

Communication Protocol of PV Grid-Connected String Inverters

V1.1.32

Version number	Date	Note
V1.1.0	2016-4-11	initial version. Unofficial version(V1.0.13) is no longer used.
V1.1.1	2016-5-13	modify the register address and some related content: 5039–Power limitation adjustment 5040–Reactive power adjustment
V1.1.2	2017-5-13	Add Inverter model : SG36KTL-M、SG10KTL-M、 SG12KTL-M、SG80KTL、SG80KTL-M、 SG125HV
V1.1.3	2017-6-10	Add Inverter model:SG33K3J、 “Fault run” change to “Fault” Add country code:UAE,Israel,Hungary
V1.1.4	2017-6-15	AddSG125HV the number of mppt and combiner board information
V1.1.5	2017-6-20	Add Inverter data point : State setting
V1.1.6	2017-7-10	Add Inverter fault/alarm code 007/030/031/032/033
V1.1.7	2017-8-7	Modify the name of fault code: 003/006/014/016/019/021/022/025/026/041/042//048/049/050
V1.1.8	2017-8-12	Delete Inverter fault/alarm code: 051 Add Inverter fault/alarm code: 053/054/055/056/059/060
V1.1.9	2017-9-20	Add Inverter one working state
V1.1.10	2017-9-26	Modify the code of JP
V1.1.11	2017-10-19	Add Inverter fault/alarm code 564/565/580/581
V1.1.12	2017-10-24	Add country and region code 26/27/28/29/63/64/65/66/67/59/98 Modifyfault/alarmnote: “LCD”changedto“LCD or APP”
V1.1.13	2017-11-2	Add Inverter data point : Total apparent power
V1.1.14	2017-11-18	Add Inverter model: SG15KTL-M、SG20KTL-M
V1.1.15	2017-11-25	Add Inverter model: SG30KTL-M Add Inverter fault/alarm code: 116
V1.1.16	2017-12-22	Add Inverter model:SG111HV Modify SG10KTL-M, SG12KTL-M limit the maximum power ratio of 110%

V1.1.17	2018-1-18	Increase the support of “Total apparent power” point inverter model information
V1.1.18	2018-03-17	Delete some product types according to overseas sales list. “U1 Limit” default value is adjusted to 950. Add Inverter fault/alarm code: 117
V1.1.19	2018-04-24	Add Inverter fault/alarm code: 34/106 Add country code: US-NE
V1.1.20	2018-05-24	Add PID work state、PID night recovery、PID day protection、PID alarm code
V1.1.21	2018-06-15	Adjust the description of fault code 44 Adjust the description of fault code 23/40 Add Inverter fault/alarm code: 45/46 Add Appendix 5
V1.2.22	2018-08-07	Add Inverter fault/alarm code: 105 Add Inverter model : SG110HV-M
V1.1.23	2018-8-17	Adjust the description of fault code 2/15
V1.1.24	2018-08-31	Add Inverter data point : DC Voltage 6 –DC Voltage 12, DC current 6 –DC current 12; Current of 19 th input –Current of 24 th input Delete the fault/alarm code 6/26/75 Adjust the description of fault code 15/74
V1.1.25	2018-09-18	Adjust address :DC Voltage 9 –DC Voltage 12, DC current 9 –DC current 12 Add country code: MYS/PHL, Add Inverter fault/alarm code: 566/567/568/569/570/571,582/583/584/585/586/587
V1.1.26	2018-11-7	Add Inverter fault/alarm code: 448-471
V1.1.27	2018-11-7	Add Inverter model: SG33CX、SG40CX、SG50CX、SG110CX、 Add SG5-20K Meter information(read-only register: 5083-0104, holding register: 5009-5015) Modify the name of fault code: 030/031/032/033/042 Add Q(U)/Q(P) curve definition
V1.1.28	2019-4-9	Add Inverter model: SG250HX
V1.1.29	2019-5-23	Add Inverter fault/alarm code: 220/221/222/223/224/225/226/227/514 Modify the SG250HX power limitation setting range 0-1110, See Appendix 6. Add Inverter model: SG30CX/SG33CX-US/SG55CX-US/SG250HX-US
V1.1.30	2019-9-21	Add Inverter model: SG25CX-SA/SG100CX-JP/SG250HX-IN
V1.1.31	2020-3-12	Add Inverter fault code 1500-1531

V1.1.32	2020-6-17	Adjust the description and applicable Inverter of points, update Appendix6, Appendix 9, Appendix10
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Valid for device types:

In production:

SG30KTL-M, SG30KTL-M-V31, SG33KTL-M, SG36KTL-M, SG33K3J, SG49K5J, SG34KJ, LP_P34KSG, SG50KTL-M-20, SG60KTL, G80KTL, SG80KTL-20, SG60KU-M
SG5KTL-MT, SG6KTL-MT, SG8KTL-M, SG10KTL-M, SG10KTL-MT, SG12KTL-M, SG15KTL-M, SG17KTL-M, SG20KTL-M,
SG80KTL-M, SG111HV, SG125HV, SG125HV-20, SG33CX, SG40CX, SG50CX, SG110CX, SG250HX, SG30CX,SG33CX-US,SG55CX-US,SG250HX-US
SG25CX-SA,SG100CX-JP,SG250HX-IN

Discontinued:

SG30KTL, SG10KTL, SG12KTL, SG15KTL, SG20KTL, SG30KU, SG36KTL, SG36KU, SG40KTL, SG40KTL-M, SG50KTL-M, SG60KTL-M, SG60KU

Statement

1. Introduction

This communication adopts modbus RTU protocol, and applies to the communication between Sungrow PV grid-connected string inverters and the upper computer (PC) monitoring software. This protocol can read the real-time operating data and fault states of inverters.

2. Communication Interface

1) RS485

	Default setting
Address	Inverter: 1 – 247 settable PC: 1 – 247 settable
Broadcast	Yes
Baud rate	9600bit/s
Check bit	Null or settable
Data bit	8
Stop bit	1
Mode	RTU
Appliance interface	RS485-2W cable connection

2) Ethernet (optional)

Default:

- IP: 192.168.1.100;
- Sub-Net: 255.255.0.0
- Port: 502

3. Definition of Address

4. Data type

U16: 16-bit unsigned integer, big-endian

S16: 16-bit signed integer, big-endian

U32: 32-bit unsigned integer; little-endian for double-word data. Big-endian for byte data

S32: 32-bit signed integer; little-endian for double-word data. Big-endian for byte data

Example:

transmission order of U16 data 0x0102 is 01, 02

transmission order of U32 data 0x01020304 is 03, 04, 01, 02

The transmission order of multibyte data UTF-8: the high-byte data is in the front and the low-byte data is at back.

Example: transmission order of UTF-8 data ABCD is A, B, C, D.

2. Value description

The decimal parameters are transmitted as integer after expansion. For example: 10.333 KW is transmitted as 10333; 800.5 V is transmitted as 8005. Negative numbers are transmitted as complement, 0xFFFF signifying -1.

Unavailable register cannot be viewed or set. The return of unsigned number is F, For example: “0xFFFF” is the return for U16, “0xFFFFFFFF” is the return for U32; the return of signed number is the max. positive number, e.g. “0x7FFF” for S16, “0x7FFFFFFF” for S32; 0x00 for UTF-8. UTF-8 occupies 1 byte. The length of odd number is complemented by 0x00.

Example:

SG80KTL only one MPPT input,

MPPT 2 voltage (5013)

MPPT 2 current (5014)

MPPT 3 voltage (5015)

MPPT 3 current (5016)

MPPT 4 voltage (5115)

MPPT 4 current (5116), The data for these registers are 0xFFFF.

3. Address type

Address of 3x type is read-only register, supporting the cmdcode inquiry of 0x04.

Address of 4x type is holding register, supporting the cmdcode inquiry of 0x03, and cmdcodeswrite-in of 0x10 and 0x06. Cmdcodes 0x10 and 0x06 support the broadcast address.

Support Modbus error code 02 (address error), 04 (setting failure).

Visit all registers by subtracting 1 from the register address. Example: if the address is 5000 –5001, visit it using address 4999 –5000. Entering “01 04 1387 00 02 + CRC” to check the data of address 5000 –5001.

4. Verify type

CRC16 generates polynomial 0xA001, little-endian.

3.1 Running information variable address definition (read-only register, Address type: 3X)

No.	Name	Address	Data type	Data range	Unit	Note
Device attributes						
1	Reserved	4950 – 4951	U32			
2	Reserved	4952 – 4953	U32			
3	Reserved	4954–4968	U16			
4	Reserved	4969–4983	U16			
5	Reserved	4984 – 4989	U16			
6	SN	4990 – 4999	UTF-8			Data type :UTF-8
7	Device type code	5000	U16			See Appendix 6
8	Nominal active power	5001	U16		0.1kW	
9	Output type	5002	U16	0-two phase; 1-3P4L; 2-3P3L		
10	Daily power yields	5003	U16		0.1 kWh	
11	Total power yields	5004~5005	U32		kWh	
12	Total running time	5006~5007	U32		h	
13	Internal temperature	5008	S16		0.1℃	
14	Total apparent power	5009~5010	U32		VA	Valid for inverters: SG5KTL-MT

						SG6KTL-MT SG8KTL-M SG10KTL-M SG10KTL-MT SG12KTL-M SG15KTL-M SG17KTL-M SG20KTL-M SG33K3J SG36KTL-M SG40KTL-M SG50KTL SG50KTL-M SG60KTL SG60KTL-M SG60KU-M SG80KTL SG80KTL-M SG111HV SG125HV SG125HV-20 SG33CX SG40CX SG50CX SG110CX SG250HX SG30CX SG36CX-US SG60CX-US SG33CX-US SG55CX-US SG250HX-US SG250HX-IN SG25CX-SA SG100CX-JP SG225HX SG75TX
15	MPPT 1 voltage	5011	U16		0.1V	See Appendix 6
16	MPPT 1 current	5012	U16		0.1A	
17	MPPT 2 voltage	5013	U16		0.1V	
18	MPPT 2 current	5014	U16		0.1A	
19	MPPT 3 voltage	5015	U16		0.1V	
20	MPPT 3 current	5016	U16		0.1A	
21	Total DC power	5017~5018	U32		W	

22	A-B line voltage/phase A voltage	5019	U16		0.1 V	Output type (address: 5002) is 1: upload phase voltage; 2: upload line voltage
23	B-C line Voltage/phase B Voltage	5020	U16		0.1 V	Output type (address: 5002) is 1: upload phase voltage; 2: upload line voltage
24	C-A line Voltage/phase C Voltage	5021	U16		0.1 V	Output type (address: 5002) is 1: upload phase voltage; 2: upload line voltage
25	Phase A current	5022	U16		0.1 A	
26	Phase B current	5023	U16		0.1 A	
27	Phase C current	5024	U16		0.1 A	
28	Reserved	5025~5026	U32			
29	Reserved	5027~5028	U32			
30	Reserved	5029~5030	U32			
31	Total active power	5031~5032	U32		W	
32	Total reactive power	5033~5034	S32		Var	
33	Power factor	5035	S16		0.001	>0 means leading <0 means lagging
34	Grid frequency	5036	U16		0.1 Hz	
35	Reserved	5037	U16			
36	Work state	5038	U16	See Appendix 1		Data of address 5039 – 5045 are additional
	Fault/Alarm time: Year	5039	U16			Fault/Alarm time and Fault/Alarm code (5039 – 5045) are valid only when the device work state is fault (0x5500) or alarm (0x9100).
	Fault/Alarm time: Month	5040	U16			
	Fault/Alarm time: Day	5041	U16			
	Fault/Alarm time: Hour	5042	U16			
	Fault/Alarm time: Minute	5043	U16			
	Fault/Alarm time: Second	5044	U16			
	Fault/Alarm code 1	5045	U16	See Appendix 3		
	Reserved	5046 – 5048	U16			
37	Nominal reactive power	5049	U16		0.1kVar	
38	Reserved	5050~5070	U32			
39	Array insulation resistance	5071	U16	1 – 20000(0xFFFF: invalid)	1kΩ	
40	Reserved	5072	U16			
41	Reserved	5073-5076				

42	Active Power Regulation Setpoint	5077 – 5078	U32		1w	
43	Reactive Power Regulation Setpoint	5079-5080	S32		1Var	
44	Work state	5081 – 5082	U32			See Appendix 2
45	Meter power	5083~5084	S32		1w	Valid for inverters: SG5KTL-MT SG6KTL-MT SG8KTL-M SG10KTL-M SG10KTL-MT SG12KTL-M SG15KTL-M SG17KTL-M SG20KTL-M Note: Country set to Europe Area.
46	Meter A phase power	5085~5086	S32		1w	
47	Meter B phase power	5087~5088	S32		1w	
48	Meter C phase power	5089~5090	S32		1w	
49	Load power	5091~5092	S32		1w	
50	Daily export energy	5093~5094	U32		0.1kWh	
51	Total export energy	5095~5096	U32		0.1kWh	
52	Daily import energy	5097~5098	U32		0.1kWh	
53	Total import energy	5099~5100	U32		0.1kWh	
54	Daily direct energy consumption	5101~5102	U32		0.1kWh	
55	Total direct energy consumption	5103~5104	U32		0.1kWh	
56	Reserved	5105 – 5112				
57	Daily running time	5113	U16		1min	
58	Present country	5114	U16			See Appendix 4
59	MPPT 4 voltage	5115	U16		0.1V	See Appendix 6
60	MPPT 4 current	5116	U16		0.1A	
61	MPPT 5 voltage	5117	U16		0.1V	
62	MPPT 5 current	5118	U16		0.1A	
63	MPPT 6 voltage	5119	U16		0.1V	
64	MPPT 6 current	5120	U16		0.1A	
65	MPPT 7 voltage	5121	U16		0.1V	
66	MPPT 7 current	5122	U16		0.1A	
67	MPPT 8 voltage	5123	U16		0.1V	
68	MPPT 8 current	5124	U16		0.1A	
69	Reserved	5125				
70	Reserved	5126 - 5127				
71	Monthly power yields	5128 – 5129	U32		0.1kWh	
72	MPPT 9 voltage	5130	U16		0.1V	See Appendix 6
73	MPPT 9 current	5131	U16		0.1A	
74	MPPT 10 voltage	5132	U16		0.1V	
75	MPPT 10 current	5133	U16		0.1A	

76	MPPT 11 voltage	5134	U16		0.1V	
77	MPPT 11 current	5135	U16		0.1A	
78	MPPT 12 voltage	5136	U16		0.1V	
79	MPPT 12 current	5137	U16		0.1A	
80	Reserved	5138 – 5139	U16			
81	Reserved	5140				
82	Reserved	5141				
83	Reserved	5142				
84	Reserved	5143				
85	Total power yields	5144 – 5145	U32		0.1kWh	(Display accuracy increased to 0.01kWh) Valid for inverters: SG5KTL-MT SG6KTL-MT SG8KTL-M SG10KTL-M SG10KTL-MT SG12KTL-M SG15KTL-M SG17KTL-M SG20KTL-M SG80KTL-M SG111HV SG125HV SG125HV-20 SG33CX SG40CX SG50CX SG110CX SG250HX SG30CX SG36CX-US SG60CX-US SG250HX-US SG250HX-IN SG25CX-SA SG100CX-JP SG225HX SG75TX
86	Negative voltage to the ground	5146	S16	-15000~15000	0.1V	
87	Bus voltage	5147	U16	0 – 15000	0.1V	
88	Grid frequency	5148	U16		0.01Hz	(Display accuracy increased to 0.01Hz)

						Valid for inverters: SG5KTL-MT SG6KTL-MT SG8KTL-M SG10KTL-M SG10KTL-MT SG12KTL-M SG15KTL-M SG17KTL-M SG20KTL-M SG80KTL-M SG111HV SG125HV SG125HV-20 SG33CX SG40CX SG50CX SG110CX SG250HX SG30CX SG36CX-US SG60CX-US SG250HX-US SG250HX-IN SG25CX-SA SG100CX-JP SG225HX SG75TX
89	Reserved	5149	U16	0~15000	0.1V	
90	PID work state	5150	U16	2: PID Recover Operation 4: Anti-PID Operation 8: PID Abnormity		Valid for inverters: SG5KTL-MT SG6KTL-MT SG8KTL-M SG10KTL-M SG10KTL-MT SG12KTL-M SG15KTL-M SG17KTL-M SG20KTL-M SG80KTL-M SG125HV SG125HV-20 SG80KTL SG33CXSG40CX SG50CX

						SG110CX SG100CX SG136TX SG250HX SG30CX SG36CX-US SG60CX-US SG250HX-US SG250HX-IN SG25CX-SA SG100CX-JP SG225HX SG75TX
91	PID alarm code	5151	U16	432:PID resistance abnormal 433:PID function abnormal 434:PID overvoltage/overcurrent protection		See Appendix 5
92	Reserved	5152	U16			
93	Reserved	5153-7012				
Combiner board information						
1	String 1 current	7013	U16		0.01A	<p>Before checking the current information of one input, please make sure the hardware supports this function. If parameter can be viewed in the LCD panel or APP software(default menu-running information), the corresponding address is readable.</p> <p>Number of strings, please see Appendix 6</p>
2	String 2 current	7014	U16		0.01A	
3	String 3 current	7015	U16		0.01A	
4	String 4 current	7016	U16		0.01A	
5	String 5 current	7017	U16		0.01A	
6	String 6 current	7018	U16		0.01A	
7	String 7 current	7019	U16		0.01A	
8	String 8 current	7020	U16		0.01A	
9	String 9 current	7021	U16		0.01A	
10	String 10 current	7022	U16		0.01A	
11	String 11 current	7023	U16		0.01A	
12	String 12 current	7024	U16		0.01A	
13	String 13 current	7025	U16		0.01A	
14	String 14 current	7026	U16		0.01A	
15	String 15 current	7027	U16		0.01A	
16	String 16 current	7028	U16		0.01A	
17	String 17 current	7029	U16		0.01A	
18	String 18 current	7030	U16		0.01A	
19	String 19 current	7031	U16		0.01A	
20	String 20 current	7032	U16		0.01A	

21	String 21 current	7033	U16		0.01A	
22	String 22 current	7034	U16		0.01A	
23	String 23 current	7035	U16		0.01A	
24	String 24 current	7036	U16		0.01A	

a) Parameter setting address definition (holding register, Address type: 4X)

No.	Name	Address	Data type	Data range	Unit	Note
Setting data						
1	System clock: Year	5000	U16			Receive time synchronization setting of the monitoring system
2	System clock: Month	5001	U16			
3	System clock: Day	5002	U16			
4	System clock: Hour	5003	U16			
5	System clock: Minute	5004	U16			
6	System clock: Second	5005	U16			
7	Start/Stop	5006	U16	0xCF (Start) 0xCE (Stop)		
8	Power limitation switch	5007	U16	0xAA: Enable; 0x55: Disable		
9	Power limitation setting	5008	U16	See Appendix 6	0.1%	Available when the power limitation switch (5007) is enabled
10	Reserved	5009	U16			Valid for inverters: SG5KTL-MT SG6KTL-MT SG8KTL-M SG10KTL-M SG10KTL-MT SG12KTL-M SG15KTL-M SG17KTL-M SG20KTL-M Note: Country set to EuropeArea.
11	Export power limitation	5010	U16	0xAA: Enable; 0x55: Disable		
12	Export power limitation value	5011	U16	0-Rated active power		
13	Current transformer output current	5012	U16	1-100	A	
14	Current transformer range	5013	U16	1-10000	A	
15	Current transformer	5014	U16	0- Internal 1- External		

16	Export power limitation percentage	5015	U16	0~1000	0.1%	
17	Reserved	5016-5018				
18	Power factor setting	5019	S16	-1000 - -800 800 – 1000	0.001	Available when the reactive power adjustment switch (5036) is set to power factor setting valid (0xA1) > 0 means leading < 0 means lagging
19	Reserved	5020 – 5033	U16			
20	Reserved	5034	U16			
21	Night SVG Switch	5035	U16	0xAA: Enable; 0x55: Disable		Valid for inverters: SG80KTL-M SG125HV-20 SG33CX SG40CX SG50CX SG100CX SG110CX SG136TX SG250HX SG30CX SG36CX-US SG60CX-US SG250HX-US SG250HX-IN SG225HX SG250HX SG25CX-SA SG100CX-JP SG75TX
22	Reactive power adjustment mode	5036	U16	0x55: OFF, power factor returns to 1, reactive power percentage returns to 0; 0xA1: power factor setting valid, Reactive		

				power percentage returns to 0; 0xA2: Reactive power percentage setting valid, power factor returns to 1; 0xA3: Enable Q(P) curve configuration; 0xA4: Enable Q(U) curve configuration		
23	Reactive power percentage setting	5037	S16	0 – 1000 0 - -1000	0.1%	Available when the reactive power adjustment switch (5036) is set to Reactive power percentage setting valid (0xA2)
24	Reserved	5038				
25	Power limitation adjustment	5039	U16	See Appendix 6	0.1kW	Available when the power limitation switch (5007) is enabled
26	Reactive power adjustment	5040	S16	See Appendix 6	0.1kV ar	Available when the reactive power adjustment switch (5036) is set to Reactive power percentage setting valid (0xA2)
27	PID Recovery	5041	U16	0xAA: Enable; 0x55: Disable		Valid for inverters: SG5KTL-MT SG6KTL-MT SG8KTL-M SG10KTL-M SG10KTL-MT SG12KTL-M SG15KTL-M SG17KTL-M SG20KTL-M SG80KTL-M SG125HV SG125HV-20 SG80KTL SG33CX SG40CX SG50CX SG100CX SG110CX SG136TX

						SG250HX SG30CX SG36CX-US SG60CX-US SG250HX-US SG250HX-IN SG25CX-SA SG100CX-JP SG225HX SG75TX
28	Anti-PID	5042	U16	0xAA: Enable; 0x55: Disable		Valid for inverters: SG125HV SG125HV-20 SG250HX SG250HX-US SG250HX-IN SG136TX SG225HX
29	Reserved	5043 – 5047				
30	Q(P) curve 1	5048-5077		See Appendix 7 Note: The reactive power adjustment switch (5036) is set to Enable Q(P) curve (0xA3)		Except inverters :CX/HX/TX
31	Q(U) curve 1	5078-5115		See Appendix 8 Note: The reactive power adjustment switch (5036) is set to Enable Q(U) curve (0xA4)		Except inverters :CX/HX/TX
32	Q(P) curve 2	5116-5134		See Appendix 9 Note: The reactive power adjustment switch (5036) is set to Enable Q(P) curve (0xA3)		Valid for inverters: SG33CX/SG40CX/SG50CX/ SG110CX/ SG250HX/ SG30CX/SG36CX-US/ SG60CX-US/SG250HX-US SG250HX-IN/SG225HX/SG75TX SG25CX-SA SG100CX-JP
33	Q(U) curve 2	5135-5154		See Appendix 10 Note: The reactive power adjustment switch (5036) is set to Enable Q(U) curve		Valid for inverters: SG33CX/SG40CX/SG50CX/ SG110CX/ SG250HX/ SG30CX//SG36CX-US/ SG60CX-US/SG250HX-US

				(0xA4)		SG250HX-IN/SG225HX/SG75TX SG25CX-SA SG100CX-JP
34	Reserved	5155-5199				

Appendix

Appendix 1 Device Work State 1

Device state (register 5038)	
State	Value read by register 5038
Run	0x0
Stop	0x8000
Key stop	0x1300
Emergency Stop	0x1500
Standby	0x1400
Initial standby	0x1200
Starting	0x1600
Alarm run	0x9100
Derating run	0x8100
Dispatch run	0x8200
Fault	0x5500
Communicate fault	0x2500

Appendix 2 Device Work State2

Work State (5081 – 5082)		Note
State	Corresponding BIT in address 5081-5082	
Run	0	Total run state bit BIT17
Stop	1	1
Key stop	3	3
Emergency Stop	5	5
Standby	4	4
Initial standby	2	2
Starting	6	6
Alarm run	10	Total run state bit BIT17
Derating run	11	Total run state bit BIT17
Dispatch run	12	Total run state bit BIT17
Fault	9	Total fault state bit BIT18
Communicate fault	13	Total fault state bit BIT18
Total run bit (device is grid-connected running)	17	
Total fault bit (device is in fault stop state)	18	

Appendix 3 Device Fault Code(Note: Please refer to the product user manual for handling measures)

LCD or APP display (decimal)	Communication send data (hexadecimal)	Description	Classification
002	0x0002	Grid overvoltage	Fault
003	0x0003	Grid transient overvoltage	Fault
004	0x0004	Grid undervoltage	Fault
005	0x0005	Grid low voltage	Fault
007	0x0007	AC instantaneous overcurrent	Fault
008	0x0008	Grid overfrequency	Fault
009	0x0009	Grid underfrequency	Fault
010	0x000A	Grid power outage	Fault
011	0x000B	Device abnormal	Fault
012	0x000C	Excessive leakage current	Fault
013	0x000D	Grid abnormal	Fault
014	0x000E	10-minute grid overvoltage	Fault
015	0x000F	Grid high voltage	Fault
016	0x0010	Output overload	Fault
017	0x0011	Grid voltage unbalance	Fault
019	0x0013	Device abnormal	Fault
020	0x0014	Device abnormal	Fault
021	0x0015	Device abnormal	Fault
022	0x0016	Device abnormal	Fault

023

049	0x0031	Device abnormal	Fault
050	0x0032	Device abnormal	Fault
053	0x0035	Device abnormal	Fault
054	0x0036	Device abnormal	Fault
055	0x0037	Device abnormal	Fault
056	0x0038	Device abnormal	Fault
059	0x003B	Device abnormal	Alarm
060	0x003C	Device abnormal	Fault
070	0x0046	Fan alarm	Alarm
071	0x0047	AC-side SPD alarm	Alarm
072	0x0048	DC-side SPD alarm	Alarm
074	0x004A	Communication alarm	Alarm
076	0x004C	Device abnormal	Alarm
079	0x004F	PV2 abnormal	Alarm
080	0x0050	PV3 abnormal	Alarm
081	0x0051	PV4 abnormal	Alarm
087	0x0057	Electric arc detection module abnormal	Alarm
88	0x0058	Electric arc fault	Alarm
89	0x0059	Electric arc detection disabled	Fault
105	0x0069	Grid-side protection self-check failure	Alarm
106	0x006A	Grounding cable fault	Fault
116	0x0074	Device abnormal	Fault
117	0x0075	Device abnormal	Fault
220	0x00DC	PV5 abnormal	Fault
221	0x00DD	PV6 abnormal	Alarm
222	0x00DE	PV7 abnormal	Alarm
223	0x00DF	PV8 abnormal	Alarm
224	0x00E0	PV9 abnormal	Alarm
225	0x00E1	PV10 abnormal	Alarm
226	0x00E2	PV11 abnormal	Alarm
227	0x00E3	PV12 abnormal	Alarm
514	0x0202	Meter communication abnormal alarm	Alarm
532	0x0214	String 1 reverse connection alarm	Alarm
533	0x0215	String 2 reverse connection alarm	Alarm
534	0x0216	String 3 reverse connection alarm	Alarm
535	0x0217	String 4 reverse connection alarm	Alarm
536	0x0218	String 5 reverse connection alarm	Alarm
537	0x0219	String 6 reverse connection alarm	Alarm
538	0x021A	String 7 reverse connection alarm	Alarm
539	0x021B	String 8 reverse connection alarm	Alarm
540	0x021C	String 9 reverse connection alarm	Alarm
541	0x021D	String 10 reverse connection alarm	Alarm
542	0x021E	String 11 reverse connection alarm	Alarm

543	0x021F	String 12 reverse connection alarm	Alarm
544	0x0220	String 13 reverse connection alarm	Alarm
545	0x0221	String 14 reverse connection alarm	Alarm
546	0x0222	String 15 reverse connection alarm	Alarm
547	0x0223	String 16 reverse connection alarm	Alarm
564	0x0234	String 17 reverse connection alarm	Alarm
565	0x0235	String 18 reverse connection alarm	Alarm
566	0x0236	String 19 reverse connection alarm	Alarm
567	0x0237	String 20 reverse connection alarm	Alarm
568	0x0238	String 21 reverse connection alarm	Alarm
569	0x0239	String 22 reverse connection alarm	Alarm
570	0x023A	String 23 reverse connection alarm	Alarm
571	0x023B	String 24 reverse connection alarm	Alarm
548	0x0224	String 1 abnormal alarm	Alarm
549	0x0225	String 2 abnormal alarm	Alarm
550	0x0226	String 3 abnormal alarm	Alarm
551	0x0227	String 4 abnormal alarm	Alarm
552	0x0228	String 5 abnormal alarm	Alarm
553	0x0229	String 6 abnormal alarm	Alarm
554	0x022A	String 7 abnormal alarm	Alarm
555	0x022B	String 8 abnormal alarm	Alarm
556	0x022C	String 9 abnormal alarm	Alarm
557	0x022D	String 10 abnormal alarm	Alarm
558	0x022E	String 11 abnormal alarm	Alarm
559	0x022F	String 12 abnormal alarm	Alarm
560	0x0230	String 13 abnormal alarm	Alarm
561	0x0231	String 14 abnormal alarm	Alarm
562	0x0232	String 15 abnormal alarm	Alarm
563	0x0233	String 16 abnormal alarm	Alarm
580	0x0244	String 17 abnormal alarm	Alarm
581	0x0245	String 18 abnormal alarm	Alarm
582	0x0246	String 19 abnormal alarm	Alarm
583	0x0247	String 20 abnormal alarm	Alarm
584	0x0248	String 21 abnormal alarm	Alarm
585	0x0249	String 22 abnormal alarm	Alarm
586	0x024A	String 23 abnormal alarm	Alarm
587	0x024B	String 24 abnormal alarm	Alarm
448	0x01C0	String 1 reverse connection fault	Alarm
449	0x01C1	String 2 reverse connection fault	Fault
450	0x01C2	String 3 reverse connection fault	Fault
451	0x01C3	String 4 reverse connection fault	Fault
452	0x01C4	String 5 reverse connection fault	Fault
453	0x01C5	String 6 reverse connection fault	Fault

454	0x01C6	String 7 reverse connection fault	Fault
455	0x01C7	String 8 reverse connection fault	Fault
456	0x01C8	String 9 reverse connection fault	Fault
457	0x01C9	String 10 reverse connection fault	Fault
458	0x01CA	String 11 reverse connection fault	Fault
459	0x01CB	String 12 reverse connection fault	Fault
460	0x01CC	String 13 reverse connection fault	Fault
461	0x01CD	String 14 reverse connection fault	Fault
462	0x01CE	String 15 reverse connection fault	Fault
463	0x01CF	String 16 reverse connection fault	Fault
464	0x01D0	String 17 reverse connection fault	Fault
465	0x01D1	String 18 reverse connection fault	Fault
466	0x01D2	String 19 reverse connection fault	Fault
467	0x01D3	String 20 reverse connection fault	Fault
468	0x01D4	String 21 reverse connection fault	Fault
469	0x01D5	String 22 reverse connection fault	Fault
470	0x01D6	String 23 reverse connection fault	Fault
471	0x01D7	String 24 reverse connection fault	Fault
1500	0x05DC	PV1 overvoltage	Fault
1501	0x05DD	PV2 overvoltage	Fault
1502	0x05DE	PV3 overvoltage	Fault
1503	0x05DF	PV4 overvoltage	Fault
1504	0x05E0	PV5 overvoltage	Fault
1505	0x05E1	PV6 overvoltage	Fault
1506	0x05E2	PV7 overvoltage	Fault
1507	0x05E3	PV8 overvoltage	Fault
1508	0x05E4	PV9 overvoltage	Fault
1509	0x05E5	PV10 overvoltage	Fault
1510	0x05E6	PV11 overvoltage	Fault
1511	0x05E7	PV12 overvoltage	Fault
1512	0x05E8	PV13 overvoltage	Fault
1513	0x05E9	PV14 overvoltage	Fault
1514	0x05EA	PV15 overvoltage	Fault
1515	0x05EB	PV16 overvoltage	Fault
1516	0x05EC	PV17 overvoltage	Fault
1517	0x05ED	PV18 overvoltage	Fault
1518	0x05EE	PV19 overvoltage	Fault
1519	0x05EF	PV20 overvoltage	Fault
1520	0x05F0	PV21 overvoltage	Fault
1521	0x05F1	PV22 overvoltage	Fault
1522	0x05F2	PV23 overvoltage	Fault
1523	0x05F3	PV24 overvoltage	Fault
1524	0x05F4	PV25 overvoltage	Fault

1525	0x05F5	PV26 overvoltage	Fault
1526	0x05F6	PV27 overvoltage	Fault
1527	0x05F7	PV28 overvoltage	Fault
1528	0x05F8	PV29 overvoltage	Fault
1529	0x05F9	PV30 overvoltage	Fault
1530	0x05FA	PV31 overvoltage	Fault
1531	0x05FB	PV32 overvoltage	Fault

Appendix 4 Country Information

Code	Country	Country (English)	Note
0	GB	Great Britain	
1	DE	Germany	
2	FR	France	
3	IT	Italy	
4	ES	Spain	
5	AT	Austria	
6	AU	Australia	
7	CZ	Czech	
8	BE	Belgium	
9	DK	Denmark	
10	GR_L	Greece Land	
11	GR_IS	Greece Island	
12	NL	Netherlands	
13	PT	Portugal	
14	CHN	China	
15	SE	Sweden	
16	Other 50Hz		
17	RO	Romania	
18	TH	Thailand	
19	TK	Turkey	
20	AU-WEST	Australia(west)	
21	Reserved		
25	Vorarlberg (Austria)	Vorarlberg	District
26	IND	India	
27	ARE	Arab Emirates	
28	ISR	Israel	
29	HUN	Hungary	
30	MYS	Malaysia	
31	PHL	Philippines	
32	POL	Poland	
33	Reserved		
34	COL	Poland	
35~58	Reserved		
59	US-HWE	America(Hawaii)	District
60	CA	Canada	
61	US	America	
62	Other 60Hz		
63	KOR	Korea	
64	ZAF	South Africa	

65	CHL	Chile	
66	BRA	Brazil	
67	TPE	Chinese Taipei	District
69	JP	Japan	
76	EN50549-1	Europe	
77	EN50549-2	Europe	
97	US-NE	America(ISO-NE)	District
98	US-SA	America(1741-SA)	District
170	Mexico_220	Mexico	

Appendix 5、PID alarm code

LCD or APP display (decimal)	Communication send data (hexadecimal)	Description	Note
432	0x01B0	PID impedanceabnormity	<ol style="list-style-type: none"> 1. Check to ensure that the inverter is equipped with the PID regulation function. 2. Check whether the ISO impedance protection value is excessively high through the LCD or the APP, so as to ensure the requirements are met. 3. Check whether the positive and negative insulation resistances to earth of the battery panel are excessively low. 4. Please contact SUNGROW if the fault still exists.
433	0x01B1	PID function abnormity	<ol style="list-style-type: none"> 1. Check to ensure that the inverter is equipped with the PID regulation function. 2. Check device operating environment and ensure the transformer-side phase line or N line impedance to ground is normal. 3. Please contact SUNGROW if the fault still exists.
434	0x01B2	PID overvoltage/overcurrent protection	<ol style="list-style-type: none"> 1. Check if the actual ISO impedance is excessively large (greater than 1.5M ohms). 2. Check whether the set PID control duty cycle is excessively large. 3. Please contact SUNGROW if the fault still exists.

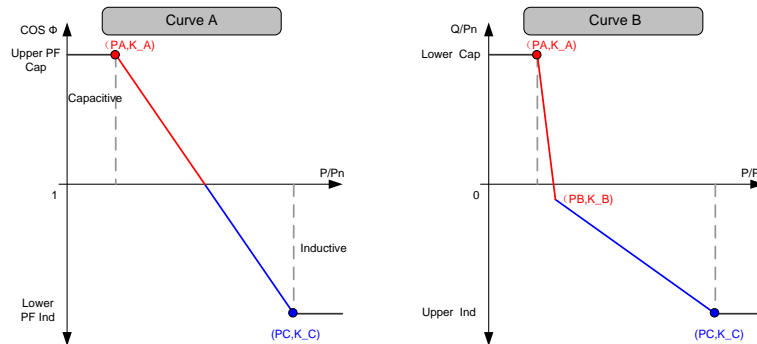
Appendix 6、Device Information(Note: If the value of string/MPPT is 1, it indicates that no string information (7013-7036) is uploaded to the read-only memory.)

Model	Type code	MPPT	String/MPPT	Power limited range(0.1%)	Power limited range (0.1kWh)	Reactive powerlimited range(0.1kVar)
SG30KTL	0x27	2	4	0-1100	0-330	-150-150
SG10KTL	0x26	2	3	0-1100	0-110	-50-50
SG12KTL	0x29	2	3	0-1100	0-132	-60-60
SG15KTL	0x28	2	3	0-1100	0-165	-75-75
SG20KTL	0x2A	2	3	0-1100	0-220	-100-100
SG30KU	0x2C	2	5	0-1100	0-330	-150-150
SG36KTL	0x2D	2	5	0-1100	0-396	-180-180
SG36KU	0x2E	2	5	0-1100	0-396	-180-180
SG40KTL	0x2F	2	4	0-1100	0-396	-180-180
SG40KTL-M	0x0135	3	3	0-1100	0-440	-200-200
SG50KTL-M	0x011B	4	3	0-1100	0-550	-250-250
SG60KTL-M	0x0131	4	4	0-1100	0-660	-300-300
SG60KU	0x0136	1	8	0-1100	0-660	-300-300
SG30KTL-M	0x0141	3	3;3;2	0-1000	0-300	-150-150
SG30KTL-M-V31	0x70	3	3;3;2	0-1000	0-300	-150-150
SG33KTL-M	0x0134	3	3;3;2	0-1100	0-363	-165-165
SG36KTL-M	0x74	3	3;3;2	0-1000	0-360	-180-180
SG33K3J	0x013D	3	3	0-1000	0-333	-166-166
SG49K5J	0x0137	4	3	0-1000	0-495	-247-247
SG34KJ	0x72	2	4	0-1000	0-340	-170-170
LP_P34KSG	0x73	1	4	0-1000	0-340	-170-170
SG50KTL-M-20	0x011B	4	3	0-1100	0-550	-250-250
SG60KTL	0x010F	1	14	0-1100	0-660	-300-300
SG80KTL	0x0138	1	18	0-1000	0-800	-400-400
SG80KTL-20	0x0138	1	18	0-1000	0-800	-400-400
SG60KU-M	0x0132	4	4	0-1100	0-660	-300-300
SG5KTL-MT	0x0147	2	1	0-1100	0-55	-25-25
SG6KTL-MT	0x0148	2	1	0-1100	0-66	-30-30
SG8KTL-M	0x013F	2	1	0-1100	0-88	-40-40
SG10KTL-M	0x013E	2	1	0-1100 If country isGermany, range is 0-1000	0-110 If country isGermany, range is0-100	-50-50
SG10KTL-MT	0x2C0F	2	2	0-1100	0-110	-50-50
SG12KTL-M	0x013C	2	2	0-1100	0-132	-60-60
SG15KTL-M	0x0142	2	2	0-1100	0-165	-75-75
SG17KTL-M	0x0149	2	2	0-1100	0-187	-85-85
SG20KTL-M	0x0143	2	2	0-1100	0-220	-100-100

SG80KTL-M	0x0139	4	4	0-1100	0-880	-400-400
SG111HV	0x014C	1	1	0-1000	0-1110	-555-555
SG125HV	0x013B	1	1	0-1000	0-1250	-625-625
SG125HV-20	0x2C03	1	1	0-1000	0-1250	-625-625
SG30CX	0x2C10	3	2	0-1000	0-299	-179~179
SG33CX	0x2C00	3	2	0-1100	0-363	-218~218
SG33CX-US	0x2C0A	3	2	0-1100	0-330	-198~198
SG40CX	0x2C01	4	2	0-1100	0-440	-264~264
SG50CX	0x2C02	5	2	0-1100	0-550	-330~330
SG55CX-US	0x2C0B	5	2	0-1100	0-550	-330~330
SG110CX	0x2C06	9	2	0-1100	0-1100	-660~660
SG250HX	0x2C0C	12	2	0-1110	0-2500	-1500~1500
SG250HX-US	0x2C11	12	2	0-1110	0-2500	-1500~1500
SG100CX-JP	0x2C12	12	2	0-1000	0-1000	-660~660
SG250HX-IN	0x2C13	12	2	0-1250	0-2500	-1500~1500
SG25CX-SA	0x2C15	3	2	0-1100	0-275	-165~165

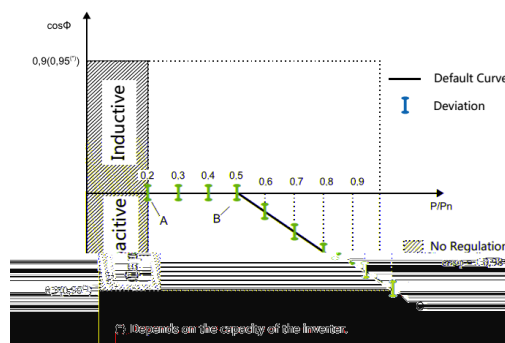
Appendix 7Q(P) Curve 1

5048~5064, curve(not applicable to Italy)



Curve	5048	U16	0 – 1, 0 Curve A, 1 Curve B		Curve A: $PA < PC$ Curve B: $(PA \leq PB \leq PC, \text{ but } PA \neq PC)$ and $(KA \leq KB \leq KC$ or $KA \geq KB \geq KC, \text{ but } KA \neq KC)$
PB	5049	U16	200-1000 Curve B is valid	0.1%	
KB	5050	S16	-500-500 Curve B is valid	0.001	
PA(Lower Power)	5051	U16	Curve A: 0~500 Curve B: 100-1000	0.1%	
PC(Upper Power)	5052	U16	Curve A: 500~1000 Curve B: 200-1000	0.1%	
KA(Upperlimit-PF)	5053	S16	Curve A: 900~1000 Curve B: -500-500	0.001	
KC(Lower limit-PF)	5054	S16	Curve A: 900~1000 Curve B: -500-500	0.001	
Reserved	5055-5064				

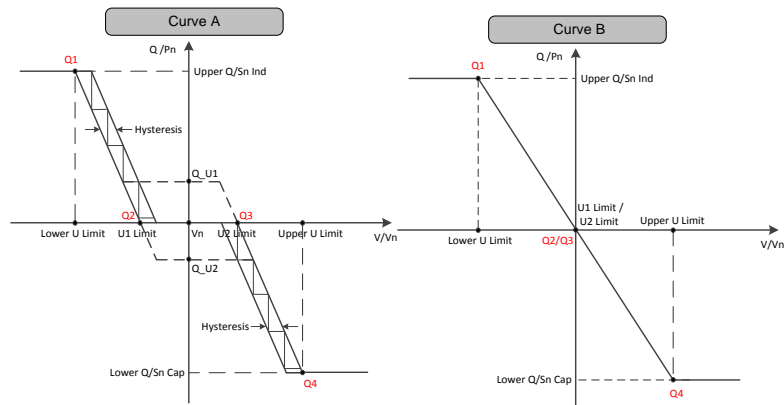
5065~5077, curve(applicable to Italy)



powerA	5065	U16	200~1000	0.1%	$powerA \leq powerB < powerC$
powerB	5066	U16	200~1000	0.1%	
powerC	5067	U16	200~1000	0.1%	
pf_max	5068	U16	900~1000	0.001	
Uin	5069	U16	1000~1100	0.1%	$U_{in} > U_{out}$
Uout	5070	U16	900~1000	0.1%	
Reserved	5071~5077	U16			

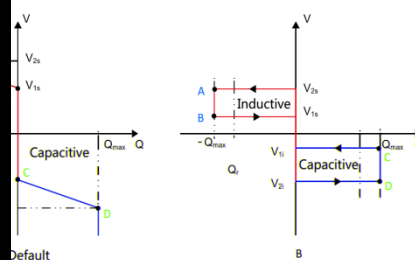
Appendix 8 Q(U) Curve 1

5078~5097, curve(not applicable to Italy)



Curve	5078	U16	0-1, 0 Curve A, 1 Curve B		Curve A: (U1Limit+Hysteresis<U2 Limit-Hysteresis) and (-Upper Q/Sn<=Q_U1<= Lower Q/Sn) and (-Upper Q/Sn<=Q_U2<= Lower Q/Sn) Curve: U1 Limit == U2 Limit
Q_U1	5079	S16	-500-500, Curve A is valid	0.1%	
			-500-500, Curve A is valid	0.1%	
			800~1000	0.1%	
			1000~1200	0.1%	
			900~1100	0.1%	
			900~1100	0.1%	
			0~50 Curve A is valid	0.1%	
			(Ind) 0~ 500	0.1%	
			(Cap) 0~500	0.1%	

98~5115, curve(applicable to Italy)



Default

B

900~1100	0.1%	
900~1100	0.1%	$V_{2i} < V_{1i} < V_{1s} < V_{2s}$
900~1100	0.1%	
900~1100	0.1%	

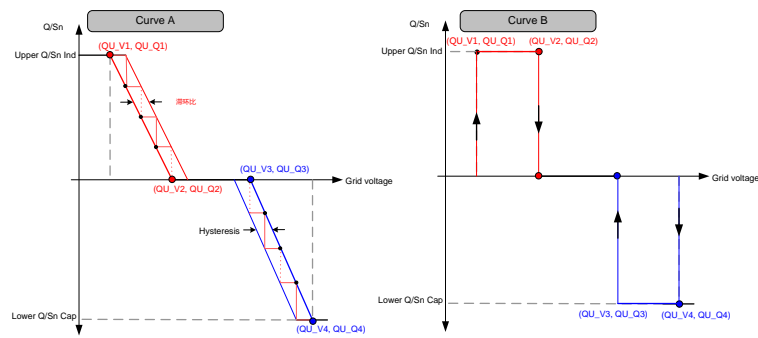
(Italy)					
Q _{max} (Italy)	5102	U16	500~1000	0.001	
P _{in} (Italy)	5103	U16	200~1000	0.1%	P _{in} > P _{out}
P _{out} (Italy)	5104	U16	10~200	0.1%	
Curve (Italy)	5105	U16	0-1, 0 Curve A, 1 Curve B		
Reserved	5106~5115				

Appendix9 Q(P) Curve 2

Q(P) Curve	5116	U16	0-1 0: Curve A 1: Curve B		<p>1. $QP_P1 \leq QP_P2 < QP_P3$ 2. If $QP_P1 = QP_P2$, $QP_K1 = QP_K2$</p> <p>QP_EnableMode: Enter and exit Q (P) mode conditions, If enable, unconditional entry and exit; If disable, conditional entry and exit: the voltage is higher than QP_EnterVoltageRatio, the voltage is lower than UoutQP_ExitVoltageRatio, and the power is lower than QP_ExitPowerRatio</p>
QP_P1	5117	U16	100~1000	0.1%	
QP_P2	5118	U16	200~1000	0.1%	
QP_P3	5119	U16	200~1000	0.1%	
QP_K1	5120	S16	Curve A: 900~1000 Curve B: -600~600	0.001	
QP_K2	5121	S16	Curve A: 900~1000 Curve B: -600~600	0.001	
QP_K3	5122	S16	Curve A: 900~1000 Curve B: -600~600	0.001	
QP_EnterVoltageRatio	5123	U16	1000~1100	0.1%	
QP_ExitVoltageRatio	5124	U16	900~1000	0.1%	

QP_ExitPowerRatio	5125	U16	10-200	0.1%	
QP_EnableMode	5126	U16	0xAA Enable 0x55 Disable		
Reserved	5127-5134	U16			

Appendix10 Q(U) Curve 2



Q(U)曲线	5135	U16	0-1 0: Curve A; 1: Curve B		QU_V1 ve B,; Inioiooower QU_EnableMode: Enter and exit Q (U) mode conditions, If enable, unconditional entry and exit; If disable, conditional entry and exit: the current power is higher than QU_EnterPower, and the current power is lower than QU_ExitPower.
滞环比	5136	U16	0~50	0.1%	
QU_V1	5137	U16	800~ 1000	0.1%	
QU_Q1	5138	U16	-600~0	0.1%	
QU_V2	5139	U16	800~1100	0.1%	
QU_Q2	5140	U16	-600~600	0.1%	
QU_V3	5141	U16	1000~1200	0.1%	
QU_Q3	5142	U16	-600~600	0.1%	
QU_V4	5143	U16	1000~1200	0.1%	
QU_Q4	5144	U16	0~600	0.1%	
QU_EnterPower	5145	U16	200-1000	0.1%	
QU_ExitPower	5146	U16	10-200	0.1%	
QU_EnableMode	5147	U16	0xAA Enable 0x55 Disable		
Reserved	5148~5154				

8. Examples

Take ComTest for example.

a) Acquire one piece of running information

Supposed that the inverter address is 1, it needs to acquire data from address 5000 of 3x address type.

The PC sends (HEX):

01 04 13 87 00 01 85 67

The inverter replies (HEX):

01 04 02 01 32 39 75

Note: The type code of inverter SG60KU-M is 0x0132.

b) Acquire multiple running information

Supposed that the inverter address is 1, it needs to acquire 10 data from address starting from 5000 of 3x address type

The PC sends (HEX):

01 04 13 87 00 0A C4 A0

The inverter replies (HEX):

01 04 14 01 32 00 28 00 00 00 00 00 05 00 00 00 26 00 00 00 00 00 00 56 EA

Note: The type code of inverter SG60KU-M is 0x0132. The nominal output power is 4.0kW, two-phase. Daily power generation is 0. The total power generation is 5kWh. The total running time is 38h. The internal temperature is 0°C. The internal transformer temperature is 0°C.

c) Acquire SN

Supposed that the inverter address is 1, it needs to acquire 10 data from address starting from 4990 of 3x address type

The PC sends (HEX):

01 04 13 7D 00 0A E4 91

The inverter replies (HEX):

01 04 14 31 32 31 32 31 32 30 30 31 00 00 00 00 00 00 00 00 00 00 00 9B 56

Note:

1. SN data type is UTF-8;

2. Serial number is: 121212001

d) Read one setting datum

Supposed that the inverter address is 1, it needs to read data from address 5000 of 4x address type.

The PC sends (HEX):

01 03 13 87 00 01 30 A7

The inverter replies (HEX):

01 03 02 07 D8 BA 2E

Note: the data read out is year 2008.

e) Read multiple setting data

Supposed that the inverter address is 1, it needs to read 10 data from address starting from 5000 of 4x address type.

The PC sends (HEX):

01 03 13 87 00 0A 71 60

The inverter replies (HEX):

01 03 14 07 DA 00 0A 00 1E 00 09 00 28 00 25 00 CE 00 AA 01 F4 00 00 80 53

Note: The data are October, 10, 2010, 09:40:37; Stop; power limitation on, power limitation value is 50 %.

f) Set one datum

Supposed that the inverter address is 1, it needs to set data from address 5000 of 4x address type.

The PC sends (HEX):

01 10 13 87 00 01 02 07 DA 19 4D

The inverter replies (HEX):

01 10 13 87 00 01 B5 64

Or

The PC sends (HEX):

01 06 13 87 07 DA BE CC

The inverter replies (HEX):

01 06 13 87 07 DA BE CC

Note: The setting data is year 2010

g) Set multiple data

Supposed that the inverter address is 1, it needs to set 10 data to address starting from 5000 of 4x address type.

The PC sends (HEX):

01 10 13 87 00 0A 14 07 D9 00 0A 00 1E 00 09 00 10 00 00 00 CE 00 AA 01 F4 00 00 3E 65

The inverter replies (HEX):

01 10 13 87 00 0A F4 A3

Note: The data are October, 30, 2009, 09:16:00, stop, power limitation on, power limitation value is 50 %.

h) Read device running information

Supposed that the inverter address is 1, it needs to set 8 data to address starting from 5038 of 3x address type.

The PC sends (HEX):

01 04 13 AD 00 0864 A9

The inverter replies (HEX):

01 04 10 55 00 07 DF 00 0C 00 15 00 04 00 0C 00 3B 00 0A EE D1

Note:

1) Device running state is Fault(0x5500); the fault/alarm time and code are valid in this state;

2) Fault time: 4 (0x0004):12(0x000C): 59(0x003B), Dec. (0x000C), 21(0x0015), 2015(0x07DF); the fault is island (0x000A).