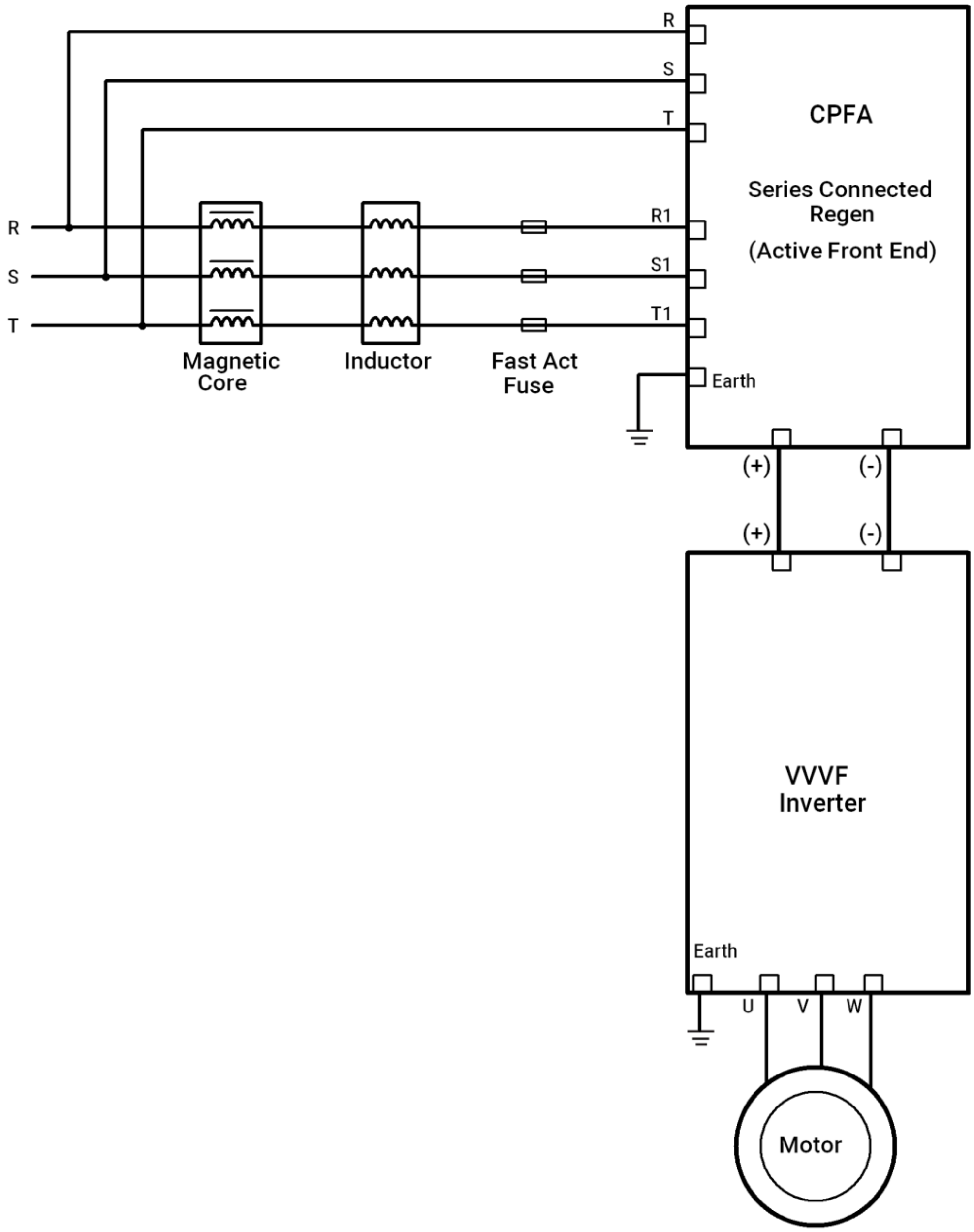

Figure 11 - CPFA Schematic diagram and inverter main circuit wiring for C5 and C6 chassis models

Hint	The C5 chassis requires an external reactor IPC-PF-150/0.7MH-L, connected to the R1/S1/T1 terminals
	The C6 chassis requires an external reactor IPC-PF-300/0.7MH-L, connected to the R1/S1/T1 terminals

CPFE Schematic circuit wiring

The wiring of the CPFE elevator energy feedback device and the inverter main circuit is shown in Figure 12.

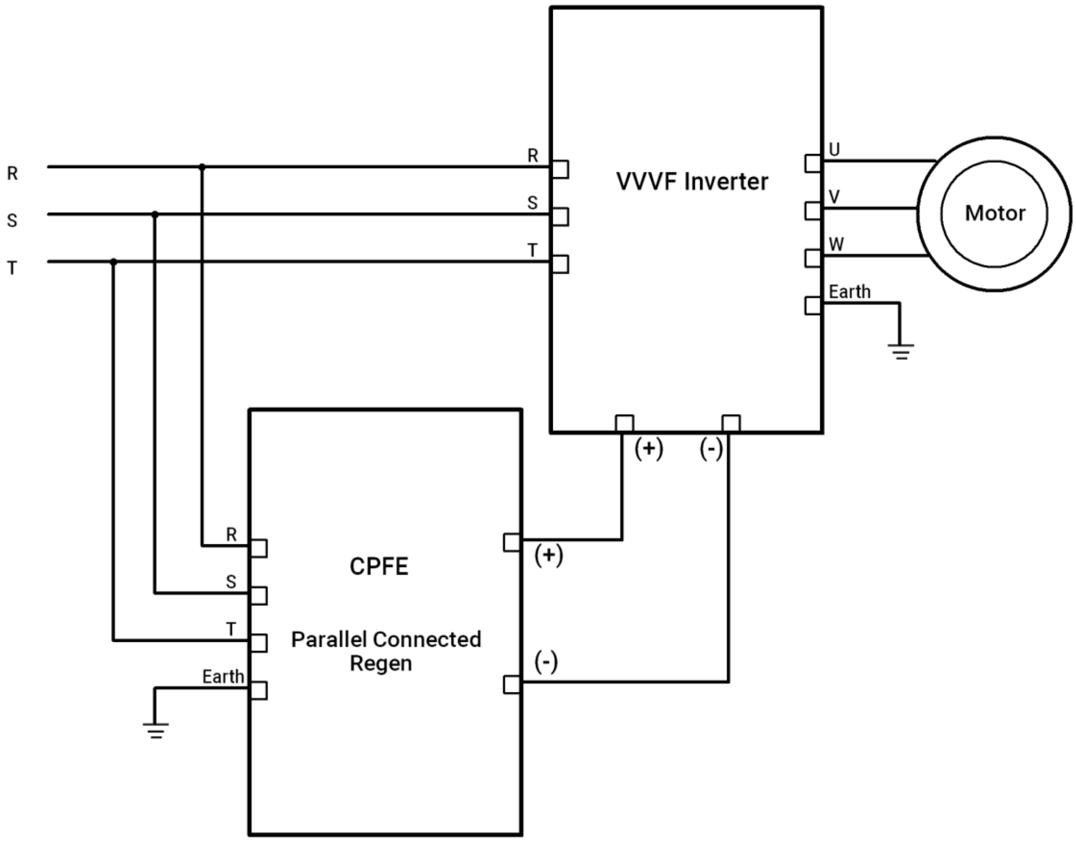

Figure 12 - CPFE and inverter main circuit wiring

The length of the cable connecting the CPFE unit to the elevator's control cabinet is required to be less than 10 meters. If it is more than 10 meters, the wire diameter should be increased to the next available size.

4.3 Control board Configuration

4.4.1 Control board connections description

There is a control board inside the CPFA/E power feedback device, and its control connections are described in Table 8.

Table 8 - Control Board Connection Description

Connections		Description
Control Port	CN16 (DC BUS)	DC bus voltage supply port (note that the positive and negative poles cannot be connected incorrectly)
	CN5 (R S T)	Grid three-phase sampling port
	J2 (T1), J3 (T2)	Temperature sensor ports
	CN4 (FAN)	DC 24V fan control port, output current 0.5A (note that the positive and negative poles cannot be connected incorrectly)
	CN6(HU)	U-phase voltage type Hall sensor connector
	CN8(HV)	V-phase voltage type Hall sensor connector
	CN9 (HW)	W-phase voltage type Hall sensor connector
	CN7	RS232 keypad communication port
User Terminals	TA、TB、TC	TA/TB is the normally closed output of the relay; TC/TB is the normally open output of the relay. (AC: 270V/3A; DC: 30V/3A); Its function is determined by the setting of parameter HH -- 06
	T1A、T1B、T1C	T1A/T1B is the normally closed output of the relay; T1C/T1B is the normally open output of the relay. (AC: 270V/3A; DC: 30V/3A); Its function is determined by the setting of parameter HH -- 07
	24V	24V output voltage, maximum output current 0.5A, with COM as its ground terminal
	EXT	External fault input: active with a short circuit between EXT and COM, inactive when the short circuit is removed
	DI1	Enable Input: Regen unit is active when D1 is connected to COM, and inactive when the D1 input is open
	DI2	External fan control input: Fan will run in forced operation when DI2 is connected to COM
	DI3	Reserved
	DI4	Reserved
	DI5	External Contactor feedback normally open. Regen unit will operate with external mains contactor closed when DI5 is connected to COM and be inactive when the DI5 input is open

Connections		Description
User Terminals	DI6	Optional power grid status input terminal. Used to disable regeneration in the event of a mains fault. Regen unit is inactive when DI6 is connected to COM, and active when the DI6 input is open
	DI7	Reserved
	COM	Common
	485+ / 485-	RS485 communication interface

4.4.2 Control mode selection

The device has two control modes: Shutdown and Power Regeneration. These three modes are selected by combining terminals DI1, DI3, DI4, DI5, DI6, and DI7, as shown in Table 9.

Table 9 - Device Control Mode Table

mode	DI terminal (DI and COM: short circuited = 1, disconnected = 0, X to any)					
	DI1	**DI3**	**DI4**	**DI5**	**DI6**	**DI7**
Shutdown	0	X	X	X	X	X
Power Regeneration	1	X	X	1	0	X
Shutdown	1	X	X	0	0	X
Shutdown	1	X	X	X	1	0
Shutdown	1	X	X	1	1	1
Shutdown	1	0	X	0	1	1
Shutdown	1	1	1	0	1	1
N/A	1	1	0	0	1	1

4.4.3 Default configuration

The default configuration of the CPFA/E power feedback device is Power Regeneration control mode, when DI1 and DI5 are short-circuited to COM, as shown in Table 9. Parameter UU -- 24 of Table 19 is set to 0 and configured as Power Regeneration mode.

Hint	The red switch on the chassis cover is directly connected to the DI1 and COM terminals. When turned ON, DI1 and COM are connected. When turned OFF, DI1 and COM are disconnected.

If the CPFA/E needs to be configured for other control modes, select the control mode in Table 9 and configure the parameters UU -- 24 and UU -- 30 in Table 19 accordingly. Please refer to Table 8 for the corresponding control board connection description.

4.4 Wiring Cable Description

Table 10 - Cabinet Wiring Cable Description Table

Item		**Cable cross-sectional area（mm^2）**			
400VAC Range		**Main Circuit**	**Grounding**	**Control Terminals**	**Note**
CPFA	CPFA-3P7-400-50/60-0	≥2.5	≥0.8	≥0.8	
	CPFA-7P5-400-50/60-0	≥4	≥0.8	≥0.8	
	CPFA-11-400-50/60-0	≥6	≥2.5	≥0.8	
	CPFA-15-400-50/60-0	≥6	≥2.5	≥0.8	
	CPFA-18P5-400-50/60-0	≥8	≥2.5	≥0.8	
	CPFA-22-400-50/60-0	≥10	≥4	≥0.8	
	CPFA-30-400-50/60-0	≥10	≥4	≥0.8	
	CPFA-37-400-50/60-0	≥20	≥6	≥0.8	
	CPFA-45-400-50/60-0	≥25	≥6	≥0.8	
	CPFA-55-400-50/60-0	≥25	≥6	≥0.8	
	CPFA-75-400-50/60-0	≥35	≥8	≥0.8	Synchronous signal terminal of three-phase power grid R, S, T≥4. Control Terminals≥0.8
	CPFA-90-400-50/60-0	≥35	≥8	≥0.8	
	CPFA-110-400-50/60-0	≥50	≥8	≥0.8	
	CPFA-132-400-50/60-0	≥65	≥10	≥0.8	
	CPFA-160-400-50/60-0	≥65	≥10	≥0.8	
	Warning: The Main Circuit includes: R1, S1, T1, DC(+), DC(-)				
CPFE	CPFE-5P5-400-50/60-0	≥2.5	≥2.5	≥0.8	
	CPFE-11-400-50/60-0	≥4	≥2.5	≥0.8	
	CPFE-18-400-50/60-0	≥6	≥4	≥0.8	
	CPFE-30-400-50/60-0	≥8	≥6	≥0.8	
	CPFE-45-400-50/60-0	≥10	≥8	≥0.8	
	Warning: The Main Circuit includes: R1, S1, T1, DC(+), DC(-)				

4.6 Installation space requirements

Hint	1.If the device is installed in a control cabinet, install adequate ventilation to ensure that the temperature around the device does not exceed the specified value.
	2. If the device is installed in a control cabinet, please ensure that there is appropriate space reserved on the top, bottom, left and right sides of each device. As shown in Figure 13
	3、When installing multiple devices in the same equipment or control cabinet, it is recommended to install them adjacent to each other. As shown in Figure 14.
	4、If the installation space is limited and it must be arranged in a stacked configuration, a partition should be set in the middle to prevent the heat from the lower section from affecting the upper section. As shown in Figure 13.
Warning	The device should not be installed near flammable and explosive objects, in areas with direct sunlight, conductive dust and corrosive gases, or within reach of human hands, as it may cause accidents.

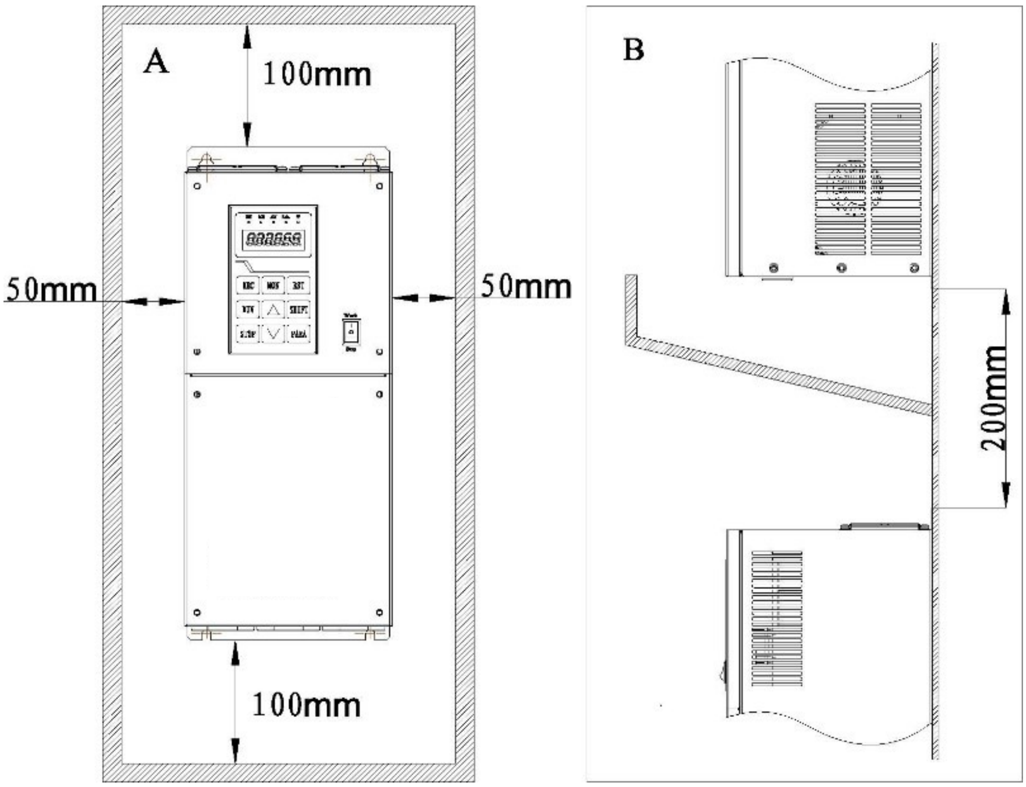

Figure 13 Requirements for Reserved Installation Space on Each Device

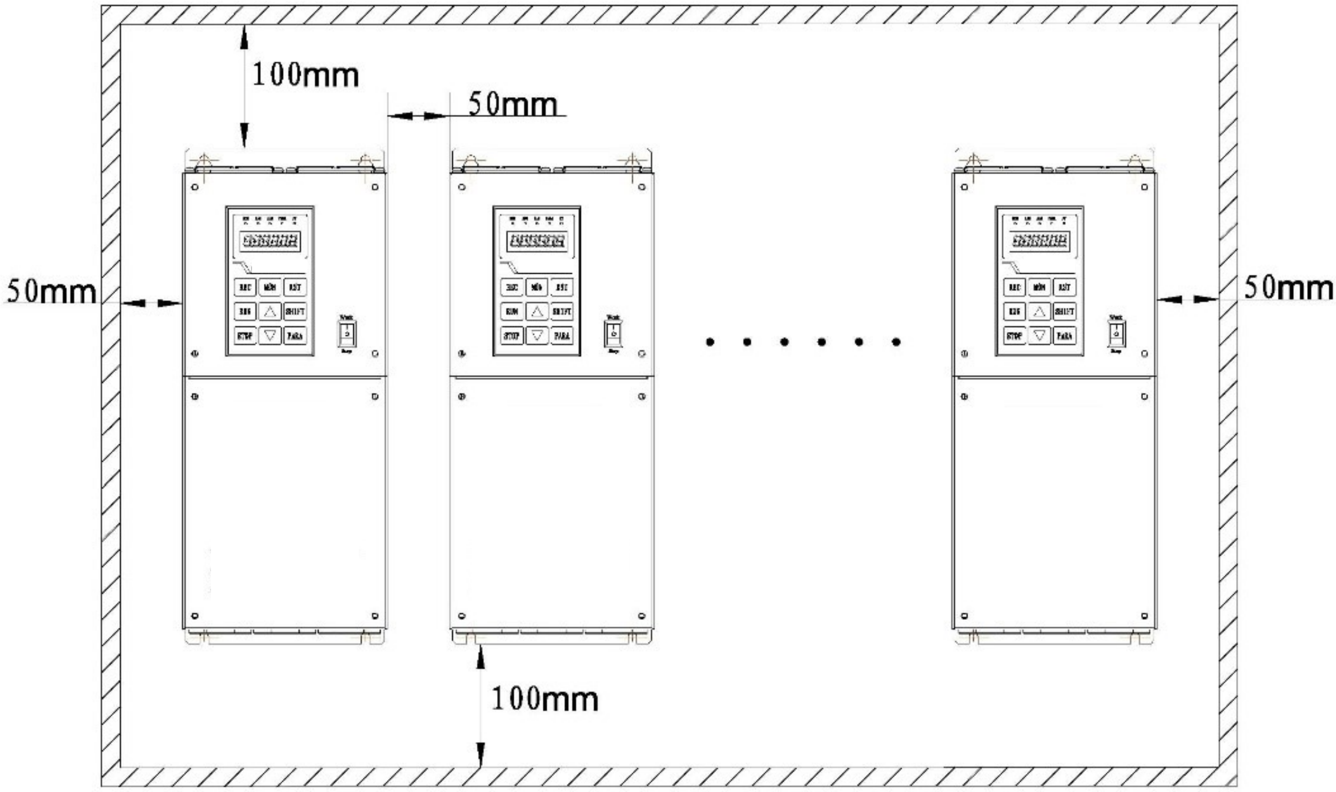

Figure 14 – Requirements for Installation of multiple Devices

Chapter 5 Parameter Settings

5.1 Keypad operation

The keypad consists of three parts: status indicator area, data display area, and key operation area.

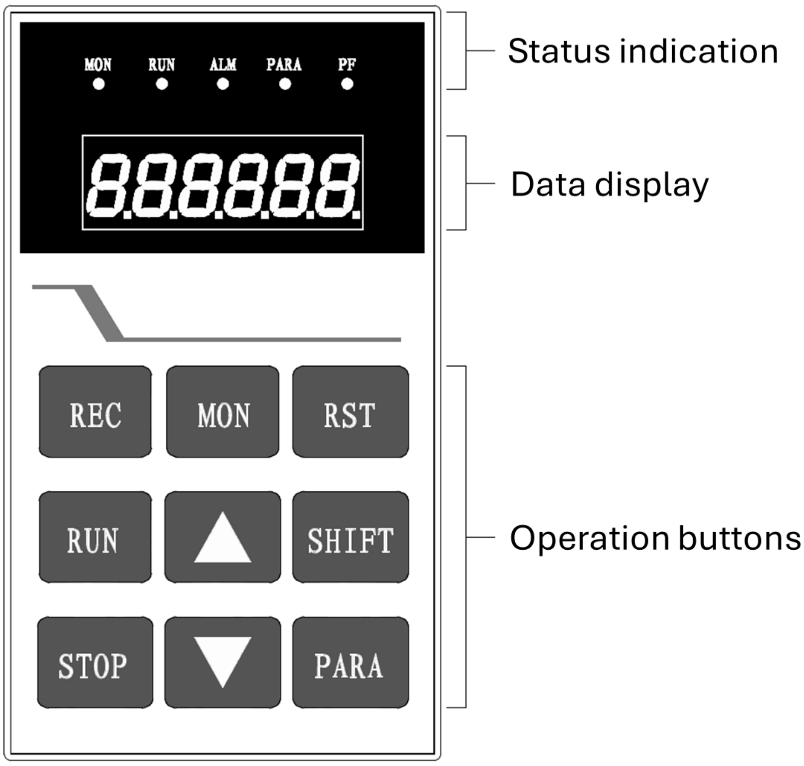

Figure 15 - Keypad layout

5.1.1 Status indicator section

Table 11 - Keypad status indicator lights

Indicator light	Indicative content
MON	This light is on to indicate entering the "MON" or "REC" menu
RUN	This light is on to indicate that the unit is enabled via DI1 and COM connections being short circuited
ALM	This light is on to indicate that the unit is in a fault/alarm state and has stopped working. The corresponding fault codes are shown in the data display section
PARA	This light is on to indicate entering the "PARA" or "RST" menu
PF	Flashes when CPFA is in Active Front End with voltage boost regen mode
Warning: When all status indicator lights remain ON and the data display is 8.8.8.8.8. This indicates that there is no communication between the keypad and regeneration module	

5.1.2 Data display section

The data is displayed using a six-digit LED display, and the content shown varies depending on the selected parameter code. The displayed content is represented in decimal digits, and individual items are displayed in code form (such as displaying fault codes).

When the software detects a fault, regardless of the current display status, the data display will immediately display the fault code corresponding to the fault, and the "ALM" indicator will light up. After the fault is eliminated, the reset time will be delayed (the software defaults to 3 seconds, and different reset times can be programmed according to different faults. Please refer to Table 18 for specific settings). The software will automatically recover and display parameter "FF -- 00”.

5.1.3 Operation key section

Table 12 - Keypad Keys Table

Button	**Key functions**
MON	Enter the "MON" menu to view monitoring parameters
REC	Enter the "REC" menu and view the fault record parameters (After the fault occurs, you can press this button to view the fault record)
PARA	Enter the "PARA" menu to modify or view functional parameters
RST	Enter the "RST" menu to modify or view debugging parameters (password is required to modify) 888888 is the default password
SHIFT	Shift Left key (Press "SHIFT" once shifts one bit to the left, and flashes)
△	Value up key
▽	Value down key
STOP	Enter parameter modification menu (this button is only effective when DI1 is disconnected from the COM terminal)
RUN	Confirm parameter modification

Table 13 - Operation chart for viewing Monitoring and Fault Record Parameters

Step	Keyboard operation	
	Monitoring parameter viewing	**View fault record parameters**
Menu	Press the MON key to enter, Default display, monitor FF -- 00	Press the REC key to enter, Default display, record REC -- 00
Select	Use the SHIFT, △, and ▽ keys to select monitor codes	Use the SHIFT, △, and ▽ keys to select record codes
confirm	Press RUN to confirm	Press RUN to confirm

Hint	Only when DI1 is disconnected from the COM terminal can the parameters in Table 14, Table 15, and Table 16 be modified.

Table 14 - Operation Table for Modifying or Viewing Functional Parameters

Step	Keyboard operation	
	Functional parameter modification	**View functional parameters**
Menu	Press the PARA key to enter, Default Display, parameter HH -- 00	Press the PARA key to enter, Default Display, parameter HH -- 00
Select	Use the SHIFT, △, and ▽ keys to select parameter codes	Use the SHIFT, △, and ▽ keys to select parameter codes
Enter modify	Press STOP to enter the data entry menu, and the current value will be displayed	
Modify	Use the SHIFT, △, and ▽ keys to modify parameter values (note: changes have not been saved yet)	
Confirm	Press RUN to save changes	Press RUN to confirm entered value

Table 15 - System parameter modification or viewing operation

Step	**Keyboard operation**	
	System parameter modification	**System parameter viewing**
Menu	Press the RST key to enter, Default Display, UU -- 00	Press the RST key to enter, Default Display, UU -- 00
Select	Use the SHIFT, △, and ▽ keys to select parameter codes	Use the SHIFT, △, and ▽ keys to select parameter codes
Password state	Press keypad <u>STOP button</u> to enter the password input state, At this point, the display shows ------	
Password input	Use the SHIFT, △, and ▽ keys to enter the correct six-digit password	
Password confirm	Confirm password by pressing RUN	
Modify	Use the SHIFT, △, and ▽ keys to modify parameter values (note: changes have not been saved yet)	
Confirm	Press RUN to save changes	Press RUN to confirm entered value

Table 16 - Password change procedure

Step	**Keyboard operation**
Menu	Press the RST key to enter, default display is UU -- 00
Select	Use the SHIFT, △, and ▽ keys to select UU -- 99
Original password status	Press STOP to enter the original password input state, which displays -----------
Original password input	Use the SHIFT, △, and ▽ keys to enter the correct original password
Original password confirmation	Press RUN to confirm the original password and enter the new password input state, At this point, the display shows ------ (Note: The Six-digit password cannot contain "-" Characters)
New password input	Use the SHIFT, △, and ▽ keys to enter the new password value (note: changes have not been saved yet)
New password confirmation	Confirm the modified new password value by pressing RUN to save it

5.2 Monitoring parameters

Table 17 shows the monitoring parameter table. For parameter access procedure, refer to

Table 13.

Table 17 - Monitoring Parameters

Parameter code	Parameter Name	Unit	Range	Display Content Description
FF--00	Feedback energy	kWh	0～99999.9	Accumulated energy fed back to the power grid
FF--01	PWM output enable state	1	0～1	0 → stopped 1 → enabled
FF--02	Voltage level of AC power grid	VAC	380	The voltage level and effective value of the AC power grid applied to the device
FF--03	Machine power	kW	2.2～500.0	The power rating of the device
FF--04	Sensor Temperature T1	ºC	-20～99.9	Temperature of sensor T1
FF--05	Sensor Temperature T2	ºC	-20～99.9	Temperature of sensor T2
FF--06	Fan control status	1	0～1	0 → Fan OFF 1 → Fan ON
FF--07	EEPROM status	1	0～1	0 → Reading and writing error 1 → Reading and writing normal
FF--08	RS232 communication status	1	0～1	0 → Communication error 1 → Communication normal
FF--09	TA/TB/TC Relay output status	1	0～1	0 → TA/TB closed, TC/TB opened 1 → TA/TB opened, TC/TB closed
FF--10	T1A/T1B/T1C Relay output status	1	0～1	0 → T1A/T1B closed, T1C/T1B opened 1 → T1A/T1B opened, T1C/T1B closed
FF--11	DI1 Input Status	1	0～1	1 = DI1/COM Open. 0 = DI1/COM closed
FF--12	DI2 Input Status	1	0～1	1 = DI2/COM Open. 0 = DI2/COM closed
FF--13	DI3 Input Status	1	0～1	1 = DI3/COM Open. 0 = DI3/COM closed
FF--14	DI4 Input Status	1	0～1	1 = DI4/COM Open. 0 = DI4/COM closed
FF--15	DI5 Input Status	1	0～1	1 = DI5/COM Open. 0 = DI5/COM closed
FF--16	DI6 Input Status	1	0～1	1 = DI6/COM Open. 0 = DI6/COM closed
FF--17	DI7 Input Status	1	0～1	1 = DI7/COM Open. 0 = DI7/COM closed
FF--18	EXT Input Status	1	0～1	1 = EXT/COM Open. 0 = EXT/COM closed

FF--19	Device Control mode	1	0～2	0 → Shutdown mode 1 → Power Regeneration mode 2 → Reserved
FF--20	DC Bus Voltage	V	0～1240.0	Displays the DC bus voltage
FF--21	DC bus charging Indication	1	0～1	0 → Bus charging not complete 1 → Bus charging complete
FF--22	Chip PWM output status	1	0～1	0 → No PWM output 1 → With PWM output
FF--23	Rectification feedback state	1	0～1	0 → Rectifier supply to drive only 1 → Active Front End with voltage boost regen mode
FF--24	R-phase zero bias coefficient of the power grid	1	0～65520	Displaying a Range between 30768 and 34768 indicates correct calibration, otherwise recalibration is required
FF--25	S-phase zero bias coefficient of the power grid	1	0～65520	
FF--26	T-phase zero bias coefficient of the power grid	1	0～65520	
FF--27	Current R-phase zero bias coefficient	1	0～65520	Displaying a Range between 30768 and 34768 indicates correct calibration, otherwise it needs to be recalibrated (the Hall sensor needs to be connected before calibration)
FF--28	Current S-phase zero bias coefficient	1	0～65520	
FF--29	Current T-phase zero bias coefficient	1	0～65520	
FF--30	Phase sequence of three-phase power grid	1	0～1	0 → phase sequence R → S → T 1 → Phase sequence R → T → S
FF--31	Three Phase grid voltage	VAC	0.0～900.0	Display three-phase AC grid voltage
FF--32	R Phase grid voltage	VAC	0.0～520.0	Display R-phase AC grid voltage
FF--33	S Phase grid voltage	VAC	0.0～520.0	Display S-phase AC grid voltage
FF--34	T Phase grid voltage	VAC	0.0～520.0	Display T-phase AC grid voltage

FF--35	Three phase average current	A	0～2000.0	Display the current of the AC power grid
FF--36	R Phase current	A	0～2000.0	Display the average current and effective value of the R-phase power grid
FF--37	S Phase current	A	0～2000.0	Display the average current and effective value of the S-phase power grid
FF--38	T Phase current	A	0～2000.0	Display the average current and effective value of the T-phase power grid
FF--39	Regenerated electrical energy	kWh	0～99999.9	Total electrical energy regenerated to the supply during regen
FF--40	Average frequency of the power grid	Hz	0～100.00	Display the average frequency of three-phase power grid
FF--41	R Phase grid frequency	Hz	0～100.00	Display R Phase grid frequency
FF--42	S Phase grid frequency	Hz	0～100.00	Display S Phase grid frequency
FF--43	T Phase grid frequency	Hz	0～100.00	Display T Phase grid frequency
FF--44	Recorded maximum current during operation	A	0.0～600.0	Actual maximum operating current=this value/number of Hall turns
FF--45	Device maximum current limit	A	0.0～600.0	Actual maximum current set=this value/number of Hall turns
FF--46	Regenerated power	kW	0.0～999.9	Regenerated power back to the supply
FF--47	Load power	kW	0.0～999.9	Power consumption of the connected load
FF--48	Accumulated power on time	H	0～99999.9	Accumulated power on time of the device
FF--49	Accumulated running time	H	0～99999.9	Accumulated running time of the device
Other	Display 8.8.8.8.8.8.	N/A	N/A	Keypad communication error

5.3 Functional parameters

Table 18 shows the functional parameters table. For parameter access procedure, refer to Table 14.

Table 18 - Device Functional Parameters

Code	Parameter Name	Unit	Range	Default value	Description
HH--00	Sensor T1 OH1 overheat protection temperature	ºC	55～95.0	80.0	If the value of T1 temperature sensor is higher than this set value, oH1 overheat protection will be triggered
HH--01	Sensor T2 OH2 overheat protection temperature	ºC	55～95.0	80.0	If the value of T2 temperature sensor is higher than this set value, oH2 overheat protection will be triggered
HH--02	OH1 overheat protection recovery time	S	2～3600	3	If FF -- 04 is less than (“HH -- 00” – 10 deg), the protection will be restored after HH -- 02 delay
HH--03	OH2 overheat protection recovery time	S	2～3600	3	If FF -- 05 is less than (“HH -- 01” – 10 deg), the protection will be restored after HH -- 03 delay
HH--04	Fan control mode	1	0～4	0	Fan control mode reference Fan control modes Table 21 shows the fan control modes. Table 21
HH--05	EXT external error recovery time	S	2～3600	3	If the external error is cleared and the recovery time delay has elapsed the software will automatically recover
HH--06	TA/TB/TC Relay Function	1	0～24	14	Program to desired function, refer to Table 22
HH--07	T1A/T1B/T1C Relay Function	1	0～24	14	Program to desired function, refer to Table 22

Code	Parameter Name	Unit	Range	Default value	Description
HH--08	dc bus Threshold voltage	V	180.0～1200.0	400.0	TA/TB/TC relay, bus threshold voltage setpoint. refer to Table 22
HH--09	dc bus Threshold voltage	V	180.0～1200.0	400.0	T1A/T1B/T1C relay, threshold voltage 1 as shown in Table 22
HH--10	TA/TB/TC Relay operation time	min	1～17280	30	TA/TB/TC relay set time, refer to Table 22
HH--11	T1A/T1B/T1C Relay operation time	min	1～17280	30	T1A/T1B/T1C relay set time 1, refer to Table 22
HH--12	TA/TB/TC Relay enabled time	S	0～240	30	TA/TB/TC relay enabled time, refer to Table 22
HH--13	T1A/T1B/T1C Relay enabled time	S	0～240	30	T1A/T1B/T1C relay conduction time 1, refer to Table 22
HH--14	TA/TB/TC Relay disabled time	S	0～240	30	TA/TB/TC relay disabled time, refer to Table 22
HH--15	T1A/T1B/T1C Relay disabled time	S	0～240	30	T1A/T1B/T1C relay disabled time 1, refer to Table 22

HH--16	DC Bus Voltage Automatic calibration	V	200.0～ 1200.0	Display bus voltage	Automatic calibration of DC Bus Voltage Set this parameter to a value of 6 and press RUN to carry out automatic calibration. After 3s new value will be learned. This parameter can also be manually adjusted in steps no larger than +/-50VDC
HH--17	Pre-Charge contactor open Voltage threshold	V	220～ 300	220.0	When the DC bus voltage is less than the set value, the pre-charge contactor will open
HH--18	Pre-Charge contactor closure Voltage threshold	V	320～ 580	380.0	When the DC bus voltage is greater than the HH--18, the pre-charge contactor will engage after HH—21 time.
HH--19	DC Bus Voltage OE overvoltage protection threshold	V	720～ 820	800.0	When the DC bus voltage exceeds the set value, an oE overvoltage protection error will be reported
HH--20	DC Bus Voltage LE undervoltage protection threshold	V	310～ 370	320.0	When the DC bus voltage is less than the set value, an LE undervoltage protection error will be reported
HH--21	Charging contactor closing delay time	S	2～240	2	When the closing condition (HH—18) is reached and HH--21 time has elapsed, the pre-charge closure will occur
HH--22	OE overvoltage protection recovery time	S	2～3600	3	When the DC Bus Voltage falls to less than (“HH--19” - 20VDC) the OE fault will be cleared after HH—22 time

HH--23	LE undervoltage Protection recovery time	S	1～3600	3	When the DC bus voltage rises above HH--20 the LE fault will be cleared after HH—23 time
HH--24	HE hardware overvoltage protection recovery time	S	2～3600	3	When the DC Bus voltage falls below Hardware Overvoltage level 840VDC - 20VDC, HE fault will be cleared after HH—24 time
HH--25	RS485 communication Address	1	0～31	31	RS485 communication Address
HH--26	Three Phase Current Zero bias correction	1	0～6	0	Automatic calibration of three phase current balancing. Currents across three phases should be equal and this calibration balances the current sensors. Set this parameter to a value of “6” and press RUN to carry out automatic calibration. After 3s new value will be learned and this value will return to “1”. A value of “0” on completion indicates a failed calibration
HH--27	Power supply for three-phase power grid Phase sequence correction	1	0～6	Auto-matic	Mains phase order calibration. Set this parameter to a value of “6” and press RUN to carry out automatic calibration. After 3s new value will be learned and this value will return to “1”. A value of “0” on completion indicates a failed calibration

HH--28	Three-phase power grid Effective value voltage Automatic calibration	VAC	50.0～ 900.0	Display grid voltage	Mains phase order calibration. Mains Voltage calibration Using a correctly calibrated meter, measure the mains voltage of the three phase supply (Phase to phase). Set this parameter to the independently measured value and press RUN to carry out automatic calibration. After 3s new calibrated value will be displayed. NOTE: If an attempt is made to adjust this parameter, but the same value is entered (rewriting the currently saved value), it is necessary to power off and power on again.
HH--29	FF three-phase grid frequency Error protection recovery time	S	1～3600	3	If the FF error of the power grid is resolved, the fault will be cleared and the operation restored after HH—29 time
HH--30	UF three-phase power grid error protection recovery time	S	1～3600	3	If the UF error of the power grid is resolved, the fault will be cleared and the operation restored after HH—30 time
HH--31	Three-phase power grid overvoltage protection setting value	VAC	225～ 308	308.0	If the three-phase power grid phase voltage is greater than the value set in HH--31, a UF protection error will be declared
HH--32	Three-phase power grid undervoltage protection setting value	VAC	131～ 222	131.0	If the three-phase power grid phase voltage is less than the value set in HH--32, a UF protection error will be declared

HH--33	PF power grid abnormality or phase loss error protection recovery time	S	2～3600	3	When the PF fault condition is cleared, operation will be restored after HH—33 time
HH--34	OC overcurrent protection recovery time	S	2～3600	3	When the OC fault is cleared, operation will be restored after HH—34 time
HH--35	Overload protection starting point	1	0.75 ～ 0.95	0.75	Percentage of the maximum current used for the OL protection time calculation in HH—36.
HH--36	OL Overload fault time	S	0.1～5.0	3.0	Time allowed for maximum current during operation Refer to the calculation formula below
Overload protection time (seconds): Y=1000 * (1-A) 2+B, where A is HH -- 35 and B is HH -- 36					
HH--37	OL overload fault recovery time	S	2～3600	3	OL Overload fault will be cleared and operation restored after HH—37 time
HH--38	DC Bus Voltage Setpoint	VDC	400～800	640.0 (CPFA) 600 (CPFE)	CPFA Sets the DC Bus voltage regulation level. Set to the level required for full load, full speed operation. Can be used to boost to the required DC Bus level for higher voltage motors. CPFE When the DC bus voltage is higher than the set value, regeneration to the mains begins. When it is lower than the set value regeneration to the mains stops. Set to value displayed in FF--20.

HH--39	Three phase emergency power supply output voltage	VAC	280～480	380.0	Reserved
HH--40	Fan start temperature	°C	43～53	43.0	Fan control mode reference point. Refer to Table 21 – HH--04 Fan Control Mode Table for further details.
HH--41	Emergency power delay enable	1	0～1	1	Reserved
HH--42	Three phase emergency power supply Delay output time	S	0.1～1800.0	10.0	Reserved
Others	Display 8.8.8.8.8.8	Hold	Hold	Hold	Hold

5.4 System parameters

Table 19 shows the system parameters table. For parameter access procedure, refer to Table 15.

Table 19 – Device System parameter Table

Code	Parameter Name	Unit	Range	Default value	Description
UU--00	Restore initialization parameters	1	0～6	0	A setting of 6 will initialize the parameters when power is cycled.
UU--01	PWM carrier frequency	KHz	10.0～10.0	10.0	Consult factory prior to adjustment

UU--02	PWM dead zone	μS	2.0～10.0	3.0	Consult factory prior to adjustment
UU--03	PWM output mode	1	0～1	0	0 → vector bipolar 1 → vector unipolarity Consult factory prior to adjustment
UU--04	Zero crossing point of three-phase power grid	1	500～8000	4000	Consult factory prior to adjustment
UU--05	Hall rated current	A	5～2000	100	Consult factory prior to adjustment
UU--06	Number of Hall sensor turns	1	1～5	1	Consult factory prior to adjustment
UU--07	Measured line Current value display calibration	A	2.0 ～ 1000.0	Display current measured value	Using a correctly calibrated meter, measure the mains current at the three-phase connection to the CPFA/E. Set this parameter to the independently measured value and press RUN to carry out automatic calibration. After 3s new calibrated value will be displayed. (Maximum correction value +/-50A) NOTE: If an attempt is made to adjust this parameter, but the same value is entered (rewriting the currently saved value), it is necessary to power off and power on again.
UU--08	Feedback energy ratio coefficient	1	0.80～2.00	1.00	Consult factory prior to adjustment
UU--09	Rectification energy ratio coefficient	1	0.80～2.00	1.00	Consult factory prior to adjustment

UU--10	Feedback energy display reset	1	0～6	0	0 → Idle/No reset 1 → Reset successful 6 → Enter to zero display
UU--11	Motoring energy display reset	1	0～6	0	
UU--12	Selection of grid frequency measurement	1	0～2	0	0 → rated frequency not measured 1 → measures the actual frequency of the 50Hz power grid 2 → measures the actual frequency of the 60Hz power grid
UU--13	Rated frequency of the power grid	Hz	40.0～70.0	50.00	Rated frequency of three-phase power supply
UU--14	50Hz Grid Over frequency	Hz	55.0～65.0	65.00	50Hz Grid over frequency protection point
UU--15	50Hz Grid under frequency	Hz	35.0～45.0	35.00	50Hz Grid under frequency protection point
UU--16	60Hz Grid Over frequency	Hz	66.0～78.0	78.00	60Hz Grid over frequency protection point
UU--17	60Hz Grid under frequency	Hz	42.0～54.0	42.00	60Hz Grid under frequency protection point
UU--18	Clear all error records	1	0～6	0	Set to 6 to clear error records 0 → Idle 1 → cleared successfully 6 → clear error records
UU--19	Leading and lagging phase angle	degree	-20～20	0.0	Consult factory prior to adjustment
UU--20	P-parameter of current PI	1	0.01～4.00	1.000	Consult factory prior to adjustment
UU--21	I parameter of current PI	1	0.001～1.5	0.007	Consult factory prior to adjustment

UU--22	Rectification charging current acceleration	1	1～4	1	25ms x value eg. 25ms x 1=25ms
UU--23	Maximum current during machine operation	A	0.8～1.1 Times	Built-in	Maximum current=this value/Hall turns
UU--24	Operating mode	1	0～1	0	0 → Rectifier mode (Non regen) 1 → Regen mode with voltage boost (voltage boost for CPFA)
UU--25	Output sampling standard voltage of three-phase emergency power supply	VAC	307.0～921	614.0	Consult factory prior to adjustment
UU--26	P-parameter of voltage PI	1	0.01～ 4.00	0.500	Consult factory prior to adjustment
UU--27	P-parameter of voltage PI	1	0.001～ 1.5	0.100	Consult factory prior to adjustment
UU--28	Rectification feedback voltage difference level	1	2.0～16.0	3.0	Voltage difference: 220VAC: 120/3.0=40.0V Other power grids: 160/3.0=53.3V Consult factory prior to adjustment
UU--29	Current feedforward decoupling coefficient	1	0.0～ 0.250	0.200	Consult factory prior to adjustment
UU--30	DI2 Software Logic Operation	1	0～2	0	0 → No function 1 → Short circuit is valid 2 → Open circuit is valid
UU--31	Emergency power acceleration time	1	1～15	4	Reserved
UU--32	DI4 enable delay	1	0～1	1	0 → No delay 1 → UU—33 delay enabled

UU--33	DI4 enable delay time	S	1～1200	30	DI4 enable operation delay
UU--34	Feedback current deviation value	1	1～320	40	Consult factory prior to adjustment
UU--35	Relay operating temperature	ºC	10.0～50.0	43.0	Control relay setting 24 temperature threshold, refer to Table 22
UU--36	Float charging voltage	V	400～800	650.0	Consult factory prior to adjustment
UU—37 *CPFE only	DI2 Hardware Logic Control (For Relay output only)	1	0-2	0	0 → uses UU—30 1 → Inverts output 2 → Non inverted output
UU—38 *CPFE only	Modification of feedback energy display	kW	0~99,999.9	Current value	Consult factory prior to adjustment
UU—39 *CPFE only	Rectification energy display modification	kW	0~99,999.9	Current value	Consult factory prior to adjustment
UU--97	Accumulated operation time reset	1	0～1	0	0 → Idle 1 → resets time to 0
UU--98	Software version		PFA-X.X	X:0～9	Other parameters, display 8.8.8.8.8.8
UU--99	Change password	1	0,1,2,3,4 5,6,7,8,9	Default 888888	Refer to Table 16. After UU—00 parameter initialization, the password will also be initialized to 888888

5.5 Troubleshooting

Table 20 shows the parameter table for recorded Faults. For parameter access procedure, refer to Table 13.

Table 20 – Recorded Fault Parameters

Code	Parameter Name	Unit	Range	Default value	Description
REC-00	Fault history. Fault 1 (The most recent fault)		E0-XXX	E0----	The 5 Previous faults, with REC-00 being the most recent.
REC-01	Fault history. Fault 2		E1-XXX	E1----	
REC-02	Fault history. Fault 3		E2-XXX	E2----	
REC-03	Fault history. Fault 4		E3-XXX	E3----	
REC-04	Fault history. Fault 5		E4-XXX	E4----	
Display will show Ey-xxx where: y = fault number xxx = one error code of oH1、oH2、EF、oE、LE、HE、FF、UF、PF、oC、oL, Table 23					
REC-05	Number of oH1 fault occurrences		oH1-XX	oH1-00	XX: Display 0-99 Cycles
REC-06	Bus voltage when last oH1 fault occurred	V	0～1240.0	0.0	DC Bus Voltage
REC-07	R-phase voltage when last oH1 fault occurred	VAC	0.0～520	0.0	R Phase voltage
REC-08	S-phase voltage when last oH1 fault occurred	VAC	0.0～520	0.0	S Phase voltage

Code	Parameter Name	Unit	Range	Default value	Description
REC-09	T-phase voltage when last oH1 fault occurred	VAC	0.0～520	0.0	T Phase voltage
REC-10	R-phase current when last oH1 fault occurred	A	0～2000.0	0.0	R Phase current
REC-11	S-phase current when last oH1 fault occurred	A	0～2000.0	0.0	S Phase current
REC-12	T-phase current when last oH1 fault occurred	A	0～2000.0	0.0	T Phase current
REC-13	Number of oH2 fault occurrences		oH2-XX	oH2-00	XX: Display 0-99 cycles
REC-14	Bus voltage when last oH2 fault occurred	V	0～1240.0	0.0	DC Bus Voltage
REC-15	R-phase voltage when last oH2 fault occurred	VAC	0.0～520	0.0	R Phase voltage
REC-16	S-phase voltage when last oH2 fault occurred	VAC	0.0～520	0.0	S Phase voltage
REC-17	T-phase voltage when last oH2 fault occurred	VAC	0.0～520	0.0	T Phase voltage
REC-18	R-phase current when last oH2 fault occurred	A	0～2000.0	0.0	R Phase current
REC-19	S-phase current when last oH2 fault occurred	A	0～2000.0	0.0	S Phase current

Code	Parameter Name	Unit	Range	Default value	Description
REC-20	T-phase current when last oH2 fault occurred	A	0～2000.0	0.0	T Phase current
REC-21	Number of EF fault occurrences		EF--XX	EF--00	XX: Display 0-99 cycles
REC-22	Bus voltage when last EF fault occurred	V	0～1240.0	0.0	DC Bus Voltage
REC-23	R-phase voltage when last EF fault occurred	VAC	0.0～520	0.0	R Phase voltage
REC-24	S-phase voltage when last EF fault occurred	VAC	0.0～520	0.0	S Phase voltage
REC-25	T-phase voltage when last EF fault occurred	VAC	0.0～520	0.0	T Phase voltage
REC-26	R-phase current when last EF fault occurred	A	0～2000.0	0.0	R Phase current
REC-27	S-phase current when last EF fault occurred	A	0～2000.0	0.0	S Phase current
REC-28	T-phase current when last EF fault occurred	A	0～2000.0	0.0	T Phase current
REC-29	Number of oE fault occurrences		oE--XX	oE--00	XX: Display 0-99 cycles
REC-30	Bus voltage when last oE fault occurred	V	0～1240.0	0.0	DC Bus Voltage

Code	Parameter Name	Unit	Range	Default value	Description
REC-31	oE R-phase voltage when last oE fault occurred	VAC	0.0～520	0.0	R Phase voltage
REC-32	S-phase voltage when last oE fault occurred	VAC	0.0～520	0.0	S Phase voltage
REC-33	T-phase voltage when last oE fault occurred	VAC	0.0～520	0.0	T Phase voltage
REC-34	R-phase current when last oE fault occurred	A	0～ 2000.0	0.0	R Phase current
REC-35	S-phase current when last oE fault occurred	A	0～ 2000.0	0.0	S Phase current
REC-36	T-phase current when last oE fault occurred	A	0～ 2000.0	0.0	T Phase current
REC-37	Number of LE fault occurrences		LE--XX	LE--00	XX: Display 0-99 cycles
REC-38	Bus voltage when last LE fault occurred	V	0～ 1240.0	0.0	DC Bus Voltage
REC-39	R-phase voltage when last LE fault occurred	VAC	0.0～520	0.0	R Phase voltage
REC-40	S-phase voltage when last LE fault occurred	VAC	0.0～520	0.0	S Phase voltage
REC-41	T-phase voltage when last LE fault occurred	VAC	0.0～520	0.0	T Phase voltage

Code	Parameter Name	Unit	Range	Default value	Description
REC-42	R-phase current when last LE fault occurred	A	0～2000.0	0.0	R Phase current
REC-43	S-phase current when last LE fault occurred	A	0～2000.0	0.0	S Phase current
REC-44	T-phase current when last LE fault occurred	A	0～2000.0	0.0	T Phase current
REC-45	Number of HE fault occurrences		HE--XX	HE--00	XX: Display 0-99 cycles
REC-46	Bus voltage when last HE fault occurred	V	0～1240.0	0.0	DC Bus Voltage
REC-47	R-phase voltage when last HE fault occurred	VAC	0.0～520	0.0	R Phase voltage
REC-48	S-phase voltage when last HE fault occurred	VAC	0.0～520	0.0	S Phase voltage
REC-49	T-phase voltage when last HE fault occurred	VAC	0.0～520	0.0	T Phase voltage
REC-50	R-phase current when last HE fault occurred	A	0～2000.0	0.0	R Phase current
REC-51	S-phase current when last HE fault occurred	A	0～2000.0	0.0	S Phase current
REC-52	T-phase current when last HE fault occurred	A	0～2000.0	0.0	T Phase current

Code	Parameter Name	Unit	Range	Default value	Description
REC-53	Number of FF fault occurrences		FF--XX	FF--00	XX: Display 0-99 cycles
REC-54	Bus voltage when last FF fault occurred	V	0～1240.0	0.0	DC Bus Voltage
REC-55	R-phase voltage when last FF fault occurred	VAC	0.0～520	0.0	R Phase voltage
REC-56	S-phase voltage when last FF fault occurred	VAC	0.0～520	0.0	S Phase voltage
REC-57	T-phase voltage when last FF fault occurred	VAC	0.0～520	0.0	T Phase voltage
REC-58	R-phase current when last FF fault occurred	A	0～2000.0	0.0	R Phase current
REC-59	S-phase current when last FF fault occurred	A	0～2000.0	0.0	S Phase current
REC-60	T-phase current when last FF fault occurred	A	0～2000.0	0.0	T Phase current
REC-61	Number of UF fault occurrences		UF--XX	UF--00	XX: Display 0-99 cycles
REC-62	Bus voltage when last UF fault occurred	V	0～1240.0	0.0	DC Bus Voltage
REC-63	R-phase voltage when last UF fault occurred	VAC	0.0～520	0.0	R Phase voltage

Code	Parameter Name	Unit	Range	Default value	Description
REC-64	S-phase voltage when last UF fault occurred	VAC	0.0～520	0.0	S Phase voltage
REC-65	T-phase voltage when last UF fault occurred	VAC	0.0～520	0.0	T Phase voltage
REC-66	R-phase current when last UF fault occurred	A	0～2000.0	0.0	R Phase current
REC-67	S-phase current when last UF fault occurred	A	0～2000.0	0.0	S Phase current
REC-68	T-phase current when last UF fault occurred	A	0～2000.0	0.0	T Phase current
REC-69	Number of PF fault occurrences		PF--XX	PF--00	XX: Display 0-99 cycles
REC-70	Bus voltage when last PF fault occurred	V	0～1240.0	0.0	DC Bus Voltage
REC-71	R-phase voltage when last PF fault occurred	VAC	0.0～520	0.0	R Phase voltage
REC-72	S-phase voltage when last PF fault occurred	VAC	0.0～520	0.0	S Phase voltage
REC-73	T-phase voltage when last PF fault occurred	VAC	0.0～520	0.0	T Phase voltage
REC-74	R-phase current when last PF fault occurred	A	0～2000.0	0.0	R Phase current

Code	Parameter Name	Unit	Range	Default value	Description
REC-75	S-phase current when last PF fault occurred	A	0～2000.0	0.0	S Phase current
REC-76	T-phase current when last PF fault occurred	A	0～2000.0	0.0	T Phase current
REC-77	Number of oC fault occurrences		oC--XX	oC--00	XX: Display 0-99 cycles
REC-78	Bus voltage when last oC fault occurred	V	0～1240.0	0.0	DC Bus Voltage
REC-79	R-phase voltage when last oC fault occurred	VAC	0.0～520	0.0	R Phase voltage
REC-80	S-phase voltage when last oC fault occurred	VAC	0.0～520	0.0	S Phase voltage
REC-81	T-phase voltage when last oC fault occurred	VAC	0.0～520	0.0	T Phase voltage
REC-82	R-phase current when last oC fault occurred	A	0～2000.0	0.0	R Phase current
REC-83	S-phase current when last oC fault occurred	A	0～2000.0	0.0	S Phase current
REC-84	T-phase current when last oC fault occurred	A	0～2000.0	0.0	T Phase current
REC-85	Number of oL fault occurrences		oL--XX	oL--00	XX: Display 0-99 cycles

Code	Parameter Name	Unit	Range	Default value	Description
REC-86	Bus voltage when last oL fault occurred	V	0～1240.0	0.0	DC Bus Voltage
REC-87	R-phase voltage when last oL fault occurred	VAC	0.0～520	0.0	R Phase voltage
REC-88	S-phase voltage when last oL fault occurred	VAC	0.0～520	0.0	S Phase voltage
REC-89	T-phase voltage when last oL fault occurred	VAC	0.0～520	0.0	T Phase voltage
REC-90	R-phase current when last oL fault occurred	A	0～2000.0	0.0	R Phase current
REC-91	S-phase current when last oL fault occurred	A	0～2000.0	0.0	S Phase current
REC-92	T-phase current when last oL fault occurred	A	0～2000.0	0.0	T Phase current
Other	Display 8.8.8.8.8.8.	Hold	Hold	Hold	Hold

5.6 Fan control modes

Table 21 shows the fan control modes.

Table 21 – HH--04 Fan Control Mode Table

Parameter value	Fan Control Description
0	The fan operates when the temperature of sensor T1 displayed in “FF -- 04” or the temperature of sensor T2 displayed in “FF -- 05” is greater than the Fan Start Temperature parameter “HH -- 40”, or the unit is in operation. The fan stops 1 second after the temperature of sensor T1 or T2 is less than “HH -- 40” – 3 °C, or the unit has stopped operating.
1	The fan is always ON after power ON
2	The fan will run in forced operation when DI2 is connected to COM The fan will stop 1 second after DI2 is disconnected from COM
3	The fan operates when the temperature of sensor T1 displayed in “FF -- 04” or the temperature of sensor T2 displayed in “FF -- 05” is greater than the Fan Start Temperature parameter “HH -- 40”, or DI2 is connected to COM. The fan stops 1 second after the temperature of sensor T1 or T2 is less than “HH -- 40” – 3 °C, or DI2 is disconnected to COM.
4	The fan operates when the temperature of sensor T1 displayed in “FF -- 04” or the temperature of sensor T2 displayed in “FF -- 05” is greater than the Fan Start Temperature parameter “HH -- 40”. The fan stops 1 second after the temperature of sensor T1 or T2 is less than “HH -- 40” – 3 °C.

5.7 Output Relay operating modes

Table 22 shows the operating modes for relays TA/TB/TC and T1A/T1B/T1C.

Table 22 Relay Operating Mode Table

Control mode	HH—05 TA/TB/TC Relay Control Description Enabled: TA/TB open, TC/TB closed Disabled: TA/TB closed, TC/TB open	HH—06 T1A/T1B/T1C Relay Control Description Enabled: T1A/T1B open, T1C/T1B closed Disabled: T1A/T1B closed, T1C/T1B open
0	Overload condition control: In Overload, enabled Not in Overload, disabled	
1	DI1 logic: DI1/COM closed, enabled DI1/COM open, disabled	
2	DI2 logic DI2/COM closed, enabled DI2/COM open, disabled	
3	DI3 logic: DI3/COM closed, enabled DI3/COM open, disabled	
4	DI4 logic: DI4/COM closed, enabled DI4/COM open, disabled	
5	DI5 logic: DI5/COM closed, enabled DI5/COM open, disabled	
6	DI6 logic: DI6/COM closed, enabled DI6/COM open, disabled	
7	DI7 logic: DI7/COM closed, enabled DI7/COM open, disabled	
8	EXT control: EXT/COM closed, enabled EXT/COM open, disabled	
9	Fan control: Fan operating, enabled; Fan stopped, disabled	

Control mode	HH—05 TA/TB/TC Relay Control Description Enabled: TA/TB open, TC/TB closed Disabled: TA/TB closed, TC/TB open	HH—06 T1A/T1B/T1C Relay Control Description Enabled: T1A/T1B open, T1C/T1B closed Disabled: T1A/T1B closed, T1C/T1B open
10	Reserved	
11	Rectification feedback output state control: Regen mode with voltage boost (voltage boost for CPFA), enabled Rectifier mode (Non regen), disabled	
12	PWM output enabled state: PWM output operating, enabled PWM output stopped, disabled	
13	DC bus pre-charge contactor status: When the contactor is closed, enabled (On full power with mains available) When the contactor opens, disabled (Powered off, and until 1-2s after full power up. Immediately on mains loss)	
14	Error status: When there is an error, enabled When there is no error, disabled	
15	DC bus overvoltage threshold reached: If DC Bus>HH–08, enabled If DC Bus<(HH—08 -20V), disabled	DC bus overvoltage threshold reached: If DC Bus>HH–09, enabled If DC Bus<(HH—09 -20V), disabled
16	DC bus undervoltage threshold reached: If DC Bus>HH–08, enabled If DC Bus<(HH—08 +20V), disabled	DC bus undervoltage threshold reached: If DC Bus>HH–09, enabled If DC Bus<(HH—09 +20V), disabled
17	When DI1 is enabled, this setting uses HH–10 to add a total operating time for the relay to perform cyclic operation. Within the HH–10 time, HH—12 is the time the relay is enabled and HH—14 is the time the relay is disabled. This cycle continues until the HH—10 time has elapsed.	When DI1 is enabled, this setting uses HH–11 to add a total operating time for the relay to perform cyclic operation. Within the HH–11 time, HH—13 is the time the relay is enabled and HH—15 is the time the relay is disabled. This cycle continues until the HH—11 time has elapsed.
18	When DI2 is enabled, this setting uses HH–10 to add a total operating time for the relay to perform cyclic operation. Within the HH–10 time, HH—12 is the time the relay is enabled and HH—14 is the time the relay is disabled. This cycle continues until the HH—10 time has elapsed.	When DI2 is enabled, this setting uses HH–11 to add a total operating time for the relay to perform cyclic operation. Within the HH–11 time, HH—13 is the time the relay is enabled and HH—15 is the time the relay is disabled. This cycle continues until the HH—11 time has elapsed.

Control mode	HH—05 TA/TB/TC Relay Control Description Enabled: TA/TB open, TC/TB closed Disabled: TA/TB closed, TC/TB open	HH—06 T1A/T1B/T1C Relay Control Description Enabled: T1A/T1B open, T1C/T1B closed Disabled: T1A/T1B closed, T1C/T1B open
19	When EXT is enabled, this setting uses HH–10 to add a total operating time for the relay to perform cyclic operation. Within the HH–10 time, HH—12 is the time the relay is enabled and HH—14 is the time the relay is disabled. This cycle continues until the HH—10 time has elapsed.	When EXT is enabled, this setting uses HH–11 to add a total operating time for the relay to perform cyclic operation. Within the HH–11 time, HH—13 is the time the relay is enabled and HH—15 is the time the relay is disabled. This cycle continues until the HH—11 time has elapsed.
20	When DI1 is enabled the relay performs a cyclic operation. HH—12 is the time the relay is enabled and HH—14 is the time the relay is disabled.	When DI1 is enabled the relay performs a cyclic operation. HH—13 is the time the relay is enabled and HH—15 is the time the relay is disabled.
21	When DI2 is enabled the relay performs a cyclic operation. HH—12 is the time the relay is enabled and HH—14 is the time the relay is disabled.	When DI2 is enabled the relay performs a cyclic operation. HH—13 is the time the relay is enabled and HH—15 is the time the relay is disabled.
22	When EXT is enabled the relay performs a cyclic operation. HH—12 is the time the relay is enabled and HH—14 is the time the relay is disabled.	When EXT is enabled the relay performs a cyclic operation. HH—13 is the time the relay is enabled and HH—15 is the time the relay is disabled.
23	DC bus charging status: Bus charged and ready to run, enabled Otherwise, disabled	DC bus charging status: Bus charged and ready to run, enabled Otherwise, disabled
24	Temperature sensing with UU–35 as the set threshold Th for temperature sensors T1 and T2: If T1>Th or T2>Th, enabled If T1<(Th -2 °C) and T2<(Th -2 °C), disabled	Temperature sensing with UU–35 as the set threshold Th for temperature sensors T1 and T2: If T1>Th or T2>Th, enabled If T1<(Th -2 °C) and T2<(Th -2 °C), disabled

6.8 Commonly used parameters settings

5.8.1 Rectification feedback/feedback action voltage

If the rectification feedback/feedback action voltage cannot meet the requirements of the target application, the HH parameters in Table 18 can be changed. Parameter HH -- 38 changes the rectification feedback/feedback action voltage.

5.8.2 Precharge contactor voltage

If the voltage of the charging contactor cannot meet the requirements of the target application, the HH parameters in Table 18Table 18 - Device Functional Parameters can be changed. Parameter HH -- 18 changes the operating voltage of the charging contactor when it is engaged.

5.8.3 Delay time for precharge contactor operation

If the delay time of the charging contactor cannot meet the requirements of the target application, the HH parameters in Table 18 can be changed. Parameter HH -- 21 changes the delay time for the charging contactor to engage.

5.8.4 Error protection recovery time

The default error protection recovery time for the software is 3 seconds. If the error protection recovery time cannot meet the needs of the target application, the HH parameters in Table 18 can be changed. Parameters HH -- 02 or HH -- 03 or HH -- 05 or HH -- 22 or HH -- 23 or HH -- 24 or HH -- 29 or HH -- 30 or HH -- 33 or HH -- 34 or HH -- 37 change error protection recovery time.

5.8.5 Relay normally open and normally closed contact output settings

If it is necessary to use the normally open and normally closed contact output of the relay as control, the relay can be configured for control, by referring to parameters HH-- 06 and HH -- 07 in Table 18, and Table 22.

5.8.6 Overheat protection temperature value

If it is necessary to change the overheat protection temperature value, please refer to parameters HH-- 00 and HH -- 01 in Table 18.

5.8.7 Fan Control Mode

If it is necessary to change the fan control mode, please refer to parameter HH—04 in Table 18. In addition, Table 21 provides information relating to the different fan control modes available.

5.8.8 Overvoltage protection threshold voltage

To change the overvoltage protection threshold voltage, please refer to parameters HH -- 19 or HH -- 31in Table 18.

5.8.9 Undervoltage protection threshold voltage

To change the undervoltage protection threshold voltage, please refer to parameter HH -- 20 or HH -- 32 in Table 18.

5.8.10 Voltage and current zero bias correction

To calibrate and balance current sensing, refer to parameter HH -- 26 in Table 18.

5.8.11 Voltage and current display value correction

To calibrate DC Bus, and Mains AC voltage, refer to parameters HH -- 16 or HH -- 28 in Table 18.

5.8.12 Current overload time

Refer to parameters HH -- 35 and HH -- 36 in Table 18.

Hint	The setting of commonly used control parameters, namely the parameters mentioned above, can also be completed through RS485 communication settings.

5.9 RS485 communication

5.9.1 The adopted data communication protocol

The communication protocol used for the control board in our product device is a subset of the MODBUS communication protocol. The communication protocol defines the method and function code for reading and writing control board parameters.

5.9.2 Networking method

Through RS485 communication, two networking methods can be formed: "single host multi slave" and "single host single slave".

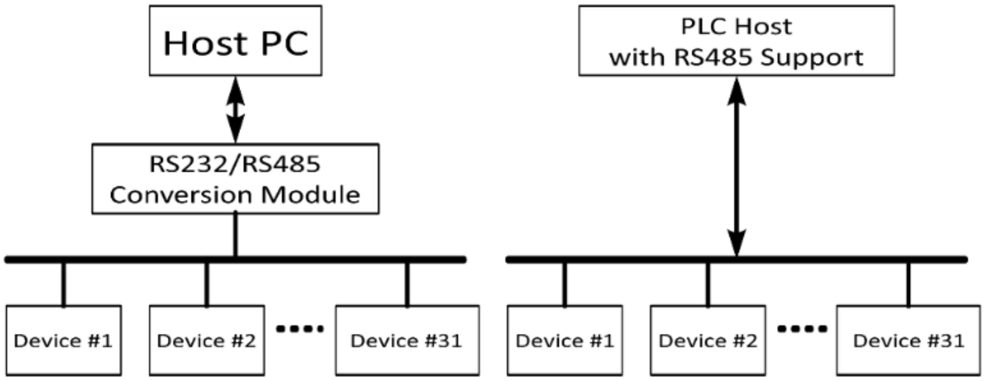

Figure 16 Schematic diagram of single host multi slave unit network mode

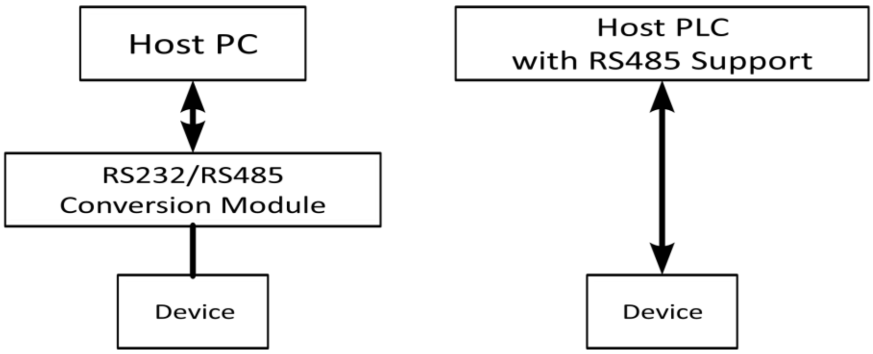

Figure 17 Schematic diagram of single host and single slave unit network mode

5.9.3 Communication physical Interface mode

The control board in our product has RS485 interface terminals (respectively: RS485 signal positive "485+" and RS485 signal negative "485-"). The communication mode is asynchronous communication, half duplex, 9600 baud rate, eight data bits, no parity check, and one stop bit.

For further assistance and technical support on the definition of registers, please contact our Elevator Department:

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Chapter 6 Fault Handling

6.1 Keypad fault codes

In normal working conditions, when the software detects an abnormal occurrence, it will automatically stop outputting and jump to the fault display state and display the current fault on the keypad. Fault codes and causes are as follows:

Table 23 - Fault Code

Display Code	Fault Description	Cause of Fault
oH1	Temperature sensor T1 overheated	The temperature sensor T1 of the device is overheated
oH2	Temperature sensor T2 overheated	The temperature sensor T2 of the device is overheated
EF	EXT terminal input fault	Input fault of EXT terminal on control board
oE	Overvoltage	DC bus voltage too high
LE	Undervoltage	DC bus voltage too low
HE	Hardware overvoltage	Hardware detected high DC bus voltage
FF	Abnormal grid frequency	Abnormal power supply frequency
UF	Abnormal voltage amplitude of the power grid	Abnormal voltage amplitude in the AC power grid
PF	Missing phase in the power grid or abnormal power supply in the power grid	Missing phase in the AC power grid or abnormal power supply in the AC power grid FF and PF errors can be logged on mains power down
oC	Overcurrent	Three phase current output overcurrent
oL	Overload	Continuous excessive three-phase current output

When a fault occurs, the software will automatically stop the output and continuously display the type of fault that occurred on the keypad. After the fault is eliminated, and after a certain amount of fault recovery time, the software will automatically resume to normal working state (the software defaults to 3s, and the fault recovery time can be modified, please refer to the relevant Fault Protection Recovery Time settings in the HH-xx menu. See Table 18 - Device Functional Parameters).

Whether in normal working or faulty conditions, fault records can be viewed through the keypad. Please refer to Table 20 for details.

6.2 Common fault Cause Analysis and Troubleshooting

Table 24 - Common Fault Causes and Troubleshooting

Common faults	**Cause analysis and troubleshooting methods**
Rectification feedback or feedback not working	Check if the wiring is correct. Check the isolator switch on the cover is on. Check if the control mode configured on the control terminal is correct. Check if the selected device matches the target application's operating voltage. Check if the external power grid is functioning properly. Check for any device damage. Check the type of error reported by the keypad.
Inverter overvoltage protection during feedback	Check the unit is enabled and operating in regen mode. Check if the selected device has sufficient capacity. Check whether the feedback action voltage of the device matches the frequency converter. Check if the device is damaged. Check if feedback is working.
Device overheating protection	Check fan operation and condition Poor ventilation in the installation site of the device results in the inability to dissipate the heat generated during operation. Check if the overheat protection temperature parameters are correct. The selected device capacity is too small, please recalculate the selection.
Device overload protection	Check if the overload time curve is set correctly (HH—35 and HH—36). The selected device capacity is too small, please recalculate the selection.
Device reports abnormal power grid fault protection	Check if the isolator between the device and the power grid is functioning properly. Check if the wiring of the three-phase power grid is correct. Check if the control mode configured on the input terminals is correct. PF and FF errors can be displayed on power down.

Chapter 7 Maintenance and Inspection

To prevent potential problems and maintain the high and long-term device reliability, routine inspections should be carried out. Please pay attention to the following items when inspecting the device.

7.1 Routine inspections

First visually inspect the operation status from the outside for any abnormalities. The following items should be checked:

- The expected performance can be achieved (in accordance with standard specifications).
- The surrounding environment meets the standard specifications.
- There is no abnormal sound, vibration, or odour.
- There are no signs of overheating and abnormal phenomena such as discoloration.
- The keyboard indicator light or data display is normal.
- The machine's heat dissipation is normal.

Routine inspections can then be conducted after the operation has stopped, the power has been disconnected, and the cabinet door has been opened. Even if the power supply is disconnected, there is still electricity stored in the electrolytic capacitors of the DC part of the main circuit, and discharge takes a certain amount of time. There is a risk of high voltage. You should wait for more than ten minutes or use measuring tools such as a multimeter to confirm that the DC bus voltage has decreased to a safe voltage value (below DC25V), before conducting inspection work. Regular inspections are usually carried out according to the following checklist:

Table 25 - Regular Inspection Checklist

Inspection area	Inspection items	Inspection method
Surrounding environment	Check the surrounding temperature, humidity, vibration, and air (for dust, corrosive gases, oil fumes, water droplets, etc.)	Visual inspection Measurement with testing instruments
Surrounding environment	Check the surrounding temperature, humidity, vibration, and air (for dust, corrosive gases, oil fumes, water droplets, etc.)	Visually inspect the surroundings for foreign objects such as tools or hazardous materials
Voltage	Is the voltage of the main circuit and control circuit normal	Measurement with a Multimeter, etc.
Structural components such as frames	Is there any abnormal sound or vibration	Visual inspection
Structural components such as frames	Whether the bolts (fasteners) are loose	tighten
Structural components such as frames	Is there any deformation, damage, discoloration due to overheating, dirt or dust attachment	Visual inspection

Inspection area		Inspection items	Inspection method
Main circuit	General	Check for any looseness or detachment of bolt parts	Tighten
		Whether the device and insulation are deformed, cracked, damaged, discoloured due to overheating, and whether there is dirt or dust attachment	Visual inspection
	Wiring	Is there any discoloration or deformation due to overheating, and is there any damage, cracks, or discoloration in the insulation layer of the wire	Visual inspection
	Terminal block	Whether there is any damage	Visual inspection
Main circuit	Electrolytic capacitor	Is there any leakage, discoloration, cracks, or shell expansion, is the safety valve protruding, and is there any obvious expansion of the safety valve	Visual inspection
	Resistor	Is there any odour or insulation cracking caused by overheating	Smell, Visual inspection
		Whether there is a broken wire	Visually inspect or remove one side of the connection, measure with a Multimeter
Control circuit	Circuit board	Are there any loose screw and connector parts, odours or discoloration, cracks, damages, deformations, or obvious rusting? Are there any signs of leakage or deformation in the capacitor	Tighten Smell, Visual inspection
Cooling system	Cooling fan	Is there any abnormal sound or vibration	Auditory and visual inspection, manual rotation, power must be disconnected
		Are there any loose fixings	Tighten

Inspection area		Inspection items	Inspection method
		Is there any discoloration due to overheating	Visual inspection
	Ventilation path	Is there any blockage or foreign object attached to the heat sink and fan and exhaust ports	Visual inspection

For further information and support

please contact your local CPA Office

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