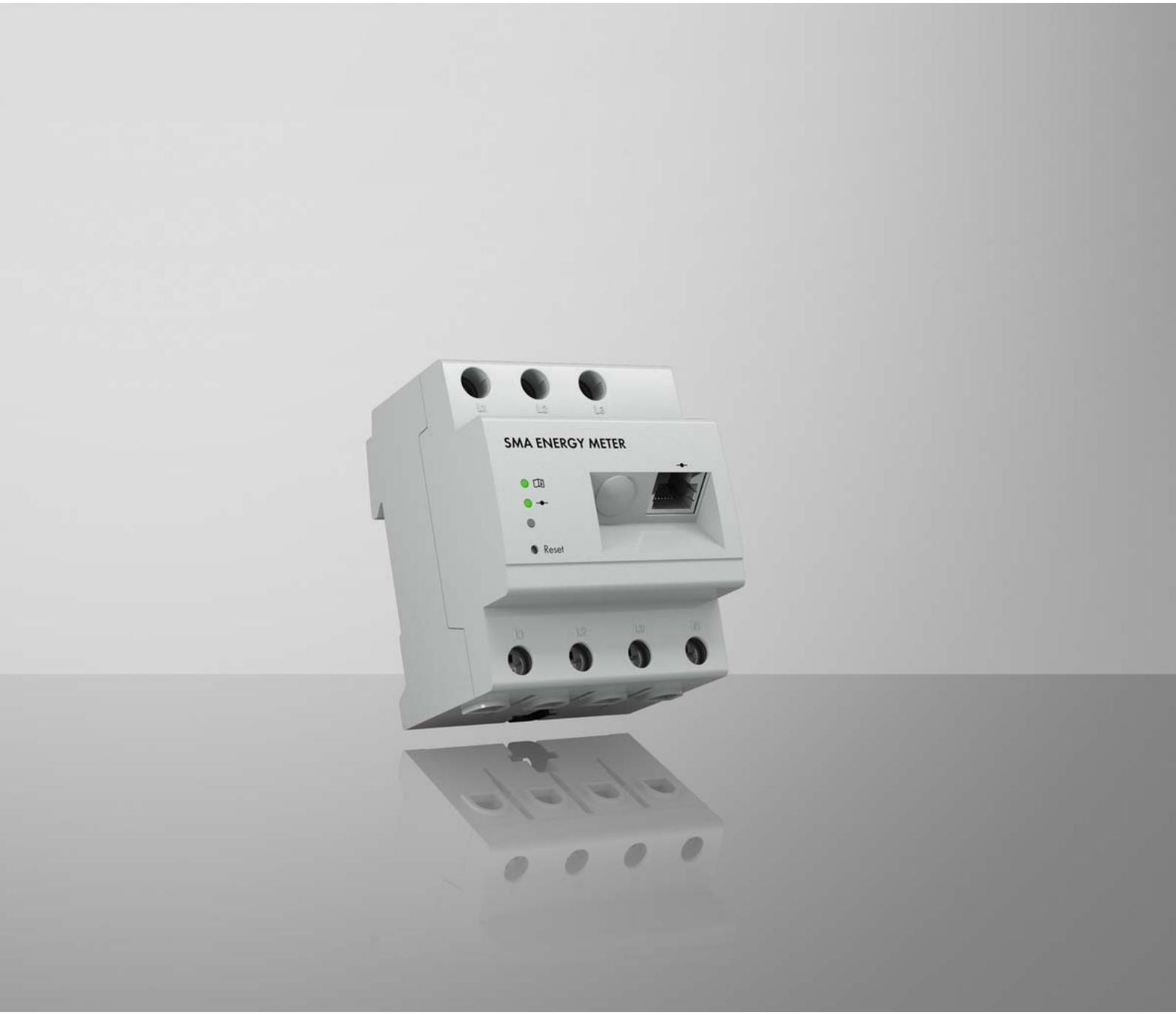
Technical Information

SMA ENERGY METER
Meter Protocol



1 Information on this Document

1.1 Validity

This document describes the meter protocol of the SMA Energy Meter.

1.2 Target Group

This document is intended for qualified persons. Qualified persons must have the following skills:

- Knowledge of IP-based network protocols
- Knowledge of and compliance with this document

1.3 Terms

Designation	Explanation
Speedwire	Speedwire designates SMA Ethernet technology and is based on Ethernet technology. Speedwire sends and receives UDP telegrams to the IANA registered Port 9522.
SMA Net	SMA Net referred to the use of serial transmissions in HDLC format. The SMA Net protocol ID determines the syntax and semantics of a data package.
SMA device address	A SMA device address is a 6-byte long worldwide unique identifier for an SMA device.
SUSy ID	A SUSy ID is a 2-byte long identifier for SMA hardware and is located in the first 2 bytes of SMA device address.

2 Description

The meter protocol is used for the transmission of measured values of a measuring point to the SMA Energy Meter. In doing so, the measured values (data points) in a telegram are stored and transmitted in a row.

The protocol has the protocol ID **0x6069**.

Pairs of values are transmitted in the data telegram. Each measured value (in accordance with OBIS) is preceded by its identification number. The classes B, C, D and E are to be shown. Class A (medium) is assumed to be "1: Electricity."

Energy meters always use measuring type 8 (time integral1, energy meter readings) and are transmitted with a data length of 8 bytes.

In addition, each data package includes a time stamp in milliseconds (32 bit, with overflow) and the SMA device address of the measuring point (6 byte, made up of the SUSy-ID of the device and a unique serial number).

3 Data Format

The data within a structure is stored binary. The order is based on the Network Byte Order (Big-Endian).

Several measuring points can be transmitted within a telegram.

The minimum number of measuring points is zero. "Empty telegrams" can be sent with this that only contain the sender and the measuring time in order to trigger monitoring functions, for example.

Structural design of the energy meter protocol:

BYTE 0 to 5	BYTE 6 to 9	BYTE 10 and the following (see below)
Energy meter identifier (SMA device address)	Measuring time (in ms, with overflow)	Sequence of pairs with OBIS identifier and measured value (number can be calculated from the telegram length)

Design of the OBIS identifier (4 byte):

BYTE 0	BYTE 1	BYTE 2	Byte 3
Measuring channel OBIS: Channel (B)	Measured value index OBIS Measurement value (C)	Measurement type OBIS Measurement type (D)	Tariff OBIS Tariff (E)

Energy meter data:

DWORD 0	DWORD 1				DWORD 2			
OBIS identifier (see above)	BYTE 7	BYTE 6	BYTE 5	BYTE 4	BYTE 3	BYTE 2	BYTE 1	BYTE 0

Measured value:

DWORD 0	DWORD 1		
OBIS identifier (see above)	BYTE 3	BYTE 2	BYTE 1	BYTE 0

Software version:

DWORD 0	DWORD 1			
OBIS identifier (see above)	BYTE 3 (Major)	BYTE 2 (Minor)	BYTE 1 (Build)	BYTE 0 (Revision)

The SMA software version is displayed as follows:

Major.Minor.Build.Revision

The revision is distinguished as follows:

- S – Special version
- A – Alpha (not yet feature complete, version for verification and validation)
- B – Beta (feature complete, version for verification and validation)
- R – Release candidate / Release (version for verification, validation and field test / public version)
- E – Experimental version (serves as local verification)
- N – No revision

Each revision "S", "A", "B", "R", and "E" can manage its own build number range within a tuple (Major.Minor).
The revisions "A", "B", and "R" are used in strict serial sequence and increment the build number. The experimental versions "E" do not increment the build number.

3.1 Defined Channels

The following table provides an overview of the measuring channels and their definition:

	Current average 4 byte/data point	Energy meter reading 8 byte/data point	Description
Sums			
1	1:1.4.0	1:1.8.0	Active power/energy +
2	1:2.4.0	1:2.8.0	Active power/energy −
3	1:3.4.0	1:3.8.0	Reactive power/energy +
4	1:4.4.0	1:4.8.0	Reactive power/energy −
9	1:9.4.0	1:9.8.0	Apparent power/energy +
10	1:10.4.0	1:10.8.0	Apparent power/energy −
13	1:13.4.0	–	Power factor
Phase 1			
21	1:21.4.0	1:21.8.0	Active power/energy +
22	1:22.4.0	1:22.8.0	Active power/energy −
23	1:23.4.0	1:23.8.0	Reactive power/energy +
24	1:24.4.0	1:24.8.0	Reactive power/energy −
29	1:29.4.0	1:29.8.0	Apparent power/energy +
30	1:30.4.0	1:30.8.0	Apparent power/energy −
31	1:31.4.0	–	Electric current
32	1:32.4.0	–	Voltage
Phase 2			
41	1:41.4.0	1:41.8.0	Active power/energy +
42	1:42.4.0	1:42.8.0	Active power/energy −
43	1:43.4.0	1:43.8.0	Reactive power/energy +
44	1:44.4.0	1:44.8.0	Reactive power/energy −
49	1:49.4.0	1:49.8.0	Apparent power/energy +
50	1:50.4.0	1:50.8.0	Apparent power/energy −
51	1:51.4.0	–	Electric current
52	1:52.4.0	–	Voltage

	Current average 4 byte/data point	Energy meter reading 8 byte/data point	Description
Phase 3			
61	1:61.4.0	1:61.8.0	Active power/energy +
62	1:62.4.0	1:62.8.0	Active power/energy −
63	1:63.4.0	1:63.8.0	Reactive power/energy +
64	1:64.4.0	1:64.8.0	Reactive power/energy −
69	1:69.4.0	1:69.8.0	Apparent power/energy +
70	1:70.4.0	1:70.8.0	Apparent power/energy −
71	1:71.4.0	–	Electric current
72	1:72.4.0	–	Voltage
Other			
127	144:0.0.0	–	Software version (4 byte)

3.2 Manufacturer Specific Codes

In addition to the standardized channels, manufacturer specific data channels are used. The software version of a device can be transmitted with the code 144 for group B with this, for example.

In value groups B, C, D, E and F the following ranges are available for the manufacturer specific purposes:

- Group B: 128 to 199;
- Group C: 128 to 199 and 240;
- Group D: 128 to 254;
- Group E: 128 to 254;
- Group F: 128 to 254;

If any of these value groups contain a value in the manufacturer specific range, then the whole OBIS code shall be considered as manufacturer specific. Thus, the values of other groups do not necessarily carry a meaning (as defined in this standard or in IEC 62056-62).

Manufacturer specific codes can only be 4 byte long. In order to code longer data, group E can be used to number values consecutively.

3.3 Resolution of the Measured Values

The resolution has been defined for the individual physical measured values as follows:

- 0.1 W
- 1 Ws
- 1 mA
- 1 mV
- 0.001 for cos(φ)

4 Example for an Energy Meter Telegram in Speedwire

The following example contains only exemplary values in order to illustrate the basic design. In a complete telegram, all mandatory values must be transmitted within a telegram.

All data are transmitted in "Network Byte Order" (Big-Endian):

Offset	Content	Description
0	"SMA"	**ID string** Value: "S", "M", "A", 0
4	4	Data length: 4 byte (0x00000004)
	0x02A0	Tag: "Tag0" (42), version 0
8	0x0001	Group1 (default group)
12	0x002C	Data length: 44 byte (variable)
	0x0010	Tag: "SMA Net 2", version 0
16	0x6069	Protocol ID (energy meter protocol) Data length: 2 byte
18	0x01	**Energy meter identifier** Data length: 6 byte Susy-ID: 270 (0x10E) SerNo.: 258 (0x102)
19	0x0E	
20	0x00	
21	0x00	
22	0x01	
23	0x02	
24	0x00	**Ticker measuring time in ms (with overflow)** Data length: 4 byte Value: 3451005 ms (0x34A87D)
25	0x34	
26	0xA8	
27	0x7D	
28	0x01	Measuring channel (default channel)
29	0x01	Measured value index (1 = sum active power, reference)
30	0x08	Measurement type (energy meter)
31	0x00	Tariff (total tariff)
32	0x00	**Energy meter reading in Ws** Data length: 8 byte Value: 85366.55 kWh are equivalent to 307319580000 Ws (0x478DACA560)
33	0x00	
34	0x00	
35	0x47	
36	0x8D	
37	0xAC	
38	0xA5	
39	0x60	
40	0x01	Measuring channel (default channel)

Offset	Content	Description
41	0x02	Measured value index (2 = sum active power, feed-in)
42	0x08	Measurement type (energy meter)
43	0x00	Tariff (total tariff)
44	0x00	**Energy meter reading in Ws** Data length: 8 byte Value: 111383.713 kWh are equivalent to 400981366800 Ws (0x5D5C5A1810)
45	0x00	
46	0x00	
47	0x5D	
48	0x5C	
49	0x5A	
50	0x18	
51	0x10	
52	0x01	Measuring channel (default channel)
53	0x02	Measured value index (2 = sum active power, feed-in)
54	0x04	Measurement type (current average)
55	0x00	Tariff (total tariff)
56	0x00	**Power in W** Data length: 4 byte Value: 11.451 kW are equivalent to 11451 W (0x2CBB)
57	0x00	
58	0x2C	
59	0xBB	
60	0x0000	Data length: 0 byte due to the "end" data
62	0x0000	End

Key:

- Start identifier
- Day entry
- Context 0
- Data field
- Data of the energy meter

4.1 Provided Data

- The value 0 is initially used for the tariff (sum).
- The channel 0 is initially used for the measuring channel.

In addition, a time stamp and the energy meter identifier (6 byte, made up of the SMA device identifier (SUSy ID = 270) and a unique, unchangeable serial number of the energy meter) is transmitted within each data package.

SMA Solar Technology AG uses the channel identifier 0 for the internal measurements. This allows for a later connection of additional individual circuit measurements that can be displayed on the channels 1 to 10, etc.