Sigenergy

Modbus Protocol

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Contents

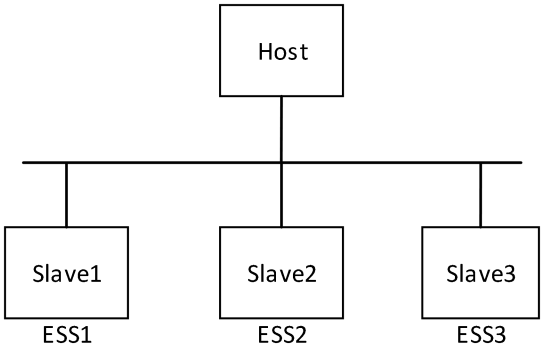
Version	Date	Change Description
V1.0-V1.8	2023-08-15 to 2024-08-05	Added description for interaction timeout. Supporting plant-wide power control. Added definition for alarm severity. Added a few phase power related registers and mode controlling registers. Added DC Charger related registers. Modified and added a few remote EMS and ESS control related registers. Added description of using different Modbus slave address querying different devices or power plant.
V2.0	2024-10-14	Added AC-Charger model and it's related registers. Added AC-Charger related system state and alarm appendix. Added DC-Charger related alarm appendix. Modified appendix names. Modified descriptions of RTU frame and PDU examples in chapter 6.
V2.1	2024-10-30	Added "Applicable model abbreviation" definition. Added applicable model columns in chapter 5. Added descriptions for communication interfaces. Added PV related registers. Modified alarm code names.
V2.2	2024-11-28	Added description for plant broadcast address. Added inverter level power control related registers. Modified plant parameter registers.
V2.3	2024-12-09	Added new applicable models.
V2.4	2025-02-05	Modified a few inverter's registers.

V2.5	2025-02-19	Added a few plant ESS related registers, two grid point and two PCS power control registers. Modified comments of a few holding registers. Added a few hybrid inverter battery temperature and voltage-related registers.
V2.6	2025-03-31	Added plant running info registers:plant PV total generation, Total load daily consumption, Total load consumption(30088-30094); Smart load 1-24 total consumption (30098-30144); smart load 1-24 power(30146-30192); Added plant parameter setting registers:[ESS] backup SOC, charge cut-off SOC and discharge cut-off SOC(40046 - 40048); Added hybrid inverter running info registers: ower adjustment related registers feedback value (30613-30619); PV daily generation and PV total generation (31509-31511).
V2.7	2025-05.23	Added plant running info registers: Third party inverter power(30194), Cumulative Energy Interface(30196-30268); Added an enumeration to register EMS working mode(30003): "5: Full Feed-in to Grid" and "9: Custom" Deleted hybrid inverter setting parameter: Grid code(40501) Appendix 1 "Running state" added an enumeration: Environmental Abnormality 0x07

1. Introduction

This Modbus protocol complies the standard Modbus Application protocol specification. The physical media is multiple, such as RS485, Fast Ethernet, WLAN, Optical fiber and 4G. The figure below shows a simple host-slave mode in Modbus protocol.

Specifically, in a inverter-consisted power plant, to request information or control an individual devices, Modbus frames should be sent to the corresponding device's Modbus slave address, which must be set to a unique value among a inverter-consisted power plant in App. To request plant information or control plant behavior, Modbus frames should be sent to Modbus slave address 247, known as the "**plant address**". To control plant behavior and to not receive Modbus reply, Modbus frames should be sent to Modbus slave address 0, known as the "**plant broadcast address**".



2. Applicable Model

Table 2-1 lists the machine models applicable to this protocol. Each applicable model abbreviation in the table represents all the machine models listed to its right. In Chapter 5, "Register Address Definition," each register corresponds to a specific applicable model abbreviation, indicating that the register can only be read or written by the machine models the abbreviation represents.

Table 2-1 Applicable models

Applicable model abbreviation	Model	Note
Hybrid Inv.	SigenStor EC (3.0, 3.6, 4.0, 4.6, 5.0, 6.0, 8.0, 10.0, 12.0) SP series	MPPT count: 2-4 PV count: 2-4
	Sigen Hybrid (3.0, 3.6, 4.0, 4.6, 5.0, 6.0) SP	MPPT count: 2-4 PV count: 2-4
	Sigen Hybrid (5.0, 6.0, 8.0, 10.0, 12.0, 15.0, 17.0, 20.0, 25.0, 30.0) TP series	MPPT count: 2-4 PV count: 2-4
	SigenStor EC (5.0, 6.0, 8.0, 10.0, 12.0, 15.0, 17.0, 20.0, 25.0, 30.0) TP/TPLV series	MPPT count: 2-4 PV count: 2-4
	Sigen PV (50, 60, 80, 100, 110, 125)M1-HYA series	MPPT count: 4-8 PV count: 8-16
	PG Controller (3.8, 4.8, 5.7, 7.6, 9.6, 11.4) series	MPPT count: 2-4 PV count: 2-4
EVAC	Sigen EVAC (7, 11, 22) 4G T2 WH	/
	Sigen EVAC (7, 11, 22) 4G T2SH WH	/
	PG EVAC (9.6, 11.5) series	/
PV Inv.	Sigen PV Max (3.0, 3.6, 4.0, 4.6, 5.0, 6.0) SP	MPPT count: 2-4 PV count: 2-4
	Sigen PV Max (5.0, 6.0, 8.0, 10.0, 12.0, 15.0, 17.0, 20.0, 25.0) TP	MPPT count: 2-4 PV count: 2-4
	Sigen PV (50, 60, 75, 80, 99.9, 100, 110, 125)M1 series	MPPT count: 4-8 PV count: 8-16

3. Communication Interface

3.1 RS485

For applicable model abbreviation type "EVAC" devices, the interface described in this section is not supported.

For applicable model abbreviation type "Hybrid Inv." and “PV Inv.” devices, third-party controllers only need to connect to one device in the power plant through the interface (RS485) described in this section and can read or write registers of all devices within the power plant (with different modbus slave addresses). The power plant can consist of multiple parallel-connected "Hybrid Inv." or “PV Inv.” devices.

Table 3-1 RS485 interface description

Parameter	Description
Transfer mode	RTU mode
Communication mode	Half duplex
Baud rate	9600bps(default)
Start bit	1
Data bit	8
Check bit	None
Stop bit	1

3.2 Fast Ethernet/WLAN/Optical fiber/4G

For applicable model abbreviation type "Hybrid Inv." and “PV Inv.” devices,

third-party controllers only need to connect to one device in the power plant through the interface described in this section and can read or write registers of all devices within the power plant (with different modbus slave addresses). The power plant can consist of multiple parallel-connected "Hybrid Inv." or “PV Inv.” devices.

For applicable model abbreviation type “EVAC” device, it must be connected to a "Hybrid Inv." or “PV Inv.”device. Third-party controllers have to connect to the "Hybrid Inv." or “PV Inv.” device using the interface described in this section to access registers of the “EVAC” device.

Table 3-2 Fast Ethernet/WLAN/Optical fiber/4G interface description

Parameter	Description
Transfer mode	TCP mode
Communication mode	Full duplex
Link layer Mode	TCP Server
Application layer Mode	Slave
Port	502

3.3 Fast Ethernet/WLAN/Optical fiber/4G*

For applicable model abbreviation type "Hybrid Inv." and “PV Inv.” devices, third-party controllers only need to connect to one device in the power plant through the interface described in this section and can read or write registers of all devices within the power plant (with different modbus slave addresses). The power plant can consist of multiple parallel-connected "Hybrid Inv." or “PV

Inv." devices.

For applicable model abbreviation type "EVAC" device, it must be connected to a "Hybrid Inv." or "PV Inv." device. Third-party controllers have to connect to the "Hybrid Inv." or "PV Inv." device using the interface described in this section to access registers of the "EVAC" device.

Table 3-3 Fast Ethernet/WLAN/Optical fiber/4G interface description

Parameter	Description
Transfer mode	TCP mode
Communication mode	Full duplex
Link layer Mode	TCP Client
Application layer Mode	Slave
Port	custom

*Note :To be specific, if 4G is the only physical communication media, the protocol then only supports one inverter device to connect the third party cloud as a client.

4. Technical Terms

4.1 Technical item name specification:

Table 4-1 Technical item description

Item	Description
Host	The one that initiates an application request is referred to the host
Slave	The one that responds to an application request is referred to the slave
Access plant address	247
Plant broadcast address	0

Slave address range	1-246
U16	Unsigned integer of 16-bit
U32	Unsigned integer of 32-bit
U64	Unsigned integer of 64-bit
S16	Signed integer of 16-bit
S32	Signed integer of 32-bit
STRING	Character string in ASCII
RO	Read only, only support 0x04 command
WO	Write only, only support 0x06 command
RW	Read and write, support 0x04、0x06、0x10 command

4.2 Interaction timeout

A communication process following the Modbus protocol should always be stared by a host.

Minimum Request period : 1000 ms

After sending an unicast request, before receiving a respond from the slave device, the host should wait for up to 1000ms to send a new unicast request to the slave device. If no respond is received from the slave device after waiting for 1000 ms, the host should regard this request as a timeout. In poor network conditions or when using extra-long RS485 connections, it may be necessary to appropriately increase the minimum request period.

Plant broadcast address:

When the host sends a broadcast request to Modbus slave address 0, the devices will perform but will not reply Modbus frame.

4.3 Alarm severity level definition

There are only two levels of alarms, and their definitions are as follows:

Critical Alarm: The external environment does not meet the operating conditions for the device, or a serious device fault has occurred. The device will enter fault mode and stop operating. The alarm can be automatically cleared once the external conditions or the device fault is resolved.

General Alarm: Due to minor faults either in the external environment or within the device, the device can still operate normally or at a reduced capacity. The alarm can be automatically cleared once the external conditions or the device fault is resolved.

5. Register Address Definition

5.1 Plant running information address definition (read-only register)

The registers below can only be accessed by slave address 247, namely “plant address”. To obtain power plant data, inquiries should be send to address 247.

Table 5-1 Plant running information address definition

No.	Name	Add.	QTY	Perm.	Data Type	Gain	Unit	Hybrid Inv,	PV inv.	Comment

1	System time	30000	2	RO	U32	1	s	√	√	Epoch seconds
2	System time zone	30002	1	RO	S16	1	min	√	√	
3	EMS work mode	30003	1	RO	U16	N/A	N/A	√	√	0: Max self consumption; 1: AI Mode; 2: TOU 5: Full Feed-in to Grid 7: Remote EMS mode 9: Custom
4	[Grid Sensor] Status	30004	1	RO	U16	N/A	N/A	√	√	(gateway or meter connection status) 0: not connected 1: connected
5	[Grid sensor] Active power	30005	2	RO	S32	1000	kW	√	√	Data collected from grid sensor at grid to system checkpoint; >0 buy from grid; <0 sell to grid
6	[Grid sensor] Reactive power	30007	2	RO	S32	1000	kVar	√	√	Data collected from grid sensor at grid to system checkpoint;
7	On/Off Grid status	30009	1	RO	U16	N/A	N/A	√		0: on grid 1: off grid (auto) 2: off grid (manual)
8	Max active power	30010	2	RO	U32	1000	kW	√	√	This is should be the base value of all active power adjustment actions
9	Max apparent power	30012	2	RO	U32	1000	kVar	√	√	This is should be the base value of all reactive power adjustment actions
10	[ESS] SOC	30014	1	RO	U16	10	%	√		
11	Plant phase A active power	30015	2	RO	S32	1000	kW	√	√	
12	Plant phase B active power	30017	2	RO	S32	1000	kW	√	√	
13	Plant phase C active power	30019	2	RO	S32	1000	kW	√	√	
14	Plant phase A reactive power	30021	2	RO	S32	1000	kVar	√	√	
15	Plant phase B reactive power	30023	2	RO	S32	1000	kVar	√	√	

16	Plant phase C reactive power	30025	2	RO	S32	1000	kVar	√	√	
17	General Alarm1	30027	1	RO	U16	N/A	N/A	√	√	If any hybrid inverter has alarm , then this alarm will be set accordingly. Refer to Appendix 2
18	General Alarm2	30028	1	RO	U16	N/A	N/A	√	√	If any hybrid inverter has alarm , then this alarm will be set accordingly. Refer to Appendix 3
19	General Alarm3	30029	1	RO	U16	N/A	N/A	√		If any hybrid inverter has alarm , then this alarm will be set accordingly. Refer to Appendix 4
20	General Alarm4	30030	1	RO	U16	N/A	N/A	√	√	If any hybrid inverter has alarm , then this alarm will be set accordingly. Refer to Appendix 5
21	Plant active power	30031	2	RO	S32	1000	kW	√	√	
22	Plant reactive power	30033	2	RO	S32	1000	kVar	√	√	
23	Photovoltaic power	30035	2	RO	S32	1000	kW	√	√	
24	[ESS] Power	30037	2	RO	S32	1000	kW	√		<0: discharging >0: charging
25	Available max active power	30039	2	RO	U32	1000	kW	√	√	Feed to the ac terminal. Count only the running inverters
26	Available min active power	30041	2	RO	U32	1000	kW	√		Absorb from the ac terminal. Count only the running inverters
27	Available max reactive power	30043	2	RO	U32	1000	kVar	√	√	Feed to the ac terminal. Count only the running inverters
28	Available min reactive power	30045	2	RO	U32	1000	kVar	√	√	Absorb from the ac terminal. Count only the running inverters
29	[ESS]Available max charging power	30047	2	RO	U32	1000	kW	√		Count only the running inverters

30	[ESS]Available max discharging power	30049	2	RO	U32	1000	kW	√		Count only the running inverters
31	Plant running state	30051	1	RO	U16	N/A	N/A	√	√	Refer to Appendix 1
32	[Grid sensor] Phase A active power	30052	2	RO	S32	1000	kW	√	√	Data collected from grid sensor at grid to system checkpoint; >0 buy from grid; <0 sell to grid
33	[Grid sensor] Phase B active power	30054	2	RO	S32	1000	kW	√	√	Data collected from grid sensor at grid to system checkpoint; >0 buy from grid; <0 sell to grid
34	[Grid sensor] Phase C active power	30056	2	RO	S32	1000	kW	√	√	Data collected from grid sensor at grid to system checkpoint; >0 buy from grid; <0 sell to grid
35	[Grid sensor] Phase A reactive power	30058	2	RO	S32	1000	kVar	√	√	Data collected from grid sensor at grid to system checkpoint;
36	[Grid sensor] Phase B reactive power	30060	2	RO	S32	1000	kVar	√	√	Data collected from grid sensor at grid to system checkpoint;
37	[Grid sensor] Phase C reactive power	30062	2	RO	S32	1000	kVar	√	√	Data collected from grid sensor at grid to system checkpoint;
38	[ESS]Available max charging capacity	30064	2	RO	U32	100	kWh	√		Count only the running inverters
39	[ESS]Available max discharging capacity	30066	2	RO	U32	100	kWh	√		Count only the running inverters
40	[ESS] Rated charging power	30068	2	RO	U32	1000	kW	√		
41	[ESS] Rated discharging power	30070	2	RO	U32	1000	kW	√		
42	General Alarm5	30072	1	RO	U16	N/A	N/A	√		If any hybrid inverter has alarm , then this alarm will be set accordingly. Refer to Appendix 11

43	Reserved	30073	10	RO	N/A	N/A	N/A			
44	[ESS] Rated energy capacity	30083	2	RO	U32	100	kWh	√		
45	[ESS] Charge Cut-Off SOC	30085	1	RO	U16	10	%	√		
46	[ESS] Discharge Cut-Off SOC	30086	1	RO	U16	10	%	√		
47	[ESS] SOH	30087	1	RO	U16	10	%	√		This value is the weighted average of the SOH of all ESS devices in the power plant, with each rated capacity as the weight.
48	Plant PV total generation	30088	4	RO	U64	100	kWh	√	√	
49	Total load daily consumption	30092	2	RO	U32	100	kWh	√	√	
50	Total load consumption	30094	4	RO	U64	100	kWh	√	√	
51	[Smart load 1] Total consumption	30098	2	RO	U32	100	kWh	√	√	
52	[Smart load 2] Total consumption	30100	2	RO	U32	100	kWh	√	√	
53	[Smart load 3] Total consumption	30102	2	RO	U32	100	kWh	√	√	
54	[Smart load 4] Total consumption	30104	2	RO	U32	100	kWh	√	√	
55	[Smart load 5] Total consumption	30106	2	RO	U32	100	kWh	√	√	
56	[Smart load 6] Total consumption	30108	2	RO	U32	100	kWh	√	√	
57	[Smart load 7] Total consumption	30110	2	RO	U32	100	kWh	√	√	
58	[Smart load 8] Total consumption	30112	2	RO	U32	100	kWh	√	√	
59	[Smart load 9] Total consumption	30114	2	RO	U32	100	kWh	√	√	
60	[Smart load 10] Total consumption	30116	2	RO	U32	100	kWh	√	√	
61	[Smart load 11] Total consumption	30118	2	RO	U32	100	kWh	√	√	
62	[Smart load 12] Total consumption	30120	2	RO	U32	100	kWh	√	√	

63	[Smart load 13] Total consumption	30122	2	RO	U32	100	kWh	√	√	
64	[Smart load 14] Total consumption	30124	2	RO	U32	100	kWh	√	√	
65	[Smart load 15] Total consumption	30126	2	RO	U32	100	kWh	√	√	
66	[Smart load 16] Total consumption	30128	2	RO	U32	100	kWh	√	√	
67	[Smart load 17] Total consumption	30130	2	RO	U32	100	kWh	√	√	
68	[Smart load 18] Total consumption	30132	2	RO	U32	100	kWh	√	√	
69	[Smart load 19] Total consumption	30134	2	RO	U32	100	kWh	√	√	
70	[Smart load 20] Total consumption	30136	2	RO	U32	100	kWh	√	√	
71	[Smart load 21] Total consumption	30138	2	RO	U32	100	kWh	√	√	
72	[Smart load 22] Total consumption	30140	2	RO	U32	100	kWh	√	√	
73	[Smart load 23] Total consumption	30142	2	RO	U32	100	kWh	√	√	
74	[Smart load 24] Total consumption	30144	2	RO	U32	100	kWh	√	√	
75	[Smart load 1] Power	30146	2	RO	I32	1000	kW	√	√	
76	[Smart load 2] Power	30148	2	RO	I32	1000	kW	√	√	
77	[Smart load 3] Power	30150	2	RO	I32	1000	kW	√	√	
78	[Smart load 4] Power	30152	2	RO	I32	1000	kW	√	√	
79	[Smart load 5] Power	30154	2	RO	I32	1000	kW	√	√	
80	[Smart load 6] Power	30156	2	RO	I32	1000	kW	√	√	
81	[Smart load 7] Power	30158	2	RO	I32	1000	kW	√	√	
82	[Smart load 8] Power	30160	2	RO	I32	1000	kW	√	√	
83	[Smart load 9] Power	30162	2	RO	I32	1000	kW	√	√	

84	[Smart load 10] Power	30164	2	RO	I32	1000	kW	√	√	
85	[Smart load 11] Power	30166	2	RO	I32	1000	kW	√	√	
86	[Smart load 12] Power	30168	2	RO	I32	1000	kW	√	√	
87	[Smart load 13] Power	30170	2	RO	I32	1000	kW	√	√	
88	[Smart load 14] Power	30172	2	RO	I32	1000	kW	√	√	
89	[Smart load 15] Power	30174	2	RO	I32	1000	kW	√	√	
90	[Smart load 16] Power	30176	2	RO	I32	1000	kW	√	√	
91	[Smart load 17] Power	30178	2	RO	I32	1000	kW	√	√	
92	[Smart load 18] Power	30180	2	RO	I32	1000	kW	√	√	
93	[Smart load 19] Power	30182	2	RO	I32	1000	kW	√	√	
94	[Smart load 20] Power	30184	2	RO	I32	1000	kW	√	√	
95	[Smart load 21] Power	30186	2	RO	I32	1000	kW	√	√	
96	[Smart load 22] Power	30188	2	RO	I32	1000	kW	√	√	
97	[Smart load 23] Power	30190	2	RO	I32	1000	kW	√	√	
98	[Smart load 24] Power	30192	2	RO	I32	1000	kW	√	√	
99	Third Party inverter active power	30194	2	RO	I32	1000	kW	√	√	
100	Total generation of third party inverter	30196	4	RO	U64	100	kWh	√	√	
101	Total charged energy of the ESS	30200	4	RO	U64	100	kWh	√	√	
102	Total discharged energy of the ESS	30204	4	RO	U64	100	kWh	√	√	
103	Total charged energy of the EVDC	30208	4	RO	U64	100	kWh	√	√	
104	Total discharged energy of the	30212	4	RO	U64	100	kWh	√	√	

	EVDC									
105	Total imported energy	30216	4	RO	U64	100	kWh	√	√	
106	Total exported energy	30220	4	RO	U64	100	kWh	√	√	
107	Total energy output of oil-fueled generator	30224	4	RO	U64	100	kWh	√	√	
108	Total energy consumption of common loads	30228	4	RO	U64	100	kWh	√	√	New statistics interface, excluding EVAC and EVDC charged energy.
109	Total charged energy of the EVAC	30232	4	RO	U64	100	kWh	√	√	New statistics interface,
110	Total generation of self PV	30236	4	RO	U64	100	kWh	√	√	New statistics interface, excluding generation of third party inverter
111	Total generation of third party inverter	30240	4	RO	U64	100	kWh	√	√	New statistics interface
112	Total charged energy of the ESS	30244	4	RO	U64	100	kWh	√	√	New statistics interface
113	Total discharged energy of the ESS	30248	4	RO	U64	100	kWh	√	√	New statistics interface
114	Total charged energy of the EVDC	30252	4	RO	U64	100	kWh	√	√	New statistics interface
115	Total discharged energy of the EVDC	30256	4	RO	U64	100	kWh	√	√	New statistics interface
116	Total imported energy	30260	4	RO	U64	100	kWh	√	√	New statistics interface
117	Total exported energy	30264	4	RO	U64	100	kWh	√	√	New statistics interface
118	Total energy output of oil-fueled generator	30268	4	RO	U64	100	kWh	√	√	New statistics interface

*Note :For the new energy-statistics interface (registers 30228~30268), after upgrading the device firmware to support this interface, the register values will reset to 0 and start fresh counting without inheriting historical data.

5.2 Plant parameter setting address definition (holding register)

The registers below can only be accessed by slave address 0 or 247. To modify plant-level registers, send commands to address 0 or 247. When sending commands to address 0, the device will only execute and will not reply. When sending commands to address 247, the device will both execute and respond.

Note: Power control related registers not explicitly mentioned in the "Comment" will take effect only when the remote EMS control mode value is 0.

Table 5-2 Plant parameter setting address definition

No.	Name	Add.	QTY	Perm.	Data Type	Gain	Unit	Hybrid Inv,	PV inv.	Comment
1	Start/Stop	40000	1	WO	U16	N/A	N/A	√	√	0: Stop 1: Start
2	Active power fixed adjustment target value	40001	2	RW	S32	1000	kW	√	√	
3	Reactive power fixed adjustment target value	40003	2	RW	S32	1000	kVar	√	√	Range: [-60.00 * base value ,60.00 * base value]. Takes effect globally regardless of the EMS operating mode.
4	Active power percentage adjustment target value	40005	1	RW	S16	100	%	√	√	Range: [-100.00,100.00]
5	Q/S adjustment target value	40006	1	RW	S16	100	%	√	√	Range: [-60.00,60.00]. Takes effect globally regardless of the EMS operating mode.
6	Power factor adjustment target value	40007	1	RW	S16	1000	N/A	√	√	Range: (-1, -0.8] U [0.8, 1]. Grid Sensor needed. Takes effect globally regardless of the EMS operating mode.
7	Phase A active power fixed adjustment target value	40008	2	RW	S32	1000	kW	√		Valid only when output type is L1/L2/L3/N

8	Phase B active power fixed adjustment target value	40010	2	RW	S32	1000	kW	√		Valid only when output type is L1/L2/L3/N
9	Phase C active power fixed adjustment target value	40012	2	RW	S32	1000	kW	√		Valid only when output type is L1/L2/L3/N
10	Phase A reactive power fixed adjustment target value	40014	2	RW	S32	1000	kVar	√		Valid only when output type is L1/L2/L3/N
11	Phase B reactive power fixed adjustment target value	40016	2	RW	S32	1000	kVar	√		Valid only when output type is L1/L2/L3/N
12	Phase C reactive power fixed adjustment target value	40018	2	RW	S32	1000	kVar	√		Valid only when output type is L1/L2/L3/N
13	Phase A Active power percentage adjustment target value	40020	1	RW	S16	100	%	√		Valid only when output type is L1/L2/L3/N. Range: [-100.00,100.00]
14	Phase B Active power percentage adjustment target value	40021	1	RW	S16	100	%	√		Valid only when output type is L1/L2/L3/N. Range: [-100.00,100.00]
15	Phase C Active power percentage adjustment target value	40022	1	RW	S16	100	%	√		Valid only when output type is L1/L2/L3/N. Range: [-100.00,100.00]
16	Phase A Q/S fixed adjustment target value	40023	1	RW	S16	100	%	√		Valid only when output type is L1/L2/L3/N. Range: [-60.00,60.00]
17	Phase B Q/S fixed adjustment target value	40024	1	RW	S16	100	%	√		Valid only when output type is L1/L2/L3/N. Range: [-60.00,60.00]
18	Phase C Q/S fixed adjustment target value	40025	1	RW	S16	100	%	√		Valid only when output type is L1/L2/L3/N. Range: [-60.00,60.00]
19	Reserved	40026	3	RW	N/A	N/A	N/A			
20	Remote EMS enable	40029	1	RW	U16	N/A	N/A	√	√	0: disabled 1: enabled When needed to control EMS remotely, this register needs to be enabled. When enabled, the plant's EMS work mode (30003) will switch to remote EMS.

21	Independent phase power control enable	40030	1	RW	U16	N/A	N/A	√		Valid only when output type is L1/L2/L3/N. To enable independent phase control, this parameter must be enabled. 0: disabled 1: enabled
22	Remote EMS control mode	40031	1	RW	U16	N/A	N/A	√	√	Mode values' definition refer to Appendix 6
23	ESS max charging limit	40032	2	RW	U32	1000	kW	√		[0, Rated ESS charging power]. Takes effect when Remote EMS control mode (40031) is 3 or 4.
24	ESS max discharging limit	40034	2	RW	U32	1000	kW	√		[0, Rated ESS discharging power]. Takes effect when Remote EMS control mode (40031) is 5 or 6.
25	PV max power limit	40036	2	RW	U32	1000	kW	√		Takes effect when Remote EMS control mode (40031) is 3, 4, 5 or 6.
26	[Grid Point]Maximum export limitation	40038	2	RW	U32	1000	kW	√	√	Grid Sensor needed. Takes effect globally regardless of the EMS operating mode.
27	[Grid Point] Maximum import limitation	40040	2	RW	U32	1000	kW	√	√	Grid Sensor needed. Takes effect globally regardless of the EMS operating mode.
28	PCS maximum export limitation	40042	2	RW	U32	1000	kW	√	√	Range:[0, 0xFFFFFFFE]。With value 0xFFFFFFFF, register is not valid. In all other cases, Takes effect globally.
29	PCS maximum import limitation	40044	2	RW	U32	1000	kW	√	√	Range:[0, 0xFFFFFFFE]。With value 0xFFFFFFFF, register is not valid. In all other cases, Takes effect globally.
30	[ESS]Backup SOC	40046	1	RW	U16	10	%	√		Range: [0,100.0]
31	[ESS] Charge Cut-Off SOC	40047	1	RW	U16	10	%	√		Range: [0,100.0]

32	[ESS] Discharge Cut-Off SOC	40048	1	RW	U16	10	%	√		Range: [0,100.0]

5.3 Hybrid inverter running information address definition (read-only register)

The registers below can only be accessed with a valid Hybrid inverter's Modbus slave address (1-246). When using PV string related registers, please refer to the PV count listed in Tabel2-1 in Chapter 2, to ensure if the register is available.

Table 5-3 Hybrid inverter running information address definition

No.	Name	Add.	QTY	Perm.	Data Type	Gain	Unit	Hybrid Inv,	PV inv.	Comment
1	Model type	30500	15	RO	STRING	N/A	N/A	√	√	
2	Serial number	30515	10	RO	STRING	N/A	N/A	√	√	
3	Machine firmware version	30525	15	RO	STRING	N/A	N/A	√	√	
4	Rated active power	30540	2	RO	U32	1000	kW	√	√	
5	Max. apparent power	30542	2	RO	U32	1000	kVA	√	√	
6	Max. active power	30544	2	RO	U32	1000	kW	√	√	
7	Max. absorption power	30546	2	RO	U32	1000	kW	√		
8	Rated battery capacity	30548	2	RO	U32	100	kWh	√		
9	[ESS]Rated charge power	30550	2	RO	U32	1000	kW	√		
10	[ESS]Rated discharge power	30552	2	RO	U32	1000	kW	√		
11	Reserved	30554	12	RO	N/A	N/A	N/A			
12	[ESS]Daily charge energy	30566	2	RO	U32	100	kWh	√		

13	[ESS]Accumulated charge energy	30568	4	RO	U64	100	kWh	√		
14	[ESS]Daily discharge energy	30572	2	RO	U32	100	kWh	√		
15	[ESS]Accumulated discharge energy	30574	4	RO	U64	100	kWh	√		
16	Running state	30578	1	RO	U16	N/A	N/A	√	√	Refer to Appendix 1
17	Max.active power adjustment value	30579	2	RO	S32	1000	kW	√	√	
18	Min. active power adjustment value	30581	2	RO	S32	1000	kW	√		
19	Max. reactive power adjustment value fed to the ac terminal	30583	2	RO	U32	1000	kVar	√	√	
20	Max. reactive power adjustment value absorbed from the ac terminal	30585	2	RO	U32	1000	kVar	√	√	
21	Active power	30587	2	RO	S32	1000	kW	√	√	
22	Reactive power	30589	2	RO	S32	1000	kVar	√	√	
23	[ESS]Max. battery charge power	30591	2	RO	U32	1000	kW	√		
24	[ESS]Max. battery discharge power	30593	2	RO	U32	1000	kW	√		
25	[ESS]Available battery charge Energy	30595	2	RO	U32	100	kWh	√		
26	[ESS]Available battery discharge Energy	30597	2	RO	U32	100	kWh	√		
27	[ESS] Charge / discharge power	30599	2	RO	S32	1000	kW	√		
28	[ESS]Battery SOC	30601	1	RO	U16	10	%	√		
29	[ESS]Battery SOH	30602	1	RO	U16	10	%	√		
30	[ESS]Average cell temperature	30603	1	RO	S16	10	℃	√		
31	[ESS] Average cell voltage	30604	1	RO	U16	1000	V	√		
32	Alarm1	30605	1	RO	U16	N/A	N/A	√	√	Refer to Appendix 2

33	Alarm2	30606	1	RO	U16	N/A	N/A	√	√	Refer to Appendix 3
34	Alarm3	30607	1	RO	U16	N/A	N/A	√		Refer to Appendix 4
35	Alarm4	30608	1	RO	U16	N/A	N/A	√	√	Refer to Appendix 5
36	Alarm5	30609	1	RO	U16	N/A	N/A	√		Refer to Appendix 11
37	Reserved	30610	3	RO	N/A	N/A	N/A			
38	Active power fixed value adjustment feedback	30613	2	RO	S32	1000	kW	√	√	
39	Reactive power fixed value adjustment feedback	30615	2	RO	S32	1000	kVar	√	√	
40	Active power percentage adjustment feedback	30617	1	RO	S16	100	%	√	√	
41	Reactive power Q/S adjustment feedback	30618	1	RO	S16	100	%	√	√	
42	Power factor adjustment feedback	30619	1	RO	S16	1000	N/A	√	√	
43	[ESS]Maximum battery (cluster) temperature	30620	1	RO	S16	10	℃	√		
44	[ESS]Minimum battery (cluster) temperature	30621	1	RO	S16	10	℃	√		
45	[ESS] Maximum battery (cluster) cell voltage	30622	1	RO	U16	1000	V	√		
46	[ESS] Minimum battery (cluster) cell voltage	30623	1	RO	U16	1000	V	√		
47	Rated grid voltage	31000	1	RO	U16	10	V	√	√	
48	Rated grid frequency	31001	1	RO	U16	100	Hz	√	√	
49	Grid frequency	31002	1	RO	U16	100	Hz	√	√	
50	[PCS] Internal temperature	31003	1	RO	S16	10	℃	√	√	
51	Output type	31004	1	RO	U16	N/A	N/A	√	√	0: L/N 1: L1/L2/L3 2: L1/L2/L3/N 3: L1/L2/N

52	A-B line voltage	31005	2	RO	U32	100	V	√	√	Invalid when output type is L/N, L1/L2/N, or L1/L2/N
53	B-C line voltage	31007	2	RO	U32	100	V	√	√	
54	C-A line voltage	31009	2	RO	U32	100	V	√	√	
55	Phase A voltage	31011	2	RO	U32	100	V	√	√	When output type is L/N, refers to "Phase voltage"
56	Phase B voltage	31013	2	RO	U32	100	V	√	√	Invalid when output type is L/N, L1/L2/N, or L1/L2/N
57	Phase C voltage	31015	2	RO	U32	100	V	√	√	
58	Phase A current	31017	2	RO	S32	100	A	√	√	When output type is L/N, refers to "Phase current"
59	Phase B current	31019	2	RO	S32	100	A	√	√	Invalid when output type is L/N, L1/L2/N, or L1/L2/N
60	Phase C current	31021	2	RO	S32	100	A	√	√	
61	Power factor	31023	1	RO	U16	1000	N/A	√	√	
62	PACK count	31024	1	RO	U16	1	N/A	√		
63	PV string count	31025	1	RO	U16	1	N/A	√	√	
64	MPPT count	31026	1	RO	U16	1	N/A	√	√	
65	PV1 voltage	31027	1	RO	S16	10	V	√	√	Please refer to the PV count listed in Tabel2-1 in chapter 2, to ensure if the register is available.
66	PV1 current	31028	1	RO	S16	100	A	√	√	
67	PV2 voltage	31029	1	RO	S16	10	V	√	√	
68	PV2 current	31030	1	RO	S16	100	A	√	√	
69	PV3 voltage	31031	1	RO	S16	10	V	√	√	
70	PV3 current	31032	1	RO	S16	100	A	√	√	

71	PV4 voltage	31033	1	RO	S16	10	V	√	√	
72	PV4 current	31034	1	RO	S16	100	A	√	√	
73	PV power	31035	2	RO	S32	1000	kW	√	√	
74	Insulation resistance	31037	1	RO	U16	1000	MΩ	√	√	
75	Startup time	31038	2	RO	U32	1	s	√	√	
76	Shutdown time	31040	2	RO	U32	1	s	√	√	
77	PV5 voltage	31042	1	RO	S16	10	V	√	√	Please refer to the PV count listed in Tabel2-1 in chapter 2, to ensure if the register is available.
78	PV5 current	31043	1	RO	S16	100	A	√	√	
79	PV6 voltage	31044	1	RO	S16	10	V	√	√	
80	PV6 current	31045	1	RO	S16	100	A	√	√	
81	PV7 voltage	31046	1	RO	S16	10	V	√	√	
82	PV7 current	31047	1	RO	S16	100	A	√	√	
83	PV8 voltage	31048	1	RO	S16	10	V	√	√	
84	PV8 current	31049	1	RO	S16	100	A	√	√	
85	PV8 current	31050	1	RO	S16	10	V	√	√	
86	PV9 current	31051	1	RO	S16	100	A	√	√	
87	PV10 voltage	31052	1	RO	S16	10	V	√	√	
88	PV10 current	31053	1	RO	S16	100	A	√	√	
89	PV11 voltage	31054	1	RO	S16	10	V	√	√	
90	PV11 current	31055	1	RO	S16	100	A	√	√	

91	PV12 voltage	31056	1	RO	S16	10	V	√	√	
92	PV12 current	31057	1	RO	S16	100	A	√	√	
93	PV13 voltage	31058	1	RO	S16	10	V	√	√	
94	PV13 current	31059	1	RO	S16	100	A	√	√	
95	PV14 voltage	31060	1	RO	S16	10	V	√	√	
96	PV14 current	31061	1	RO	S16	100	A	√	√	
97	PV15 voltage	31062	1	RO	S16	10	V	√	√	
98	PV15 current	31063	1	RO	S16	100	A	√	√	
99	PV16 voltage	31064	1	RO	S16	10	V	√	√	
100	PV16 current	31065	1	RO	S16	100	A	√	√	
101	[DC Charger] Vehicle battery voltage	31500	1	RO	U16	10	V	√		
102	[DC Charger] Charging current	31501	1	RO	U16	10	A	√		
103	[DC Charger] Output power	31502	2	RO	S32	1000	kW	√		
104	[DC Charger] Vehicle SOC	31504	1	RO	U16	10	%	√		
105	[DC Charger] Current charging capacity	31505	2	RO	U32	100	kWh	√		Single time
106	[DC Charger] Current charging duration	31507	2	RO	U32	1	s	√		Single time
107	PV daily generation	31509	2	RO	U32	100	kWh	√	√	
108	PV total generation	31511	2	RO	U32	100	kWh	√	√	

5.4 Hybrid inverter parameter setting address definition (holding register)

The registers below can only be accessed with a valid Hybrid inverter's Modbus slave address (1-246).

Table 5-4 Hybrid inverter parameter setting address definition

No.	Name	Add.	QTY	Perm.	Data Type	Gain	Unit	Hybrid Inv,	PV inv.	Comment
1	Start/Stop	40500	1	WO	U16	N/A	N/A	√	√	0: Stop 1: Start
2	Reserved	40501	1	RW	U16	N/A	N/A			
3	[DC Charger] Start/Stop	41000	1	WO	U16	N/A	N/A	√		0: Start 1: Stop
4	Remote EMS dispatch enable	41500	1	RW	U16	N/A	N/A		√	0: disabled 1: enabled The enabled inverter only reacts on power control command from register: 41501, 41503, 41505, 41506, 40507。
5	Active power fixed value adjustment	41501	2	RW	S32	1000	kW		√	
6	Reactive power fixed value adjustment	41503	2	RW	S32	1000	kVar		√	
7	Active power percentage adjustment	41505	1	RW	S16	100	%		√	
8	Reactive power Q/S adjustment	41506	1	RW	S16	100	%		√	
9	Power factor adjustment	41507	1	RW	S16	1000	N/A		√	

5.5 AC-Charger running information address definition (read-only register)

The registers below can only be accessed with a valid AC-Charger's Modbus slave address (1-246). And are only applicable for "EVAC" devices.

Table 5-5 AC-Charger running information address definition

No.	Name	Add.	QTY	Perm.	Data Type	Gain	Unit	Comment
1	System state	32000	1	RO	U16	N/A	N/A	System states according to IEC61851-1 definition. Refer to Appendix 7.
2	Total energy consumed	32001	2	RO	U32	100	kWh	
3	Charging power	32003	2	RO	S32	1000	kW	
4	Rated power	32005	2	RO	U32	1000	kW	
5	Rated current	32007	2	RO	S32	100	A	
6	Rated voltage	32009	1	RO	U16	10	V	
7	AC-Charger input breaker rated current	32010	2	RO	S32	100	A	
8	Alarm1	32012	1	RO	U16	N/A	N/A	Refer to Appendix 8
9	Alarm2	32013	1	RO	U16	N/A	N/A	Refer to Appendix 9
10	Alarm3	32014	1	RO	U16	N/A	N/A	Refer to Appendix 10

5.6 AC-Charger parameter setting address definition (holding register)

The registers below can only be accessed with a valid AC-Charger's modbus slave address (1-246). And are only applicable for "EVAC" devices.

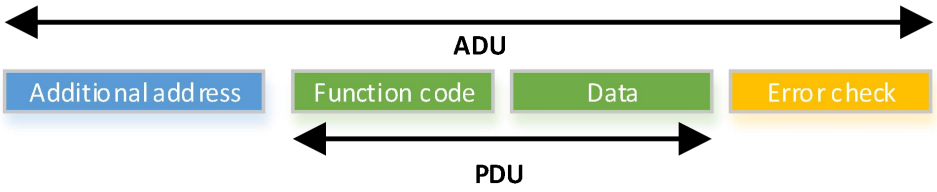
Table 5-6 AC-Charger parameter setting address definition

No.	Name	Add.	QTY	Perm.	Data Type	Gain	Unit	Comment
1	Start/Stop	42000	1	WO	U16	N/A	N/A	0: Start

								1: Stop
2	Charger output current	42001	2	RW	U32	100	N/A	[6, X] X is the smaller value between the rated current and the AC-Charger input breaker rated current.

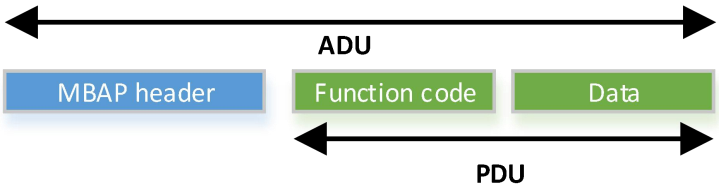
6. Modbus Protocol Command Overview

(1) MODBUS-RTU frame format



Filed	Length(Bytes)	Description
Slave Address	1	Customized by user (1~247)
PDU	X	Described in chapter 6.1
Error Check	2	Crc16 check. It is worth pointing out that the byte order of CRC16 is the little-end mode

(2) MODBUS-TCP frame format



Filed	Length(Bytes)	Description
Transmission identifier	2	Matching identifier between a request frame and a response frame
Protocol type	2	0 = Modbus protocol
Data length	2	Follow-up data length

Slave Address	1	Customized by user (1~247)

6.1 Function code

Index	Function code	Description
1	0x03	Read Read-only Register(RO)
2	0x04	Read Holding Register(RW/WO)
3	0x06	Write a single Register
4	0x10	Write multiple Registers

6.1.1 Read Read-only Register

Request

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Function code	1 Byte	0x03
Starting address	2 Bytes	0x0000~0xFFFF
Quantity of registers	2 Bytes	1~124

Response

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Function code	1 Byte	0x03
Byte count	1 Byte	2 x N
Register value	2 x N Bytes	N=Quantity of Registers

Error

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Error code	1 Byte	0x83
Exception code	1 Byte	01 or 02 or 03 or 04

Example PDU: The following example contains only the slave address and the Protocol Data Unit (PDU). If using Modbus RTU mode, a CRC16 should be added at the end; if using Modbus TCP mode, an MBAP header should be added at the beginning.

Example Meaning: Read the *Rated active power* register of the hybrid inverter

with Modbus slave address 1.

Host Query Command: 01 03 77 4C 00 02

Slave Normal Response: 01 03 04 00 00 61 A8

Slave Exception Response: 01 83 04

6.1.2 Read Holding Register

Request

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Function code	1 Byte	0x04
Starting address	2 Bytes	0x0000~0xFFFF
Quantity of registers	2 Bytes	1~124

Response

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Function code	1 Byte	0x04
Byte count	1 Byte	2 x N
Register value	2 x N Bytes	N=Quantity of Registers

Error

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Error code	1 Byte	0x84
Exception code	1 Byte	01 or 02 or 03 or 04

Example PDU: The following example contains only the slave address and the Protocol Data Unit (PDU). If using Modbus RTU mode, a CRC16 should be added at the end; if using Modbus TCP mode, an MBAP header should be added at the beginning.

Example Meaning: Read the *Active power fixed adjustment target value* register of a power plant with Modbus slave address 247.

Host Query Command: F7 04 9C 41 00 02

Slave Normal Response: F7 04 04 00 00 61 A8

Slave Exception Response: F7 83 04

6.1.3 Write a single Register

Request

Filed	Length(Bytes)	Description
Slave address	1 Byte	0~247
Function code	1 Byte	0x06
Register address	2 Bytes	0x0000~0xFFFF
Register value	2 Bytes	0x0000~0xFFFF

Response

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Function code	1 Byte	0x06
Register address	2 Bytes	0x0000~0xFFFF
Register value	2 Bytes	0x0000~0xFFFF

Error

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Error code	1 Byte	0x86
Exception code	1 Byte	01 or 02 or 03 or 04

Example PDU: The following example contains only the slave address and the Protocol Data Unit (PDU). If using Modbus RTU mode, a CRC16 should be added at the end; if using Modbus TCP mode, an MBAP header should be added at the beginning.

Example Meaning: Write the *Grid code* register of the hybrid inverter with Modbus slave address 1.

Host Query Command: 01 06 9E 34 00 01

Slave Normal Response:01 06 9E 34 00 01

Slave Exception Response: 01 86 04

6.1.4 Write multiple Registers

Request

Filed	Length(Bytes)	Description
Slave address	1 Byte	0~247
Function code	1 Byte	0x10
Starting address	2 Bytes	0x0000~0xFFFF
Quantity of registers	2 Bytes	1~123
Byte count	1 Byte	2 x N
Registers value	2 x N Bytes	N=Quantity of Registers

Response

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Function code	1 Byte	0x10
Starting address	2 Bytes	0x0000~0xFFFF
Quantity of registers	2 Bytes	1~123

Error

Filed	Length(Bytes)	Description
Slave address	1 Byte	1~247
Error code	1 Byte	0x90
Exception code	1 Byte	01 or 02 or 03 or 04

Example PDU: The following example contains only the slave address and the Protocol Data Unit (PDU). If using Modbus RTU mode, a CRC16 should be added at the end; if using Modbus TCP mode, an MBAP header should be added at the beginning.

Example Meaning: Write the *Active power fixed adjustment target value* register of a power plant with Modbus slave address 247.

Host Query Command: F7 10 9C 41 00 02 04 00 00 61 A8

Slave Normal Response: F7 10 9C 41 00 02

Slave Exception Response: F7 90 04

6.2 Exception code

Code	Name	Meaning
0x01	ILLEGAL FUNCTION	The function code received in the query is not an allowable action for the server (or slave). This may be because the function code is only applicable to newer devices, and was not implemented in the unit selected. It could also indicate that the server (or slave) is in the wrong state to process a request of this type, for example because it is unconfigured and is being asked to return register values.
0x02	ILLEGAL DATA ADDRESS	The data address received in the query is not an allowable address for the server (or slave). More specifically, the combination of reference number and transfer length is invalid.
0x03	ILLEGAL DATA VALUE	A value contained in the query data field is not an allowable value for server (or slave). This indicates a fault in the structure of the remainder of a complex request, such as that the implied length is incorrect. It specifically does NOT mean that a data item submitted for storage in a register has a value outside the expectation of the application program, since the MODBUS protocol is unaware of the significance of any particular value of any particular register.
0x04	SLAVE DEVICE FAILURE	An unrecoverable error occurred while the server (or slave) was attempting to perform the requested action.

Appendix 1 Running state

Running State	Value
Standby	0x00
Running	0x01
Fault	0x02
Shutdown	0x03
Environmental Abnormality	0x07

Appendix 2 PCS alarm code -- 1

Alarm Code	Alarm Description	Bit	Severity Level

1001	Software version mismatch	0	Critical
1002	Low insulation resistance	1	Critical
1003	Over-temperature	2	Critical
1004	Equipment fault	3	Critical
1005	System grounding fault	4	General
1006	PV string over-voltage	5	Critical
1007	PV string reversely connected	6	Critical
1008	PV string back-filling	7	Critical
1009	AFCI fault	8	Critical
1010	Grid power outage	9	Critical
1011	Grid over-voltage	10	Critical
1012	Grid under-voltage	11	Critical
1013	Grid over-frequency	12	Critical
1014	Grid under-frequency	13	Critical
1015	Grid voltage imbalance	14	Critical
1016	DC component of output current out of limit	15	Critical

Appendix 3 PCS alarm code -- 2

Alarm Code	Alarm Description	Bit	Severity Level
1017	Leak current out of limit	0	Critical
1018	Communication abnormal	1	General

1019	System internal protection	2	Critical
1020	AFCI self-checking circuit fault	3	Critical
1021	Off-grid protection	4	Critical
1022	Manual operation protection	5	Critical
1024	Abnormal phase sequence	7	Critical
1025	Short circuit to PE	8	Critical
1026	Soft start failure	9	Critical
Not defined	Not defined	Not defined	

Appendix 4 ESS alarm code

Alarm Code	Alarm Description	Bit	Severity Level
2001	Software version mismatch	0	Critical
2002	The energy storage module has low insulation resistance to ground	1	General
2003	The temperature is too high	2	Critical
2004	Equipment fault	3	Critical
2005	Under-temperature	4	Critical
2008	Internal protection	5	Critical
2009	Thermal runaway	6	Critical
Not defined	Not defined	Not defined	

Appendix 5 Gateway alarm code

Alarm Code	Alarm Description	Bit	Severity Level
3001	Software version mismatch	0	Critical
3002	The temperature is too high	1	Critical
3003	Equipment fault	2	Critical
3004	Excessive leakage current in off-grid output	3	Critical
3005	N line grounding fault	4	Critical
3006	Abnormal phase sequence of grid wiring	5	Critical
3007	Abnormal phase sequence of inverter wiring	6	Critical
3008	Grid phase loss	7	Critical
Not defined	Not defined	Not defined	

Appendix 6 Remote EMS control mode

Remote EMS control mode	Value
PCS remote control	0x00

Standby	0x01
Maximum self-consumption	0x02
Command charging (consume grid power first)	0x03
Command charging (consume PV power first)	0x04
Command discharging (output from PV first)	0x05
Command discharging (output from ESS first)	0x06

Appendix 7 AC-Charger system state

System State	Value
System innit	0x00
A1/A2	0x01
B1	0x02
B2	0x03
C1	0x04
C2	0x05
F	0x06
E	0x07

Appendix 8 AC-Charger alarm code -- 1

Alarm Code	Alarm Description	Bit	Severity Level
5001_1	Grid overvoltage	0	Critical
5001_2	Grid undervoltage	1	Critical
5001_3	Overload	2	Critical
5001_4	Short circuit	3	Critical
5001_5	Charging output overcurrent	4	Critical
5001_6	Leak current out of limit	5	Critical
5001_7	Grounding fault	6	Critical
5001_8	Abnormal phase sequence of grid wiring	7	Critical
5001_9	PEN Fault	8	Critical
Not defined	Not defined	Not defined	

Appendix 9 AC-Charger alarm code -- 2

Alarm Code	Alarm Description	Bit	Severity Level
5002_1	Leak current detection circuit fault	0	Critical
5002_2	Relay stuck	1	Critical

5002_3	Pilot circuit fault	2	Critical
5002_4	Auxiliary power supply module fault	3	Critical
5002_5	Electric lock fault	4	Critical
5002_6	Lamp panel communication fault	5	General
Not defined	Not defined	Not defined	

Appendix 10 AC-Charger alarm code -- 3

Alarm Code	Alarm Description	Bit	Severity Level
5003	Too high internal temperature	0	Critical
5004	Charging cable fault	1	Critical
5005	Meter communication fault	2	General
Not defined	Not defined	Not defined	

Appendix 11 DC-Charger alarm code

Alarm Code	Alarm Description	Bit	Severity Level
5101	Software version mismatch	0	Critical

5102	Low insulation resistance to ground	1	Critical
5103	Over-temperature	2	Critical
5104	Equipment fault	3	Critical
5105	Charging fault	4	Critical
5106	Equipment protection	5	Critical
Not defined	Not defined	Not defined	