



Modbus RTU Protocol

Administrator

2017/9/1

Version	Changes	Date of change	Responsible person	Remark
V000	First version	2017.09.01		
V57	1. To add Input Register 174 for reading the inverter's switch/dip switch status	2023.06.13	Alex	
V58	1. Added an explanation about the polling time.	2023.10.28	Alex	

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1. Introduction to the Modbus RTU protocol

1) Message Format

Address	Function Code	Data	CRC checksum	
1 byte	1 byte	1-252 byte	Low byte	High byte

Table 1 Message Format

The Modbus protocol utilizes several function codes, including:

Function Code 0x03: Read Holding Registers

Function Code 0x04: Read Input Registers

Function Code 0x06: Write Single Holding Register

Function Code 0x10: Write Multiple Holding Registers

2) Byte Order

Start bit	Data								Stop bit
1	Bit0	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	1

Table 2 Byte Order

3) Requests and Responses

Responses include normal responses and exception responses, the exception codes are defined as follows:

Exception code	Description of the exception	Remark
0x01	Illegal Function	Secondary does not recognize the function code
0x02	Illegal Data Address	The data address does not match the length
0x03	Illegal Data Value	The data value is out of bounds or the number of registers is incorrect
0x04	Secondary read and write failed	Read and write errors
0x06	Secondary Busy	Secondary busy

Table 3 Exception Code Definitions

a) Read the hold and input registers

Request	Normal Response	Exception Response
Address	Address	Address
Function code(0x03/0x04)	Function Code(0x03/0x04)	Function Code(0x83/0x84)
SN[0]	SN[0]	SN[0]
SN[1]	SN[1]	SN[1]
SN[2]	SN[2]	SN[2]
SN[3]	SN[3]	SN[3]
SN[4]	SN[4]	SN[4]
SN[5]	SN[5]	SN[5]
SN[6]	SN[6]	SN[6]
SN[7]	SN[7]	SN[7]
SN[8]	SN[8]	SN[8]
SN[9]	SN[9]	SN[9]
Start address A low byte	Start address A low byte	Start address A low byte
Start address A high byte	Start address A high byte	Start address A high byte
Number of registers N low bytes	Number of bytes	<u>Exception code</u>
Number of registers N high bytes	Register A value is low byte	CRC checks low bytes
CRC checks low bytes	Register A value high bytes	CRC checks high bytes
CRC checks high bytes	Register A+1 value low bytes	
	Register A+1 value high bytes	
	
	
	Register A+N-1 value low bytes	
	Register A+N-1 value high bytes	
	CRC checks low bytes	
	CRC checks high bytes	

Table 4 Read Requests and Responses

b) Write a single hold register

Request	Normal Response	Exception Response
Address	Address	Address
Function Code(0x06)	Function Code(0x06)	Function Code(0x86)
SN[0]	SN[0]	SN[0]
SN[1]	SN[1]	SN[1]
SN[2]	SN[2]	SN[2]
SN[3]	SN[3]	SN[3]
SN[4]	SN[4]	SN[4]
SN[5]	SN[5]	SN[5]
SN[6]	SN[6]	SN[6]
SN[7]	SN[7]	SN[7]
SN[8]	SN[8]	SN[8]
SN[9]	SN[9]	SN[9]
Register address low byte	Register address low byte	Register address low byte
Register address high bytes	Register address high bytes	Register address high bytes
Register value low byte	Register value low byte	<u>Exception code</u>
Register value high bytes	Register value high bytes	CRC checks low bytes
CRC checks low bytes	CRC checks low bytes	CRC checks high bytes
CRC checks high bytes	CRC checks high bytes	

Table 5 Writing Individual Registers and Responses

c) Write multiple hold registers

Request	Normal Response	Exception Response
Address	Address	Address
Function Code(0x10)	Function Code(0x10)	Function Code(0x90)
SN[0]	SN[0]	SN[0]
SN[1]	SN[1]	SN[1]
SN[2]	SN[2]	SN[2]
SN[3]	SN[3]	SN[3]

SN[4]	SN[4]	SN[4]
SN[5]	SN[5]	SN[5]
SN[6]	SN[6]	SN[6]
SN[7]	SN[7]	SN[7]
SN[8]	SN[8]	SN[8]
SN[9]	SN[9]	SN[9]
Start address A low byte	Start address A low byte	Start address A low byte
Start address A high byte	Start address A high byte	Start address A high byte
Number of registers N low bytes	Number of registers N low bytes	Exception code
Number of registers N high bytes	Number of registers N high bytes	CRC checks low bytes
Number of bytes	CRC checks low bytes	CRC checks high bytes
Register A value low bytes	CRC checks high bytes	
Register A value high bytes		
Register A+1 value low bytes		
Register A+1 value high bytes		
.....		
.....		
Register A+N-1 value low bytes		
Register A+N-1 value high bytes		
CRC checks low bytes		
CRC checks high bytes		

Table 6 Writing Multiple Registers and Responses

2. Communication Configuration

- 1) Physical interface: RS-485
- 2) Communication mode: Universal asynchronous transceiver (UART)
- 3) Baud rate: 19200bps
- 4) One start bit, 8 data bits, no parity bits, one stop bit, total 10 bytes.
- 5) Minimum polling period: 1s

Notes:

Tip 1: According to LuxpowerTek's communication protocol, make sure the interval for querying inverter data is more than 1 second. If you're planning to query device data frequently, just disconnect the WiFi Dongle.

Tip 2: If you're monitoring your device through the LuxpowerTek web server and need the WiFi Dongle, ensure you query device data at intervals greater than 1 minute. This helps keep your device monitored and the MODBUS RS485 serial port working fine.

- 6) Register width: 2 bytes
- 7) 16-bit integer decoding order: The high and low byte order is reversed, for example 0x01 0x02, it should be parsed as 0x0201=513
- 8) 32-bit integer decoding order: The high and low byte order is reversed, the byte sequence within the word reversed, for example 0x01 0x02 0x03 0x04, should be parsed as 0x04030201=67305985
- 9) A maximum of 40 registers can be queried in a single request. The inverter software groups the registers in sets of 40, starting from 0-39 for the first group, 40-79 for the second group, 80-119 for the third group, and so on. When querying 40 registers, the starting address must be 0 (0-39), 40 (40-79), 80 (80-119), and so on. It is not allowed to query registers that span across different groups simultaneously. For example, if you need to query the values of registers 38-40, you must perform two separate queries because 38-39 are in the first group and 40 is in the second group.
- 10) The maximum number of registers that can be queried in a single request for the new inverter is 127.

3. Register Mapping Table

1) Input Register

It is used to store the operational data of the energy storage inverter, which can only be read and not written, and supports function codes 0x04.

Input Addr	Item	Unit	Range	Note
0	State		0-65535	For more information, see the definition of the operation mode of off-grid-connected energy storage all-in-one file
1	Vpv1	0.1V	0-65535	PV1 voltage, the AC energy storage system does not have this variable
2	Vpv2	0.1V	0-65535	PV2 voltage, the AC energy storage system does not have this variable
3	Vpv3	0.1V	0-65536	PV3 voltage, the AC energy storage system does not have this variable
4	Vbat	0.1V	0-65535	Battery voltage
5	SOC	%	0-100	Battery capacity
	SOH	%	0-100	Battery State of health
6	Internal Fault		0-65535	For more information, see Internal Fault Code Definition file
7	Ppv1	W	0-65535	PV1 power/ AC energy storage Ppv
8	Ppv2	W	0-65535	PV2 power, the AC energy storage system does not have this variable
9	Ppv3	W	0-65536	PV3 power (total PV power, obtained by adding PV1, 2, 3), the AC energy storage system does not have this variable
10	Pcharge	W	0-65535	Charging power (power flowing into the battery)
11	Pdischarge	W	0-65535	Discharging power (power flowing out of battery power)
12	VacR	0.1V	0-65535	R-phase utility grid voltage
13	VacS	0.1V	0-65535	S-phase utility grid voltage
14	VacT	0.1V	0-65535	T-phase utility grid voltage
15	Fac	0.01Hz	0-65535	Utility grid frequency
16	Pinv	W	0-65535	On-grid inverter power (For three phase: R phase)
17	Prec	W	0-65535	AC charging rectification power (For three phase: R phase)
18	IinvRMS	0.01A	0-65535	Inverter rms current output (For three phase: R phase)
19	PF	0.001	0-2000	Power factor $x \in [0,1000] \rightarrow x/1000$ $x \in (1000,2000) \rightarrow (1000-x)/1000$ (For three phase: R phase)
20	VepsR	0.1V	0-65535	R phase off-grid output voltage
21	VepsS	0.1V	0-65535	S phase off-grid output voltage
22	VepsT	0.1V	0-65535	T phase off-grid output voltage

23	Feps	0.01Hz	0-65535	Off-grid output frequency
24	Peps	W	0-65535	Off-grid inverter power (For three phase: R phase)
25	Seps	VA	0-65535	Off-grid apparent power (For three phase: R phase)
26	Ptogrid	W	0-65535	User on-grid power (For three phase: R phase)
27	Ptouser	W	0-65535	Grid power capacity (For three phase: R phase)
28	Epv1_day	0.1kWh	0-65535	PV1 power generation today / AC Energy Storage Epv_day
29	Epv2_day	0.1kWh	0-65535	PV2 power generation today, the AC energy storage system does not have this variable
30	Epv3_day	0.1kWh	0-65535	PV3 power generation today (total PV=PV1+PV2+PV3), the AC energy storage system does not have this variable
31	Einv_day	0.1kWh	0-65535	Today's on-grid inverter output energy
32	Erec_day	0.1kWh	0-65535	Today's AC charging rectifier energy
33	Echg_day	0.1kWh	0-65535	Energy Charge today
34	Edischg_day	0.1kWh	0-65535	Energy Discharge today
35	Eeps_day	0.1kWh	0-65535	Today's off-grid output energy
36	Etogrid_day	0.1kWh	0-65535	Today's export to gird energy
37	Etouser_day	0.1kWh	0-65535	Electricity supplied to user from the grid today
38	Vbus1	0.1V	0-65535	Voltage of Bus 1
39	Vbus2	0.1V	0-65535	Voltage of Bus 2
40	Epv1_all L	0.1kWh	0-65535	PV1 cumulative power generation/AC energy storage Epv_all Low byte
41	Epv1_all H	0.1kWh	0-65535	PV1 cumulative power generation/AC energy storage Epv_all high byte
42	Epv2_all L	0.1kWh	0-65535	PV2 cumulative power generation low byte, AC energy storage does not have this variable
43	Epv2_all H	0.1kWh	0-65535	PV2 cumulative power generation high byte, AC energy storage does not have this variable
44	Epv3_all L	0.1kWh	0-65535	PV3 cumulative power generation low byte (total PV=PV1+PV2+PV3), AC energy storage does not have this variable.
45	Epv3_all H	0.1kWh	0-65535	PV3 cumulative power generation high byte (total PV=PV1+PV2+PV3), AC energy storage does not have this variable
46	Einv_all L	0.1kWh	0-65535	Inverter output accumulated power low byte

47	Einv_all H	0.1kWh	0-65535	Inverter output accumulates power high byte
48	Erec_all L	0.1kWh	0-65535	AC charging accumulates rectified power Low byte
49	Erec_all H	0.1kWh	0-65535	AC charging accumulates rectified power high byte
50	Echg_all L	0.1kWh	0-65535	Cumulative charge energy low byte
51	Echg_all H	0.1kWh	0-65535	Cumulative charge energy high byte
52	Edischg_all L	0.1kWh	0-65535	Cumulative discharge charge energy Low byte
53	Edischg_all H	0.1kWh	0-65535	Cumulative discharge charge energy High byte
54	Eeps_all L	0.1kWh	0-65535	Cumulative inverter off-grid output energy Low byte
55	Eeps_all H	0.1kWh	0-65535	Cumulative inverter off-grid output energy High byte
56	Etogrid_all L	0.1kWh	0-65535	Accumulate export energy Low byte
57	Etogrid_all H	0.1kWh	0-65535	Accumulate export energy High byte
58	Etouser_all L	0.1kWh	0-65535	Cumulative import energy Low byte
59	Etouser_all H	0.1kWh	0-65535	Cumulative import energy high byte
60	FaultCode L		0-65535	For more information, see Fault code definition file
61	FaultCode H		0-65535	<u>For more information, see Fault code definition file</u>
62	WarningCode L		0-65535	<u>For more information, see Alarm code definition file</u>
63	WarningCode H		0-65535	For more information, see Alarm code definition file
64	Tinner	celsius	0-65535	Internal temperature
65	Tradiator1	Celsius	0-65535	Radiator temperature 1
66	Tradiator2	celsius	0-65535	Radiator temperature 2
67	Tbat	celsius	0-65535	Battery temperature
69	RunningTime L	second		Runtime duration
70	RunningTime H	second		Runtime duration
71	AutoTestStart	Bit0-3		0 - not started ; 1 - started
	UbAutoTestStatus	Bit4-7		0-waiting 1-testing 2-test fail 3-V test OK 4-F test OK 5- test pass
	UbAutoTestStep	Bit8-11		1-V1L test 2-V1H 3-F1L test 4-F1H test

				5-V2L test 6-V2H test 7-F2L test 8-F2H test
72	wAutoTestLimit	0.1V/0. 01Hz		When ubAuto Test Step=1,2,5,6, is the voltage limit; When ubAutoTest Step=3,4,7,8, it is the frequency limit
73	uwAutoTestDefault Time	ms		
74	uwAutoTestTripValue	0.1V/0. 01Hz		When ubAuto Test Step=1,2,5,6, is the voltage limit; When ubAutoTestStep=3,4,7,8, it is the frequency limit
75	uwAutoTestTripTime	ms		
77	ACInputType	Bit0	0 or 1	0-Grid 1-Generator for 12KHybrid
	ACCoupleInverterFlow	Bit1	0 or 1	0-no flow 1-show flow
	ACCoupleEn	Bit2	0 or 1	0-Disable 1-Enable
80	BatTypeAndBrand			For more information, see the model definition file
	BatComType		0 or 1	0-CAN 1-485
81	MaxChgCurr	0.01A		The maximum charging current of BMS limits
82	MaxDischgCurr	0.01A		The maximum discharging current of BMS limits
83	ChargeVoltRef	0.1V		Recommends charging voltage by BMS
84	DischgCutVolt	0.1V		Recommends a discharging cut-off voltage by BMS
85	BatStatus0_BMS			Status information of BMS
86	BatStatus1_BMS			Status information of BMS
87	BatStatus2_BMS			Status information of BMS
88	BatStatus3_BMS			Status information of BMS
89	BatStatus4_BMS			Status information of BMS
90	BatStatus5_BMS			Status information of BMS
91	BatStatus6_BMS			Status information of BMS
92	BatStatus7_BMS			Status information of BMS
93	BatStatus8_BMS			Status information of BMS
94	BatStatus9_BMS			Status information of BMS
95	BatStatus_INV			The inverter aggregates lithium battery status information
96	BatParallelNum			Number of batteries in parallel
97	BatCapacity	Ah		Battery capacity
98	BatCurrent_BMS	0.01A		Battery current , with signed number
99	FaultCode_BMS			

100	WarningCode_BMS			
101	MaxCellVolt_BMS	0.001V		Maximum voltage of cell
102	MinCellVolt_BMS	0.001V		Minimum voltage of cell
103	MaxCellTemp_BMS	0.1°C		Maximum temperature of cell, with signed number
104	MinCellTemp_BMS	0.1°C		Minimum temperature of cell, with signed number
105	BMSFWUpdateState		1-3	1-Upgrade in process 2-Upgrade successful 3- Upgrade failed
106	CycleCnt_BMS			Number of charging/discharging cycles
107	BatVoltSample_INV	0.1V		Inverter samples the battery voltage
108	T1	0.1°C		BT temperature for 12k
109	T2	0.1°C		Reserved
110	T3	0.1°C		Reserved
111	T4	0.1°C		Reserved
112	T5	0.1°C		Reserved
113	MasterOrSlave	Bit0~1	1,2	Primary or Secondary 1: Primary 2: Secondary
	SingleOrThreePhase	Bit2~3	1-3	1:R; 2:S ; 3:T; Parallel phase 1:R 2:S 3:T
	Resvd	Bit4~7		Reserved
	ParallelNum	Bit8~16	1~255	Number of inverters in parallel
114	OnGridloadPower	W		Load power of the 12k inverter when it is not off-grid
115	SN[0]-Year		'0'-'9' 'A'-'Z'	The serial number is a ten-digit ASCII code For example: The serial number is AB12345678 SN[0]=0x41(A) : : : : SN[9]=0x38(8)
	SN[1]-week		'0'-'9' 'A'-'Z'	
116	SN[2]-week		'0'-'9' 'A'-'Z'	
	SN[3]-factory		'0'-'9' 'A'-'Z'	
117	SN[4]-product code		'0'-'9' 'A'-'Z'	
	SN[5] -product code		'0'-'9' 'A'-'Z'	

118	SN[6] -serial number		'0'-'9' 'A'-'Z'	
	SN[7]-serial number		'0'-'9' 'A'-'Z'	
119	SN[8] -serial number		'0'-'9' 'A'-'Z'	
	SN[9] -流水号		'0'-'9' 'A'-'Z'	
120	VBusP	0.1V		Half BUS voltage
121	GenVolt	0.1V		Generator voltage Voltage of generator for three phase: R phase
122	GenFreq	0.01Hz		Generator frequency
123	GenPower	W		Voltage of generator for three phase: R phase
124	Egen_day	0.1kWh		Energy of generator today
125	Egen_all L	0.1kWh		Low byte of total generator energy
126	Egen_all H	0.1kWh		High byte of total generator energy
127	EPSVoltL1N	0.1V		Voltage of EPS L1N Voltage of generator for three phase: S phase
128	EPSVoltL2N	0.1V		Voltage of EPS L2N Voltage of generator for three phase: T phase
129	Peps_L1N	W		Active power of EPS L1N Off-grid active power of three phase: S phase
130	Peps_L2N	W		Active power of EPS L2N Off-grid active power of three phase: T phase
131	Seps_L1N	VA		Apparent power of EPS L1N Off-grid apparent power of three phase: S phase
132	Seps_L2N	VA		Apparent power of EPS L2N Off-grid apparent power of three phase: T phase
133	EepsL1N_day	0.1kWh		Daily energy of EPSL1N Off-grid daily energy of three phase: S phase
134	EepsL2N_day	0.1kWh		Daily energy of EPSL2N Off-grid daily energy of three phase: T phase
135	EepsL1N_all L	0.1kWh		Low byte of total EPSL1N energy Total off-grid power of three phase: S phase
136	EepsL1N_all H	0.1kWh		High byte of total EPSL1N energy Total off-grid power of three cameras: S phase
137	EepsL2N_all L	0.1kWh		Low word of total EPSL2N energy Total off-grid power of three phase: T phase

138	EepsL2N_all H	0.1kWh		High byte of total EPSL2N energy Total off-grid power of three byte: T phase
139				
140	AFCI_CurrCH1	mA		AFCI current
141	AFCI_CurrCH2	mA		AFCI current
142	AFCI_CurrCH3	mA		AFCI current
143	AFCI_CurrCH4	mA		AFCI current
144	AFCIFlag.ArcAlarmCH1	Bit0		Arc status of CH1 0-Normal 1-Alarm
	AFCIFlag.ArcAlarmCH2	Bit1		Arc status of CH2 0-Normal 1-Alarm
	AFCIFlag.ArcAlarmCH3	Bit2		Arc status of CH3 0-Normal 1-Alarm
	AFCIFlag.ArcAlarmCH4	Bit3		Arc status of CH4 0-Normal 1-Alarm
	AFCIFlag.SelfTestResult CH1	Bit4		Test result of CH1 0-Normal 1-fail
	AFCIFlag.SelfTestResult CH2	Bit5		Test result of CH2 0-Normal 1-fail
	AFCIFlag.SelfTestResult CH3	Bit6		Test result of CH3 0-Normal 1-fail
	AFCIFlag.SelfTestResult CH4	Bit7		Test result of CH4 0-Normal 1-fail
	AFCI_ArcAlarm.rsvd	Bit8-15		
145	AFCI_ArcCH1			Real time arc of CH1
146	AFCI_ArcCH2			Real time arc of CH2
147	AFCI_ArcCH3			Real time arc of CH3
148	AFCI_ArcCH4			Real time arc of CH4
149	AFCI_MaxArcCH1			Max arc of CH1
150	AFCI_MaxArcCH2			Max arc of CH2
151	AFCI_MaxArcCH3			Max arc of CH3
152	AFCI_MaxArcCH4			Max arc of CH4
153	ACCouplePower	W		AC Coupled inverter power
154	AutoTestTripValue[0]	0.1V/0.01Hz		
.....				
161	AutoTestTripValue[7]	0.1V/0.01Hz		
162	AutoTestTripTime [0]	ms		
.....				
169	AutoTestTripTime [7]	ms		
170	Pload	W		
171	Eload_day	0.1kWh		
172	Eload_allL	0.1kWh		
173	Eload_allH	0.1kWh		
174	SwitchState.SafetySw	Bit0~4	0~0x1F	The status of the 5-digit safety DIP switch
	SwitchState.rsvd	Bit5-15	0	Reserved
.....
180	Pinv_S	W	0-65535	On grid inverter power of three phase: S phase

181	Pinv_T	W	0-65535	On grid inverter power of three phase: T phase
182	Prec_S	W	0-65535	Charging rectification power of three phase: S phase
183	Prec_T	W	0-65535	Charging rectification power of three phase: T phase
184	Ptogrid_S	W	0-65535	User on-grid power of three phase: S phase
185	Ptogrid_T	W	0-65535	User on-grid power of three phase: T phase
186	Ptouser_S	W	0-65535	Grid supply power of three phase: S phase
187	Ptouser_T	W	0-65535	Grid supply power of three phase: T phase
188	GenPower_S	W	0-65535	Power of generator for three phase: S phase
189	GenPower_T	W	0-65535	Power of generator for three phase: T phase
190	linvRMS_S	0.01	0-65535	Effective value of three phase inverter current: S phase
191	linvRMS_T	0.01	0-65535	Effective value of three phase inverter current: T phase
192	PF_S	0.001	0-2000	Power factor of phase S in three-phase inverter $x \in (0,1000] \rightarrow x/1000$ $x \in (1000,2000) \rightarrow (1000-x)/1000$
193	PF_T	0.001	0-2000	Power factor of phase T in three-phase inverter $x \in (0,1000] \rightarrow x/1000$ $x \in (1000,2000) \rightarrow (1000-x)/1000$
192	PF_S	0.001	0-2000	Power factor of phase S in three-phase inverter $x \in (0,1000] \rightarrow x/1000$ $x \in (1000,2000) \rightarrow (1000-x)/1000$
.....
.....
400	FaultRecord1_Y&M			Fault Records 1_years & months
401	FaultRecord1_D&H			Fault Records 1_days & hours
402	FaultRecord1_M&S			Fault Records 1_minutes & seconds
403	FaultRecord1_Code			Fault Records 1_fault code, e.g. E019 (Busbar overvoltage)
404	FaultRecord1_Value			Fault Records 1_fault value, for example 5950 (595V), if there is no corresponding fault value, it is 0
405	FaultRecord1_SetOrClr		0/1	Fault Records 1_Fault occurred or cleared (0-fault occurred, 1-fault cleared)
406	FaultRecord2_Y&M			Fault Records 2_years & months
407	FaultRecord2_D&H			Fault Records 2_days & hours
408	FaultRecord2_M&S			Fault Records 2_minutes & seconds
409	FaultRecord2_Code			Fault Records 2_fault code, for

				example E019 (busbar overvoltage)
410	FaultRecord2_Value			Fault Records 2_Fault value, for example 5950 (595V), if there is no corresponding fault value, it is 0
411	FaultRecord2_SetOrClr		0/1	Fault Records 2_Fault occurred or clear (0 - Fault Occurred, 1- Fault Cleared)
			
			
			
			
			
			
994	FaultRecord100_Y&M			Fault Records 100_years & months
995	FaultRecord100_D&H			Fault records 100_days & hours
996	FaultRecord100_M&S			Fault Records 100_minutes & seconds
997	FaultRecord100_Code			Fault Records 100_fault code, e.g. E019 (busbar overvoltage)
998	FaultRecord100_Value			The fault record is 100_fault value, such as 5950 (595V), if there is no corresponding fault value, it is 0
999	FaultRecord100_SetOrClr		0/1	Fault Records 100_Fault Occurred or Cleared (0 - Fault Occurred, 1 - Fault Cleared)
1000	WarnRecord1_Y&M			Alarm Records 1_years & months
1001	WarnRecord1_D&H			Alarm Records 1_days & hours
1002	WarnRecord1_M&S			Alarm records 1_minutes &seconds
1003	WarnRecord1_Code			Alarm Records 1_alarm code, for example E019 (busbar overvoltage)
1004	WarnRecord1_Value			Alarm Records 1_Alarm value, for example 5950 (595V), if there is no corresponding alarm value, it is 0
1005	WarnRecord1_SetOrClr		0/1	Alarm Records 1_Alarm occurred or cleared (0 - alarm occurred, 1 - alarm cleared)
1006	WarnRecord2_Y&M			Alarm records 2_years & months
1007	WarnRecord2_D&H			Alarm Records 2_days & hour
1008	WarnRecord2_M&S			Alarm Records 2_minutes & seconds
1009	WarnRecord2_Code			Alarm Records 2_Alarm code, for example E019 (busbar overvoltage)
1010	WarnRecord2_Value			Alarm Records 2_Alarm value, for example 5950 (595V), if there is no corresponding alarm value, it is 0
1011	WarnRecord2_SetOrClr		0/1	Alarm Records 2_Alarm occurred or cleared (0 - alarm occurred, 1 - alarm cleared)

			
			
			
			
			
1594	WarnRecord100_Y&M			Alarm Records 100_years & months
1595	WarnRecord100_D&H			Alarm Records for 100_days & hours
1596	WarnRecord100_M&S			Alarm records 100_minutes &seconds
1597	WarnRecord100_Code			Alarm Records 100_alarm code, such as E019 (busbar overvoltage)
1598	WarnRecord100_Value			Alarm records 100_alarm value, for example 5950 (595V), or if there is no corresponding alarm value, it is 0.
1599	WarnRecord100_SetOr Clr		0/1	Alarm Records 100_Alarm occurred or cleared (0 - alarm occurred, 1 - alarm cleared)
			

Table 7 Input Register Mapping Table (Signed numbers indicated with a green background)

2) Hold Register

It is used to store the operational data of the energy storage inverter, which can only be read and written, and supports function codes 0x03, 0x06, 0x10.

Hold Addr	Item	Unit	Range and default	Note
7	FWCode0		'A'-'Z' 'a'-'z'	For more information of the model code, see Software Version Definition file
	FWCode1		'A'-'Z' 'a'-'z'	For more information of the code name for the derived model, see the software version definition file
8	FWCode2		'A'-'Z' 'a'-'z'	For more information of the ODM code, see Software Version Definition
	FWCode3		'A'-'Z' 'a'-'z'	For more information of the region code, see Software Version Definition file
9	Slave Ver		0-255	For more information of the software version number for redundant CPU, see Software version definition file
	Com Ver		0-255	For Communication CPU software version number, see software version definition file
10	Cntl Ver		0-255	For Control CPU software version number, see software version definition file
	FWVer		0-255	For external software version

				<u>number, see Software Version Definition file</u>
11	ResetSetting.EnergyRecordClr	Bit0	0/1	<u>Resetting energy and running time</u>
	ResetSetting.AlltoDefault	Bit1	0/1	Reset all settings
	ResetSetting.AdjRatioClr	Bit2	0/1	Reset all adjust data
	ResetSetting.FaultRecordClr	Bit3	0/1	Clear the failure record
	...	Bit4	0/1	
	...	Bit5	0/1	
	...	Bit6	0/1	
	ResetSetting.InvReboot	Bit5	0/1	0-null 1-restart inverter
	ResetSetting.rsvd	Bit6	0/1	Retain
	ResetSetting.rsvd	Bit7	0/1	Retain
	ResetSetting.rsvd	Bit8	0/1	Retain
	ResetSetting.rsvd	Bit9	0/1	Retain
	ResetSetting.rsvd	Bit10	0/1	Retain
	ResetSetting.rsvd	Bit11	0/1	Retain
	ResetSetting.rsvd	Bit12	0/1	Retain
	ResetSetting.rsvd	Bit13	0/1	Retain
12	Time_Year		17-255	inverter time-year
	Time_Month		1-12	inverter time-month
13	Time_Date		1-31	inverter time-day
	Time_Hour		0-23	inverter time-hour
14	Time_Minute		0-59	inverter time-minute
	Time_Second		0-59	inverter time-second
15	Com Addr		0-150	MODBUS address
16	Language		0-1	0-English 1-German Language 0-English 1-German
20	PVInputModel		0-4 For 12KHybrid:0-7	0: No PV plug in 1: PV1 plug in 2: PV2 plug in 3: two PVs in parallel 4: two separate PVs, AC energy storage does not have this variable. For 12KHybrid: 0-No PV 1-PV1 in 2-PV2 in 3-PV3 in 4-PV1&2 in 5-PV1&3 in 6-PV2&3 in 7-PV1&2&3 in
21	FuncEn.EPSEn	0	0/1	Off-grid mode enable
	FuncEn.OVFLoadDerateEn	1	0/1	Overfrequency load reduction enable

	FuncEn.DRMSEn	2	0/1	DRMS enable
	FuncEn.LVRTEn	3	0/1	Low voltage ride-through enable
	FuncEn.AntislardEn	4	0/1	Anti-islanding enablement
	FuncEn.NeutralDetectEn	5	0/1	Ground neutral detection enable
	FuncEn.GridOnPowerSEN	6	0/1	On-grid power soft start enable
	FuncEn.ACChargeEn	7	0/1	AC charging enable
	FuncEn.SWSeamlesslyEn	8	0/1	seamless off-grid mode switching enable
	FuncEn.SetToStandby	9	0/1	0: Standby 1: Power on
	FuncEn.ForcedDischgEn	10	0/1	Forced discharge enable
	FuncEn.ForcedChgEn	11	0/1	Force charge enable
	FuncEn.ISOEn	12	0/1	ISO enable, and AC energy storage does not have this variable
	FuncEn.GFCIEn	13	0/1	GFCI enable
	FuncEn.DCIEn	14	0/1	DCI enable
	FuncEn.FeedInGridEn	15	0/1	0-disable 1-enable
22	StartPVVolt	0.1V	900-5000	PV start-up voltage, AC energy storage does not have this variable
23	ConnectTime	s	30-600	Waiting time of on-grid
24	ReconnectTime	s	0-900	Waiting time of Reconnect on-grid
25	GridVoltConnLow	0.1V	According to specific regulatory requirements	The lower limit of the allowed on-grid voltage.
26	GridVoltConnHigh	0.1V	According to specific regulatory requirements	The upper limit of the the allowed on-grid voltage.
27	GridFreqConnLow	0.01Hz	According to specific regulatory requirements	The lower limit of the allowable on-grid frequency
28	GridFreqConnHigh	0.01Hz	According to specific regulatory requirements	The upper limit of the the allowed on-grid frequency.
29	GridVoltLimit1Low	0.1V	According to specific regulatory requirements	Grid voltage level 1 undervoltage protection point

30	GridVoltLimit1High	0.1V	According to specific regulatory requirements	Grid voltage level 1 overvoltage protection point
31	GridVoltLimit1LowTime	Main period	According to specific regulatory requirements	Grid voltage level 1 undervoltage protection time
32	GridVoltLimit1HighTime	Main period	According to specific regulatory requirements	Grid voltage level 1 overvoltage protection time
33	GridVoltLimit2Low	0.1V	According to specific regulatory requirements	Grid voltage level 2 undervoltage protection point
34	GridVoltLimit2High	0.1V	According to specific regulatory requirements	Grid voltage level 2 overvoltage protection point
35	GridVoltLimit2LowTime	Main period	According to specific regulatory requirements	Grid voltage level 2 undervoltage protection time
36	GridVoltLimit2HighTime	Main period	According to specific regulatory requirements	Grid voltage level 2 overvoltage protection time
37	GridVoltLimit3Low	0.1V	According to specific regulatory requirements	Grid voltage level 3 undervoltage protection point
38	GridVoltLimit3High	0.1V	According to specific regulatory requirements	Grid voltage level 3 overvoltage protection point
39	GridVoltLimit3LowTime	Main period	According to specific regulatory requirements	Grid voltage level 3 undervoltage protection time
40	GridVoltLimit3HighTime	Main period	According to specific regulatory requirements	Grid voltage level 3 overvoltage protection time
41	GridVoltMovAvgHigh	0.1V	According to specific regulatory	Grid voltage sliding average overvoltage protection point

			requirements	
42	GridFreqLimit1Low	0.01Hz	According to specific regulatory requirements	Grid frequency level 1 underfrequency protection point
43	GridFreqLimit1High	0.01Hz	According to specific regulatory requirements	Grid frequency level 1 overfrequency protection point
44	GridFreqLimit1LowTime	Main period	According to specific regulatory requirements	Grid frequency level 1 underfrequency protection time
45	GridFreqLimit1HighTime	Main period	According to specific regulatory requirements	Grid frequency level 1 overfrequency protection time
46	GridFreqLimit2Low	0.01Hz	According to specific regulatory requirements	Grid frequency level 2 underfrequency protection point
47	GridFreqLimit2High	0.01Hz	According to specific regulatory requirements	Power grid frequency level 2 overfrequency protection point
48	GridFreqLimit2LowTime	Main period	According to specific regulatory requirements	Grid frequency level 2 underfrequency protection time
49	GridFreqLimit2HighTime	Main period	According to specific regulatory requirements	Grid frequency level 2 overfrequency protection time
50	GridFreqLimit3Low	0.01Hz	According to specific regulatory requirements	Grid frequency level 3 underfrequency protection point
51	GridFreqLimit3High	0.01Hz	According to specific regulatory requirements	Grid frequency level 3 overfrequency protection point
52	GridFreqLimit3LowTime	Main period	According to specific regulatory requirements	Grid frequency level 3 underfrequency protection time
53	GridFreqLimit3HighTime	Main period	According to specific regulatory requirements	Grid frequency level 3 overfrequency protection time

54	MaxQPercentForQV	%	According to specific regulatory requirements	The maximum percentage of reactive power for the Q(V) curve
55	V1L	0.1V	According to specific regulatory requirements	Q(V) curve undervoltage 1
56	V2L	0.1V	According to specific regulatory requirements	Q(V) curve undervoltage 2
57	V1H	0.1V	According to specific regulatory requirements	Q(V) curve overvoltage 1
58	V2H	0.1V	According to specific regulatory requirements	Q(V) curve overvoltage 2
59	ReactivePowerCMDType		0-7	Reactive power command type 0 - unit power factor 1 - fixed PF 2 - default PF curve (American machine: Q(P)) 3 - custom PF curve 4 - capacitive reactive power percentage 5- inductive reactive power percentage 6-QV curve 7-QV_Dynamic
60	ActivePowerPercentCMD	%	0-100	Active power percentage set value
61	ReactivePowerPercentCMD	%	0-60	Reactive power percentage set value
62	PFCMD	0.001	750-1000, 1750-2000	PF set value, 750-1000(under), 1750-2000(over)
63	PowerSoftStartSlope	%/min	1-4000	Loading rate, the percentage of power increase per minute.
64	ChargePowerPercentCMD	%	0-100	Charging power percentage setting
65	DischgPowerPercentCMD	%	0-100	Discharging power percentage setting
66	ACChgPowerCMD	%	0-100	AC charge percentage setting
67	ACChgSOCLimit	%	0-100	SOC limit setting for AC charging
68	ACChgStartHour	hour	0-23	AC charging start time - hour setting.
	ACChgStartMinute	min	0-59	AC charging start time_minute setting

69	ACChgEndHour	hour	0-23	AC charging end time_hour setting
	ACChgEndMinute	min	0-59	AC charging end time_minute setting
70	ACChgStartHour1	hour	0-23	AC charging start time_hour setting
	ACChgStartMinute1	min	0-59	AC charging start time_minutesetting
71	ACChgEndHour1	hour	0-23	AC charging end time_hour setting
	ACChgEndMinute1	min	0-59	AC charging end time_minute setting
72	ACChgStartHour2	hour	0-23	AC charging start time_hour setting
	ACChgStartMinute2	min	0-59	AC charging start time_minute setting
73	ACChgEndHour2	hour	0-23	AC charging end time_hour setting
	ACChgEndMinute2	min	0-59	AC charging end time_minute setting
74	ChgFirstPowerCMD	%	0-100	Charging priority percentage setting
75	ChgFirstSOCLimit	%		Charging priority SOC limit setting
76	ChgFirstStartHour	hour	0-23	Charging priority start time_hour setting
	ChgFirstStartMinute	min	0-59	Charge priority start time_min setting
77	ChgFirstEndHour	hour	0-23	Charging priority end time_hour setting
	ChgFirstEndMinute	min	0-59	Charging priority end time_minute setting
78	ChgFirstStartHour1	hour	0-23	Charging priority start time_hour setting
	ChgFirstStartMinute1	min	0-59	Charging priority start time_min setting
79	ChgFirstEndHour1	hour	0-23	Charging priority end time_hour setting
	ChgFirstEndMinute1	min	0-59	Charging priority end time_minute setting
80	ChgFirstStartHour2	hour	0-23	Charging priority start time_hour setting
	ChgFirstStartMinute2	min	0-59	Charging priority start time_minute setting
81	ChgFirstEndHour2	hour	0-23	Charging priority end time_hour setting
	ChgFirstEndMinute2	min	0-59	Charging priority end time_minute setting

				time_minut setting
82	ForcedDischgPowerCM D	%	0-100	Forced discharge percentage setting
83	ForcedDischgSOCLimit	%	0-100	Forced discharge SOC limit setting
84	ForcedDischgStartHour	hour	0-23	Forced discharge start time_hour setting
	ForcedDischgStartMinut e	min	0-59	Forced discharge start time_minute setting
85	ForcedDischgEndHour	hour	0-23	Forced discharge end time_hour setting
	ForcedDischgEndMinute	min	0-59	Forced discharge end time_minute setting
86	ForcedDischgStartHour1	hour	0-23	Forced discharge start time_hour setting
	ForcedDischgStartMinut e1	min	0-59	Forced discharge start time_minute setting
87	ForcedDischgEndHour1	hour	0-23	Forced discharge end time_hour setting
	ForcedDischgEndMinute 1	min	0-59	Forced discharge end time_minute setting
88	ForcedDischgStartHour2	hour	0-23	Forced discharge start time_hour setting
	ForcedDischgStartMinut e2	min	0-59	Forced discharge start time_minute setting
89	ForcedDischgEndHour2	hour	0-23	Forced discharge end time_hour setting
	ForcedDischgEndMinute 2	min	0-59	Forced discharge end time_minute setting
90	EPSVoltageSet	1V	230,240, 277,208 ,220	Off-grid output voltage level setting
91	EPSFreqSet	1Hz	50,60	Off-grid output frequency system settings
92	LockInGridVForPFCurve	0.1V	2300-3000	cospφ(P)lock in voltage
93	LockOutGridVForPFCurv e	0.1V	1500-3000	cospφ(P)lock out voltage
94	LockInPowerForQVCurv e	%	0-100	Q(V) lock in power
95	LockOutPowerForQVCur ve	%	0-100	Q(V) lock out power

96	DelayTimeForQVCurve	Main period	0-2000	Q(V) delay
97	DelayTimeForOverFDer ate	Main period	0-1000	Overfrequency load reduction delay
99	ChargeVoltRef	0.1V	500-590	Lead-acid battery charging specified voltage
100	CutVoltForDischg	0.1V	400-520	Lead-acid battery discharge cut-off voltage
101	ChargeRate ChargeCurr	A	0-140	Charging current
102	DischgRate DischgCurr	A	0-140	Discharging current
103	MaxBackFlow	%	0-100	Feed-in grid power setting
105	EOD	%	10%-90%	Cut SOC for discharging
106	TemprLowerLimitDischg	0.1°C	0-65536	Lead-acid Temperature low limit for discharging
107	TemprUpperLimitDischg	0.1°C	0-65536	Lead-acid Temperature high limit for discharging
108	TemprLowerLimitChg	0.1°C	0-65536	Lead-acid Temperature low limit for charging
109	TemprUpperLimitChg	0.1°C	0-65536	Lead-acid Temperature high limit for charging
110	FunctionEn1.ubPVGridOffEn	Bit0	0,1	0 - disable 1 - enable, AC energy storage does not have this variable
	FunctionEn1.ubFastZero Export	Bit1		0 - disable 1 - enable
	FunctionEn1.ubMicroGridEn	Bit2		0 - disable 1 - enable
	FunctionEn1.ubBatShared	Bit3		0 - disable 1 - enable
	FunctionEn1.ubChgLastEn	Bit4		0 - disable 1 - enable
	FunctionEn1.CTSampleRatio	Bit5-6		0 : 1/1000 1- 1/3000
	FunctionEn1. BuzzerEn	Bit7		0-disable 1-enable, only available for off-grid For 12k: DrycontactorCntl En
	FunctionEn1. PVCTSampType	Bit8-9		0-PV power 1-SpecLoad
	FunctionEn1. TakeLoadTogether	Bit10		For off-grid: 0-disable 1- enable, for 12K : 0-ongrid disable 1- enable
	FunctionEn1. OnGridWorkingMode	Bit11		For 12K: consistant chk mask 0- disable 1-enable 0-self consumption 1-Charge First, only available for off-grid For 12K: consistantchk mask 0-

				disable 1-enable
	FunctionEn1. PVCTSsampleRatio	Bit12-13		0 : 1/1000 1- 1/3000
	FunctionEn1.GreenMod eEn	Bit14		0-disable 1- enable, only available for off-grid
	FunctionEn1.EcoModeE n	Bit15		0-disable 1- enable, only available for off-grid
112	SetSystemType		0,1,2	Set the single/parallel type 0-no parallel (single one) 1- Single-phase parallel operation forms a single-phase system. (Primary, which will not show on off-grid mode) 2-Secondary (will not show on off-grid mode) 3-Single phase parallel operation forms a three phase system(Primary, which will not show on off-grid mode)
113	SetComposedPhase		1-3	Parallel phase setting 1-R 2-S 3-T
114	ClearFunction		1	Parallel Alarm clear1- clear
115	OVFDerateStartPoint	0.01Hz	5000-5200	Overfrequency load reduction start frequency point
116	PtoUserStartdischg	1W	50W-	Ptouser: value of discharging initiate
117	PtoUserStartchg	1W	- -50W	Ptouser: starts AC charging less than this value
118	VbatStartDerating	0.1V	>CutVoltForDisc hg+2V	For lead-acid battery, according to given curve decrease discharging power when voltage lower than this value
119	wCT_PowerOffset	1W	±1000W	signed short int; CT Power compensation, PtoUser direction is positive.
120	stSysEnable.bit.HalfHourACChrStartEn	Bit0	0,1	0-Disable, 1-Enable; Default:0;
	stSysEnable.bit.ACChargeType	Bit1~3	0-5	0-disable 1-according to time 2-accordidng to voltage 3-according to SOC 4-according to Voltage and Time 5-according to SOC and Time For 12K: 0 - according to time

				1 - according to SOC/Volt
	stSysEnable.bit.DischgCt rlType	Bit4~5	0-2	0-according to voltage 1- according to SOC 2- according to both
	stSysEnable.bit.OnGridE ODType	Bit6	0-1	0-according to voltage 1- according to SOC
	stSysEnable.bit. GenChargeType	Bit7	0-1	0-According to Battery voltage 1-According to Battery SOC
124	OVFDerateEndPoint	0.01Hz	5000-5200	Overfrequency load reduction ends at the frequency point
125	SOCLowLimitForEPSDisc hg	%	0-EOD	SOC low limit for EPS discharge
126	OptimalChg_DisChg.Tim e0	Bit0~1	0~2	0:00~0:30 Mark of time period charging and discharging. Default: 0; 0 - does not operate, 1-AC charge, 2-PV charge, 3 - discharge
	OptimalChg_DisChg.Tim e1	Bit2~3	0~2	0:30~1:00 Mark of time period charging and discharging.
	OptimalChg_DisChg.Tim e2	Bit4~5	0~2	1:00~1:30 Mark of time period charging and discharging.
			
	OptimalChg_DisChg.Tim e7	Bit14~15	0~2	3:30~4:00 Mark of time period charging and discharging.
127	OptimalChg_DisChg.Tim e8	Bit0~1	0~2	4:00~4:30 Mark of time period charging and discharging. Default: 0; 0 - does not operate, 1-AC charge, 2-PV charge, 3 - discharge
	OptimalChg_DisChg.Tim e9	Bit2~3	0~2	4:30~5:00 Mark of time period charging and discharging.
	OptimalChg_DisChg.Tim e10	Bit4~5	0~2	5:00~5:30 Mark of time period charging and discharging.
			
	OptimalChg_DisChg.Tim e15	Bit14~15	0~2	7:30~8:00 Mark of time period charging and discharging.

128	OptimalChg_DisChg.Tim e16	Bit0~1	0~2	8:00~8:30 Mark of time period charging and discharging. Default: 0; 0 - does not operate, 1-AC charge, 2-PV charge, 3 - discharge
	OptimalChg_DisChg.Tim e17	Bit2~3	0~2	8:30~9:00 Mark of time period charging and discharging.
	OptimalChg_DisChg.Tim e18	Bit4~5	0~2	9:00~9:30 Mark of time period charging and discharging.
			
	OptimalChg_DisChg.Tim e23	Bit14~15	0~2	11:30~12:00 Mark of time period charging and discharging.
129	OptimalChg_DisChg.Tim e24	Bit0~1	0~2	12:00~12:30 Mark of time period charging and discharging. Default: 0; 0 - does not operate, 1-AC charge, 2-PV charge, 3 - discharge;
	OptimalChg_DisChg.Tim e25	Bit2~3	0~2	12:30~13:00 Mark of time period charging and discharging.
	OptimalChg_DisChg.Tim e26	Bit4~5	0~2	13:00~13:30 Mark of time period charging and discharging.
			
	OptimalChg_DisChg.Tim e31	Bit14~15	0~2	17:00~17:30 Mark of time period charging and discharging.
130	OptimalChg_DisChg.Tim e32	Bit0~1	0~2	16:00~16:30 Mark of time period charging and discharging. 0 - does not operate, 1-AC charge, 2-PV charge, 3 - discharge;
	OptimalChg_DisChg.Tim e33	Bit2~3	0~2	16:30~17:00 Mark of time period charging and discharging.

	OptimalChg_DisChg.Tim e34	Bit4~5	0~2	17:00~17:30 Mark of time period charging and discharging.
			
	OptimalChg_DisChg.Tim e39	Bit14~15	0~2	19:30~20:00 Mark of time period charging and discharging.
131	OptimalChg_DisChg.Tim e40	Bit0~1	0~2	20:00~20:30 Mark of time period charging and discharging. 0-does not operate, 1-AC charge, 2-PV charge, 3 - discharge
	OptimalChg_DisChg.Tim e41	Bit2~3	0~2	20:30~21:00 Mark of time period charging and discharging.
	OptimalChg_DisChg.Tim e42	Bit4~5	0~2	21:00~21:30 Mark of time period charging and discharging.
			
	OptimalChg_DisChg.Tim e47	Bit14~15	0~2	23:30~0:00 Mark of time period charging and discharging.
132	BatCellVoltLow	0.1V	0-200	Battery cell voltage lower limit.
	BatCellVoltHigh	0.1V	0-200	Battery cell voltage upper limit
133	BatCellSerialNum	1	0-200	Number of battery cells in series
	BatCellParaNum	1	0-200	Number of battery cells in parallel
134	UVFDerateStartPoint	0.01Hz	4500-5000	Underfrequency load reduction starting point
135	UVFDerateEndPoint	0.01Hz	4500-5000	The end point of underfrequency load reduction
136	OVFDerateRatio	%Pm/Hz	1-100	Underfrequency load ramp rate
137	SpecLoadCompensate	w	0-65535	The maximum amount of compensation for a specific load
138	ChargePowerPercentC MD	0.1%	0-1000	Charging power percentage setting
139	DischgPowerPercentCM D	0.1%	0-1000	Discharging power percentage setting
140	ACChgPowerCMD	0.1%	0-1000	AC charge percentage setting
141	ChgFirstPowerCMD	0.1%	0-1000	Charging priority percentage setting

142	ForcedDischgPowerCM D	0.1%	0-1000	Forced discharge percentage setting
143	ActivePowerPercentCM D	0.1%	0-1000	Inverse active percentage setting
144	FloatChargeVolt	0.1V	500-560	Float charge voltage
145	OutputPrioConfig		0-3	0-bat first 1-PV first 2-AC first
146	LineMode		0-2	0-APL(90-280V 20ms) 1-UPS (170-280V 10ms)2-GEN (90-280V 20ms)
147	Battery capacity	Ah	0-10000	Battery capacity, for unmatched batteries
148	Battery nominal Voltage	0.1V	400-590	Battery rating voltage, for unmatched batteries
149	EqualizationVolt		500-590	Battery equalization voltage
150	EqualizationInterval	Day	0-365	Balancing interval
151	EqualizationTime	hour	0-24	Balancing duration
152	ACFirstStartHour	hour	0-23	AC load start time_hours setting
	ACFirstStartMinute	min	0-59	AC load start time_minutes setting
153	ACFirstEndHour	hour	0-23	AC load end time_hours setting
	ACFirstEndMinute	min	0-59	AC load end time_minutes setting
154	ACFirstStartHour1	hour	0-23	AC load start time_hours setting
	ACFirstStartMinute1	min	0-59	AC load start time_minutes setting
155	ACFirstEndHour1	hour	0-23	AC load end time_hours setting
	ACFirstEndMinute1	min	0-59	AC load end time_minutes setting
156	ACFirstStartHour2	hour	0-23	AC load start time_Hours setting
	ACFirstStartMinute2	min	0-59	AC load start time_minutes setting
157	ACFirstEndHour2	hour	0-23	AC load end time_hours setting
	ACFirstEndMinute2	min	0-59	AC load end time_minutes setting
158	ACChgStartVolt	0.1V	385-520	Battery voltage of AC charging start, which will be valid after selecting ACChg according to voltage
159	ACChgEndVolt	0.1V	480-590	Battery voltage of AC charging cut-off, effective after selecting ACChg according to voltage.
160	ACChgStartSOC	%	0-90	SOC of AC charging start , which will be valid after selecting ACChg according to SOC

161				
162	BatLowVoltage	0.1V	400-500	Battery undervoltage alarm point, which will be valid after selecting DisChgCtrl according to voltage or both
163	BatLowBackVoltage	0.1V	420-520	Battery undervoltage alarm recovery point, which will be valid after selecting DisChgCtrl according to voltage or both
164	BatLowSOC	%	0-90	Battery undervoltage alarm point, which will be valid after selecting DisChgCtrl according to SOC or both
165	BatLowBackSOC	%	20-100	Battery undervoltage alarm recovery point, which will be valid after selecting DisChgCtrl according to SOC or both
166	BatLowtoUtilityVoltage	0.1V	444-514	Voltage point for battery undervoltage to grid transfer, which will be valid after selecting DisChgCtrl according to voltage or both.
167	BatLowtoUtilitySOC	%	0-100	SOC for battery undervoltage to grid transfer, which will be valid after selecting DisChgCtrl according to SOC or both.
168	ACCharge Bat Current	A	0-140	Charge Current from AC
169	OngridEOD_Voltage	0.1V	400-560	On-grid end of discharge voltage
171	SOCCurve_BatVolt1	0.1V	400-600	SOC(V)
172	SOCCurve_BatVolt 2	0.1V	400-600	
173	SOCCurve_SOC1	1%	0-100	
174	SOCCurve_SOC2	1%	0-100	
175	SOCCurve_InnerResistance	mΩ	0-100	
176	MaxGridInputPower	W		
177	GenRatePower	W		
179	uFunctionEn2.ACCTDirection	Bit0	0,1	0-Normal 1-Reversed
	uFunctionEn2.PVCTDirection	Bit1	0,1	0-Normal 1-Reversed
	uFunctionEn2.AFCIAlar mClr	Bit2	0,1	0-null 1-clear
	uFunctionEn2.BatWake upEn-PVSellFirst	Bit3	0,1	0-Disable 1-Enable Power loss is not saved

	uFunctionEn2.VoltWattEn	Bit4	0,1	0-Disable 1-Enable
	uFunctionEn2.TriptimeUnit	Bit5	0,1	0-Disable 1-Enable
	uFunctionEn2.ActPowerCMDEn	Bit6	0,1	0-Disable 1-Enable
	uFunctionEn2.ubGridPeakShaving	Bit7	0,1	0-Disable 1-Enable
	uFunctionEn2.ubGenPeakShaving	Bit8	0,1	0-Disable 1-Enable
	uFunctionEn2.ubBatChgControl	Bit9	0,1	0-SOC,1-Volt
	uFunctionEn2.ubBatDiscChgControl	Bit10	0,1	0-SOC,1-Volt
	uFunctionEn2.ubACcoupling	Bit11	0,1	0-Disable 1-Enable
	uFunctionEn2.ubPVArcEn	Bit12	0,1	0-Disable 1-Enable
	uFunctionEn2.ubSmartLoadEn	Bit13	0,1	0-Generator 1-Smart Load
	uFunctionEn2.ubRSDDisable	Bit14	0,1	0-Enable 1-Disable
	uFunctionEn2.OnGridAIwaysOn	Bit15	0,1	0-Disable 1-Enable
180	AFCIArcThreshold			
181	VoltWatt_V1	0.1V		1.05Vn-1.09Vn, default1.06Vn
182	VoltWatt_V2	0.1V		(V1+0.01Vn)-1.10Vn, default1.1Vn
183	VoltWatt_DelayTime	Main cnt	500-60000ms	Default 10000ms
184	VoltWatt_P2	%	0-200	
185	Vref_QV	0.1V		
186	Vref_filtertime	s	300-5000	
187	Q3_QV	%		
188	Q4_QV	%		
189	P1_QP	%		
190	P2_QP	%		
191	P3_QP	%		
192	P4_QP	%		
193	UVFIIncreaseRatio	%Pm/Hz	1-100	Underfrequency load ramp rate
194	GenChgStartVolt	0.1V	384-520	Initial voltage for generator charging the battery, which will

				be valid after selecting GenChg according to voltage.
195	GenChgEndVolt	0.1V	480-590	Battery voltage at the end of generator charging, which will be valid after selecting GenChg according to voltage.
196	GenChgStartSOC	%	0-90	SOC for generator charging the battery, which will be valid after selecting GenChg according to SOC
197	GenChgEndSOC	%	20-100	SOC at the end of generator charging, which will be valid after selecting GenChg according to SOC
198	MaxGenChgBatCurr	A	0-60	Charge current from generator
199	OverTempDeratePoint	0.1°C	600-900	Overtemperature load reduction point
201	ChgFirstEndVolt	0.1V	480-590	Charging priority voltage limit
202	ForceDichgEndVolt	0.1V	400-560	Forced discharge voltage limit
203	GridRegulation			Grid regulation settings
204	LeadCapacity	Ah	50-850	
205	GridType			0-Split240V 1-Split208V 2-Single240V 3-Single230V 4-Split200V
206	GridPeakShavingPower	0.1kw	0-255	
207	GridPeakShavingSOC	%	0-100	
208	GridPeakShavingVolt	0.1V	480-590	
209	PeakShavingStartHour	hour	0-23	PeakShaving start time_Hour setting
	PeakShavingStartMinute	min	0-59	PeakShaving start time_minutes setting
210	PeakShavingEndHour	hour	0-23	PeakShaving end time_hours setting
	PeakShavingEndMinute	min	0-59	PeakShaving end time_minutes setting
211	PeakShavingStartHour1	hour	0-23	PeakShaving start time_hours setting
	PeakShavingStartMinute1	min	0-59	PeakShaving start time_minutes setting

212	PeakShavingEndHour1	hour	0-23	PeakShaving end time_hours setting
	PeakShavingEndMinute1	min	0-59	PeakShaving end time_minutes setting
213	SmartLoadOnVolt	0.1V	480-590	
214	SmartLoadOffVolt	0.1V	400-520	
215	SmartLoadOnSOC	%	0-100	
216	SmartLoadOffSOC	%	0-100	
217	StartPVpower	0.1kW	0-120	
218	GridPeakShavingSOC1	%	0-100	
219	GridPeakShavingVolt1	0.1V	480-590	
220	ACCoupleStartSOC	%	0-80	
221	ACCoupleEndSOC	%	0-100	
222	ACCoupleStartVolt	0.1V	400-520	
223	ACCoupleEndVolt	0.1V	400-560	
224	LCDVersion	Bit0~7	0-255	
	LCDScreenType	Bit8~10	0-7	0 - big screen 1 - small screen
	LCDMachineModelCode	Bit11~15	0~31	00:12K 01: All-in-one 02: Three phase inverter
225				
226	Resvd	Bit0~1		
	Function3.ExCtEn	Bit2	0,1	0-Disable 1-Enable
	Function3.RunwithoutGrid	Bit3	0,1	0-Disable 1-Enable
	Function3.NPeRlyEn	Bit4	0,1	0-Disable 1-Enable
	Resvd	Bit4~15		Reserved, unused
			
			

Table 8 Hold register mapping table

4. Appendix

- 1) Definition of the operation mode of on/off-grid energy storage all in one machine.

Status	All-in-one status	Remark
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code		
0x00	Standby	
0x01	Fault	
0x02	Programming	
0x04	PV PV connected to grid	PV power feed back to grid, AC energy storage does not have this variable.
0x08	PV PV charging	PV power charge the battery, AC energy storage does not have this variable.
0x0C	PV charging connected to the grid	A portion of the PV power is used for battery charging, while another portion is used for feeding back to grid, and AC energy storage does not have this variable.
0x10	The battery connect to the grid	The power od battery discharging will feed back to grid
0x14	(PV+ battery) connected to the grid	Battery discharge and PV energy are connected to the grid together, and AC energy storage does not have this variable
0x20	AC charging	Grid charges the battery
0x28	(PV+AC) charging	PV and grid power charge the battery together, and AC energy storage does not have this variable.
0x40	The battery is off-grid	off-grid mode, battery discharge
0x60	Off-grid + battery charging	On-grid system charge the battery (AC Coupled)
0x80	PV off-grid	PV power fluctuates randomly, the off-grid output is unstable, and the inverter is prohibited from working in this state, and AC energy storage does not have this variable.
0xC0	(PV+ battery) off-grid	In Off-gird mode, PV power and battery discharge, AC energy storage does not have this variable.
0x88	PV charging + off-grid	A portion of the PV power is used for off-grid output, while another portion is used for battery charging, and AC energy storage does not have this variable.

Table 9 Operational mode definitions

2) Fault and Alarm Code Definitions

Bit0-31	Fault information	Fault Code	Warning information	Warning Code
0	Internal communication failure 1	E000	Battery communication failed	W000
1	Model fault	E001	AFCI communication failure	W001
2	rsvd	E002	AFCI High Battery low temperature AFCI High	W002
3	rsvd	E003	Meter communication failed	W003

4	rsvd	E004	The battery cannot be charged and discharged	W004
5	rsvd	E005	The automated test failed	W005
6	rsvd	E006	RSD Active	W006
7	rsvd	E007	LCD communication failure	W007
8	Parallel CAN communication failure	E008	Software version mismatch	W008
9	The host is missing	E009	The fan is stuck and not rotating	W009
10	The rated power output of multiple hosts or parallel machines is inconsistent	E010	rsvd	W010
11	The AC of the parallel system is inconsistent or the safety settings of the parallel system are inconsistent	E011	The number of secondary units for parallel operation exceeds the limit	W011
12	UPS short circuit	E012	The parallel operation system is experiencing phase loss	W012
13	UPS backfilling	E013	The parallel operation system does not have a designated primary unit	W013
14	BUS short circuit	E014	Set up multiple hosts in the parallel system	W014
15	The phase of the three-phase parallel system is abnormal	E015	Battery reverse	W015
16	Relay failure	E016	No grid connection	W016
17	Internal communication failure 2	E017	The grid voltage exceeds the specified range	W017
18	Internal communication failure 3	E018	The grid frequency exceeds the specified range	W018
19	BUS overvoltage	E019	rsvd	W019
20	EPS connection fault	E020	The insulation resistance is low, and AC energy storage does not have this variable	W020
21	PV overvoltage, AC energy storage without this fault	E021	The leakage current is too high	W021
22	Overcurrent protection	E022	DCI exceeded the standard	W022
23	Neutral fault	E023	PV short circuit, AC energy storage does not have this variable	W023
24	PV short circuit, AC energy storage has no such fault	E024	rsvd	W024
25	Heatsink temperature out of range	E025	Battery overvoltage	W025

26	Internal failure	E026	Battery undervoltage	W026
27	Consistency failure	E027	Battery open circuit	W027
28	The generator connection in parallel system is inconsistent	E028	Off-grid overload	W028
29	Parallel synchronization triggers signal loss	E029	Off-grid overvoltage	W029
30	rsvd	E030	Meter reversed	W030
31	Internal communication failure 4	E031	DCV exceeded the standard	W031

Table 10 Fault and alarm definitions

FaultCode	Fault description	LCD display	Trouble shooting
E000	Internal communication fault1	E000	Restart inverter, if the error still exist, contact us (DSP&M3)
E001	Model fault	E001	Reset model, check if safety standard switch is at the right place
E002	rsvd	E002	
E003	rsvd	E003	
E004	rsvd	E004	
E005	rsvd	E005	
E006	rsvd	E006	
E007	rsvd	E007	
E008	Parallel CAN communication failure	E008	Check CAN cable connection
E009	The host is missing	E009	Check parallel setting
E010	Inconsistent rated power output in multi-host or parallel computing systems. (Mutl Primary or Rating Watt Diff)	E010	Check parallel setting
E011	Inconsistent AC connection or grid safety settings in parallel computing systems. (AC Connection Diff Or Grid Safety Setting Diff)	E011	Check parallel setting Check parallel connection or contact us

E012	UPS UPS short circuit	E012	Check parallel connection or contact us
E013	UPS UPS backfilling	E013	Restart inverter, if the error still exist, contact us
E014	BUS BUS short circuit	E014	Contact us
E015	Phase abnormality in a three-phase parallel system	E015	Check parallel connection and setting
E016	Relay fault	E016	Restart inverter, if the error still exist, contact us
E017	Internal communication fault2	E017	Restart inverter, if the error still exist, contact us (DSP&M8)
E018	Internal communication fault3	E018	Restart inverter, if the error still exist, contact us (DSP&M3)
E019	Bus voltage high	E019	Check PV input connection
E020	EPS connection fault	EPS CN Fault	Check EPS and AC connection
E021	PV voltage high	PV voltage high	Check PV input connection
E023	Neutral fault	Neutral fault	Check neutral connection
E024	PV short	E024	Check PV connection
E025	Temperature over range	NTC Open	Check NTC connection
E026	Internal Fault	E026	Restart inverter, if the error still exist, contact us (Bus sample)
E027	Sample inconsistant between main and slave CPU	E027	Restart inverter, if the error still exist, contact us
E028	sync signal lost in parallel system or Gen connection issue. The parallel synchronization signal is lost or the generator connection is abnormal	E028	Check CAN cable connection Check Gen connection or Contact us
E029	sync triger signal lost in parallel system. Parallel synchronization triggers signal loss	E029	Check CAN cable connection

E030	rsvd	E030	
E031	Internal communication fault4	E031	Restart inverter, if the error still exist, contact us (DSP&M8)

Table 11 Failure Information Table

WarningCode	Warning description	LCD display	Trouble shooting
W000	Communication failure with battery	Batery Com Fault	Check communication cable, if the warning still exist, contact us
W001	AFCI communication fault		
W002	AFCI High		
W003	Communication failure with meter	Meter Com Fault	Check communication cable, if the warning still exist, contact us
W004	Battery failure	Battery failure	Restart battery, if the warning still exist, contact us
W005	AutoTest failure	AutoTest failure	Restart inverter, if the error still exist, contact us
W006			
W007	LCD communication Fault	W007	Restart battery, if the warning still exist, contact us
W008	Software mismatch	W008	
W009	Fan Stuck	W009	Restart inverter, if the error still exist, contact us
W010	Same para address	W010	
W011	Secondary overflow	W011	Check parallel number
W012	BatOnMosor Phase loss for parallel system	W012	Restart inverter, if the error still exist, contact us
W013	Overtemprature or No primary set in parallel system	W013	Restart inverter(or check parallel setting), if the error still exist, contact us
W014	Muti-Primary set in parallel system	W014	Check parallel setting
W015	Battery Reverse	W015	Check battery power connect
W016	No AC Connection	No AC Connection	Check AC Connection
W017	AC Voltage out of range	AC V Outrange	Check AC voltage
W018	AC Frequency out of range	AC F Outrange	Check AC frequency
W019	AC inconsistent in	W019	Check parallel connection or

	parallel system2 The parallel AC is inconsistent		contact us
W020	PV Isolation low	PV Isolation low	Restart inverter, if the error still exist, contact us
W021	Leakage I high	Leakage I high	Restart inverter, if the error still exist, contact us
W022	DC injection high	DC injection high	Restart inverter, if the error still exist, contact us
W023	PV short circuit	PV short	Check PV input connection
W024	rsvd	W024	Restart inverter, if the error still exist, contact us
W025	Battery voltage high	Bat Volt High	Check battery connection
W026	Battery voltage low	Bat Volt Low	Check battery connection
W027	Battery open	Battery open	Check battery connection
W028	EPS Overload	EPS Over load	Check EPS load
W030	Meter Reversed	W030	Check meter connection
W031	EPS DCV high	W031	Restart inverter, if the error still exist, contact us

Table 12 Alarm information table

3) On-grid Regulatory Mapping Table

Bit0-31	Type of safety	Remark	American model voltage system Safety type
0	General	Same VDE0126	UL1741&IEEE1547
1	VDE0126	Germany	Hawaii
2	AS4777	Australia	USA(rule21)
3	NEWZEALAND	New Zealand	PR-LUMA
4	CGC	China	
5	G59	United Kingdom	
6	G83	United Kingdom	
7	N4105	Germany	
8	CEI0-21	Italy	
9	EN50438		
10	EN50438_Finland	Finland	
11	Japan	Japan	
12	Shenzhen Lux Power Technology Co., Ltd	Thailand	www.luxpowertek.com

13	MEA	Thailand	
14	EN50438_Ireland	Ireland	
15	Czech	Czech Republic	
16	South Africa	South Africa	
17	Barbados		
18	CEI021ARETI		
19	EN50549		
20	Denmark		
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			

Table 13: on-grid regulatory mapping table