EMA ELECTRICAL MULTIFUNCTION ANALYZER RECORDER COMMUNICATION PROTOCOL

- **ASCII standard EMA**
- **MODBUS-RTU**

USER MANUAL
IM 145-U v. 6.6

Firmware Vers. X.11.25
X=4÷9

For other communication protocol available on EMA analyzer please to see specific instruction manual.

Optional communication protocol available are:

- **PROFIBUS-DP**
- **ethernet TCP/IP**

For other communication protocol please contact our service.

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1) ASCII STANDARD EMA COMMUNICATION PROTOCOL

1.1) EMA SERIAL COMMUNICATION PROTOCOL

Serial communication occurs between a device and a Host computer according to a master-slave model, in which the device is configured as the slave.
The communication through a defined protocol is carried out on a single line (half duplex), meaning that messages are sent in to opposite directions in different time.
The device places itself in a reception mode when it receives a STX (Start of TeXt) character; and it remains in this condition until it receives an ETX (End of TeXt) character.
The characters used for the communication are all part of the ASCII (American Standard Code for Information Interchange)

1.2) IDENTIFICATION SEQUENCE

For a multi-drop connection, each slave must have a specific code in order to be identified by the Host device, avoiding errors on the communication line.
To avoid communication errors and to optimize the line speed the operator may assign to each unit a logical number (address or node)
Beside of the possibility to identify the device through a logical number the operator may assign to the slave a serial number instead (serial number is assigned by the manufacturer).
Suggested is to assign a logical number in order to speed-up the whole communication process.

1.3) DATA REQUEST SEQUENCE (R = Request or Reading)

To start a sequence of data request the operator may proceed in the following order:

EXAMPLE 1:

<STX>01R80<ETX> (5AH)	
<STX>	Start block character
01	Instrument identification
R80	Command
<ETX>	End block character
(5AH)	Check character

Start block character
Always <STX> (02H) begins the string of block character or message

Instrument identification
The instrument identification is represented through its logical number, address/node expressed in hexadecimals code (01-FF).

Command
The command to be sent is always expressed with the character R (52H), which means Read, followed by the variable numbers, expressed in hexadecimals.

End block character
Always <ETX> (03H) ends the string of block character or message.

Check character
This characters is obtained from the addition of the XOR logical functions, normally this check is used to verify the transmitted data.

EXAMPLE 1 (of calculated Check Character):
If the reading of rms voltage measured by the EMA 10 shall be initialized than the following process may be followed:

If <STX>01R80<ETX> **(5AH**) is the message to be sent than:

STX	02H	XOR
0	30H	XOR
1	31H	XOR
R	52H	XOR
8	38H	XOR
0	30H	XOR
ETX	03H	=
BCC=**5AH**		

H stays for Hexadecimal

DATA ANSWERING SEQUENCE of EXAMPLE 1
The unit which recognizes the own serial number or logical address/node, answers with the following message:

<STX>+400.0<SP><ETX><SPC>	
<STX>	Start block character
+400.0<SP>	Data block
<ETX>	End block character
<SPC>	Check character (<SPC> = SPACE =20H)

Start block character
Always <STX> (02H) begins the string of block character or message

Data block
The data block is the parameter value and can represent the following:
Example 1: +400.0<SP> is the answer of variable number request 81, 82 or 83.

<SP>, multiplier (×1).

The multiplier may be the following:

<SP>	space	(×1)	Example: +400.0<SP>
k	Kilo	(×1000)	Example: +123.456k
M	Mega	(×1000000)	Example: +1.256M
G	Giga	(×1000000000)	Example: +12.4G

End block character
Always <ETX> (03H) ends the string of block character or message.

Check character
This characters is obtained from the addition of the XOR logical functions, normally this check is used to verify the transmitted data.

The EMA, if questioned, will reply, if the conditions BCC (Block Check Character) is satisfied, with the following message to the operator:

<STX>+400.0<SP><ETX>(20H)

EXAMPLE 2:

<STX>01RD1<ETX> (27H)	
<STX>	Start block character
01	Instrument identification
RD1	Command
<ETX>	End block character
(27H)	Check character

Start block character
Always <STX> (02H) begins the string of block character or message

Instrument identification
The instrument identification is represented through its logical number, address/node expressed in hexadecimals code (01-FF).

Command
The command to be sent is always expressed with the character R (52H), which means Read, followed by the variable numbers, expressed in hexadecimals.

End block character
Always <ETX> (03H) ends the string of block character or message.

Check character
This characters is obtained from the addition of the XOR logical functions, normally this check is used to verify the transmitted data.

EXAMPLE 2 (of calculated Check Character):

If the reading of 15' average power stored in the RAM of EMA 10 shall be initialized than the following process may be followed:

If <STX>01RD1<ETX> **(27H**) is the message to be sent than:

STX	02H	XOR
0	30H	XOR
1	31H	XOR
R	52H	XOR
D	44H	XOR
1	31H	XOR
ETX	03H	=
BCC=**27H**		

H stays for Hexadecimal

DATA ANSWERING SEQUENCE of EXAMPLE 2
The unit answers with an error message:

<STX>E014<ETX>(71H)

E014, error E014 indicates that the 15' average power were not stored, impossible answering to the Host, message is over.

1.4) PARAMETER SETTING SEQUENCE

Setting sequence is always carried-out by a Host device in order to change specific parameters, if necessary, on the instrument.
As parameter setting sequence the operator may change from the Host device all the settings of the instrument as KTA, KTV, P av., B. Light, Date-Time I/O etc.
The following operation must be considered when sending the parameter setup to the unit:

<STX> S110903001W04=01<ETX>(74H)

<STX>
Always <STX> (02H) begins the string of block character or message.

S110903001
The character S (53H) is followed by the serial number (identification number) of the instrument or by the logical number. If serial number is chosen than maximum 9 characters must be defined, if logical number is chosen than 2 character in hexadecimal (01-FF) must be defined.

W04=
The command W (57H) means Write followed by the variable number to be set, expressed in decimals characters and always followed by the character = (3DH).

01
The new alphanumerical value, which is going to be programmed on the instrument.

<ETX>
Always <ETX> (03H) ends the string of block character or message.

EXAMPLE 1:
Logical Number Setting (01, expressed in hexadecimal) of EMA 11 with serial number 110903001.

<STX> S110903001W04=01<ETX>

The BCC (Check Character is calculated as following:

STX	02H	XOR
S	53H	XOR
1	31H	XOR
1	31H	XOR
0	30H	XOR
9	39H	XOR
0	30H	XOR
3	33H	XOR
0	30H	XOR
0	30H	XOR
1	31H	XOR
W	57H	XOR
0	30H	XOR
4	34H	XOR
=	3DH	XOR
0	30H	XOR
1	31H	XOR
ETX	03H	=
BCC = 06H		

DATA ANSWERING SEQUENCE of EXAMPLE 2
Once the setting were identified by the instrument, the following messages will be sent from the instrument to the Host:

<STX>E000<ETX> (74H)

where,

<STX>
Always <STX> (02H) begins the string of block character or message.

E000
Error message, E (45H), followed by 3 numerical characters which shows the type of error, see chapter **1.9)**
Code E000 indicates that the operation has been carried out correctly.

<ETX>
Always <ETX> (03H) ends the string of block character or message.

(74H)
Check character is obtained from the addition of the XOR logical functions, normally this check is used to verify the transmitted data.

1.5) CHECK CHARACTERS
<STX> Start of Text (02H)
Start of text characters.

<ETX> End of Text(03H)
End of text characters.

BCC Block Check Character
It is represented by a 2 digit characters, resulting from EXCLUSIVE OR (XOR) of all the characters from <STX> up to, including, <ETX>, used to verify the transmitted data.

1.6) VARIABLES (Reading codes)

N.Var	Description	Command
000	INFO STORAGE AVG.POWERS	R00
001	INFO STORAGE MIN./MAX.	R01
002	INFO STORAGE HARMONICS	R02
003	INFO STORAGE SAMPLES Answer format: <STX>srrrrraaaa.auuuu.uffff.f<ETX>(BCC) s=status (0=OFF; 1=ON) rrrrr=number of stored records aaaa.a=memory available for archive (KB) uuuu.u=memory used by archive (KB) ffff.f=memory free for archive (KB)	R03
004	NEUTRAL CURRENT	R04
005	3-PHASE SYSTEM ACTIVE ENERGY (acquired) (double format)	R05
006	3-PHASE SYSTEM ACTIVE ENERGY (transferred) (double format)	R06
007	3-PHASE SYSTEM REACTIVE ENERGY (inductive) (double format)	R07
008	3-PHASE SYSTEM REACTIVE ENERGY (capacitive) (double format)	R08
009	HW & OPTIONS INFO Return an integer 16bit value. Bit0: harmonic (0=disabled; 1=enabled) Bit1: timebandds (0=disabled; 1=enabled) Bit2÷3: reserved Bit4÷7: number of Digital Input (0÷15) Bit8÷11: number of Digital Output (0÷15) Bit12÷15: number of Analog Output (0÷15)	R09
010	AVERAGE REACTIVE POWER	R0A
011	AVERAGE LINE 1 CURRENT	R0B
012	AVERAGE LINE 2 CURRENT	R0C
013	AVERAGE LINE 3 CURRENT	R0D
014	INFO STORAGE COUNTERS Answer format: <STX>srrrrraaaa.auuuu.uffff.f<ETX>(BCC) s=status (0=OFF; 1=ON) rrrrr=number of stored records aaaa.a=memory available for archive (KB) uuuu.u=memory used by archive (KB) ffff.f=memory free for archive (KB)	R0E
016	PWM OUT ANALOG 1	R10
017	PWM OUT ANALOG 2	R11
018	PWM OUT ANALOG 3	R12
019	PWM OUT ANALOG 4 0=0mA ÷255=20mA	R13
021	TOTAL ENERGY BAND 1	R15
022	TOTAL ENERGY BAND 2	R16
023	TOTAL ENERGY BAND 3	R17
024	TOTAL ENERGY BAND 4 Answer format: <STX>Wh+><SP>Wh-><SP>Varh+><SP>Varh-<ETX>(BCC)	R18
032	GENERIC COUNTER 1 VALUE	R20
033	GENERIC COUNTER 2 VALUE	R21
034	GENERIC COUNTER 3 VALUE	R22
035	GENERIC COUNTER 4 VALUE	R23
036	GENERIC COUNTER 5 VALUE	R24
037	GENERIC COUNTER 6 VALUE	R25
038	GENERIC COUNTER 7 VALUE	R26
039	GENERIC COUNTER 8 VALUE	R27
040	GENERIC COUNTER 1 SETTING	R28
041	GENERIC COUNTER 2 SETTING	R29
042	GENERIC COUNTER 3 SETTING	R2A
043	GENERIC COUNTER 4 SETTING	R2B
044	GENERIC COUNTER 5 SETTING	R2C
045	GENERIC COUNTER 6 SETTING	R2D
046	GENERIC COUNTER 7 SETTING	R2E
047	GENERIC COUNTER 8 SETTING	R2F

	Answer format: <STX>i<SP>j<SP>username<SP>k<ETX>(BCC) i=Digital Input associated to the counter j=name index (0=kWh+; 1=kWh-; 2=kVARh+; 3=kVArh-; 4=Water; 5=Gas; 6=user name username= counter's name defined by the user (xxxxxxxx) k=pulse's weight (00000.00)	
060	HOUR COUNTER Answer: 6 values of 9 digits separed by spaces.	R3C
128	THREE-PHASE SYSTEM VOLTAGE (rms)	R80
129	PHASE L1 VOLTAGE (rms)	R81
130	PHASE L2 VOLTAGE (rms)	R82
131	PHASE L3 VOLTAGE (rms)	R83
132	PHASE L1-L2 VOLTAGE (rms)	R84
133	PHASE L2-L3 VOLTAGE (rms)	R85
134	PHASE L3-L1 VOLTAGE (rms)	R86
136	THREE-PHASE SYSTEM CURRENT (rms)	R88
137	LINE L1 CURRENT (rms)	R89
138	LINE L2 CURRENT (rms)	R8A
139	LINE L3 CURRENT (rms)	R8B
140	THD IL1(Total Harmonic Distortion %)	R8C
141	THD IL2(Total Harmonic Distortion %)	R8D
142	THD IL3(Total Harmonic Distortion %)	R8E
144	THREE-PHASE SYSTEM POWER FACTOR	R90
145	PHASE L1 POWER FACTOR	R91
146	PHASE L2 POWER FACTOR	R92
147	PHASE L3 POWER FACTOR	R93
148	3-PHASE SYSTEM COSFI	R94
149	PHASE L1 COSFI	R95
150	PHASE L2 COSFI	R96
151	PHASE L3 COSFI	R97
152	3-PHASE SYSTEM APPARENT POWER	R98
153	PHASE L1 APPARENT POWER	R99
154	PHASE L2 APPARENT POWER	R9A
155	PHASE L3 APPARENT POWER	R9B
160	3-PHASE SYSTEM ACTIVE POWER	RA0
161	PHASE L1 ACTIVE POWER	RA1
162	PHASE L2 ACTIVE POWER	RA2
163	PHASE L3 ACTIVE POWER	RA3
168	3-PHASE SYSTEM REACTIVE POWER	RA8
169	PHASE L1 REACTIVE POWER	RA9
170	PHASE L2 REACTIVE POWER	RAA
171	PHASE L3 REACTIVE POWER	RAB
176	3-PHASE SYSTEM ACTIVE ENERGY (acquired)	RB0
177	3-PHASE SYSTEM REACTIVE ENERGY (inductive)	RB1
178	3-PHASE SYSTEM ACTIVE ENERGY (transferred)	RB2
179	3-PHASE SYSTEM REACTIVE ENERGY (capacitive)	RB3
180	FREQUENCY	RB4
182	THD VL1(Total Harmonic Distortion %)	RB6
183	THD VL2(Total Harmonic Distortion %)	RB7
184	THD VL3(Total Harmonic Distortion %)	RB8
185	AVERAGE ACTIVE POWER	RB9
186	AVERAGE CURRENT	RBA
187	AVERAGE REACTIVE POWER	RBB
188	INTERNAL TEMPERATURE	RBC
189	AVERAGE LINE L1 CURRENT	RBD
190	AVERAGE LINE L2 CURRENT	RBE
191	AVERAGE LINE L3 CURRENT	RBF
192	VARIABLE GROUP FROM 128 TO 185 Received variables are: (128, 129, 130, 131, 132, 133, 134, 136, 137, 138, 139, 144, 145, 146, 147, 152, 153, 154, 155, 160, 161, 162, 163, 168, 169, 170, 171, 176, 177, 178, 179, 180, 182, 183, 184, 185)	RC0

193	NEUTRAL CURRENT	RC1
194	VOLTAGE UNBALANCE	RC2
195	CURRENT UNBALANCE	RC3
208	Variable group programmable by the operator Refer to variable D0.	RD0
209	First stored value in RAM of average power Average power transfer, at the end of the received block, it is necessary to confirm the command W06 to the unit when the block has been received correctly; repeat transfer steps until all blocks has been transferred.	RD1
211	FIRST STORED VALUE OF HARMONICS Harmonics transfer, at the end of the received block, it is necessary to confirm the command W0B to the unit when the block has been received correctly; repeat transfer steps until all blocks has been transferred.	RD3
212	INFO COUNTER RECORD Answer format: <STX>yymmddhhnn0000010001rrrrE<ETX>(BCC) yy: year mm: month dd: day hh: hour nn: minutes rrrr: rate (minutes)	RD4
213	DATA COUNTER RECORD Answer format: <STX>yymmddhhnn+xxxx<SP>+zz.zzk+…<ETX>(BCC) yy: year mm: month dd: day hh: hour nn: minutes xxxx<SP>: first value without multiply factor (Space) (ex.) zz.zzk: second value with multiply factor (k or M) (ex.)	RD5
214	INFO SAMPLES The command transfers a list of selected variables stored in RAM to download it. Transfer the stored values with command RD7.	RD6
215	SAMPLES VALUES STORED IN RAM Samples transfer, at the end of the received block, it is necessary to confirm the command W1D to the unit when the block has been received correctly; repeat transfer steps until all blocks has been transferred.	RD7
216	DATA BLOCK FORMAT RELATIVE TO RD9 The command transfers a list of selected variables stored in RAM to download it. Transfer the stored values with command RD9.	RD8
217	MIN/MAX VALUES STORED IN RAM Min/Max transfer, at the end of the received block, it is necessary to confirm the command W08 to the unit when the block has been received correctly; repeat transfer steps until all blocks has been transferred.	RD9
218	ENERGY TYPE (normal/heavy) 0=normal (kWh-kVArh); 1=heavy (MWh-MVArh)	RDA
219	DIGITAL INPUT TYPE 0=not used; 1=sync.rtc; 2=periods; 3=generic counters; 4=GMC; 5=GME; 6=ELKO	RDB
221	DIGITAL OUTPUT STATUS bit(n) associated to DigOut(n+1) n=0..5 bit values: 0=OFF; 1=ON	RDD
222	DIGITAL INPUT STATUS bit(n) associated to DigIn(n+1) n=0..5 bit values: 0=OFF; 1=ON	RDE
223	WIRING MODE 0= 4Wire; 1= 3Wire; 2= Aron	RDF
225	All MIN/MAX values displayed on the instrument All values are transferred in the same order as they are displayed on the instrument.	RE1
227	SERIAL NUMBER	RE3
228	MIN/MAX THREE-PHASE SYSTEM VOLTAGE	RE4
229	MIN/MAX PHASE VOLTAGE L1	RE5
230	MIN/MAX PHASE VOLTAGE L2	RE6
231	MIN/MAX PHASE VOLTAGEL3	RE7
232	MIN/MAX THREE-PHASE SYSTEM CURRENT	RE8
233	MIN/MAX LINE CURRENT L1	RE9
234	MIN/MAX LINE CURRENT L2	REA
235	MIN/MAX LINE CURRENT L3	REB
236	MIN/MAX 3-PHASE SYSTEM ACTIVE POWER	REC

237	MIN/MAX 3-PHASE SYSTEM APPARENT POWER	RED
238	MIN/MAX 3-PHASE SYSTEM POWER FACTOR	REE
239	MIN/MAX AVERAGE POWER	REF
240	DATE (dd/mm/yy)	RF0
241	TIME (hh/mm/ss)	RF1
242	DAY OF THE WEEK (i.e. Saturday, 10 characters)	RF2
244	ALL BAND ENERGY COUNTERS Relative to: Year, Previous Year.	RF4
245	ALL BAND ENERGY COUNTERS Relative to: Today, Yesterday, This Month, Previous Month.	RF5
246	SAMPLINGS RELATIVE TO THE VOLTAGE SIGNAL PHASE 1,2 AND 3 Answer format: <STX><SP>768 characters (64samples x 4characters x 3 voltages)<ETX> (BCC)	RF6
247	SAMPLINGS RELATIVE TO THE CURRENT SIGNAL PHASE 1,2 AND 3 Answer format: <STX><SP>768 characters (64samples x 4characters x 3 currents)<ETX> (BCC)	RF7
248	INSTRUMENT FIRMWARE RELEASE	RF8
249	INSTANT VALUES OF VOLTAGE PHASE 1 HARMONICS Answer format: <STX><SP>160 characters (00000 + 31harmonics x 5characters)<ETX>(BCC) The first 00000 is only for internal uses.	RF9
250	INSTANT VALUES OF VOLTAGE PHASE 2 HARMONICS Answer format: <STX><SP>160 characters (00000 + 31harmonics x 5characters)<ETX>(BCC) The first 00000 is only for internal uses.	RFA
251	INSTANT VALUES OF VOLTAGE PHASE 3 HARMONICS Answer format: <STX><SP>160 characters (00000 + 31harmonics x 5characters)<ETX>(BCC) The first 00000 is only for internal uses.	RFB
252	INSTANT VALUES OF CURRENT PHASE 1 HARMONICS Answer format: <STX><SP>160 characters (00000 + 31harmonics x 5characters)<ETX>(BCC) The first 00000 is only for internal uses.	RFC
253	INSTANT VALUES OF CURRENT PHASE 2 HARMONICS Answer format: <STX><SP>160 characters (00000 + 31harmonics x 5characters)<ETX>(BCC) The first 00000 is only for internal uses	RFD
254	INSTANT VALUES OF CURRENT PHASE 3 HARMONICS Answer format: <STX><SP>160 characters (00000 + 31harmonics x 5characters)<ETX>(BCC) The first 00000 is only for internal uses.	RFE
255	SUB-VERSION FIRMWARE	RFF

1.7) PROGRAMMABLE PARAMETERS (Writing codes)

000	SERIAL COMMUNICATION format: (Baud rate, Parity, Bit, Stop) Baud Rate 1200, 2400, 4800, 9600, 19200 Parity N=None, E=Even, O=Odd Bit 7, 8 Stop 1, 2 Ex.: W00=9600,N,8,1	W00
004	LOGICAL ADDRESS Range of value: 00÷ff (0÷255) Ex.: W04=1b	W04
005	DELETING OF THE 1ST BLOCK OF VALUES OF COUNTERS STORED IN RAM	W05
009	DATE/TIME/DAY Format: (yymmddhhmmssD) D = day of the week (1 = Monday……..7 = Sunday)	W09
010	SOLAR/SUMMER TIME HOUR CHANGE 00-23:hour of the change 24: disabled	W0A
024	INTEGRATION TIME FOR AVERAGE POWER CALCULATION Range: 1÷99 (min.) Ex.: W18=15	W18
027	BACKLIGHT ON TIME (seconds) Range: 1÷360 (seconds) 0: always on Ex.: W1B=60	W1B
028	FREQUENCY MEASURING RANGE Format: s,ffff s: synchronization type (0 = internal, 1 = external from V-L1) ffff: frequency*100 Range: 5÷500 Hz Ex.: W1C=0,5000 (50.00 Hz internal)	W1C
016	TRANSFORMING RATIO CT Range: 0.01÷9999.99 Ex.: W10=100.00	W10
018	TRANSFORMING RATIO VT Range: 0.01÷9999.99 Ex.: W12=1000.00	W12
006	DELETING OF THE 1ST BLOCK OF VALUES OF AVERAGE POWER STORED IN RAM	W06
007	DELETING ALL MIN/MAX VALUES STORED IN RAM	W07
008	DELETING OF THE 1ST BLOCK OF VALUES OF VALUE OF MIN/MAX STORED IN RAM	W08
011	DELETING OF THE 1ST BLOCK OF VALUES OF HARMONIC STORED IN RAM	W0B
029	DELETING THE 1ST BLOCK OF VALUES OF SAMPLES STORED IN RAM	W1D
015	DELETING OF ALL VALUES STORED IN RAM Ex.: W0F=00	W0F
020	PROGRAMMING, ERASING OF THE VALUES STORED IN RAM 1 or 0, 15' Av. Power storing 1 = YES, 0 = NO 1 or 0, Min/Max storing 1 = YES, 0 = NO 1 or 0, Harmonics storing 1 = YES, 0 = NO 1 or 0 Sample values storing 1 = YES, 0 = NO 1 or 0 Counters values storing 1 = YES, 0 = NO Ex.: for storing Min/Max W14=0,1,0,0	W14
021	PROGRAMMING MIN/MAX AND SAMPLES CAMPAIGN ACQUISITION Ex. MIN/MAX values storing 1: MIN/MAX storing 0060 : sampling rate for MIN/MAX storing expressed in minutes. E4...EF : MIN/MAX variable to store in RAM W15=1,0060,E4E5E6E7E8E9EAEBECEDEEEF Ex. Sample values storing 2: Sample storing 0010 : sampling rate for Sample storing expressed in seconds. 80...A8 : Variable number to store in RAM W15=2,0010,80818283889098A0A8	W15
022	PROGRAMMING COUNTERS CAMPAIGN ACQUISITION Ex. counters values storing 0060: sampling rate for counters storing expressed in minutes. E4...EF: counters variable to store in RAM W16=1,0060,E4E5E6E7E8E9EAEBECEDEEEF	W16
031	ENERGY RESET 43000: energy values (B0, B1, B2, B3) reset 75000: time-band energy reset 75430: all energy values reset Ex.: W1F=75000	W1F

DIGITAL OUTPUT 1		
032	PULSE Format: B0 : variable to associate (hex.) 0.125: pulse coefficient (kWh ÷ kVARh); range: 0÷10.00 250: pulse duration time (msec.); range: 50÷500 Ex.: W20 = B0,0.125,250	W20
033	THRESHOLD Format: A0 : variable to associate (hex.) L : Lower limit H : Higher limit N : Always on 5000 : intervention value 15 : hysteresis percentage value (intervention threshold); range: 0÷99 30 : delay time on threshold intervention (seconds); range: 0÷999 Ex.: W21 = A0,H,5000,15,30	W21
056	BAND Format: 81: variable to associate B: Band 100: min intervention value 300: max intervention value 15: hysteresis percentage value (intervention threshold); range: 0÷99 30: delay time on threshold intervention (seconds); range: 0÷999 Ex.: W38 = 81,B,100,300,15,30	W38

DIGITAL OUTPUT 2		
048	PULSE Format: B0 : variable to associate 0.125 : pulse coefficient (kWh ÷ kVARh); range: 0÷10.00 250 : pulse duration time (msec.); range: 50÷500 Ex. W30 = B0,0.125,250	W30
049	THRESHOLD Format: A0 : variable to associate L : Lower limit H : Higher limit N : Always on 200000 : intervention value 15 : hysteresis percentage value (intervention threshold); range: 0÷99 30 : delay time on threshold intervention (seconds); range: 0÷999 Ex. W31 = A0,H,200000,15,30	W31
057	BAND Format: 82 : variable to associate B : Band 10.55 : min intervention value 20 : max intervention value 15 : hysteresis percentage value (intervention threshold); range: 0÷99 30 : delay time on threshold intervention (seconds); range: 0÷999 Ex.: W39 = 82,B,10.55,20,15,30	W39

DIGITAL OUTPUT 3		
036	PULSE Format B0 : variable to associate 0.125 : pulse coefficient (kWh ÷ kVARh); range: 0÷10.00 250 : pulse duration time (msec.); range: 50÷500 Ex. W24 = B0,0.125,250	W24
037	THRESHOLD Format: 98 : variable to associate L : Lower limit H : Higher limit N : Always on 0.90 : intervention value 15 : hysteresis percentage value (intervention threshold); range: 0÷99 20 : delay time on threshold intervention (seconds); range: 0÷999 Ex. W25 = 98,L,0.90,15,20	W25
062	BAND Format: A0 : variable to associate B : Band 1000 : min intervention value 15000 : max intervention value 15 : hysteresis percentage value (intervention threshold); range: 0÷99 30 : delay time on threshold intervention (seconds); range: 0÷999 Ex.: W3E = A0,B,1000,15000,15,30	W3E

DIGITAL OUTPUT 4		
038	PULSE Format B0 : variable to associate 0.125 : pulse coefficient (kWh ÷ kVARh); range: 0÷10.00 250 : pulse duration time (msec.); range: 50÷500 Ex. W26 = B0,0.125,250	W26
039	THRESHOLD Format: A0 : variable to associate L : Lower limit H : Higher limit N : Always on 200000 : intervention value 15 : hysteresis percentage value (intervention threshold); range: 0÷99 030 : delay time on threshold intervention (seconds); range: 0÷999 Ex. W27 = A0,H,200000,15,30	W27
059	BAND Format: 88 : variable to associate B : Band 10 : min intervention value 150 : max intervention value 15 : hysteresis percentage value (intervention threshold); range: 0÷99 30 : delay time on threshold intervention (seconds); range: 0÷999 Ex.: W3B = 88,B,10,150,15,30	W3B

DIGITAL OUTPUT 5		
040	PULSE Format: B0 : variable to associate 0.125 : pulse coefficient (kWh ÷ kVARh); range: 0÷10.00 250 : pulse duration time (msec.); range: 50÷500 Ex. W26 = B0,0.125,250	W28
041	THRESHOLD Format: A0 : variable to associate L : Lower limit H : Higher limit N : Always on 200000 : intervention value 15 : hysteresis percentage value (intervention threshold); range: 0÷99 30 : delay time on threshold intervention (seconds); range: 0÷999 Ex. W27 = A0,H,200000,15,30	W29
060	BAND Format: 89 : variable to associate B : Band 10.5 : min intervention value 15.5 : max intervention value 15 : hysteresis percentage value (intervention threshold); range: 0÷99 30 : delay time on threshold intervention (seconds); range: 0÷999 Ex.: W3C = 89,B,10.5,15.5,15,30	W3C

DIGITAL OUTPUT 6		
042	PULSE Format B0 : variable to associate 0.125 : pulse coefficient (kWh ÷ kVARh); range: 0÷10.00 250 : pulse duration time (msec.); range: 50÷500 Ex. W26 = B0,0.125,250	W2A
043	THRESHOLD Format: A0 : variable to associate L : Lower limit H : Higher limit N : Always on 200000 : intervention value 15 : hysteresis percentage value (intervention threshold); range: 0÷99 30 : delay time on threshold intervention (seconds); range: 0÷999 Ex. W27 = A0,H,200000,15,30	W2B
061	BAND Format: A8 : variable to associate B : Band -10000 : min intervention value 15000 : max intervention value 15 : hysteresis percentage value (intervention threshold); range: 0÷99 30 : delay time on threshold intervention (seconds); range: 0÷999 Ex.: W3D = A8,B,-10000,15000,15,30	W3D

ANALOG OUTPUT 1		
035	ANALOG Format: 80 : variable to associate (hex.) 0/4: 0 : Mono-directional output 0-20mA 4 : Mono-directional output 4-20mA 100 : minimum value. 300.50 : maximum value. Ex. W23 = 80,0,100,300.50	W23

ANALOG OUTPUT 2		
051	ANALOG Format: 80 : variable to associate 0/4: 0 : Mono-directional output 0-20mA 4 : Mono-directional output 4-20mA 00.00 : minimum value. 30.00 : maximum value. Ex. W33 = 80,4,100,300	W33

ANALOG OUTPUT 3		
052	ANALOG Format: A8 : variable to associate 0/4: 0 : Mono-directional output 0-20mA 4 : Mono-directional output 4-20mA 100 : minimum value. 300 : maximun value. Ex. W34 = A8,0,100,300	W34

ANALOG OUTPUT 4		
053	ANALOG Format: A8 : variable to associate 0/4: 0 : Mono-directional output 0-20mA 4 : Mono-directional output 4-20mA 100 : minimum value. 300 : maximum value. Ex. W35 = A8,4,100,300	W35

079	MIN/MAX VALUES RESET Ex.: W=00	W4F
080	VARIABLE PROGRAMMING 50 If less than 5 values are programmed, than replace the not used values with FF. Ex.: <STX>0AW50=81, 98, A8, B0, B4<ETX>(6AH) Ex.: <STX>0AW50=80, C0, FF, FF, FF<ETX>(64H) 81,98, A8, B0, B4 are single values C0 is variable groups FF is used to replace the values which wants not to be read.	W50
081	TARIFF PROGRAMMING Format: 1: Tariff period (1 = period 1, 2 = period 2, …….A = period 10) hhmmb : start time - band (Start hh:mm) and b band (0 = band1, 1 = band2, 2 = band3, 3 = band4) D: Day of the week, days are in the following order: Mon,Tue,Wed,Thu,Fri,Sat,Sun - 0=day disabled, 1=day enabled M : Month selection (Jan, Feb, Mar, Apr…….Dec) 0 = month disabled, 1 = month enabled Ex.: W51=1050000600107002080030900010001110021200311111001110000000111 |p| 1b | 2b | 3b | 4b | 5b | 6b | 7b | 8b | day | month |	W51

ENERGY COUNTER PRESET		
065	3-PHASE SYSTEM ACTIVE ENERGY (acquired) (double format)	W65
066	3-PHASE SYSTEM ACTIVE ENERGY (transferred) (double format)	W66
067	3-PHASE SYSTEM REACTIVE ENERGY (inductive) (double format)	W67
068	3-PHASE SYSTEM REACTIVE ENERGY (capacitive) (double format)	W68

090	ENERGY TYPE 0=normal (kWh-kVArh) 1=heavy (MWh-MVArh) Ex.:W5A=1	W5A

091	DIGITAL INPUT TYPE 0= not used; 1= sync. Rtc 2= periods 3= generic couters 4= GMC 5= GME 6= ELKO Ex: W5B=1	W5B

095	WIRING MODE 0= 4 wire 1= 3 wire 2= Aron Ex: W5F=2	W5F

GENERIC COUNTER		
160	GENERIC COUNTER 1 VALUE	WA0
161	GENERIC COUNTER 2 VALUE	WA1
162	GENERIC COUNTER 3 VALUE	WA2
163	GENERIC COUNTER 4 VALUE	WA3
164	GENERIC COUNTER 5 VALUE	WA4
165	GENERIC COUNTER 6 VALUE	WA5
166	GENERIC COUNTER 7 VALUE	WA6
167	GENERIC COUNTER 8 VALUE	WA7
	Ex: WA0=10000000.0	
168	GENERIC COUNTER 1 SETTING	WA8
169	GENERIC COUNTER 2 SETTING	WA9
170	GENERIC COUNTER 3 SETTING	WAA
171	GENERIC COUNTER 4 SETTING	WAB
172	GENERIC COUNTER 5 SETTING	WAC
173	GENERIC COUNTER 6 SETTING	WAD
174	GENERIC COUNTER 7 SETTING	WAE
175	GENERIC COUNTER 8 SETTING	WAF
	Format: WAx=I<SP>j<SP>username<SP>k i=Digital Input associated to the counter j=name index (0=kWh+; 1=kWh-; 2=kVARh+; 3=kVArh-; 4=Water; 5=Gas; 6=user name username= counter's name defined by the user (xxxxxxxx) k=pulse's weight (00000.00) Ex. WA8=1 6 LEVEL1 00001.0	

1.8) PROGRAMMABLE PARAMETERS (Writing codes crescent order)

000	SERIAL COMMUNICATION	W00
004	LOGICAL ADDRESS	W04
006	DELETING OF THE FIRST BLOCK OF VALUES OF AVERAGE POWER STORED IN RAM	W06
007	DELETING ALL MIN/MAX VALUES STORED IN RAM	W07
008	DELETING OF THE FIRST BLOCK OF VALUES OF VALUE OF MIN/MAX STORED IN RAM	W08
009	DATE/TIME/DAY	W09
010	SOLAR/SUMMER TIME HOUR CHANGE	W0A
011	DELETING OF THE FIRST BLOCK OF VALUES OF HARMONIC STORED IN RAM	W0B
015	DELETING OF ALL VALUES STORED IN RAM	W0F
016	TRANSFORMING RATIO CT	W10
018	TRANSFORMING RATIO VT	W12
020	PROGRAMMING, ERASING OF THE VALUES STORED IN RAM	W14
021	PROGRAMMING MIN/MAX AND SAMPLES CAMPAIGN ACQUISITION	W15
022	PROGRAMMING COUNTERS CAMPAIGN ACQUISITION	W16
024	INTEGRATION TIME FOR AVERAGE POWER CALCULATION	W18
027	BACKLIGHT ON TIME (seconds)	W1B
028	FREQUENCY MEASURING RANGE	W1C
029	DELETING THE FIRST BLOCK OF VALUES OF SAMPLES STORED IN RAM	W1D
031	ENERGY RESET	W1F

DIGITAL OUTPUT 1		
032	PULSE	W20
033	THRESHOLD	W21

ANALOG OUTPUT 1		
035	ANALOG	W23

DIGITAL OUTPUT 3		
036	PULSE	W24
037	THRESHOLD	W25

DIGITAL OUTPUT 4		
038	PULSE	W26
039	THRESHOLD	W27

DIGITAL OUTPUT 5		
040	PULSE	W28
041	THRESHOLD	W29

DIGITAL OUTPUT 6		
042	PULSE	W2A
043	THRESHOLD	W2B

DIGITAL OUTPUT 2		
048	PULSE	W30
049	THRESHOLD	W31

ANALOG OUTPUT 2		
051	ANALOG	W33

ANALOG OUTPUT 3		
052	ANALOG	W34

ANALOG OUTPUT 4		
053	ANALOG	W35

DIGITAL INPUT 1		
054	INPUT	W36

DIGITAL INPUT 2		
055	INPUT	W37

DIGITAL OUTPUT 1		
056	BAND	W38

DIGITAL OUTPUT 2		
057	BAND	W39

DIGITAL OUTPUT 4		
058	BAND	W3B

DIGITAL OUTPUT 5		
060	BAND	W3C

DIGITAL OUTPUT 6		
061	BAND	W3D

DIGITAL OUTPUT 3		
062	BAND	W3E

079	MIN/MAX VALUES RESET	W4F
080	VARIABLE PROGRAMMING 50	W50
081	TARIFF PROGRAMMING	W51

090	ENERGY TYPE	W5A

091	DIGITAL INPUT TYPE	W5B

095	WIRING MODE	W5F

101	3-PHASE SYSTEM ACTIVE ENERGY (acquired) (double format)	W65
102	3-PHASE SYSTEM ACTIVE ENERGY (transferred) (double format)	W66
103	3-PHASE SYSTEM REACTIVE ENERGY (inductive) (double format)	W67
104	3-PHASE SYSTEM REACTIVE ENERGY (capacitive) (double format)	W68

160	GENERIC COUNTER 1 VALUE	WA0
161	GENERIC COUNTER 2 VALUE	WA1
162	GENERIC COUNTER 3 VALUE	WA2
163	GENERIC COUNTER 4 VALUE	WA3
164	GENERIC COUNTER 5 VALUE	WA4
165	GENERIC COUNTER 6 VALUE	WA5
166	GENERIC COUNTER 7 VALUE	WA6
167	GENERIC COUNTER 8 VALUE	WA7
168	GENERIC COUNTER 1 SETTING	WA8
169	GENERIC COUNTER 2 SETTING	WA9
170	GENERIC COUNTER 3 SETTING	WAA
171	GENERIC COUNTER 4 SETTING	WAB
172	GENERIC COUNTER 5 SETTING	WAC
173	GENERIC COUNTER 6 SETTING	WAD
174	GENERIC COUNTER 7 SETTING	WAE
175	GENERIC COUNTER 8 SETTING	WAF

1.9) ERROR MESSAGES

E000	**No Error** None error has been occurred during the data transmission.	
E004	**No 15' (Buffer Empty)** None of 15' values has been stored.	**E014**
E005	**No Min/Max (Buffer Empty)** None of Min/Max values has been stored.	**E015**
E006	**No Harmonics (Buffer Empty)** None of Harmonic values, both for voltage and current, up to the 31st order has been stored.	**E016**
E007	**No Sample (Buffer Empty)** None of Sample values has been stored.	**E017**

1.10) NOTES

2) MODBUS-RTU COMMUNICATION PROTOCOL

2.1) MODBUS PROTOCOL

Modbus is a master-slave communication protocol able to support up to 247 slaves organized as a bus or as a star network;
The phisical link layer can be RS232 for a point to point connection or RS485 for a network.
The communication is half-duplex.
The network messages can be Query-Response or Broadcast type.
The Query-Response command is transmitted from the Master to an estabilished Slave and generally it is followed by an answering message.
The Broadcast command is transmitted from the Master to all Slaves and is never followed by an answer.

MODBUS use two modes for transmission.

A) ASCII Mode: uses a limited character set as a whole for the comunication.

B) RTU Mode: binary,with time frame synchronization,faster than the ASCII Mode,uses half so long data block than the ASCII Mode.

EMA analyzers employ RTU mode.

GENERIC MESSAGE STRUCTURE:

START OF FRAME	ADDRESS FIELD	FUNCTION CODE	DATA FIELD	ERROR CHECK	END OF FRAME

START OF FRAME = Starting message marker
ADDRESS FIELD = Includes device address in wich you need to comunicate in Query-Response mode. In case the message is a Broadcast type it includes 00.
FUNCTION CODE = Includes the operation code that you need to perform.
DATA FIELD = Includes the data field.
ERROR CHECK = Field for the error correction code.
END OF FRAME = End message marker.

Communication frame structure:

Mode RTU

Bit per byte = mode a) 1 Start, 8 Bit, 1 Parity, 1 Stop
mode b) 1 Start, 8 Bit, 2 Stop

START OF FRAME = silence on line for time >=4 characters
ADDRES FIELD = 1 character
FUNCTION CODE = 1 character
DATA FIELD = N characters
ERROR CHECK = 16 bit CRC
END OF FRAME = silence on line for time >=4 characters

The wait time for response is 30-50 msecond.

CRC GENERATION

Example of the CRC-16 generation with "C" language:

```
static unsigned char auchCRCHi [ ] = {
0x00,  0xC1,  0x81,  0x40,  0x01,  0xC0,  0x80,  0x41,  0x01,  0xC0,  0x80,  0x41,  0x00,  0xC1,  0x81,  0x40,
0x01,  0xC0,  0x80,  0x41,  0x00,  0xC1,  0x81,  0x40,  0x00,  0xC1,  0x81,  0x40,  0x01,  0xC0,  0x80,  0x41,
0x01,  0xC0,  0x80,  0x41,  0x00,  0xC1,  0x81,  0x40,  0x00,  0xC1,  0x81,  0x40,  0x01,  0xC0,  0x80,  0x41,
0x00,  0xC1,  0x81,  0x40,  0x01,  0xC0,  0x80,  0x41,  0x01,  0xC0,  0x80,  0x41,  0x00,  0xC1,  0x81,  0x40,
0x01,  0xC0,  0x80,  0x41,  0x00,  0xC1,  0x81,  0x40,  0x00,  0xC1,  0x81,  0x40,  0x01,  0xC0,  0x80,  0x41,
0x00,  0xC1,  0x81,  0x40,  0x01,  0xC0,  0x80,  0x41,  0x01,  0xC0,  0x80,  0x41,  0x00,  0xC1,  0x81,  0x40,
0x00,  0xC1,  0x81,  0x40,  0x01,  0xC0,  0x80,  0x41,  0x01,  0xC0,  0x80,  0x41,  0x00,  0xC1,  0x81,  0x40,
0x01,  0xC0,  0x80,  0x41,  0x00,  0xC1,  0x81,  0x40,  0x00,  0xC1,  0x81,  0x40,  0x01,  0xC0,  0x80,  0x41,
0x01,  0xC0,  0x80,  0x41,  0x00,  0xC1,  0x81,  0x40,  0x01,  0xC1,  0x81,  0x40,  0x01,  0xC0,  0x80,  0x41,
0x00,  0xC1,  0x81,  0x40,  0x01,  0xC0,  0x80,  0x41,  0x01,  0xC0,  0x80,  0x41,  0x00,  0xC1,  0x81,  0x40,
0x00,  0xC1,  0x81,  0x40,  0x01,  0xC0,  0x80,  0x41,  0x01,  0xC0,  0x80,  0x41,  0x00,  0xC1,  0x81,  0x40,
0x01,  0xC0,  0x80,  0x41,  0x00,  0xC1,  0x81,  0x40,  0x00,  0xC1,  0x81,  0x40,  0x01,  0xC0,  0x80,  0x41,
0x00,  0xC1,  0x81,  0x40,  0x01,  0xC0,  0x80,  0x41,  0x01,  0xC0,  0x80,  0x41,  0x00,  0xC1,  0x81,  0x40,
0x01,  0xC0,  0x80,  0x41,  0x00,  0xC1,  0x81,  0x40,  0x00,  0xC1,  0x81,  0x40,  0x01,  0xC0,  0x80,  0x41,
0x01,  0xC0,  0x80,  0x41,  0x00,  0xC1,  0x81,  0x40,  0x00,  0xC1,  0x81,  0x40,  0x01,  0xC0,  0x80,  0x41,
0x00,  0xC1,  0x81,  0x40,  0x01,  0xC0,  0x80,  0x41,  0x01,  0xC0,  0x80,  0x41,  0x00,  0xC1,  0x81,  0x40
} ;

static unsigned char auchCRCLo [ ] = {
0x00,  0xC0,  0xC1,  0x01,  0xC3,  0x03,  0x02,  0xC2,  0xC6,  0x06,  0x07,  0xC7,  0x05,  0xC5,  0xC4,  0x04,
0xCC,  0x0C,  0x0D,  0xCD,  0x0F,  0xCF,  0xCE,  0x0E,  0x0A,  0xCA,  0xCB,  0x0B,  0xC9,  0x09,  0x08,  0xC8,
0xD8,  0x18,  0x19,  0xD9,  0x1B,  0xDB,  0xDA,  0x1A,  0x1E,  0xDE,  0xDF,  0x1F,  0xDD,  0x1D,  0x1C,  0xDC,
0x14,  0xD4,  0xD5,  0x15,  0xD7,  0x17,  0x16,  0xD6,  0xD2,  0x12,  0x13,  0xD3,  0x11,  0xD1,  0xD0,  0x10,
0xF0,  0x30,  0x31,  0xF1,  0x33,  0xF3,  0xF2,  0x32,  0x36,  0xF6,  0xF7,  0x37,  0xF5,  0x35,  0x34,  0xF4,
0x3C,  0xFC,  0xFD,  0x3D,  0xFF,  0x3F,  0x3E,  0xFE,  0xFA,  0x3A,  0x3B,  0xFB,  0x39,  0xF9,  0xF8,  0x38,
0x28,  0xE8,  0xE9,  0x29,  0xEB,  0x2B,  0x2A  0xEA,  0xEE,  0x2E,  0x2F,  0xEF,  0x2D,  0xED,  0xEC,  0X2C,
0xE4,  0x24,  0x25,  0xE5,  0x27,  0xE7,  0xE6,  0x26,  0x22,  0xE2,  0xE3,  0x23,  0xE1,  0x21,  0x20,  0xE0,
0xA0,  0x60,  0x61,  0xA1,  0x63,  0xA3,  0xA2,  0x62,  0x66,  0xA6,  0xA7,  0x67,  0xA5,  0x65,  0x64,  0xA4,
0x6C,  0xAC,  0xAD,  0x6D,  0xAF,  0x6F,  0x6E,  0xAE,  0xAA,  0x6A,  0x6B,  0xAB,  0x69,  0xA9,  0xA8,  0x68,
0x78,  0xB8,  0xB9,  0x79,  0xBB,  0x7B,  0x7A,  0xBA,  0xBE,  0x7E,  0x7F,  0xBF,  0x7D,  0xBD,  0xBC,  0x7C,
0xB4,  0x74,  0x75,  0xB5,  0x77,  0xB7,  0xB6,  0x76,  0x72,  0xB2,  0xB3,  0x73,  0xB1,  0x71,  0x70,  0xB0,
0x50,  0x90,  0x91,  0x51,  0x93,  0x53,  0x52,  0x92,  0x96,  0x56,  0x57,  0x97,  0x55,  0x95,  0x94,  0x54,
0x9C,  0x5C,  0x5D,  0x9D,  0x5F,  0x9F,  0x9E,  0x5E,  0x5A,  0x9A,  0x9B,  0x5B,  0x99,  0x59,  0x58,  0x98,
0x88,  0x48,  0x49,  0x89,  0x4B,  0x8B,  0x8A,  0x4A,  0x4E,  0x8E,  0x8F,  0x4F,  0x8D,  0x4D,  0x4C,  0x8C,
0x44,  0x84,  0x85,  0x45,  0x87,  0x47,  0x46,  0x86,  0x82,  0x42,  0x43,  0x83,  0x41,  0x81,  0x80,  0x40
}
unsigned short CRC16 (ptMsg, usDataLen)
unsigned char *ptMsg;                       / * message to calculate CRC upon * /
unsigned short usDataLen;                   / * number of bytes in message * /
{
        unsigned char uchCRCHi = 0xFF;              / * CRC high byte * /
        unsigned char uchCRCLo =0xFF;               / * CRC low byte * /
        unsigned uIndex;

        while (usDataLen--)                 / * pass through message buffer * /
        {
           uIndex = uchCRCHi ^ *ptMsg++;            /.* calculate the CRC * /
           uchCRCHi = uchCRCLo ^ auchCRCHi [ uIndex ] ;
           uchCRCLo = auchCRCLo [ uIndex ]
        }
        return (uchCRCHi « 8 | uchCRCLo ) ;
    }
```

Note: The"Error Check (CRC)" field must be computed reffering to the characters from the first of ADDR to the last of DATA inclusive.

2.2) READING OF THE REGISTERS (Function Code $ 03)

Reads the binary contents of holding registers (4X references) in the slave.
Broadcast is not supported.
The Query message specified the starting register and quantity of register to be read.

QUERY:

START OF FRAME	ADDRESS FIELD	FUNCTION CODE	START ADDRESS	No. OF REGISTERS	ERROR CHECK	END OF FRAME

START OF FRAME = Starting message marker.
ADDRESS FIELD = EMA device address (00...FF HEX) (1 byte).
FUNCTION CODE = Operation code (03 HEX) (1 byte).
START ADDRESS = First register address to be read (2 byte).
No.OF REGISTERS = Number of registers (max 126) to be read (4 byte or 2 byte for 1 IEEE meas value).
ERROR CHECK = Check sum.
END OF FRAME = End message marker.

WARNING:
It is possible to read more than one variable at the same time only if their addresses are consecutive and the variables on the same line cannot be divided.
The register data in the response message are packet as two bytes per register,with the binary contents right justified within each byte.
For each register,the first byte contains the high order bits and the second contains the low order bits.

RESPONSE:

START OF FRAME	ADDRESS FIELD	FUNCTION CODE	No. OF BYTES	D0, D1, …, Dn	ERROR CHECK	END OF FRAME

START OF FRAME = Starting message marker.
ADDRESS FIELD = UPM device address (00...FF HEX) (1byte).
FUNCTION CODE = Operation code (03 HEX) (1 Byte).
No.OF SEND BYTES = Number of data bytes (00...?? HEX) (1 byte). 1 register requires 2 data bytes.
D0, D1, .., Dn = data bytes (00...?? HEX) (Nr. of register x 2 = n. byte).
ERROR CHECK = Check sum.
END OF FRAME = End message marker.

See the TABLE OF EMA REGISTERS to the sect. 5 and see the EXAMPLE to the sect. 6:

IEE STANDARD FLOATING POINT

The basic format allows a IEEE standard floating-point number to be representing in single-32 bit format as:

$$N.n = (-1)^S \; 2^{e'-127} \; (1.\ f)$$

where S is the sign bit,e' is the biased exponent,and *f* is the fraction strored normalized without the leaning 1.
Internally the exponent is 8 bits in length and the stored fraction is 23 bits long.

The floating-point formats is presented in the follow:

	S	e + 127	*f*
bit number	31	30 23	22 0

IEEE Standard Floating-Point Single Precision Notation

Length in bits:

Sign	1
Exponent	8
Fraction	23+ (1)
Total	m= 32 + (1)

Exponent (e):

Max	255
Min	0
Bias	127

Note:Fractions are always normalized and the leading 1 (hidden bit) is not stored.

The IEEE standard floating-point register is start to $ 2000.

See the TABLE OF EMA REGISTERS to the sect.5:

2.3) SETUP OF THE EMA PARAMETERS (Function Code $ 10)

Presets values into a sequence of holding registers (4X references).
When broadcast, the function presets the same register references in all attached slaves.

NOTE: The function will override the controller's memory protect state.The preset values will remain valid in the registers until the controller's logic next solves the register contents.The register values will remain if they are not programmed in the controller's logic.

The query message specified the register reference to be preset.Registers are addressed starting at zero:register 1 is addressed as 0.

WARNING: It is possible to write more than one variable at the same time only if their addresses are consecutive and the variables on the same line cannot be divided.

QUERY:

START OF FRAME	ADDRESS FIELD	FUNCTION CODE	START ADDRESS	No. OF REGISTERS	No. OF BYTES	D0, D1, …, Dn	ERROR CHECK	END OF FRAME

START OF FRAME	=	Starting message marker.	
ADDRESS FIELD	=	EMA device address (00...FF HEX)	(1 byte).
FUNCTION CODE	=	Operation code (10 HEX)	(1 byte).
START ADDRESS	=	First register address to be written	(2 byte).
No. OF REGISTER	=	Number of registers to be written (1,2,3,4,...)	(2 byte).
No. OF BYTES	=	Number of data bytes (HEX)	(1 byte): 1register requires 2 data bytes.
D0,D1,..,Dn	=	Data bytes (00...? HEX)	(1 byte) (Nr.of register x 2 = n. byte).
ERROR CHECK	=	Check sum.	
END OF FRAME	=	End message marker.	

The normal response retums the slave address, function code,starting address and quantity of register preset.

RESPONSE:

START OF FRAME	ADDRESS FIELD	FUNCTION CODE	START ADDRESS	No. OF REGISTERS	ERROR CHECK	END OF FRAME

START OF FRAME	=	Starting message marker.	
ADDRESS FIELD	=	EMA device address (00...FF HEX)	(1 byte).
FUNCTION CODE	=	Operation code (10 HEX)	(1 byte).
START ADDRESS	=	First register address to be written	(2 byte).
No. OF REGISTER	=	Number of registers to be written	(2 byte).
ERROR CHECK	=	Check sum.	
END OF FRAME	=	End message marker.	

See the TABLE OF EMA REGISTERS to the sect. 5 and see the EXAMPLE to the sect. 6 :

2.4) ERROR MESSAGE FROM SLAVE TO MASTER

When a slave device receives a not valid query, it does transmit an error message.

RESPONSE:

START OF FRAME	ADDRESS FIELD	FUNCTION CODE	ERROR CODE	ERROR CHECK	END OF FRAME

START OF FRAME = Starting message marker.
ADDRESS FIELD = EMA device address (00...FF HEX) (1 byte).
FUNCTION CODE = Operation code with bit 7 high (1 byte).
ERROR CODE = Message containing communication failure (1 byte).
ERROR CHECK = Check sum.
END OF FRAME = End message marker.

ERROR EXAMPLE

QUERY

Field Name	Example (Hex)
Slave Address	01
Function Code	03
Starting Address Hi	00
Starting Address Lo	00
Number Of Word Hi	00
Number Of Word Lo	05
Error Check (CRC)	??
	??

RESPONSE

Field Name	Example (Hex)
Slave Address	01
Function Code	83 (1)
Error Code	02 (2)
Error Check (CRC)	??
	??

(1): Function Code transmitted by master with bit 7 high.
(2): Error type:
01= Illegal Function
02= Illegal data address
03= Illegal data value
09= Ram Record Void

2.5) DIAGNOSTIC (Function Code $ 08)

This function provides a test for checking the communication system.
Broadcast is not supported.
The instrument's protocol has only the sub-function 0 of the diagnostics sub-functions set of the standard modbus protocol.
The Query and the Response messages are the following:

QUERY:

START OF FRAME	ADDRESS FIELD	FUNCTION CODE	SUB FUNCTION	DATA	ERROR CHECK	END OF FRAME

START OF FRAME = Starting message marker.
ADDRESS FIELD = EMA device address (00...FF HEX) (1 byte).
FUNCTION CODE = Operation code (08 HEX) (1 byte).
SUB FUNCTION = Sub-function 0 (00 00 hex) (2 byte).
DATA = Two bytes data to choose (2 byte).
ERROR CHECK = Check sum.
END OF FRAME = End message marker.

RESPONSE:

The response must be the loopback of the same data.

START OF FRAME	ADDRESS FIELD	FUNCTION CODE	SUB FUNCTION	DATA	ERROR CHECK	END OF FRAME

START OF FRAME = Starting message marker.
ADDRESS FIELD = EMA device address (00...FF HEX) (1 byte).
FUNCTION CODE = Operation code (08 HEX) (1 byte).
SUB FUNCTION = Sub-function 0 (00 00 hex) (2 byte).
DATA = A two bytes data
ERROR CHECK = Check sum.
END OF FRAME = End message marker.

DIAGNOSTIC EXAMPLE

QUERY		**RESPONSE**	
Field Name	Example (Hex)	Field Name	Example (Hex)
Slave Address	01	Slave Address	01
Function Code	08	Function Code	08
Sub-function Hi	00	Sub-function Hi	00
Sub-function Lo	00	Sub-function Lo	00
Data Hi	F1	Data Hi	F1
Data Lo	A7	Data Lo	A7
Error Check (CRC)	??	Error Check (CRC)	??
	??		??

2.6) REPORT SLAVE ID (Function Code $ 11)

This function returns the type of the instrument and the current status of the slave run indicator.
Broadcast is not supported.
The Query and the Reponse messages are the following:

QUERY:

START OF FRAME	ADDRESS FIELD	FUNCTION CODE	ERROR CHECK	END OF FRAME

START OF FRAME = Starting message marker.
ADDRESS FIELD = EMA device address (00...FF HEX) (1 byte).
FUNCTION CODE = Operation code (11 HEX) (1 byte).
ERROR CHECK = Check sum.
END OF FRAME = End message marker.

RESPONSE:

The normal response has the slave ID identifier (53 HEX) and the run indicator status (FF HEX).

START OF FRAME	ADDRESS FIELD	FUNCTION CODE	BYTE COUNT	SLAVE ID	RUN INDICATOR STATUS	ERROR CHECK	END OF FRAME

START OF FRAME = Starting message marker.
ADDRESS FIELD = EMA device address (00...FF HEX) (1 byte).
FUNCTION CODE = Operation code (11 HEX) (1 byte).
BYTE COUNT = Number of data bytes (02 HEX) (1 byte).
SLAVE ID = Slave ID identifier (53 HEX) (1 byte).
RUN INDICATOR STATUS = Run indicator status (FF HEX) (1 byte).
ERROR CHECK = Check sum.
END OF FRAME = End message marker.

REPORT SLAVE ID EXAMPLE

QUERY

Field Name	Example (Hex)
Slave Address	01
Function Code	11
Error Check (CRC)	??
	??

RESPONSE

Field Name	Example (Hex)
Slave Address	01
Function Code	11
Byte count	02
Slave ID	53
Run indicator status	FF
Error Check (CRC)	??
	??

2.7) TABLE OF EMA REGISTERS

The following table shown all the EMA registers.
The **M.U**. and **Type** columns are referred to integer register (first column).

MEASURED VALUES (Function code $ 03)

Integer		Float (IEEE)		Description	M.U.	Type
Register HEX	Word	Register HEX	Word			
$1000	4	$2000	2	3-PHASE SYSTEM VOLTAGE	[mV]	(Uns.) MSB=0
$1004	4	$2002	2	PHASE VOLTAGE L_{1-N}	[mV]	(Unsigned)
$1008	4	$2004	2	PHASE VOLTAGE L_{2-N}	[mV]	(Unsigned)
$100C	4	$2006	2	PHASE VOLTAGE L_{3-N}	[mV]	(Unsigned)
$1010	4	$2008	2	LINE VOLTAGE L_{1-2}	[mV]	(Unsigned)
$1014	4	$200A	2	LINE VOLTAGE L_{2-3}	[mV]	(Unsigned)
$1018	4	$200C	2	LINE VOLTAGE L_{3-1}	[mV]	(Unsigned)
$101C	4	$200E	2	3-PHASE SYSTEM CURRENT	[mA]	(Signed)MSB=1
$1020	4	$2010	2	LINE CURRENT L_1	[mA]	(Signed)
$1024	4	$2012	2	LINE CURRENT L_2	[mA]	(Signed)
$1028	4	$2014	2	LINE CURRENT L_3	[mA]	(Signed)
$102C	4	$2016	2	3-PHASE SYS. POWER FACTOR	[-]	(Signed)
$1030	4	$2018	2	POWER FACTOR L_1	[-]	(Signed)
$1034	4	$201A	2	POWER FACTOR L_2	[-]	(Signed)
$1038	4	$201C	2	POWER FACTOR L_3	[-]	(Signed)
$103C	4	$201E	2	3-PHASE SYSTEM COS∅	[-]	(Signed)
$1040	4	$2020	2	PHASE COS$∅_1$	[-]	(Signed)
$1044	4	$2022	2	PHASE COS$∅_2$	[-]	(Signed)
$1048	4	$2024	2	PHASE COS$∅_3$	[-]	(Signed)
$104C	4	$2026	2	3-PHASE S. APPARENT POWER	[mVA]	(Signed)
$1050	4	$2028	2	APPARENT POWER L_1	[mVA]	(Signed)
$1054	4	$202A	2	APPARENT POWER L_2	[mVA]	(Signed)
$1058	4	$202C	2	APPARENT POWER L_3	[mVA]	(Signed)
$105C	4	$202E	2	3-PHASE SYS. ACTIVE POWER	[mW]	(Signed)
$1060	4	$2030	2	ACTIVE POWER L_1	[mW]	(Signed)
$1064	4	$2032	2	ACTIVE POWER L_2	[mW]	(Signed)
$1068	4	$2034	2	ACTIVE POWER L_3	[mW]	(Signed)
$106C	4	$2036	2	3-PHASE S. REACTIVE POWER	[mVAR]	(Signed)
$1070	4	$2038	2	REACTIVE POWER L_1	[mVAR]	(Signed)
$1074	4	$203A	2	REACTIVE POWER L_2	[mVAR]	(Signed)
$1078	4	$203C	2	REACTIVE POWER L_3	[mVAR]	(Signed)
$107C	4	$203E	2	3-PHASE SYS. ACTIVE ENERGY+	[Wh]	(Unsigned)
$1080	4	$2040	2	3-PHASE S. REACTIVE ENERGY+	[VARh]	(Unsigned)
$1084	4	$2042	2	3-PHASE SYS.ACTIVE EN.	[Wh]	(Unsigned)
$1088	4	$2044	2	3-PHASE SYS.REACT.EN.	[VARh]	(Unsigned)
$108C	4	$2046	2	FREQUENCY	[mHz]	(Unsigned)
$1090	4	$2048	2	THD VOLTAGE L_1	[m%]	(Unsigned)
$1094	4	$204A	2	THD VOLTAGE L_2	[m%]	(Unsigned)
$1098	4	$204C	2	THD VOLTAGE L_3	[m%]	(Unsigned)
$109C	4	$204E	2	THD CURRENT L_1	[m%]	(Unsigned)
$10A0	4	$2050	2	THD CURRENT L_2	[m%]	(Unsigned)
$10A4	4	$2052	2	THD CURRENT L_3	[m%]	(Unsigned)
$10A8	4	$2054	2	3-PHASE AVG. ACTIVE POWER	[mW]	(Unsigned)
$10AC	4	$2056	2	3-PHASE AVERAGE CURRENT	[mA]	(Unsigned)
$11C0	4	$2068	2	TEMPERATURE	[m°C]	(Signed)
$11C4	4	$2A3A	2	NEUTRAL CURRENT	[mA]	(Signed)
$11C8	4	$2A3C	2	3 PHASE AVG. REACTIVE POWER	[mVAR]	(Signed)
$11CC	4	$2A40	2	AVERAGE LINE CURRENT L_1	[mA]	(Signed)
$11D0	4	$2A42	2	AVERAGE LINE CURRENT L_2	[mA]	(Signed)
$11D4	4	$2A44	2	AVERAGE LINE CURRENT L_3	[mA]	(Signed)
$11D8	4	$2A46	2	MAX AVERAGE 3-PH. CURRENT	[mA]	(Signed)
$11DC	4	$2A48	2	MAX AVERAGE LINE CURRENT L_1	[mA]	(Signed)
$11E0	4	$2A4A	2	MAX AVERAGE LINE CURRENT L_2	[mA]	(Signed)
$11E4	4	$2A4C	2	MAX AVERAGE LINE CURRENT L_3	[mA]	(Signed)
$11E8	4	$2A4E	2	MAX AVG NEUTRAL CURRENT L_N	[mA]	(Signed)
$11EC	4	$2A3E	2	AVERAGE NEUTRAL CURRENT L_N	[mA]	(Signed)
$11F0	4	$206A	2	VOLTAGE UNBALANCE	[m%]	(Unsigned)
$11F4	4	$206C	2	CURRENT UNBALANCE	[m%]	(Unsigned)

NOTE: WHEN THE INSTRUMENT CAN'T MEASURE IT SEND 0000 AS VALUE.

MIN/MAX VALUES (Function code $ 03)

Integer		Float (IEEE)		Description	M.U.	Type
Register HEX	Word	Register HEX	Word			
$10B0	3	$20B0	3	YY MM DD	[-]	(Unsigned)
$10B3	3	$20B3	3	HH MM SS	[-]	(Unsigned)
$10B6	4	$20B6	2	MIN 3-PHASE SYSTEM VOLTAGE	[mV]	(Unsigned)
$10BA	3	$20B8	3	YY MM DD	[-]	(Unsigned)
$10BD	3	$20BB	3	HH MM SS	[-]	(Unsigned)
$10C0	4	$20BE	2	MAX 3-PHASE SYSTEM VOLTAGE	[mV]	(Unsigned)
$10C4	3	$20C0	3	YY MM DD	[-]	(Unsigned)
$10C7	3	$20C3	3	HH MM SS	[-]	(Unsigned)
$10CA	4	$20C6	2	MIN 1-PHASE VOLTAGE L_{1-N}	[mV]	(Unsigned)
$10CE	3	$20C8	3	YY MM DD	[-]	(Unsigned)
$10D1	3	$20CB	3	HH MM SS	[-]	(Unsigned)
$10D4	4	$20CE	2	MAX 1-PHASE VOLTAGE L_{1-N}	[mV]	(Unsigned)
$10D8	3	$20D0	3	YY MM DD	[-]	(Unsigned)
$10DB	3	$20D3	3	HH MM SS	[-]	(Unsigned)
$10DE	4	$20D6	2	MIN 1-PHASE VOLTAGE L_{2-N}	[mV]	(Unsigned)
$10E2	3	$20D8	3	YY MM DD	[-]	(Unsigned)
$10E5	3	$20DB	3	HH MM SS	[-]	(Unsigned)
$10E8	4	$20DE	2	MAX 1-PHASE VOLTAGE L_{2-N}	[mV]	(Unsigned)
$10EC	3	$20E0	3	YY MM DD	[-]	(Unsigned)
$10EF	3	$20E3	3	HH MM SS	[-]	(Unsigned)
$10F2	4	$20E6	2	MINIMUN 1-PHASE VOLTAGE L_{3-N}	[mV]	(Unsigned)
$10F6	3	$20E8	3	YY MM DD	[-]	(Unsigned)
$10F9	3	$20EB	3	HH MM SS	[-]	(Unsigned)
$10FC	4	$20EE	2	MAXIMUM 1-PHASE VOLTAGE L_{3-N}	[mV]	(Unsigned)
$1100	3	$20F0	3	YY MM DD	[-]	(Unsigned)
$1103	3	$20F3	3	HH MM SS	[-]	(Unsigned)
$1106	4	$20F6	2	MIN 3-PHASE SYSTEM CURRENT	[mA]	(Signed)
$110A	3	$20F8	3	YY MM DD	[-]	(Unsigned)
$110D	3	$20FB	3	HH MM SS	[-]	(Unsigned)
$1110	4	$20FE	2	MAX 3-PHASE SYSTEM CURRENT	[mA]	(Signed)
$1114	3	$2100	3	YY MM DD	[-]	(Unsigned)
$1117	3	$2103	3	HH MM SS	[-]	(Unsigned)
$111A	4	$2106	2	MINIMUN LINE CURRENT L_1	[mA]	(Signed)
$111E	3	$2108	3	YY MM DD	[-]	(Unsigned)
$1121	3	$210B	3	HH MM SS	[-]	(Unsigned)
$1124	4	$210E	2	MAXIMUM LINE CURRENT L_1	[mA]	(Signed)
$1128	3	$2110	3	YY MM DD	[-]	(Unsigned)
$112B	3	$2113	3	HH MM SS	[-]	(Unsigned)
$112E	4	$2116	2	MINIMUN LINE CURRENT L_2	[mA]	(Signed)
$1132	3	$2118	3	YY MM DD	[-]	(Unsigned)
$1135	3	$211B	3	HH MM SS	[-]	(Unsigned)
$1138	4	$211E	2	MAXIMUM LINE CURRENT L_2	[mA]	(Signed)
$113C	3	$2120	3	YY MM DD	[-]	(Unsigned)
$113F	3	$2123	3	HH MM SS	[-]	(Unsigned)
$1142	4	$2126	2	MINIMUN LINE CURRENT L_3	[mA]	(Signed)
$1146	3	$2128	3	YY MM DD	[-]	(Unsigned)
$1149	3	$212B	3	HH MM SS	[-]	(Unsigned)
$114C	4	$212E	2	MAXIMUM LINE CURRENT L_3	[mA]	(Signed)
$1150	3	$2130	3	YY MM DD	[-]	(Unsigned)
$1153	3	$2133	3	HH MM SS	[-]	(Unsigned)
$1156	4	$2136	2	MIN.3 PHASE SYS. ACTIVE POWER	[mW]	(Signed)
$115A	3	$2138	3	YY MM DD	[-]	(Unsigned)
$115D	3	$213B	3	HH MM SS	[-]	(Unsigned)
$1160	4	$213E	2	MAX.3 PHASE SYS.ACTIVE POWER	[mW]	(Signed)
$1164	3	$2140	3	YY MM DD	[-]	(Unsigned)
$1167	3	$2143	3	HH MM SS	[-]	(Unsigned)
$116A	4	$2146	2	MIN.3 PHASE S.APPARENT POWER	[mVA]	(Signed)
$116E	3	$2148	3	YY MM DD	[-]	(Unsigned)
$1171	3	$214B	3	HH MM SS	[-]	(Unsigned)
$1174	4	$214E	2	MAX.3 PHASE S.APPARENT POWER	[mVA]	(Signed)

$1178	3	$2150	3	YY MM DD	[-]	(Unsigned)
$117B	3	$2153	3	HH MM SS	[-]	(Unsigned)
$117E	4	$2156	2	MIN.3 PHASE S..POWER FACTOR	[-]	(Signed)
$1182	3	$2158	3	YY MM DD	[-]	(Unsigned)
$1185	3	$215B	3	HH MM SS	[-]	(Unsigned)
$1188	4	$215E	2	MAX.3 PHASE S..POWER FACTOR	[-]	(Signed)
$118C	3	$2160	3	YY MM DD	[-]	(Unsigned)
$118F	3	$2163	3	HH MM SS	[-]	(Unsigned)
$1192	4	$2166	2	MIN.3 PHASE AVERAGE POWER	[mW]	(Unsigned)
$1196	3	$2168	3	YY MM DD	[-]	(Unsigned)
$1199	3	$216B	3	HH MM SS	[-]	(Unsigned)
$119C	4	$216E	2	MAX 3 PHASE AVERAGE POWER	[mW]	(Unsigned)

HARMONICS VALUES (Function code $03)

Integer		Float (IEEE)		Description	M.U.	Type
Register HEX	Word	Register HEX	Word			
$1200	4	$2200	2	1ST VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1204	4	$2202	2	2ND VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1208	4	$2204	2	3RD VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$120C	4	$2206	2	4TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1210	4	$2208	2	5TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1214	4	$220A	2	6TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1218	4	$220C	2	7TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$121C	4	$220E	2	8TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1220	4	$2210	2	9TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1224	4	$2212	2	10TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1228	4	$2214	2	11TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$122C	4	$2216	2	12TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1230	4	$2218	2	13TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1234	4	$221A	2	14TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1238	4	$221C	2	15TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$123C	4	$221E	2	16TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1240	4	$2220	2	17TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1244	4	$2222	2	18TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1248	4	$2224	2	19TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$124C	4	$2226	2	20TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1250	4	$2228	2	21TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1254	4	$222A	2	22TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1258	4	$222C	2	23TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$125C	4	$222E	2	24TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1260	4	$2230	2	25TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1460	4	$2400	2	26TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1464	4	$2402	2	27TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1468	4	$2404	2	28TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$146C	4	$2406	2	29TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1470	4	$2408	2	30TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1474	4	$240A	2	31TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)

$1264	4	$2232	2	1ST VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1268	4	$2234	2	2ND VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$126C	4	$2236	2	3RD VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1270	4	$2238	2	4TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1274	4	$223A	2	5TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1278	4	$223C	2	6TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$127C	4	$223E	2	7TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1280	4	$2240	2	8TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1284	4	$2242	2	9TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1288	4	$2244	2	10TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$128C	4	$2246	2	11TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1290	4	$2248	2	12TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1294	4	$224A	2	13TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1298	4	$224C	2	14TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$129C	4	$224E	2	15TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$12A0	4	$2250	2	16TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$12A4	4	$2252	2	17TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$12A8	4	$2254	2	18TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$12AC	4	$2256	2	19TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$12B0	4	$2258	2	20TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$12B4	4	$225A	2	21TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$12B8	4	$225C	2	22TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$12BC	4	$225E	2	23TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$12C0	4	$2260	2	24TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$12C4	4	$2262	2	25TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1478	4	$240C	2	26TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$147C	4	$240E	2	27TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1480	4	$2410	2	28TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1484	4	$2412	2	29TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1488	4	$2414	2	30TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$148C	4	$2416	2	31TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)

$12C8	4	$2264	2	1ST VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$12CC	4	$2266	2	2ND VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$12D0	4	$2268	2	3RD VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$12D4	4	$226A	2	4TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$12D8	4	$226C	2	5TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$12DC	4	$226E	2	6TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$12E0	4	$2270	2	7TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$12E4	4	$2272	2	8TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$12E8	4	$2274	2	9TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$12EC	4	$2276	2	10TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$12F0	4	$2278	2	11TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$12F4	4	$227A	2	12TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$12F8	4	$227C	2	13TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$12FC	4	$227E	2	14TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$1300	4	$2280	2	15TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$1304	4	$2282	2	16TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$1308	4	$2284	2	17TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$130C	4	$2286	2	18TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$1310	4	$2288	2	19TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$1314	4	$228A	2	20TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$1318	4	$228C	2	21TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$131C	4	$228E	2	22TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$1320	4	$2290	2	23TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$1324	4	$2292	2	24TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$1328	4	$2294	2	25TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$1490	4	$2418	2	26TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$1494	4	$241A	2	27TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$1498	4	$241C	2	28TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$149C	4	$241E	2	29TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$14A0	4	$2420	2	30TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)
$14A4	4	$2422	2	31TH VOLTAGE HARMONIC OF THE L_3 PHASE	[%]	(Unsigned)

$132C	4	$2296	2	1ST CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1330	4	$2298	2	2ND CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1334	4	$229A	2	3RD CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1338	4	$229C	2	4TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$133C	4	$229E	2	5TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1340	4	$22A0	2	6TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1344	4	$22A2	2	7TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1348	4	$22A4	2	8TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$134C	4	$22A6	2	9TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1350	4	$22A8	2	10TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1354	4	$22AA	2	11TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1358	4	$22AC	2	12TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$135C	4	$22AE	2	13TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1360	4	$22B0	2	14TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1364	4	$22B2	2	15TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1368	4	$22B4	2	16TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$136C	4	$22B6	2	17TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1370	4	$22B8	2	18TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1374	4	$22BA	2	19TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1378	4	$22BC	2	20TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$137C	4	$22BE	2	21TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1380	4	$22C0	2	22TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1384	4	$22C2	2	23TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1388	4	$22C4	2	24TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$138C	4	$22C6	2	25TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$14A8	4	$2424	2	26TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$14AC	4	$2426	2	27TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$14B0	4	$2428	2	28TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$14B4	4	$242A	2	29TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$14B8	4	$242C	2	30TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$14BC	4	$242E	2	31TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)

$1390	4	$22C8	2	1ST CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1394	4	$22CA	2	2ND CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1398	4	$22CC	2	3RD CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$139C	4	$22CE	2	4TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13A0	4	$22D0	2	5TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13A4	4	$22D2	2	6TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13A8	4	$22D4	2	7TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13AC	4	$22D6	2	8TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13B0	4	$22D8	2	9TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13B4	4	$22DA	2	10TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13B8	4	$22DC	2	11TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13BC	4	$22DE	2	12TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13C0	4	$22E0	2	13TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13C4	4	$22E2	2	14TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13C8	4	$22E4	2	15TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13CC	4	$22E6	2	16TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13D0	4	$22E8	2	17TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13D4	4	$22EA	2	18TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13D8	4	$22EC	2	19TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13DC	4	$22EE	2	20TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13E0	4	$22F0	2	21TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13E4	4	$22F2	2	22TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13E8	4	$22F4	2	23TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13EC	4	$22F6	2	24TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$13F0	4	$22F8	2	25TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$14C0	4	$2430	2	26TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$14C4	4	$2432	2	27TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$14C8	4	$2434	2	28TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$14CC	4	$2436	2	29TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$14D0	4	$2438	2	30TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$14D4	4	$243A	2	31TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)

$13F4	4	$22FA	2	1ST CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$13F8	4	$22FC	2	2ND CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$13FC	4	$22FE	2	3RD CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$13F0	4	$2300	2	4TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1404	4	$2302	2	5TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1408	4	$2304	2	6TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$140C	4	$2306	2	7TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1410	4	$2308	2	8TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1414	4	$230A	2	9TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1418	4	$230C	2	10TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$141C	4	$230E	2	11TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1420	4	$2310	2	12TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1424	4	$2312	2	13TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1428	4	$2314	2	14TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$142C	4	$2316	2	15TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1430	4	$2318	2	16TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1434	4	$231A	2	17TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1438	4	$231C	2	18TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$143C	4	$231E	2	19TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1440	4	$2320	2	20TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1444	4	$2322	2	21TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1448	4	$2324	2	22TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$144C	4	$2326	2	23TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1450	4	$2328	2	24TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1454	4	$232A	2	25TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$14D8	4	$243C	2	26TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$14DC	4	$243E	2	27TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$14E0	4	$2440	2	28TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$14E4	4	$2442	2	29TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$14E8	4	$2444	2	30TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$14EC	4	$2446	2	31TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)

TIME BAND ENERGY COUNTER (FUNCTION CODE $03)

Integer		Float (IEEE)		Description	M.U.	Type
Register HEX	Word	Register HEX	Word			
$1500	4	$2500	2	Acquired active energy previous month band 1	[Wh]	(Unsigned)
$1504	4	$2502	2	Inductive reactive energy previous month band 1	[VArh]	(Unsigned)
$1508	4	$2504	2	Transferred active energy previous month band 1	[Wh]	(Unsigned)
$150C	4	$2506	2	Capacitive reactive energy previous month band 1	[VArh]	(Unsigned)
$1510	4	$2508	2	Acquired active energy previous month band 2	[Wh]	(Unsigned)
$1514	4	$250A	2	Inductive reactive energy previous month band 2	[VArh]	(Unsigned)
$1518	4	$250C	2	Transferred active energy previous month band 2	[Wh]	(Unsigned)
$151C	4	$250E	2	Capacitive reactive energy previous month band 2	[VArh]	(Unsigned)
$1520	4	$2510	2	Acquired active energy previous month band 3	[Wh]	(Unsigned)
$1524	4	$2512	2	Inductive reactive energy previous month band 3	[VArh]	(Unsigned)
$1528	4	$2514	2	Transferred active energy previous month band 3	[Wh]	(Unsigned)
$152C	4	$2516	2	Capacitive reactive energy previous month band 3	[VArh]	(Unsigned)
$15C0	4	$2560	2	Acquired active energy previous month band 4	[Wh]	(Unsigned)
$15C4	4	$2562	2	Inductive reactive energy previous month band 4	[VArh]	(Unsigned)
$15C8	4	$2564	2	Transferred active energy previous month band 4	[Wh]	(Unsigned)
$15CC	4	$2566	2	Capacitive reactive energy previous month band 4	[VArh]	(Unsigned)
$1530	4	$2518	2	Acquired active energy current month band 1	[Wh]	(Unsigned)
$1534	4	$251A	2	Inductive reactive energy current month band 1	[VArh]	(Unsigned)
$1538	4	$251C	2	Transferred active energy current month band 1	[Wh]	(Unsigned)
$153C	4	$251E	2	Capacitive reactive energy current month band 1	[VArh]	(Unsigned)
$1540	4	$2520	2	Acquired active energy current month band 2	[Wh]	(Unsigned)
$1544	4	$2522	2	Inductive reactive energy current month band 2	[VArh]	(Unsigned)
$1548	4	$2524	2	Transferred active energy current month band 2	[Wh]	(Unsigned)
$154C	4	$2526	2	Capacitive reactive energy current month band 2	[VArh]	(Unsigned)
$1550	4	$2528	2	Acquired active energy current month band 3	[Wh]	(Unsigned)
$1554	4	$252A	2	Inductive reactive energy current month band 3	[VArh]	(Unsigned)
$1558	4	$252C	2	Transferred active energy current month band 3	[Wh]	(Unsigned)
$155C	4	$252E	2	Capacitive reactive energy current month band 3	[VArh]	(Unsigned)
$15D0	4	$2568	2	Acquired active energy current month band 4	[Wh]	(Unsigned)
$15D4	4	$256A	2	Inductive reactive energy current month band 4	[VArh]	(Unsigned)
$15D8	4	$256C	2	Transferred active energy current month band 4	[Wh]	(Unsigned)
$15DC	4	$256E	2	Capacitive reactive energy current month band 4	[VArh]	(Unsigned)
$1560	4	$2530	2	Acquired active energy previous day band 1	[Wh]	(Unsigned)
$1564	4	$2532	2	Inductive reactive energy previous day band 1	[VArh]	(Unsigned)
$1568	4	$2534	2	Transferred active energy previous day band 1	[Wh]	(Unsigned)
$156C	4	$2536	2	Capacitive reactive energy previous day band 1	[VArh]	(Unsigned)
$1570	4	$2538	2	Acquired active energy previous day band 2	[Wh]	(Unsigned)
$1574	4	$253A	2	Inductive reactive energy previous day band 2	[VArh]	(Unsigned)
$1578	4	$253C	2	Transferred active energy previous day band 2	[Wh]	(Unsigned)
$157C	4	$253E	2	Capacitive reactive energy previous day band 2	[VArh]	(Unsigned)
$1580	4	$2540	2	Acquired active energy previous day band 3	[Wh]	(Unsigned)
$1584	4	$2542	2	Inductive reactive energy previous day band 3	[VArh]	(Unsigned)
$1588	4	$2544	2	Transferred active energy previous day band 3	[Wh]	(Unsigned)
$158C	4	$2546	2	Capacitive reactive energy previous day band 3	[VArh]	(Unsigned)
$15E0	4	$2570	2	Acquired active energy previous day band 4	[Wh]	(Unsigned)
$15E4	4	$2572	2	Inductive reactive energy previous day band 4	[VArh]	(Unsigned)
$15E8	4	$2574	2	Transferred active energy previous day band 4	[Wh]	(Unsigned)
$15EC	4	$2576	2	Capacitive reactive energy previous day band 4	[VArh]	(Unsigned)
$1590	4	$2548	2	Acquired active energy current day band 1	[Wh]	(Unsigned)
$1594	4	$254A	2	Inductive reactive energy current day band 1	[VArh]	(Unsigned)
$1598	4	$254C	2	Transferred active energy current day band 1	[Wh]	(Unsigned)
$159C	4	$254E	2	Capacitive reactive energy current day band 1	[VArh]	(Unsigned)
$15A0	4	$2550	2	Acquired active energy current day band 2	[Wh]	(Unsigned)
$15A4	4	$2552	2	Inductive reactive energy current day band 2	[VArh]	(Unsigned)
$15A8	4	$2554	2	Transferred active energy current day band 2	[Wh]	(Unsigned)
$15AC	4	$2556	2	Capacitive reactive energy current day band 2	[VArh]	(Unsigned)
$15B0	4	$2558	2	Acquired active energy current day band 3	[Wh]	(Unsigned)

$15B4	4	$255A	2	Inductive reactive energy current day band 3	[VArh]	(Unsigned)
$15B8	4	$255C	2	Transferred active energy current day band 3	[Wh]	(Unsigned)
$15BC	4	$255E	2	Capacitive reactive energy current day band 3	[VArh]	(Unsigned)
$15F0	4	$2578	2	Acquired active energy current day band 4	[Wh]	(Unsigned)
$15F4	4	$257A	2	Inductive reactive energy current day band 4	[VArh]	(Unsigned)
$15F8	4	$257C	2	Transferred active energy current day band 4	[Wh]	(Unsigned)
$15FC	4	$257E	2	Capacitive reactive energy current day band 4	[VArh]	(Unsigned)

$1F80	4	$2FA0	2	Acquired active energy previous year band 1	[Wh]	(Unsigned)
$1F84	4	$2FA2	2	Inductive reactive energy previous year band 1	[VArh]	(Unsigned)
$1F88	4	$2FA4	2	Transferred active energy previous year band 1	[Wh]	(Unsigned)
$1F8C	4	$2FA6	2	Capacitive reactive energy previous year band 1	[VArh]	(Unsigned)
$1F90	4	$2FA8	2	Acquired active energy previous year band 2	[Wh]	(Unsigned)
$1F94	4	$2FAA	2	Inductive reactive energy previous year band 2	[VArh]	(Unsigned)
$1F98	4	$2FAC	2	Transferred active energy previous year band 2	[Wh]	(Unsigned)
$1F9C	4	$2FAE	2	Capacitive reactive energy previous year band 2	[VArh]	(Unsigned)
$1FA0	4	$2FB0	2	Acquired active energy previous year band 3	[Wh]	(Unsigned)
$1FA4	4	$2FB2	2	Inductive reactive energy previous year band 3	[VArh]	(Unsigned)
$1FA8	4	$2FB4	2	Transferred active energy previous year band 3	[Wh]	(Unsigned)
$1FAC	4	$2FB6	2	Capacitive reactive energy previous year band 3	[VArh]	(Unsigned)
$1FB0	4	$2FB8	2	Acquired active energy previous year band 4	[Wh]	(Unsigned)
$1FB4	4	$2FBA	2	Inductive reactive energy previous year band 4	[VArh]	(Unsigned)
$1FB8	4	$2FBC	2	Transferred active energy previous year band 4	[Wh]	(Unsigned)
$1FBC	4	$2FBE	2	Capacitive reactive energy previous year band 4	[VArh	(Unsigned)

$1FC0	4	$2FC0	2	Acquired active energy current year band 1	[Wh]	(Unsigned)
$1FC4	4	$2FC2	2	Inductive reactive energy current year band 1	[VArh]	(Unsigned)
$1FC8	4	$2FC4	2	Transferred active energy current year band 1	[Wh]	(Unsigned)
$1FCC	4	$2FC6	2	Capacitive reactive energy current year band 1	[VArh]	(Unsigned)
$1FD0	4	$2FC8	2	Acquired active energy current year band 2	[Wh]	(Unsigned)
$1FD4	4	$2FCA	2	Inductive reactive energy current year band 2	[VArh]	(Unsigned)
$1FD8	4	$2FCC	2	Transferred active energy current year band 2	[Wh]	(Unsigned)
$1FDC	4	$2FCE	2	Capacitive reactive energy current year band 2	[VArh]	(Unsigned)
$1FE0	4	$2FD0	2	Acquired active energy current year band 3	[Wh]	(Unsigned)
$1FE4	4	$2FD2	2	Inductive reactive energy current year band 3	[VArh]	(Unsigned)
$1FE8	4	$2FD4	2	Transferred active energy current year band 3	[Wh]	(Unsigned)
$1FEC	4	$2FD6	2	Capacitive reactive energy current year band 3	[VArh]	(Unsigned)
$1FF0	4	$2FD8	2	Acquired active energy current year band 4	[Wh]	(Unsigned)
$1FF4	4	$2FDA	2	Inductive reactive energy current year band 4	[VArh]	(Unsigned)
$1FF8	4	$2FDC	2	Transferred active energy current year band 4	[Wh]	(Unsigned)
$1FFC	4	$2FDE	2	Capacitive reactive energy current year band 4	[VArh]	(Unsigned)

TOTAL TIME BAND ENERGY COUNTER- Double format (Function code $03)

N.A.		$2A60	4	Total Acquired active energy band 1	[-]	(Unsigned)
N.A.		$2A64	4	Total Transferred active energy band 1	[-]	(Unsigned)
N.A.		$2A68	4	Total Inductive reactive energy band 1	[-]	(Unsigned)
N.A.		$2A6C	4	Total Capacitive reactive energy band 1	[-]	(Unsigned)
N.A.		$2A70	4	Total Acquired active energy band 2	[-]	(Unsigned)
N.A.		$2A74	4	Total Transferred active energy band 2	[-]	(Unsigned)
N.A.		$2A78	4	Total Inductive reactive energy band 2	[-]	(Unsigned)
N.A.		$2A7C	4	Total Capacitive reactive energy band 2	[-]	(Unsigned)
N.A.		$2A80	4	Total Acquired active energy band 3	[-]	(Unsigned)
N.A.		$2A84	4	Total Transferred active energy band 3	[-]	(Unsigned)
N.A.		$2A88	4	Total Inductive reactive energy band 3	[-]	(Unsigned)
N.A.		$2A8C	4	Total Capacitive reactive energy band 3	[-]	(Unsigned)
N.A.		$2A90	4	Total Acquired active energy band 4	[-]	(Unsigned)
N.A.		$2A94	4	Total Transferred active energy band 4	[-]	(Unsigned)
N.A.		$2A98	4	Total Inductive reactive energy band 4	[-]	(Unsigned)
N.A.		$2A9C	4	Total Capacitive reactive energy band 4	[-]	(Unsigned)

VALUES STORED IN RAM (Function.code $03)

Integer		Float (IEEE)		Description	M.U.	Type
Register HEX	Word	Register HEX	Word			
$1600	1	$2600	1	LOGICAL NUMBER	[-]	(Unsigned)
$1601	3	$2601	3	YYMMDD	[-]	(Unsigned)
$1604	1	$2604	1	nn= order no. of 15'energy value stored in a day	[-]	(Unsigned)
$1605	4	$2605	2	ACTIVE 15'	[mWh]	(Unsigned)
$1609	4	$2607	2	REACTIVE 15'	[mVArh]	(Unsigned)

MIN/MAX VALUES STORED IN RAM (Function.code $03)

HEADER

Integer		Float (IEEE)		Description	U.M.	Type
Register HEX	Word	Register HEX	Word			
$1B30	3	$2B30	3	YY MM DD	[-]	(Unsigned)
$1B33	3	$2B33	3	HH MM SS	[-]	(Unsigned)
$1B36	1	$2B36	1	time of mem	[min]	(Unsigned)

1st DATA BLOCK

Integer		Float (IEEE)		Description	U.M.	Type
Register HEX	Word	Register HEX	Word			
$1B47	4	$2B47	4	Block num.(2 word) + $0 (1 word) + Block full of 0=NO/1=Yes (1 word)		
$1B4B	4	$2B4B	2	MIN 3-PHASE SYSTEM VOLTAGE	[mV]	(Unsigned)
$1B4F	4	$2B4D	2	MAX 3-PHASE SYSTEM VOLTAGE	[mV]	(Unsigned)
$1B53	4	$2B4F	2	MIN PHASE VOLTAGE L_{1-N}	[mV]	(Unsigned)
$1B57	4	$2B51	2	MAX PHASE VOLTAGE L_{1-N}	[mV]	(Unsigned)
$1B5B	4	$2B53	2	MIN PHASE VOLTAGE L_{2-N}	[mV]	(Unsigned)
$1B5F	4	$2B55	2	MAX PHASE VOLTAGE L_{2-N}	[mV]	(Unsigned)
$1B63	4	$2B57	2	MIN PHASE VOLTAGE L_{3-N}	[mV]	(Unsigned)
$1B67	4	$2B59	2	MIN PHASE VOLTAGE L_{3-N}	[mV]	(Unsigned)
$1B6B	4	$2B5B	2	MIN 3-PHASE SYSTEM CURRENT	[mA]	(Signed)
$1B6F	4	$2B5D	2	MAX 3-PHASE SYSTEM CURRENT	[mA]	(Signed)
$1B73	4	$2B5F	2	MIN LINE CURRENT L_1	[mA]	(Signed)
$1B77	4	$2B61	2	MAX LINE CURRENT L_1	[mA]	(Signed)
$1B7B	4	$2B63	2	MIN LINE CURRENT L_2	[mA]	(Signed)
$1B7F	4	$2B65	2	MAX LINE CURRENT L_2	[mA]	(Signed)
$1B83	4	$2B67	2	MIN LINE CURRENT L_3	[mA]	(Signed)
$1B87	4	$2B69	2	MAX LINE CURRENT L_3	[mA]	(Signed)
$1B8B	4	$2B6B	2	MIN 3 PHASE SYSTEM ACTIVE POWER	[mW]	(Signed)
$1B8F	4	$2B6D	2	MAX 3 PHASE SYSTEM ACTIVE POWER	[mW]	(Signed)
$1B93	4	$2B6F	2	MIN 3 PHASE SYSTEM REACTIVE POWER	[mW]	(Signed)
$1B97	4	$2B71	2	MAX 3 PHASE SYSTEM REACTIVE POWER	[mW]	(Signed)
$1B9B	4	$2B73	2	MIN 3 PHASE SYSTEM POWER FACTOR	[-]	(Signed)
$1B9F	4	$2B75	2	MAX 3 PHASE SYSTEM POWER FACTOR	[-]	(Signed)
$1BA3	4	$2B77	2	MIN 3 PHASE SYSTEM AVERAGE POWER	[mW]	(Signed)
$1BA7	4	$2B79	2	MAX 3 PHASE SYSTEM AVERAGE POWER	[mW]	(Signed)

2ND DATA BLOCK

Integer		Float (IEEE)		Description	U.M.	Type
Register HEX	Word	Register HEX	Word			
$1BAB	4	$2B7B	4	Block num.(2 word) + $0 (1 word) + Block full of 0=NO/1=Yes (1 word)		
$1BAF	4	$2B7F	2	MIN 3 PHASE SYSTEM VOLTAGE	[mV]	(Unsigned)
$1BB3	4	$2B81	2	MAX 3 PHASE SYSTEM VOLTAGE	[mV]	(Unsigned)
$1BB7	4	$2B83	2	MIN PHASE VOLTAGE L_{1-N}	[mV]	(Unsigned)
$1BBB	4	$2B85	2	MAX PHASE VOLTAGE L_{1-N}	[mV]	(Unsigned)
$1BBF	4	$2B87	2	MIN PHASE VOLTAGE L_{2-N}	[mV]	(Unsigned)
$1BC3	4	$2B89	2	MAX PHASE VOLTAGE L_{2-N}	[mV]	(Unsigned)
$1BC7	4	$2B8B	2	MIN PHASE VOLTAGE L_{3-N}	[mV]	(Unsigned)
$1BCB	4	$2B8D	2	MAX PHASE VOLTAGE L_{3-N}	[mV]	(Unsigned)
$1BCF	4	$2B8F	2	MIN 3-PHASE SYSTEM CURRENT	[mA]	(Signed)
$1BD3	4	$2B91	2	MAX 3-PHASE SYSTEM CURRENT	[mA]	(Signed)
$1BD7	4	$2B93	2	MIN LINE CURRENT L_1	[mA]	(Signed)
$1BDB	4	$2B95	2	MAX LINE CURRENT L_1	[mA]	(Signed)
$1BDF	4	$2B97	2	MIN LINE CURRENT L_2	[mA]	(Signed)
$1BE3	4	$2B99	2	MAX LINE CURRENT L_2	[mA]	(Signed)
$1BE7	4	$2B9B	2	MIN LINE CURRENT L_3	[mA]	(Signed)
$1BEB	4	$2B9D	2	MAX LINE CURRENT L_3	[mA]	(Signed)
$1BEF	4	$2B9F	2	MIN 3-PHASE SYSTEM ACTIVE POWER	[mW]	(Signed)
$1BF3	4	$2BA1	2	MAX 3-PHASE SYSTEM ACTIVE POWER	[mW]	(Signed)
$1BF7	4	$2BA3	2	MIN 3-PHASE SYSTEM REACTIVE POWER	[mW]	(Signed)
$1BFB	4	$2BA5	2	MAX 3-PHASE SYSTEM REACTIVE POWER	[mW]	(Signed)
$1BFF	4	$2BA7	2	MIN 3-PHASE SYSTEM POWER FACTOR	[-]	(Signed)
$1C03	4	$2BA9	2	MAX 3-PHASE SYSTEM POWER FACTOR	[-]	(Signed)
$1C07	4	$2BAB	2	MIN 3-PHASE SYSTEM AVERAGE POWER	[mW]	(Signed)
$1C0B	4	$2BAD	2	MAX 3-PHASE SYSTEM AVERAGE POWER	[mW]	(Signed)

3RD.....10TH DATA BLOCK

(3RD DATA BLOCK)

Integer		Float (IEEE)		Description	U.M.	Type
Register HEX	Word	Register HEX	Word			
$1C0F	4	$2BAF	4	Block num.(2 word) + $0 (1 word) + Block full of 0=NO/1=Yes (1 word)		
……	…	……	…	…….....	…….	.....
……	…	……	…	…….....	…….	.....
$1C6F	4	$2BE1	2	MAX 3-PHASE SYSTEM AVERAGE POWER	[mW]	(Signed)

(4TH DATA BLOCK)

Integer		Float (IEEE)		Description	U.M.	Type
Register HEX	Word	Register HEX	Word			
$1C73	4	$2BE3	4	Block num.(2 word) + $0 (1 word) + Block full of 0=NO/1=Yes (1 word)		
……	…	……	…	…….....	…….	.....
……	…	……	…	…….....	…….	.....
$1CD3	4	$2C15	2	MAX 3-PHASE SYSTEM AVERAGE POWER	[mW]	(Signed)

(5TH DATA BLOCK)

Integer		Float (IEEE)		Description	U.M.	Type
Register HEX	Word	Register HEX	Word			
$1CD7	4	$2C17	4	Block num.(2 word) + $0 (1 word) + Block full of 0=NO/1=Yes (1 word)		
……	…	……	…	……	…….	…….
……	…	……	…	……	…….	…….
$1D37	4	$2C49	2	MAX 3-PHASE SYSTEM AVERAGE POWER	[mW]	(Signed)

(6TH DATA BLOCK)

Integer		Float (IEEE)		Description	U.M.	Type
Register HEX	Word	Register HEX	Word			
$1D3B	4	$2C4B	4	Block num.(2 word) + $0 (1 word) + Block full of 0=NO/1=Yes (1 word)		
……	…	……	…	……	…….	…….
……	…	……	…	……	…….	…….
$1D9B	4	$2C7D	2	MAX 3-PHASE SYSTEM AVERAGE POWER	[mW]	(Signed)

(7TH DATA BLOCK)

Integer		Float (IEEE)		Description	U.M.	Type
Register HEX	Word	Register HEX	Word			
$1D9F	4	$2C7F	4	Block num.(2 word) + $0 (1 word) + Block full of 0=NO/1=Yes (1 word)		
……	…	……	…	……	…….	…….
……	…	……	…	……	…….	…….
$1DFF	4	$2CB1	2	MAX 3-PHASE SYSTEM AVERAGE POWER	[mW]	(Signed)

(8TH DATA BLOCK)

Integer		Float (IEEE)		Description	U.M.	Type
Register HEX	Word	Register HEX	Word			
$1E03	4	$2CB3	4	Block num.(2 word) + $0 (1 word) + Block full of 0=NO/1=Yes (1 word)		
……	…	……	…	……	…….	…….
……	…	……	…	……	…….	…….
$1E63	4	$2CE5	2	MAX 3-PHASE SYSTEM AVERAGE POWER	[mW]	(Signed)

(9TH DATA BLOCK)

Integer		Float (IEEE)		Description	U.M.	Type
Register HEX	Word	Register HEX	Word			
$1E67	4	$2CE7	4	Block num.(2 word) + $0 (1 word) + Block full of 0=NO/1=Yes (1 word)		
……	…	……	…	……	…….	…….
……	…	……	…	……	…….	…….
$1EC7	4	$2D19	2	MAX 3-PHASE SYSTEM AVERAGE POWER	[mW]	(Signed)

(10TH DATA BLOCK)

Integer		Float (IEEE)		Description	U.M.	Type
Register HEX	Word	Register HEX	Word			
$1ECB	4	$2D1B	4	Block num.(2 word) + $0 (1 word) + Block full of 0=NO/1=Yes (1 word)		
……	…	……	…	……	…….	…….
……	…	……	…	……	…….	…….
$1F2B	4	$2D4D	2	MAX 3-PHASE SYSTEM AVERAGE POWER	[mW]	(Signed)

HARMONICS VALUES STORED IN RAM (Function code $03)

Integer		Float (IEEE)		Description	M.U.	Type
Register HEX	Word	Register HEX	Word			
$1660	1	$2660	1	LOGICAL NUMBER	[-]	(Unsigned)
$1661	3	$2661	3	YY MM DD	[-]	(Unsigned)
$1664	1	$2664	1	nn=order number of 15' in a day	[-]	(Unsigned)
$1665	4	$2665	2	1ST VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1669	4	$2667	2	2ND VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$166D	4	$2669	2	3RD VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1671	4	$266B	2	4TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1675	4	$266D	2	5TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1679	4	$266F	2	6TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$167D	4	$2671	2	7TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1681	4	$2673	2	8TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1685	4	$2675	2	9TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1689	4	$2677	2	10TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$168D	4	$2679	2	11TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1691	4	$267B	2	12TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1695	4	$267D	2	13TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1699	4	$267F	2	14TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$169D	4	$2681	2	15TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$16A1	4	$2683	2	16TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$16A5	4	$2685	2	17TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$16A9	4	$2687	2	18TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$16AD	4	$2689	2	19TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$16B1	4	$268B	2	20TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$16B5	4	$268D	2	21TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$16B9	4	$268F	2	22TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$16BD	4	$2691	2	23TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$16C1	4	$2693	2	24TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$16C5	4	$2695	2	25TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1900	4	$2800	2	26TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1904	4	$2802	2	27TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1908	4	$2804	2	28TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$190C	4	$2806	2	29TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1910	4	$2808	2	30TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$1914	4	$280A	2	31TH VOLTAGE HARMONIC OF THE L_1 PHASE	[%]	(Unsigned)
$16C9	4	$2697	2	1st VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$16CD	4	$2699	2	2ND VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$16D1	4	$269B	2	3RD VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$16D5	4	$269D	2	4TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$16D9	4	$269F	2	5TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$16DD	4	$26A1	2	6TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$16E1	4	$26A3	2	7TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$16E5	4	$26A5	2	8TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$16E9	4	$26A7	2	9TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$16ED	4	$26A9	2	10TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$16F1	4	$26AB	2	11TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$16F5	4	$26AD	2	12TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$16F9	4	$26AF	2	13TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$16FD	4	$26B1	2	14TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1701	4	$26B3	2	15TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1705	4	$26B5	2	16TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1709	4	$26B7	2	17TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$170D	4	$26B9	2	18TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1711	4	$26BB	2	19TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1715	4	$26BD	2	20TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1719	4	$26BF	2	21TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$171D	4	$26C1	2	22TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1721	4	$26C3	2	23TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1725	4	$26C5	2	24TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)
$1729	4	$26C7	2	25TH VOLTAGE HARMONIC OF THE L_2 PHASE	[%]	(Unsigned)

$1918	4	$280C	2	26TH VOLTAGE HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$191C	4	$280E	2	27TH VOLTAGE HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1920	4	$2810	2	28TH VOLTAGE HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1924	4	$2812	2	29TH VOLTAGE HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1928	4	$2814	2	30TH VOLTAGE HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$192C	4	$2816	2	31TH VOLTAGE HARMONIC OF THE L2 PHASE	[%]	(Unsigned)

$172D	4	$26C9	2	1ST VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1731	4	$26CB	2	2ND VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1735	4	$26CD	2	3RD VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1739	4	$26CF	2	4TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$173D	4	$26D1	2	5TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1741	4	$26D3	2	6TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1745	4	$26D5	2	7TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1749	4	$26D7	2	8TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$174D	4	$26D9	2	9TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1751	4	$26DB	2	10TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1755	4	$26DD	2	11TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1759	4	$26DF	2	12TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$175D	4	$26E1	2	13TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1761	4	$26E3	2	14TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1765	4	$26E5	2	15TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1769	4	$26E7	2	16TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$176D	4	$26E9	2	17TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1771	4	$26EB	2	18TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1775	4	$26ED	2	19TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1779	4	$26EF	2	20TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$177D	4	$26F1	2	21TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1781	4	$26F3	2	22TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1785	4	$26F5	2	23TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1789	4	$26F7	2	24TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$178D	4	$26F9	2	25TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1930	4	$2818	2	26TH OLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1934	4	$281A	2	27TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1938	4	$281C	2	28TH OLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$193C	4	$281E	2	29TH OLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1940	4	$2820	2	30TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1944	4	$2822	2	31TH VOLTAGE HARMONIC OF THE L3 PHASE	[%]	(Unsigned)

$1791	4	$26FB	2	1ST CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1795	4	$26FD	2	2ND CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1799	4	$26FF	2	3RD CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$179D	4	$2701	2	4TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17A1	4	$2703	2	5TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17A5	4	$2705	2	6TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17A9	4	$2707	2	7TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17AD	4	$2709	2	8TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17B1	4	$270B	2	9TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17B5	4	$270D	2	10TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17B9	4	$270F	2	11TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17BD	4	$2711	2	12TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17C1	4	$2713	2	13TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17C5	4	$2715	2	14TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17C9	4	$2717	2	15TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17CD	4	$2719	2	16TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17D1	4	$271B	2	17TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17D5	4	$271D	2	18TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17D9	4	$271F	2	19TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17DD	4	$2721	2	20TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17E1	4	$2723	2	21TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17E5	4	$2725	2	22TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17E9	4	$2727	2	23TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17ED	4	$2729	2	24TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$17F1	4	$272B	2	25TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)

$1948	4	$2824	2	26TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$194C	4	$2826	2	27TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1950	4	$2828	2	28TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1954	4	$282A	2	29TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$1958	4	$282C	2	30TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)
$195C	4	$282E	2	31TH CURRENT HARMONIC OF THE L1 PHASE	[%]	(Unsigned)

$17F5	4	$272D	2	1STCURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$17F9	4	$272F	2	2ND CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$17FD	4	$2731	2	3RD CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1801	4	$2733	2	4TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1805	4	$2735	2	5TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1809	4	$2737	2	6TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$180D	4	$2739	2	7TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1811	4	$273B	2	8TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1815	4	$273D	2	9TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1819	4	$273F	2	10TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$181D	4	$2741	2	11TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1821	4	$2743	2	12TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1825	4	$2745	2	13TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1829	4	$2747	2	14TH CURRENT HARMONIC OF THE L 2 PHASE	[%]	(Unsigned)
$182D	4	$2749	2	15TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1831	4	$274B	2	16TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1835	4	$274D	2	17TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1839	4	$274F	2	18TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$183D	4	$2751	2	19TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1841	4	$2753	2	20TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1845	4	$2755	2	21TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1849	4	$2757	2	22TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$184D	4	$2759	2	23TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1851	4	$275B	2	24TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1855	4	$275D	2	25TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1960	4	$2830	2	26TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1964	4	$2832	2	27TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1968	4	$2834	2	28TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$196C	4	$2836	2	29TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1970	4	$2838	2	30TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)
$1974	4	$283A	2	31TH CURRENT HARMONIC OF THE L2 PHASE	[%]	(Unsigned)

$1859	4	$275F	2	1ST CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$185D	4	$2761	2	2ND CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1861	4	$2763	2	3RD CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1865	4	$2765	2	4TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1869	4	$2767	2	5TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$186D	4	$2769	2	6TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1871	4	$276B	2	7TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1875	4	$276D	2	8TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1879	4	$276F	2	9TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$187D	4	$2771	2	10TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1881	4	$2773	2	11TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1885	4	$2775	2	12TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1889	4	$2777	2	13TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$188D	4	$2779	2	14TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1891	4	$277B	2	15TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1895	4	$277D	2	16TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1899	4	$277F	2	17TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$189D	4	$2781	2	18TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$18A1	4	$2783	2	19TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$18A5	4	$2785	2	20TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$18A9	4	$2787	2	21TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$18AD	4	$2789	2	22TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$18B1	4	$278B	2	23TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$18B5	4	$278D	2	24TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$18B9	4	$278F	2	25TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)

$1978	4	$283C	2	26TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$197C	4	$283E	2	27TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1980	4	$2840	2	28TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1984	4	$2842	2	29TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$1988	4	$2844	2	30TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)
$198C	4	$2846	2	31TH CURRENT HARMONIC OF THE L3 PHASE	[%]	(Unsigned)

SAMPLES VALUES STORED IN RAM (Function code $03)

Integer		Float (IEEE)		Description	M.U.	Type
Register HEX	Word	Register HEX	Word			
$19A3	3	$2B37	3	YY MM DD	[-]	(Unsigned)
$19A6	3	$2B3A	3	HH MM SS	[-]	(Unsigned)
$19A9	1	$2B3D	1	time of mem	[min]	(Unsigned)
$1A4D	4	$2DA0	2	3-PHASE SYSTEM VOLTAGE	[mV]	(Unsigned)
$1A51	4	$2DA2	2	PHASE VOLTAGE L1-N	[mV]	(Unsigned)
$1A55	4	$2DA4	2	PHASE VOLTAGE L2-N	[mV]	(Unsigned)
$1A59	4	$2DA6	2	PHASE VOLTAGE L3-N	[mV]	(Unsigned)
$1A5D	4	$2DA8	2	LINE VOLTAGE L1-2	[mV]	(Unsigned)
$1A61	4	$2DAA	2	LINE VOLTAGE L2-3	[mV]	(Unsigned)
$1A65	4	$2DAC	2	LINE VOLTAGE L3-1	[mV]	(Unsigned)
$1A69	4	$2DAE	2	3-PHASE SYSTEM CURRENT	[mA]	(Signed)
$1A6D	4	$2DB0	2	LINE CURRENT L1	[mA]	(Signed)
$1A71	4	$2DB2	2	LINE CURRENT L2	[mA]	(Signed)
$1A75	4	$2DB4	2	LINE CURRENT L3	[mA]	(Signed)
$1A79	4	$2DB6	2	3-PHASE SYS. POWER FACTOR	[-]	(Signed)
$1A7D	4	$2DB8	2	POWER FACTOR L1	[-]	(Signed)
$1A81	4	$2DBA	2	POWER FACTOR L2	[-]	(Signed)
$1A85	4	$2DBC	2	POWER FACTOR L3	[-]	(Signed)
$1A89	4	$2DBE	2	3-PHASE S. APPARENT POWER	[mVA]	(Signed)
$1A8D	4	$2DC0	2	APPARENT POWER L1	[mVA]	(Signed)
$1A91	4	$2DC2	2	APPARENT POWER L2	[mVA]	(Signed)
$1A95	4	$2DC4	2	APPARENT POWER L3	[mVA]	(Signed)
$1A99	4	$2DC6	2	3-PHASE SYS. ACTIVE POWER	[mW]	(Signed)
$1A9D	4	$2DC8	2	ACTIVE POWER L1	[mW]	(Signed)
$1AA1	4	$2DCA	2	ACTIVE POWER L2	[mW]	(Signed)
$1AA5	4	$2DCC	2	ACTIVE POWER L3	[mW]	(Signed)
$1AA9	4	$2DCE	2	3-PHASE S. REACTIVE POWER	[mVAR]	(Signed)
$1AAD	4	$2DD0	2	REACTIVE POWER L1	[mVAR]	(Signed)
$1AB1	4	$2DD2	2	REACTIVE POWER L2	[mVAR]	(Signed)
$1AB5	4	$2DD4	2	REACTIVE POWER L3	[mVAR]	(Signed)
$1AB9	4	$2DD6	2	FREQUENCY	[mHz]	(Unsigned)
$1ABD	4	$2DD8	2	THD VOLTAGE L1	[m%]	(Unsigned)
$1AC1	4	$2DDA	2	THD VOLTAGE L2	[m%]	(Unsigned)
$1AC5	4	$2DDC	2	THD VOLTAGE L3	[m%]	(Unsigned)
$1AC9	4	$2DDE	2	THD CURRENT L1	[m%]	(Unsigned)
$1ACD	4	$2DE0	2	THD CURRENT L2	[m%]	(Unsigned)
$1AD1	4	$2DE2	2	THD CURRENT L3	[m%]	(Unsigned)
$1AD5	4	$2DE4	2	3-PHASE AVG. ACTIVE POWER	[mW]	(Unsigned)

COUNTERS VALUES STORED IN RAM (Function.code $03)

Integer		Double (IEEE)		Description	U.M.	Type
Register HEX	Word	Register HEX	Word			
$1F40	3	$2E00	3	YY MM DD	[-]	(Unsigned)
$1F43	3	$2E03	3	HH MM 00	[-]	(Unsigned)
$1F46	1	$2E06	1	time of mem	[min]	(Unsigned)
$1F47	1	$2E07	1	Block full of 0=NO/1=Yes (1 word)	[-]	(Unsigned)
$1F48	4	$2E08	4	Wh+	[-]	(Unsigned)
$1F4C	4	$2E0C	4	VArh+	[-]	(Unsigned)
$1F50	4	$2E10	4	Wh-	[-]	(Unsigned)
$1F54	4	$2E14	4	VArh-	[-]	(Unsigned)
$1F58	4	$2E18	4	Counter 1	[-]	(Unsigned)
$1F5C	4	$2E1C	4	Counter 2	[-]	(Unsigned)
$1F60	4	$2E20	4	Counter 3	[-]	(Unsigned)
$1F64	4	$2E24	4	Counter 4	[-]	(Unsigned)
$1F68	4	$2E28	4	Counter 5	[-]	(Unsigned)
$1F6C	4	$2E2C	4	Counter 6	[-]	(Unsigned)
$1F70	4	$2E30	4	Counter 7	[-]	(Unsigned)
$1F74	4	$2E34	4	Counter 8	[-]	(Unsigned)

ENERGY COUNTERS - Double format (Function code $03)

Integer		Float (IEEE)		Description	M.U.	Type
Register HEX	Word	Register HEX	Word			
N.A.		$2A50	4	3-PHASE SYS. ACTIVE ENERGY+	[-]	[-]
N.A.		$2A54	4	3-PHASE SYS. ACTIVE ENERGY-	[-]	[-]
N.A.		$2A58	4	3-PHASE SYS. REACTIVE EN.+	[-]	[-]
N.A.		$2A5C	4	3-PHASE SYS. REACTIVE.EN.-	[-]	[-]

ANALOG OUTPUT PWM VALUES (Function code $03)

(Returned values: 0=0mA ÷ 255=20mA)

Integer		Float (IEEE)		Description	M.U.	Type
Register HEX	Word	Register HEX	Word			
$1A1A	2	N.A.	[-]	PWM ANALOG OUTPUT 1	[-]	[-]
$1A1B	2	N.A.	[-]	PWM ANALOG OUTPUT 2	[-]	[-]
$1A1C	2	N.A.	[-]	PWM ANALOG OUTPUT 3	[-]	[-]
$1A1D	2	N.A.	[-]	PWM ANALOG OUTPUT 4	[-]	[-]

WAVEFORM'S SAMPLES (Function code $03)

(64 x integer value)

Integer		Float (IEEE)		Description	M.U.	Type
Register HEX	Word	Register HEX	Word			
$1F30	64	N.A.	[-]	64 SAMPLES OF LINE VOLTAGE L_1	[-]	[-]
$1F32	64	N.A.	[-]	64 SAMPLES OF LINE VOLTAGE L_2	[-]	[-]
$1F34	64	N.A.	[-]	64 SAMPLES OF LINE VOLTAGE L_3	[-]	[-]
$1F36	64	N.A.	[-]	64 SAMPLES OF LINE CURRENT L_1	[-]	[-]
$1F38	64	N.A.	[-]	64 SAMPLES OF LINE CURRENT L_2	[-]	[-]
$1F3A	64	N.A.	[-]	64 SAMPLES OF LINE CURRENT L_3	[-]	[-]

HOUR COUNTERS – Long Integer format (Function code $03)

Integer		Float (IEEE)		Description	M.U.	Type
Register HEX	Word	Register HEX	Word			
$1625	4	N.A.	[-]	HOUR COUNTER 1	[s]	[-]
$1629	4	N.A.	[-]	HOUR COUNTER 2	[s]	[-]
$162D	4	N.A.	[-]	HOUR COUNTER 3	[s]	[-]
$1631	4	N.A.	[-]	HOUR COUNTER 4	[s]	[-]
$1635	4	N.A.	[-]	HOUR COUNTER 5	[s]	[-]
$1639	4	N.A.	[-]	HOUR COUNTER 6	[s]	[-]

ONLY READ EMA PARAMETERS (Function code $03)

Register HEX	Word	Description	Range
$1A00	5	SERIAL NUMBER	XXXXXXXXX
$1A05	7	VERSION NUMBER	XXX.XXXX
$1A0D	1	TYPE OF RAM	1=32 kB 2=128 kB 3=256 kB 4=512 kB 5=1024 Kb
$1A0E	1	BI/MO DIRECTIONAL	1=mono 2=bidir.
$1A0F	1	NUMBER OF DIGITAL OUTPUTS	0=none 1=1 ecc.=ecc.
$1A10	1	NUMBER OF ANALOG OUTPUTS	0=none 1=1 ecc.=ecc.
$1A11	1	NUMBER OF DIGITAL INPUTS	0=none 1=1 ecc.=ecc.
$1A12	9	INFO STORAGE AVG.POWERS	byte1÷2: status (0=OFF; 1= ON) (int) byte3÷6: number of records (long) byte7÷10: memory reserved (KB) (float) byte11÷14: memory used (KB) (float) byte15÷18: memory free (KB) (float)
$1A13	9	INFO STORAGE MIN./MAX	as before
$1A14	9	INFO STORAGE HARMONICS	as before
$1A15	9	INFO STORAGE SAMPLES	as before
$1A17	9	INFO STORAGE COUNTERS	as before
$1A18	2	HARDWARE & OPTIONS INFO	bit0: harmonics (0=dis.; 1=en.) bit1: time bands (0=dis.; 1=en.) bit2÷3: N.A. bit4÷7: number of Dig.Inp (0÷15) bit8÷11: number of Dig.Out (0÷15) bit12÷15: number of An.Out (0÷15) bit16÷31: N.A.
$1A19	1	SUB-VERSION FIRMWARE	XX
$1A28	1	BAUD RATE	2=1200 baud 3=2400 baud 4=4800 baud 5=9600 baud 6=19200 baud
$1A29	1	PARITY	0=none 1=even parity 2=odd parity
$1A2A	1	BIT	7=7 bit 8=8 bit
$1ADB	2	DIGITAL OUTPUT STATUS	bit(n)=DI(n+1) n=0..5 (0=OFF; 1=ON)
$1ADC	2	DIGITAL INPUT STATUS	bit(n)=DI(n+1) n=0..5 (0=OFF; 1=ON)

READ & WRITE EMA PARAMETERS (Function code $03 & $10)

NOTE: the variable indicated by yes resets the instrument. Wait 1 second before sending another command

Integer Register HEX	Word	Description	Range	Reset
$1A16	2	ENERGY TYPE	0=normal(kWh-kVArh) 1=heavy (MWh-MVArh)	YES
$1A20	1	LOGICAL NUMBER	01-255	YES
$1A21	3	DATE	YY MMDD	YES
$1A24	1	DAY OF WEEK	1=monday 2=tuesday 3=wednesday 4=thursday 5=friday 6=saturday 7=sunday	NO
$1A25	3	TIME	HH MM SS	NO
$1A2B	1	TRANSFORM RATIO KCT	1÷2500	YES
$1A2C	1	TRANSFORM RATIO KVT	1÷3000	YES
$1A2D	1	SYNCHRO TYPE	0=intemal 1=extemal	NO
$1A2E	1	FREQUENCY	5÷500 Hz (x100)	NO
$1A2F	1	TIME FOR AVERAGE	1÷99	YES
$1A30	1	BACKLIGHT ON TIME (sec)	0÷360	NO
$1A40	1	MIN/MAX TIME TO STORE IN RAM	1-9999	NO
$1A41	1	MIN/MAX 3-PH.VOLTAGE STORE	0=do not store 1=store	NO
$1A42	1	MIN/MAX VOLTAGE L_{1-N} STORE	0=do not store 1=store	NO
$1A43	1	MIN/MAX VOLTAGE L_{2-N} STORE	0=do not store 1=store	NO
$1A44	1	MIN/MAX VOLTAGE L_{3-N} STORE	0=do not store 1=store	NO
$1A45	1	MIN/MAX 3PH.CURRENT STORE	0=do not store 1=store	NO
$1A46	1	MIN/MAX CURRENT L_1 STORE	0=do not store 1=store	NO
$1A47	1	MIN/MAX CURRENT L_2 STORE	0=do not store 1=store	NO
$1A48	1	MIN/MAX CURRENT L_3 STORE	0=do not store 1=store	NO
$1A49	1	MIN/MAX ACTIVE POWER STORE	0=do not store 1=store	NO
$1A4A	1	MIN/MAX APP.POWER STORE	0=do not store 1=store	NO
$1A4B	1	MIN/MAX POWER FACT.STORE	0=do not store 1=store	NO
$1A4C	1	MIN/MAX AV.POWER STORE	0=do not store 1=store	NO
$1ADA	2	DIGITAL INPUT TYPE	0=not used 1=clock sync. 2=periods 3=generic counters 4=Ext. DI 5=GMC (opz.) 6=GME (opz.)	YES
$1ADD	2	WIRING MODE	0=4 wire 1=3 wire 2=Aron	YES

Float Register HEX	Word	Description	Range	Reset
$2A32	2	TRANFORM CT RATIO floating point	0.01÷9999.99	YES
$2A34	2	TRANFORM VT RATIO floating point	0.01÷9999.99	YES
$2A36	2	FORCED FREQUENCY floating point	5.00÷500.00	(readonly)

(Firmware x.11.15 or previous)
TIMEBANDS- TARIFF PERIOD 1

Integer Register HEX	Word	Description	Range	Reset
$3100	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$3103	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$3106	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$3109	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$310C	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$310F	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$3112	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$3115	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$3118	1	DAY selecting	(2)	NO
$3119	1	MONTH selecting	(3)	NO

(1) it defines the beginning (hours and minutes) of each tariff band during the day.
it is possible to input up to 8 changes during the day.
it is possible to set four different bands (0,1,2,3).
i.e.: to program the start of 2st tariff band (1) at 06:00 send $0006,$0000,$0001

(2) DAY: Programming: put to 1 the Bit relative to the day which are selected.

X	*X*	*X*	*X*	*X*	*X*	*X*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Mo	*Tu*	*We*	*Th*	*Fr*	*Sa*	*Su*									

i.e.:to program all day from Monday to Friday send $F800

(3) MONTH Programming: put to 1 the Bit relative to the month which are selected.

X	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*X*	*0*	*0*	*0*	*0*
Ja	*Fe*	*Ma*	*Ap*	*Ma*	*Ju*	*Ju*	*Au*	*Se*	*Oc*	*No*	*De*				

i.e.:to programming the month of November,December,January,February and March send $E030

TIMEBANDS-TARIFF PERIOD 2

Integer Register HEX	Word	Description	Range	Reset
$311A	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$311D	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$3120	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$3123	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$3126	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$3129	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$312C	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$312F	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$3132	1	DAY selecting	(2)	NO
$3133	1	MONTH selecting	(3)	NO

TIMEBANDS-TARIFF PERIOD 3

Integer Register HEX	Word	Description	Range	Reset
$3134	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$3137	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$313A	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$313D	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$3140	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$3143	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$3146	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$3149	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$314C	1	DAY selecting	(2)	NO
$314D	1	MONTH selecting	(3)	NO

TIMEBANDS-TARIFF PERIOD 4

Integer Register HEX	Word	Description	Range	Reset
$314E	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$3151	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$3154	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$3157	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$315A	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$315D	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$3160	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$3163	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$3166	1	DAY selecting	(2)	NO
$3167	1	MONTH selecting	(3)	NO

TIMEBANDS-TARIFF PERIOD 5

Integer Register HEX	Word	Description	Range	Reset
$3168	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$316B	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$316E	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$3171	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$3174	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$3177	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$317A	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$317D	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$3180	1	DAY selecting	(2)	NO
$3181	1	MONTH selecting	(3)	NO

TIMEBANDS-TARIFF PERIOD 6

Integer Register HEX	Word	Description	Range	Reset
$3182	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$3185	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$3188	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$318B	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$318E	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$3191	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$3194	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$3197	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$319A	1	DAY selecting	(2)	NO
$319B	1	MONTH selecting	(3)	NO

TIMEBANDS-TARIFF PERIOD 7

Integer Register HEX	Word	Description	Range	Reset
$319C	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$319F	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$31A2	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$31A5	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$31A8	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$31AB	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$31AE	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$31B1	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$31B4	1	DAY selecting	(2)	NO
$31B5	1	MONTH selecting	(3)	NO

TIMEBANDS-TARIFF PERIOD 8

Integer Register HEX	Word	Description	Range	Reset
$31B6	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$31B9	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$31BC	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$31BF	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$31C2	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$31C5	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$31C8	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$31CB	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$31CE	1	DAY selecting	(2)	NO
$31CF	1	MONTH selecting	(3)	NO

TIMEBANDS-TARIFF PERIOD 9

Integer Register HEX	Word	Description	Range	Reset
$31D0	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$31D3	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$31D6	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$31D9	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$31DC	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$31DF	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$31E2	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$31E5	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$31E8	1	DAY selecting	(2)	NO
$31E9	1	MONTH selecting	(3)	NO

TIMEBANDS-TARIFF PERIOD 10

Integer Register HEX	Word	Description	Range	Reset
$31EA	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$31ED	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$31F0	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$31F3	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$31F6	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$31F9	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$31FC	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$31FF	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$3202	1	DAY selecting	(2)	NO
$3203	1	MONTH selecting	(3)	NO

(Firmware x.11.16 or upper)

TIMEBANDS- TARIFF PERIOD 1

Integer Register HEX	Word	Description	Range	Reset
$3100	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$3103	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$3106	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$3109	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$310C	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$310F	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$3112	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$3115	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$3118	3	Hours and Minutes and band of begin the 9th tariff band	(1)	NO
$311B	3	Hours and Minutes and band of begin the 10th tariff band	(1)	NO
$311E	3	Hours and Minutes and band of begin the 11th tariff band	(1)	NO
$3121	3	Hours and Minutes and band of begin the 12th tariff band	(1)	NO
$3124	1	DAY selecting	(2)	NO
$3125	1	StartMonth	(3)	NO
$3126	1	StartDay	(3)	NO
$3127	1	StopMonth	(3)	NO
$3128	1	StopDay	(3)	NO

(1) it defines the beginning (hours and minutes) of each tariff band during the day.
it is possible to input up to 12 changes during the day.
it is possible to set four different bands (0,1,2,3).
i.e.: to program the start of 2st tariff band (1) at 06:00 send $0006,$0000,$0001

(2) DAY: Programming: put to 1 the Bit relative to the day which are selected.

X	X	X	X	X	X	X	0	0	0	0	0	0	0	0	0
Mo	Tu	We	Th	Fr	Sa	Su									

i.e.:to program all day from Monday to Friday send $F800

(3) it defines the beginning (month and day) and the ending (month and day) of the period.
Month: 1=January, …, 12=December.
Day: 1…31.

TIMEBANDS- TARIFF PERIOD 2

Integer Register HEX	Word	Description	Range	Reset
$3129	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$312C	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$312F	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$3132	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$3135	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$3138	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$313B	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$313E	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$3141	3	Hours and Minutes and band of begin the 9th tariff band	(1)	NO
$3144	3	Hours and Minutes and band of begin the 10th tariff band	(1)	NO
$3147	3	Hours and Minutes and band of begin the 11th tariff band	(1)	NO
$314A	3	Hours and Minutes and band of begin the 12th tariff band	(1)	NO
$314D	1	DAY selecting	(2)	NO
$314E	1	StartMonth	(3)	NO
$314F	1	StartDay	(3)	NO
$3150	1	StopMonth	(3)	NO
$3151	1	StopDay	(3)	NO

TIMEBANDS- TARIFF PERIOD 3

Integer Register HEX	Word	Description	Range	Reset
$3152	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$3155	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$3158	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$315B	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$315E	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$3161	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$3164	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$3167	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$316A	3	Hours and Minutes and band of begin the 9th tariff band	(1)	NO
$316D	3	Hours and Minutes and band of begin the 10th tariff band	(1)	NO
$3170	3	Hours and Minutes and band of begin the 11th tariff band	(1)	NO
$3173	3	Hours and Minutes and band of begin the 12th tariff band	(1)	NO
$3176	1	DAY selecting	(2)	NO
$3177	1	StartMonth	(3)	NO
$3178	1	StartDay	(3)	NO
$3179	1	StopMonth	(3)	NO
$317A	1	StopDay	(3)	NO

TIMEBANDS- TARIFF PERIOD 4

Integer Register HEX	Word	Description	Range	Reset
$317B	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$317E	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$3181	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$3184	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$3187	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$318A	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$318D	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$3190	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$3193	3	Hours and Minutes and band of begin the 9th tariff band	(1)	NO
$3196	3	Hours and Minutes and band of begin the 10th tariff band	(1)	NO
$3199	3	Hours and Minutes and band of begin the 11th tariff band	(1)	NO
$319C	3	Hours and Minutes and band of begin the 12th tariff band	(1)	NO
$319F	1	DAY selecting	(2)	NO
$31A0	1	StartMonth	(3)	NO
$31A1	1	StartDay	(3)	NO
$31A2	1	StopMonth	(3)	NO
$31A3	1	StopDay	(3)	NO

TIMEBANDS- TARIFF PERIOD 5

Integer Register HEX	Word	Description	Range	Reset
$31A4	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$31A7	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$31AA	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$31AD	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$31B0	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$31B3	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$31B6	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$31B9	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$31BC	3	Hours and Minutes and band of begin the 9th tariff band	(1)	NO
$31BF	3	Hours and Minutes and band of begin the 10th tariff band	(1)	NO
$31C2	3	Hours and Minutes and band of begin the 11th tariff band	(1)	NO
$31C5	3	Hours and Minutes and band of begin the 12th tariff band	(1)	NO
$31C8	1	DAY selecting	(2)	NO
$31C9	1	StartMonth	(3)	NO
$31CA	1	StartDay	(3)	NO
$31CB	1	StopMonth	(3)	NO
$31CC	1	StopDay	(3)	NO

TIMEBANDS- TARIFF PERIOD 6

Integer Register HEX	Word	Description	Range	Reset
$31CD	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$31D0	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$31D3	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$31D6	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$31D9	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$31DC	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$31DF	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$31E2	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$31E5	3	Hours and Minutes and band of begin the 9th tariff band	(1)	NO
$31E8	3	Hours and Minutes and band of begin the 10th tariff band	(1)	NO
$31EB	3	Hours and Minutes and band of begin the 11th tariff band	(1)	NO
$31EE	3	Hours and Minutes and band of begin the 12th tariff band	(1)	NO
$31F1	1	DAY selecting	(2)	NO
$31F2	1	StartMonth	(3)	NO
$31F3	1	StartDay	(3)	NO
$31F4	1	StopMonth	(3)	NO
$31F5	1	StopDay	(3)	NO

TIMEBANDS- TARIFF PERIOD 7

Integer Register HEX	Word	Description	Range	Reset
$31F6	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$31F9	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$31FC	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$31FF	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$3202	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$3205	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$3208	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$320B	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$320E	3	Hours and Minutes and band of begin the 9th tariff band	(1)	NO
$3211	3	Hours and Minutes and band of begin the 10th tariff band	(1)	NO
$3214	3	Hours and Minutes and band of begin the 11th tariff band	(1)	NO
$3217	3	Hours and Minutes and band of begin the 12th tariff band	(1)	NO
$321A	1	DAY selecting	(2)	NO
$321B	1	StartMonth	(3)	NO
$321C	1	StartDay	(3)	NO
$321D	1	StopMonth	(3)	NO
$321E	1	StopDay	(3)	NO

TIMEBANDS- TARIFF PERIOD 8

Integer Register HEX	Word	Description	Range	Reset
$321F	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$3222	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$3225	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$3228	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$322B	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$322E	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$3231	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$3234	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$3237	3	Hours and Minutes and band of begin the 9th tariff band	(1)	NO
$323A	3	Hours and Minutes and band of begin the 10th tariff band	(1)	NO
$323D	3	Hours and Minutes and band of begin the 11th tariff band	(1)	NO
$3240	3	Hours and Minutes and band of begin the 12th tariff band	(1)	NO
$3243	1	DAY selecting	(2)	NO
$3244	1	StartMonth	(3)	NO
$3245	1	StartDay	(3)	NO
$3246	1	StopMonth	(3)	NO
$3247	1	StopDay	(3)	NO

TIMEBANDS- TARIFF PERIOD 9

Integer Register HEX	Word	Description	Range	Reset
$3248	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$324B	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$324E	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$3251	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$3254	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$3257	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$325A	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$325D	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$3260	3	Hours and Minutes and band of begin the 9th tariff band	(1)	NO
$3263	3	Hours and Minutes and band of begin the 10th tariff band	(1)	NO
$3266	3	Hours and Minutes and band of begin the 11th tariff band	(1)	NO
$3269	3	Hours and Minutes and band of begin the 12th tariff band	(1)	NO
$326C	1	DAY selecting	(2)	NO
$326D	1	StartMonth	(3)	NO
$326E	1	StartDay	(3)	NO
$326F	1	StopMonth	(3)	NO
$3270	1	StopDay	(3)	NO

TIMEBANDS- TARIFF PERIOD 10

Integer Register HEX	Word	Description	Range	Reset
$3271	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$3274	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$3277	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$327A	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$327D	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$3280	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$3283	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$3286	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$3289	3	Hours and Minutes and band of begin the 9th tariff band	(1)	NO
$328C	3	Hours and Minutes and band of begin the 10th tariff band	(1)	NO
$328F	3	Hours and Minutes and band of begin the 11th tariff band	(1)	NO
$3292	3	Hours and Minutes and band of begin the 12th tariff band	(1)	NO
$3295	1	DAY selecting	(2)	NO
$3296	1	StartMonth	(3)	NO
$3297	1	StartDay	(3)	NO
$3298	1	StopMonth	(3)	NO
$3299	1	StopDay	(3)	NO

TIMEBANDS- TARIFF PERIOD 11

Integer Register HEX	Word	Description	Range	Reset
$329A	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$329D	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$32A0	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$32A3	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$32A6	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$32A9	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$32AC	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$32AF	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$32B2	3	Hours and Minutes and band of begin the 9th tariff band	(1)	NO
$32B5	3	Hours and Minutes and band of begin the 10th tariff band	(1)	NO
$32B8	3	Hours and Minutes and band of begin the 11th tariff band	(1)	NO
$32BB	3	Hours and Minutes and band of begin the 12th tariff band	(1)	NO
$32BE	1	DAY selecting	(2)	NO
$32BF	1	StartMonth	(3)	NO
$32C0	1	StartDay	(3)	NO
$32C1	1	StopMonth	(3)	NO
$32C2	1	StopDay	(3)	NO

TIMEBANDS- TARIFF PERIOD 12

Integer Register HEX	Word	Description	Range	Reset
$32C3	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$32C6	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$32C9	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$32CC	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$32CF	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$32D2	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$32D5	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$32D8	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$32DB	3	Hours and Minutes and band of begin the 9th tariff band	(1)	NO
$32DE	3	Hours and Minutes and band of begin the 10th tariff band	(1)	NO
$32E1	3	Hours and Minutes and band of begin the 11th tariff band	(1)	NO
$32E4	3	Hours and Minutes and band of begin the 12th tariff band	(1)	NO
$32E7	1	DAY selecting	(2)	NO
$32E8	1	StartMonth	(3)	NO
$32E9	1	StartDay	(3)	NO
$32EA	1	StopMonth	(3)	NO
$32EB	1	StopDay	(3)	NO

TIMEBANDS- TARIFF PERIOD 13

Integer Register HEX	Word	Description	Range	Reset
$32EC	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$32EF	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$32F2	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$32F5	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$32F8	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$32FB	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$32FE	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$3301	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$3304	3	Hours and Minutes and band of begin the 9th tariff band	(1)	NO
$3307	3	Hours and Minutes and band of begin the 10th tariff band	(1)	NO
$330A	3	Hours and Minutes and band of begin the 11th tariff band	(1)	NO
$330D	3	Hours and Minutes and band of begin the 12th tariff band	(1)	NO
$3310	1	DAY selecting	(2)	NO
$3311	1	StartMonth	(3)	NO
$3312	1	StartDay	(3)	NO
$3313	1	StopMonth	(3)	NO
$3314	1	StopDay	(3)	NO

TIMEBANDS- TARIFF PERIOD 14

Integer Register HEX	Word	Description	Range	Reset
$3315	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$3318	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$331B	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$331E	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$3321	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$3324	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$3327	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$332A	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$332D	3	Hours and Minutes and band of begin the 9th tariff band	(1)	NO
$3330	3	Hours and Minutes and band of begin the 10th tariff band	(1)	NO
$3333	3	Hours and Minutes and band of begin the 11th tariff band	(1)	NO
$3336	3	Hours and Minutes and band of begin the 12th tariff band	(1)	NO
$3339	1	DAY selecting	(2)	NO
$333A	1	StartMonth	(3)	NO
$333B	1	StartDay	(3)	NO
$333C	1	StopMonth	(3)	NO
$333D	1	StopDay	(3)	NO

TIMEBANDS- TARIFF PERIOD 15

Integer Register HEX	Word	Description	Range	Reset
$333E	3	Hours and Minutes and band of begin the 1st tariff band	(1)	NO
$3341	3	Hours and Minutes and band of begin the 2nd tariff band	(1)	NO
$3344	3	Hours and Minutes and band of begin the 3rd tariff band	(1)	NO
$3347	3	Hours and Minutes and band of begin the 4th tariff band	(1)	NO
$334A	3	Hours and Minutes and band of begin the 5th tariff band	(1)	NO
$334D	3	Hours and Minutes and band of begin the 6th tariff band	(1)	NO
$3350	3	Hours and Minutes and band of begin the 7th tariff band	(1)	NO
$3353	3	Hours and Minutes and band of begin the 8th tariff band	(1)	NO
$3356	3	Hours and Minutes and band of begin the 9th tariff band	(1)	NO
$3359	3	Hours and Minutes and band of begin the 10th tariff band	(1)	NO
$335C	3	Hours and Minutes and band of begin the 11th tariff band	(1)	NO
$335F	3	Hours and Minutes and band of begin the 12th tariff band	(1)	NO
$3362	1	DAY selecting	(2)	NO
$3363	1	StartMonth	(3)	NO
$3364	1	StartDay	(3)	NO
$3365	1	StopMonth	(3)	NO
$3366	1	StopDay	(3)	NO

HOLYDAYS (read only)

Integer Register HEX	Word	Description
$3400	1	day of holyday no. 1
$3401	1	month of holyday no. 1
$3402	1	day of holyday no. 2
$3403	1	month of holyday no. 2
$3404	1	day of holyday no. 3
$3405	1	month of holyday no. 3
$3406	1	day of holyday no. 4
$3407	1	month of holyday no. 4
$3408	1	day of holyday no. 5
$3409	1	month of holyday no. 5
$340A	1	day of holyday no. 6
$340B	1	month of holyday no. 6
$340C	1	day of holyday no. 7
$340D	1	month of holyday no. 7
$340E	1	day of holyday no. 8
$340F	1	month of holyday no. 8
$3410	1	day of holyday no. 9
$3411	1	month of holyday no. 9
$3412	1	day of holyday no. 10
$3413	1	month of holyday no. 10
$3414	1	day of holyday no. 11
$3415	1	month of holyday no. 11
$3416	1	day of holyday no. 12
$3417	1	month of holyday no. 12
$3418	1	day of holyday no. 13
$3419	1	month of holyday no. 13
$341A	1	day of holyday no. 14
$341B	1	month of holyday no. 14
$341C	1	day of holyday no. 15
$341D	1	month of holyday no. 15
$341E	1	day of holyday no. 16
$341F	1	month of holyday no. 16
$3420	1	day of holyday no. 17
$3421	1	month of holyday no. 17
$3422	1	day of holyday no. 18
$3423	1	month of holyday no. 18
$3424	1	day of holyday no. 19
$3425	1	month of holyday no. 19
$3426	1	day of holyday no. 20
$3427	1	month of holyday no. 20
$3428	1	day of holyday no. 21
$3429	1	month of holyday no. 21
$342A	1	day of holyday no. 22
$342B	1	month of holyday no. 22
$342C	1	day of holyday no. 23
$342D	1	month of holyday no. 23
$342E	1	day of holyday no. 24
$342F	1	month of holyday no. 24
$3430	1	day of holyday no. 25
$3431	1	month of holyday no. 25
$3432	1	day of holyday no. 26
$3433	1	month of holyday no. 26
$3434	1	day of holyday no. 27
$3435	1	month of holyday no. 27
$3436	1	day of holyday no. 28
$3437	1	month of holyday no. 28
$3438	1	day of holyday no. 29
$3439	1	month of holyday no. 29
$343A	1	day of holyday no. 30
$343B	1	month of holyday no. 30

$343C	1	day of holyday no. 31
$343D	1	month of holyday no. 31
$343E	1	day of holyday no. 32
$343F	1	month of holyday no. 32
$3440	1	day of holyday no. 33
$3441	1	month of holyday no. 33
$3442	1	day of holyday no. 34
$3443	1	month of holyday no. 34
$3444	1	day of holyday no. 35
$3445	1	month of holyday no. 35
$3446	1	day of holyday no. 36
$3447	1	month of holyday no. 36
$3448	1	day of holyday no. 37
$3449	1	month of holyday no. 37
$344A	1	day of holyday no. 38
$344B	1	month of holyday no. 38
$344C	1	day of holyday no. 39
$344D	1	month of holyday no. 39
$344E	1	day of holyday no. 40
$344F	1	month of holyday no. 40

GENERIC COUNTERS VALUES- Double format

Register HEX	Word	Description	Range	Reset
$2B00	4	Generic Counter 1 Value	0÷99999999.9	NO
$2B02	4	Generic Counter 2 Value	0÷99999999.9	NO
$2B04	4	Generic Counter 3 Value	0÷99999999.9	NO
$2B06	4	Generic Counter 4 Value	0÷99999999.9	NO
$2B08	4	Generic Counter 5 Value	0÷99999999.9	NO
$2B0A	4	Generic Counter 6 Value	0÷99999999.9	NO
$2B0C	4	Generic Counter 7 Value	0÷99999999.9	NO
$2B0E	4	Generic Counter 8 Value	0÷99999999.9	NO

GENERIC COUNTERS SETTINGS

Register HEX	Word	Description	Range	Reset
$2B10	7	Generic Counter 1 Setting	(*)	NO
$2B12	7	Generic Counter 2 Setting	(*)	NO
$2B14	7	Generic Counter 3 Setting	(*)	NO
$2B16	7	Generic Counter 4 Setting	(*)	NO
$2B18	7	Generic Counter 5 Setting	(*)	NO
$2B1A	7	Generic Counter 6 Setting	(*)	NO
$2B1C	7	Generic Counter 7 Setting	(*)	NO
$2B1E	7	Generic Counter 8 Setting	(*)	NO

(*)
Description:
Byte(s) Read/Write
1: Counter (i) -> Digital Input association
2: Counter's name type (0=kWh+; 1=kWh-; 2=kVArh+; 3=kVArh-; 4=Water; 5=Gas; 6=User.)
3÷10: Counter's name (ASCII codes)
11÷14: Pulse's weight (0÷1999.99)

ONLY WRITE EMA PARAMETERS (Function code $10)

Register HEX	Word	Description	Range	Reset
$1A90	1	DELETING RAM	9=deleting all archives	YES
$1A91	1	SET RAM STORING	0=nothing 1=15' 2=min/max 3=15'+min/max 4=armonics 5=15'+armonics 6=min/max+armonics 7=15'+min/max+armonics 8=sample 9=15'+sample A=min/max+sample B=15'+min/max+sample C=armonics+sample D=15'+armonics+sample E=min/max+armonics+sample F=15'+min/max+armonics+sample 10=counters 11=15'+counters 12=min/max+counters 13=15'+min/max+counters 14=armonics+counters 15=15'+armonics+counters 16=min/max+armonics+counters 17=15'+min/max+armonics+counters 18=sample+counters 19=15'+sample+counters 1A=min/max+sample+counters 1B=15'+min/max+sample+counters 1C=armonics+sample+counters 1D=15'+armonics+sample+counters 1E=min/max+armonics+sample+counters 1F=15'+min/max+armonics+sample+counters	YES
$1A92	1	15' STORED IN RAM	0=nothing 1=delete first one	YES
$1A93	1	MIN/MAX STORED IN RAM	0=nothing 1=sending the following block 2=deleting all min/max value in RAM	NO
$1A94	1	HARMONICS STORED IN RAM	0=nothing 1=delete first one	NO
$1A95	1	SAMPLES STORED IN RAM	0=nothing 1=delete first one	NO
$1A96	1	CONSUMPTION ENERGY COUNTER	1=reset count B0...B3 2=reset timebands 3=reset all	YES
$1A97	1	MIN/MAX VALUES	1=reset all	NO
$1A98	1	COUNTERS STORED IN RAM	0=nothing 1=delete first one	NO
$1A4D	-	SAMPLES RATE + SET VARIABLE	See Note 1	YES
$1A50	1	COUNTERS RATE	0÷9999 (min.)	NO
$1A51	1	Wh+	0=disabled 1=enabled	NO
$1A52	1	VArh+	0=disabled 1=enabled	NO
$1A53	1	Wh-	0=disabled 1=enabled	NO
$1A54	1	VArh-	0=disabled 1=enabled	NO
$1A55	1	Counter 1	0=disabled 1=enabled	NO
$1A56	1	Counter 2	0=disabled 1=enabled	NO
$1A57	1	Counter 3	0=disabled 1=enabled	NO

$1A58	1	Counter 4	0=disabled 1=enabled	NO
$1A59	1	Counter 5	0=disabled 1=enabled	NO
$1A5A	1	Counter 6	0=disabled 1=enabled	NO
$1A5B	1	Counter 7	0=disabled 1=enabled	NO
$1A5C	1	Counter 8	0=disabled 1=enabled	NO

Note 1.
The first word is the rate in seconds (Int type).
The following chars are the measure code of the variables that must be enabled.
If the number of the activated variables s odd, then it is necessary to follow a 0x00 char to end the list.
If the number of the activated variables is even, then it is necessary to follow a 0x0000 word to end the list.

Ex.
Setting for all the available variables:
80 81 82 83 84 85 86 88 89 8A 8B 90 91 92 93 98 99 9A 9B A0 A1 A2 A3 A8 A9 AA AB B4 B6 B7 B8 8C 8D 8E B9 00 list of variables plus 0x00 termination

Setting for an even number of variables:
81 82 83 89 8A 8B 00 00 list of variables plus 0x0000 termination

Setting for an odd number of variables:
80 81 83 88 8B 90 B4 00 list of variables plus 0x00 termination

The measure code for the variables available to store into the RAM are the following:

Measure	Code
3-PHASE SYSTEM VOLTAGE	$80
PHASE VOLTAGE L_{1-N}	$81
PHASE VOLTAGE L_{2-N}	$82
PHASE VOLTAGE L_{3-N}	$83
LINE VOLTAGE L_{1-2}	$84
LINE VOLTAGE L_{2-3}	$85
LINE VOLTAGE L_{3-1}	$86
3-PHASE SYSTEM CURRENT	$88
LINE CURRENT L_1	$89
LINE CURRENT L_2	$8A
LINE CURRENT L_3	$8B
3-PHASE SYS. POWER FACTOR	$90
POWER FACTOR L_1	$91
POWER FACTOR L_2	$92
POWER FACTOR L_3	$93
3-PHASE S. APPARENT POWER	$98
APPARENT POWER L_1	$99
APPARENT POWER L_2	$9A
APPARENT POWER L_3	$9B
3-PHASE SYS. ACTIVE POWER	$A0
ACTIVE POWER L_1	$A1
ACTIVE POWER L_2	$A2
ACTIVE POWER L_3	$A3
3-PHASE S. REACTIVE POWER	$A8
REACTIVE POWER L_1	$A9
REACTIVE POWER L_2	$AA
REACTIVE POWER L_3	$AB
FREQUENCY	$B4
THD VOLTAGE L_1	$B6
THD VOLTAGE L_2	$B7
THD VOLTAGE L_3	$B8
THD CURRENT L_1	$8C
THD CURRENT L_2	$8D
THD CURRENT L_3	$8E
3-PHASE AVG. ACTIVE POWER	$B9

DIGITAL OUT 1

Register HEX	Word	Description	Range	Reset
$1AA0	1	MODE	0= off 1= upper limit 2= lower limit 3= pulse 4= band 5= always on	YES
$1AA1	1	VARIABLE	80-BC	YES
$1AA2	1	PULSE COEFFICIENT	0÷9.999	YES
$1AA3	1	PULSE DURATION (msec)	50÷999	YES
$1AA4	1	INTERVENTION VALUE (integer)		YES
$1AA5	1	HYSTERISIS	0-99	YES
$1AA6	1	DELAY TIME in sec	0-999	YES
$2AA8	2	FLOAT INTERVENTION VALUE		YES
$2AAA	2	FLOAT INF. BAND VALUE		YES
$2AAC	2	FLOAT SUP.BAND VALUE		YES

DIGITAL OUT 2

Register HEX	Word	Description	Range	Reset
$1AB0	1	MODE	0= off 1= upper limit 2= lower limit 3= pulse 4= band 5= always on	YES
$1AB1	1	VARIABLE	80-BC	YES
$1AB2	1	PULSE COEFFICIENT	0÷9.999	YES
$1AB3	1	PULSE DURATION (msec)	50÷999	YES
$1AB4	1	INTERVENTION VALUE		YES
$1AB5	1	HYSTERISIS	0-99	YES
$1AB6	1	DELAY TIME in sec	0-999	YES
$2AB8	2	FLOAT INTERVENTION VALUE		YES
$2ABA	2	FLOAT INF. BAND VALUE		YES
$2ABC	2	FLOAT SUP.BAND VALUE		YES

DIGITAL OUT 3

Register HEX	Word	Description	Range	Reset
$1AC0	1	MODE	0= off 1= upper limit 2= lower limit 3= pulse 4= band 5= always on	YES
$1AC1	1	VARIABLE	80-BC	YES
$1AC2	1	PULSE COEFFICIENT	0÷9.999	YES
$1AC3	1	PULSE DURATION (msec)	50÷999	YES
$1AC4	1	INTERVENTION VALUE		YES
$1AC5	1	HYSTERISIS	0-99	YES
$1AC6	1	DELAY TIME in sec	0-999	YES
$2AC8	2	FLOAT INTERVENTION VALUE		YES
$2ACA	2	FLOAT INF. BAND VALUE		YES
$2ACC	2	FLOAT SUP.BAND VALUE		YES

DIGITAL OUT 4

Register HEX	Word	Description	Range	Reset
$1AD0	1	MODE	0= off 1= upper limit 2= lower limit 3= pulse 4= band 5= always on	YES
$1AD1	1	VARIABLE	80-BC	YES
$1AD2	1	PULSE COEFFICIENT	0÷9.999	YES
$1AD3	1	PULSE DURATION (msec)	50÷999	YES
$1AD4	1	INTERVENTION VALUE		YES
$1AD5	1	HYSTERISIS	0-99	YES
$1AD6	1	DELAY TIME in sec	0-999	YES
$2AD8	2	FLOAT INTERVENTION VALUE		YES
$2ADA	2	FLOAT INF. BAND VALUE		YES
$2ADC	2	FLOAT SUP.BAND VALUE		YES

DIGITAL OUT 5

Register HEX	Word	Description	Range	Reset
$1A70	1	MODE	0= off 1= upper limit 2= lower limit 3= pulse 4= band 5= always on	YES
$1A71	1	VARIABLE	80-BC	YES
$1A72	1	PULSE COEFFICIENT	0÷9.999	YES
$1A73	1	PULSE DURATION (msec)	50÷999	YES
$1A74	1	INTERVENTION VALUE		YES
$1A75	1	HYSTERISIS	0-99	YES
$1A76	1	DELAY TIME in sec	0-999	YES
$2AE8	2	FLOAT INTERVENTION VALUE		YES
$2AEA	2	FLOAT INF. BAND VALUE		YES
$2AEC	2	FLOAT SUP.BAND VALUE		YES

DIGITAL OUT 6

Register HEX	Word	Description	Range	Reset
$1A80	1	MODE	0= off 1= upper limit 2= lower limit 3= pulse 4= band 5= always on	YES
$1A81	1	VARIABLE	80-BC	YES
$1A82	1	PULSE COEFFICIENT	0÷9.999	YES
$1A83	1	PULSE DURATION (msec)	50÷999	YES
$1A84	1	INTERVENTION VALUE		YES
$1A85	1	HYSTERISIS	0-99	YES
$1A86	1	DELAY TIME in sec	0-999	YES
$2AF8	2	FLOAT INTERVENTION VALUE		YES
$2AFA	2	FLOAT INF. BAND VALUE		YES
$2AFC	2	FLOAT SUP.BAND VALUE		YES

ANALOG OUT1

Register HEX	Word	Description	Range	Reset
$1AE0	1	MODE	0=0-20mA mono 1=4-20mA mono	YES
$1AE1	1	VARIABLE	80..BC	YES
$1AE2	1	MIN LIMIT VALUE	YES	
$1AE3	1	MAX.LIMIT VALUE	YES	

ANALOG OUT 2

Register HEX	Word	Description	Range	Reset
$1AE8	1	MODE	0=0-20mA mono 1=4-20mA mono	YES
$1AE9	1	VARIABLE	80..BC	YES
$1AEA	1	MIN LIMIT VALUE	YES	
$1AEB	1	MAX.LIMIT VALUE	YES	

ANALOG OUT 3

Register HEX	Word	Description	Range	Reset
$1AF0	1	MODE	0=0-20mA mono 1=4-20mA mono	YES
$1AF1	1	VARIABLE	80..BC	YES
$1AF2	1	MIN LIMIT VALUE	YES	
$1AF3	1	MAX.LIMIT VALUE	YES	

ANALOG OUT 4

Register HEX	Word	Description	Range	Reset
$1AF8	1	MODE	0=0-20mA mono 1=4-20mA mono	YES
$1AF9	1	VARIABLE	80..BC	YES
$1AFA	1	MIN LIMIT VALUE	YES	
$1AFB	1	MAX.LIMIT VALUE	YES	

DIGITAL IN 1

Register HEX	Word	Description	Range	Reset
$1ADA	1	MODE	0= off 1= sync. RTC 2= Timeband (with Digital In 2)	YES

DIGITAL IN 2

Register HEX	Word	Description	Range	Reset
$1ADB	1	MODE	0= off 1= sync. RTC 2= Timeband (with Digital In 2)	YES

ADVICE:PROGRAM OUTPUT PARAMETERS ALL AT THE SAME TIME TO PREVENT THE INSTRUMENT FROM RESETTING REPEATEDLY,THUS AVOIDING TIME WASTE

2.8) EXAMPLE OF READING AND SETUP REGISTERS

READING OF THE VALUES OF 4 CURRENTS (Function Code $03)

QUERY

Field Name	Example (Hex)
Slave Address	01
Function Code	03
Starting Address Hi	10
Starting Address Lo	1C
Number Of Word Hi	00
Number Of Word Lo	10
Error Check (LRC or CRC)	??
	??

RESPONSE

Field Name	Example (Hex)
Slave Address	01
Function Code	03
Byte Count	20
Data Hi | Value	
Data Lo | with	
Data Hi | 4	
Data Lo | word	
Data Hi | for	
Data Lo | each	
Data Hi | current	
Data Lo |	
Or (for IEEE)	
Data Hi | Value	
Data Lo | with 2	
Data Hi | for each	
Data Lo | current	
Error Check (LRC or CRC)	??
	??

SET UP OF THE LOGICAL NUMBER [Slave Address] (Function Code $10)

QUERY

Field Name	Example (Hex)	
Slave Address	01	
Function Code	10	
Starting Address Hi	1A	
Starting Address Lo	20	
Number Of Word Hi	00	
Number Of Word Lo	01	
Byte Count	02	
Logical Number	(1)	(*)
Error Check (LRC or CRC)	??	
	??	

(*) Accepted values:from $01 to $FF

RESPONSE

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	20
Number Of Word Hi	00
Number Of Word Lo	01
Error Check (LRC or CRC)	??
	??

READING OFTHE SERIAL COMMUNICATION PARAMETERS (Function Code $03)

QUERY

Field Name	Example (Hex)	
Slave Address	01	
Function Code	03	
Starting Address Hi	1A	
Starting Address Lo	28	
Number Of Word Hi	00	
Number Of Word Lo	03	
Byte Count	01	
Baud Rate Hi	00	
Baud Rate Lo	03	(1)
Parity Hi	00	
Parity Lo	01	(2)
Bit Hi	00	
Bit Lo	08	(3)
Error Check (LRC or CRC)	??	
	??	

RESPONSE

Field Name	Example (Hex)
Slave Address	01
Function Code	03
Starting Address Hi	1A
Starting Address Lo	28
Number Of Word Hi	00
Number Of Word Lo	03
Error Check (LRC or CRC)	??
	??

(1): Baud Rate=2400 Baud
(2): Parity=Even
(3): Bit=8/RTU

SET UP OF THE DATE/HOUR/DAY (Function Code $10)

QUERY

Field Name	Example (Hex)	
Slave Address	01	
Function Code	10	
Starting Address Hi	1A	
Starting Address Lo	21	
Number Of Word Hi	00	
Number Of Word Lo	07	
Byte Count	0E	
Year Hi	00	??
Year Lo	5F	(1)
Month Hi	00	
Month Lo	0A	(2)
Day Hi	00	
Day Lo	05	(3)
Hours Hi	00	
Hours Lo	09	(4)
Minutes Hi	00	
Minutes Lo	2A	(5)
Second Hi	00	
Second Lo	00	(6)
Day of Week Hi	00	
Day of Week Lo	04	(7)
Error Check (LRC or CRC)	??	
	??	

RESPONSE

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	21
Number Of Word Hi	00
Number Of Word Lo	07
Error Check (LRC or CRC)	??

(1): Year=95
(2): Month=10
(3): Day=05
(4): Hours=09
(5): Minutes=42
(6). Second=00
(7): Day Of Week= THURSDAY

SET UP OF THE CTS & VTS TRANSFORM RATIOS (Function Code $ 10)

QUERY

Field Name	Example (Hex)	
Slave Address	01	
Function Code	10	
Starting Address Hi	1A	
Starting Address Lo	2B	
Number Of Word Hi	00	
Number Of Word Lo	02	
Byte Count	04	
CTS Hi		
CTS Lo	2C	(1)
VTS Hi	00	
VTS Lo	64	(1)
Error Check (LRC or CRC)	??	
	??	

RESPONSE

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	2B
Number Of Word Hi	00
Number Of Word Lo	02
Error Check (LRC or CRC)	??
01	??

(1): CTS=300 (1.500/5)
(1): VTS=100 (10.000/100)

SET UP OF THE PULSE DIGITAL OUTPUTS PARAM.(Function Code $10)

QUERY

Field Name	Example (Hex)	
Slave Address	01	
Function Code	10	
Starting Address Hi	1A	
Starting Address Lo	A0	
Number Of Word Hi	00	
Number Of Word Lo	04	
Byte Count	08	
Mode Hi	00	
Mode Lo	03	(1)
Associated Variable Hi	00	
Associated Variable Lo	B0	(2)
Pulse Coefficient Hi	00	
Pulse Coefficient Lo	7D	(3)
Pulse Duration Time Hi	00	
Pulse Duration Time Lo	FA	(4)
Error Check (LRC or CRC)	??	
	??	

RESPONSE

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	A0
Number Of Word Hi	00
Number Of Word Lo	04
Error Check (LRC or CRC)	??
	??

(1): Mode = Pulse
(2): Associated Variable = 3-Phase System Active Energy
(3): Pulse Coefficient = 0,125
(4): Pulse Duration Time = 250 msec.

SET UP OF THE THRESHOLD DIGITAL OUTPUTS (Function Code $ 10)

QUERY

Field Name	Example (Hex)	
Slave Address	01	
Function Code	10	
Starting Address Hi	1A	
Starting Address Lo	A0	
Number Of Word Hi	00	
Number Of Word Lo	07	
Byte Count	0E	
Mode Hi	00	
Mode Lo	01	(1)
Associated Variable Hi	00	
Associated Variable Lo	81	(2)
Pulse Coefficient Hi	00	
Pulse Coefficient Lo	00	(3)
Pulse Duration Time Hi	00	
Pulse Duration Time Lo	00	(4)
Intervention Percentage Value (Set) Hi	0B	
Intervention Percentage Value (Set) Lo	B8	(5)
Histeresys Percentage Value Hi	00	
Histeresys Percentage Value Lo	05	(6)
Delay Time On Threshold Intervention Hi	00	
Delay Time On Threshold Intervention Lo	10	(7)
Error Check (LRC or CRC)	??	
	??	

RESPONSE

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	A0
Number Of Word Hi	00
Number Of Word Lo	07
Error Check (LRC or CRC)	??
??	

(1): Mode = Upper limit
(2): Associated Variable = Phase Vloltage $L_{1\text{-}N}$
(3): Pulse Coefficient = it has not effect in upper limit mode
(4): Pulse Duration Time = it has not effect in upper limit mode
(5): Intervention Value (Set) = 3000V
(6): Histeresys Percentage Value = 5 %
(7): Delay Time On Threshold Intervention = 16 sec.

SET UP OF THE ANALOG OUTPUTS PARAM.(Function Code $ 10)

QUERY

Field Name	Example (Hex)	
Slave Address	01	
Function Code	10	
Starting Address Hi	1A	
Starting Address Lo	E0	
Number Of Word Hi	00	
Number Of Word Lo	04	
Byte Count	08	
Mode Hi	00	
Mode Lo	00	(1)
Associated Variable Hi	00	
Associated Variable Lo	A0	(2)
Percentage Minimun Value Hi	17	
Percentage Minimum Value Lo	70	(3)
Percentage Maximun Value Hi	1D	
Percentage Maximum Value Lo	4C	(4)
Error Check (LRC or CRC)	??	
	??	

RESPONSE

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	E0
Number Of Word Hi	00
Number Of Word Lo	04
Error Check (LRC or CRC)	??
	??

(1): Mode = 0+20mA bidirectional
(2): Associated Variable = 3-Phase System Active Power
(3): Percentage Minimum Value = 60,00%
(4): Percentage Maximum Value = 75.00%

SETUP THE 15' AV.POWER STORING (Function Code $ 10)

QUERY

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	91
Number Of Word Hi	00
Number Of Word Lo	01
Byte Count	02
Data stored in RAM Hi	00
Data stored in Ram Lo	01
Error Check (LRC or CRC)	??
	??

RESPONSE

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	91
Number Of Word Hi	00
Number Of Word Lo	01
Error Check (LRC or CRC)	??
	??

15' AV.POWER VALUES STORED IN RAM TRANSFER (Funct.Code $ 03 & 10)

QUERY A (reading of the 15' energy counter value of the instrument EMA)

Field Name	Example (Hex)	
Slave Address	01	
Function Code	03	
Starting Address Hi	16	(IEEE=26)
Starting Address Lo	00	(IEEE=00)
Number Of Word Hi	00	(IEEE=00)
Number Of Word Lo	0D	(IEEE=09)
Error Check (LRC or CRC)	??	
	??	

RESPONSE A (if the questioned EMA has no value stored in memory)

Field Name	Example (Hex)
Slave Address	01
Function Code	83
Error Code	??
Error Check (LRC or CRC)	??

RESPONSE A (if the questioned EMA has stored more than one 15' energy value)

Field Name	Example (Hex)
Slave Address	01
Function Code	03
Byte Count	1A
Logical number Hi	00
Logical number Lo	01
Year Hi	00
Year Lo	5F = 96
Mounth Hi	00
Mounth Lo	08 = 08
Day Hi	00
Day Lo	1A = 26
order number of 15' energy value Hi	00
order number of 15' energy value Lo	05 = 05
Data Hi	| Value with 4 word x 15'
Data Lo	| active energy
Data Hi	|
Data Lo	|
Data Hi	| Value with 4 word x 15'
Data Lo	| reactive energy
Data Hi	|
Data Lo	|
or (for IEEE)	
Data Hi	| Value with 2 word x 15'
Data Lo	| active energy
Data Hi	| Value with 2 word x 15'
Data Lo	| reactive energy
Error Check (LRC or CRC)	??
	??

QUERY B (Erasing from the instrument the value just read. It's necessary to archive the following value)

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	92
Number Of Word Hi	00
Number Of Word Lo	01
Byte Count	02
Delate first 15' stored in Ram Hi	00
Delete first 15' stored in Ram Lo	01
Error Check (LRC or CRC)	??
	??

RESPONSE B

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	92
Number Of Word Hi	00
Number Of Word Lo	01
Error Check (LRC or CRC)	??
	??

SETUP THE MIN/MAX VALUES STORING (Function Code $ 10)

QUERY A (setup the data to store in RAM)

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	91
Number Of Word Hi	00
Number Of Word Lo	01
Byte Count	02
Data stored in RAM Hi	00
Data stored in RAM Lo	02
Error Check (LRC or CRC)	??
	??

RESPONSE A

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	91
Number Of Word Hi	00
Number Of Word Lo	01
Error Check (LRC or CRC)	??
	??

QUERY B (setup the MIN/MAX value and time to store in RAM)

Field Name	Example (Hex)	
Slave Address	01	
Function Code	10	
Starting Address Hi	1A	
Starting Address Lo	40	
Number Of Word Hi	00	
Number Of Word Lo	0D	
Byte Count	1A	
Time to store in RAM HI	00	
Time to store in RAM Lo	02	
3-Phase System Voltage Hi	00	
3-Phase System Voltage Lo	01	=Store ON
Phase $L_{1\text{-}N}$ Voltage Hi	00	
Phase $L_{1\text{-}N}$ Voltage Lo	00	=Store OFF
Phase $L_{2\text{-}N}$ Voltage Hi	00	
Phase $L_{2\text{-}N}$ Voltage Lo	00	=Store OFF
Phase $L_{3\text{-}N}$ Voltage Hi	00	
Phase $L_{3\text{-}N}$ Voltage Lo	00	=Store OFF
3-Phase System Current Hi	00	
3-Phase System Current Lo	01	=Store ON
Phase L_1 Current Hi	00	
Phase L_1 Current Lo	00	=Store OFF
Phase L_2 Current Hi	00	
Phase L_2 Current Lo	00	=Store OFF
Phase L_3 Current Hi	00	
Phase L_3 Current Lo	00	=Store OFF
3-Phase System Active Power Hi	00	
3-Phase System Active Power Lo	01	=Store ON
3-Phase System Apparent Power Hi	00	
3-Phase System Apparent Power Lo	01	=Store ON
3-Phase System Power Factor Hi	00	
3-Phase System Power Factor Lo	01	=Store ON
3-Phase System Average Power Hi	00	
3-Phase System Average Power Lo	01	=Store ON
Error Check (LRC or CRC)	??	
	??	

RESPONSE B

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	40
Number Of Word Hi	00
Number Of Word Lo	0D
Error Check (LRC or CRC)	??
	??

MIN/MAX VALUES STORED IN RAM TRANSFER (Function Code $ 03 & $ 10)

QUERY A (reading of the data format of the MIN/MAX values stored in the RAM of the instrument EMA)

Field Name	Example (Hex)
Slave Address	01
Function Code	03
Starting Address Hi	1B
Starting Address Lo	30
Number Of Word Hi	00
Number Of Word Lo	07
Error Check (LRC or CRC)	??
	??

RESPONSE A (if the questioned EMA has no value stored in memory)

Field Name	Example (Hex)
Slave Address	01
Function Code	83
Error Code	09
Error Check (LRC or CRC)	??
	??

RESPONSE A (if the questioned EMA has stored more than one MIN/MAX value)

Field Name	Example (Hex)
Slave Address	01
Function Code	0E
Byte Count	1A
Start recorder Year Hi	00
Start recorder Year Lo	5F = 95
Start recorder Mounth Hi	00
Start recorder Mounth Lo	08 = 08
Start recorder Day Hi	00
Start recorder Day Lo	1A = 26
Start recorder Hour Hi	00
Start recorder Hour Lo	10 = 10
Start recorder Minute Hi	00
Start recorder Minute Lo	2A = 42
Start recorder Second Hi	00
Start recorder Second Lo	2D = 45
Storing time (minutes) Hi	00
Storing time (minutes) Lo	02 = 02
Error Check (LRC or CRC)	??
	??

QUERY B (reading of the first group of MIN/MAX stored data in the RAM of the instrument EMA)

Field Name	Example (Hex)
Slave Address	01
Function Code	03
Starting Address Hi	1B
Starting Address Lo	47
Number Of Word Hi	00
Number Of Word Lo	64
Byte Count	C8
Error Check (LRC or CRC)	??
	??

RESPONSE B

Field Name	Example (Hex)
Slave Address	01
Function Code	03
Byte Count	C8
Block num (a) Hi	00
Block num (a) Lo	00
Block num (b) Hi	00
Block num (b) Lo	01
Null word	00
Block full Hi	0A
Block full Lo	12
:	| MIN/MAX
:	| Values
1st group of MIN/MAX	| with 100
:	| Word
:	| ($64)
Error Check (LRC or CRC)	??
	??

QUERY C (reading of the tenth group of MIN/MAX stored data in the RAM of the instrument EMA)

Field Name	Example (Hex)
Slave Address	01
Function Code	03
Starting Address Hi	1E
Starting Address Lo	CB
Number Of Word Hi	00
Number Of Word Lo	64
Byte Count	C8
Error Check (LRC or CRC)	??
	??

RESPONSE C

Field Name	Example (Hex)
Slave Address	01
Function Code	03
Byte Count	C8
:	| MIN/MAX
:	| Values
10st group of MIN/MAX	| with 100
:	| Word
:	| ($64)
Error Check (LRC or CRC)	??
	??

QUERY D (presetting the instrument to send the following ten groups of MIN/MAX stored data. It's necessary to archieve the following value)

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	93
Number Of Word Hi	00
Number Of Word Lo	01
Byte Count	02
Delete first ten groups of MIN/MAX stored Hi	00
Delete first ten groups of MIN/MAX stored Lo	01
Error Check (LRC or CRC)	??
	??

RESPONSE D

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	93
Number Of Word Hi	00
Number Of Word Lo	01
Error Check (LRC or CRC)	??
	??

QUERY E (reading of the eleventh group of MIN/MAX stored data in the RAM of the instrument EMA)

Field Name	Example (Hex)
Slave Address	01
Function Code	03
Starting Address Hi	1B
Starting Address Lo	47
Number Of Word Hi	00
Number Of Word Lo	64
Byte Count	C8
Error Check (LRC or CRC)	??
	??
	??

RESPONSE E

Field Name	Example (Hex)
Slave Address	01
Function Code	03
Byte Count	C8
:	| MIN/MAX
:	| Values
1st group of MIN/MAX	| with 100
:	| Word
:	|($64)
Error Check (LRC or CRC)	??

SETUP THE 15' HARMONICS STORING (Function Code $ 10)

QUERY

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	91
Number Of Word Hi	00
Number Of Word Lo	01
Byte Count	02
Data stored in RAM Hi	00
Data stored in RAM Lo	04
Error Check (LRC or CRC)	??
	??

RESPONSE

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	91
Number Of Word Hi	00
Number Of Word Lo	01
Error Check (LRC or CRC)	??
	??

15'HARMONICS VALUES STORED IN RAM TRANSFER (Funct.Code $03 & $10)

QUERY A (reading the value of voltage V harmonics stored in the RAM of the instrument EMA)

Field Name	Example (Hex)	
Slave Address	01	
Function Code	03	
Starting Address Hi	16	(IEEE=26)
Starting Address Lo	60	(IEEE=60)
Number Of Word Hi	00	
Number Of Word Lo	69	
Error Check (LRC or CRC)	??	
	??	

RESPONSE A (if the questioned EMA has no value stored in memory)

Field Name	Example (Hex)
Slave Address	01
Function Code	83
Error Code	09
Error Check (LRC or CRC)	??

RESPONSE A (if the questioned EMA has stored more then one 15' harmonics)

Field Name	Example (Hex)
Slave Address	01
Function Code	03
Byte Count	D2
Logical number Hi	00
Logical number Lo	01
Year Hi	00
Year Lo	5F = 96
Mounth Hi	00
Mounth Lo	08 = 08
Day Hi	00
Day Lo	1A = 26
1st Voltage harmonic L1 phase Hi	00
1st Voltage harmonic L1 phase Lo	05 = 05
:	| other 24
:	| values
: 15'harmonics stored value	| with 4
:	| word for
:	| each
or	(for IEEE)
:	| other 49
:15' harmonics stored value	| values with
:	| 2 word
:	| for each
Error Check (LRC or CRC)	??
	??

QUERY B (Erasing from the instrument the value just read.It's necessary to archieve the following value)

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	94
Number Of Word Hi	00
Number Of Word Lo	01
Byte Count	02
Delete first 15' harmonics value stored Hi	00
Delete first 15' harmonics value stored Lo	01
Error Check (LRC or CRC)	??
	??

RESPONSE B

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	94
Number Of Word Hi	00
Number Of Word Lo	01
Error Check (LRC or CRC)	??
	??

SETUP THE SAMPLES STORING (Function Code $ 10)

QUERY (setting of a odd number of samples)

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	4D
Number Of Word Hi	00
Number Of Word Lo	05
Byte Count	0A
Sample Rate Hi	00
Sample Rate Lo	01
Data stored in RAM Hi	80
Data stored in RAM Lo	81
Data stored in RAM Hi	83
Data stored in RAM Lo	88
Data stored in RAM Hi	8B
Data stored in RAM Lo	90
Data stored in RAM Hi	B4
Data stored in RAM Lo	00
Error Check (LRC or CRC)	??
	??

RESPONSE

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	4D
Number Of Word Hi	00
Number Of Word Lo	05
Error Check (LRC or CRC)	??
	??

QUERY (setting of a even number of samples)

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	4D
Number Of Word Hi	00
Number Of Word Lo	05
Byte Count	0A
Sample Rate Hi	00
Sample Rate Lo	01
Data stored in RAM Hi	80
Data stored in RAM Lo	81
Data stored in RAM Hi	83
Data stored in RAM Lo	88
Data stored in RAM Hi	8B
Data stored in RAM Lo	90
Data stored in RAM Hi	00
Data stored in RAM Lo	00
Error Check (LRC or CRC)	??
	??

RESPONSE

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	4D
Number Of Word Hi	00
Number Of Word Lo	05
Error Check (LRC or CRC)	??
	??

SAMPLES VALUES STORED IN RAM TRANSFER (Funct.Code $03 & $10)

QUERY A (reading of the data format of the samples values stored in the RAM of the instrument EMA)

Field Name	Example (Hex)
Slave Address	01
Function Code	03
Starting Address Hi	2B
Starting Address Lo	37
Number Of Word Hi	00
Number Of Word Lo	07
Error Check (LRC or CRC)	??
	??

RESPONSE A (if the questioned EMA has no value stored in memory)

Field Name	Example (Hex)
Slave Address	01
Function Code	83
Error Code	09
Error Check (LRC or CRC)	??
	??

RESPONSE A (if the questioned EMA has stored one or more sample value)

Field Name	Example (Hex)
Slave Address	01
Function Code	03
Byte Count	0E
Start recorder Year Hi	00
Start recorder Year Lo	09 = 2009
Start recorder Mounth Hi	00
Start recorder Mounth Lo	01 = January
Start recorder Day Hi	00
Start recorder Day Lo	1A = 26
Start recorder Hour Hi	00
Start recorder Hour Lo	10 = 10
Start recorder Minute Hi	00
Start recorder Minute Lo	2A = 42
Start recorder Second Hi	00
Start recorder Second Lo	2D = 45
Storing time (seconds) Hi	00
Storing time (seconds) Lo	02 = 01
Error Check (LRC or CRC)	??
	??

QUERY B (reading the value of the samples values stored in the RAM of the instrument EMA)

Field Name	Example (Hex)	
Slave Address	01	
Function Code	03	
Starting Address Hi	2D	(IEEE)
Starting Address Lo	A0	(IEEE)
Number Of Word Hi	00	
Number Of Word Lo	46	
Error Check (LRC or CRC)	??	
	??	

RESPONSE B (if the questioned EMA has no value stored in memory)

Field Name	Example (Hex)
Slave Address	01
Function Code	83
Error Code	09
Error Check (LRC or CRC)	??

RESPONSE B (if the questioned EMA has stored one or more samples)

Field Name	Example (Hex)
Slave Address	01
Function Code	03
Byte Count	8C
:	| 35 values
: 35 samples stored values	| with 2 word
:	| for each
Error Check (LRC or CRC)	??
	??

QUERY C (Erasing from the instrument the value just read.It's necessary to archieve the following value)

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	95
Number Of Word Hi	00
Number Of Word Lo	01
Byte Count	02
Delete first samples value stored Hi	00
Delete first samples value stored Lo	01
Error Check (LRC or CRC)	??
	??

RESPONSE C

Field Name	Example (Hex)
Slave Address	01
Function Code	10
Starting Address Hi	1A
Starting Address Lo	95
Number Of Word Hi	00
Number Of Word Lo	01
Error Check (LRC or CRC)	??
	??

2.9) TROUBLESHOOTING

If response from EMA doesn't happen:

- check connection from EMA and RS232/RS485 converter ;
- check if data outgoing from the RS232 serial port of the PC come in the RS232/485 converter
- try to increase the wait time for response (50 to 100mS is good);
- check if the transmitted data stream is **EXACTLY** as in example, monitoring the data on the RS485 serial line with a terminal (eg. Hyperterminal or other emulator);
- if the RS232/485 converter is not our model CUS, be sure the turnaround-time is set in range 1 to 2 mS

2.10) NOTES

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