SOFAR Modbus User Guide

Physical Transmission: RS485 Address:	1 ... 63
Baud rate:	9600bps (or adjusted in the LCD screen in newer devices)
Maximum Distance:	1000m
Medium: Shielded twisted pair (STP) Mode:	MODBUS - RTU

Introduction

SofarSolar has used different Modbus protocols for historical inverter series.

To determine the correct protocol, the inverter family has to be interpreted by the serial number.

There is 3 locations where the serial number can be found, depending on the series

1st location:	0x2001 ... 0x2007
2nd location:	0x0445 ... 0x044C
3rd location:	0x0445 ... 0x044C and 0x0470…0x0471 (the registers have to be combined for the serial number)

Old serial number system (14 digits)

2nd and 3rd letter of S/N	Family SOFAR	Family ZCS Azzurro	Type	Modbus Protocol	Serial number
A1	SOFAR 1000...3000TL	AZZURRO 1PH 1100TL-3000TL-V1	Solar	SOFAR 1…40KTL	0x2001 … 0x2007
A3	SOFAR 1100…3300TL-G3	AZZURRO 1PH 1100-3300TL-V3	Solar	SOFAR 1…40KTL	0x2001 … 0x2007
B1	SOFAR 3...6KTLM	AZZURRO 1PH 3000-6000-V1	Solar	SOFAR 1…40KTL	0x2001 … 0x2007
C1…C4	SOFAR 10…20KTL	AZZURRO 3PH 10KTL-20KTL-V1	Solar	SOFAR 1…40KTL	0x2001 … 0x2007
D1…D4	SOFAR 30…40KTL	AZZURRO 3PH 30KTL-40-HV-V1	Solar	SOFAR 1…40KTL	0x2001 … 0x2007
E1	ME 3000-SP	AZZURRO 3000SP	Battery	SOFAR HYD 3...6K-ES and ME3000-SP	0x2001 … 0x2007
F1…F4	SOFAR 3.3…12KTL-X	AZZURRO 3PH 3.3KTL-12KTL-V1	Solar	SOFAR 1…40KTL	0x2001 … 0x2007
G1…G4	SOFAR 30…40KTL-G2	-	Solar	SOFAR 1…40KTL	0x2001 … 0x2007
H1	SOFAR 3…6KTLM-G2	AZZURRO 1PH 3000-6000-V2	Solar	SOFAR 1…40KTL	0x2001 … 0x2007
H3	SOFAR 3…6KTLM-G3	AZZURRO 1PH 3000TLM-6000TLM-V3	Solar	SOFAR HYD-3PH and SOFAR -G3	0x445 … 0x44C
H4	SOFAR 7.5KTLM-G3	-	Solar	SOFAR HYD-3PH and SOFAR -G3	0x445 … 0x44C
I1	SOFAR 50…70KTL	AZZURRO 3PH 50KTL-70KTL-HV-V1	Solar	SOFAR 50…70KTL	0x2001 … 0x2007
J1…J3	SOFAR 50…70KTL-G2	AZZURRO 3PH 50KTL-70KTL-HV-V1	Solar	SOFAR 50…70KTL	0x2001 … 0x2007
K1	SOFAR 7.5KTLM	-	Solar	SOFAR 1…40KTL	0x2001 … 0x2007
L1	SOFAR 20...33KTL-G2	AZZURRO 3PH 20KTL-33KTL-V2	Solar	SOFAR 1…40KTL	0x2001 … 0x2007
M1	HYD 3000…6000-ES	AZZURRO 1PH HYD3000-6000 ZSS	Hybrid	SOFAR HYD 3...6K-ES and ME3000-SP	0x2001 … 0x2007
M2	HYD 3000…6000-EP	AZZURRO 1PH HYD3000-6000 ZSS-HP	Hybrid	SOFAR HYD-3PH and SOFAR -G3	0x445 … 0x44C
N1	SOFAR 10...15KTL-G2	AZZURRO 3PH 10KTL-15KTL-V2	Solar	SOFAR 1…40KTL	0x2001 … 0x2007
P1…P2	HYD 5…20KTL-3PH	AZZURRO 3PH HYD5000…20000 ZSS	Hybrid	SOFAR HYD-3PH and SOFAR -G3	0x445 … 0x44C
Q1	SOFAR 75…136KTL	AZZURRO 3PH 80KTL-LV…136-HV	Solar	SOFAR HYD-3PH and SOFAR -G3	0x445 … 0x44C
R1	SOFAR 255KTL-HV	AZZURRO 3PH 255KTL-HV	Solar	SOFAR HYD-3PH and SOFAR -G3	0x445 … 0x44C

S1	SOFAR 15…24KTLX-G3	AZZURRO 3PH 15KTL-24KTL-V3	Solar	SOFAR HYD-3PH and SOFAR -G3	0x445 … 0x44C
S2	SOFAR 3.3…12KTLX-G3	AZZURRO 3PH 3.3KTL-12KTL-V3	Solar	SOFAR HYD-3PH and SOFAR -G3	0x445 … 0x44C
S3	SOFAR 25…50KTLX-G3	AZZURRO 3PH 25KTL-50KTL-V3	Solar	SOFAR HYD-3PH and SOFAR -G3	0x445 … 0x44C
S4	SOFAR 60…80KTLX-G3	AZZURRO 60KTL-V3/3PH 80KTL-V3	Solar	SOFAR HYD-3PH and SOFAR -G3	0x445 … 0x44C
T1	SOFAR 7…10.5KTLM-G3	-	Solar	SOFAR HYD-3PH and SOFAR -G3	0x445 … 0x44C
U1..U2	ME 5…20KTL-3PH	-	Battery	SOFAR HYD-3PH and SOFAR -G3	0x445 … 0x44C

New Serial number system 2023 (20 digits)

4-6th letter of serial number	Family SOFAR	Family ZCS Azurro	Type	Modbus Protocol	Serial number registers
036	SOFAR 100…125KTLX-G4	-	Solar	SOFAR HYD-3PH and SOFAR -G3	0x0445 … 0x044C + 0x0470…0x0471
005	ESI 2.5…5.0K		Hybrid	SOFAR HYD-3PH and SOFAR -G3	0x0445 … 0x044C + 0x0470…0x0471

Data format HYD 5-20KTL-3PH

HYD 5-20K-3PH MODBUS communication protocol data field adopts the "BIG ENDIAN" mode, that is, the high byte comes first and the low byte comes after. Examples are as follows One 16-bit register contains a value of 0x12AB, and the order of sending register values is High byte=0x12
Low byte=0xAB
Interpretation of high and low words of 32bit data

MODBUS addresses 0x068E and 0x068F are combined into 32bit data. The high 16bit data comes first and the low 16bit data comes next, that is, 32bit data 0x12345678
The message read is Tx: 01 03 06 8E 00 02 A4 A8
The returned message is Rx: 01 03 04 12 34 56 78 81 07
1. Data field HYD 5-20K-3PH MODBUS communication protocol data field adopts the "BIG INDIAN" mode, that is, the high byte comes first and the low byte comes after. Examples are as follows One 16-bit register contains a value of 0x12AB, and the order of sending register values is High byte=0x12
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2. Rules for register reading: there is no limit on reading, the function code is 0x03, and any address valid for the protocol can be read as the starting address

Writing to registers (here example for HYD)

Rules and restrictions on register writing: write the start address and fixed length limit, and the function code is 0x10. The specific register writing requirements are as follows:

Register Block (Hex)	Register Block (dec.)	Notes
0x1004~0x100A	4100~4106	It is required to write from 4100, and the write length is 7 and the write value of 4106 is 1;
0x100B~0x100F	4107~4111	It is required to write from 4107, and the write length is 5 and the write value of 4111 is 1;
0x1011~0x1020	4113~4128	It is required to write from 4113, and the write length is 16;
0x1023~0x1024	4131~4132	It is required to write from 4131, and the write length is 2;
0x1025~0x1026	4133~4134	It is required to write from 4133, and the write length is 2;
0x1027	4135	It is required to write from 4135, and the write length is 1;
0x1028	4136	It is required to write from 4136, and the write length is 1;
0x1029~0x102A	4137~4138	It is required to write from 4137, and the write length is 2;
0x102B~0x102C	4139~4140	It is required to write from 4139, and the write length is 2;
0x102D	4141	It is required to write from 4141, and the write length is 1;
0x1030~0x1033	4144~4147	It is required to write from 4144, and the write length is 4;
0x1034	4148	It is required to write from 4148, and the write length is 1;
0x1035~0x1037	4149~4151	It is required to write from 4149, and the write length is 3;
0x1038	4152	It is required to write from 4152, and the write length is 1;
0x1044~0x1053	4164~4179	It is required to write from 4164, and the write length is 16 and the write value of 4179 is 1; The write value of 4166 is 9 when the battery type is EMS;
0x1104	4356	It is required to write from 4356, and the write length is 1;
0x1110	4368	It is required to write from 4368, and the write length is 1;
0x1111~0x111F	4369~4383	It is required to write from 4369 and the write length is 1 or 15; When the write length is 15, the write values of 4379~4382 are 0 respectively;
0x1120~0x112F	4384~4399	It is required to write from 4384, and the write length is 1 or 16; When the write length is 16, the write values of 4394~4398 are 0 respectively;
0x1130~0x1133	4400~4403	It is required to write from 4400, and the write length is 4;
0x1187~0x118C	4487~4492	It is required to write from 4487, and the write length is 6;
0x1189~0x118C	4489~4492	It is required to write from 4489, and the write length is 4;

Real-time Active / Reactive Power Control

Below the register addresses for the active and reactive power control can be found. Please refer to the examples for more details.

			Reading			Control			
Modbus Protocol	**Firmware Version**	**Serial number**	**Actual Active Power**	**Actual Reactive Power**	**Function Code**	**Active Power setpoint**	**Reactive Power setpoint**	**Reactive Power mode**	**Active Power mode**
SOFAR 1…40KTL		0x2001 … 0x2007	0x000C	0x000D	0x03, 0x04	0x1041	0x1062	0x1060	0x1040
SOFAR HYD 3...6K-ES and ME3000-SP		0x2001 … 0x2007	0x0214	N/A	0x03, 0x04	0x1041	0x1062	0x1060	0x1040
SOFAR 50…70KTL	V2.50	0x2001 … 0x2007	0x000F	0x0010	0x04	0x1041	0x1062	0x1060	0x1040
SOFAR HYD-3PH and SOFAR -G3		0x445 … 0x44C	0x0485	0x0486	0x03, 0x10				

I. SOFAR -G3 protocol example

Realtime Active and reactive Power control

The G3 inverters can be controlled from external controllers with below registers. Those registers are using volatile memory area to avoid damage through frequent writing cycles.
The register 1105 defined if active (Bit 0) or reactive (Bit 1) power is written, and what reactive mode is used (Bit 2). 0 for reactive power, 1 for power factor (equal to Cos Phi).
SVG is the reactive power support when no PV power is present (Bit 3), with the mode selection in Bit 4 (0 for fixed reactive power, 1 for reactive power)

Register address (Hex)	Field	Type	Accuracy	Unit	Min	Max	Read/Write	Remarks
1105	Power_Control	U16					RWV	Power control. Bit0: active (address 0x1106) enable bit Bit1: Reactive (address 0x1107-0x1108) enable bit Bit2: Reactive mode selection bit (0: Reactive_Power; 1: Power_Factor) Bit3: SVG enable bit Bit4: SVG reactive mode selection bit (0: Fixed_Reactive_Power; 1: Reactive_Power)
1106	Active_Power_Export_Limit	U16	0,1	%Pn	0	1000	RWV	Output maximum active power percentage
1107	Active_Power_Import_Limit	U16	0,1	%Pn	0	1000	RWV	Input maximum active power percentage
1108	Reactive_Power_Setting	I16	0,1	%Sn	-1000	1000	RWV	Percentage of reactive power.

								Note: The maximum reactive power is limited by the specific model.
1109	Power_Factor_Setting	I16	0,01	p.u.	-100	100	RWV	Power factor. Note: The minimum power factor is limited by the specific model.
110A	Active_Power_Limit_Speed	U16	1	%	1	65535	RWV	Active power limit change rate
110B	Reactive_Power_Response_Time	U16	0,1	second	0	65535	RWV	Reactive power setting response time

I. 1-40KW protocol example

Modification of active power

Step 1: Read operation.
Command: 88 04 10 40 00 10 EB 8B
This step is designed to not change the original configuration parameters of the client machine, so it can only be done in a "read first, write later" manner.)
Step 2: Reorganisation instructions in response to.
1) Assume that the response command is as follows.
8804200001 0384005509C40A5A0014012C012CFFFFFFFF00000000000000000000000000000000000000000688C
Replace the purple section with:

The green section is reserved.

Default setting in yellow: 0055 indicates power on)

The last two bytes of the answer instruction are not wanted and 688C is removed.

Blue part: set according to the value to be set for active load shedding, e.g. to be set to 67% corresponding to 029E; to be set to 100% is 03E8; to be set to 50% is 01F4. Here to have active load shedding to 67%, the blue part is changed to 029E, output active power =

2) Instructions after recombination

8813104000100001029E005509C40A5A0014012C012CFFFFFFFF00000000000000000000000000000000

3) Add 2 bytes of CRC checksum at the end.

Tool URL.http://www.metools.info/code/c15.html

The calibration value is 79CB. Contrary to the calculation)

Step 3: The entire instruction for an active load shedding of 67% is

8813104000100001029E005509C40A5A0014012C012CFFFFFFFF00000000000000000000000000000000079CB

Step 4: Read and send the read command again to confirm that it has been set up successfully.

The value of the position in the blue part of the answer command, which corresponds to the one written, indicates that it has been set successfully.

Modification of reactive power

Step 1: Read operation.

Command: 88 04 10 60 00 10 EA 41

This step is designed to not change the original configuration parameters of the client machine, so it can only be done in a "read first, write later" manner.)

Step 2: Reorganisation instructions in response to.

1) Assume that the response command is as follows.

88 04 20 00 07 00 64 00 00 00 00 64 00 32 00 64 00 32 00 64 00 32 00 5F 00 64 00 69 00 64 00 68 00 70 00 60 BA 40

Replace the purple section with: 88 13 10 60 00 10 00 01

The green section is reserved.

Default setting for blue section: 0064 Power factor valid for reactive mode one): 1.00.

The last two bytes of the answer instruction are not wanted and BA 40 is removed.

Yellow part: 0000 fixed reactive power percentage, set according to the reactive power value to be set, e.g. to set to 67% corresponds to 029E; to set to 100% is 03E8; to set to 50% is 01F4. Here to 67%, the yellow part is changed to 029E

2) Instructions after recombination

88 13 10 60 00 10 00 01 00 64 029E 00 64 00 32 00 64 00 32 00 64 00 32 00 5F 00 64 00 69 00 64 00 68 00 70 00 60

3) Add 2 bytes of CRC checksum at the end.

Step 3: The entire instruction for an active load shedding of 67% is

88 13 10 60 00 10 00 01 00 64 029E 00 64 00 32 00 64 00 32 00 64 00 32 00 5F 00 64 00 69 00 64 00 68 00 70 00 60 00 60 12 89

Step 4: Read and send the read command again to confirm that it has been set up successfully.

88 04 20 00 01 00 64 02 9E 00 64 00 32 00 64 00 32 00 64 00 32 00 5F 00 64 00 69 00 64 00 64 00 68 00 70 00 60 00 23 4A

The value of the position in the blue part of the answer command, which corresponds to the one written, indicates that it has been set successfully.