HDRU Series

Power Regenerative Unit

User Manual

V1.5 2019.05

FOREWORD

Thank you for purchasing HDRU series power regenerative unit manufactured by Shenzhen Hpmont Technology Co., Ltd.

Based on the DSP digital control, HDRU series power regenerative unit (hereinafter referred to as HDRU) use the advanced PWM rectification control technology, replace the normal dynamic braking unit and feedback the regenerative power to power network to reduce the power consumption and achieve energy saving and environmental protection. HDRU have built-in fuses and three-phase feedback inductances and have over-temperature, overvoltage and overcurrent protection function, which make they have low harmonic pollution and high power factor, etc.

This User Manual describes how to use the HDRU and its installation wiring, troubleshooting and daily maintenance etc.

Before using the product, please read through this user manual carefully.
In addition, please do not use this product until you have fully understood safety precautions.

Note:

- Preserve this Manual for future use.
- If you need the User Manual due to damage, loss or other reasons, please contact the regional distributor of our company or directly contact our company Technical Service Center.
- If you still have some problems during use, please contact our company Technical Service Center.
- Due to product upgrade or specification change, and for the purpose of improving convenience and accuracy of this manual, this manual's contents may be modified.
- Email address: **overseas_1@hpmont.com**

Version and Revision Records

Time: 2019/05

Version: V1.5

Revised chapter	Revised contents
Chapter 6	• Function parameter modification
Chapter 7	• Fault change

CONTENTS

Chapter 1 Safety Information and Precautions

1.1 Safety Definition

Danger

Danger: A Danger contains information which is critical for avoiding safety hazard.

Warning

Warning: A Warning contains information which is essential for avoiding a risk of damage to product or other equipments.

Note

Note: A Note contains information which helps to ensure correct operation of the product.

1.2 Precautions

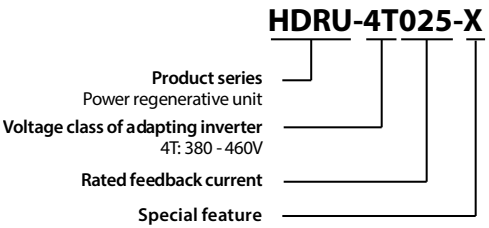
Before delivering, this product has been strictly checked and reliably packaged. Due to handling, loading and unloading in transit, it may cause damage. Therefore, after open the package please check product integrality carefully:

Check items	Check methods
Whether the produtct is in agreement with your ordering information	Check the nameplate on the right side of product
Whether there is damage to parts or damaged	Check the overall appearance, check if there is damage in transit
If there is loose screws or other fasten parts	If necessary, use the screwdriver to check
Whether the manual intact	Check the manual

If has lacked, please contact manufacturer.

Chapter 2 Product Information

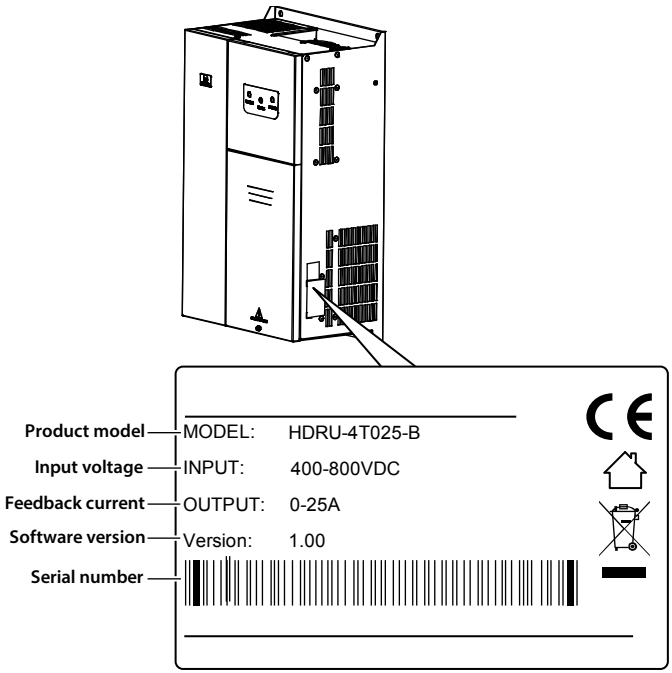
2.1 Model



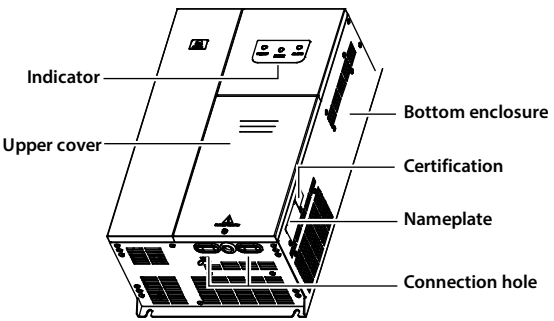
2.2 Product Selection

Size	Model	Rated feedback current	Power of adaptive inverter
FR1B	HDRU-4T025-B	25A	380V / 7.5 - 22kW
FR2B	HDRU-4T050-B	50A	380V / 30 - 37kW
FR2B	HDRU-4T075-B	75A	380V / 45 - 75kW

2.3 Nameplate



2.4 Part Name



Chapter 3 Mechanical Installation

Danger

- Do not install if the HDRU is imcomplete or impaired.
- Make sure that the HDRU is far from the explosive and combustible things.
- Only when the power supply is completely cut-off 10 minutes later can you do the wiring job.

Warning

- It is required not only carry the display panel and the cover but also the bottom enclosure of the HDRU.
- Do not play metal into the HDRU when installing.

3.1 Requirement for the Installation Site

Ensure the installation site meeting the following requirements:

- Do not install at the direct sunlight, moisture, water droplet location;
- Do not install at the combustible, explosive, corrosive gas and liquid location;
- Do not install at the oily dust, fiber and metal powder location;
- Be vertical installation on fire-retardant material with a strong support;
- Make sure adequate cooling space for the HDRU so as to keep the ambient temperature among -10 - +40℃;
- Install at where the vibration is 3.5m/s^2 in 2 - 9Hz, 10m/s^2 in 9 - 200Hz (IEC60721-3-3);
- Install at where the humidity is less than 95%RH and non-condensing location;
- Protection level of HDRU is IP20 and pollution level is 2 (Dry, non-conducting dust pollution).

Note:

1. It needs derating use if the HDRU operation temperature exceeds 40℃. The derating value of HDRU shall be 2% for each degree centigrade. Max. allowed temperature is 50℃.

2. Keep ambient temperature among -10 - +40℃. It can improve the HDRU operation performance if install at the location with good ventilation or cooling devices.

3.2 Installation Direction and Space

When install HDRU, it should consider the heat dissipation of air flow. To achieve good cooling efficiency, install the HDRU perpendicularly according to Table 3-1.

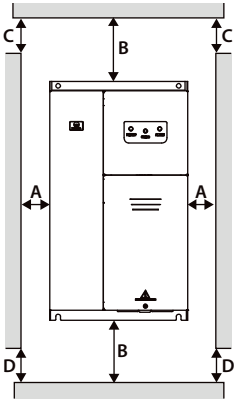


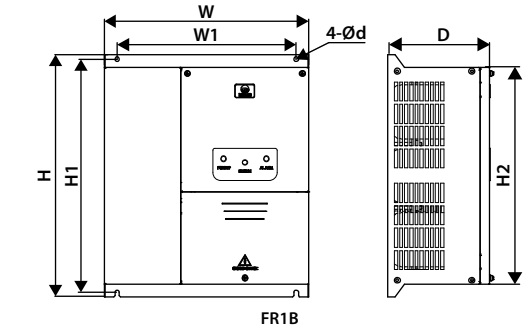
Table 3-1 Installation space size table

A (left and right)	≥50mm
B (up and down)	≥100mm
C (up vent)	≥50mm
D (down vent)	≥50mm

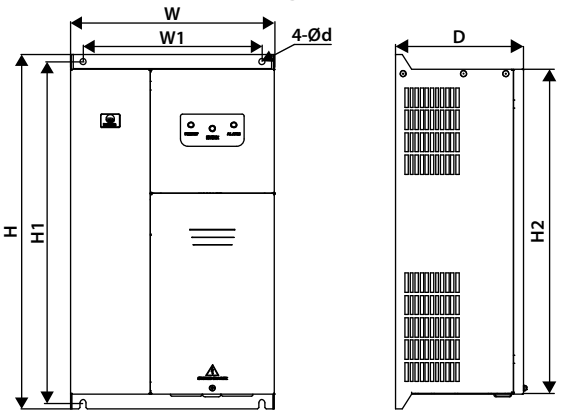
3.3 Dimensions and Weight

The dimensions and weight of HDRU are as shown in Table 3-2.

For the corresponding model of the mounting size, please refer to 2.2 Product Selection, on page 3.



FR1B



FR2B

Table 3-2 HDRU dimensions and weight

Model	Dimension (mm)			Mounting dimension (mm)				GW
	W	H	D	W1	H1	H2	d	(kg)
FR1B	320	380	160	280	365	340	7	17.5
FR2B	320	555	200	280	535	510	10	43.5

Chapter 4 Wiring and Application

Danger

- Only qualified electrical engineer can perform wiring job.
- The cable on power terminal should have no metal parts exposed in air.
- Do not dismantle HDRU or do wiring operation until the power is cut-off for more than 10 minutes, the internal charge indicator of HDRU is off and the voltage between (+) and (-) of the main circuit terminals is below 36V.
- The power regenerative unit will produce large leakage current.The GND terminal of unit must be grounded firmly. Two independent ground wires can guarantee reliable grounding.
- Do not touch the wire terminals of HDRU when it is live. The power terminals are neither allowed connecting to the enclosure nor short-circuiting.
- The chassis shell should be installed before powering-up. Nobody is allowed to open the shell when HDRU is living.

Warning

- Make sure the HDRU's power supply voltage is the same as the inverter's rated voltage.
- HDRU has been passed the withstand voltage test, do not do withstand test on HDRU.
- Do wiring connection according to the wiring figure. Do not connect the HDRU's DC bus terminals (+) and (-) to the inverter's DC terminals (+) and (-).
- Make sure the terminals are fixed tightly.
- Do not play screws, washers and metal bars etc. metal into the HDRU when installing.
- Do not mount the HDRU at the water pipe where may have a water droplet splash.
- Do not supply the damage or parts of insufficiency of the HDRU with power.
- Do not check or detect the signal during the HDRU operation.

4.1 Wiring Requirements

Wiring Requirements	
1	For the two power terminals' wiring between the inverter and the HDRU, it is suggested to use the red and the black of 600V voltage level cable, to prevent the DC bus terminal wiring error.
2	The two lines should be closed and used twisted pair when connect the inverter with the HDRU so as to reduce the current loop. It suggests that the length of wiring should be less than 2m and not exceed 5m.
3	The interval distance between the control terminal wiring and the power terminal wiring should be greater than 0.3m so as to reduce the interference to control terminal signal.
4	Caused by filter inductance, HDRU will creates induced voltage in running. The earth terminal of HDRU and related inverter's earth terminal should be reliable grounding.

4.2 Power Terminal Description

Power terminals layout as shown in Figure 4-1 and Figure 4-2.

Power terminals description as shown in Table 4-1.

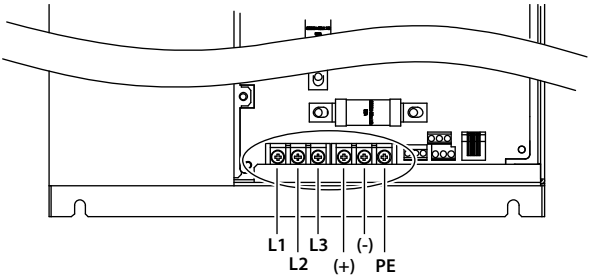


Figure 4-1 FR1 power terminal

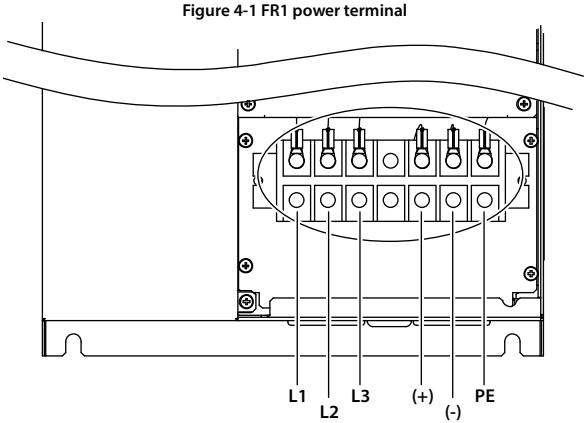


Figure 4-2 FR2B power terminal

Table 4-1 Power terminal function description of HDRU

Terminal		Description
L1/L2/L3	Three-phase AC power supply output terminal	The three-phase AC power supply output terminal of HDRU
(+), (-)	DC bus input terminal	Respectively connect to the inverter's (+) and (-) DC bus
PE	Protection ground terminal	Connect with the protective ground

4.3 Control Terminal Description

The positions of control terminal, fuses and indicators of HDRU are shown as Figure 4-3 and Figure 4-4.

Control terminals description as shown in Table 4-2.

Refer to section 4.4 for fuses, section 4.5 for indicator.

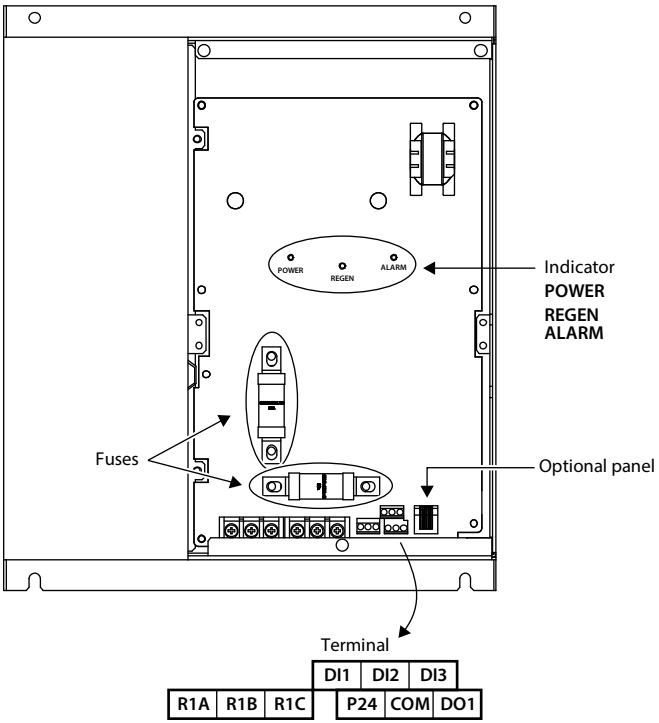


Figure 4-3 Positions of control terminal, fuses and indicators of FR1B

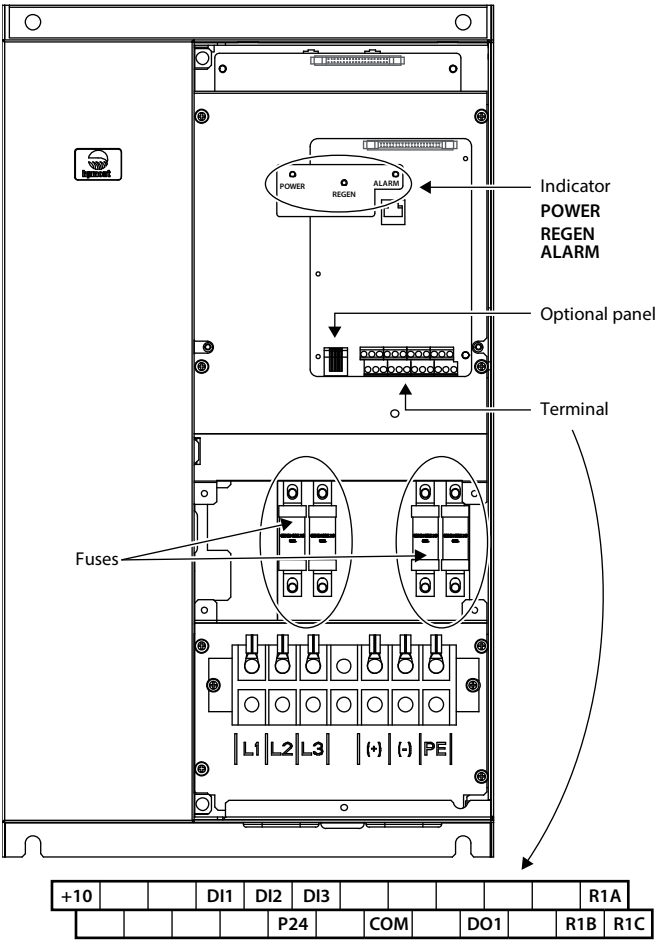


Figure 4-4 Positions of control terminal and panel terminal of FR2B

Table 4-2 Control terminal function description

Terminal		Description
DI1 - DI3	Digital input	Programmable optical-coupled isolation, it is enabled when short connected with COM Input voltage range: 0 - 30VDC. Input impedance: 4.7kΩ
DO1, COM	Digital output	Programmable optical-coupled isolation, open collector output Output voltage range: 0 - 30VDC, maximum output current is 50mA
P24, COM	+24V power supply	Digital input/output power supply, max output current is 200mA
R1A/R1B/R1C	Relay output terminal	Programmable relay contact output Contact rating: 250VAC / 3A or 30VDC /1A • R1C-R1A: Normally open contact, R1C-R1B: Normally closed contact

4.4 Fuse Explanation

The DC bus input side of HDRU is built-in fuses whose location is shown as Figure 4-3 or Figure 4-4.

If the HDRU is damaged by accident, these fuses can break off the electrical connection between HDRU and inverter's DC bus so as to avoid inverter damage.

When the fuse is damaged, please use another fuse which is the same as the damaged one, such as the same brand and model. If have any question, please contact us or our suppliers.

4.5 Indicator Description

The position of indicator light as shown in Figure 4-3, Figure 4-4.

Table 4-3 Indicator description

Indicator		Description
POWER	HDRU power-on indicator	On: The HDRU is at power-on state Off: The HDRU is not at power-on state
REGEN	HDRU's operating state indicator	On: The HDRU is at regenerative state Off: The HDRU is not at regenerative state
ALARM	HDRU's fault alarm state indicator	On: The HDRU is faulty Off: The HDRU is not faulty

4.6 Typical Connection

The typical connection of HDRU and HD series inverter is shown as Figure 4-5.

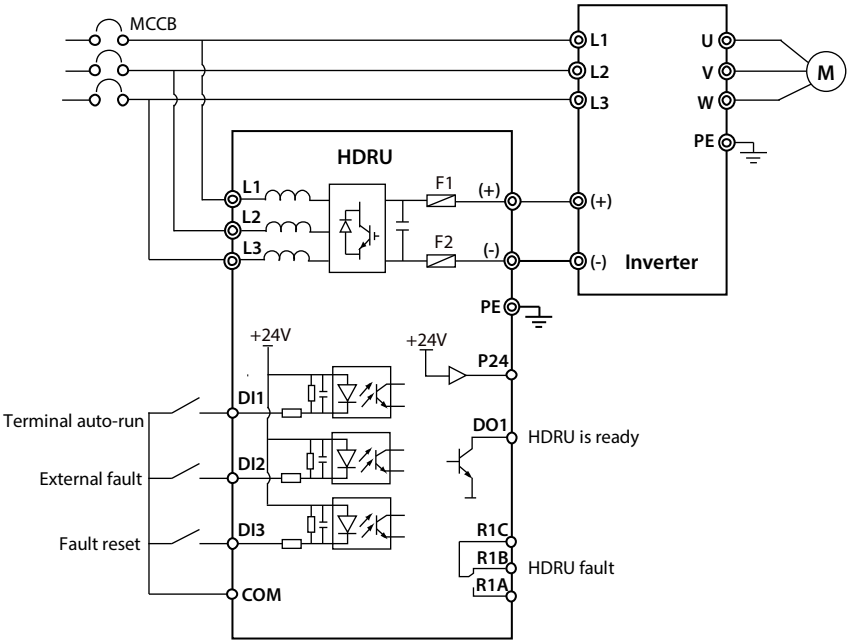


Figure 4-5 Connection of HDRU

Note:

1. Please connect positive and negative terminal correctly, connect (+) terminal of HDRU DC bus to (+) terminal of inverter DC bus, connect (-) terminal of HDRU DC bus to inverter DC bus.

2. When power on HDRU and inverter at the same time, and the voltage difference must less than F00.27, the HDRU works as it should.

Danger

Since the filter inductance reasons, the adaptive inverter and the HDRU metal enclosure will induce voltage at HDRU runtime. Please make sure that ground terminals of the HDRU and the adaptive inverter are reliable grounded, otherwise there is the risk of electric shock.

4.7 Typical Application

The HDRU has automatic mode and manual mode. The automatic mode has fully automatic mode and terminal automatic mode, while the manual mode has panel manual mode and terminal manual mode.

The user can set the different working modes of the feedback unit by setting the function parameters F00.00 and F00.01.

Automatic mode as an example

The feedback unit factory default parameter is set to automatic mode.

Set F00.01 as 0 or 3.

The feedback unit automatically runs according to the bus voltage value, and stops automatically when there is no feedback current. shown as Figure 4-6.

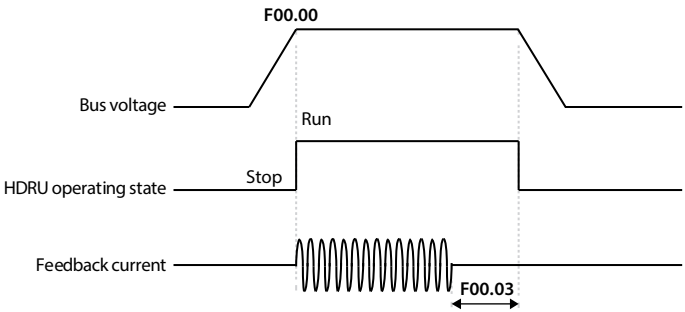


Figure 4-6 Automatic mode

Chapter 5 Accessory

The HDRU default parameter is set as automatic mode 1, namely it need not set parameters via the optional display panel and run normally.

If you want to change HDRU defaulted parameters, you can use the optional display panel (HD-LED) whose shape is shown as Table 5-1.

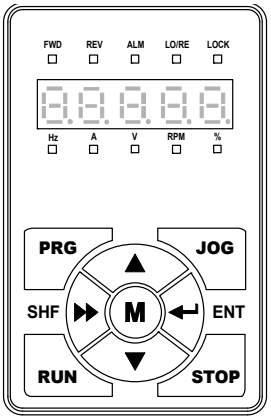


Table 5-1 Key function description

Key	Function
PRG	Entry or exit programming key
JOG	Reserved
RUN	When operating panel control, start the drive
STOP	a. When the operator panel controls, stop HDRU b. When the fault is detected, reset the fault for the fault
M	Reserved
▲	Increase value or parameter
▼	Decrease value or parameter
▶▶	a. Select the setting data modification bit b. Cycle to stop / run the display status parameters
↵	a. Enter the submenu b. Confirm the settings after setting

When use the optional display panel for HDRU, the panel extension cable is a necessary.

There are models for selection, as follows:

- 1m extension cable to panel: HD-CAB-1M
- 2m extension cable to panel: HD-CAB-2M
- 3m extension cable to panel: HD-CAB-3M
- 6m extension cable to panel: HD-CAB-6M

Chapter 6 Function Introduction

6.1 Group D: Display Parameters

Group D is state display parameters. The users can directly check the state parameters by checking the function code of Group D.

6.1.1 D00: State Display Parameter 1

Ref. Code	Function Description	Setting Range [Default]
D00.00	HDRU series	[Actual value]
D00.01	HDRU software version	[Actual value]
D00.02	HDRU customer serial number	[Actual value]
D00.06	HDRU rated voltage	[Actual value]
D00.07	HDRU rated current	[Actual value]
D00.08	HDRU state	[Actual value]
	Display the HDRU state.	

Unit	Ten	Hundred
1: Faulty 0: Normal	1: Run 0: Stop	1: Feedback 0: No feedback

6.1.2 D01: State Display Parameter 2

Ref. Code	Function Description	Setting Range [Default]
D01.00	Output current	[Actual value]
D01.01	Grid voltage	[Actual value]
D01.02	Grid frequency	[Actual value]
D01.03	Bus voltage	[Actual value]
D01.04	Input active power	[Actual value]
D01.05	Power factor	[Actual value]
D01.06	Active current component	[Actual value]
D01.07	Reactive current component	[Actual value]
D01.08	High-bit of power regeneration	[Actual value]
	Display the high-bit of power regeneration, and the unit is k kWh.	
D01.09	Low-bit of power regeneration	[Actual value]
	Display the low-bit of power regeneration, and the unit is kWh.	
D01.10	Module temperature	[Actual value]
D01.11	Present faulty code	[Actual value]
D01.12	L1/L2/L3 phase sequence indication	[Actual value]
	Display the L1/L2/L3 phase sequence indication. • 0: L1 is proceeding to L2, and L2 is proceeding to L3. • 1: L1 is proceeding to L3, and L3 is proceeding to L2.	
D01.13	Power-on time display	[Actual value]
	Display the time at power on, and the unit is hour.	

Ref. Code	Function Description	Setting Range [Default]
D01.14	**Run time dispaly**	**[Actual value]**
	Display the run time, and the unit is hour.	
D01.15	**L1 phase current RMS**	**[Actual value]**
D01.16	**L2 phase current RMS**	**[Actual value]**
D01.17	**L3 phase current RMS**	**[Actual value]**
D01.18	**L1 phase voltage RMS**	**[Actual value]**
D01.19	**L2 phase voltage RMS**	**[Actual value]**
D01.20	**L3 phase voltage RMS**	**[Actual value]**
D01.21	**External bus voltage**	**[Actual value]**
	Display external bus access voltage. If the difference between the D1.03 bus voltage value and the D01.21 external bus voltage value is less than the F00.27 setting value, the feedback unit can work normally.	
D01.22	**Input terminal status**	**[Actual value]**
	Display input terminal status. Every bit (binary) of this function parameter represent different physical channel, see chart. • 0: Input terminal is disconnected with related common terminal. • 1: Input terminal is connected with related common terminal.	Bit2 | Bit1 | Bit0 DI3 | DI2 | DI1
D01.23	**Output terminal status**	**[Actual value]**
	Display output terminal status. Every bit of this function parameter represent different physical channel, see chart. • 0: Output terminal is disconnected with related common terminal. • 1: Output terminal is connected with related common terminal.	Bit2 | Bit1 | Bit0 RLY1 | Reserved | DO1

6.2 Group F: General Function Parameters

6.2.1 F00: Basic Parameters

Ref. Code	Function Description	Setting Range [Default]
F00.00	**Bus voltage setting**	**600 - 800 [650 V]**
F00.01	**Feedback unit working mode**	**0 - 4 [0]**
	0: Automatic mode. • The feedback unit automatically runs according to the set value of the bus voltage value F00.00. When the feedback current value is less than the set value of F00.02 and the time F00.03 is delayed, the feedback unit stops running. 2: Operation panel manual mode. • Press **RUN** key, the feedback unit will run, press **STOP** key, and the feedback unit will stop. 3: Terminal automatic mode. • When the input terminal function of No. 1 is valid, the feedback unit automatically runs according to the set value of the bus voltage value F00.00. When the feedback current value is less than the set value of F00.02 and the time F00.03 is delayed, the feedback unit stops running. 4: Terminal manual mode. • When the input function of the 2nd input terminal is valid, the feedback unit operates; when the function of the 2nd terminal is invalid, the feedback unit stops.	
F00.02	**Energy feedback stop value**	**0.0 - 10.0 [Model confirmed]**

Ref. Code	Function Description	Setting Range [Default]
F00.03	**Feedback retention time**	**0.0 - 99.9 [5.0s]**
	When the feedback unit works in the automatic mode, the feedback unit current current value is less than the F00.02 setting value and the F00.03 time delay, the feedback unit stops running.	
F00.07	**Voltage loop proportional gain**	**1 - 30000 [Model confirmed]**
F00.08	**Voltage loop integral gain**	**1 - 30000 [Model confirmed]**
	Increasing F00.07 and F00.08 can speed up the response of the voltage regulation and keep the bus voltage stable. • F00.08 and F00.08 are too large, causing the bus voltage to oscillate.	
F00.09	**Current loop proportional gain**	**1 - 30000 [Model confirmed]**
F00.10	**Current loop integral gain**	**1 - 30000 [Model confirmed]**
	Increasing F00.09 and F00.10 can speed up the response of current regulation and keep the bus voltage stable. • F00.09 and F00.10 are too large, the inductance whistle increases, and the current waveform will oscillate.	
F00.11	**Phase-locked loop proportional gain**	**1 - 30000 [200]**
F00.12	**Phase-locked loop integral gain**	**1 - 30000 [50]**
F00.16	**Voltage loop filtering time**	**0 - 200 [0]**
F00.17	**Inductance**	**0 - 100.0 [5.0%]**
F00.18	**AC side voltage frequency setting**	**0,1 [0]**
	0: 50Hz. 1: 60Hz.	
F00.19	**Carrier frequency setting**	**1 - 16kHz [Model confirmed]**
	Defines the carrier frequency of the feedback unit output PWM wave. • The carrier frequency will affect the noise of the feedback unit. The higher the carrier frequency, the lower the noise. Please set the carrier frequency reasonably. • If the carrier frequency setting is greater than the factory setting, the feedback unit needs to be derated by 5% for every 1 kHz increase.	
F00.20	**Rectifier current limit**	**10.0 - 200.0 [150.0%]**
F00.21	**Fan operating mode**	**0,1 [0]**
	0: The fan runs when the feedback unit is running; when the feedback unit stops, the fan stops after 30s. 1: Run at power-on.	
F00.25	**Automatic reset times**	**0 - 100 [0]**
	When set to 0, it means that automatic reset is prohibited, and fault protection is immediately performed. • When there is no fault detected within 5 minutes, the fault auto reset count is automatically cleared. • The fault auto reset count is cleared when there is an external fault reset.	
F00.26	**Automatic reset interval**	**2.0 - 20.0 [5.0s/time]**

6.2.2 F01: Parameter Protection Function

Ref. Code	Function Description	Setting Range [Default]
F01.00	**User password**	**00000 – 65535 [0]**
	XXXXX: To enable the password protection function, set any non-zero number as the password. • After set the password, it need input the correct password when you enter into parameter setting state. Otherwise you can not change any parameter via panel, but only check. • After input the correct password, press **PRG** key to exit to stop/run state or detect that there is no press on the panel within 5 minutes, the user's password will be valid. If want to change the parameters, it need input correct password. If detect that there is press within 5 minutes, it will restart 5 minutes timing again. 00000: The factory setting of HDRU and no user's password. • If the user unlocks the password, it means clearing the user's password.	
F01.02	**Function code parameter initialization**	**0 - 4 [0]**
	0: No operation. • The feedback unit is in the normal parameter read and write status. • Whether the parameter can be changed depends on the setting status of the user password and the current working condition of the feedback unit. 1: Restore factory parameters. • Operation steps: Set F01.02 = 2, press ↵ key to confirm. At this time, the factory parameters are restored. The operation panel displays "rESEt". After the factory parameters are restored, the operation panel displays the shutdown status parameters. 4: Clear the fault information. • Clear the fault information recorded in F05.00 - F05.29.	

6.2.3 F02: Input Terminal Functions

Ref. Code	Function Description		Setting Range [Default]
F02.00	**DI1 terminal function**		**0 - 4 [1]**
F02.01	**DI2 terminal function**		**0 - 4 [3]**
F02.02	**DI3 terminal function**		**0 - 4 [4]**
	0: Reserved. 1: Termianl auto-run. 2: Terminal manually run.	3: External fault. 4: Fault reset.	
F02.03	**Reserved**		
F02.04	**Terminal detect filter time**		**0.000 - 2.000 [0.010s]**
F02.05	**DO1 terminal function**		**0 - 5 [1]**
F02.06	**Reserved**		
F02.07	**Relay 1 function**		**0 - 6 [4]**
	0: Reserved. 1: HDRU is ready. 2: HDRU is running. 3: In undervoltage lockout. 4: HDRU is faulty.	5: L1/L2/L3 phase sequence. • When L1 is proceeding to L2, and L2 is proceeding to L3, the output is disabled. Otherwise the output is enabled. 6 : Bus voltage building.	

6.2.4 F03: SCI Communication

If need to use communication control or any questions, please contact with manufacturer.

Ref. Code	Function Description	Setting Range [Default]
F03.00	**Data format**	**0 - 5 [0]**
	0: 1-8-2 format, no parity, RTU. 1: 1-8-1 format, even parity, RTU. 2: 1-8-1 format, odd parity, RTU. 3: 1-7-2 format, no parity, ASCII. 4: 1-7-1 format, even parity, ASCII. 5: 1-7-1 format, odd parity, ASCII.	
F03.01	**Baud rate selection**	**0 - 5 [3]**
	0: 1200bps. 1: 2400bps. 2: 4800bps. 3: 9600bps. 4: 19200bps. 5: 38400bps.	
F03.02	**Local address**	**0 - 247 [2]**
	F02.02 = 0, it means broadcast address.	
F03.03	**Host PC response time**	**0 - 1000 [0ms]**
F03.04	**Detection time of communication timeout**	**0.0 - 1000.0 [0.0s]**
	When the time at no communication data exceeds the setting time of F02.04, it will be considered as communication timeout fault. • F02.04 = 0, it will not detect communication timeout.	
F03.05	**Detection time of communication error**	**0.0 - 1000.0 [0.0s]**
	When the time at communication error exceeds the setting time of F02.05, it will be considered as communication fault. • F02.05 = 0, it will not detect the communication error.	

6.2.5 F04: Display Parameters

Ref. Code	Function Description	Setting Range [Default]
F04.00	**Display parameter 1**	**1 - 24 [3]**
F04.01	**Display parameter 2**	**1 - 24 [4]**
F04.02	**Display parameter 3**	**1 - 24 [9]**
F04.03	**Display parameter 4**	**1 - 24 [0]**
F04.04	**Display parameter 5**	**1 - 24 [0]**
F04.05	**Display parameter 6**	**1 - 24 [0]**
	1: Output current. 2: Grid voltage. 3: Grid frequency. 4: Bus voltage. 5: Input active power. 6: Power factor. 7: Active current component. 8: Reactive current component. 9: High-bit of power regeneration. 10: Low-bit of power regeneration. 11: Module temperature. 12: Present faulty code. 13: L1/L2/L3 phase sequence. • When L1 is proceeding to L2, and L2 is proceeding to L3, the phase sequence will be 0. • Otherwise it will be 1. 14: Power-on time accumulation. 15: Running time accumulation. 16: L1 phase current RMS. 17: L2 phase current RMS. 18: L3 phase current RMS. 19: L1 phase voltage RMS. 20: L2 phase voltage RMS. 21: L3 phase voltage RMS. 22: External bus voltage. 23: Input terminal status. 24: Output terminal status.	
F04.06	**Parameter initialization**	**0 - 3 [0]**
	0: No operation. • The HDRU is in regular parameter read/write state. • Whether can change the parameter it depends on the user's password state and the actual operating conditions. 1: Restore all parameters to factory settings except F00.10. • Operation steps: If set F03.06 = 1, press ↵ to ensure and the parameters are restored to factory settings. The display panel dispalys "rESEt". Then the display panel will display parameters in stop state after finish restoring to factory setting. 2: Reserved. 3: Clear the faulty information. • The faulty information of F04.00 - F04.12 will be cleared.	

6.2.6 F05: Diagnostics Parameters

Ref. Code	Function Description	Setting Range [Default]
F05.00	1st fault type (the latest one)	[Actual value]
F05.01	DC bus voltage for the 1st fault	
F05.02	current input for the 1st fault	
F05.03	voltage input for the 1st fault	
F05.04	grid frequency for the 1st fault	
F05.05	internal time for the 1st fault	
F05.06	2nd fault type	
F05.07	DC bus voltage at the 2nd fault	
F05.08	Input current at the 2nd fault	
F05.09	Input voltage at the 2nd fault	
F05.10	2nd fault grid frequency	
F05.11	internal time at the 2nd fault	
F05.12	3rd fault type	
F05.13	DC bus voltage at the 3rd fault	
F05.14	Input current at the 3rd fault	
F05.15	Input voltage at the 3rd fault	
F05.16	3rd fault grid frequency	
F05.17	3rd time between failures	
F05.18	4th fault type	
F05.19	DC bus voltage at the 4th fault	
F05.20	Input current at the 4th fault	
F05.21	Input voltage at the 4th fault	
F05.22	4th fault grid frequency	
F05.23	4th time between failures	
F05.24	5th fault type	
F05.25	DC bus voltage at the 5th fault	
F05.26	Input current at the 5th fault	
F05.27	Input voltage at the 5th fault	
F05.28	5th fault grid frequency	
F05.29	5th time between failures	
	-Lu-: Undervoltage. E0001: Overcurrent. E0004: Overvoltage. E0008: Power module fault. E0009: Module overheat fault. E0013: Power-on buffer contactor is not attracted. E0014: Current detection failure. E0015: AC voltage loss phase.	E0016: AC current loss phase. E0017: HDRU overload. E0018: AC voltage overload. E0019: AC frequency overload. E0021: Control board EEPROM fault. E0022: Display panel EEPROM fault. (Only display, the HDRU can not protect) E0024: External fault.

6.3 Group y: Manufacturer Function Parameters

The Group y is the manufacturer parameters group for debugging at the factory before delivery.

Chapter 7 Troubleshooting and Maintenance

7.1 Troubleshooting

Fault		Reasons	Countermeasure
E0001	Overcurrent	• HDRU capacity is too small • F00.07 - F00.10 setting is improper	• Select proper HDRU • Adjust F00.07 - F00.10 • Please seek technical support
E0004	Overvoltage	• HDRU capacity is too small • F00.07 - F00.10 setting is improper • F00.00 setting is too high	• Select proper HDRU • Adjust F00.07 - F00.10 • Reduce the value of F00.00
E0008	Power module fault	• Output current is too large • Power module damage	• Please check the wire and mechanics • Please contact the supplier for repairing
E0009	Module overheat fault	• Environment temperature exceeds the specifications • Poor external ventilation • Fan fault • Temperature detection circuit malfunction	• Derated use, increase the power • Improve the external ventilation • Replace the fan • Please seek technical support
E0013	Power-on buffer contactor is not attracted	• Contactor fault • Fault of control circuit	• Please seek technical support
E0014	Current detection fault	• Three-phase output current zero drift detection abnormal	• Please contact the supplier for repairing
E0015	AC voltage loss phase	• The three-phase input power supply is abnormal • The HDRU is abnormal	• Check the three-phase input power supply • Please seek technical support
E0016	AC current loss phase	• AC side current loss phase	• Check the three-phase input power supply • Please seek technical support
E0017	HDRU overload	• HDRU capacity is too small	• Select proper HDRU
E0018	AC voltage overload	• The three-phase input power supply amplitude is abnormal • The HDRU is abnormal	• Check the three-phase input voltage • Please check the HDRU
E0019	AC frequency overload	• The three-phase input power supply frequency is abnormal • The HDRU is abnormal	• Check the three-phase input voltage • Please check the HDRU
E0021	Control board EEPROM fault	• Memory circuit fault of control board EEPROM	• Please contact the supplier for repairing
E0022	Panel EEPROM fault	• Memory circuit fault of display panel EEPROM	• Replace the display panel • Please contact the supplier for repairing
E0024	External fault	• The input terminal corresponding action	• Check the input terminal wiring

7.2 Maintenance

Danger

- Only a trained and qualified professional person can maintain the HDRU.
- Maintenance personnel should take off all metal jewellery before carrying out maintenance or internal measurements in HDRU. Suitable clothes and tools must be used.
- High voltage exists when t HDRU is powered up or running.
- Checking and maintaining can only be done after HDRU's AC power is cut off. And wait for at least 10 minutes if maintain the cover.

Warning

- For the HDRU stored for more than 2 years, please use voltage regulator to increase the input voltage gradually.
- Do not leave metal parts like screws or pads inside the HDRU.
- Do not make modification on the inside of HDRU without instruction from the supplier.
- There are IC components inside the HDRU, which are sensitive to static electricity. Directly touch the components on the PCB board is forbidden.

Daily Maintenance

The HDRU must operate in the specified environment, see section 3.1, page 5.

Please follow Table 7-1 to do daily maintenance work, in order to find abnormal phenomena in time and extend the service life of HDRU.

Table 7-1 Daily checking items

Items	Content	Criteria
Operating environment	Temperature and humidity	-10 - +40°C, derating at 40 - 50°C Less than 95%RH, non-condensing
	Dust and water dripping	No conductive dust accumulating, no water dripping
	Gas	No strange smell
HDRU	Oscillation and heating	Stable oscillation and proper temperature
	Noise	No abnormal sound

Periodical Maintenance

Customer should check HDRU every 3 to 6 months according to the actual environment so as to avoid hidden problems and make sure the HDRU runs well for a long time.

General Inspection:

- Check whether the screws of control terminals are loose. If so, tighten them with a screw driver;
- Check whether the main circuit terminals are properly connected; Whether the mains cables are over heated;
- Check whether the power cables and control cables are damaged, especially check for any wear on the cable tube;
- Check whether the insulating tapes around the cable lugs are stripped, and for signs of overheating near terminations.

Note:

1. Dielectric strength test of HDRU has already been conducted in the factory. Do not do the test again. Otherwise, the HDRU might be damaged.

2. If insulation test to HDRU is necessary, it must be done to the ground after all input/output terminals are short-connected by conductors. It is forbidden for each terminal to ground test. It is recommended to use the 500V megger.

3. For HDRU stored for a long time, must be powered up every 2 years. When supplying AC power to HDRU, use a voltage regulator to gradually raise the input voltage to rated input voltage at least 5 hours.

Replacing Damaged Parts

The components that are easily damaged are: Cooling fan and electrolytic capacitors of filters. Their lifetime depends largely on their application environment and preservation. The users can decide the time when the components should be replaced according to their service time.

Easily damaged	Cooling fan	Electrolytic capacitors
Life	60, 000 hours	50, 000 hours
Possible cause of damages	Wear of the bearing, aging of the fan vanes	High ambient temperature, aging of electrolyte and large pulse current induced by rapid changing loads
Criteria	After the drive is switched off, check if the abnormal conditions such as crack existing on fan vanes and other parts. When the drive is switched on, check if drive running is normal, and check if there is any abnormal oscillation.	Check if frequent overcurrent or overvoltage failures occur during drive start-up with load. Check if there is any leakage of liquids. Check if the safety valve protrudes. Measure the static capacitance and insulation resistance.

Unwanted HDRU

When disposing HDRU, please pay attention to the following factors:

- The capacitors may explode if they are burnt.
- Poisonous gas may be generated when the plastic parts like front covers are burnt.
- Disposing method: Please dispose unwanted HDRU as industrial waste.

Appendix A Parameters

Attributes are changed:

"*": It denotes that the value of this parameter is the actual value which cannot be modified.

"×": It denotes that the setting parameter cannot be modified in run state.

"○": It denotes that the setting parameter can be modified in run state.

Ref. Code	Function	Setting Range	Default	Attribute	Setting
D00: State Display Parameter (on pages 19)					
D00.00	HDRU series	0x10 - 0x99	Actual value	*	
D00.01	HDRU software version	1.00 - 9.99	Actual value	*	
D00.02	HDRU customer serial number	1.00 - 9.99	Actual value	*	
D00.06	HDRU rated voltage	0.1 - 999.9A	Actual value	*	
D00.07	HDRU rated current	320 - 480V	Actual value	*	
D00.08	HDRU state	Unit: 1: Faulty 0: Normal Ten: 1: Run 0: Stop Hundred: 1: Feedback 0: No feedback	Actual value	*	
D01: State Display Parameter 2 (on pages 19)					
D01.00	Output current	0.0 - 999.9A	Actual value	*	
D01.01	Grid voltage	0 - 999V	Actual value	*	
D01.02	Grid frequency	1.00 - 99.99Hz	Actual value	*	
D01.03	Bus voltage	0 - 999V	Actual value	*	
D01.04	Input active power	0.1 - 999.9kw	Actual value	*	
D01.05	Power factor	0.01-1.00	Actual value	*	
D01.06	Active current component	0.0 - 999.9A	Actual value	*	
D01.07	Reactive current component	0.0 - 999.9A	Actual value	*	
D01.08	High-bit of power regeneration	0 - 65535kkWh	Actual value	*	
D01.09	Low-bit of power regeneration	0.1 - 999.9kWh	Actual value	*	
D01.10	Module temperature	0.0 - 99.9℃	Actual value	*	
D01.11	Present faulty code	0 - 100	Actual value	*	
D01.12	L1/L2/L3 phase sequence indication	0: L1 is proceeding to L2, and L2 is proceeding to L3 2: L1 is proceeding to L3, and L3 is proceeding to L2	Actual value	*	

Ref. Code	Function	Setting Range	Default	Attribute	Setting
D01.13	Power-on time display	0 - 65535 hours	Actual value	*	
D01.14	Run time dispaly	0 - 65535 hours	Actual value	*	
D01.15	L1 phase current RMS	0.0 - 999.9A	Actual value	*	
D01.16	L2 phase current RMS	0.0 - 999.9A	Actual value	*	
D01.17	L3 phase current RMS	0.0 - 999.9A	Actual value	*	
D01.18	L1 phase voltage RMS	0 - 999V	Actual value	*	
D01.19	L2 phase voltage RMS	0 - 999V	Actual value	*	
D01.20	L3 phase voltage RMS	0 - 999V	Actual value	*	
D01.21	External bus voltage	0 - 999V	Actual value	*	
D01.22	Input terminal status	Bit0 - Bit2 corresponding to DI1 - DI3 0: Input terminal is disconnected with related common terminal 1: Input terminal is connected with related common terminal	Actual value	*	
D01.23	Output terminal status	Bit0 corresponding to DO1 Bit2 corresponding to RLY1 0: Output terminal is disconnected with related common terminal 1: Output terminal is connected with related common terminal	Actual value	*	
F00: Basic Parameters (on pages 20)					
F00.00	Bus voltage setting	600 – 800V	650V	×	
F00.01	Feedback unit working mode	0: Automatic mode 2: Operation panel manual mode 3: Terminal automatic mode 4: Terminal manual mode	0	×	
F00.02	Energy feedback stop value	0.0 - 10.0V	Model confirmed	○	
F00.03	Feedback retention time	0.0 - 99.9s	5.0s	○	
F00.07	Voltage loop proportional gain	1 - 30000	Model confirmed	○	
F00.08	Voltage loop integral gain	1 - 30000		○	
F00.09	Current loop proportional gain	1 - 30000		○	
F00.10	Current loop integral gain	1 - 30000		○	
F00.11	Phase-locked loop proportional gain	1 - 30000	200	○	
F00.12	Phase-locked loop integral gain	1 - 30000	50	○	
F00.16	Voltage loop filtering time	0 - 200	0	○	
F00.17	Inductance	0 - 100.0%	5.0%	○	
F00.18	AC side voltage frequency setting	0: 50Hz 1: 60Hz	0	×	

Ref. Code	Function	Setting Range	Default	Attribute	Setting
F00.19	Carrier frequency setting	1 - 16kHz	Model confirmed	×	
F00.20	Rectifier current limit	10.0 - 200.0%	150.0%	×	
F00.21	Fan operating mode	0: The fan runs when the feedback unit is running; when the feedback unit stops, the fan stops after 30s 1: Run at power-on	0	○	
F00.25	Automatic reset times	0 - 100	0	×	
F00.26	Automatic reset interval	2.0 - 20.0s/time	5.0s/time	×	
F01: Parameter Protection Function (on pages 22)					
F01.00	User password	00000 - 65535	0	×	
F01.02	Function code parameter initialization	0: No operation 1: Restore factory parameters 4: Clear the fault information	0	×	
F02: Input Terminal Functions (on pages 22)					
F02.00	DI1 terminal function	0: Reserved 1: Termianl auto-run 2: Terminal manually run 3: External fault 4: Fault reset	1	×	
F02.01	DI2 terminal function		3	×	
F02.02	DI3 terminal function		4	×	
F02.04	Terminal detect filter time	0.000 - 2.000s	0.010s	○	
F02.05	DO1 terminal function	0: Reserved 1: HDRU is ready 2: HDRU is running 3: In undervoltage lockout 4: HDRU is faulty 5: L1/L2/L3 phase sequence 6: Bus voltage building	1	×	
F02.06	Reserved				
F02.07	Relay 1 function		4	×	
F03: SCI Communication (on pages 23)					
F03.00	Data format	0: 1-8-2 format, no parity, RTU 1: 1-8-1 format, even parity, RTU 2: 1-8-1 format, odd parity, RTU 3: 1-7-2 format, no parity, ASCII 4: 1-7-1 format, even parity, ASCII 5: 1-7-1 format, odd parity, ASCII	0	×	
F03.01	Baud rate selection	0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps	3	×	
F03.02	Local address	0 - 247	2	×	
F03.03	Host PC response time	0 - 1000ms	0ms	×	
F03.04	Detection time of communication timeout	0.0 - 1000.0s *0.0: Not detect communication timeout*	0.0s	×	

Ref. Code	Function	Setting Range	Default	Attribute	Setting
F03.05	Detection time of communication error	0.0 - 1000.0s *0.0: Not detect the communication error*	0.0s	×	
F04: Display Parameters (on pages 24)					
F04.00	Display parameter 1	1: Output current 2: Grid voltage 3: Grid frequency 4: Bus voltage 5: Input active power 6: Power factor 7: Active current component 8: Reactive current component 9: High-bit of power regeneration 10: Low-bit of power regeneration 11: Module temperature 12: Present faulty code 13: L1/L2/L3 phase sequence 14: Power-on time accumulation 15: Running time accumulation 16: L1 phase current RMS 17: L2 phase current RMS 18: L3 phase current RMS 19: L1 phase voltage RMS 20: L2 phase voltage RMS 21: L3 phase voltage RMS 22: External bus voltage 23: Input terminal status 24: Output terminal status	3	○	
F04.01	Display parameter 2		4	○	
F04.02	Display parameter 3		9	○	
F04.03	Display parameter 4		0	○	
F04.04	Display parameter 5		0	○	
F04.05	Display parameter 6		0	○	
F04.06	Parameter initialization	0: No operation 1: Restore all parameters to factory settings except F00.10 2: Reserved 3: Clear the faulty information	0	×	
F05: Diagnostics Parameters (on pages 25)					
F05.00	1st fault type (the latest one)	-Lu-: Undervoltage E0001: Overcurrent E0004: Overvoltage E0008: Power module fault E0009: Module overheat fault E0013: Power-on buffer contactor is not attracted E0014: Current detection failure E0015: AC voltage loss phase E0016: AC current loss phase E0017: HDRU overload E0018: AC voltage overload E0019: AC frequency overload E0021: Control board EEPROM fault	0	*	

Ref. Code	Function	Setting Range	Default	Attribute	Setting
		E0022: Display panel EEPROM fault E0024: External fault			
F05.01	DC bus voltage for the 1st fault	0 - 999V	0V	*	
F05.02	current input for the 1st fault	0.0 - 999.9A	0.0A	*	
F05.03	voltage input for the 1st fault	0 - 999V	0V	*	
F05.04	grid frequency for the 1st fault	0.0 - 99.00Hz	0.0Hz	*	
F05.05	internal time for the 1st fault	0.0 - 6553.5h	0.0h	*	
F05.06	2nd fault type	0 - 99	0	*	
F05.07	DC bus voltage at the 2nd fault	0 - 999V	0V	*	
F05.08	Input current at the 2nd fault	0.0 - 999.9A	0.0A	*	
F05.09	Input voltage at the 2nd fault	0 - 999V	0V	*	
F05.10	2nd fault grid frequency	0.0 - 99.00Hz	0.0Hz	*	
F05.11	internal time at the 2nd fault	0.0 - 6553.5h	0.0h	*	
F05.12	3rd fault type	0 - 99	0	*	
F05.13	DC bus voltage at the 3rd fault	0 - 999V	0V	*	
F05.14	Input current at the 3rd fault	0.0 - 999.9A	0.0A	*	
F05.15	Input voltage at the 3rd fault	0 - 999V	0V	*	
F05.16	3rd fault grid frequency	0.0 - 99.00Hz	0.0Hz	*	
F05.17	3rd time between failures	0.0 - 6553.5h	0.0h	*	
F05.18	4th fault type	0 - 99	0	*	
F05.19	DC bus voltage at the 4th fault	0 - 999V	0V	*	
F05.20	Input current at the 4th fault	0.0 - 999.9A	0.0A	*	
F05.21	Input voltage at the 4th fault	0 - 999V	0V	*	
F05.22	4th fault grid frequency	0.0 - 99.00Hz	0.0Hz	*	
F05.23	4th time between failures	0.0 - 6553.5h	0.0h	*	
F05.24	5th fault type	0 - 99	0	*	
F05.25	DC bus voltage at the 5th fault	0 - 999V	0V	*	
F05.26	Input current at the 5th fault	0.0 - 999.9A	0.0A	*	
F05.27	Input voltage at the 5th fault	0 - 999V	0V	*	
F05.28	5th fault grid frequency	0.0 - 99.00Hz	0.0Hz	*	
F05.29	5th time between failures	0.0 - 6553.5h	0.0h	*	