**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 | Three-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 - 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.

| Register Number | Register Address (Dec) | Register Address (Hex) | Dimension [bit] | Description | 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** | **62** | | **Three-phase Electric Measurement** | | | | | | | |
| 20481 | 20480 | 5000 | 1 | | Phase 1 Current Value (R) | unsigned integer | | A | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0); (14) | 4 | |
| 20482 | 20481 | 5001 | 13 | | *RESERVED (all return "8000h")* | | | | | | | |
| 20495 | 20494 | 500E | 1 | | 1-N Voltage | unsigned integer | | V | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0); (15) | 4 | |
| 20496 | 20495 | 500F | 17 | | *RESERVED (all return "8000h")* | | | | | | | |
| 20513 | 20512 | 5020 | 1 | | Phase 1 (R) phase current THD vs. fundamental | unsigned integer | | % | | 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 | | % | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 4 | |
| 20518 | 20517 | 5025 | 5 | | *RESERVED (all return "8000h")* | | | | | | | |
| #RIF! | 20522 | 502A | 1 | | Three-phase Active Power | signed integer | | kW | | Expressed in "numeric coding"; with mark (more significant bit = mark); (16) | 4 | |
| 20524 | 20523 | 502B | 1 | | Three-phase reactive power | signed integer | | kvar | | Expressed in "numeric coding"; with mark (more significant bit = mark); (16) | 4 | |
| 20525 | 20524 | 502C | 2 | | *RESERVED (all return "8000h")* | | | | | | | |
| 20527 | 20526 | 502E | 1 | | Threee-Phase Apparent Power | signed integer | | kVA | | Expressed in "numeric coding"; with mark (more significant bit = mark); (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 | | kWh | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0); (17) | 4 | Y |
| 20535 | 20534 | 5036 | 2 | | Negative Three-phase Active Energy | unsigned integer | | kWh | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0); (17) | 4 | Y |
| 20537 | 20536 | 5038 | 2 | | *RESERVED (returns "80000000h")* | | | | | | | |
| 20539 | 20538 | 503A | 2 | | Positive Three-phase Reactive Energy | unsigned integer | | kvarh | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0); (17) | 4 | Y |
| 20541 | 20540 | 503C | 2 | | Negative Three-phase Reactive Energy | unsigned integer | | kvarh | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0); (17) | 4 | Y |
| 20543 | 20542 | 503E | 2 | | *RESERVED (returns "80000000h")* | | | | | | | |
| 20545 | 20544 | 5040 | 1 | | Phase 1 Active Power | signed integer | | kW | | Expressed in "numeric coding"; with mark (more significant bit = mark); (18) | 4 | |
| 20546 | 20545 | 5041 | 2 | | *RESERVED (returns "8000h")* | | | | | | | |
| 20548 | 20547 | 5043 | 1 | | Phase 1 Reactive power | signed integer | | kvar | | Expressed in "numeric coding"; with mark (more significant bit = mark); (18) | 4 | |
| 20549 | 20548 | 5044 | 8 | | *RESERVED (returns "8000h")* | | | | | | | |
| 20557 | 20556 | 504C | 1 | | Phase 1 Apparent Power | signed integer | | | | Expressed in "numeric coding"; with mark (more significant bit = mark); (18) | 4 | |
| 20558 | 20557 | 504D | 8 | | *RESERVED (returns "8000h")* | | | | | | | |
| 20566 | 20565 | 5055 | 2 | | Phase 1 Positive Active Energy | unsigned integer | | kvarh | | Expressed in "numeric coding"; with mark (more significant bit = mark); (19) | 4 | |
| 20568 | 20567 | 5057 | 4 | | *RESERVED (returns "80000000h")* | | | | | | | |
| 20572 | 20571 | 505B | 2 | | Phase 1 Negative Active Energy | unsigned integer | | kvarh | | Expressed in "numeric coding"; with mark (more significant bit = mark); (19) | 4 | |
| 20574 | 20573 | 505D | 4 | | *RESERVED (returns "80000000h")* | | | | | | | |
| 20578 | 20577 | 5061 | 2 | | Phase 1 Positive Reactive Energy | unsigned integer | | kvar | | Expressed in "numeric coding"; with mark (more significant bit = mark); (19) | 4 | |
| 20580 | 20579 | 5063 | 4 | | *RESERVED (returns "80000000h")* | | | | | | | |
| 20584 | 20583 | 5067 | 2 | | Phase 1 Negative Reactive Energy | unsigned integer | | kvar | | Expressed in "numeric coding"; with mark (more significant bit = mark); (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")* | | | | | | | |
| 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 | |

NOTA 14) to obtain the real value, the contents of this register must be multiplied with the multiplicative coefficient in holding register 0x5008.
NOTA 15) to obtain the real value, the contents of this register must be multiplied with the multiplicative coefficient in holding register 0x5007.
NOTA 16) to obtain the real value, the contents of this register must be multiplied with the multiplicative coefficient in holding register 0x5009.
NOTA 17) to obtain the real value, the contents of this register must be multiplied with the multiplicative coefficient in holding register 0x500B.
NOTA 18) to obtain the real value, the contents of this register must be multiplied with the multiplicative coefficient in holding register 0x500A.
NOTA 19) to obtain the real value, the contents of this register must be multiplied with the multiplicative coefficient in holding 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** | **1** | | **Three-phase Electric Measurement** | | | | | | | | |
| 20481 | 20480 | 5000 | 1 | | Measure Type Configuration | | | | | (8) | 3 | 6,16 | |
| 20482 | 20481 | 5001 | 6 | | Reserved | | | | | | | | |
| 20488 | 20487 | 5007 | 1 | | Voltage multiplier factor | | | | | (10)(14) | 3 | 6,16 | |
| 20489 | 20488 | 5008 | 1 | | Current multiplier factor | | | | | (10)(14) | 3 | 6,16 | |
| 20490 | 20489 | 5009 | 1 | | Total power multiplier factor | | | | | (10)(14) | 3 | 6,16 | |
| 20491 | 20490 | 500A | 1 | | Phase power multiplier factor | | | | | (10)(14) | 3 | 6,16 | |
| 20492 | 20491 | 500B | 1 | | Total energy multiplier factor | | | | | (10)(14) | 3 | 6,16 | |
| 20493 | 20492 | 500C | 1 | | Phase energy multiplier factor | | | | | (10)(14) | 3 | 6,16 | |
| 20494 | 20493 | 500D | 1 | | Alarm/event 1 value | | | | | (12) | 3 | 6,16 | |
| 20495 | 20494 | 500E | 2 | | Alarm/event 1 threshold | | | | | (10)(11) | 3 | 6,16 | |
| 20497 | 20496 | 5010 | 1 | | Alarm/event 1 delay | | | s | | (10) | 3 | 6,16 | |
| 20498 | 20497 | 5011 | 1 | | Alarm/event 1 Hysteresis | | 0,1 | % | | (10) | 3 | 6,16 | |
| 20499 | 20498 | 5012 | 1 | | Event type | | | | | (13) | 3 | 6,16 | |

NOTE 8) BYTE1 (MSB): "11": unipolar 1V-1I system; "33": 3V-3I system without neutral informations; "34": 3V-4I system ----
BYTE0 (LSB): "00": if the active power flows in the normal/indicated direction ("upstream to downstream" or depending on the polarity indicated for the connection ), "default"; "01": if the active power flows in reverse direction ("downstream to upstream" or on opposite direction compared to the connection polarity indicated)

NOTE 9) Expressed as a "numeric coding" with sign (always positive value, most significant bit = 0)

NOTE 10) Expressed as a "numeric coding" (most significant bit = sign)

NOTE 11) Measurement unit compatible with the value configured in the previous register, multiplied by the multiplication factor concerning that value.

NOTE 12) Register address (absolute value) of the desired value

NOTE 13) BIT 0 : 1= The event generates an alarm, 0 = The event doesn't generate an alarm
BIT 1 : 1 = The event generates a push&link action, 0 =The event doesn't generate a push&link action

NOTE 14) The value read in the register containing the measurement data is divided by the corresponding multiplication factor indicated in this register, if the register is not present, a multiplicative factor 1 has to be considered
Example: I1 [A] = Phase 1 current value ( R ) / Current multiplier factor = 1023 / 100 = 10,23A
The value can not be changed by the user