



Technical Information

SMA SOLID-Q 50 / PRO 60 Modbus® Interface



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1 Information on this Document

Validity

This document is valid for SMA SOLID-Q 50 & SOLID-Q PRO 60 inverters in China.

Target Group

This document is intended for qualified persons. Only persons with appropriate skills are allowed to perform the tasks described in this document.

2 Safety

2.1 Intended Use

The Modbus interface of the supported SOLID-Q is designed for industrial use, via RS485 or RS422 protocol to enable remote control of the PV system, remote querying of values, and remote parameter setting.

2.2 Skills of Qualified Persons

The activities described in this document must only be performed by qualified persons. Qualified persons must have the following skills:

- Detailed knowledge of the grid management services
- Knowledge of IP-based network protocols
- Training in the installation and configuration of IT systems
- Knowledge of the Modbus specifications
- Knowledge of and compliance with this document and all safety information

3 SMA-China Modbus Profile

3.1 Information on the Assignment Tables

The assignment tables of the SMA-China Modbus profile present the following information:

Information	Explanation
ADR (DEC)	Decimal Modbus address.
Description/ number code(s)	Short description of the Modbus register and the number codes used.
Type	Type of the data (see Section 3.2).

Unit	Unit of the data.
Gain	Real value = Gain * output value
Access	RO: Read Only RW: Read and Write

3.2 SMA-China Data Types and NaN Values

The following table shows the data types used in the SMA-China Modbus profile and the possible NaN values. The SMA-China data types are listed in the assignment tables in the **Type** column. They describe the data widths of the assigned values:

Type	Description	NaN value
S16	A signed word (16-bit).	0x8000
U16	A unsigned word (16-bit).	0xFFFF
U32	A unsigned double word (32-bit).	0xFFFF FFFF
ASCII	Use 8 bit to indicate all the number 0~9, the letter, and some special symbol (for example &, @, and so on)	0~9, a~z, A~Z, blank

3.3 SMA-China Modbus Profile - Register Overview

In the following table you will find all the measured values and parameters of the SMA-China Modbus Profile.

Read-Only Registers

ADR (DEC)	Description/number code	Type	Unit	Gain	Access
30001	Device Type: 1=Single phase / 3=Three phase	U16	-	-	RO
30002	E-Today	U32	kwh	0.1	RO
30004	E-Total	U32	kwh	0.1	RO
30006	H-total	U32	h	1	RO
30012	Device State: 0 = wait / 1 = normal / 2 = faulty	U16	-	-	RO
30013	Error Code	U16	-	-	RO
30014	Connect Time	U16	s	1	RO

30015	Temperature	S16	°C	0.1	RO
	<u>Connection Mode of PV Strings</u>				
	0 = None				
	1 = PV1 Connected				
	2 = PV2 Connected				
30016	3 = PV1/PV2 Independently Connected	U16	-	-	RO
	4 = All Input Parallel Connected				
	5 = PV1/PV3 Independently Connected				
	6 = PV2/PV3 Independently Connected				
	7 = PV1/PV2/PV3 Independently Connected				
	8 = PV3 Connected				
30017	Bus Voltage	U16	V	0.1	RO
30018	PV1 Voltage	U16	V	0.1	RO
30019	PV1 Current	U16	A	0.1	RO
30020	PV2 Voltage	U16	V	0.1	RO
30021	PV2 Current	U16	A	0.1	RO
30022	PV3 Voltage	U16	V	0.1	RO
30023	PV3 Current	U16	A	0.1	RO
30029	L1 Phase Voltage [SOLID-Q 50] L1 - L2 Line Voltage [SOLID-Q PRO 60]	U16	V	0.1	RO
30030	L1 Phase Current	U16	A	0.1	RO
30031	L2 Phase Voltage [SOLID-Q 50] L2 - L3 Phase Voltage [SOLID-Q PRO 60]	U16	V	0.1	RO
30032	L2 Phase Current	U16	A	0.1	RO
30033	L3 Phase Voltage [SOLID-Q 50] L3 - L1 Phase Voltage [SOLID-Q PRO 60]	U16	V	0.1	RO
30034	L3 Phase Current	U16	A	0.1	RO
30035	Grid Frequency	U16	Hz	0.01	RO
30038	Pac	U32	W	1	RO
30040	Qac	U32	Var	1	RO
30042	Power Factor	S16	-	-	RO
	<u>Reactive Power Mode</u>				
30043	0 = None	U16	-	-	RO
	1 = Fixed Power Factor				
	2 = Cos Phi(P) curve				

	4 = Fixed Q value 5 = Q(U) curve				
	<u>Active Power Mode</u>				
30044	0 = None 1 = Fixed Active Power	U16	-	-	RO
30047	Version of Protocol	U16	-	-	RO
30048	String 1 Current	U16	A	0.1	RO
30049	String 2 Current	U16	A	0.1	RO
30050	String 3 Current	U16	A	0.1	RO
30051	String 4 Current	U16	A	0.1	RO
30052	String 5 Current	U16	A	0.1	RO
30053	String 6 Current	U16	A	0.1	RO
30054	String 7 Current	U16	A	0.1	RO
30055	String 8 Current	U16	A	0.1	RO
30056	String 9 Current	U16	A	0.1	RO
30057	String 10 Current	U16	A	0.1	RO
30058	String 11 Current	U16	A	0.1	RO
30059	String 12 Current	U16	A	0.1	RO

Read and Write Registers

ADR (DEC)	Description/number code	Type	Unit	Gain	Access
40013	0=Power Off / 1=Power On	U16	-	-	RW
42021	...				
...	Serial Number (16 digits: 2 ASCII per ADR ..1 to ..8)	ASCII	-	-	RW
42028					
45001	Grid Code (see Section 4.4)	U16	-	-	RW
45007	Grid Voltage High Limit2	U16	V	0.1	RW
45008	Grid Voltage High Limit Time2	U16	ms	20	RW
45009	Grid Voltage High Limit1	U16	V	0.1	RW
45010	Grid Voltage High Limit Time1	U16	ms	20	RW
45011	Grid Voltage Low Limit2	U16	V	0.1	RW
45012	Grid Voltage Low Limit Time2	U16	ms	20	RW

45013	Grid Voltage Low Limit 1	U16	V	0.1	RW
45014	Grid Voltage Low Limit Time 1	U16	ms	20	RW
45015	Grid Voltage High Recovery Value	U16	V	0.1	RW
45016	Grid Voltage Low Recovery Value	U16	V	0.1	RW
45017	Grid Frequency High Limit2	U16	Hz	0.01	RW
45018	Grid Frequency High Limit Time2	U16	ms	20	RW
45019	Grid Frequency High Limit 1	U16	Hz	0.01	RW
45020	Grid Frequency High Limit Time 1	U16	ms	20	RW
45021	Grid Frequency Low Limit2	U16	Hz	0.01	RW
45022	Grid Frequency Low Limit Time2	U16	ms	20	RW
45023	Grid Frequency Low Limit 1	U16	Hz	0.01	RW
45024	Grid Frequency Low Limit Time 1	U16	ms	20	RW
45025	Grid Frequency High Recovery Value	U16	Hz	0.01	RW
45026	Grid Frequency Low Recovery Value	U16	Hz	0.01	RW
45027	10 Minutes Average Overvoltage Threshold	U16	V	0.1	RW
45028	ISO Fault Threshold	U16	kOhm	1	RW
45029	DCI Fault Threshold	U16	mA	1	RW
45030	Active Power Set	U16	%	-	RW
45031	Active Power Control Response Time	U16	s	1	RW
	<u>Reactive Power Control Mode</u>				
	0 = None				
	1 = Fixed Power Factor [ADR 45038]				
45037	2 = Cos Phi(P) curve [ADR 45039 .. 45042]	U16	-	-	RW
	4 = Fixed Q value [ADR 45043]				
	5 = Q(U) curve [ADR 45044 .. 45047]				
45038	Power Factor: - = Lagging / + = Leading	U16	-	0.01	RW
45039	Cos Phi(P) Curve: First Point of Active Power	U16	%	-	RW
45040	Cos Phi(P) Curve: First Point of Cos Phi - = Lagging / + = Leading	U16	-	0.01	RW
45041	CosPhi(P) Curve: Second Point of Active Power	U16	%	-	RW
45042	CosPhi(P) Curve: Second Point of CosPhi	U16	-	0.01	RW

- = Lagging / + = Leading					
45043	Q Command Mode Set Value - = Lagging / + = Leading	U16	%	-	RW
45044	Q(U) Curve First Point of U	U16	%	-	RW
45045	Q(U) Curve First Point of Q - = Lagging / + = Leading	U16	%	-	RW
45046	Q(U) Curve Second Point of U	U16	%	-	RW
45047	Q(U) Curve Second Point of Q - = Lagging / + = Leading	U16	%	-	RW
45052	Q(U) Curve Response Time	U16	s	1	RW
45053	LVRT Support Current Factor (K-factor)	U16	-	-	RW
45054	LVRT U-T Curve: U1 (see Section 3.7)	U16	%	-	RW
45055	LVRT U-T Curve: T1 (see Section 3.7)	U16	ms	20	RW
45056	LVRT U-T Curve: U2 (see Section 3.7)	U16	%	-	RW
45057	LVRT U-T Curve: T2 (see Section 3.7)	U16	ms	20	RW
45058	LVRT U-T Curve: U3 (see Section 3.7)	U16	%	-	RW
45059	LVRT U-T Curve: T3 (see Section 3.7)	U16	ms	20	RW

3.4 Warning and Error Codes

Warning code	Description
0	No warning
30	Recovered from warning
151	SPD warning
156	Internal fan abnormal
157	External fan 1 abnormal
158	External fan 2 abnormal
161	Fuse abnormal

163	PV string current abnormal
166	CPU selftest warning – register abnormal
167	CPU selftest warning – RAM abnormal
168	CPU selftest warning – ROM abnormal

Error code	Description
1	Internal communication failure
2	EEPROM R/W failure
3	Relay check failure
4	DC injection too high
8	AC HCT failure
9	Residual Current Device failure
11	Internal software mismatch
33	f _{ac} out of range
34	V _{ac} out of range
35	Utility loss
36	Residual current too high
37	V _{pv} overvoltage
38	Isolation fault
40	Overtemperature
41	Consistent Fault: Vac different
42	Consistent Fault: Fac different
43	Consistent Fault: Residual current different
44	Consistent Fault: DC injection different
46	Too high DC bus voltage

48 Average volt of ten minutes out of range

3.5 Grid Codes

Grid Code	Description
0x23	China CN NB/T 32004*
0x37	China CN NB/T 32004**
0x38	China CN GB/T 19964**

Note:

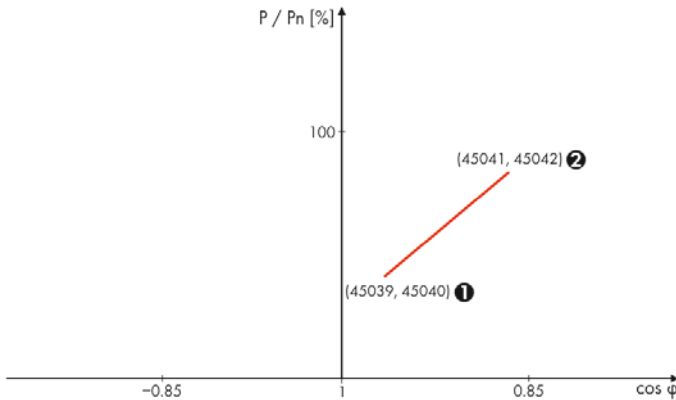
* applicable for SOLID-Q 50

** applicable for SOLID-Q PRO 60

3.6 Dynamic Reactive Power Management

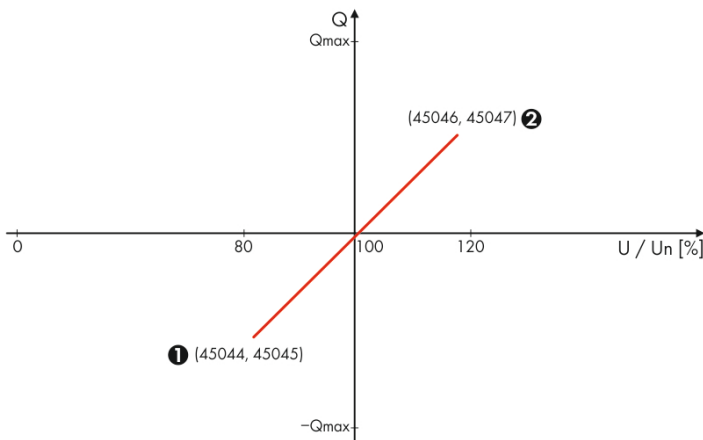
3.6.1 CosPhi(P) curve

To activate CosPhi(P) curve, please use ADR 45037 and then use ADR 45039 .. 45042 to set the curve points as highlighted in below graphic. Points I and II can be set in both quadrants. The range of CosPhi is -0.80 .. 0.80.



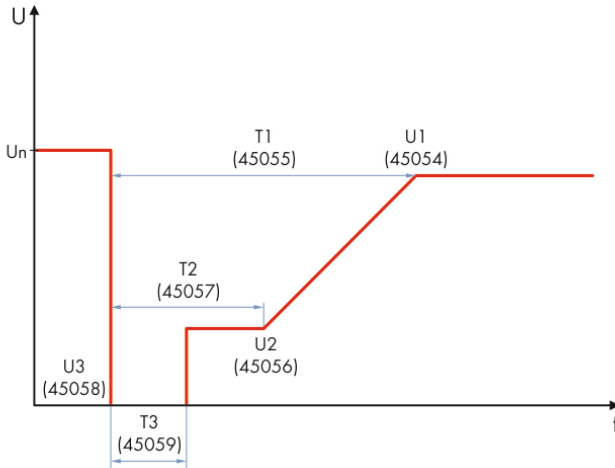
3.6.2 Q(U) curve

To activate Q(U) curve, please use ADR 45037 and then use ADR 45044 .. 45047 to set the curve points as highlighted in below graphic. Point I be set in upper-left (II) and lower-left (III) quadrants, Point II can be set in upper-right (I) and lower-right (IV.) quadrant. Q_{max} is limited by the CosPhi range of -0.80 .. 0.80.



3.7 LVRT curve settings

To adjust the LVRT curve, please use points T1-3 and U1-3 [ADR 45054...45059] as depicted below.



3.8 Frame format

MODBUS function codes:

- Read Holding Register (0x03)
- Read Input Register (0x04)
- Write Holding Single Register (0x06)
- Write Holding Multiple Registers (0x10)
- Write Holding Multiple Registers (0x10) for broadcast

Remark: when reading or writing registers, the actual address is „address in table - 1“

3.8.1 Read Holding Register (Function Code: 0x03)

Request:

Device ID	1 Byte
Function code	1 Byte
Register Address(Hi)	1 Byte
Register Address(Lo)	1 Byte
Register length	2 Byte
CRC(Lo)	1 Byte
CRC(Hi)	1 Byte

Response:

Device ID	1 Byte
Function code	1 Byte
Byte count	1 Byte
Data	$N \times 1$ Byte
CRC(Lo)	1 Byte
CRC(Hi)	1 Byte

Error:

Device ID	1 Byte
Function code + 0x80	1 Byte
Exception code	1 Byte
CRC(Lo)	1 Byte
CRC(Hi)	1 Byte

3.8.2 Read Input Register (Function Code: 0x04)

Request:

Device ID	1 Byte
Function code	1 Byte
Register Address(Hi)	1 Byte
Register Address(Lo)	1 Byte
Register length	2 Byte
CRC(Lo)	1 Byte
CRC(Hi)	1 Byte

Response:

Device ID	1 Byte
Function code	1 Byte
Byte count	1 Byte
Data	$N \times 1$ Byte
CRC(Lo)	1 Byte
CRC(Hi)	1 Byte

Error:

Device ID	1 Byte
Function code + 0x80	1 Byte
Exception code	1 Byte
CRC(Lo)	1 Byte
CRC(Hi)	1 Byte

3.8.3 Write Holding Single Register (Function Code: 0x06)

Request:

Device ID	1 Byte
Function code	1 Byte
Register Address(Hi)	1 Byte
Register Address(Lo)	1 Byte
Data	2 Byte
CRC(Lo)	1 Byte
CRC(Hi)	1 Byte

Response:

Device ID	1 Byte
Function code	1 Byte
Register Address(Hi)	1 Byte
Register Address(Lo)	1 Byte
Data	2 Byte
CRC(Lo)	1 Byte
CRC(Hi)	1 Byte

Error:

Device ID	1 Byte
Function code + 0x80	1 Byte
Exception code	1 Byte
CRC(Lo)	1 Byte
CRC(Hi)	1 Byte

3.8.4 Write Holding Multiple Registers (Function Code: 0x10)

Request:

Device ID	1 Byte
Function code	1 Byte
Register Address(Hi)	1 Byte
Register Address(Lo)	1 Byte
Register length	2 Byte
Data length	1 Byte
Data	N × 1Byte
CRC(Lo)	1 Byte
CRC(Hi)	1 Byte

Response:

Device ID	1 Byte
Function code	1 Byte
Register Address(Hi)	1 Byte
Register Address(Lo)	1 Byte
Register length	2 Byte
CRC(Lo)	1 Byte
CRC(Hi)	1 Byte

Error:

Device ID	1 Byte
Function code + 0x80	1 Byte
Exception code	1 Byte
CRC(Lo)	1 Byte
CRC(Hi)	1 Byte

3.8.5 Write Holding Multiple Registers (Function Code: 0x10) for broadcast

Request:

Device ID	1 Byte
Function code	1 Byte
Register Address(Hi)	1 Byte
Register Address(Lo)	1 Byte
Register length	2 Byte
Data length	1 Byte
Data	$N \times 1\text{Byte}$
CRC(Lo)	1 Byte
CRC(Hi)	1 Byte

Response: none

3.8.6 Exception Codes

- 0x01 Illegal function
- 0x02 Illegal address
- 0x03 Illegal data
- 0x04 Slave device failure

4 Contact

If you experience any technical problems with our products, please contact the SMA Service Hotline to provide you with the necessary assistance:

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No 198, Xiangyang Road

215011 Suzhou (China)

SMA Service Hotline: 400 801 9996