PA 144, SMC 144, SMV, SMVQ, SMP, SMPQ

Multifunctional Panel Meters & Power Quality Analyzers

Communication Protocol Manual

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For device firmware revision 1.0.x

Preliminary

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1 Communication Between the Device and the Host System

Each SMV, SMP or SMPQ device is equipped by default with a USB communication. This port is capable to emulate virtual serial communication to the host PC. The USB port can be used for data acquisition, configuration and status checks using the proprietary protocol KMB Long supported by the ENVIS software suite. Optionally each device can be equipped with RS232 or RS485 line. With this remote serial communication option exclusively the KMB Long or Modbus RTU is supported to provide all information to the operator's PC. The most advanced communication option for this products line is the Ethernet support. With this option the user gets simultaneous access to various type of data over: TCP/IP based implementation of the Modbus RTU, KMB Long protocol and embedded web server with actual data and configuration.

2 Modbus Description

SMxx instruments implement a Modbus RTU or Modbus TCP server interface. For more details about various Modbus implementations see http://www.modbus.org/specs.php.

Devices with serial line (RS232, RS485) can be configured to use the Modbus RTU protocol . For this option the address, baud rate and parity bit are specified (see the respective part of user manual for configuration details). A gap between bytes corresponding to maximum 1.5 characters (bytes) is allowed while receiving a command or transmitting a reply.

For Ethernet the Modbus TCP implementation is available. The listening port can be configured together with other TCP/IP settings (default port: 502). The instrument sends back a reply within 200 ms time frame after receiving each command. Up to three requests from different masters can be processed concurrently by each device. Between each master and the instrument the communication must follow the single request-reply. Master should wait for each reply before submiting new request.

2.1 Supported Functions

- 3 (0x03) read holding registers
- 4 (0x04) read input registers
- 16 (0x10) write multiple registers

The “broadcast” mode is not supported.

2.2 Modbus Quantity Encoding

Access to data structure components is provided using read/write from/to relevant registers as shown in the chart in the following subsections. Modbus protocol is based on variable mappings into 16 bit registers. Single-byte quantities are stored in such a register in the format of 0x00nn where nn is a single-byte parameter. For multibyte quantities the byte ordering is a big endian. 32-bit and 64-bit integers and floats are ordered in consequent 16-bit registers from MSB to LSB serialy. Floats are encoded using the IEEE 754 float number format.

Structures which hold the instrument status information are stored in an array of ‘holding’ registers. The currently measured data can be read as the contents of the ‘input’ registers. Each structure component is stored within the array of registers using the base addresses and a given offset.

Each value is encoded in the following way:

1. if not stated otherwise, each register is encoded in the same way as the corresponding variable in the respective message of the KMB Long protocol (Section 3).
2. Actual data values of float type (voltage, current, powers, etc.) hold the value of the respective quantity, no recalculation is needed.

ANSI C and .NET functions(sample code) for time and value conversions can be provided upon request.

2.3 Modbus Register Map

– mapping top input and holding registers:
IR = input register, 16-bit, read only
HR = holding register, 16-bit, read and write

blocks in registers	base address	type
Identification	0x200	IR
Configurable Settings	0x700	HR
Inconfigurable Settings	0x800	IR
Actual Data	0x1000	IR
Electricity Meter	0x2000	IR

IR and HR have separated address spaces. For simplicity those are now taken together so it is possible to map HR in IR space and read them also with function 0x04.

2.4 Data Mapping in 16-bit Registers.

Identification 0x200

Offset IR	size/type	mapped data
0	16b	DEVICE_NUMBER
1	16b	DEVICE_TYPE
2	16b	PROPS_TYPE
3	16b	SOFTWARE_VERSION
4	16b	HARDWARE_VERSION
5	16b	BOOTLOADER VERSION
6, 7, 8, 9	64b	Time of Use

Configurable Settings 0x700

The configurable settings as provided in the following table can be modified by the Modbus function 0x16 - Write Multiple Registrers. When device receives a message with such function, all related registers are stored. If nessecary the soft erase action is performed prior to sending an answer to the request. The need for this action is implied by the change to certain registers - see column „Soft Erase". The change is than also written to the device log for further reference.

Offset IR	Offset HR	size/type	mapped data	Soft Erase
0	0	16b	VT	Yes
1	1	16b	VT N	Yes
2	2	16b	CT	Yes
3	3	16b	CT N	Yes
4	4	8b	Measurement Method	Yes
5, 6	5, 6	32b, float	Nominal Voltage	No
7, 8	7, 8	32b, float	Nominal Power	No

Inconfigurable Settings 0x800

Offset IR	size/type	mapped data
0	16b	Default Frequency
1	8b	Device Address
2	8b	Remote Baud Rate
3	8b	Protocol
4,5	32b	IP Address
6	16b	Port
7, 8, 9, 10	64b	GMT Time
11, 12	32b	Netmask
13, 14	32b	Gateway
15	16b	Modbus Port
16	16b	Webserver Port

Actual Data 0x1000

Offset IR	size/type	mapped data
0	8b	Config Change counter
1	16b	Error Code
2	16b	Sample Overflow/Underflow
3	16b	Input/Output status
4, 5	32b, float	Frequency
6, 7	32b, float	Analog value
8, 9	32b, float	I_4
10, 11	32b, float	Voltage Unbalance
12, 13	32b, float	Current Unbalance
14, 15	32b, float	Phase of Current Unbalance
16, 17	32b, float	U_{LN1}
18, 19	32b, float	U_{LN2}
20, 21	32b, float	U_{LN3}
22, 23	32b, float	U_N
24, 25	32b, float	U_{LL1}
26, 27	32b, float	U_{LL2}
28, 29	32b, float	U_{LL3}
30, 31	32b, float	I_1
32, 33	32b, float	I_2
34, 35	32b, float	I_3

Offset IR	size/type	mapped data
36, 37	32b, float	I_N
38, 39	32b, float	P_1
40, 41	32b, float	P_2
42, 43	32b, float	P_3
44, 45	32b, float	P_N
46, 47	32b, float	P_{fh1}
48, 49	32b, float	P_{fh2}
50, 51	32b, float	P_{fh3}
52, 53	32b, float	P_{fhN}
54, 55	32b, float	Q_1
56, 57	32b, float	Q_2
58, 59	32b, float	Q_3
60, 61	32b, float	Q_N
62, 63	32b, float	Q_{fh1}
64, 65	32b, float	Q_{fh2}
66, 67	32b, float	Q_{fh3}
68, 69	32b, float	Q_{fhN}
70, 71	32b, float	$THDU_1$
72, 73	32b, float	$THDU_2$
74, 75	32b, float	$THDU_3$
76, 77	32b, float	$THDU_N$
78, 79	32b, float	$THDI_1$
80, 81	32b, float	$THDI_2$
82, 83	32b, float	$THDI_3$
84, 85	32b, float	$THDI_N$
86, 87	32b, float	S_1
88, 89	32b, float	S_2
90, 91	32b, float	S_3
92, 93	32b, float	S_N
94, 95	32b, float	PF_1
96, 97	32b, float	PF_2
98, 99	32b, float	PF_3
100, 101	32b, float	PF_N
102, 103	32b, float	D_1
104, 105	32b, float	D_2
106, 107	32b, float	D_3
108, 109	32b, float	RESERVED
110, 111	32b, float	$cos(\varphi)_1$
112, 113	32b, float	$cos(\varphi)_2$
114, 115	32b, float	$cos(\varphi)_3$
116, 117	32b, float	$cos(\varphi)_N$
118, 119	32b, float	P_{3P}
120, 121	32b, float	P_{fh3P}
122, 123	32b, float	Q_{3P}
124, 125	32b, float	Q_{fh3P}
126, 127	32b, float	S_{3P}

Offset IR	size/type	mapped data
128, 129	32b, float	PF_{3P}
130, 131	32b, float	D_{3P}
132, 133	32b, float	Ufh_1
134, 135	32b, float	Ufh_2
136, 137	32b, float	Ufh_3
138, 139	32b, float	Ufh_N
140, 141	32b, float	Ifh_1
142, 143	32b, float	Ifh_2
144, 145	32b, float	Ifh_3
146, 147	32b, float	Ifh_N
148, 149	32b, float	φu_1
150, 151	32b, float	φu_2
152, 153	32b, float	φu_3
154, 155	32b, float	φu_N
156, 157	32b, float	φi_1
158, 159	32b, float	φi_2
160, 161	32b, float	φi_3
162, 163	32b, float	φi_N
164, 165	32b, float	$Pst1$ SMPQ, SMVQ
166, 167	32b, float	$Pst2$ SMPQ, SMVQ
168, 169	32b, float	$Pst3$ SMPQ, SMVQ
170, 171	32b, float	$Plt1$ SMPQ, SMVQ
172, 173	32b, float	$Plt2$ SMPQ, SMVQ
174, 175	32b, float	$Plt3$ SMPQ, SMVQ
176, 177...274, 275	32b, float	$U_{1h1}...U_{1h50}$
276, 277...374, 375	32b, float	$U_{2h1}...U_{2h50}$
376, 377...474, 475	32b, float	$U_{3h1}...U_{3h50}$
476, 477...574, 575	32b, float	$U_{Nh1}...U_{Nh50}$
576, 577...674, 675	32b, float	$I_{1h1}...I_{1h50}$
676, 677...774, 775	32b, float	$I_{2h1}...I_{2h50}$
776, 777...874, 875	32b, float	$I_{3h1}...I_{3h50}$
876, 877...974, 975	32b, float	$I_{Nh1}...I_{Nh50}$
976, 977...1074, 1075	32b, float	$U_{1ih1}...U_{1ih50}$
1076, 1077...1174, 1175	32b, float	$U_{2ih1}...U_{2ih50}$
1176, 1177...1274, 1275	32b, float	$U_{3ih1}...U_{3ih50}$
1276, 1277...1374, 1375	32b, float	$U_{Nih1}...U_{Nih50}$
1376, 1377...1474, 1475	32b, float	$I_{1ih1}...I_{1ih50}$
1476, 1477...1574, 1575	32b, float	$I_{2ih1}...I_{2ih50}$
1576, 1577...1674, 1675	32b, float	$I_{3ih1}...I_{3ih50}$
1676, 1677...1774, 1775	32b, float	$I_{Nih1}...I_{Nih50}$
1776, 1777...1874, 1875	32b, float	$\Delta\varphi I_{1h1}...\Delta\varphi I_{1h50}$
1876, 1877...1974, 1975	32b, float	$\Delta\varphi I_{2h1}...\Delta\varphi I_{2h50}$
1976, 1977...2074, 2075	32b, float	$\Delta\varphi I_{3h1}...\Delta\varphi I_{3h50}$
2076, 2077...2174, 2175	32b, float	$\Delta\varphi I_{Nh1}...\Delta\varphi I_{Nh50}$
2176, 2177	32b, float	$RCS\,L1_{AVG}$RCS module
2178, 2179	32b, float	$RCS\,L1_{MIN}$RCS module

Offset IR	size/type	mapped data
2180, 2181	32b, float	$RCS\ L1_{MAX}$RCS module
2182, 2183	32b, float	$RCS\ L2_{AVG}$RCS module
2184, 2185	32b, float	$RCS\ L2_{MIN}$RCS module
2186, 2187	32b, float	$RCS\ L2_{MAX}$RCS module
2188, 2189	32b, float	$RCS\ L3_{AVG}$RCS module
2190, 2191	32b, float	$RCS\ L3_{MIN}$RCS module
2192, 2193	32b, float	$RCS\ L3_{MAX}$RCS module

Electricity Meter 0x2000

Offset IR	size/type	Mapped Data	period, type of energy
0,1	32b, float	I_1	actual reading
2,3	32b, float	I_2	imported energy
4,5	32b, float	I_3	
6,7	32b, float	E_1	exported energy
8,9	32b, float	E_2	
10,11	32b, float	E_3	
12,13	32b, float	L_1	inductive
14,15	32b, float	L_2	
16,17	32b, float	L_3	
18,19	32b, float	C_1	capacitive
20,21	32b, float	C_2	
22,23	32b, float	C_3	
24,25	32b, float	I_{T1}	by tariff
26,27	32b, float	I_{T2}	imported energy
28,29	32b, float	I_{T3}	
30,31	32b, float	E_{T1}	exported energy
32,33	32b, float	E_{T2}	
34,35	32b, float	E_{T3}	
36,37	32b, float	L_{T1}	inductive
38,39	32b, float	L_{T2}	
40,41	32b, float	L_{T3}	
42,43	32b, float	C_{T1}	capacitive
44,45	32b, float	C_{T2}	
46,47	32b, float	C_{T3}	
48,49	32b, float	I_1	last month
50,51	32b, float	I_2	imported energy
52,53	32b, float	I_3	
54,55	32b, float	E_1	exported energy
56,57	32b, float	E_2	
58,59	32b, float	E_3	
60,61	32b, float	L_1	inductive
62,63	32b, float	L_2	
64,65	32b, float	L_3	

Offset IR	size/type	Mapped Data	period, type of energy
66,67	32b, float	C_1	capacitive
68,69	32b, float	C_2	
70,71	32b, float	C_3	
72,73	32b, float	I_{T1}	by tariff
74,75	32b, float	I_{T2}	imported energy
76,77	32b, float	I_{T3}	
78,79	32b, float	E_{T1}	exported energy
80,81	32b, float	E_{T2}	
82,83	32b, float	E_{T3}	
84,85	32b, float	L_{T1}	inductive
86,87	32b, float	L_{T2}	
88,89	32b, float	L_{T3}	
90,91	32b, float	C_{T1}	capacitive
92,93	32b, float	C_{T2}	
94,95	32b, float	C_{T3}	
96,97,98,99	64b	Electricity Meter Time	last month
100,101,102,103	64b	Electricity Meter Reset Time	
104,105	32b, float	T1 $3P_{MAX-TOT}$	over all
106,107	32b, float	T2$3P_{MAX-TOT}$	
108,109	32b, float	T3$3P_{MAX-TOT}$	
110,111	32b, float	$3P_{MAX-TOT}$	
112, 113, 114, 115	64b	Time of T1 $3P_{MAX-TOT}$	
116,117,118,119	64b	Time of T2$3P_{MAX-TOT}$	
120,121,122,123	64b	Time of T3$3P_{MAX-TOT}$	
124, 125,126,127	64b	Time of $3P_{MAX-TOT}$	
128,129	32b, float	T1 $3P_{MAX-TOT}$	current month
130,131	32b, float	T2 $3P_{MAX-TOT}$	
132,133	32b, float	T3$3P_{MAX-TOT}$	
134,135	32b, float	$3P_{MAX-TOT}$	
136, 137, 138, 139	64b	Time of T1 $3P_{MAX-TOT}$	
140,141,142,143	64b	Time of T2 $3P_{MAX-TOT}$	
144,145,146,147	64b	Time of T3 $3P_{MAX-TOT}$	
148, 149,150,151	64b	Time of $3P_{MAX-TOT}$	
152,153	32b, float	T1$3P_{MAX-TOT}$	last month
154,155	32b, float	T2$3P_{MAX-TOT}$	
156,157	32b, float	T3$3P_{MAX-TOT}$	
158,159	32b, float	$3P_{MAX-TOT}$	
160, 161, 162, 163	64b	Time of T1 $3P_{MAX-TOT}$	
164,165,166,167	64b	Time of T1 $3P_{MAX-TOT}$	
168,169,170,171	64b	Time of T1 $3P_{MAX-TOT}$	
172, 173,174,175	64b	Time of $3P_{MAX-TOT}$	
176, 177,178,179	64b	$3P_{MAX-TOT}$ reset time	over all

2.5 Modbus Communication Examples

2.5.1 Reading Device Identification Example

Request: 05 04 01 FF 00 05 41 00

05	device address
04	reading input registers (IR)
01 FF	start address – 1 (0x1FF –> 0x200 –> 1)
00 05	registry count
41 00	CRC-16

Answer: 05 04 0A 00 01 40 03 00 30 06 31 00 01 DA 35

05	device address
04	reading input registers (IR)
0A	data byte-count (10 – equals to five 16-bit registers)
00 01	DEVICE_NUMBER
40 03	DEVICE_TYPE
00 30	PROPS_TYPE
06 31	SOFTWARE_VERSION
00 01	HARDWARE_VERSION
DA 35	CRC-16

2.5.2 Reading Configurable Settings Example

Request: 05 03 06 FF 00 09 F0 B4

Answer: 05 03 12 FF FF FF FF 00 01 00 01 00 05 43 66 00 00 42 C8 00 00 9A 96

2.5.3 Write Into (Modify) the Configurable Settings

Request: 05 10 06 FF 00 09 12 FF FF FF FF 00 01 00 01 00 05 43 66 00 00 42 C8 00 00 54 11

Answer: 05 10 06 FF 00 09 33 31

3 KMB Long Communication protocol

The communication channel uses the setting of 8 data bits, no parity, and one stop bit. The address and data flow rate can be set. The communication protocol employs the master-slave philosophy. In response to receiving a proper message or command the instrument sends back a relevant reply. All supported messages do have a uniform format (frame):

1. instrument address (1 byte), values 0 and 255 are reserved
2. length of message body (two bytes)
3. type of message (1 byte)
4. message body – varies in accordance with type of message
5. 16-bit CRC –

When the instrument receives a command, it sends back a relevant reply. The type-of-message byte in answer contains zero if no problem has occured. In case of error the type-of-message code is ORed with 0x80 and followed by one-byte message body containing error code value. All values are coded in the Network notation (Big Endian).

3.1 KMB Long Quantity Encoding

1. times and dates are all 64-bit values coded as a number of milliseconds since 00:00:00 1.1.2000.
2. MTN, MTNN, MTP and MTPN are multiplicators defining the current transformer ratio. The xxxN ratios are used for the fourth phase/channel.
   (a) For MTN, MTNN (voltage) if the is 0xffff that means a direct measurement, otherwise the value is ratio for xxx/100.
   (b) For MTP and MTPN (current) - the ratio xxx/1A or xxx/5A is defined by the most significant bit - if it is set that means the ratio is $(VALUE\&0x7FFF)/5$(A) otherwise it is $VALUE/1$(A).
3. specific interpretation of values or bit mapping for special variables is explained in the message structure in the following text.
4. Measured data are optimally coded according to the following table.

Quantity	Coding			Invalid Value
U_LN	u16	$*\{MTN\|MTNN\}/40$	V	
U_LL	u16	$*\{MTN\}/40$	V	
I	u16	$*\{MTP\|MTPN\}/5000$	A	
I_{calc}	u16	$*MTP/5000$	A	
Powers	float	$*\{MTP\|TPN\} * \{MTN\|MTNN\}$	W, Var, VA	
Voltage Unbalance	u16	/100		$0xFFFF$
Voltage THD	u16	/100	%	$0xFFFF$
Current THD	u16	/100	%	$0xFFFF$
Voltage Harmonics	u16	$*MTN/40$	V	$0xFFFF$
Current Harmonics	u16	$*MTP/5000$	A	$0xFFFF$
Harmonic Angle	s16	/4096	rad	$0x7FFF$
Frequency	u16	/100	Hz	$0xFFFF$
Flicker	u16	/100		$0xFFFF$
Energies	u32	$*MTN * MTP$	Wh, Varh	

3.2 Available functions

3.2.1 0x01 Identify

This message identifies the communicating device and holds basic information about it. It is used for device enumerations, firmware upgrades, data interchange and prior to most other common tasks.

u16 DeviceNo; .... serial number
u16 DeviceType; .... device type code, defining options
u16 PropsType; .... device family ID, should be 0x30
u16 SoftwareVersion; .... version of the firmware
u16 HardwareVersion; .... revision of the hardware
u16 SoftwareModules; .... b0: 1 = MODULE_PQEVENTS
u8 DeviceAddr; .... communication address of the device
u8 BootloaderVersion; .... version of the bootloader
u8 Reserved;

3.2.2 0x3A Actual Data

Request should contain a MessageConfigInt mask, defining the composition of the reply. Actualy all measured data can be partitioned by several groups especially to optimize performance on slow communication links. In the reply there is a copy of the request mask and a selcted subgroup of the actual data. Message config int value masks groups of data for inclusion.

Meaning of Bits in MsgCfgInt:

0-3 bit phase selection (1,2,3,N)

4 main actual data group (U, I, P, Q, cos, THDU, THDI)

5 voltage harmonics

6 current harmonics

7 harmonic phase shift

8 voltage interharmonics

9 current interharmonics

10 whether odd values are included

11-16 maximal order of the harmonic

17 power quiality data (P_{lt}, P_{st})

18 phasors of U and I

23-31 wave shape samples (U1,..,UN, I1,...,IN)

Actual data structure

u32 MsgCfgInt;

Header Quantities

u8 CFG_change_count; .... increased each time configuration changes
u16 ErrCode; .... device error code
b7: error in archive CRC,
b4: error in RTC,
b2: calibration damaged,
b1: configuration damaged
u16 flags; .... measurement flags
b0: power supply failure,
b1: voltage event,
b2: frequency change,
b3: RTC adjustment,
b4: frequency error,
b5: DAC synchronization error
u8 overfl; .... samples are out of DAC linearity range,
U1..UN, I1..IN
u8 underfl; .... TRMS value is bellow the defined range
0: OFF, 1: ON, U1..UN, I1..IN
u16 InputOutput; .... state of the inputs & outputs
b0 = Led1, b1 = Led2, b2 = OUT1, b3 = OUT2,
b15 = Input,

Global Variables

u16 Freq; .... frequency
float Analog; .... analog input or temperature based on the actual device type
u16 Icomp; .... Calculated (virtual) I_{PE} or I_{PEN}
u16 RESERVED; .... reserved
u8 phaseOrder; .... automaticlay detected phase order
0: L1L2L3, 1: L1L3L2, 2: unrecognised

Phase Quantities

u16 uLN[4]; .... line-to-neutral voltages
u16 uLL[3]; .... line-to-line voltages
u16 iL[4]; .... currents 1, 2, 3, N
float pwr[4]; .... active power 1, 2, 3, N
float pwrf[4]; .... active power of the first harmonic 1, 2, 3, N
float var[4]; .... reactive power 1, 2, 3, N
float varf[4]; .... reactive power of the first harmonic 1, 2, 3, N

Actual Evaluation of Flicker Severity

u16 Pst[4]; .... short time flicker severity index
u16 Plt[4]; .... long time flicker severity index

Harmonic Distortion

u16 uTHD[4]; .... Total Harmonic Distortion of Voltage
u16 iTHD[4]; .... Total Harmonic Distortion of Current
u16 HsgU[4][HARMONIC_COUNT]; .... voltage harmonics
u16 HsgI[4][HARMONIC_COUNT]; .... current harmonics
u16 fiHI[4][HARMONIC_COUNT]; .... angle (phase shift) of each harmonic
u16 HsgiU[4][HARMONIC_COUNT]; .... voltage interharmonic group
u16 HsgIi[4][HARMONIC_COUNT]; .... current interharmonic group

Waveshape Samples

u16 u_wave[4][64]; .... voltage
u16 i_wave[4][64]; .... current

3.2.3 0x26, 0x27 SmpInstallConfig

This structure contains values regarding to the basics of the installation of the device such as instrument transformer ratios and nominal values for voltage and power. The data is organised in the following structure:

u16 MTN; .... VT ratio, x/100, 0xFFFF if not used
u16 MTNN; .... VT ratio for N, x/100, 0xFFFF if not used
u16 MTP; .... CT ratio, MSB bit-> CT secondary=5A
u16 MTPN; .... CT ratio for N, MSB bit-> CT secondary=5A
u16 defFreq; .... actualy supports only 50Hz
u8 MeassureMethod; .... 2 = 3-Y, 3 = 3-d, 5 = 4f
float NomU; .... nominal voltage without VT
float NomPwr; .... nominal power without VT and CT
u32, u8 .... 5 bytes reserve

3.2.4 0x4E, 0x4F SmpConfig

This configuration handles additional device configuration such as communication option, display behavior, time zone related settings, administrator access, averaging and flicker meter configuration.

Communication Option Configuration

u8 DeviceAddr; .... node address
u8 RemoteBdRate; .... communication speed
0: 4.8, 1: 9.6, 2: 19.2, 3: 38.4, 4: 57.6, 5: 115.2, 6: 230.4 [kbaud]
u8 Protocol; .... serial line communiction protocol
0: KMB,
1: Modbus no parity, 2: ModBUS parity even, 3: ModBUS parity none
4: NMEA - GPS time synchronization
u32 IPAddress; .... device ip address in binary form
u32 Netmask; .... network mask
u32 Gateway; .... default gateway ip adfress
u16 KMB_Port; .... TCP/IP port for KMB Long
u16 ModBus_Port; .... TCP/Ip port for Modbus
u16 Web_Port; .... TCP/IP port for embedded webserver

Display Option Configuration

u8 DisplayManner; .... display behavior configuration
...bits 7-6 backlight 0-OFF 1-ON 2-AUTO
...bits 5-4 display behavior 0: scroll each 3sec,
2: wait 10 sec, then def. val.,
def: hold last selected screen
...bits 0-3: displayed value 0: ULL, 1: uLN, 2: I,
3: P (power), 4: Q (var),
5: S (VA), 6: pf ,
7: $cos(\phi)$, 8: THD U,
9: THD I, 10: harm U,
11: harm I, 12: Energies,
13: 3P energies, 14: PavgMax,
15: Frequency & Temperature
u8 DisplayResolution; .... 0: 4 digits, 1: 3 digits
u8 Language; .... 0: EN, 1: CZ, 2: HR

Device Lock

u8 Lock; .... 0: unlocked, other: locked
u16 AdminPassword; .... defined by administrator

Clock Configuration

u8 TimeZone; .... selected time zone - 12: GMT
u8 SummerTime; .... 0: none, other: summer time enabled
u8 Synchronization; .... 0: none,1: network frequency (not supported),
2: communication line, 3: external output

Averaging Option Configuration

u8 UI_WidowType; .... voltage and current window type
0: fixed averaging

1: sliding averaging
2: thermal function

u8 PQS_WindowType; ....window type for powers, same as previous
u8 PmaxWindowType; .... PavgMax window type - 0: fixed, 1: floating

u8 UI_WindowLength .... averaging window length [s, m[1]]
u8 PQS_WindowLength; ....averaging window length [s, m (if >100)]
u16 PmaxWindowLength;.................averaging window length [s, m (if >100)]

u8 UI_AutoErase; ....0: off, 1: day, 2: week, 3: month, 4: year
u8 PQS_AutoErase; ....0: off, 1: day, 2: week, 3: month, 4: year

Flicker Configuration

u8 FlickerTshort; ....short term evaluation interval(1,5,10,15min)
u16 FlickerTlong; .... long term evaluation interval multiples of Tshort (up to 1008xTshort)
u16 FlickerOffset;................................start time of the flicker evaluation

0x12 AdjustTime

New method: Length of the message is 9 bytes. Maximal allowed time difference to perform adjustation is ±6 hours from actual time. When time is adjusted it will skip the archives or stops creating the archives until current time is equal to last saved archive time.

u64 Time; ....Time in milliseconds since 1.1.2000 (KMBTime)

u8 cnf; .... configuration byte, use 0xFF (reserved for future use)

Old method: Length of the message is 3 bytes.

u16 Time; .... Number of seconds in hour on which adjustation is performed

u8 Tol; ....Maximal allowed tolerance; Tol=0xff ignore the tolerance, If time difference is larger than 5 times the tolerance, adjustation will not be performed (diff>5*Tol).

Replies: Instrument will reply by one five different message about result of adjustation.

0x80 .... time is out of tolerance

0x90 .... record period is to short (<3s) no adjustation was performed

0xA0 ....adjustation through comm. interface is not allowed

0xC0 .. Time was partially adjusted, it's necessary to perform adjustation again to set accurate time

0x00 .... Time was fully adjusted

[1] The window length is in minutes if value is >100. Value in minutes is obtained by decreasing the actual value by 100.

0x34 GetElmer

Returns actual state of Electricity meter. Message to get actual state of electricity meter for instrument with adress 0x01: 01 00 01 34 00 C0 5E

- u8 RecordAddress; .... record address, 0=actual state
- u16 MTN; .... instrument MTN configuration
- u16 MTNN; .... instrument MTN of neutral configuration
- u16 MTP; .... instrument MTP configuration
- u16 MTPN; .... instrument MTP of neutral configuration
- u32 I[3]; .... active energy import in each phase
- u32 E[3]; .... active energy export in each phase
- u32 L[3]; .... inductive energy in each phase
- u32 C[3]; .... capacitive energy in each phase
- u32 IT[3]; .... three-phase active energy import for each tariff
- u32 ET[3]; .... three-phase active energy export for each tariff
- u32 LT[3]; .... three-phase inductive energy for each tariff
- u32 CT[3]; .... three-phase capacitive energy for each tariff
- u32 LM_I[3]; .... active import energy in each phase (end of last month)
- u32 LM_E[3]; .... active export energy in each phase (end of last month)
- u32 LM_L[3]; .... inductive energy in each phase (end of last month)
- u32 LM_C[3]; .... capacitive energy in each phase (end of last month)
- u32 LM_IT[3]; .... three-phase active import for each tariff (end of last month)
- u32 LM_ET[3]; .... three-phase active export for each tariff (end of last month)
- u32 LM_LT[3]; ... three-phase inductive energy for each tariff (end of last month)
- u32 LM_CT[3]; .. three-phase capacitive energy for each tariff (end of last month)
- u64 Time; .... Time of last save to memory
- u64 ElmerResetTime; .... Time of last electricity meter reset
- MaxValue PavgMax[4][3]; .... max value of Pavg. First index [4]: tariff 1-3 and Total, second index[3]: Total Pavgmax, Pavgmax of current month, Pavgmax of last month
- u64 PavgMaxResetTime; .... Time of last Pavgmax reset

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