SLANVERT

Regenerative Braking Unit
User manual

Hope Senlan Science and Technology Holding Corp., Ltd.

Index

Chapter1 Safety information

1.1 Safety

Danger	Improper use may cause dangerous situations, resulting in personal injury or death or significant property damage.
Warning	Improper use may cause dangerous situations, resulting in mild or moderate personal injury, damage to the device or failure of the device to operate properly.
Note	In order to achieve better product use results, some tips are given.

Form 1-1 Safety guide

1.2 Installation and wiring precautions

Danger	1、Wiring work must be performed by professionally qualified personnel, otherwise there is a risk of electric shock or risk of machine damage due to incorrect wiring. 2、When installing and wiring, the device and the inverter connected to it must be power off the device and wait 5 to 10 minutes to confirm that the internal capacitors of each related device discharge the stored power before operating to ensure personal safety. 3、The ground terminal of this device must be reliably grounded , otherwise there may be a risk of electric shock.
Warning	1、The feedback three-phase output terminals and DC bus voltage input terminals of this device must be correctly distinguished and wired correctly, otherwise it will not work, and may even cause damage to the device itself and related devices, and pose a fire risk. 2、Install this device in a well-ventilated area, otherwise the device may be damaged by overheating.

1.3 Precautions for use

Danger	After being powered on, the internal components of this device will contain dangerous high voltages. Non-professionals are advised not to touch the internal components of the machine at will, otherwise there may be a risk of electric shock.
Warning	Do not drop screws, washers and other metal objects into the device, otherwise there is a risk of damage to the device. Make sure the main case cover is closed properly during use.

Chapter 2 Precautions for unpacking

2.1 Unboxing appearance acceptance

RBU device have passed strict testing and quality inspection before leaving the factory. Before unpacking, please carefully check whether the product packaging is damaged due to careless transportation, and whether there are any damaged parts, falling off, or dents in the front cover or body caused by transportation. If there is packaging damage or product problems, please contact our company or supplier in time.

2.2 Product acceptance

Confirm the following items after unpack:

1、Confirm the model number is the product model you ordered.

2、Check whether there are any damaged during transportation.

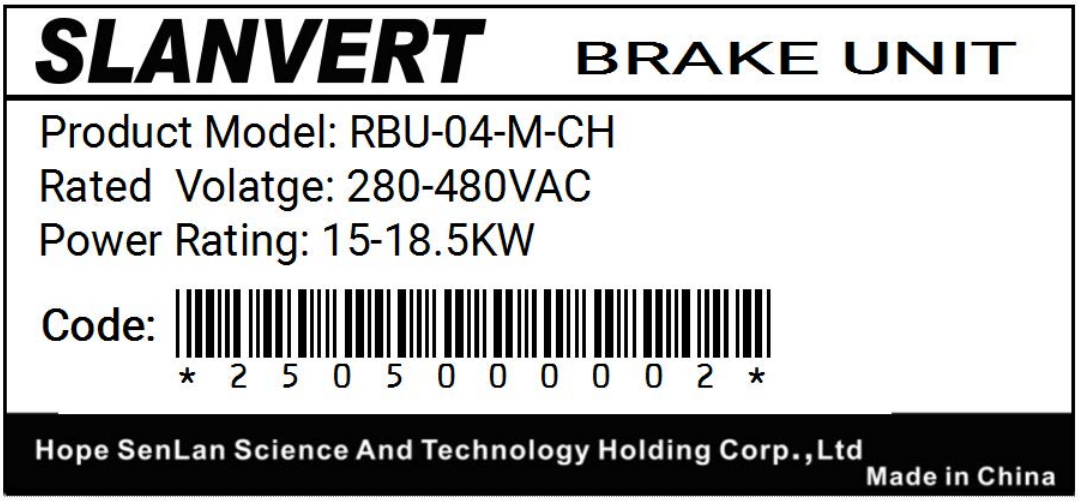


Fig 2-1 Label

Model	Input Voltage	Power
RBU-04-M-CH	280Vac～480Vac	15~18.5KW
Note	Refer chapter 3 for more information	

Form 2-1 Product information

Danger	1、Do not install device which is damaged or missing parts, otherwise there will be a risk of machine power-on damage or personal safety. 2、If there is packaging damage or product problems, please contact our company or supplier in time.

Chapter 3 Models and Specifications

3.1 Model

R B U - 04 - T - C S				
	①	② ③ ④ ⑤		
①：TYPE	RBU	Sinewave Regenerataive Braking Unit		
②：INPUT	02	190Vac～250Vac		
	04	280Vac～480Vac		
	06	530Vac～790Vac		
③：POWER	T	5.5～7.5KW		
	S	11～15KW		
	M	18.5～22KW		
	L	30～37KW		
	X	45KW		
	055	55KW	075	75KW
	090	90KW	110	110KW
	132	132KW	160	160KW
	185	185KW	220	220KW
	250	250KW	280	280KW
	315	315KW	355	355KW
	……	……	……	……
④：CONTROL	C	Digital control		
⑤：TYPE	S	Standard type		
	H	Heavy duty type		
	C	Continuous type		

Form 3-1 Plate

3.2 Technical Data

ITEM		DESCRIPTION
VOLTAGE	Input	3 Phase 190Vac～250Vac 3 Phase 280Vac～480Vac 3 Phase 530Vac～790Vac
	Frequency	40Hz～70Hz
CONTROL	Current Ctrl	Vector control, current and voltage THD < 5% @ 100% load
	Output	DC bus voltage intelligent predictive control
	Rectifier feedback	330Vdc（220Vac）± 150Vdc Adjustable 600Vdc（380Vac）± 200Vdc Adjustable 1000Vdc（660Vac）± 200Vdc Adjustable
	Fan Control	Enable at 43℃, disable at 40℃, control programmable
	Protection	Overcurrent protection, overload protection, current limit protection, DC short circuit protection, DC overvoltage protection, DC undervoltage protection, overheat protection, grid amplitude fault protection, frequency fault protection, grid phase fault protection, AC short circuit protection, external EXT Terminal input fault protection, etc.
DISPLAY	Status	Power supply indication, monitoring indication, enable operation indication, fault indication, parameter modification indication, rectifier feedback/feedback status indication, keyboard data display, etc.
ENVIRONMENT	Install place	Inside the cabinet, the altitude is no more than 1000m (for every 1000m the altitude increases, the rating must be derated by 10%), no direct sunlight, no conductive dust and corrosive gases
	Temperature	-10～40℃, Well ventilated
	Humidity	Below 90%RH (no condensation)
	Vibration	Below 0.5g
	Air	No dust, direct sunlight, corrosive gas, flammable gas, oil mist, steam, water, etc., not contain too much salt
	Install method	Wall-mounted, protection grade IP20
STORAGE	Temperature	-40～70℃
	Humidity	5～95％RH
	Air	No dust, direct sunlight, corrosive gas, flammable gas, oil mist, steam, water, etc., not contain too much salt.

Form 3-2 Technical data

3.3 Product selection instructions

- Adaptive motor power is calculated based on input voltage, and there is no need to enlarge or reduce the capacity. In situations where motor power generation efficiency is relatively high, the power level needs to be increased by one level when selecting the model.
- When applied to permanent magnet synchronous motors (power generation efficiency of synchronous motors with same power is one level higher than non-synchronous motors), power level needs to be enlarged by one level when selecting.
- Standard type (S series), braking torque 110%, suitable for: centrifuge, lathe, textile machine, printing machine, sugar mill honey separator, industrial dehydrator, packaging machine, kowtow machine, oil pumping machine, rewinding machine, paper machine, spindle, gantry planer, etc. If you are not sure about the selection, please choose the heavy-duty (H series) RBU sine wave energy feedback device. In the case of motor emergency braking (when the motor brakes from high speed or heavy load, motor emergency braking time is less than 8 seconds), power level needs to be increased by one gear when selecting the model.
- Heavy-duty type (H series), braking torque 150%, suitable for: cranes, hoists, lifts, tower cranes, winches, cable cars, port door cranes, shearers, downlink belt conveyors, winches, rolling mills, cranes, overhead cranes Cars, cranes, wire drawing machines, wire drawing machines, monkey carts, stackers, coilers, ship unloaders, ship locks, etc.
- Continuous type (C series), braking torque 220%, suitable for continuous and uninterrupted feedback situations, commonly used in dynamometers and grid-connected motors for feedback.
- 25% DTC rated current refers to the rated current of machine feedback operation at 1/4 working mode. That is: within a 2min (min is minutes) period, the feedback continues to work for 0.5min and stops for 1.5min.
- 50% DTC rated current refers to rated current of machine feedback operation at 1/2 working mode. That is: within a 2min (min is minutes) cycle, feedback continues to work for 1min and stops for 1min.
- 100% DTC rated current refers to the rated current of machine feedback operation during continuous uninterrupted operation.
- Peak current can last for 3 seconds.

MODEL（S series）	**INPUT**	**POWER（KW）**		**25%DTC Rated Current**	**Peak Current**	**Case**
		VM	**PM**			
RBU-06-045-CS	660Vac	45	37	36A	45A	C3
RBU-06-055-CS		55	45	44A	55A	C3
RBU-06-075-CS		75	55	60A	75A	C3
RBU-06-090-CS		90	75	85A	110A	C4
RBU-06-110-CS		110	90	105A	132A	C4
RBU-06-132-CS		132	110	125A	160A	C4
RBU-06-160-CS		160	132	145A	185A	C5
RBU-06-185-CS		185	160	170A	220A	C5

MODEL（S series）	INPUT	POWER（KW）		25%DTC Rated Current	Peak Current	Case
		VM	PM			
RBU-06-220-CS	660Vac	220	185	200A	250A	C5
RBU-06-250-CS		250	220	220A	280A	C6
RBU-06-280-CS		280	250	250A	315A	C6
RBU-06-315-CS		315	280	280A	355A	C6
RBU-06-355-CS		355	315	315A	400A	C6
RBU-04-T-CS	380Vac	5.5～7.5	3.7～5.5	12.0A	16.0A	C2
RBU-04-S-CS		11～15	7.5～11	16.5A	22.5A	C2
RBU-04-M-CS		18.5～22	15～18.5	25.5A	32A	C2
RBU-04-L-CS		30～37	22～30	36A	45A	C2
RBU-04-X-CS		45	37	44A	55A	C2
RBU-04-055-CS		55	45	60A	75A	C3
RBU-04-075-CS		75	55	72A	90A	C3
RBU-04-090-CS		90	75	88A	110A	C3
RBU-04-110-CS		110	90	125A	160A	C4
RBU-04-132-CS		132	110	145A	185A	C4
RBU-04-160-CS		160	132	170A	220A	C5
RBU-04-185-CS		185	160	200A	250A	C5
RBU-04-220-CS		220	185	225A	280A	C5
RBU-04-250-CS		250	220	280A	355A	C6
RBU-04-280-CS		280	250	315A	400A	C6
RBU-04-315-CS		315	280	355A	450A	C6
RBU-04-355-CS		355	315	400A	500A	C6
RBU-02-T-CS	220Vac	3.7～5.5	2.2～3.7	12.0A	16.0A	C2
RBU-02-S-CS		7.5～11	5.5～7.5	16.5A	22.5A	C2
RBU-02-M-CS		15	11	25.5A	32A	C2
RBU-02-L-CS		18.5	15	36A	45A	C2
RBU-02-X-CS		22	18.5	44A	55A	C2
RBU-02-030-CS		30	22	60A	75A	C3
RBU-02-037-CS		37	30	72A	90A	C3
RBU-02-045-CS		45	37	88A	110A	C3
RBU-02-055-CS		55	45	125A	160A	C4
RBU-02-075-CS		75	55	145A	185A	C4

Form 3-3 Standard product selection

MODEL（H series）	INPUT	POWER（KW）		25%DTC Rated Current	Peak Current	Case
		VM	PM			
RBU-06-037-CH	660Vac	37	30	33A	45A	C3
RBU-06-045-CH		45	37	41A	55A	C3
RBU-06-055-CH		55	45	56A	75A	C3
RBU-06-075-CH		75	55	80A	110A	C4
RBU-06-090-CH		90	75	95A	132A	C4
MODEL（H series）	**INPUT**	**POWER（KW）**		**50%DTC Rated Current**	**Peak Current**	**Case**
		VM	**PM**			
RBU-06-110-CH	660Vac	110	90	115A	160A	C4
RBU-06-132-CH		132	110	132A	185A	C5
RBU-06-160-CH		160	132	160A	220A	C5
RBU-06-185-CH		185	160	185A	250A	C5
RBU-06-220-CH		220	185	210A	280A	C6
RBU-06-250-CH		250	220	235A	315A	C6
RBU-06-280-CH		280	250	265A	355A	C6
RBU-06-315-CH		315	280	300A	400A	C6
RBU-04-T-CH	380Vac	3.7～5.5	2.2～3.7	11.0A	16.0A	C2
RBU-04-S-CH		7.5～11	5.5～7.5	15.0A	22.5A	C2
RBU-04-M-CH		15～18.5	11～15	24A	32A	C2
RBU-04-L-CH		22～30	18.5～22	33A	45A	C2
RBU-04-X-CH		37	30	41A	55A	C2
RBU-04-045-CH		45	37	56A	75A	C3
RBU-04-055-CH		55	45	67A	90A	C3
RBU-04-075-CH		75	55	82A	110A	C3
RBU-04-090-CH		90	75	120A	160A	C4
RBU-04-110-CH		110	90	135A	185A	C4
RBU-04-132-CH		132	110	160A	220A	C5
RBU-04-160-CH		160	132	185A	250A	C5
RBU-04-185-CH		185	160	220A	280A	C5
RBU-04-220-CH		220	185	265A	355A	C6
RBU-04-250-CH		250	220	300A	400A	C6
RBU-04-280-CH		280	250	335A	450A	C6
RBU-04-315-CH		315	280	375A	500A	C6
RBU-02-T-CH	220Vac	2.2～3.7	2.2	11.0A	16.0A	C2
RBU-02-S-CH		5.5～7.5	3.7～5.5	15.0A	22.5A	C2
RBU-02-M-CH		11	7.5	24A	32A	C2
RBU-02-L-CH		15	11	33A	45A	C2
RBU-02-X-CH		18.5	15	41A	55A	C2
RBU-02-022-CH		22	18.5	56A	75A	C3
RBU-02-030-CH		30	22	67A	90A	C3
RBU-02-037-CH		37	30	82A	110A	C3
RBU-02-045-CH		45	37	120A	160A	C4
RBU-02-055-CH		55	45	135A	185A	C4

Form 3-4 Heavy-duty product selection

MODEL（C series）	INPUT	POWER（KW）		100%DTC Rated Current	Peak Current	Case
		VM	PM			
RBU-06-030-CC	660Vac	30	22	25A	45A	C3
MODEL（C series）	**INPUT**	**POWER（KW）**		**100%DTC Rated Current**	**Peak Current**	**Case**
		VM	**PM**			
RBU-06-037-CC	660Vac	37	30	30A	55A	C3
RBU-06-045-CC		45	37	41A	75A	C3
RBU-06-055-CC		55	45	55A	110A	C4
RBU-06-075-CC		75	55	75A	132A	C4
RBU-06-090-CC		90	75	90A	160A	C4
RBU-06-110-CC		110	90	110A	185A	C5
RBU-06-132-CC		132	110	132A	220A	C5
RBU-06-160-CC		160	132	160A	250A	C5
RBU-06-185-CC		185	160	170A	280A	C6
RBU-06-220-CC		220	185	200A	315A	C6
RBU-06-250-CC		250	220	220A	355A	C6
RBU-06-280-CC		280	250	250A	400A	C6
RBU-04-T-CC	380Vac	2.2～3.7	2.2	9.0A	16.0A	C2
RBU-04-S-CC		5.5～7.5	3.7～5.5	13.0A	22.5A	C2
RBU-04-M-CC		11	7.5	16.5A	32A	C2
RBU-04-L-CC		15	11	24.2A	45A	C2
RBU-04-X-CC		18.5～22	15～18.5	30.2A	55A	C2
RBU-04-030-CC		30	22	41A	75A	C3
RBU-04-037-CC		37	30	50A	90A	C3
RBU-04-045-CC		45	37	60A	110A	C3
RBU-04-055-CC		55	45	90A	160A	C4
RBU-04-075-CC		75	55	105A	185A	C4
RBU-04-090-CC		90	75	132A	220A	C5
RBU-04-110-CC		110	90	160A	250A	C5
RBU-04-132-CC		132	110	185A	280A	C5
RBU-04-160-CC		160	132	250A	355A	C6
RBU-04-185-CC		185	160	280A	400A	C6
RBU-04-220-CC		220	185	315A	450A	C6
RBU-04-250-CC		250	220	355A	500A	C6
RBU-02-T-CC	220Vac	2.2	2.0	9.0A	16.0A	C2
RBU-02-S-CC		3.7～5.5	2.2～3.7	13.0A	22.5A	C2
RBU-02-M-CC		7.5	5.5	16.5A	32A	C2
RBU-02-L-CC		11	7.5	24.2A	45A	C2
RBU-02-X-CC		15	11	30.2A	55A	C2
RBU-02-018-CC		18.5	15	41A	75A	C3
RBU-02-022-CC		22	18.5	50A	90A	C3
RBU-02-030-CC		30	22	60A	110A	C3
RBU-02-037-CC		37	30	90A	160A	C4
RBU-02-045-CC		45	37	105A	185A	C4

Form 3-5 Continuous product selection

3.4 Product dimension and installation dimension

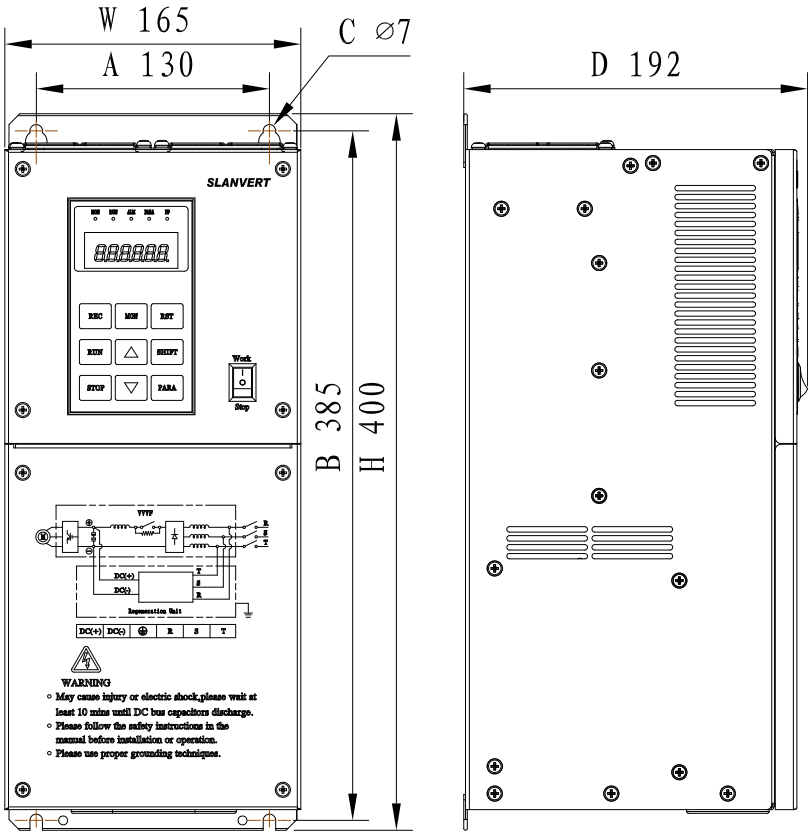


Fig 3-1 C2 Case dimension

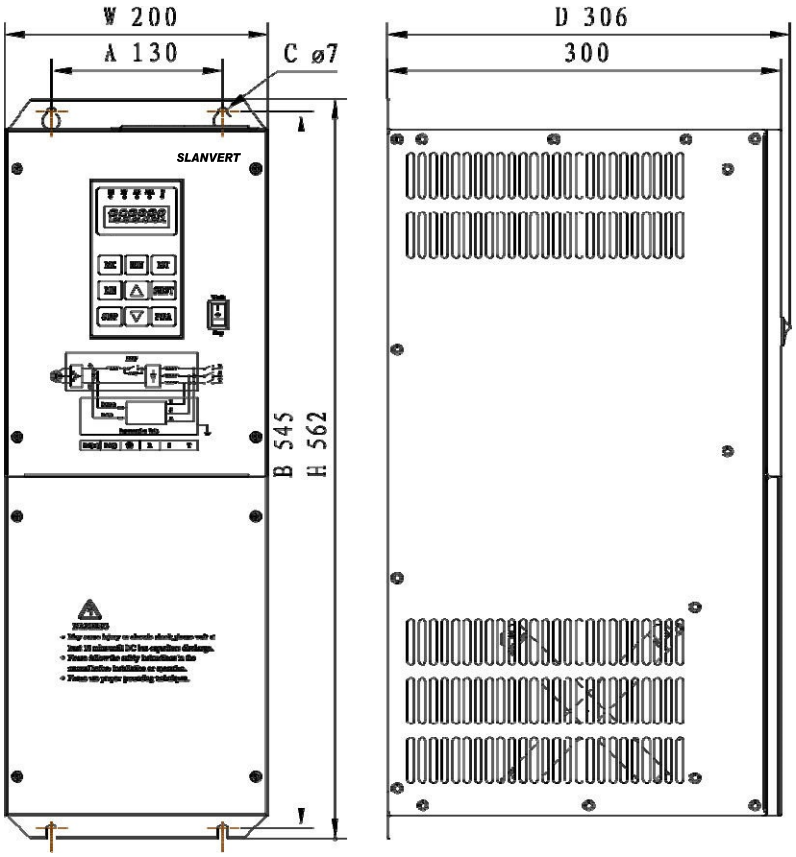


Fig 3-2 C3 Case dimension

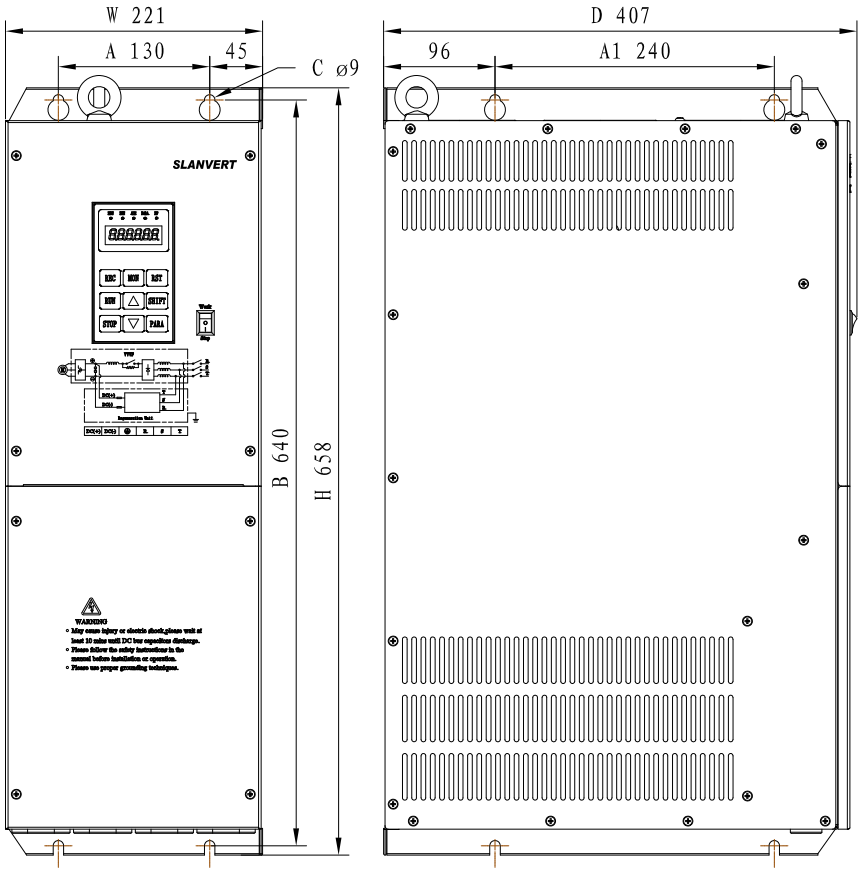


Fig 3-3 C4 Case dimension

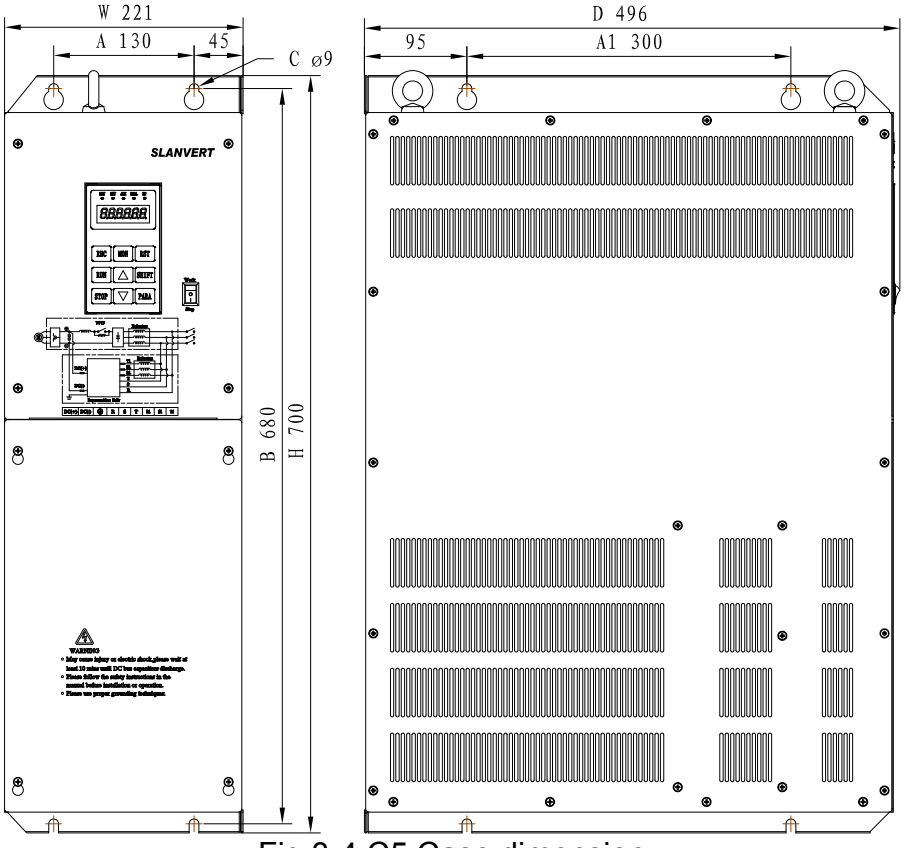


Fig 3-4 C5 Case dimension

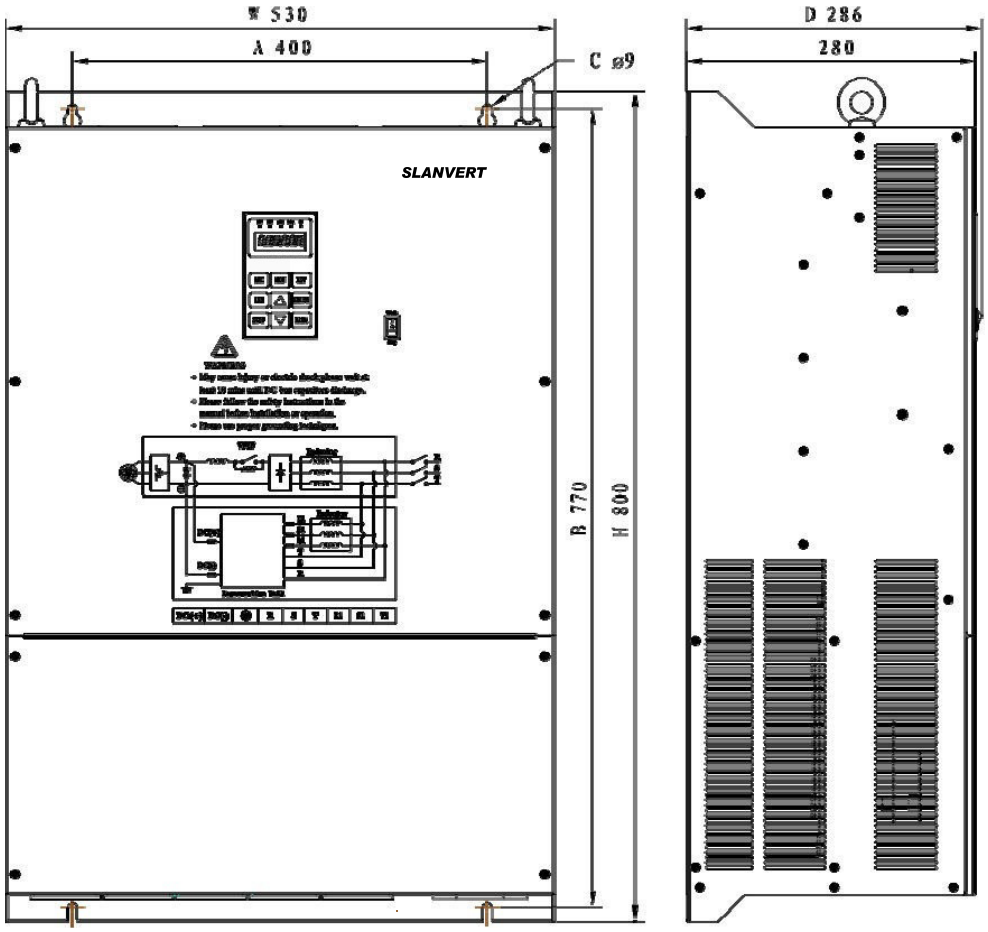
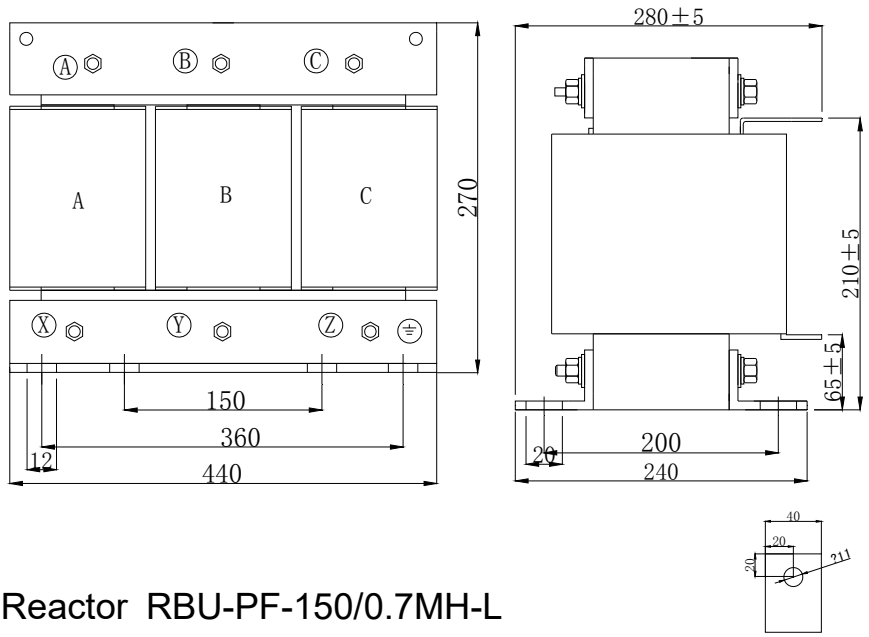
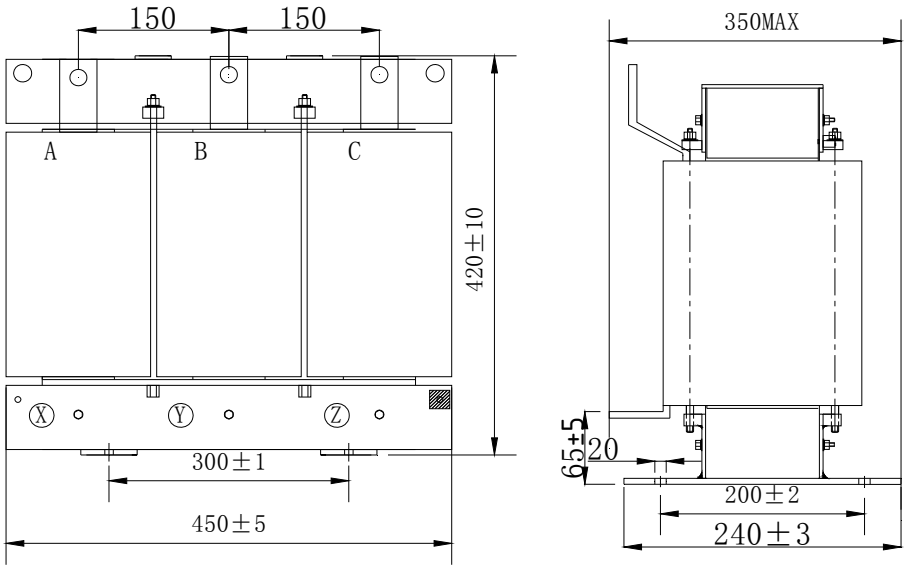


Fig 3-5 C6 Case dimension



Reactor RBU-PF-150/0.7MH-L

Fig 3-6 External reactor RBU-PF-150/0.7 MH -L dimension



Reactor:RBU-PF-300/0.7MH-L

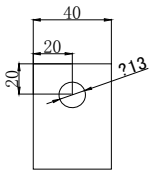


Fig 3-7 External reactor RBU-PF-300/0.7MH-L dimension

Note	**C4 case and C5 case need to lock 8 mounting screws at the same time.**
	C5 case is equipped an external reactor RBU-PF-150/0.7-L, which is connected to R1/S1/T1 terminal.
	C6 case is equipped with an external reactors RBU-PF-300/0.7-L, which are connected in parallel to R1/S1/T1. **Note: RBU-06-250-CS/RBU-06-220-CH/RBU-06-185-CC is a C6 case, accompanied by an external reactor, the RBU-PF-150/0.7MH-L, which is connected to R1/S1/T1.**

CASE	W_mm	H_mm	A_mm	B_mm	C_mm	D_mm	Packing weight
C2 Wall-mounted	165	400	130	385	¢ 7	192	13.5KG built-in reactor
C3 Wall-mounted	200	562	130	545	¢ 7	306	35KG built-in reactor
C4 Wall-mounted	221	658	130	640	¢ 9	407	58KG built-in reactor
C4 Flat type	407	658	240	640	¢ 9	221	
C5 Wall-mounted	221	700	130	680	¢ 9	496	166KG Include external reactor RBU-PF-150/0.7MH-L
C5 Flat type	496	700	300	680	¢ 9	221	
C6 Wall-mounted	530	800	400	770	¢ 9	270	242KG Include external reactor RBU-PF-300/0.7MH-L

Form 3-6 Main case installation dimension

Chapter 4 Installation

4.1 Main circuit wiring

1、Main circuit is connected in the form of terminals. Open terminal cover of the main case and connect according to terminal marking.

Fig 4-1 C2、C3、C4 Main circuit wiring

Terminal	Description
R、S、T	Three-phase power terminal blocks. No phase sequence.
⏚	Device ground terminal, used for shell grounding.
DC（+）	DC output terminal. Connect to inverter DC positive terminal.
DC（-）	DC output terminal. Connect to inverter DC negative terminal.

Form 4-1 C2、C3、C4 Main circuit wiring

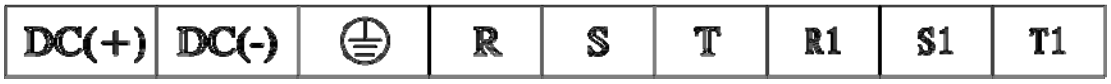


Fig 4-2 C5、C6 Main circuit wiring

Terminal	Description
R、S、T	Refer fig 4-4 for connection detail.
R1、S1、T1	Refer fig 4-4 for connection detail.
⏚	Device ground terminal, used for shell grounding.
DC（+）	DC output terminal. Connect to inverter DC positive terminal.
DC（-）	DC output terminal. Connect to inverter DC negative terminal.

Form 4-2 C5、C6 Main circuit wiring

2、The connection diagram of energy feedback device and frequency converter is shown in Figure 4-3 and Figure 4-4.

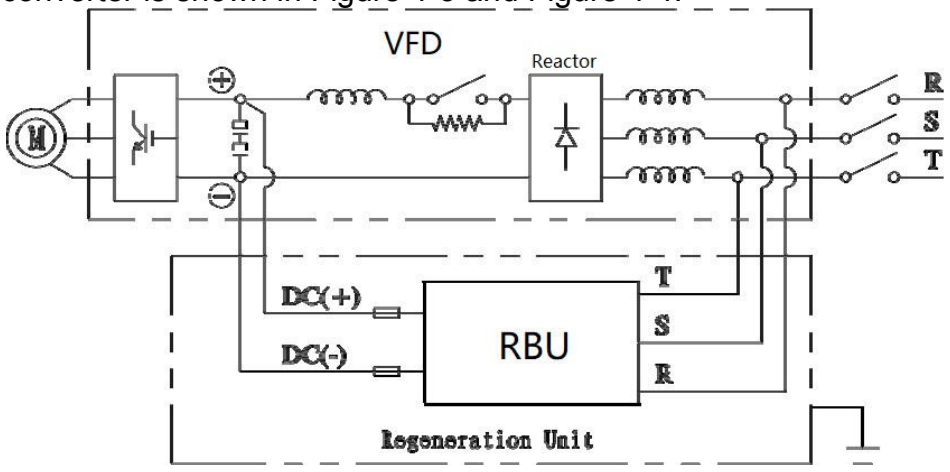


Fig 4-3 C2 C2/C3/C4 Wiring diagram or RBU and VFD

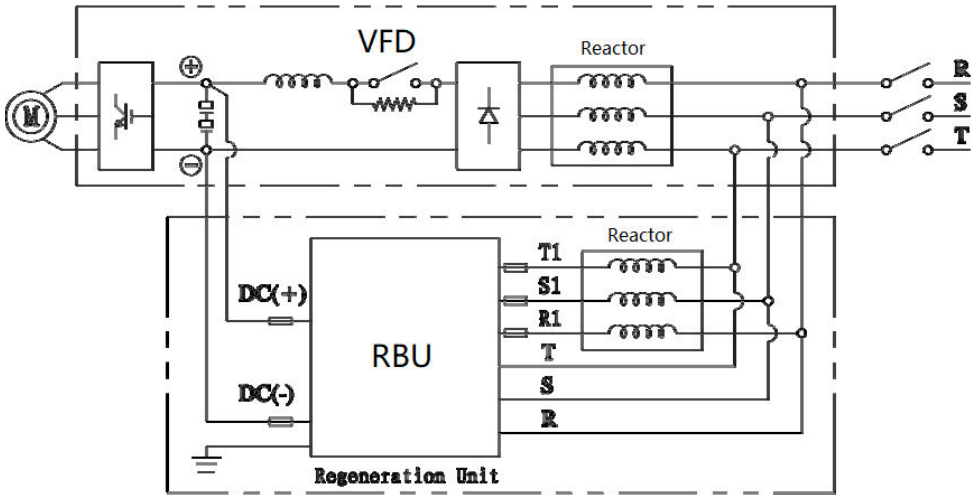


Fig 4-4 C5/C6 Wiring diagram of RBU and VFD

Note	C5 case is equipped an external reactor RBU-PF-150/0.7MH-L, which is connected to R1/S1/T1 terminal.
	C6 case is equipped an external reactor RBU-PF-300/0.7MH-L, which is connected to R1/S1/T1 terminal. **Note: RBU-06-250-CS/RBU-06-220-CH/RBU-06-185-CC is a C6 case, accompanied by an external reactor, the RBU-PF-150/0.7MH-L, which connect to R1/S1/T1.**

4.2 Control wiring

1. There is a control board inside the RBU sine wave energy feedback device, and its control terminals are shown in form 4-3.

Interface		Description
Control port	CN16（DC BUS）	DC bus port(cannot be connected incorrectly)
	CN5（R S T）	Three-phase sampling port
	J2（T1）、J3（T2）	Temperature sensor port
	CN6（HU）	U-phase voltage Hall sensor sampling port
	CN8（HV）	V-phase voltage Hall sensor sampling port
	CN9（HW）	W-phase voltage Hall sensor sampling port
	CN7	RS232 keyboard communication port
User port	TA、TB、TC	TA/TB is relay normally closed output. TC/TB is relay normally open output. (AC: 270V/3A; DC: 30V/3A) It's function is set by HH06 parameter
	T1A、T1B、T1C	T1A/T1B is relay normally closed output. T1C/T1B is relay normally open output. (AC: 270V/3A; DC: 30V/3A) It's function is set by HH07 parameter
	24V	24V output, maximum output current 0.5A, COM is the ground terminal
	EXT	External fault input: valid when EXT and COM are shorted, invalid when EXT and COM are disconnected
	DI1	Machine enable control terminal: short connection between DI1 and COM is valid, disconnection between DI1 and COM is invalid.
	DI2	External control input: valid when DI2 and COM are short-circuited, invalid when DI2 and COM are disconnected
	DI3	Elevator emergency power enable input terminal: DI3 and COM are short-circuited to enable the elevator emergency power output DI3 is disconnected from COM to stop the elevator emergency power output
	DI4	Elevator emergency power supply shut-off input terminal: DI4 and COM are short-circuited to turn off the elevator emergency power supply output. DI4 is disconnected from COM to not turn off the elevator emergency power output
	DI5	Normally open input terminal of the contactor: DI5 and COM are short-circuited to pull in, and DI5 and COM are disconnected to be disconnected

	DI6	Grid status input terminal: short circuit between DI6 and COM means the grid is abnormal, disconnection between DI6 and COM means the grid is normal
	DI7	Battery status input terminal: If DI7 and COM are shorted, the battery is charged; if DI7 is disconnected from COM, the battery is discharged
	COM	commons
	485+、485-	RS485 communication interface

Form 4-3 Control board terminal description

2. Control panel has three control modes: shutdown, rectifier feedback, and emergency power output. These three modes are selected by the combination of DI1, DI3, DI4, DI5, DI6 and DI7 terminals. See form 4-4 for details.

MODE	DI（DI and COM：short=0，open=1，X=any）					
	DI1	DI3	DI4	DI5	DI6	DI7
Stop	1	X	X	X	X	X
Rectifier feedback /feedback	0	X	X	0	1	X
Stop	0	X	X	1	1	X
Stop	0	X	X	X	0	1
Stop	0	X	X	0	0	0
Stop	0	1	X	1	0	0
Stop	0	0	0	1	0	0
Emergency power output	0	0	1	1	0	0

Form 4-3 Control mode of control panel

3. RBU sine wave energy feedback device is preset to rectifier feedback /feedback control mode, DI1 and DI5 are short-circuited to COM. See form 4-4 for details. UU24 parameter in form 5-9 is set to 1 and configured in feedback mode. In feedback mode, when input DC bus voltage is greater than feedback action voltage, machine works in feedback state; when input DC bus voltage is less than feedback action voltage, machine works in feedback stop state. In feedback mode, you can configure UU30 parameters in form 5-9 and select float control.

Note	Red switch button on main case covers of C1 and C2 are directly connected to the DI1 and COM terminals. Red switch operation: Work is DI1 and COM short-circuited; Stop is DI1 and COM are disconnected

4. If RBU sine wave energy feedback device needs to be configured in other control mode, it can be configured according to UU24 and UU30 parameters in form 4-4 and form 5-9. For control panel port function description, refer to form 4-3.

4.3 Power cable instruction

MODEL			Cable cross-sectional area（mm^2）		
S series	H series	C series	main	Gnd	Terminal
RBU-02-T-CS	RBU-02-T-CH	RBU-02-T-CC	≥2.5	≥0.8	≥0.8
RBU-02-S-CS	RBU-02-S-CH	RBU-02-S-CC	≥4	≥0.8	≥0.8
RBU-02-M-CS	RBU-02-M-CH	RBU-02-M-CC	≥6	≥2.5	≥0.8
RBU-02-L-CS	RBU-02-L-CH	RBU-02-L-CC	≥6	≥2.5	≥0.8
RBU-02-X-CS	RBU-02-X-CH	RBU-02-X-CC	≥8	≥2.5	≥0.8

RBU-02-030-CS	RBU-02-022-CH	RBU-02-018-CC	≥10	≥4	≥0.8
RBU-02-037-CS	RBU-02-030-CH	RBU-02-022-CC	≥10	≥4	≥0.8
RBU-02-045-CS	RBU-02-037-CH	RBU-02-030-CC	≥20	≥6	≥0.8
RBU-02-055-CS	RBU-02-045-CH	RBU-02-037-CC	≥25	≥6	≥0.8
RBU-02-075-CS	RBU-02-055-CH	RBU-02-045-CC	≥25	≥6	≥0.8
MODEL			**Cable cross-sectional area（mm²）**		
S series	**H series**	**C series**	**main**	**Gnd**	**Terminal**
RBU-04-T-CS	RBU-04-T-CH	RBU-04-T-CC	≥2.5	≥0.8	≥0.8
RBU-04-S-CS	RBU-04-S-CH	RBU-04-S-CC	≥4	≥0.8	≥0.8
RBU-04-M-CS	RBU-04-M-CH	RBU-04-M-CC	≥6	≥2.5	≥0.8
RBU-04-L-CS	RBU-04-L-CH	RBU-04-L-CC	≥6	≥2.5	≥0.8
RBU-04-X-CS	RBU-04-X-CH	RBU-04-X-CC	≥8	≥2.5	≥0.8
RBU-04-055-CS	RBU-04-045-CH	RBU-04-030-CC	≥10	≥4	≥0.8
RBU-04-075-CS	RBU-04-055-CH	RBU-04-037-CC	≥10	≥4	≥0.8
RBU-04-090-CS	RBU-04-075-CH	RBU-04-045-CC	≥20	≥6	≥0.8
RBU-04-110-CS	RBU-04-090-CH	RBU-04-055-CC	≥25	≥6	≥0.8
RBU-04-132-CS	RBU-04-110-CH	RBU-04-075-CC	≥25	≥6	≥0.8
RBU-06-045-CS	RBU-06-037-CH	RBU-06-030-CC	≥8	≥2.5	≥0.8
RBU-06-055-CS	RBU-06-045-CH	RBU-06-037-CC	≥10	≥4	≥0.8
RBU-06-075-CS	RBU-06-055-CH	RBU-06-045-CC	≥10	≥4	≥0.8
RBU-06-090-CS	RBU-06-075-CH	RBU-06-055-CC	≥20	≥6	≥0.8
RBU-06-110-CS	RBU-06-090-CH	RBU-06-075-CC	≥25	≥6	≥0.8
RBU-06-132-CS	RBU-06-110-CH	RBU-06-090-CC	≥25	≥6	≥0.8
Note	Main circuit includes：R、S、T、DC（+）、DC（-）				

Form 4-5　C2、C3、C4 wiring cable description

MODEL			**Cable cross-sectional area（mm²）**		
S series	**H series**	**C series**	**main**	**Gnd**	**Terminal**
RBU-04-160-CS	RBU-04-132-CH	RBU-04-090-CC	≥35	≥8	≥0.8
RBU-04-185-CS	RBU-04-160-CH	RBU-04-110-CC	≥35	≥8	≥0.8
RBU-04-220-CS	RBU-04-185-CH	RBU-04-132-CC	≥50	≥8	≥0.8
RBU-04-250-CS	RBU-04-220-CH	RBU-04-160-CC	≥65	≥10	≥0.8
RBU-04-280-CS	RBU-04-250-CH	RBU-04-185-CC	≥65	≥10	≥0.8
RBU-04-315-CS	RBU-04-280-CH	RBU-04-220-CC	≥80	≥10	≥0.8
RBU-04-355-CS	RBU-04-315-CH	RBU-04-250-CC	≥80	≥10	≥0.8
RBU-06-160-CS	RBU-06-132-CH	RBU-06-110-CC	≥35	≥8	≥0.8
RBU-06-185-CS	RBU-06-160-CH	RBU-06-132-CC	≥35	≥8	≥0.8
RBU-06-220-CS	RBU-06-185-CH	RBU-06-160-CC	≥50	≥8	≥0.8
RBU-06-250-CS	RBU-06-220-CH	RBU-06-185-CC	≥65	≥10	≥0.8
RBU-06-280-CS	RBU-06-250-CH	RBU-06-220-CC	≥65	≥10	≥0.8
RBU-06-315-CS	RBU-06-280-CH	RBU-06-250-CC	≥80	≥10	≥0.8
RBU-06-355-CS	RBU-06-315-CH	RBU-06-280-CC	≥80	≥10	≥0.8
Note	Main circuit includes：R、S、T、DC（+）、DC（-） The cross-sectional area of R、S、T wiring cable is ≥ 4mm²				

Form 4-6 C5、C6 wiring cable description

4.4 Installation space requirements

Note	1. If device is installed in a container, heat dissipation issues must be fully considered and heat dissipation holes must be reserved, fan installed to ensure that the temperature around the device does not exceed the specified value. It shall not be installed in a closed box with poor heat dissipation and small space.
	2. Device is installed in a container such as a control cabinet, ensure that appropriate space is reserved for each device up, down, left, and right. As shown in Fig 4-5A.
	3. When installing multiple devices in the same control cabinet, it is recommended to install them horizontally in order to facilitate wiring and reduce mutual thermal influence. As shown in Figure 4-6.
	4. Installation space is limited and must be arranged up and down (vertical arrangement), a partition should be installed in the middle to prevent the heat from the lower part from affecting upper part. As shown in Figure 4-5B.
Warning	Device cannot be installed near flammable and explosive objects. It cannot be installed in places exposed to direct sunlight, conductive dust and corrosive gases. It cannot be installed in places that are within reach of human hands, otherwise it may cause accidents.

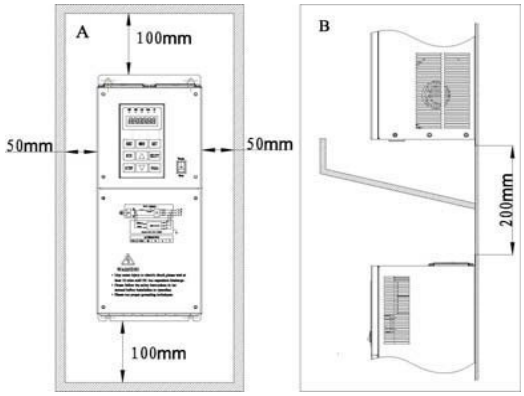


Fig 4-5 Requirement of device reserved installation space

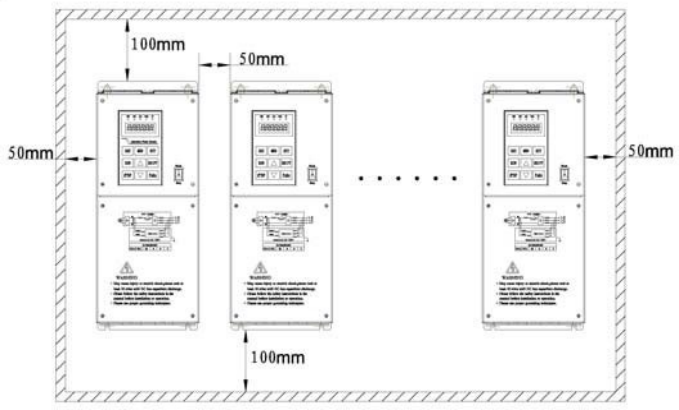


Fig 4-6 Multi devices space requirement

Chapter 5 Parameter setting

5.1 Keyboard control instructions

5.1.1 Keyboard panel

The keyboard panel consists of three parts: status indication area, data display area and key operation area.

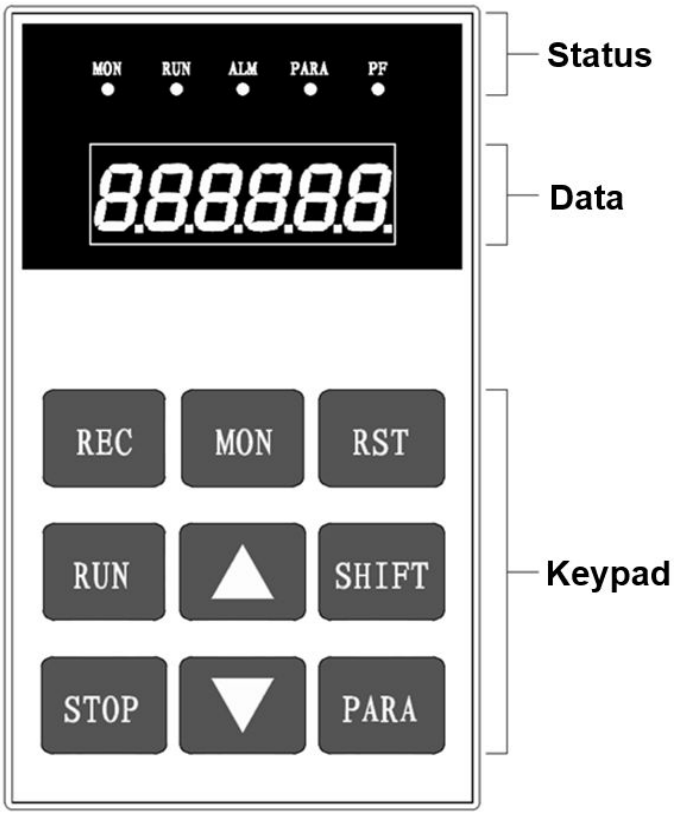


Fig 5-1 Keyboard panel

5.1.2 status indication

LED	Description
MON	This light indicates entering the "MON" or "REC" menu display state.
RUN	This light indicates that machine under enable working state when DI1 and COM port are short-circuited.
ALM	This light indicates that machine under fault alarm state, machine stops working, and the corresponding fault code is displayed in the data display part.
PARA	This light indicates entering the "PARA" or "RST" menu display state.
PF	This light indicates that it has entered the three-phase emergency power output state; This light flash indicates that it's under feedback output state or the rectifier feedback output state. The flashing frequency is 5Hz.
NOTE：All LED always on and data displays 8.8.8.8.8.8. This indicates communication cable connection fault.	

Form 5-1 Panel LED

5.1.3 Data display

Data display is displayed with a six-bit LED digital tube, and the displayed content is different depending on the selected parameter code. The displayed content is expressed in decimal digits, and some are displayed in the form of codes (for example, display fault codes).

When the software detects a fault, no matter what the current display status is, the data display part will directly display the fault code corresponding to the fault, and the "ALM" indicator will light up the alarm; when the fault is eliminated, the delay setting Recovery time (the software defaults to 30 seconds, and different recovery times can be set according to different faults. Please refer to Table 5-8 for specific settings). The software will automatically recover and display the content of the "FF00" parameter item.

5.1.4 Keypad operation

Button	Function
MON	Enter "MON" menu to check monitoring parameters.
REC	Enter "REC" menu to check fault recording parameters. (After a fault occurs, press this button to view fault record)
PARA	Enter "PARA" menu to modify or check function parameters
RST	Enter "RST" menu to modify or check debugging parameters (password is required to modify)
SHIFT	Shift switch left (Each time press "SHIFT", it will shift one position to left, and shifted element flash at a frequency of 1.5Hz)
△	Value upward increment key
▽	Value downward decrement key
STOP	Enter the parameter modification state (this button is only valid when DI1 is disconnected from the COM port)
RUN	Confirm parameter modification

Form 5-2 Key description

Step	Keyboard operation	
	Monitoring parameters	Fault record parameters
Menu	Press MON key to enter, Default display is FF00	Press REC key to enter, Default display is REC00
Select	Press SHIFT, △、▽ keys to select parameter code	Press SHIFT, △、▽ keys to select parameter code
Confirm	Press RUN to confirm display	Press RUN to confirm display

Form 5-3 Monitoring parameters and fault recording parameters

Note

The parameters in Table 5-4, Table 5-5 and Table 5-6 can be modified only when DI1 is disconnected from the COM port.

Step	Keyboard operation	
	Function parameter modification	**Function parameter**
Menu	Press PARA key to enter, default display is HH00	Press PARA key to enter, default display is HH00
Select	Press SHIFT,△,▽ keys to select parameter	Press SHIFT, △ , ▽ keys to select parameter
Enter	Press STOP to enter modification status, and the six-digit modification value is displayed.	
Modify	Press SHIFT, △, ▽ key to modify parameter value, but it has not been saved yet.	
Confirm	Press RUN to confirm the modified parameter value and save it.	Press RUN to confirm display

Form 5-4 Modify function parameters

Step	Keyboard operation	
	Commission parameter modification	**Commission parameter view**
Menu	Press RST key to enter, default display UU00	Press RST key to enter, default display UU00
Select	Press SHIFT,△,▽keys to select parameter	Press SHIFT,△,▽keys to select parameter
Code status	Press STOP to enter password modify status.	
Code key in	Press SHIFT, △ , ▽ key to enter correct six-digit password	
Code confirm	Press RUN to confirm password, display six-digit modified values at the same time	
Modify	Press SHIFT,△,▽key to modify parameter, but it has not been saved yet.	
Confirm	Press RUN to confirm modified parameter value and save it.	Press RUN to confirm the display

Form 5-5 Modify Commissioning parameter

Step	Keyboard operation
Menu	Press RST key to enter, and UU00 is displayed by default
Select	Press SHIFT,△,▽ key to select UU99
Code status	Press STOP to enter the original password and the panel display------
Code key in	Press SHIFT,△,▽key to enter correct original password
Code confirm	Press RUN to enter original password and enter new password. (the six-digit password cannot contain the "" character)
New code	Press SHIFT,△,▽ key to enter the new password, but it has not been saved yet.
Confirm	Press RUN to confirm modified new password and save it.

Form 5-6 Key board password

5.1.5 Keyboard parameter

➢ Form 5-7 For monitor parameter, refer form 5-3 keypad operation steps.

No.	Name	Unit	Range	Description
FF--00	Feedback power	KWH	0～99999.9	Accumulated feedback power to grid
FF--01	PWM output enable status	1	0～1	0→PWM disable；1→PWM enable
FF--02	AC grid voltage level	VAC	220/380/660	Voltage applicable to the machine,
FF--03	Machine power	KW	2.2～500.0	Machine power level
FF--04	Temperature of sensor T1	℃	-20～99.9	Temperature of sensor T1
FF--05	Temperature of sensor T2	℃	-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→Fail；1→Normal
FF--08	RS232 status	1	0～1	0→No data send out；1→Normal
FF--09	TA/TB/TC Relay output status	1	0～1	0→TA/TB Close，TC/TB Open； 1→TA/TB Open，TC/TB Close；
FF--10	T1A/T1B/T1C Relay output status	1	0～1	0→T1A/T1B Close，T1C/T1B Open； 1→T1A/T1B Open，T1C/T1B Close；
FF--11	DI1 input status	1	0～1	1→DI1/COM OPEN，0→DI1/COM SHORT
FF--12	DI2 input status	1	0～1	1→DI2/COM OPEN；0→DI2/COM SHORT
FF--13	DI3 input status	1	0～1	1→DI3/COM OPEN；0→DI3/COM SHORT
FF--14	DI4 input status	1	0～1	1→DI4/COM OPEN；0→DI4/COM SHORT
FF--15	DI5 input status	1	0～1	1→DI5/COM OPEN；0→DI5/COM SHORT
FF--16	DI6 input status	1	0～1	1→DI6/COM OPEN；0→DI6/COM SHORT
FF--17	DI7 input status	1	0～1	1→DI7/COM OPEN；0→DI7/COM SHORT
FF--18	EXT input status	1	0～1	1→EXT/COM OPEN；0→EXT/COM SHORT
FF--19	Machine work mode	1	0～2	0→Stop；1→Feedback power mode； 2→Emergency power output mode
FF--20	DC bus voltage	V	0～1240.0	Display DC bus voltage
FF--21	DC bus charging status	1	0～1	0→Charging；1→Charge complete
FF--22	Chip PWM output status	1	0～1	0→No PWM output；1→PWM output
FF--23	Feedback status	1	0～1	0→No feedback；1→Feedback
FF--24	Voltage R phase offset	1	0～65520	The display range is between 30768 and 34768, which means the calibration is correct, otherwise it needs to be recalibrated.
FF--25	Voltage S phase offset	1	0～65520	
FF--26	Voltage T phase offset	1	0～65520	
FF--27	Current R phase offset	1	0～65520	Display range between 30768 and 34768, it means the calibration is correct, otherwise it needs to be recalibrated (the Hall sensor needs to be connected before calibrating)
FF--28	Current S phase offset	1	0～65520	
FF--29	Current T phase offset	1	0～65520	
FF--30	Phase sequence of input power	1	0～1	0→Phase sequence R→S→T 1→Phase sequence R→T→S
FF--31	Three phase input voltage	VAC	0.0～900.0	Display input voltage，Vrms
FF--32	Phase R voltage	VAC	0.0～520.0	Display phase R voltage，Vrms
FF--33	Phase S voltage	VAC	0.0～520.0	Display phase S voltage，Vrms
FF--34	Phase T voltage	VAC	0.0～520.0	Display phase T voltage，Vrms

No.	Name	Unit	Range	Description
FF--35	3 phase average current	A	0～2000.0	Display three-phase average current
FF--36	Phase R current	A	0～2000.0	Display phase R current，Irms
FF--37	Phase S current	A	0～2000.0	Display phase S current，Irms
FF--38	Phase T current	A	0～2000.0	Display phase T current，Irms
FF--39	Rectified power	KWH	0～99999.9	Accumulated electric energy consumed by the power grid during rectification
FF--40	Power average frequency	Hz	0～100.00	Display three-phase average frequency
FF--41	Phase R frequency	Hz	0～100.00	Display phase R frequency
FF--42	Phase S frequency	Hz	0～100.00	Display phase S frequency
FF--43	Phase T frequency	Hz	0～100.00	Display phase T frequency
FF--44	Machine max. current	A	0.0～600.0	Actual operating maximum current
FF--45	Default setting max. current	A	0.0～600.0	Actual operating maximum current
FF--46	Feedback power	KW	0.0～999.9	Power feedback to the grid
FF--47	Rectified power	KW	0.0～999.9	Power consumed by grid during rectification
Other	Display8.8.8.8.8.8.		Reserve	Reserve

Form 5-7 Monitoring parameter

- Form 5-8 Function parameter table

No.	Name	Unit	Range	Default	Description
HH--00	oH1 overheat protection of sensor T1	℃	55～95.0	88.0	T1 sensor value higher than HH-00, oH1 overheating protection will be triggered.
HH--01	oH2 overheat protection of sensor T2	℃	55～95.0	88.0	T2 sensor value higher than HH-00, oH2 overheating protection will be triggered.
HH--02	oH1 overheating protection recovery time	S	2～3600	30	FF04 is less than (HH00-10). After delaying the set value, protection will resume.
HH--03	oH2 overheating protection recovery time	S	2～3600	30	FF05 is less than (HH00-10). After delaying the set value, protection will resume.
HH--04	Fan control mode	1	0～4	0	Refer to form 5-11
HH--05	EXT external alarm recovery time	S	2～3600	30	After reset external alarm, delay recovery time and software will automatically recover.
HH--06	TA/TB/TC control mode	1	0～24	14	Refer to form 5-12
HH--07	T1A/T1B/T1C Relay control mode	1	0～24	14	Refer to form 5-12
HH--08	DC bus threshold voltage	V	180.0～1200.0	400.0	Control TA/TB/TC relay and set bus threshold voltage, refer to form 5-12
HH--09	DC bus threshold voltage1	V	180.0～1200.0	400.0	Control T1A/T1B/T1C relay and set bus threshold voltage, refer to form 5-12
HH--10	TA/TB/TC Relay setting time	min	1～17280	30	Control TA/TB/TC relay and set relay setting time, refer to form 5-12
HH--11	T1A/T1B/T1C Relay setting time 1	min	1～17280	30	Control T1A/T1B/T1C relay and set relay setting time 1, refer to form 5-12

No.	Name	Unit	Range	Default	Description
HH--12	TA/TB/TC Relay on time	S	0～240	30	Control TA/TB/TC relays and set the conduction time, refer to Table 5-12
HH--13	T1A/T1B/T1C Relay on time 1	S	0～240	30	Control T1A/T1B/T1C relays and set conduction time1, refer to Table 5-12
HH--14	TA/TB/TC Relay off time	S	0～240	30	Control TA/TB/TC relay and set off time, refer to Table 5-12
HH--15	T1A/T1B/T1C Relay off time 1	S	0～240	30	Control T1A/T1B/T1C relay and set off time1, refer to Table 5-12
HH--16	DC bus voltage automatic correction	V	200.0～1200.0	Display bus voltage	Enter required correction value in the modified value, and press "RUN" key 3 seconds to confirm completion of automatic correction(please correct multiple times if it exceeds ±50V)
HH--17	Charging contactor opening voltage threshold	V	220VAC: 130～170 380VAC: 220～300 660VAC: 380～480	220VAC: 130.0 380VAC: 220.0 660VAC: 380.0	After DC bus voltage is lower than set value, charging contactor open.
HH--18	Charging contactor conduction voltage threshold	V	220VAC: 220～270 380VAC: 380～580 660VAC: 640～900	220VAC: 240.0 380VAC: 430.0 660VAC: 740.0	When DC bus voltage is greater than set value and after delaying set value of item HH21, charging contactor close.
HH--19	DC bus voltage oE overvoltage protection threshold	V	220VAC: 350～480 380VAC: 720～820 660VAC: 1120～1220	220VAC: 430.0 380VAC: 800.0 660VAC: 1200.0	When the DC bus voltage is greater than the set value, an oE overvoltage protection fault will be reported.
HH--20	DC bus voltage LE undervoltage protection threshold	V	220VAC: 180～210 380VAC: 310～370 660VAC: 490～620	220VAC: 180.0 380VAC: 320.0 660VAC: 560.0	When the DC bus voltage is lower than set value, an LE undervoltage protection fault will be reported.
HH--21	Charging contactor closing delay time	S	2～240	2	When the close condition is reached, it close after delay set time,
HH--22	oE overvoltage protection recovery time	S	2～3600	30	When the voltage is less than (HH19 20) set value, protection will resume
HH--23	LE undervoltage protection recovery time	S	2～3600	30	If the DC bus voltage is greater than the HH18 item, delay the setting value and the protection will recover.
HH--24	HE hardware overvoltage protection recovery time	S	2～3600	30	When the voltage is less than (HH19 20V), delay set value and protection will resume. Hardware overvoltage: 505V, 840V, 1240V
HH--25	RS485 address	1	0～31	31	Address for RS485 communication
HH--26	Voltage and current zero offset correction	1	0～6	0	When set to 6, calibration started. After 3 seconds, it changes from 6 to 1, the calibration is completed.

No.	Name	Unit	Range	Default	Description
HH--12	TA/TB/TC Relay on time	S	0～240	30	Control TA/TB/TC relays and set the conduction time, refer to Table 5-12
HH--13	T1A/T1B/T1C Relay on time 1	S	0～240	30	Control T1A/T1B/T1C relays and set conduction time1, refer to Table 5-12
HH--14	TA/TB/TC Relay off time	S	0～240	30	Control TA/TB/TC relay and set off time, refer to Table 5-12
HH--15	T1A/T1B/T1C Relay off time 1	S	0～240	30	Control T1A/T1B/T1C relay and set off time1, refer to Table 5-12
HH--16	DC bus voltage automatic correction	V	200.0～1200.0	Display bus voltage	Enter required correction value in the modified value, and press "RUN" key 3 seconds to confirm completion of automatic correction(please correct multiple times if it exceeds ±50V)
HH--17	Charging contactor opening voltage threshold	V	220VAC: 130～170 380VAC: 220～300 660VAC: 380～480	220VAC: 130.0 380VAC: 220.0 660VAC: 380.0	After DC bus voltage is lower than set value, charging contactor open.
HH--18	Charging contactor conduction voltage threshold	V	220VAC: 220～270 380VAC: 380～580 660VAC: 640～900	220VAC: 240.0 380VAC: 430.0 660VAC: 740.0	When DC bus voltage is greater than set value and after delaying set value of item HH21, charging contactor close.
HH--19	DC bus voltage oE overvoltage protection threshold	V	220VAC: 350～480 380VAC: 720～820 660VAC: 1120～1220	220VAC: 430.0 380VAC: 800.0 660VAC: 1200.0	When the DC bus voltage is greater than the set value, an oE overvoltage protection fault will be reported.
HH--20	DC bus voltage LE undervoltage protection threshold	V	220VAC: 180～210 380VAC: 310～370 660VAC: 490～620	220VAC: 180.0 380VAC: 320.0 660VAC: 560.0	When the DC bus voltage is lower than set value, an LE undervoltage protection fault will be reported.
HH--21	Charging contactor closing delay time	S	2～240	2	When the close condition is reached, it close after delay set time,
HH--22	oE overvoltage protection recovery time	S	2～3600	30	When the voltage is less than (HH19 20) set value, protection will resume
HH--23	LE undervoltage protection recovery time	S	2～3600	30	If the DC bus voltage is greater than the HH18 item, delay the setting value and the protection will recover.
HH--24	HE hardware overvoltage protection recovery time	S	2～3600	30	When the voltage is less than (HH19 20V), delay set value and protection will resume. Hardware overvoltage: 505V, 840V, 1240V
HH--25	RS485 address	1	0～31	31	Address for RS485 communication
HH--26	Voltage and current zero offset correction	1	0～6	0	When set to 6, calibration started. After 3 seconds, it changes from 6 to 1, the calibration is completed.

No.	Name	Unit	Range	Default	Description
HH--27	Phase sequence correction of power supply three-phase	1	0～6	AUTO	0=Calibration failed 1=Calibration successful 6=Start calibration Fail after 3 seconds due to no power.
HH--28	Three-phase effective value voltage automatic correction	VAC	50.0～900.0	Display bus voltage	Enter required correction value in modified value, and press "RUN" key after 3 seconds to confirm automatic correction (please correct multiple times if it exceeds ±50V)
HH--29	FF three-phase frequency fault protection recovery time	S	2～3600	30	After the grid over/under frequency fault is eliminated and the set value is delayed, the protection will resume.
HH--30	UF three-phase power amplitude fault protection recovery time	S	2～3600	30	When the grid amplitude over/under voltage fault is eliminated and the set value is delayed, protection will be restored.
HH--31	Three-phase power phase voltage amplitude overvoltage protection setting value	VAC	220VAC: 130～180 380VAC: 225～308 660VAC: 380～496	220VAC: 153.0 380VAC: 264.0 660VAC: 458.0	If the phase voltage amplitude of the three-phase power is greater than the set value, a UF protection fault will be reported.
HH--32	Three-phase power phase voltage amplitude undervoltage protection setting value	VAC	220VAC: 76～127 380VAC: 131～222 660VAC: 228～370	220VAC: 101.0 380VAC: 175.0 660VAC: 304.0	If the phase voltage amplitude of the three-phase power is less than the set value, a UF protection fault will be reported.
HH--33	PF power abnormality or phase loss protection recovery time	S	2～3600	30	Power abnormality or phase loss fault is reset with a delay of this setting value, the protection is restored.
HH--34	oC overcurrent protection recovery time	S	2～3600	30	After overcurrent fault is reset and set value is delayed, the protection resumes.
HH--35	Overload protection starting point	1	0.75～0.95	0.75	Overload protection starting point
HH--36	Maximum current of machine operation corresponds to the overload protection time	S	0.1～5.0	3.0	This setting is overload protection time corresponding to the maximum current of the machine. Please refer to the calculation formula below.
Overload protection time (seconds): Y=1000*(1-X)2+B, set HH36=B, HH35=X, X range [0.75～0.95]					
HH--37	oL overload protection recovery time	S	2～3600	30	Current overload fault reset delay is set by this value.
HH--38	Rectified feedback voltage/feedback voltage	V	220VAC: 180～480 380VAC: 400～800 660VAC: 800～1200	220VAC: 360.0 380VAC: 640.0 660VAC: 1040.0	When the DC bus voltage is higher than this set value, feedback starts. When it is lower than this set value, rectification/feedback stops.
HH--39	Three-phase emergency power supply output voltage	VAC	220VAC: 140～300 380VAC: 280～480 660VAC: 560～760	220VAC: 220.0 380VAC: 380.0 660VAC: 660.0	Control the output voltage of the three-phase emergency power supply within range of ±10%
HH--40	Enable fan temperature	℃	43～53	43.0	Fan control mode refer form 5-11

No.	Name	Unit	Range	Default	Description
HH--41	Emergency power delay	1	0～1	1	0→disable；1→enable
HH--42	Three-phase emergency power delay output time	S	0.1～1800.0	10.0	When delay output is enabled, this item is delay output time of three phase emergency power supply.
Other	Display 8.8.8.8.8.8		reserve	reserve	reserve

Form 5-8 parameter table of control panel

- Form 5-9 Commission parameter table

No.	Name	Unit	Range	Default	Description
UU--00	Initialize parameters	1	0～6	0	Value=6, parameters initialize after restart power.
UU--01	PWM frequency	KHz	10.0～10.0	10.0	Do not modify it.
UU--02	PWM dead zone	μS	2.0～10.0	2.0	Do not modify it.
UU--03	PWM output mode	1	0～1	0	0: Vector bipolar 1: Vector unipolarity
UU--04	Power zero crossing point	1	500～4000	2000	Do not modify it.
UU--05	Hall rated current	A	5～2000	100	Do not modify it.
UU--06	Circles number of Hall	1	1～5	1	Do not modify it.
UU--07	Current effective value display correction	A	2.0～1000.0	Display current	Enter required correction value in modified value, and press "RUN" key after 3 seconds, and confirm correction
UU--08	Feedback electric energy proportional coefficient	1	0.80～2.00	1.00	Do not modify it.
UU--09	Rectified power proportional coefficient	1	0.80～2.00	1.00	Do not modify it.
UU--10	Feedback power display cleared	1	0～6	0	0: Not cleared 1: Cleared successfully 6: Start clear
UU--11	Rectified electric energy display cleared	1	0～6	0	
UU--12	Grid frequency calculation selection	1	0～2	0	0: not calculated 1: Calculate frequency 50Hz 2: Calculate frequency 60Hz
UU--13	Enter grid rated frequency	Hz	40.0～70.0	50.00	Rated frequency of input power
UU--14	50Hz over frequency	Hz	55.0～65.0	65.00	50Hz over frequency point
UU--15	50Hz underfrequency	Hz	35.0～45.0	35.00	50Hz underfrequency point
UU--16	60Hz over frequency	Hz	66.0～78.0	78.00	60Hz over frequency point
UU--17	60Hz underfrequency	Hz	42.0～54.0	42.00	60Hz underfrequency point
UU--18	Clear all fault records	1	0～6	0	0: Clear fail 1: Clear done 6: Start clear
UU--19	Phase angle	°	-20～20	0.0	Do not modify it.
UU--20	P parameter of current PI	1	0.01～4.00	1.600	Do not modify it.
UU--21	I parameter of current PI	1	0.001～1.5	0.001	Do not modify it.
UU--22	Rectified charging current time	1	1～4	1	20ms*X，EX.20ms*1=20ms
UU--23	Maximum current	A	0.8～1.1	-	Max. current = UU--23/Hall turns
UU--24	Rectifying feedback or feedback	1	0～1	0	0→Rectifying；1→feedback

No.	Name	Unit	Range	Default	Description
UU--25	Emergency power supply output sampling standard value voltage	VAC	220VAC: 155.0～465 380VAC: 307.0～921 660VAC: 450.0～1350	220VAC: 310.0 380VAC: 614.0 660VAC: 900.0	Do not modify it.
UU--26	P parameter of voltage PI	1	0.01～4.00	0.500	Do not modify it.
UU--27	I parameter of voltage PI	1	0.001～1.5	0.100	Do not modify it.
UU--28	Rectifier feedback pressure difference level	1	2.0～16.0	3.0	220VAC：120/3.0=40.0V Other power：160/3.0=53.3V
UU--29	Current feedforward coefficient	1	0.0～0.250	0.200	Do not modify it.
UU--30	DI2 Float control	1	0～2	0	0: OFF 1: Short circuit is valid 2: Disconnect valid
UU--31	Emergency power time	1	1～15	5	537ms*X，EX.537ms*5=2685ms
UU--32	DI4 delay enable	1	0～1	1	0→Disable；1→Enable
UU--33	DI4 delay enable time	S	1～1200	30	DI4 delay time
UU--34	Feedback current deviation value	1	1～320	40	Do not modify it.
UU--35	Relay operating temperature	℃	10.0～20.0	10.0	Control relay, refer form 5-12
UU--36	Float charge voltage	V	220VAC: 180～480 380VAC: 400～800 660VAC: 800～1200	220VAC: 350.0 380VAC: 650.0 660VAC: 1050.0	Do not modify it.
UU--98	Software version		HPFE-X.X	X:0～9	Display 8.8.8.8.8.8
UU--99	Change keyboard password	1	0,1,2,3,4 5,6,7,8,9	Default 888888	Form 5-6。888888 will be set after parameter initialize.

Form 5-9 Commission parameter

- Form 5-10 Fault recording parameter table

No.	Name	Unit	Range	Default	Description
REC-00	Latest fault		E0-XXX	E0----	E0----
REC-01	Fault before latest		E1-XXX	E1----	E1----
REC-02	Third fault		E2-XXX	E2----	E2----
REC-03	Fourth fault		E3-XXX	E3----	E3----
REC-04	Fifth fault		E4-XXX	E4----	E4----No fault
XXX is fault oH1、oH2、EF、oE、LE、HE、FF、UF、PF、oC、oL，refer form 6-1					
REC-05	oH1 fault times		oH1-XX	oH1-00	XX：0～99 loop
REC-06	Bus voltage at oH1	V	0～1240.0	0.0	Bus voltage
REC-07	R phase voltage at oH1	VAC	0.0～520	0.0	R phase voltage
REC-08	S phase voltage at oH1	VAC	0.0～520	0.0	S phase voltage
REC-09	T phase voltage at oH1	VAC	0.0～520	0.0	T phase voltage
REC-10	R phase current at oH1	A	0～2000.0	0.0	R phase current
REC-11	S phase current at oH1	A	0～2000.0	0.0	S phase current
REC-12	T phase current at oH1	A	0～2000.0	0.0	T phase current

No.	Name	Unit	Range	Default	Description
REC-13	oH2 fault counter		oH2-XX	oH2-00	XX：0～99 repeat
REC-14	Bus voltage at oH2	V	0～1240.0	0.0	DC bus voltage
REC-15	R phase voltage at oH2	VAC	0.0～520	0.0	R phase voltage
REC-16	S phase voltage at oH2	VAC	0.0～520	0.0	S phase voltage
REC-17	T phase voltage at oH2	VAC	0.0～520	0.0	T phase voltage
REC-18	R phase current at oH2	A	0～2000.0	0.0	R phase current
REC-19	S phase current at oH2	A	0～2000.0	0.0	S phase current
REC-20	T phase current at oH2	A	0～2000.0	0.0	T phase current
REC-21	EF alarm counter		EF--XX	EF--00	XX：0～99 repeat
REC-22	Bus voltage at EF	V	0～1240.0	0.0	DC bus voltage
REC-23	R phase voltage at EF	VAC	0.0～520	0.0	R phase voltage
REC-24	S phase voltage at EF	VAC	0.0～520	0.0	S phase voltage
REC-25	T phase voltage at EF	VAC	0.0～520	0.0	R phase voltage
REC-26	R phase current at EF	A	0～2000.0	0.0	R phase current
REC-27	S phase current at EF	A	0～2000.0	0.0	S phase current
REC-28	T phase current at EF	A	0～2000.0	0.0	T phase current
REC-29	oE alarm counter		oE--XX	oE--00	XX：0～99 repeat
REC-30	Bus voltage at oE	V	0～1240.0	0.0	DC bus voltage
REC-31	R phase voltage at oE	VAC	0.0～520	0.0	R phase voltage
REC-32	S phase voltage at oE	VAC	0.0～520	0.0	S phase voltage
REC-33	T phase voltage at oE	VAC	0.0～520	0.0	T phase voltage
REC-34	R phase current at oE	A	0～2000.0	0.0	R phase current
REC-35	S phase current at oE	A	0～2000.0	0.0	S phase current
REC-36	T phase current at oE	A	0～2000.0	0.0	T phase current
REC-37	LE alarm counter		LE--XX	LE--00	XX：0～99 repeat
REC-38	Bus voltage at LE	V	0～1240.0	0.0	DC bus voltage
REC-39	R phase voltage at LE	VAC	0.0～520	0.0	R phase voltage
REC-40	S phase voltage at LE	VAC	0.0～520	0.0	S phase voltage
REC-41	T phase voltage at LE	VAC	0.0～520	0.0	T phase voltage
REC-42	R phase current at LE	A	0～2000.0	0.0	R phase current
REC-43	S phase current at LE	A	0～2000.0	0.0	S phase current
REC-44	T phase current at LE	A	0～2000.0	0.0	T phase current
REC-45	HE alarm counter		HE--XX	HE--00	XX：0～99 repeat
REC-46	Bus voltage at HE	V	0～1240.0	0.0	DC bus voltage
REC-47	R phase voltage at HE	VAC	0.0～520	0.0	R phase voltage
REC-48	S phase voltage at HE	VAC	0.0～520	0.0	S phase voltage
REC-49	T phase voltage at HE	VAC	0.0～520	0.0	T phase voltage
REC-50	R phase current at HE	A	0～2000.0	0.0	R phase current
REC-51	S phase current at HE	A	0～2000.0	0.0	S phase current
REC-52	T phase current at HE	A	0～2000.0	0.0	T phase current
REC-53	FF alarm counter		FF--XX	FF--00	XX：0～99 repeat
REC-54	Bus voltage at FF	V	0～1240.0	0.0	DC bus voltage

No.	Name	Unit	Range	Default	Description
REC-55	R phase voltage at FF	VAC	0.0～520	0.0	R phase voltage
REC-56	S phase voltage at FF	VAC	0.0～520	0.0	S phase voltage
REC-57	T phase voltage at FF	VAC	0.0～520	0.0	T phase voltage
REC-58	R phase current at FF	A	0～2000.0	0.0	R phase current
REC-59	S phase current at FF	A	0～2000.0	0.0	S phase current
REC-60	T phase current at FF	A	0～2000.0	0.0	T phase current
REC-61	UF alarm counter		UF--XX	UF--00	XX：0～99 repeat
REC-62	Bus voltage at UF	V	0～1240.0	0.0	DC bus voltage
REC-63	R phase voltage at UF	VAC	0.0～520	0.0	R phase voltage
REC-64	S phase voltage at UF	VAC	0.0～520	0.0	S phase voltage
REC-65	T phase voltage at UF	VAC	0.0～520	0.0	T phase voltage
REC-66	R phase current at UF	A	0～2000.0	0.0	R phase current
REC-67	S phase current at UF	A	0～2000.0	0.0	S phase current
REC-68	T phase current at UF	A	0～2000.0	0.0	T phase current
REC-69	PF alarm counter		PF--XX	PF--00	XX：0～99 repeat
REC-70	Bus voltage at PF	V	0～1240.0	0.0	DC bus voltage
REC-71	R phase voltage at PF	VAC	0.0～520	0.0	R phase voltage
REC-72	S phase voltage at PF	VAC	0.0～520	0.0	S phase voltage
REC-73	T phase voltage at PF	VAC	0.0～520	0.0	T phase voltage
REC-74	R phase current at PF	A	0～2000.0	0.0	R phase current
REC-75	S phase current at PF	A	0～2000.0	0.0	S phase current
REC-76	T phase current at PF	A	0～2000.0	0.0	T phase current
REC-77	oC alarm counter		oC--XX	oC--00	XX：0～99 repeat
REC-78	Bus voltage at oC	V	0～1240.0	0.0	DC bus voltage
REC-79	R phase voltage at oC	VAC	0.0～520	0.0	R phase voltage
REC-80	S phase voltage at oC	VAC	0.0～520	0.0	S phase voltage
REC-81	T phase voltage at oC	VAC	0.0～520	0.0	T phase voltage
REC-82	R phase current at oC	A	0～2000.0	0.0	R phase current
REC-83	S phase current at oC	A	0～2000.0	0.0	S phase current
REC-84	T phase current at oC	A	0～2000.0	0.0	T phase current
REC-85	oL alarm counter		oL--XX	oL--00	XX：0～99 repeat
REC-86	Bus voltage at oL	V	0～1240.0	0.0	DC bus voltage
REC-87	R phase voltage at oL	VAC	0.0～520	0.0	R phase voltage
REC-88	S phase voltage at oL	VAC	0.0～520	0.0	S phase voltage
REC-89	T phase voltage at oL	VAC	0.0～520	0.0	T phase voltage
REC-90	R phase current at oL	A	0～2000.0	0.0	R phase current
REC-91	S phase current at oL	A	0～2000.0	0.0	S phase current
REC-92	T phase current at oL	A	0～2000.0	0.0	T phase current
Other	Display8.8.8.8.8.8.		reserve	reserve	reserve

Form 5-10 Alarm record list

Value	Fan control description
0	When FF04 value is greater than HH40 item or FF05 value is greater than HH40 item or IGBT is working, the fan runs; when FF04 value is less than (HH40 - 3) and FF05 value is less than (HH40 - 3) and IGBT stops working, the fan is delayed for 1 second stop
1	Power on, the fan keeps running
2	DI2 and COM short-circuit, the fan will run; when DI2 and COM disconnect, the fan will stop with a delay of 1 second.
3	FF04 value is greater than HH40 item or FF05 value is greater than HH40 item or DI2/COM is shorted, fan is running; when FF04 value is less than (HH40 - 3) and FF05 value is less than (HH40 - 3) and DI2/COM is disconnect, delay 1 second to stop the fan
4	The value of FF04 is greater than HH40 parameter or FF05 value is greater than HH40, the fan will run; if value of FF04 is less than (HH40 - 3) and value of FF05 is less than (HH40 - 3), the fan will stop after a delay of 1 second.

Form 5-11 Fan control list

- TA/TB/TC and T1A/T1B/T1C relay control list

Value	TA/TB/TC Relay control instructions TA/TB: Normal close; Active→ open TC/TB: Normal open; Active→ close	T1A/T1B/T1C Relay control instructions T1A/T1B: Normal close; Active→ open T1C/T1B: Normal open; Active→ close
0	Overload control： Overload→ Active；No overload→ Recovery	Overload control： Overload→ Active；No overload→ Recovery
1	DI1 control：DI1/COM short→ active；DI1/COM open→ Recover	
2	DI2 control： DI2/COM short→ Active；DI2/COM open→ Recovery	DI2 control： DI2/COM short→ Active；DI2/COM open→ Recovery
3	DI3 control：DI3/COM short→ Active；DI3/COM open→ Recover	
4	DI4 control： DI4/COM short→ Active；DI4/COM open→ Recovery	DI4 control： DI4/COM short→ Active；DI4/COM open→ Recovery
5	DI5 control：DI5/COM short→ active；DI5/COM open→ Recover	
6	DI6 control： DI6/COM short→ Active；DI6/COM open→ Recovery	DI6 control： DI6/COM short→ Active；DI6/COM open→ Recovery
7	DI7 control：DI7/COM short→ active；DI7/COM open→ Recover	
8	EXT control： EXT/COM short→ Active；EXT/COM open→ Recovery	EXT control： EXT/COM short→ Active；EXT/COM open→ Recovery
9	Fan control：active→ fan spin; Recover→ fan stop	
10	Emergency power output status control: Power output→ Active；No power output→ Recovery	Emergency power output status control: Power output→ Active；No power output→ Recovery
11	Rectifier feedback output status：Feedback output→ active；No Feedback output→ Recover	
12	PWM output enable status control： Output enable→ Active；Output disable→ Recovery	PWM output enable status control： Output enable→ Active；Output disable→ Recovery
13	DC bus charging contactor status control：Close→ active；Open→ Recover	
14	Fault control：Fault→ Active；No fault→ Recover	
15	DC bus threshold voltage：Set HH--08 = Vth DC Bus>Vth→ Active；DC bus<（Vth - 20）→ Recovery	DC bus threshold voltage1：Set HH--09 = Vth1 DC Bus>Vth1→ Active；DC bus<（Vth1 - 20）→ Recovery
16	DC bus threshold voltage：Set HH--08 = Vth DC Bus < Vth→ Active；DC bus >（Vth + 20）→ Recovery	DC bus threshold voltage1：Set HH--09 = Vth1 DC Bus〈Vth1→ Active；DC bus〉（Vth1 - 20）→ Recovery

Value	TA/TB/TC Relay control instructions TA/TB: Normal close; Active→ open TC/TB: Normal open; Active→ close	T1A/T1B/T1C Relay control instructions T1A/T1B: Normal close; Active→ open T1C/T1B: Normal open; Active→ close
17	DI1 is enable control，HH--10 is timer： In HH--10 setting, periodically switch the HH12 on time and HH14 off time. On time→ Active；Off time→ Recovery	DI1 is enable control，HH--11 is timer： In HH--11 setting, periodically switch the HH13 on time and HH15 off time. On time→ Active；Off time→ Recovery
18	DI2 is enable control，HH--10 is timer： In HH--10 setting, periodically switch the HH12 on time and HH14 off time. On time→ Active；Off time→ Recovery	DI2 is enable control，HH--11 is timer： In HH--11 setting, periodically switch the HH13 on time and HH15 off time. On time→ Active；Off time→ Recovery
19	EXT is enable control，HH--10 is timer： In HH--10 setting, periodically switch the HH12 on time and HH14 off time. On time→ Active；Off time→ Recovery	EXT is enable control，HH--11 is timer： In HH--11 setting, periodically switch the HH13 on time and HH15 off time. On time→ Active；Off time→ Recovery
20	DI1 is enable control：periodically switch the HH12 on time and HH14 off time. On time→ Active；Off time→ Recovery	DI1 is enable control：periodically switch the HH13 on time and HH15 off time. On time→ Active；Off time→ Recovery
21	DI2 is enable control：periodically switch the HH12 on time and HH14 off time. On time→ Active；Off time→ Recovery	DI2 is enable control：periodically switch the HH13 on time and HH15 off time. On time→ Active；Off time→ Recovery
22	EXT is enable control：periodically switch the HH12 on time and HH14 off time. On time→ Active；Off time→ Recovery	EXT is enable control：periodically switch the HH13 on time and HH15 off time. On time→ Active；Off time→ Recovery
23	DC bus charge complete and no faults→ Active Fault→ Recovery	DC bus charge complete and no faults→ Active Fault→ Recovery
24	Sensor T1 temp control：set UU—35 = Th T1>Th→ Active；T1<(Th-2) → Recovery	Sensor T1 temp control：set UU—35 = Th T1>Th→ Active；T1<(Th-2) → Recovery

Form 5-12 Relay control list

5.2 Control parameter setting

5.2.1 Setting of rectifier feedback/feedback active voltage

If rectifier feedback/feedback active voltage cannot meet the needs of on-site work, you can change HH38 parameter in Table 5-8 to change rectifier feedback /feedback active voltage.

5.2.2 Three-phase emergency power output voltage setting

If three-phase emergency power supply output voltage cannot meet the needs of on-site work, you can change three-phase emergency power output voltage by changing HH39 parameter in Table 5-8.

5.2.3 Three-phase emergency power delay output time

From three-phase grid power outage to three-phase emergency power output, the fastest system response time is 50mS. If delay output time of three-phase emergency power supply cannot meet the needs of on-site work, you can change HH41 parameter and HH42 parameter in Table 5-8 to change time from the three-phase grid power outage to three-phase emergency power output.

5.2.4 Charging contactor active voltage setting

If the charging contactor active voltage cannot meet the needs of on-site work, you can change HH18 parameter in Table 5-8 to change charging contactor active action voltage.

5.2.5 Charging contactor active delay time setting

If charging contactor active delay time cannot meet the needs of on-site work, you can change HH21 parameter in Table 5-8 to change charging contactor active delay time.

5.2.6 Setting the fault protection recovery time

Default fault protection recovery time of software is 30S. If fault protection recovery time cannot meet the needs of on-site work, you can change parameters of HH02 or HH03 or HH05 or HH22 or HH23 or HH24 or HH29 or HH30 or HH33 or HH34 or HH37 in Table 5-8 to change fault protection recovery time.

5.2.7 Control mode settings

RBU sine wave energy feedback device needs to be configured in other control modes, it can be configured according to UU24 and UU30 in form 4-4 and 5-9. For corresponding control board port function description, refer to form 4-3. DI1/COM is enabled control port, and this port can be configured as a simple PLC control function.

5.2.8 Setting of relay normal open and normal close output

If need to use normal open and normal close contact output of the relay as control, you can control the relay and configure it. Refer to parameters HH06 and HH07 in Table 5-8 and Table 5-12.

5.2.9 Setting of overheating protection

To change the overheat protection temperature value, please refer to HH00 and HH01 parameters in Table 5-8

5.2.10 Fan control mode setting

To change fan control mode, please refer to HH04 parameters in Table 5-8 and Table 5-11.

5.2.11 Setting of overvoltage protection threshold voltage

To change the overvoltage protection threshold voltage, please refer to HH19 or HH31 parameters in Table 5-8.

5.2.12 Setting of undervoltage protection threshold voltage

To change undervoltage protection threshold voltage, please refer to HH20 or HH32 parameters in Table 5-8.

5.2.13 Settings of voltage and current offset correction

Refer to HH26 parameters in Table 5-8.

5.2.14 Voltage and current display value correction settings

Refer to HH16 or HH28 parameters in Table 5-8.

5.2.15 Current overload time setting

Refer to HH35 and HH36 parameters in Table 5-8.

5.2.16 Rectified charging current time setting

The time for rectified charging current to set bus voltage refers to UU22 parameter in Table 5-9.

5.2.17 Setting of three-phase emergency power output

For the time for emergency power supply to accelerate from zero to standard voltage output, refer to the UU31 parameter in Table 5-9.

Note

The settings of above common control parameters can also be completed via RS485.

5.3 RS485

5.3.1 Communication protocol

The communication protocol used by control panel in the device is a subset of the MODBUS communication protocol. The communication protocol defines the methods and function codes for reading and writing control panel parameters.

5.3.2 Network

Through RS485 communication, there are two modes: "single host and multiple slaves" and "single host and single slave".

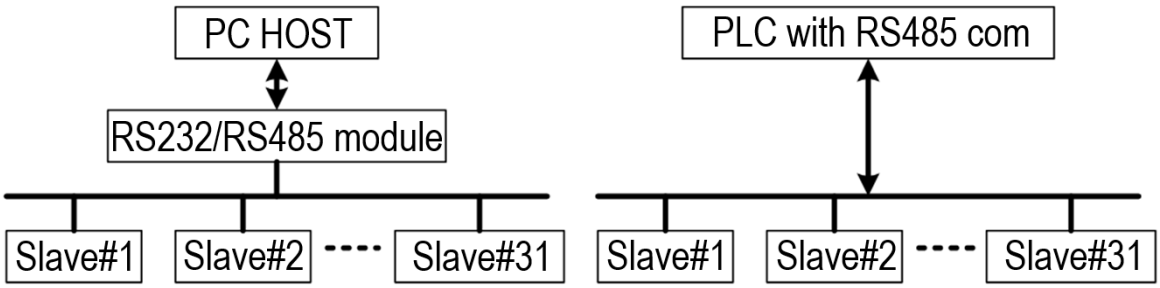


Fig 5-2 single host multi-slave network

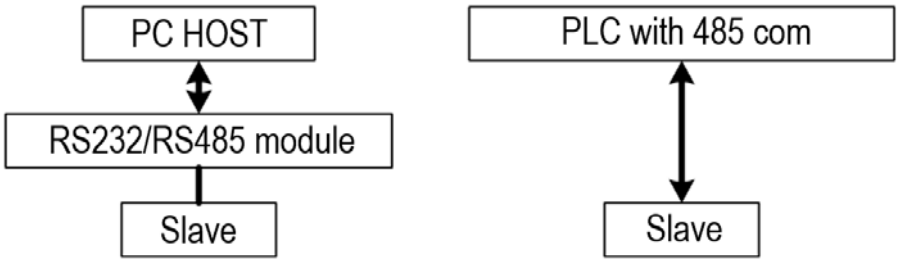


Fig 5-3 single master and single slave network

5.3.3 Communication physical interface

The control panel has RS485 interface terminals (respectively: RS485 positive signal "485+" and RS485 negative signal "485-"). The communication method is asynchronous communication, half-duplex, 9600 serial transmission rate, eight-bit data bits, no parity, one stop bit.

5.3.4 Communication protocol

Device only supports MODBUS protocol in RTU mode. The communication frame format is as follows:

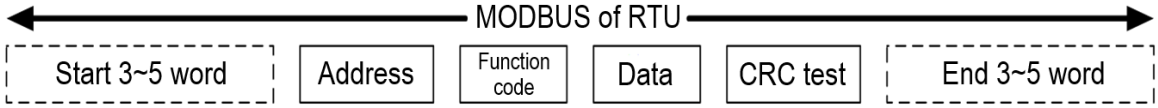


Fig 5-4 Communication protocol

The MODBUS communication protocol in RTU mode stipulates that data is sent first by high-order bytes and then by low-order bytes. Data verification uses CRC loop redundancy check.

Slave address range is 0~31. It can be set in the keyboard. If the "HH25" parameter displays 31, it means that the slave address is 31, which is 0x1F.

5.3.5 MODBUS function code

1、Support read and write functions

Code	Description
0x06	Read temporary registers with consecutive addresses (up to 16, at least 1)
0x08	Test loop feedback
0x16	Write single register

Form 5-13 Function codes supported by the control panel

Note

- The functional parameters, control parameters and status parameters of the control panel are all mapped to MODBUS read and write registers.
- Slave address range is 0~31. It can be set in the keyboard. If the "HH25" parameter displays 31, it means that slave address is 31, which is 0x1F. (DI1/COM is enable control port: short DI1/COM means enable; disconnecting DI1/COM means stop. When modifying parameters, DI1/COM needs to be disconnected to modify parameters.)
- When a single machine communicates via RS485, the J4 interface on the control board is set to ROFF (corresponding two pins are not connected by default); when multiple machines communicate via RS485 network, the J4 interface on the control board is set to RON (set The corresponding two pins are short-circuited).

5.3.6 Communication data description

Code	Function	Information	Respond		Fault
		Bit	Min. bit	Max. bit	Bit
0x06	Read registers	8	7	37	5
0x08	Test loop feedback	8	8	8	5
0x16	Write single register	8	8	8	5

Form 5-14 Information frame byte length

5.3.7 Communication fault code

Code	Description
0x00	When testing loop feedback, the input test data does not match.
0x01	When testing loop feedback, the entered test address does not match.
0x02	Register read out is zero, or greater than 16, or the wrong address (0x012C address range)
0x03	When modifying parameters, DI1/COM is not disconnected.
0x04	The address does not match modifiable register.
0x05	The register has not been completed, and new parameters are written for modification.
0x06	The code does not match, or wrong address (0x012C address range)
0x07	Input CRC check code does not match
No response. Too many RS485 parallel	RS485 communication machine address does not match (please set correct communication format: 9600 serial transmission rate, eight data bits, no parity, one stop bit; if communication format setting is incorrect, there may be no response information or there is an error in the response information)
	Eight byte command can be input in batches or all at once. If the input command is less than eight byte, there will be no response.

Form 5-15 Communication fault code

Note

- If there is no response information, set correct communication format and use test loop feedback to test whether RS485 link is normal. If there is no response information back from test loop, there is a problem with RS485 link connection.
- Input eight bytes of command information as a data command frame, and the time interval of each data command frame must be greater than 200mS. Otherwise, the input command information overlaps with response information, resulting in error or packet loss in response information.
- If input data command frame is over eight bytes, redundant input command information and response information will overlap, resulting in error in response information data.

5.3.8 Fault response information format

	Slave address	Function Code	Fault code	CRC test	
				High bit	Low bit
Hex data	1F（Slave address）	00（Code initial）	07	01	Hex data

Form 5-16 Fault response information

5.3.9 Command and response information by test

	Slave address	Function code	Test address		Test data		CRC test	
			High bit	Low bit	High bit	Low bit	High bit	Low bit
Hex data	1F（default）	08	00	55	AA	AA	0D	7A

Form 5-17 Command information for test loop feedback

	Slave address	Function code	Test address		Test data		CRC test	
			High bit	Low bit	High bit	Low bit	High bit	Low bit
Hex data	1F（default）	08	00	55	AA	AA	0D	7A

Form 5-18 Response information for test loop feedback

5.3.10 Register definition

Control panel defines hexadecimal data registers as shown in the following table (each data register is a 16-bit unsigned integer data unsigned int).

Address	Function	Size	Description	Note
0x0000	HPFE fault	0	Fault	1 fault，0 no fault
		1	oH1 temp. sensor T1 overheat	1 overheat，0 no fault
		2	oH2 temp. sensor T2 overheat	1 overheat，0 no fault
		3	EF terminal external input fault	1 EXT fault，0 no fault
		4	oE DC bus overvoltage fault	1 overvoltage，0 no fault
		5	LE DC bus undervoltage fault	1 undervoltage，0 no fault
		6	HE DC bus hardware overvoltage fault	1 overvoltage(HW)，0 no fault
		7	FF power frequency fault	1 Hz fault，0 no fault
		8	UF power amplitude fault	1 amplitude fault，0 no fault
		9	PF power phase fault	1 phase fault，0 no fault
		10	oC overcurrent fault	1 overcurrent，0 no fault
		11	oL overload fault	1 overload，0 no fault
		12	Reserve	Reserve
		13	Reserve	Reserve
		14	Reserve	Reserve
		15	Reserve	Reserve
0x0001	Feedback power	High 16	Accumulated electric energy feed back to the grid	32 bit feedback display unit：0.0001 kWh
0x0002	Feedback power	Low 16		
0x0003	PWM output status	16 bit	0 disable；1 enable	unit：1
0x0004	AC power level	16 bit	AC grid voltage level，Vrms	unit：VAC

Address	Function	Size	Description	Note
0x0005	Machine power	16 bit	Machine power level	unit：0.1KW
0x0006	Sensor T1 temp.	16 bit	Temperature sensor T1	unit：0.1℃
0x0007	Sensor T2 temp.	16 bit	Temperature sensor T2	
0x0008	Fan control	16 bit	0 fan disable；1 fan enable	
0x0009	EEPROM status	16 bit	0 fault；1 normal	
0x000A	RS232 status	16 bit	0 not send data；1 send data	unit：1
0x000B	TA/TB/TC Relay status	16 bit	0=TA/TB close，TC/TB open 1=TA/TB open，TC/TB close	unit：1
0x000C	T1A/T1B/T1C Relay status	16 bit	0=T1A/T1B close，T1C/T1B open 1=T1A/T1B open，T1C/T1B close	unit：1
0x000D	DI1 status	16 bit	1：DI1/COM open；0：DI1/COM short	unit：1
0x000E	DI2 status	16 bit	1：DI2/COM open；0：DI2/COM short	unit：1
0x000F	DI3 status	16 bit	1：DI3/COM open；0：DI3/COM short	unit：1
0x0010	DI4 status	16 bit	1：DI4/COM open；0：DI4/COM short	unit：1
0x0011	DI5 status	16 bit	1：DI5/COM open；0：DI5/COM short	unit：1
0x0012	DI6 status	16 bit	1：DI6/COM open；0：DI6/COM short	unit：1
0x0013	DI7 status	16 bit	1：DI7/COM open；0：DI7/COM short	unit：1
0x0014	EXT status	16 bit	1：EXT/COM open；0：EXT/COM short	unit：1
0x0015	Work mode	16 bit	0= Disable 1= Rectifier feedback/feedback mode 2= Emergency power output mode	unit：1
0x0016	DC bus voltage	16 bit	Display DC bus	unit：0.1V
0x0017	DC bus charge	16 bit	0= not complete；1= complete	unit：1
0x0018	PWM output	16 bit	0= no output；1= output PWM	unit：1
0x0019	Rectifier feedback	16 bit	0= no feedback；1= Rectifier feedback	unit：1
0x001A	Power phase R offset	16 bit	Display range between 30768～34768 ,out of the range need to recalibrate	unit：1
0x001B	Power phase S offset	16 bit		
0x001C	Power phase T offset	16 bit		
0x001D	Current phase R offset	16 bit	Display range between 30768～34768 , out of the range need to recalibrate (Calibration start after hall sensor connect)	unit：1
0x001E	Current phase S offset	16 bit		
0x001F	Current phase T offset	16 bit		
0x0020	Power Phase sequence	16 bit	0：R→S→T；1：R→T→S	unit：1
0x0021	Input voltage	16 bit	Display input voltage，Vrms	unit：0.1VAC
0x0022	Phase R voltage	16 bit	Display phase R voltage，Vrms	unit：0.1VAC
0x0023	Phase S voltage	16 bit	Display phase S voltage，Vrms	unit：0.1VAC
0x0024	Phase T voltage	16 bit	Display phase T voltage，Vrms	unit：0.1VAC
0x0025	Average current	16 bit	Input average current，Irms	unit：0.1A
0x0026	Phase R current	16 bit	Phase R average current，Irms	unit：0.1A
0x0027	Phase S current	16 bit	Phase S average current，Irms	unit：0.1A
0x0028	Phase T current	16 bit	Phase T average current，Irms	unit：0.1A
0x0029	Rectifier power	High 16	Accumulated electric energy consume by the power grid during rectification	32 bit display，unit：0.0001 kWh
0x002A	Rectifier power	Low 16		
0x002B	Power frequency	16 bit	Display power average frequency	unit：0.01Hz

Address	Function	Size	Description	Note
0x002C	Phase R frequency	16 bit	Display Phase R frequency	unit：0.01Hz
0x002D	Phase S frequency	16 bit	Display Phase S frequency	unit：0.01Hz
0x002E	Phase T frequency	16 bit	Display Phase T frequency	unit：0.01Hz
0x002F	Drive max. current	16 bit	Max. I=setting value/hall turn	unit：0.1A
0x0030	Default max. current	16 bit	Max. I=setting value/hall turn	unit：0.1A
0x0031	Feedback power	High 16	Display power feedback to power grid	unit：0.001KW
0x0032	Feedback power	Low 16		
0x0033	Rectifier power	High 16	Display power consumed by grid during rectification	unit：0.001KW
0x0034	Rectifier power	Low 16		
0x0035	Reserve	16 bit	Reserve	Reserve
……	Reserve	16 bit	Reserve	Reserve
0x0064	Reserve	16 bit	Reserve	Reserve
0x0065	Latest fault	16 bit	Ex：Read any register from 0x0065 to 0x0069 value is 0x1903 (decimal is)6403, X is thousand digit, Y is hundred digit, Z is ten and one digits, then X=6, Y=4, Z=03, look up table and know that oH2 fault; when read register value is 0x0000, it means there is no fault ("-" is meaningless characters, such as "-EF" actually means "EF" fault)	
0x0066	Fault before latest	16 bit		
0x0067	Third fault	16 bit		
0x0068	Fourth fault	16 bit		
0x0069	Fifth fault	16 bit		

X/Y	0	1	2	3	4	5	6	7	8	9			
Indication	C	d	E	F	H	L	o	P	U	-			
Z	01	02	03	04	05	06	07	08	09	10	11	12	13
Indication	0	1	2	3	4	5	6	7	8	9	A	b	C
Z	14	15	16	17	18	19	20	21	22	23			
Indication	d	E	F	H	L	o	P	U	-				

0x006A	oH1 fault counter	16 bit	Fault counter，0～99 repeat	unit：1
0x006B	Bus voltage at oH1	16 bit	DC bus voltage at oH1	unit：0.1V
0x006C	Phase R voltage at oH1	16 bit	R phase voltage at oH1	unit：0.1VAC
0x006D	Phase S voltage at oH1	16 bit	S phase voltage at oH1	unit：0.1VAC
0x006E	Phase T voltage at oH1	16 bit	T phase voltage at oH1	unit：0.1VAC
0x006F	Phase R current at oH1	16 bit	R phase current at oH1	unit：0.1A
0x0070	Phase S current at oH1	16 bit	S phase current at oH1	unit：0.1A
0x0071	Phase T current at oH1	16 bit	T phase current at oH1	unit：0.1A
0x0072	oH2 fault counter	16 bit	Fault counter，0～99 repeat	unit：1
0x0073	Bus voltage at oH2	16 bit	DC bus voltage at oH2	unit：0.1V
0x0074	Phase R voltage at oH2	16 bit	R phase voltage at oH2	unit：0.1VAC
0x0075	Phase S voltage at oH2	16 bit	S phase voltage at oH2	unit：0.1VAC
0x0076	Phase T voltage at oH2	16 bit	T phase voltage at oH2	unit：0.1VAC
0x0077	Phase R current at oH2	16 bit	R phase current at oH2	unit：0.1A
0x0078	Phase S current at oH2	16 bit	S phase current at oH2	unit：0.1A
0x0079	Phase T current at oH2	16 bit	T phase current at oH2	unit：0.1A
0x007A	EF fault counter	16 bit	Fault counter，0～99 repeat	unit：1
0x007B	Bus voltage at EF	16 bit	DC bus voltage at EF	unit：0.1V
0x007C	Phase R voltage at EF	16 bit	R phase voltage at EF	unit：0.1VAC

Address	Function	Size	Description	Note
0x007D	Phase S voltage at EF	16 bit	S phase voltage at EF	unit：0.1VAC
0x007E	Phase T voltage at EF	16 bit	T phase voltage at EF	unit：0.1VAC
0x007F	Phase R current at EF	16 bit	R phase current at EF	unit：0.1A
0x0080	Phase S current at EF	16 bit	S phase current at EF	unit：0.1A
0x0081	Phase T current at EF	16 bit	T phase current at EF	unit：0.1A
0x0082	oE fault counter	16 bit	Fault counter，0～99 repeat	unit：1
0x0083	Bus voltage at oE	16 bit	DC bus voltage at oE	unit：0.1V
0x0084	Phase R voltage at oE	16 bit	R phase voltage at oE	unit：0.1VAC
0x0085	Phase S voltage at oE	16 bit	S phase voltage at oE	unit：0.1VAC
0x0086	Phase T voltage at oE	16 bit	T phase voltage at oE	unit：0.1VAC
0x0087	Phase R current at oE	16 bit	R phase current at oE	unit：0.1A
0x0088	Phase S current at oE	16 bit	S phase current at oE	unit：0.1A
0x0089	Phase T current at oE	16 bit	T phase current at oE	unit：0.1A
0x008A	LE fault counter	16 bit	Fault counter，0～99 repeat	unit：1
0x008B	Bus voltage at LE	16 bit	DC bus voltage at LE	unit：0.1V
0x008C	Phase R voltage at LE	16 bit	R phase voltage at LE	unit：0.1VAC
0x008D	Phase S voltage at LE	16 bit	S phase voltage at LE	unit：0.1VAC
0x008E	Phase T voltage at LE	16 bit	T phase voltage at LE	unit：0.1VAC
0x008F	Phase R current at LE	16 bit	R phase current at LE	unit：0.1A
0x0090	Phase S current at LE	16 bit	S phase current at LE	unit：0.1A
0x0091	Phase T current at LE	16 bit	T phase current at LE	unit：0.1A
0x0092	HE fault counter	16 bit	Fault counter，0～99 repeat	unit：1
0x0093	Bus voltage at HE	16 bit	DC bus voltage at HE	unit：0.1V
0x0094	Phase R voltage at HE	16 bit	R phase voltage at HE	unit：0.1VAC
0x0095	Phase S voltage at HE	16 bit	S phase voltage at HE	unit：0.1VAC
0x0096	Phase T voltage at HE	16 bit	T phase voltage at HE	unit：0.1VAC
0x0097	Phase R current at HE	16 bit	R phase current at HE	unit：0.1A
0x0098	Phase S current at HE	16 bit	S phase current at HE	unit：0.1A
0x0099	Phase T current at HE	16 bit	T phase current at HE	unit：0.1A
0x009A	FF fault counter	16 bit	Fault counter，0～99 repeat	unit：1
0x009B	Bus voltage at FF	16 bit	DC bus voltage at FF	unit：0.1V
0x009C	Phase R voltage at FF	16 bit	R phase voltage at FF	unit：0.1VAC
0x009D	Phase S voltage at FF	16 bit	S phase voltage at FF	unit：0.1VAC
0x009E	Phase T voltage at FF	16 bit	T phase voltage at FF	unit：0.1VAC
0x009F	Phase R current at FF	16 bit	R phase current at FF	unit：0.1A
0x00A0	Phase S current at FF	16 bit	S phase current at FF	unit：0.1A
0x00A1	Phase T current at FF	16 bit	T phase current at FF	unit：0.1A
0x00A2	UF fault counter	16 bit	Fault counter，0～99 repeat	unit：1
0x00A3	Bus voltage at UF	16 bit	DC bus voltage at FF	unit：0.1V
0x00A4	Phase R voltage at UF	16 bit	R phase voltage at FF	unit：0.1VAC
0x00A5	Phase S voltage at UF	16 bit	S phase voltage at FF	unit：0.1VAC
0x00A6	Phase T voltage at UF	16 bit	T phase voltage at FF	unit：0.1VAC

Address	Function	Size	Description	Note
0x00A7	Phase R current at UF	16 bit	R phase current at UF	unit：0.1A
0x00A8	Phase S current at UF	16 bit	S phase current at UF	unit：0.1A
0x00A9	Phase T current at UF	16 bit	T phase current at UF	unit：0.1A
0x00AA	PF fault counter	16 bit	Fault counter，0～99 repeat	unit：1
0x00AB	Bus voltage at PF	16 bit	DC bus voltage at PF	unit：0.1V
0x00AC	Phase R voltage at PF	16 bit	R phase voltage at PF	unit：0.1VAC
0x00AD	Phase S voltage at PF	16 bit	S phase voltage at PF	unit：0.1VAC
0x00AE	Phase T voltage at PF	16 bit	T phase voltage at PF	unit：0.1VAC
0x00AF	Phase R current at PF	16 bit	R phase current at PF	unit：0.1A
0x00B0	Phase S current at PF	16 bit	S phase current at PF	unit：0.1A
0x00B1	Phase T current at PF	16 bit	T phase current at PF	unit：0.1A
0x00B2	oC fault counter	16 bit	Fault counter，0～99 repeat	unit：1
0x00B3	Bus voltage at oC	16 bit	DC bus voltage at oC	unit：0.1V
0x00B4	Phase R voltage at oC	16 bit	R phase voltage at oC	unit：0.1VAC
0x00B5	Phase S voltage at oC	16 bit	S phase voltage at oC	unit：0.1VAC
0x00B6	Phase T voltage at oC	16 bit	T phase voltage at oC	unit：0.1VAC
0x00B7	Phase R current at oC	16 bit	R phase current at oC	unit：0.1A
0x00B8	Phase S current at oC	16 bit	S phase current at oC	unit：0.1A
0x00B9	Phase T current at oC	16 bit	T phase current at oC	unit：0.1A
0x00BA	oL fault counter	16 bit	Fault counter，0～99 repeat	unit：1
0x00BB	Bus voltage at oL	16 bit	DC bus voltage at oL	unit：0.1V
0x00BC	Phase R voltage at oL	16 bit	R phase voltage at oL	unit：0.1VAC
0x00BD	Phase S voltage at oL	16 bit	S phase voltage at oL	unit：0.1VAC
0x00BE	Phase T voltage at oL	16 bit	T phase voltage at oL	unit：0.1VAC
0x00BF	Phase R current at oL	16 bit	R phase current at oL	unit：0.1A
0x00C0	Phase S current at oL	16 bit	S phase current at oL	unit：0.1A
0x00C1	Phase T current at oL	16 bit	T phase current at oL	unit：0.1A
0x00C2	Reserve	16 bit	Reserve	Reserve
……	Reserve	16 bit	Reserve	Reserve
0x00C8	Reserve	16 bit	Reserve	Reserve
Above registers are read-only			**Above registers are read-only**	
0x00C9	oH1 overheat protection of sensor T1	16 bit	The value of T1 sensor is higher than this set value, the H1 overheat will be triggered.	Range：550～950 unit：0.1℃
0x00CA	oH2 overheat protection of sensor T2	16 bit	The value of T2 sensor is higher than this set value, the H2 overheat will be triggered.	Range：550～950 unit：0.1℃
0x00CB	oH1 overheat recovery time	16 bit	After reset oH1 and delay time, protection will be restored.	Range：2～3600 unit：S
0x00CC	oH2 overheat recovery time	16 bit	After reset oH2 and delay time, protection will be restored.	Range：2～3600 unit：S
0x00CD	Fan control mode	16 bit	Refer to form 5-9	Range：0～4，unit：1
0x00CE	EXT fault recovery time	16 bit	After reset EXT fault and delay time, protection will be restored.	Range：2～3600 unit：S

Address	Function	Size	Description	Note
0x00CF	TA/TB/TC Relay control mode	16 bit	Refer to form 5-9	Range：0～24，unit：1
0x00D0	T1A/T1B/T1C Relay control mode	16 bit	Refer to form 5-9	Range：0～24，unit：1
0x00D1	DC bus threshold voltage	16 bit	Set DC bus threshold voltage for control TA/TB/TC relay. refer to form 5-9	Range：1800～12000 unit：0.1V
0x00D2	DC bus threshold voltage 1	16 bit	Set DC bus threshold voltage for control T1A/T1B/T1C relay. refer to form 5-9	Range：1800～12000 unit：0.1V
0x00D3	TA/TB/TC Relay timer	16 bit	Set the timer for controlling TA/TB/TC relay, refer to form 5-9	Range：1～17280 unit：min
0x00D4	T1A/T1B/T1C Relay timer 1	16 bit	Set the timer for controlling T1A/T1B/T1C relay, refer to form 5-9	Range：1～17280 unit：min
0x00D5	TA/TB/TC Relay enable time	16 bit	To control TA/TB/TC relay, refer to form 5-9	Range：0～240， unit：S
0x00D6	T1A/T1B/T1C Relay enable time 1	16 bit	To control T1A/T1B/T1C relay, refer to form 5-9	Range：0～240， unit：S
0x00D7	TA/TB/TC Relay disable time	16 bit	To control TA/TB/TC relay, refer to form 5-9	Range：0～240， unit：S
0x00D8	T1A/T1B/T1C Relay disable time 1	16 bit	To control T1A/T1B/T1C relay, refer to form 5-9	Range:0～240， unit：S
0x00D9	DC bus voltage automatic correction	16 bit	Enter the correction value, and software will complete automatic correction after 3 seconds (the correction step is within ±50V, please correct multiple times if it exceeds ±50V)	Range：2000～12000， unit：0.1V
0x00DA	Charge contactor switch off voltage threshold	16 bit	DC bus voltage is lower than set value, charge contactor will off.	unit：0.1V
0x00DB	Charge contactor switch on voltage threshold	16 bit	Bus voltage is higher than set value and delay time is 0x00DE, the charge contactor switch on.	unit：0.1V
0x00DC	DC bus voltage oE overvoltage threshold	16 bit	DC bus voltage is higher than set value, oE overvoltage fault will be reported.	unit：0.1V
0x00DD	DC bus voltage LE undervoltage threshold	16 bit	DC bus voltage is lower than set value, LE undervoltage fault will be reported.	unit：0.1V
0x00DE	Charging contactor switch on delay time	16 bit	Charge contactor reaches switch on condition. After delay time, it will switch on.	Range：2～240， unit：S
0x00DF	oE overvoltage recovery time	16 bit	DC bus voltage is lower than (0x00DC item 20) and after delay set value, protection recovery.	Range：2～3600， unit：S
0x00E0	LE undervoltage recovery time	16 bit	DC bus voltage is higher than 0x00DB parameter and after delay set value, protection recovery.	Range：2～3600， unit：S
0x00E1	HE hardware overvoltage recovery time	16 bit	Bus voltage is lower than (0x00DC item 20) and after after delay set value, hardware overvoltage is restored. Hardware overvoltage: 505V for 220VAC, 840V for 380VAC, 1240V for 660VAC	Range：2～3600， unit：S
0x00E2	RS485 address	16 bit	RS485 communication address	Address range：0～31， unit：1

Address	Function	Size	Description	Note
0x00E3	Input voltage and current offset correction	16 bit	setting value is 6, into zero-bias correction. After 3 seconds, when the reading changes from 6 to 1, the correction is complete.	Range：0～6 unit：1
0x00E4	Phase sequence correction of input power	16 bit	0 = failed 1 = successful 6 = into calibration. Calibration failure last more than 3 seconds means the power grid no power.	Range：0～6 unit：1
0x00E5	Input voltage automatic correction	16 bit	Enter correction value, automatic correction will be completed after 3 seconds. Modify is invalid during correction (correction step is within ±50V, please try multiple times if it exceeds ±50V)	Range：500～9000 unit：0.1VAC
0x00E6	FF input power frequency fault recovery time	16 bit	The fault is reset and after delay setting, the protection will be restored.	Range：2～3600 unit：S
0x00E7	Input power amplitude fault recovery time	16 bit	The fault is reset and after delay setting, the protection will be restored.	Range：2～3600 unit：S
0x00E8	Input phase voltage amplitude overvoltage setting value	16 bit	Power voltage amplitude higher than set value, UF fault will be reported.	Range refer form 5-9 unit：0.1VAC
0x00E9	Input phase voltage amplitude undervoltage setting value	16 bit	Power voltage amplitude lower than set value, UF fault will be reported.	Range refer form 5-9 unit：0.1VAC
0x00EA	PF power grid abnormality or phase loss recovery time	16 bit	Phase abnormality or missing phase fault of input power grid is eliminated and after delay setting, the protection will be restored.	Range：2～3600 unit：S
0x00EB	oC overcurrent recovery time	16 bit	Overcurrent fault is eliminated and after delay setting, the protection will be restored.	Range：2～3600 unit：S
0x00EC	Overload protection start point	16 bit	Percentage of the maximum current of the machine. When this value is exceeded, overload protection time begins to be calculated.	Range：75～95 unit：0.01
0x00ED	Maximum current of machine corresponds to the overload time	16 bit	This setting is overload time correspond to maximum current of the machine. For calculation formula, refer to form 5-9.	Range：1～50 unit：0.1S
0x00EE	oL overload recovery time	16 bit	The fault is reset and after delay setting, the protection will be restored.	Range：2～3600 unit：S
0x00EF	Rectified feedback voltage/feedback voltage	16 bit	DC bus voltage higher than this value, feedback starts. When it is lower than this setting, rectification/feedback stops.	Range refer form 5-9 unit：0.1V
0x00F0	Emergency power supply output voltage	16 bit	Control emergency power supply output voltage within ±10% range.	Range refer form 5-9 unit：0.1VAC
0x00F1	Fan enable temperature	16 bit	Fan control mode refer form 5-9	Range refer form 5-9 unit：0.1℃
0x00F2	Emergency power delay output enable	16 bit	0：Disable 1：Enable output delay	Range：0～1， unit：1
0x00F3	Emergency power supply delay output time	16 bit	When delay output is enabled, this item is set to delay output time of three-phase emergency power supply.	Range：1～18000 unit：0.1S
0x00F4	Reserve	16 bit	Reserve	Reserve
……	Reserve	16 bit	Reserve	Reserve
0x012C	Reserve	16 bit	Reserve	Reserve

Form 5-19 Register description from control panel

5.3.11 RS485 communication note

When applying RS485, following five issues as below:

1、Defined data registers from address 0x0000 to address 0x00C8 are read-only registers, the rest of registers are read-write registers.

2、DI1/COM is enable control port: short-circuited = enable; disconnected = stop. This port can be used for remote control.

3、To be modified data register from address 0x00C9 to address 0x012C through RS485 communication, DI1/COM must be disconnected.

4、One machine communicates through RS485, J4 interface on control board set to ROFF (two pins are not connect by default); when multiple machines communicate via RS485 network, J4 interface on control board needs to be set to RON (set two pins short-circuited).

5、The EEPROM in control board maximum number of write is 1 million times, please do not frequently perform RS485 communication to modify register from address 0x00C9 to address 0x012C.

5.3.12 Read and write application example

1、0x06 reads several registers with consecutive addresses (up to 16, at least 1)

2、Read three consecutive registers start from address 0x0000.

Command information：

	Slave address	Function code	Register address		Read data		CRC test	
			High bit	Low bit	High bit	Low bit	High bit	Low bit
Hex data	1F	06	00	00	00	03	CA	75

Respond information：

	Slave address	Function code	Respond bit	1st register		2nd register		CRC test	
				High bit	Low bit	High bit	Low bit	High bit	Low bit
Hex data	1F	06	06	00	09	……	……	BC	EB
1st register：0x0009 = 0000 0000 0000 1001, refer form 5-18：EXT external fault									

3、Command 0x16 write single register

4、Write to register 0x00C9.

Command information：

	Slave address	Function code	Register address		Write data		CRC test	
			High bit	Low bit	High bit	Low bit	High bit	Low bit
Hex data	1F	16	00	C9	03	20	9A	A1

Respond information：

	Slave address	Function code	Register address		Write data		CRC test	
			High bit	Low bit	High bit	Low bit	High bit	Low bit
Hex data	1F	16	00	C9	03	20	9A	A1
Data：0x0320 is 800 in decimal, refer form 5-18 : Set oH1 overheat protection of T1 to 80℃								

5.3.13 CRC cyclic redundancy check

CRC-16 is shown as form, following is language code to implement CRC-16:

```
Uint16 CRC16R(Uchar *MsgR, Uchar LengthR)
{
    Uchar CRCHiR = 0xFF;                          // High byte of CRC initialized
    Uchar CRCLoR = 0xFF;                          // Low byte of CRC initialized
    Uchar IndexR;                                 // Index into CRC lookup table
    while(LengthR--)                              // Calculate the CRC
    {
        IndexR = CRCLoR ^ *MsgR++;
        CRCLoR = CRCHiR ^ (CRCValue[IndexR] >> 8);
        CRCHiR = CRCValue[IndexR] & 0xFF;
    }
    return(CRCHiR | CRCLoR << 8);
}
const Uint16 CRCValue[256] = {
    0x0000,0xC1C0,0x81C1,0x4001,0x01C3,0xC003,0x8002,0x41C2,0x01C6,0xC006,0x8007,0x41C7,
    0x0005,0xC1C5,0x81C4,0x4004,0x01CC,0xC00C,0x800D,0x41CD,0x000F,0xC1CF,0x81CE,0x400E,
    0x000A,0xC1CA,0x81CB,0x400B,0x01C9,0xC009,0x8008,0x41C8,0x01D8,0xC018,0x8019,0x41D9,
    0x001B,0xC1DB,0x81DA,0x401A,0x001E,0xC1DE,0x81DF,0x401F,0x01DD,0xC01D,0x801C,0x41DC,
    0x0014,0xC1D4,0x81D5,0x4015,0x01D7,0xC017,0x8016,0x41D6,0x01D2,0xC012,0x8013,0x41D3,
    0x0011,0xC1D1,0x81D0,0x4010,0x01F0,0xC030,0x8031,0x41F1,0x0033,0xC1F3,0x81F2,0x4032,
    0x0036,0xC1F6,0x81F7,0x4037,0x01F5,0xC035,0x8034,0x41F4,0x003C,0xC1FC,0x81FD,0x403D,
    0x01FF,0xC03F,0x803E,0x41FE,0x01FA,0xC03A,0x803B,0x41FB,0x0039,0xC1F9,0x81F8,0x4038,
    0x0028,0xC1E8,0x81E9,0x4029,0x01EB,0xC02B,0x802A,0x41EA,0x01EE,0xC02E,0x802F,0x41EF,
    0x002D,0xC1ED,0x81EC,0x402C,0x01E4,0xC024,0x8025,0x41E5,0x0027,0xC1E7,0x81E6,0x4026,
    0x0022,0xC1E2,0x81E3,0x4023,0x01E1,0xC021,0x8020,0x41E0,0x01A0,0xC060,0x8061,0x41A1,
    0x0063,0xC1A3,0x81A2,0x4062,0x0066,0xC1A6,0x81A7,0x4067,0x01A5,0xC065,0x8064,0x41A4,
    0x006C,0xC1AC,0x81AD,0x406D,0x01AF,0xC06F,0x806E,0x41AE,0x01AA,0xC06A,0x806B,0x41AB,
    0x0069,0xC1A9,0x81A8,0x4068,0x0078,0xC1B8,0x81B9,0x4079,0x01BB,0xC07B,0x807A,0x41BA,
    0x01BE,0xC07E,0x807F,0x41BF,0x007D,0xC1BD,0x81BC,0x407C,0x01B4,0xC074,0x8075,0x41B5,
    0x0077,0xC1B7,0x81B6,0x4076,0x0072,0xC1B2,0x81B3,0x4073,0x01B1,0xC071,0x8070,0x41B0,
    0x0050,0xC190,0x8191,0x4051,0x0193,0xC053,0x8052,0x4192,0x0196,0xC056,0x8057,0x4197,
    0x0055,0xC195,0x8194,0x4054,0x019C,0xC05C,0x805D,0x419D,0x005F,0xC19F,0x819E,0x405E,
    0x005A,0xC19A,0x819B,0x405B,0x0199,0xC059,0x8058,0x4198,0x0188,0xC048,0x8049,0x4189,
    0x004B,0xC18B,0x818A,0x404A,0x004E,0xC18E,0x818F,0x404F,0x018D,0xC04D,0x804C,0x418C,
    0x0044,0xC184,0x8185,0x4045,0x0187,0xC047,0x8046,0x4186,0x0182,0xC042,0x8043,0x4183,
    0x0041,0xC181,0x8180,0x4040};
```

Chapter 6 Troubleshooting

6.1 Keyboard fault code

When software detects fault, it will automatically stop output, and display fault on keyboard. The meaning of each fault code displayed as following:

Fault Code	NAME	DESCRIPTION
oH1	T1 sensor overheat	T1 sensor on radiator is overheat
oH2	T2 sensor overheat	T2 sensor on radiator is overheat
EF	EXT external alarm	Signal on terminal of EXT fault
oE	Overvoltage	DC bus voltage too high
LE	undervoltage	DC bus voltage too low
HE	Overvoltage(hardware)	DC bus voltage too high by hardware detect
FF	Input frequency fault	Disconnected from the AC power grid or abnormal power supply frequency
UF	Input amplitude fault	Abnormal voltage amplitude of AC power grid
PF	One phase of power is missing or power supply abnormal	AC input power is missing a phase or AC power supply is abnormal
oC	Overcurrent	Three phase output overcurrent
oL	Overload	Three phase continues current output too high

Form 6-1 Keyboard fault list

When a fault occur, software will automatically stop output and display the type of fault on keyboard. When the fault is eliminated, after fault recovery time (the default software setting is 30S, the fault recovery time can be modified, refer to the "Setting of Fault Protection Recovery Time" section), software will automatically return to normal working status.

No matter in normal working status or fault status, you can view the fault record through the keyboard. Please refer to form 5-10 for detail.

6.2 Troubleshooting of common fault causes

Common malfunction	CORRECTIVE ACTION
Rectifier feedback not working	Check the wiring. Check terminal controls are correct. Check device voltage match with input voltage. Check input power voltage. Check parts damage or not. Check display fault on keyboard.
Three phase emergency power supply no output	Check any wrong connection. Check terminal controls are correct. Check device voltage match with input voltage. Check input power voltage. Check parts damage or not. Check display fault on keyboard.
Overvoltage protection during feedback	Check device capacity is sufficient. Check feedback voltage matches with converter. Check parts damage or not. Check feedback is working.
Overheat protection	Device capacity too small. Poor Ventilation, heat cannot be dissipated. Overheat protection detect value too low.
Overload protection	Check device capacity is sufficient. Check overload time curve is set correctly.
Input power fault protection	Check power switch is working normally. Check the wiring. Check terminal controls are correct.

Form 6-2 Common malfunction and Corrective action

Chapter 7 Maintenance and inspection

To prevent problems and to maintain high-reliability operation of the device, daily inspection and periodic inspection should be carried out. Please pay attention to the following items when performing inspection operation.

7.1 Daily inspection

Do not remove cover parts while machine is running or powered on. Visually check whether there are any abnormalities in the operating status from outside. The following items are usually checked:

- Expected performance can be achieved (compliance with standard spec)
- Environment meet standard requirement.
- Any abnormal sound, vibration, or smell.
- Any signs of overheating or abnormal phenomena such as discoloration.
- Keyboard indicator light or data display is normal.
- Heat dissipation of the machine is normal.

7.2 Periodic inspection

Periodic inspections should be executed after operation is stopped, power supply is disconnected, and cabinet door is opened. Even if the power supply is disconnected, there is still electricity stored in the capacitor of DC part. It takes a certain time to discharge. There is still a danger of high voltage. You should wait for more than ten minutes, or use a multimeter or other measuring tools to confirm that the DC bus voltage has dropped to a safe level. Check the voltage value (below DC25V) before proceeding with inspection. Regular inspections are usually carried out according to the following projects:

- Inspection should be executed after power is disconnected after 10 minutes. A more reliable method is to use a multimeter to measure DC voltage of terminal and confirm that it has dropped to a safe voltage value (below DC 25V) before proceeding with inspection.
- Maintenance inspection and parts replacement should be performed by professional electrician.
- Metal objects (watches, rings, etc.) should be removed before work.
- Insulated tools should be used.
- Never modify this device, there is a risk of accidents.
- Check surrounding environment is conducive to heat dissipation of the machine. It should not be exposed to direct sunlight for a long time.

Chapter 8 Product and quality

8.1 Requirements for consultation

When you need consultation, provide following information:

- Model Type
- Serial number
- Purchase date
- Content of inquiry