# COMMUNICATION MODBUS PROTOCOL

**MGF3900E**-- NA96/NA96+ plug-in module for Ethernet and Modbus TCP

## Contents



| Rev | DESCRIPTION | Date | Sw |
|---|---|---|---|
| B | Formal revision | 10/05/2016 | ➢ 3.18 |
| | | | |
| | | | |

# 1.0 ABSTRACT

### Physical level

The physical communication line complies with the EIA-RS485 standard in half-duplex modality.
In this case, as only two wires are used, only one instrument at a time can engage the line; this means that there must be a master which polls the slave instruments so the demand and the request are alternated.

On the same physical line only 32 instruments can be attached (master included). In order to increase the number of the slave instrument, the necessary repeaters must be used.

The communication parameters are :

Baud rate programmable (device dependant)
bit n. : 8
stop bit : 1
parity : programmable (device dependant)

### Data link level

The data are transmitted in a packet form (message) and are checked by a word (CRC).
See the description of the data packet in the next paragraphs for more details.

### Application level

The communication protocol used is MODBUS / JBUS compatible.
Up to 255 different instruments can be managed by the protocol.
There are no limitations to the number of possible retries done by the master.
A delay between the response from the slave and the next command could be necessary and it is specified for each device (timing).

# 2.0 DATA MESSAGE DESCRIPTION

The generic data message is composed as following :

| Device address | Functional code | Data | CRC word |
|---|---|---|---|

Two answers are possible :

Answer containing data

| Device address | Functional code | Data | CRC word |
|---|---|---|---|

Error answer

| Device address | Functional code + 0x80 | Error code | CRC word |
|---|---|---|---|

## 2.1 Parameters description

Device address : device identification number in the network.
It must be the same for the demand and the answer.
Format : 1 BYTE from 0 to 0xff
0 is for broadcast messages with no answer

Functional code : command code
Used functional code :
Format : 1 BYTE
0x03 : reading of consecutive words
0x10 : writing of consecutive words

Data : they can be
- the address of the required words (in the demand)
- the data (in the answer)

CRC word : it is the result of the calculation done on all the bytes in the message

## 2.2 Data format

The following types of format are used for the data values :

* U_WORD : one WORD - unsigned
* S_WORD : one WORD - signed
* UD_WORDS : two WORDS - unsigned
* SD_WORDS : two WORDS - signed

If the required data is in a DWORD format, 2 WORDS are transmitted and the MSW comes before the LSW (depending on the setting in the NA 96/96+ : **big endian / little endian / swap WORDS**

| MSB | LSB | MSB | LSB |
|---|---|---|---|
| Most Significant WORD | | Least Significant WORD | |

Example : 1000 = 0x 03 e8 or
0x 00 00 03 e8 (if UDWORD)

| MSB | LSB | MSB | LSB |
|---|---|---|---|
| 0x00 | 0x00 | 0x03 | 0xe8 |

## 2.3 Description of CRC calculation

The following is an example of the CRC calculation in C language.

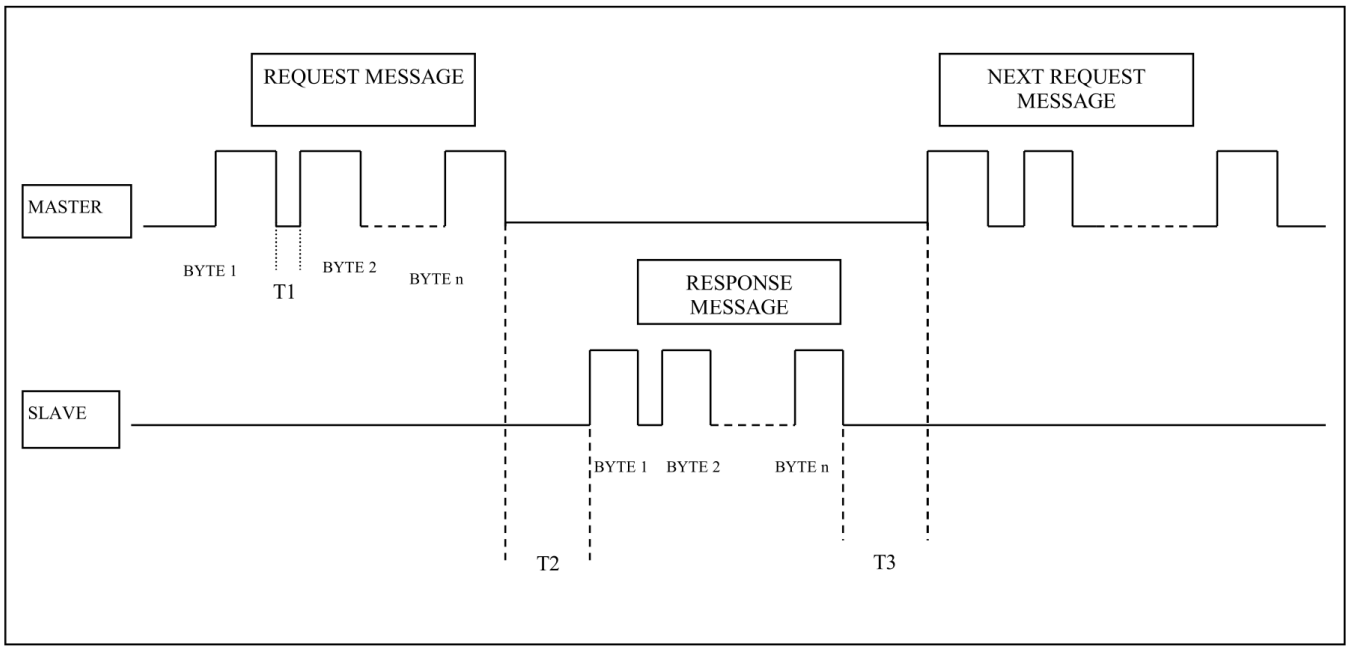
```
unsigned int calc_crc (char *ptbuf, unsigned int num)
/*     ************************************************************
 *     Descrizione : calculates a data buffer CRC WORD
 *     Input       :       ptbuf = pointer to the first byte of the buffer
 *                  num    = number of bytes
 *     Output      : //
 *     Return      :
**     ************************************************************/
 {
  unsigned int crc16;
  unsigned int temp;
  unsigned char c, flag;


  crc16 = 0xffff;                              /* init the CRC WORD */
  for (num; num>0; num--) {
        temp = (unsigned int) *ptbuf;          /* temp has the first byte */
        temp &= 0x00ff;                        /* mask the MSB */
         crc16 = crc16 ^ temp;                 /* crc16 XOR with temp */
        for (c=0; c<8; c++) {
              flag = crc16 & 0x01;             /* LSBit di crc16 is mantained */
              crc16 = crc16 >> 1;              /* Lsbit di crc16 is lost */
              if (flag != 0)
                   crc16 = crc16 ^ 0x0a001;    /* crc16 XOR with 0x0a001 */
        }
        ptbuf++;                               /* pointer to the next byte */
  }

  crc16 = (crc16 >> 8) | (crc16 << 8);         /* LSB is exchanged with MSB */

  return (crc16);

} /* calc_crc */
```

## 2.4 Error management

If the received message is incorrect (CRC16 is wrong) the polled slave doesn't answer.
If the message is correct but there are errors (wrong functional code or data) it can't be accepted, so the slave answers with an error message.

The error codes are defined in the following part of the document.

## 2.5 Timing




| TIME | DESCRIPTION | Min & Max VALUES |
|---|---|---|
| T1 | **Time between characters.**<br>If this time exceeds the max. time allowed, the message is not considered by device. | Max < 20 ms. |
| T2 | **Slave response time**<br>Minimum and maximum response time of device to the Master request. | Min = 20 ms.<br>Max = 300ms. |
| T3 | Time before a new message request from the Master | Min = 20 ms. |

# 3.0 COMMANDS

**Code 0x03 : reading of one or more consecutive WORDS**

Command format :

| BYTE | BYTE | MSB LSB | MSB LSB | CRC16 |
|---|---|---|---|---|
| Device address | Funct. Code | First WORD address | WORDS number | |

Answer format (containing data) :

| BYTE | BYTE | BYTE | MSB LSB | MSB LSB | CRC16 |
|---|---|---|---|---|---|
| Device address | Funct. Code | BYTES number | WORD 1 ..... | WORD N. | |

The BYTES number must always match the WORDS number (in the demand) * 2.

Answer format (the demand was wrong) :

| BYTE | BYTE | BYTE | CRC16 |
|---|---|---|---|
| Device address | Funct. Code + 0x80 | Error code | |

Error codes :
* 0x01 : incorrect functional code
* 0x02 : wrong first WORD address
* 0x03 : incorrect data

**Code 0x10 : writing of more consecutive WORDS**

Command format :

| BYTE | BYTE | MSB LSB | MSB LSB | BYTE | MSB LSB | MSB LSB | CRC16 |
|---|---|---|---|---|---|---|---|
| Device address | Funct. Code | First WORD address | WORDS number | BYTE numbers | Word Value | | |

Answer format (containing data) :

| BYTE | BYTE | MSB LSB | MSB LSB | CRC16 |
|---|---|---|---|---|
| Device address | Funct. Code | First WORD address | WORD N. | |

The BYTES number must always match the WORDS number (in the demand) * 2.

Answer format (the demand was wrong) :

| BYTE | BYTE | BYTE | CRC16 |
|---|---|---|---|
| Device address | Funct. Code + 0x80 | Error code | |

Error codes :
* 0x01 : incorrect functional code
* 0x02 : wrong first WORD address
* 0x03 : incorrect data

## 4.0 VARIABLES

Variables or groups of variables may be required up to 100 BYTES (sw. version < 1.09)
Variables or groups of variables may be required up to 240 BYTES (sw. version >= 1.09)

| Address | Format | Description | Unit |
|---|---|---|---|
| 0x301 | **UD_WORD** | Phase 1 : phase voltage | mV |
| 0x305 | **UD_WORD** | Phase 2 : phase voltage | mV |
| 0x309 | **UD_WORD** | Phase 3 : phase voltage | mV |
| 0x30d | **UD_WORD** | Phase 1 : current | mA |
| 0x311 | **UD_WORD** | Phase 2 : current | mA |
| 0x315 | **UD_WORD** | Phase 3 : current | mA |
| 0x319 | **UD_WORD** | 3-phase : active power | (3) |
| 0x31d | **UD_WORD** | 3-phase : reactive power | (3) |
| 0x321 | **UD_WORD** | 3-phase : apparent power | (3) |
| 0x325 | **UD_WORD** | 3-phase : positive active energy | (4) |
| 0x329 | **UD_WORD** | Chained voltage : L1-L2 | mV |
| 0x32d | **UD_WORD** | Chained voltage : L2-L3 | mV |
| 0x331 | **UD_WORD** | Chained voltage : L3-L1 | mV |
| 0x335 | **UD_WORD** | 3-phase : negative active energy | (4) |
| 0x339 | **U_WORD** | Frequency | Hz/10 |
| 0x33b | **U_WORD** | Operating timer counter | h |
| 0x33d | **S_WORD** | 3-phase : power factor | 1/100 signed |
| 0x33f | **U_WORD** | 3-phase : sector of power factor (cap or ind) | 0 : PF = 1<br>1 : ind<br>2 : cap |
| 0x340 | **U_WORD** | Voltages sequence diagnostic | 1 : OK<br>2 : error |
| 0x341 | **U_WORD** | Output relay status | (2) |
| 0x343 | **UD_WORD** | 3-phase : positive reactive energy | (4) |
| 0x347 | **U_WORD** | 3-phase : sign of active power | (5) |
| 0x348 | **UD_WORD** | 3-phase : negative reactive energy | (4) |
| 0x34c | **U_WORD** | 3-phase : sign of reactive power | (5) |
| 0x34d | **U_WORD** | 0 | |
| 0x34e | **U_WORD** | 0 | |
| 0x34f | **U_WORD** | 0 | |
| 0x350 | **UD_WORD** | 3-phase : average power | (3) |
| 0x354 | **UD_WORD** | 3-phase : peak maximum demand | (3) |
| 0x358 | **U_WORD** | Time counter for average power | minutes |
| 0x359 | **UD_WORD** | Neutral current | mA |
| 0x35d | **UD_WORD** | Phase 1 : active power | (3) |
| 0x361 | **UD_WORD** | Phase 2 : active power | (3) |
| 0x365 | **UD_WORD** | Phase 3 : active power | (3) |
| 0x369 | **U_WORD** | Phase 1 : sign of active power | (5) |
| 0x36a | **U_WORD** | Phase 2 : sign of active power | (5) |
| 0x36b | **U_WORD** | Phase 3 : sign of active power | (5) |
| 0x36c | **UD_WORD** | Phase 1 : reactive power | (3) |
| 0x370 | **UD_WORD** | Phase 2 : reactive power | (3) |
| 0x374 | **UD_WORD** | Phase 3 : reactive power | (3) |
| 0x378 | **U_WORD** | Phase 1 : sign of reactive power | (5) |
| 0x379 | **U_WORD** | Phase 2 : sign of reactive power | (5) |
| 0x37a | **U_WORD** | Phase 3 : sign of reactive power | (5) |
| 0x37b | **UD_WORD** | Phase 1 : apparent power | (3) |
| 0x37f | **UD_WORD** | Phase 2 : apparent power | (3) |
| 0x383 | **UD_WORD** | Phase 3 : apparent power | (3) |
| 0x387 | **S_WORD** | Phase 1 : power factor | 1/100 signed |
| 0x389 | **S_WORD** | Phase 2 : power factor | 1/100 signed |
| 0x38b | **S_WORD** | Phase 3 : power factor | 1/100 signed |
| 0x38d | **U_WORD** | Phase 1 : power factor sector | 0 : PF = 1<br>1 : ind<br>2 : cap |

| | | | |
|---|---|---|---|
| 0x38e | **U_WORD** | Phase 2 : power factor sector | 0 : PF = 1<br>1 : ind<br>2 : cap |
| 0x38f | **U_WORD** | Phase 3 : power factor sector | 0 : PF = 1<br>1 : ind<br>2 : cap |
| 0x390 | **U_WORD** | Phase 1 : THD V1 | % |
| 0x392 | **U_WORD** | Phase 2 : THD V2 | % |
| 0x394 | **U_WORD** | Phase 3 : THD V3 | % |
| 0x396 | **U_WORD** | Phase 1 : THD I1 | % |
| 0x398 | **U_WORD** | Phase 2 : THD I2 | % |
| 0x39a | **U_WORD** | Phase 3 : THD I3 | % |
| 0x39c | **UD_WORD** | Phase 1 : I1 average | mA |
| 0x3a0 | **UD_WORD** | Phase 2 : I2 average | mA |
| 0x3a4 | **UD_WORD** | Phase 3 : I3 average | mA |
| 0x3a8 | **UD_WORD** | Phase 1 : I1 peak maximum | mA |
| 0x3ac | **UD_WORD** | Phase 2 : I2 peak maximum | mA |
| 0x3b0 | **UD_WORD** | Phase 3 : I3 peak maximum | mA |
| 0x3b4 | **UD_WORD** | (I1+I2+I3)/3 | mA |
| 0x3b8 | **UD_WORD** | Phase 1 : V1 min | mV |
| 0x3bc | **UD_WORD** | Phase 2 : V2 min | mV |
| 0x3c0 | **UD_WORD** | Phase 3 : V3 min | mV |
| 0x3c4 | **UD_WORD** | Phase 1 : V1 max | mV |
| 0x3c8 | **UD_WORD** | Phase 2 : V2 max | mV |
| 0x3cc | **UD_WORD** | Phase 3 : V3 max | mV |
| 0x3d0 | **UD_WORD** | 3-phase : active partial energy | (4) |
| 0x3d4 | **UD_WORD** | 3-phase : reactive partial energy | (4) |
| 0x3d8 | **UD_WORD** | 3-phase : active average power | (3) |
| 0x3dc | **UD_WORD** | 3-phase : reactive average power | (3) |
| 0x3e0 | **UD_WORD** | 3-phase : apparent average power | (3) |
| 0x3e4 | **UD_WORD** | 3-phase : active PMD power | (3) |
| 0x3e8 | **UD_WORD** | 3-phase : reactive PMD power | (3) |
| 0x3ec | **UD_WORD** | 3-phase : apparent PMD power | (3) |

| | | | |
|---|---|---|---|
| 0x100 | **U_WORD** | Current transformer ratio (KTA) | Integer |
| 0x102 | **U_WORD** | Voltage transformer ratio (KTV) | 1/10 (tenths) |
| 0x104 | **UD_WORD** | Device configuration | (1) |
| 0x106 | **U_WORD** | Voltage transformer ratio (KTV) | 1/100 |
| 0x300 | **U_WORD** | Device identifier | 0x10 |

# COMMUNICATION MODBUS PROTOCOL

**MGF3900E**-- NA96/NA96+ plug-in module for Ethernet and Modbus TCP

A second address table is implemented in the software and the user may decide to use one or both freely.

| Address | Format | Description | Unit |
|---|---|---|---|
| 0x1000 | **UD_WORD** | Phase 1 : phase voltage | mV |
| 0x1002 | **UD_WORD** | Phase 2 : phase voltage | mV |
| 0x1004 | **UD_WORD** | Phase 3 : phase voltage | mV |
| 0x1006 | **UD_WORD** | Phase 1 : current | mA |
| 0x1008 | **UD_WORD** | Phase 2 : current | mA |
| 0x100a | **UD_WORD** | Phase 3 : current | mA |
| 0x100c | **UD_WORD** | Neutral current | mA |
| 0x100e | **UD_WORD** | Chained voltage : L1-L2 | mV |
| 0x1010 | **UD_WORD** | Chained voltage : L2-L3 | mV |
| 0x1012 | **UD_WORD** | Chained voltage : L3-L1 | mV |
| 0x1014 | **UD_WORD** | 3-phase : active power | (3) |
| 0x1016 | **UD_WORD** | 3-phase : reactive power | (3) |
| 0x1018 | **UD_WORD** | 3-phase : apparent power | (3) |
| 0x101a | **U_WORD** | 3-phase : sign of active power | (5) |
| 0x101b | **U_WORD** | 3-phase : sign of reactive power | (5) |
| 0x101c | **UD_WORD** | 3-phase : positive active energy | (4) |
| 0x101e | **UD_WORD** | 3-phase : positive reactive energy | (4) |
| 0x1020 | **UD_WORD** | 3-phase : negative active energy | (4) |
| 0x1022 | **UD_WORD** | 3-phase : negative reactive energy | (4) |
| 0x1024 | **S_WORD** | 3-phase : power factor | 1/100 signed |
| 0x1025 | **U_WORD** | 3-phase : sector of power factor (cap or ind) | 0 : PF = 1<br>1 : ind<br>2 : cap |
| 0x1026 | **U_WORD** | Frequency | Hz/10 |
| 0x1027 | **UD_WORD** | 3-phase : average power | (3) |
| 0x1029 | **UD_WORD** | 3-phase : peak maximum demand | (3) |
| 0x102b | **U_WORD** | Time counter for average power | minutes |
| 0x102c | **UD_WORD** | Phase 1 : active power | (3) |
| 0x102e | **UD_WORD** | Phase 2 : active power | (3) |
| 0x1030 | **UD_WORD** | Phase 3 : active power | (3) |
| 0x1032 | **U_WORD** | Phase 1 : sign of active power | (5) |
| 0x1033 | **U_WORD** | Phase 2 : sign of active power | (5) |
| 0x1034 | **U_WORD** | Phase 3 : sign of active power | (5) |
| 0x1035 | **UD_WORD** | Phase 1 : reactive power | (3) |
| 0x1037 | **UD_WORD** | Phase 2 : reactive power | (3) |
| 0x1039 | **UD_WORD** | Phase 3 : reactive power | (3) |
| 0x103b | **U_WORD** | Phase 1 : sign of reactive power | (5) |
| 0x103c | **U_WORD** | Phase 2 : sign of reactive power | (5) |
| 0x103d | **U_WORD** | Phase 3 : sign of reactive power | (5) |
| 0x103e | **UD_WORD** | Phase 1 : apparent power | (3) |
| 0x1040 | **UD_WORD** | Phase 2 : apparent power | (3) |
| 0x1042 | **UD_WORD** | Phase 3 : apparent power | (3) |
| 0x1044 | **S_WORD** | Phase 1 : power factor | 1/100 signed |
| 0x1045 | **S_WORD** | Phase 2 : power factor | 1/100 signed |
| 0x1046 | **S_WORD** | Phase 3 : power factor | 1/100 signed |
| 0x1047 | **U_WORD** | Phase 1 : power factor sector | 0 : PF = 1<br>1 : ind<br>2 : cap |
| 0x1048 | **U_WORD** | Phase 2 : power factor sector | 0 : PF = 1<br>1 : ind<br>2 : cap |
| 0x1049 | **U_WORD** | Phase 3 : power factor sector | 0 : PF = 1<br>1 : ind<br>2 : cap |
| 0x104a | **U_WORD** | Phase 1 : THD V1 | 1/10 % |
| 0x104b | **U_WORD** | Phase 2 : THD V2 | 1/10 % |
| 0x104c | **U_WORD** | Phase 3 : THD V3 | 1/10 % |
| 0x104d | **U_WORD** | Phase 1 : THD I1 | 1/10 % |

| | | | |
|---|---|---|---|
| 0x104e | **U_WORD** | Phase 2 : THD I2 | 1/10 % |
| 0x104f | **U_WORD** | Phase 3 : THD I3 | 1/10 % |
| 0x1050 | **UD_WORD** | Phase 1 : I1 average | mA |
| 0x1052 | **UD_WORD** | Phase 2 : I2 average | mA |
| 0x1054 | **UD_WORD** | Phase 3 : I3 average | mA |
| 0x1056 | **UD_WORD** | Phase 1 : I1 peak maximum | mA |
| 0x1058 | **UD_WORD** | Phase 2 : I2 peak maximum | mA |
| 0x105a | **UD_WORD** | Phase 3 : I3 peak maximum | mA |
| 0x105c | **UD_WORD** | (I1+I2+I3)/3 | mA |
| 0x105e | **UD_WORD** | Phase 1 : V1 min | mV |
| 0x1060 | **UD_WORD** | Phase 2 : V2 min | mV |
| 0x1062 | **UD_WORD** | Phase 3 : V3 min | mV |
| 0x1064 | **UD_WORD** | Phase 1 : V1 max | mV |
| 0x1066 | **UD_WORD** | Phase 2 : V2 max | mV |
| 0x1068 | **UD_WORD** | Phase 3 : V3 max | mV |
| 0x106a | **UD_WORD** | 3-phase : active partial energy | (4) |
| 0x106c | **UD_WORD** | 3-phase : reactive partial energy | (4) |
| 0x106e | **U_WORD** | Operating timer counter | H |
| 0x106f | **U_WORD** | Output relay status | (2) |
| 0x1070 | **UD_WORD** | 3-phase : active average power | (3) |
| 0x1072 | **UD_WORD** | 3-phase : reactive average power | (3) |
| 0x1074 | **UD_WORD** | 3-phase : apparent average power | (3) |
| 0x1076 | **UD_WORD** | 3-phase : active PMD power | (3) |
| 0x1078 | **UD_WORD** | 3-phase : reactive PMD power | (3) |
| 0x107a | **UD_WORD** | 3-phase : apparent PMD power | (3) |

| | | | |
|---|---|---|---|
| 0x1200 | **U_WORD** | Current transformer ratio (KTA) | integer |
| 0x1201 | **U_WORD** | Voltage transformer ratio (KTV) | 1/10 tenths)<br>e.g. KTV = 5<br>Reading = 50) |
| 0x1202 | **UD_WORD** | Device configuration | (1) |
| 0x1204 | **U_WORD** | Device identifier | 0x10 |
| 0x1205 | **U_WORD** | Voltages sequence diagnostic | 1 : OK<br>2 : error |
| 0x1206 | **U_WORD** | RFU | |
| 0x1207 | **U_WORD** | Voltage transformer ratio (KTV) | 1/100 |

| | | | | SW version |
|---|---|---|---|---|
| 0x1500 | **UD_WORD** | Low Positive Active Energy | (7) | 2.30 |
| 0x1502 | **UD_WORD** | High Positive Active Energy | (8) | 2.30 |
| 0x1504 | **UD_WORD** | Low Positive Reactive Energy | (7) | 2.30 |
| 0x1506 | **UD_WORD** | High Positive Reactive Energy | (8) | 2.30 |
| 0x1508 | **UD_WORD** | Low Negative Active Energy | (7) | 2.30 |
| 0x150A | **UD_WORD** | High Negative Active Energy | (8) | 2.30 |
| 0x150C | **UD_WORD** | Low Negative Reactive Energy | (7) | 2.30 |
| 0x150E | **UD_WORD** | High Negative Reactive Energy | (8) | 2.30 |
| 0x1510 | **UD_WORD** | Low Partial Active Energy | (7) | 2.30 |
| 0x1512 | **UD_WORD** | High Partial Active Energy | (8) | 2.30 |
| 0x1514 | **UD_WORD** | Low Partial Reactive Energy | (7) | 2.30 |
| 0x1516 | **UD_WORD** | High Partial Reactive Energy | (8) | 2.30 |
| 0x1518 | **SD_WORD** | Signed Total Active Power | (9) | 2.30 |
| 0x151A | **SD_WORD** | Signed Total Reactive Power | (9) | 2.30 |
| 0x151C | **SD_WORD** | Signed Phase1 Active Power | (9) | 2.30 |
| 0x151E | **SD_WORD** | Signed Phase2 Active Power | (9) | 2.30 |
| 0x1520 | **SD_WORD** | Signed Phase3 Active Power | (9) | 2.30 |
| 0x1522 | **SD_WORD** | Signed Phase1 Reactive Power | (9) | 2.30 |
| 0x1524 | **SD_WORD** | Signed Phase2 Reactive Power | (9) | 2.30 |
| 0x1526 | **SD_WORD** | Signed Phase3 Reactive Power | (9) | 2.30 |
| 0x1528 | **SD_WORD** | Signed Total Power Factor | 1/100 | 2.30 |
| 0x152A | **SD_WORD** | Signed Phase1 Power Factor | 1/100 | 2.30 |
| 0x152C | **SD_WORD** | Signed Phase2 Power Factor | 1/100 | 2.30 |
| 0x152E | **SD_WORD** | Signed Phase3 Power Factor | 1/100 | 2.30 |

| | | | |
|---|---|---|---|
| 0x1530 | **UD_WORD** | Apparent power | (9) | 3.00 |
| 0x1532 | **UD_WORD** | Average active power | (9) | 3.00 |
| 0x1534 | **UD_WORD** | Average reactive power | (9) | 3.00 |
| 0x1536 | **UD_WORD** | Average apparent power | (9) | 3.00 |
| 0x1538 | **UD_WORD** | Max active power | (9) | 3.00 |
| 0x153a | **UD_WORD** | Max reactive power | (9) | 3.00 |
| 0x153c | **UD_WORD** | Max apparent power | (9) | 3.00 |

| | | | | SW version |
|---|---|---|---|---|
| 0x2000 | 16 **U_WORD** | Standard setup parameters | (6) | ALL |
| 0x2100 | 24 **U_WORD** | Programming parameters of Module on SLOT 1 | (6) | ALL |
| 0x2200 | 24 **U_WORD** | Programming parameters of Module on SLOT 2 | (6) | ALL |
| 0x2300 | 24 **U_WORD** | Programming parameters of Module on SLOT 3 | (6) | ALL |

(1) ----------

| Variable | | | |
|---|---|---|---|
| MSB (BYTE 3) | BYTE 2 | BYTE 1 | LSB (BYTE 0) |
| Slot 3 | Slot 2 | Slot 1 | Slot 0 |

Type of slot :
'-' : NO MODULE
'A' : RS485
'b' : PULSES OUT
'C' : ALARMS OUT
'd' : ANALOG OUT
'E' : NEUTRAL CURRENT
'F' : I/O MODULE
'h' : TEMPERATURE
'H' : THD and HARMONICS MODULE
'M' : MEMORY MODULE

(2) ----------

| Variable | | | |
|---|---|---|---|
| BIT 3 | BIT 2 | BIT 1 | BIT 0 |
| Alarm 3 | Alarm 2 | Alarm 1 | alarm 0 |

Example : 0x0003 = alarm 0 and 1 active

(3) ----------

W, var, VA / 100 if KTA*KTV < 5000
W, var, VA if KTA*KTV >= 5000

(4) ----------

| **Transformer ratio** | **Measurement unit** | **Display Format** | **Protocol Format** |
|---|---|---|---|
| 1 ≤ KTA*KTV < 10 | Wh(varh) * 10 | xxxxxx.yy k | xxxxxxyy |
| 10 ≤ KTA*KTV < 100 | Wh(varh) * 100 | xxxxxxx.y k | xxxxxxxy |
| 100 ≤ KTA*KTV < 1000 | kWh(kvarh) | xxxxxxxx k | xxxxxxxx |
| 1000 ≤ KTA*KTV < 10000 | kWh(kvarh) * 10 | xxxxxx.yy M | xxxxxxyy |
| 10000 ≤ KTA*KTV < 100000 | kWh(kvarh) * 100 | xxxxxxx.y M | xxxxxxxy |
| 100000 ≤ KTA*KTV | kWh(kvarh) * 100 | xxxxxxxx M | xxxxxxxx |

(5) ----------

0 : positive
1 : negative

(6) ----------

It is possible to read the setup parameters for each slot mounted in the device.
The data area dedicated for each slot is 24 WORDS long even if not all are used.

For instance : Pulse Output Module has three setup Parameters for each output (six for the whole Module), instead Alarm Output Module has ten setup Parameters for each output(twenty for each Module).

For each module, 24 WORDS are always transmitted :

W23 | …. | W0

W23 is the first transmitted WORD and W0 the last

(7) ----------

High part of energy.

Always in MWh / MVArh

(8) ----------

Low part of energy.

Always in Wh / VArh

(9) ----------

Always in W / Var / VA/100

# 5.0 REMOTE RESETS AND PROGRAMMING

**NA 96/96+** parameters may be read and written accordingly to the procedure described in the following.

Master Unlock Key Writing

Every write operation must be preceded by a "Master Unlock Key" command.

Address 0x2700 : write word with value = 0x5AA5 (Master Unlock Key)

Reset of **NA 96/96+**

Any writing operation of any parameter will have effect **only** in the volatile memory (RAM).
After any writing operation of parameters described in the following of the document, if necessary to go back to the default then it is mandatory to send the following commands :

Address 0x2700 : write word with value = 0x5AA5 ( Master Unlock Key )
Address 0x2800 : write word with value = 0xYYYY ( any value )

This command will reset the **NA 96/96+** and in this way all changes will be lost so returning to the previous conditions.

EEPROM savings

If it is necessary to save the new parameters in EEPROM it is mandatory to send these following messages :

Address 0x2700 : write word with value = 0x5AA5 ( Master Unlock Key )
Address 0x2600 : write word with value = 0xYYYY ( any value )

**ADDRESS TABLE**

| Address | Format | Description | Value |
|---|---|---|---|
| 0x100 | WORD | Write Current transform ratio | 1 - 9999 |
| 0x102 | WORD | Write Voltage transform ratio | (7) |
| | | | |
| 0x2000 | 16 WORD | Write Standard setup parameters | (6) |
| 0x2100 | 24 WORD | Write Programming parameters of Module on SLOT 1 | (6) |
| 0x2200 | 24 WORD | Write Programming parameters of Module on SLOT 2 | (6) |
| 0x2300 | 24 WORD | Write Programming parameters of Module on SLOT 3 | (6) |
| 0x2400 | WORD | Reset Hour Meter, Maximum Powers, Maximum Voltages, Maximum Currents, Minimum Voltages, Active Partial Energy, Reactive Partial Energy | (8) |
| 0x2600 | WORD | Saving in EEPROM parameters changed by Remote commands | (9) |
| 0x2700 | WORD | Enable Remote Writing Operation (master Unlock Key) | (10) |
| 0x2800 | WORD | Load previous setup parameters stored in EEPROM | (11) |

(7) This value is in V/10
For instance, write 50 to have KTV = 5.0

(8) To reset desired measurements write the following word (in binary) :

0|0|0|0|0|0|0|0|0|b6|b5|b4|b3|b2|b1|b0

b0 = 1 => Reset Hour Meter
b1 = 1 => Reset Maximum Powers
b2 = 1 => Reset Maximum Voltages
b3 = 1 => Reset Maximum Currents
b4 = 1 => Reset Minimum Voltages
b5 = 1 => Reset Active Partial Energy
b6 = 1 => Reset Reactive Partial Energy

b7 .. b15 = 0

(9) Write any value to save the new parameters changed by Remote commands

(10) To do any remote programming write operation, it's mandatory to write a safety key = 0x5AA5.

(11) Write any value to abort any remote programming write operation and go back to previous values.

## Pulse Output Module

24 WORDs R/W
x|x|x|x|x|x|x|x|x|x|x|x|x|x|x|x|W5|W4|W3|W2|W1|W0

W0,W1,W2 for OUT1
W3,W4,W5 for OUT2

W0 and W3
  0 => Energy Type ACTIVE
  1 => Energy Type REACTIVE

W1 and W4
  0 => Pulse Weight 0.01 K
  1 => Pulse Weight 0.1 K
  2 => Pulse Weight 1.0 K
  3 => Pulse Weight 10.0 K
  4 => Pulse Weight 100.0K
  5 => Pulse Weight 1.0 M
  6 => Pulse Weight 10.0 M

W2 and W5
  0 => Pulse Duration 50 ms
  1 => Pulse Duration 100 ms
  2 => Pulse Duration 200 ms
  3 => Pulse Duration 300 ms

**NOTES** : x means that this word value is without meaning.

(7) in Wh up to 999999 for any CT and VT
(8) in MWh up to **99999999** for any CT and VT
(9) Powers are in W/var/VA for any CT and VT

## Alarm OUT module

```
24 WORDs R/W
x|x|x|x|W19|W18|W17|W16|W15|W14|W13|W12|W11|W10|W9|W8|W7|W6|W5|W4|W3|W2|W1|W0

W9, W8, W7, W6, W5, W4, W3, W2, W1, W0  for OUT1
W19,W18,W17,W16,W15,W14,W13,W12,W11,W10 for OUT2

W0 and W10
  0         =>  Alarm on V phase 1
  1         =>  Alarm on V phase 2
  2         =>  Alarm on V phase 3
  3         =>  Alarm on I phase 1
  4         =>  Alarm on I phase 2
  5         =>  Alarm on I phase 3
  6         =>  Alarm on V12
  7         =>  Alarm on V23
  8         =>  Alarm on V31
  9         =>  Alarm on P phase 1
 10         =>  Alarm on P phase 2
 11         =>  Alarm on P phase 3
 12         =>  Alarm on Q phase 1
 13         =>  Alarm on Q phase 2
 14         =>  Alarm on Q phase 3
 15         =>  Alarm on P  threephase
 16         =>  Alarm on Q  threephase
 17         =>  Alarm on PF threephase
 18         =>  Alarm on Frequency
 19         =>  Alarm on Active Power Demand
 20         =>  Alarm on Reactive Power Demand
 21         =>  Alarm on Current SUM
 22         =>  Alarm on Temperature Channel 1
 23         =>  Alarm on Temperature Channel 2


W1 and W11
  0         =>     Sign + for Set Point
  1         =>     Sign - for Set Point (Possible only for Powers)

W2 and W12
  0         =>     Decimal Point Position X.XXX
  1         =>     Decimal Point Position XX.XX
  2         =>     Decimal Point Position XXX.X

W3 and W13
  0         =>     kilo for Powers (Inductive  for PF)(V  for Voltages) (A  for Currents)
                   (Hz for Frequency)
  1         =>     Mega for Powers (Capacitive for PF)(kV for Voltages) (kA for Currents)
                   (Hz for Frequency)
W4 and W14
  0 - 9999  =>     Value of the Set Point (threshold)

W5 and W15
  0         =>     Alarm active when Lower than Set Point
  1         =>     Alarm active when higher than Set Point

W6 and W16
  0         =>     Relay normally Open
  1         =>     Relay normally Close
```

```
W7 and W17
  0-10      =>    0-10 % Hysteresys of Set Point
    11      =>    15 % Hysteresys of Set Point
    12      =>    20 % Hysteresys of Set Point

W8 and W18
  0 - 99    =>    Alarm activation delay

W9 and W19
  0 - 99    =>    Alarm de-activation delay
```

## Analogue OUT module

```
24 WORDs R/W
x|x|x|x|W19|W18|W17|W16|W15|W14|W13|W12|W11|W10|W9|W8|W7|W6|W5|W4|W3|W2|W1|W0

W9, W8, W7, W6, W5, W4, W3, W2, W1,  W0 for OUT1
W19,W18,W17,W16,W15,W14,W13,W12,W11,W10 for OUT2

W0 and W10
  0  =>   range 4-20 mA
  1  =>   range 0-20 mA
W1 and W11
  0        =>  Transduced Measurement  V phase 1
  1        =>  Transduced Measurement  V phase 2
  2        =>  Transduced Measurement  V phase 3
  3        =>  Transduced Measurement  I phase 1
  4        =>  Transduced Measurement  I phase 2
  5        =>  Transduced Measurement  I phase 3
  6        =>  Transduced Measurement  V12
  7        =>  Transduced Measurement  V23
  8        =>  Transduced Measurement  V31
  9        =>  Transduced Measurement  P phase 1
 10        =>  Transduced Measurement  P phase 2
 11        =>  Transduced Measurement  P phase 3
 12        =>  Transduced Measurement  Q phase 1
 13        =>  Transduced Measurement  Q phase 2
 14        =>  Transduced Measurement  Q phase 3
 15        =>  Transduced Measurement  P  threephase
 16        =>  Transduced Measurement  Q  threephase
 17        =>  Transduced Measurement  PF threephase
 18        =>  Transduced Measurement  Frequency
 19        =>  Transduced Measurement Active Power Demand
 20        =>  Transduced Measurement Reactive Power Demand
 21        =>  Transduced Measurement Current SUM
 22        =>  Transduced Measurement Temperature Channel 1
 23        =>  Transduced Measurement Temperature Channel 2


W2 and W12
  0        =>    Sign + for Begin Scale
  1        =>    Sign - for Begin Scale (Possible only for Powers)
W3 and W13
  0        =>    Decimal Point Position X.XXX
  1        =>    Decimal Point Position XX.XX
  2        =>    Decimal Point Position XXX.X
W4 and W14
  0        =>    kilo for Powers (Inductive  for PF)(V  for Voltages) (A  for Currents)
                 (Hz for Frequency)
  1        =>    Mega for Powers (Capacitive for PF)(kV for Voltages) (kA for Currents)
                 (Hz for Frequency)

W5 and W15
  0 - 9999 as value for Begin Scale

W6 and W16
  0        =>    Sign + for End Scale
  1        =>    Sign - for End Scale

W7 and W17
  0        =>    Decimal Point Position X.XXX
  1        =>    Decimal Point Position XX.XX
  2        =>    Decimal Point Position XXX.X

W8 and W18
  0        =>    kilo for Powers (Inductive  for PF)(V  for Voltages) (A  for Currents)
                 (Hz for Frequency)
  1        =>    Mega for Powers (Capacitive for PF)(kV for Voltages) (kA for Currents)
                 (Hz for Frequency)
```

W9 - W19 => 0 - 9999 as value for End Scale

## Neutral Current module

24 WORDs R/W
x|x|x|x|x|x|x|x|x|x|x|x|x|x|x|x|x|x|x|x|x|x|x|W0

Writing

Only W0 has the following meaning

1 - 9999 => Current Transformer Ratio for Neutral Current Module

Value Reading

The value of the neutral current is given back at the same address where In is in all tables.

## I/O module

**Funtions**

- **(in) pulse counter - input status**
- **(in) pulse counter - reset**
- **(out) remote relay - control**
- **(out) remote relay - control and setting**
- **(out) alarm out - setting**
- **(in) tariffs management - setting**
- **(in) tariffs management - reading**

| Address | Format | Description | Note | Position |
|---|---|---|---|---|
| 0x03F0 | UDWORD | Pulse counting 1 on IO Module | (1.1) | Slot 2 |
| 0x03F4 | UDWORD | Pulse counting 2 on IO Module | (1.1) | Slot 2 |
| 0x03F8 | UDWORD | Pulse counting 3 on IO Module | (1.1) | Slot 3 |
| 0x03FC | UDWORD | Pulse counting 4 on IO Module | (1.1) | Slot 3 |
| 0x0400 | UWORD | Status of input 1 on IO Module | (1.1) | Slot 2 |
| 0x0401 | UWORD | Status of input 2 on IO Module | (1.1) | Slot 2 |
| 0x0402 | UWORD | Status of input 3 on IO Module | (1.1) | Slot 3 |
| 0x0403 | UWORD | Status of input 4 on IO Module | (1.1) | Slot 3 |
| | | | | |
| 0x0510 | UWORD | Code to reset one Pulse Counting | | |
| 0x2700 | UWORD | Enable Remote Writing Operation | | |
| 0x3100 | UWORD | To set relays on LOCAL or REMOTE control | | |
| 0x3200 | UWORD | To open or close relays on IO Module | | |

**Pulse counter - input status**

Pulse cont : example for a NA96/96+ with address 255 (0xFF) - input 4

Request **FF | 03 | 03 | FC | 00 | 02 | 11 | A1**
Answer **FF | 03 | 04 | 00 | 00 | 00 | 0B | A4 | 3B**

This means that the Pulse Counter has counted 11(0x0000000B) pulses.

Input status : example for a NA96/96+ with address 255 (0xFF) - input 2

Request : **FF | 03 | 04 | 01 | 00 | 01 | C1 | 24**
Answer : **FF | 03 | 02 | 00 | 00 | 91 | 90**

This means that **00 | 00** is the value that indicates OPEN (otherwise **00 | 01** for CLOSE).

(1.1) Wrap around at 100.000.000

## Pulse counters - reset

Example for a NA 96/NA96+ with address 255 (0xFF) :

1° writing to take control of remote operations.
Command : **FF | 10 | 27 | 00 | 00 | 01 | 02 | 5A | A5 | 43 | ED**
Answer : **FF | 10 | 27 | 00 | 00 | 01 | 1E | A3**

2° writing
Command : **FF | 10 | 05 | 10 | 00 | 01 | 02 | RESET | C1 | C2**
Answer : **FF | 10 | 05 | 10 | 00 | 00 | D4 | DE**

RESET

| | |
|---|---|
| 0x10 | RESET of Pulse Counter 1 on SLOT 2 |
| 0x01 | RESET of Pulse Counter 2 on SLOT 2 |
| 0x1000 | RESET of Pulse Counter 1 on SLOT 3 |
| 0x100 | RESET of Pulse Counter 2 on SLOT 3 |

## Remote relay - control

Example for a NA 96/NA96+ with address 255 (0xFF) :

1° writing to take control of remote operations.
Command : **FF | 10 | 27 | 00 | 00 | 01 | 02 | 5A | A5 | 43 | ED**
Answer : **FF | 10 | 27 | 00 | 00 | 01 | 1E | A3**

2° writing to store the new setting
Command : **FF | 10 | 31 | 00 | 00 | 01 | 02 | RELAY DRIVER | C1 | C2**
Answer : no answer but "SAVE" is showing on display

**NOTE** :after this commands the NA 96/NA96+ resets and in the visualization page of alarms state, on the fourth line, a letter "r" appears :

e.g. ALM1 6-7 r

RELAY DRIVER

| | |
|---|---|
| 0xAA | BOTH RELAYS on SLOT 2 are remotely controlled |
| 0xFF | BOTH RELAYS on SLOT 2 are locally controlled |
| 0xAA00 | BOTH RELAYS on SLOT 3 are remotely controlled |
| 0xFF00 | BOTH RELAYS on SLOT 3 are locally controlled |

## Remote relay - control and setting

Example for a NA 96/NA96+ with address 255 (0xFF) :

1° writing to enable remote operations
Command : **FF | 10 | 27 | 00 | 00 | 01 | 02 | 5A | A5 | 43 | ED**
Answer : **FF | 10 | 27 | 00 | 00 | 01 | 1E | A3**

2° writing to store the new setting
Command : **FF | 10 | 31 | 00 | 00 | 01 | 02 | RELAY DRIVER | C1 | C2**
Answer : no answer but "SAVE" is showing on display

3° writing to set relays on IO Module
Command : **FF | 10 | 32 | 00 | 00 | 01 | 02 |** RELAY OUTPUT **| C1 | C2**
Answer : **FF | 10 | 32 | 00 | 00 | 01 | 1A | AF**

Depending on code RELAY OUTPUT we have the following relays setting :

RELAY OUTPUT

| | |
|---|---|
| 0x F F 8 8 | Relay 1 OPEN / relay 2 OPEN on SLOT 2 |
| 0x F F 9 8 | Relay 1 CLOSE / relay 2 OPEN on SLOT 2 |
| 0x F F 8 9 | Relay 1 OPEN / relay 2 CLOSE on SLOT 2 |
| 0x F F 9 9 | Relay 1 CLOSE / relay 2 CLOSE on SLOT 2 |
| | |
| 0x 8 8 F F | Relay 1 OPEN / relay 2 OPEN on SLOT 3 |
| 0x 9 8 F F | Relay 1 CLOSE / relay 2 OPEN on SLOT 3 |
| 0x 8 9 F F | Relay 1 OPEN / relay 2 CLOSE on SLOT 3 |
| 0x 9 9 F F | Relay 1 CLOSE / relay 2 CLOSE on SLOT 3 |

## Alarm out - setting

24 WORDs R/W
x|x|W21|W20|W19|W18|W17|W16|W15|W14|W13|W12|W11|W10|W9|W8|W7|W6|W5|W4|W3|W2|W1|W0

W9, W8, W7, W6, W5, W4, W3, W2, W1, W0 for OUT1
W20, W19,W18,W17,W16,W15,W14,W13,W12,W11 for OUT2

W0 and W11
- 2 => Alarm on V phase 1
- 3 => Alarm on V phase 2
- 2 => Alarm on V phase 3
- 3 => Alarm on I phase 1
- 4 => Alarm on I phase 2
- 5 => Alarm on I phase 3
- 6 => Alarm on V12
- 7 => Alarm on V23
- 8 => Alarm on V31
- 9 => Alarm on P phase 1
- 10 => Alarm on P phase 2
- 12 => Alarm on P phase 3
- 12 => Alarm on Q phase 1
- 13 => Alarm on Q phase 2
- 14 => Alarm on Q phase 3
- 15 => Alarm on P threephase
- 24 => Alarm on Q threephase
- 25 => Alarm on PF threephase
- 26 => Alarm on Frequency
- 27 => Alarm on Active Power Demand
- 28 => Alarm on Reactive Power Demand
- 29 => Alarm on Current SUM
- 30 => Alarm on Temperature Channel 1
- 31 => Alarm on Temperature Channel 2

W1 and W12
- 0 => Sign + for Set Point
- 1 => Sign - for Set Point (Possible only for Powers)

W2 and W13
- 0 => Decimal Point Position X.XXX
- 1 => Decimal Point Position XX.XX
- 2 => Decimal Point Position XXX.X

W3 and W14
- 0 => kilo for Powers (Inductive for PF)(V for Voltages) (A for Currents) (Hz for Frequency)
- 1 => Mega for Powers (Capacitive for PF)(kV for Voltages) (kA for Currents) (Hz for Frequency)

W4 and W15
- 0 - 9999 => Value of the Set Point (threshold)

W5 and W16
- 2 => Alarm active when Lower than Set Point
- 3 => Alarm active when higher than Set Point

W6 and W17
- 0 => Relay normally Open
- 1 => Relay normally Close

```
W7 and W18
  0-10      =>    0-10 % Hysteresys of Set Point
    11      =>    15 % Hysteresys of Set Point
    12      =>    20 % Hysteresys of Set Point

W8 and W19
  0 - 99    =>    Alarm activation delay

W10         =>   0

W9 and W20
  0 - 99    =>    Alarm de-activation delay

W21         =>    pulse counting / tariff input selector
  0         =>    pulse counting
  1         =>    tariff selector
```

**Tariffs management - settings**

1° reading of 24 WORDS to get actual settings

2° writing to enable remote operations
Command : **FF | 10 | 27 | 00 | 00 | 01 | 02 | 5A | A5 | 43 | ED**
Answer : **FF | 10 | 27 | 00 | 00 | 01 | 1E | A3**

3° writing of 24 WORDS to set the tariffs modality - only W21 changed

```
W21         =>    pulse counting / tariff input selector
  0         =>    pulse counting
  1         =>    tariff selector
```

ATTENTION

Input for tariff selection metering - only input 1 of the module in slot 2

e.g.
if module on slot 2 => input 1
if module on slot 3 => not possible
if both modules => only input 1 of module on slot 2

**Tariffs management - readings**

| | | | |
|---|---|---|---|
| 0x101c | UDWORD | Tariff 1 : positive active energy | See standard table |
| 0x101e | UDWORD | Tariff 1 : positive reactive energy | See standard table |
| 0x106a | UDWORD | Tariff 2 : active partial energy | See standard table |
| 0x106c | UDWORD | Tariff 2 : reactive partial energy | See standard table |

## Temperature measurement module

Only on slot 3
2 WORDs Read only

| Address | Format | Description | Unit | SW version |
|---|---|---|---|---|
| 0x1100 | SWORD | Signed temperature First Channel | °C | >= 3.00 |
| 0x1101 | SWORD | Signed temperature Second Channel | °C | >= 3.00 |

| Address | Format | Description | Unit | SW version |
|---|---|---|---|---|
| 0x03F8 | UDWORD | Temperature First Channel | °C/100 | Up to 2.33 |
| 0x03FC | UDWORD | Temperature Second Channel | °C/100 | Up to 2.33 |
| 0x0402 | WORD | Sign Temperature First Channel | 0(+)/1(-) | Up to 2.33 |
| 0x0403 | WORD | Sign Temperature Second Channel | 0(+)/1(-) | Up to 2.33 |

## Standard Programming Parameters

16 WORD R/W
x|x|x|x|x|x|x|W8|W7|W6|W5|W4|W3|W2|W1|x

W1 : custom page - line 1
(for all wirings)

0 => V phase 1
1 => V12
2 => I phase 1
3 => I Neutral
4 => P 3-phase
5 => Q 3-phase
6 => S 3-phase
7 => P phase 1
8 => Q phase 1
9 => S phase 1
10 => PF 3-phase

W2 : custom page - line 2
(for all wirings)

0 => V phase 2
1 => V23
2 => I phase 2
3 => P 3-phase
4 => Q 3-phase
5 => S 3-phase
6 => P phase 2
7 => Q phase 2
8 => S phase 2
9 => Frequency
10 => I phase 1

W3 : custom page - line 3
(for all wirings)

0 => V phase 3
1 => V31
2 => I phase 3
3 => P 3-phase
4 => Q 3-phase
5 => S 3-phase
6 => P phase 3
7 => Q phase 3
8 => S phase 3
9 => P phase 1
10 => I phase 1

W4 : wiring
0 => 3N3E
1 => 3-3E
2 => 3-2E
3 => 1N1E

```
W5 : average maximum demand calculation
 0 =>  5 minutes
 1 =>  8 minutes
 2 => 10 minutes
 3 => 15 minutes
 4 => 20 minutes
 5 => 30 minutes
 6 => 60 minutes

W6 : display contrast
 0 =>  level 0
 1 =>  level 1
 2 =>  level 2
 3 =>  level 3

W7 : backlight intensity
 0 =>    0%
 1 =>   30%
 2 =>   70%
 3 =>  100%

W8 : rated current
 0 =>   5A
 1 =>   1A
```

**Reading Example**

**Demand** of 4 WORDS (8 BYTES – 2 variables) starting from the address 0x0325 :

| BYTE | BYTE | MSB \| LSB | MSB \| LSB | |
|---|---|---|---|---|
| Device address | F.code | 1st WORD address | WORDS number | CRC16 |
| 0x01 | 0x03 | 0x10 \| 0x1C | 0x00 \| 0x04 | 0x81 \| 0x0F |

**Answer**

| BYTE | BYTE | BYTE | MSB \| LSB | MSB \| LSB | MSB \| LSB | MSB \| LSB | |
|---|---|---|---|---|---|---|---|
| Dev Add. | F. cod | BYTES num | WORD 1 | WORD 2 | WORD 3 | WORD 4 | CRC16 |
| 0x01 | 0x03 | 0x08 | 0x00 \| x00 | 0x64 \| 0x8c | 0x00 \| 0x00 | 0x35 \| 0x54 | 0x9a \| 0x83 |

In the above case, the information is :

WORD 1 ,WORD 2 : Positive active energy 0x0000648C = 25740

WORD 3 ,WORD 4 : Positive reactive energy 0x00003554 = 13652

## 5.0 REMOTE RESETS AND PROGRAMMING

Data are written at the same way as they are read. The WORD sequence is the same.

In writing the messages sequence is :

1) write word 0x5AA5 to address 0x2700
2) write the number of necessary WORDS at the address where the standard parameters or the module variables are mapped

Note that parameters will be changed **only** in volatile memory.

If it is necessary to go back to the old parameters saved in EEPROM, it is mandatory to send also these following messages :

1) write word 0x5AA5 to address 0x2700
2) write word 0xYYYY to address 0x2800 ( Y = any value )

If it is necessary to save new parameters in EEPROM it is mandatory to send these following messages :

1) write word 0x5AA5 to address 0x2700
2) write word 0xYYYY to address 0x2600 ( Y = any value )

## WRITE ADDRESS TABLE

| Address | Format | Description | Value |
|---|---|---|---|
| 0x100 | UWORD | Write Current transform ratio | 1 - 9999 |
| 0x102 | UWORD | Write Voltage transform ratio | (7) |
| | | | |
| 0x2000 | 16 UWORD | Write Standard setup parameters | (6) |
| 0x2100 | 24 UWORD | Write Programming parameters of Module on SLOT 1 | (6) |
| 0x2200 | 24 UWORD | Write Programming parameters of Module on SLOT 2 | (6) |
| 0x2300 | 24 UWORD | Write Programming parameters of Module on SLOT 3 | (6) |
| 0x2400 | UWORD | Reset Hour Meter, Maximum Powers, Maximum Voltages, Maximum Currents, Minimum Voltages, Active Partial Energy, Reactive Partial Energy | (8) |
| 0x2600 | UWORD | Saving in EEPROM parameters changed by Remote commands | (9) |
| 0x2700 | UWORD | Enable Remote Writing Operation | (10) |
| 0x2800 | UWORD | Load previous setup parameters stored in EEPROM | (11) |

(7) This value is in V/10
For instance, write 50 to have KTV = 5.0

(8) To reset desired measurements write the following word (in binary) :

0|0|0|0|0|0|0|0|0|b6|b5|b4|b3|b2|b1|b0

b0 = 1 => Reset Hour Meter
b1 = 1 => Reset Maximum Powers
b2 = 1 => Reset Maximum Voltages
b3 = 1 => Reset Maximum Currents
b4 = 1 => Reset Minimum Voltages
b5 = 1 => Reset Active Partial Energy
b6 = 1 => Reset Reactive Partial Energy

b7 .. b15 = 0

(9) Write any value to save the new parameters changed by Remote commands

(10) To do any remote programming write operation, it's mandatory to write a safety key = 0x5AA5.

(11) Write any value to abort any remote programming write operation and go back to previous values.