

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 | 0x5004 |
| 20480 | 5000 | 01 | 16 | Measure configuration | 71 03 | 30 | 01 00 | 0x5004 |

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 | 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") | | | | | | | |
| 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 | |



| Register Number | Register Address (Dec) | Register Address (Hex) | Dimension [word] | Bit Position | Description | Type | Scale | Unit | Range | Note | Read Function Code (Dec) | Data Storing |
|-----------------|------------------------|------------------------|------------------|--------------|----------------------------|---------------|-------|------|-------|------|--------------------------|--------------|
| 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 | |

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

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| Note 8 |
| BYTE1 (MSB): "11": Single phase system 1N-1E; "33": Three-pahse system without neutral 3-3E; "34": Three-pahse system with neutral 3N-3E. BYTE0 (LSB): "00" [default] : if the active power flows in the normal/indicated direction ("upstream to downstream" or depending on the polarity indicated for the connection); "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, divided by the 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 Link functionality action, "0" = The event doesn't generate a Link functionality action |
| Note 14 |
| 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. Example: I1 [A] = Phase 1 current value (R) / Current multiplier factor = 1023 / 100 = 10,23 A The value can not be changed by the user |