

MODBUS TABLE ORGANIZATION

| Starting Address of the Group Registers (Dec) | Starting Address of the Group Registers (Hex) | System Version (Release) | System Version (Build) | Group Name (Text)                 | Group Code (Hex) | Group Complexity (Hex) | Group Version (Hex) | Object Code |
|---|---|--------------------------|------------------------|-----------------------------------|------------------|------------------------|---------------------|-------------|
| 20480   | 5000  | 01                       | 16                     | Single-phase Electric Measurement | 71 03            | 30                     | 01 00               | 0x5002      |
| 20480   | 5000  | 01                       | 16                     | Measure configuration             | 71 03            | 30                     | 01 00               | 0x5002      |

MODBUS PROTOCOL DETAILS

| Function Code (Dec)                           | Exception Codes (Dec) | Data Encoding                              |
|---|-----------------------|--|
| 2 (Read Discrete Inputs)                      | 1, 2, 3               | "Big Endian" (most significant byte first) |
| 1 (Read Coils)                                | 1, 2, 3               | "Big Endian" (most significant byte first) |
| 5/15 (Write Single/Multiple Coils)            | 1, 2, 3               | "Big Endian" (most significant byte first) |
| 4 (Read Input Registers)                      | 1, 2, 3               | "Big Endian" (most significant byte first) |
| 3 (Read Holding register)                     | 1, 2, 3               | "Big Endian" (most significant byte first) |
| 6/16 (Write Single/Multiple Holding register) | 1, 2, 3, 4            | "Big Endian" (most significant byte first) |

MODBUS OVER SERIAL DETAILS

| Physical Layer                                       | Trasmission Modes | Device Addressing* | Baud Rates (bit/s)                                  | Data Bits | Data bits trasmission sequence | Parity | Stop Bits |
|--|-------------------|--------------------|---|-----------|--------------------------------|--------|-----------|
| standard EIA/TIA 485 (RS-485) two-wire configuration | RTU               | 1÷247*             | programmable (1200, 2400, 4800, 9600, 19200, 38400) | 8         | Least significant bit first    | NONE   | 1         |

MASTER/SLAVE COMMUNICATION TIMING

| Timer Description                            | Timer Value (msec)    |
|--|-----------------------|
| Inter-character time-out                     | < 1,5 character times |
| Response delay (from master request)         | -                     |
| Delay Time (between two master trasmissions) | -                     |

REFER ALSO TO: [www.modbus.org](http://www.modbus.org) - MODBUS over serial line specification and implementation guide V1.02  
- MODBUS APPLICATION PROTOCOL SPECIFICATION V1.1b

NOTE: [File and printed copies of this document are not subject to document change control.](#)

**\* Device Addressing:**  
**This module is to be consider as 3 modules with 3 different Modbus Address.**  
**The module takes automatically the two addresses immediately following to the programmed one (e.g. Programmed address = 12, Addresses of the module 12, 13, 14)**  
**Apply the table's registers for each Modbus address of the module**

| Register Number                 | Register Address (Dec) | Register Address (Hex) | Dimension [bit] | Description | Note | Read Function Codes (Dec) | Data Storing |
|---------------------------------|------------------------|------------------------|-----------------|-------------|------|---------------------------|--------------|
| (no DISCRETE INPUTS availables) |                        |                        |                 |             |      |                           |              |



| Register Number       | Register Address (Dec) | Register Address (Hex) | Dimension [bit] | Description | Note | Read Function Codes (Dec) | Write Function Codes (Dec) | Data Storing |
|-----------------------|------------------------|------------------------|-----------------|-------------|------|---------------------------|----------------------------|--------------|
| (no COILS availables) |                        |                        |                 |             |      |                           |                            |              |



| Register Number | Register Address (Dec) | Register Address (Hex) | Dimension [word] | Bit Position | Description                                   | Type             | Scale | Unit  | Range | Note   | Read Function Code (Dec) | Data Storing |
|-----------------|------------------------|------------------------|------------------|--------------|---|------------------|-------|-------|-------|--|--------------------------|--------------|
| 20481           | 20480                  | 5000                   | 123              |              | Single-phase Electric Measurement             |                  |       |       |       |  |                          |              |
| 20481           | 20480                  | 5000                   | 1                |              | Phase 1 Current Value (R)                     | unsigned integer | 1     | A     |       | See Note 14  | 4                        |              |
| 20482           | 20481                  | 5001                   | 13               |              | RESERVED (all return "8000h")                 |                  |       |       |       |  |                          |              |
| 20495           | 20494                  | 500E                   | 1                |              | 1-N Voltage                                   | unsigned integer | 1     | V     |       | See Note 15  | 4                        |              |
| 20496           | 20495                  | 500F                   | 17               |              | RESERVED (all return "8000h")                 |                  |       |       |       |  |                          |              |
| 20513           | 20512                  | 5020                   | 1                |              | Phase 1 (R) phase current THD vs. fundamental | unsigned integer | 1     | %     |       | Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 4                        |              |
| 20514           | 20513                  | 5021                   | 3                |              | RESERVED (all return "8000h")                 |                  |       |       |       |  |                          |              |
| 20517           | 20516                  | 5024                   | 1                |              | 1-N Voltage THD vs. fundamental               | unsigned integer | 1     | %     |       | Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 4                        |              |
| 20518           | 20517                  | 5025                   | 5                |              | RESERVED (all return "8000h")                 |                  |       |       |       |  |                          |              |
| 20523           | 20522                  | 502A                   | 1                |              | Three-phase Active Power                      | signed integer   | 1     | kW    |       | See Note 16  | 4                        |              |
| 20524           | 20523                  | 502B                   | 1                |              | Three-phase Reactive power                    | signed integer   | 1     | kvar  |       | See Note 16  | 4                        |              |
| 20525           | 20524                  | 502C                   | 2                |              | RESERVED (all return "8000h")                 |                  |       |       |       |  |                          |              |
| 20527           | 20526                  | 502E                   | 1                |              | Threee-Phase Apparent Power                   | signed integer   | 1     | kVA   |       | See Note 16  | 4                        |              |
| 20528           | 20527                  | 502F                   | 1                |              | Three-phase Power Factor (PF)                 | signed integer   | 0,01  | -     |       | Expressed in "numeric coding"; with mark (more significant bit = mark)       | 4                        |              |
| 20529           | 20528                  | 5030                   | 1                |              | RESERVED (returns "8000h")                    |                  |       |       |       |  |                          |              |
| 20530           | 20529                  | 5031                   | 1                |              | Three-phase frequency                         | signed integer   | 0,01  | Hz    |       | Expressed in "numeric coding"; with mark (more significant bit = mark)       | 4                        |              |
| 20531           | 20530                  | 5032                   | 2                |              | RESERVED (returns "80000000h")                |                  |       |       |       |  |                          |              |
| 20533           | 20532                  | 5034                   | 2                |              | Positive Three-phase Active Energy            | unsigned integer | 1     | kWh   |       | See Note 17  | 4                        | Y            |
| 20535           | 20534                  | 5036                   | 2                |              | Negative Three-phase Active Energy            | unsigned integer | 1     | kWh   |       | See Note 17  | 4                        | Y            |
| 20537           | 20536                  | 5038                   | 2                |              | RESERVED (returns "80000000h")                |                  |       |       |       |  |                          |              |
| 20539           | 20538                  | 503A                   | 2                |              | Positive Three-phase Reactive Energy          | unsigned integer | 1     | kvarh |       | See Note 17  | 4                        | Y            |
| 20541           | 20540                  | 503C                   | 2                |              | Negative Three-phase Reactive Energy          | unsigned integer | 1     | kvarh |       | See Note 17  | 4                        | Y            |
| 20543           | 20542                  | 503E                   | 2                |              | RESERVED (returns "80000000h")                |                  |       |       |       |  |                          |              |
| 20545           | 20544                  | 5040                   | 1                |              | Phase 1 Active Power                          | signed integer   | 1     | kW    |       | See Note 18  | 4                        |              |
| 20546           | 20545                  | 5041                   | 2                |              | RESERVED (returns "8000h")                    |                  |       |       |       |  |                          |              |
| 20548           | 20547                  | 5043                   | 1                |              | Phase 1 Reactive power                        | signed integer   | 1     | kvar  |       | See Note 18  | 4                        |              |
| 20549           | 20548                  | 5044                   | 8                |              | RESERVED (returns "8000h")                    |                  |       |       |       |  |                          |              |
| 20557           | 20556                  | 504C                   | 1                |              | Phase 1 Apparent Power                        | signed integer   | 1     | kVA   |       | See Note 18  | 4                        |              |
| 20558           | 20557                  | 504D                   | 8                |              | RESERVED (returns "8000h")                    |                  |       |       |       |  |                          |              |
| 20566           | 20565                  | 5055                   | 2                |              | Phase 1 Positive Active Energy                | unsigned integer | 1     | kWh   |       | See Note 19  | 4                        |              |
| 20568           | 20567                  | 5057                   | 4                |              | RESERVED (returns "80000000h")                |                  |       |       |       |  |                          |              |
| 20572           | 20571                  | 505B                   | 2                |              | Phase 1 Negative Active Energy                | unsigned integer | 1     | kWh   |       | See Note 19  | 4                        |              |
| 20574           | 20573                  | 505D                   | 4                |              | RESERVED (returns "80000000h")                |                  |       |       |       |  |                          |              |
| 20578           | 20577                  | 5061                   | 2                |              | Phase 1 Positive Reactive Energy              | unsigned integer | 1     | kvarh |       | See Note 19  | 4                        |              |
| 20580           | 20579                  | 5063                   | 4                |              | RESERVED (returns "80000000h")                |                  |       |       |       |  |                          |              |
| 20584           | 20583                  | 5067                   | 2                |              | Phase 1 Negative Reactive Energy              | unsigned integer | 1     | kvarh |       | See Note 19  | 4                        |              |
| 20586           | 20585                  | 5069                   | 18               |              | RESERVED (returns "8000h", "80000000h")       |                  |       |       |       |  |                          |              |
| 20604           | 20603                  | 507B                   | 81               |              | Measure - Harmonic I : harmonic order         |                  |       |       |       |  |                          |              |
| 20604           | 20603                  | 507B                   | 1                |              | harmonic I1 row 3                             | unsigned word    | 0,1   | %     |       |  | 4                        |              |
| 20605           | 20604                  | 507C                   | 3                |              | RESERVED (returns "8000h")                    |                  |       |       |       |  |                          |              |
| 20608           | 20607                  | 507F                   | 1                |              | harmonic I1 row 5                             | unsigned word    | 0,1   | %     |       |  | 4                        |              |
| 20609           | 20608                  | 5080                   | 3                |              | RESERVED (returns "8000h")                    |                  |       |       |       |  |                          |              |
| 20612           | 20611                  | 5083                   | 1                |              | harmonic I1 row 7                             | unsigned word    | 0,1   | %     |       |  | 4                        |              |
| 20613           | 20612                  | 5084                   | 3                |              | RESERVED (returns "8000h")                    |                  |       |       |       |  |                          |              |
| 20616           | 20615                  | 5087                   | 1                |              | harmonic I1 row 9                             | unsigned word    | 0,1   | %     |       |  | 4                        |              |
| 20617           | 20616                  | 5088                   | 3                |              | RESERVED (returns "8000h")                    |                  |       |       |       |  |                          |              |
| 20620           | 20619                  | 508B                   | 1                |              | harmonic I1 row 11                            | unsigned word    | 0,1   | %     |       |  | 4                        |              |
| 20621           | 20620                  | 508C                   | 3                |              | RESERVED (returns "8000h")                    |                  |       |       |       |  |                          |              |
| 20624           | 20623                  | 508F                   | 1                |              | harmonic I1 row 13                            | unsigned word    | 0,1   | %     |       |  | 4                        |              |
| 20625           | 20624                  | 5090                   | 59               |              | RESERVED (returns "8000h")                    |                  |       |       |       |  |                          |              |

| Register Number | Register Address (Dec) | Register Address (Hex) | Dimension [word] | Bit Position | Description                                | Type          | Scale | Unit | Range | Note | Read Function Code (Dec) | Data Storing |
|-----------------|------------------------|------------------------|------------------|--------------|--|---------------|-------|------|-------|------|--------------------------|--------------|
| 20684           | 20683                  | 50CB                   | 1                |              | harmonic I1 row 15                         | unsigned word | 0,1   | %    |       |      | 4                        |              |
| 20684           | 20683                  | 50CB                   | 19               |              | Measure - Harmonic V PH/N : harmonic order |               |       |      |       |      |                          |              |
| 20684           | 20683                  | 50CB                   | 1                |              | harmonic V1 row 3                          | unsigned word | 0,1   | %    |       |      | 4                        |              |
| 20685           | 20684                  | 50CC                   | 2                |              | RESERVED (returns "8000h")                 | unsigned word | 0,1   | %    |       |      | 4                        |              |
| 20687           | 20686                  | 50CE                   | 1                |              | harmonic V1 row 5                          | unsigned word | 0,1   | %    |       |      | 4                        |              |
| 20688           | 20687                  | 50CF                   | 2                |              | RESERVED (returns "8000h")                 | unsigned word | 0,1   | %    |       |      | 4                        |              |
| 20690           | 20689                  | 50D1                   | 1                |              | harmonic V1 row 7                          | unsigned word | 0,1   | %    |       |      | 4                        |              |
| 20691           | 20690                  | 50D2                   | 2                |              | RESERVED (returns "8000h")                 | unsigned word | 0,1   | %    |       |      | 4                        |              |
| 20693           | 20692                  | 50D4                   | 1                |              | harmonic V1 row 9                          | unsigned word | 0,1   | %    |       |      | 4                        |              |
| 20694           | 20693                  | 50D5                   | 2                |              | RESERVED (returns "8000h")                 | unsigned word | 0,1   | %    |       |      | 4                        |              |
| 20696           | 20695                  | 50D7                   | 1                |              | harmonic V1 row 11                         | unsigned word | 0,1   | %    |       |      | 4                        |              |
| 20697           | 20696                  | 50D8                   | 2                |              | RESERVED (returns "8000h")                 | unsigned word | 0,1   | %    |       |      | 4                        |              |
| 20699           | 20698                  | 50DA                   | 1                |              | harmonic V1 row 13                         | unsigned word | 0,1   | %    |       |      | 4                        |              |
| 20700           | 20699                  | 50DB                   | 2                |              | RESERVED (returns "8000h")                 | unsigned word | 0,1   | %    |       |      | 4                        |              |
| 20702           | 20701                  | 50DD                   | 1                |              | harmonic V1 row 15                         | unsigned word | 0,1   | %    |       |      | 4                        |              |

|  |
|--|
| <b>Note 14</b>   |
| Expressed on "numeric coding"; without mark (fixed more significant bit = 0);<br>To obtain the real value, the contents of this register must be <b>divided</b> by the factor in <b>holding</b> register 0x5008. |
| <b>Note 15</b>   |
| Expressed on "numeric coding"; without mark (fixed more significant bit = 0);<br>To obtain the real value, the contents of this register must be <b>divided</b> by the factor in <b>holding</b> register 0x5007. |
| <b>Note 16</b>   |
| Expressed in "numeric coding"; with mark (more significant bit = mark);<br>To obtain the real value, the contents of this register must be <b>divided</b> by the factor in <b>holding</b> register 0x5009.       |
| <b>Note 17</b>   |
| Expressed on "numeric coding"; without mark (fixed more significant bit = 0);<br>To obtain the real value, the contents of this register must be <b>divided</b> by the factor in <b>holding</b> register 0x500B. |
| <b>Note 18</b>   |
| Expressed in "numeric coding"; with mark (more significant bit = mark);<br>To obtain the real value, the contents of this register must be <b>divided</b> by the factor in <b>holding</b> register 0x500A.       |
| <b>Note 19</b>   |
| Expressed in "numeric coding"; with mark (more significant bit = mark);<br>To obtain the real value, the contents of this register must be <b>divided</b> by the factor in <b>holding</b> register 0x500C.       |

| Register Number | Register Address (Dec) | Register Address (Hex) | Dimension [word] | Bit Position | Description                    | Type | Scale | Unit | Range | Note                | Read Function Codes (Dec) | Write Function Codes (Dec) | Data Storing |
|-----------------|------------------------|------------------------|------------------|--------------|--------------------------------|------|-------|------|-------|---------------------|---------------------------|----------------------------|--------------|
| 20481           | 20480                  | 5000                   | 19               |              | Measure configuration          |      |       |      |       |                     |                           |                            |              |
| 20481           | 20480                  | 5000                   | 1                |              | Measure Type Configuration     |      | 1     | -    |       | See Note 8          | 3                         | 6,16                       |              |
| 20482           | 20481                  | 5001                   | 1                |              | CT Ratio                       |      | 1     | -    |       | See Note 9          | 3                         | 6,16                       |              |
| 20483           | 20482                  | 5002                   | 5                |              | Reserved                       |      |       |      |       |                     |                           |                            |              |
| 20488           | 20487                  | 5007                   | 1                |              | Voltage multiplier factor      |      | 1     | -    |       | See Notes 10 and 14 | 3                         | -                          |              |
| 20489           | 20488                  | 5008                   | 1                |              | Current multiplier factor      |      | 1     | -    |       | See Notes 10 and 14 | 3                         | -                          |              |
| 20490           | 20489                  | 5009                   | 1                |              | Total power multiplier factor  |      | 1     | -    |       | See Notes 10 and 14 | 3                         | -                          |              |
| 20491           | 20490                  | 500A                   | 1                |              | Phase power multiplier factor  |      | 1     | -    |       | See Notes 10 and 14 | 3                         | -                          |              |
| 20492           | 20491                  | 500B                   | 1                |              | Total energy multiplier factor |      | 1     | -    |       | See Notes 10 and 14 | 3                         | -                          |              |
| 20493           | 20492                  | 500C                   | 1                |              | Phase energy multiplier factor |      | 1     | -    |       | See Notes 10 and 14 | 3                         | -                          |              |
| 20494           | 20493                  | 500D                   | 1                |              | Alarm/event 1 value            |      | 1     | -    |       | See Note 12         | 3                         | 6,16                       |              |
| 20495           | 20494                  | 500E                   | 2                |              | Alarm/event 1 threshold        |      | 1     | -    |       | See Notes 10 and 11 | 3                         | 6,16                       |              |
| 20497           | 20496                  | 5010                   | 1                |              | Alarm/event 1 delay            |      | 1     | s    |       | See Note 10         | 3                         | 6,16                       |              |
| 20498           | 20497                  | 5011                   | 1                |              | Alarm/event 1 Hysteresis       |      | 0,1   | %    |       | See Note 10         | 3                         | 6,16                       |              |
| 20499           | 20498                  | 5012                   | 1                |              | Event type                     |      | 1     | -    |       | See Note 13         | 3                         | 6,16                       |              |

|   |
|---|
| <b>Note 8</b>   |
| BYTE1 (MSB):<br>always returns "11": Single phase system 1N-1E;<br><br>BYTE0 (LSB):<br>"00" <b>[default]</b> : if the active power flows in the normal/indicated direction ("upstream to downstream" or depending on the polarity indicated for the connection );<br>"01": if the active power flows in reverse direction ("downstream to upstream" or on opposite direction compared to the connection polarity indicated) |
| <b>Note 9</b>   |
| Expressed as a "numeric coding" with sign (always positive value, most significant bit = 0)   |
| <b>Note 10</b>  |
| Expressed as a "numeric coding" (most significant bit = sign)   |
| <b>Note 11</b>  |
| Measurement unit compatible with the value configured in the previous register, <b>divided</b> by the factor concerning that value.   |
| <b>Note 12</b>  |
| Register address (absolute value) of the desired value  |
| <b>Note 13</b>  |
| BIT 0:<br>"1" = The event generates an alarm,<br>"0" = The event doesn't generate an alarm<br><br>BIT 1:<br>"1" = The event generates a Link functionality action,<br>"0" = The event doesn't generate a Link functionality action  |
| <b>Note 14</b>  |
| The value read in the register containing the measurement data is divided by the corresponding factor indicated in this register, if the register is not present, a factor 1 has to be considered.<br><br>Example: I1 [A] = Phase 1 current value ( R ) / Current multiplier factor = 1023 / 100 = 10,23 A<br><br><b>The value can not be changed by the user</b>   |