

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) |
|---|---|--------------------------|------------------------|------------------------------------|------------------|------------------------|---------------------|
| 16384 | 4000 | 01 | 11 | State of Breaker | 51 02 | 10 | 01 00 |
| 29184 | 7200 | 01 | 11 | Three-phase Electric Protection | 73 03 | 10 | 01 01 |
| 20480 | 5000 | 01 | 11 | Three-phase Electric Measurement | 71 03 (F0 00) | 30 (14 05) | 01 00 |
| 32768 | 8000 | 01 | 11 | Single-channel Thermal Measurement | 81 00 | 10 | 01 00 |

MODBUS PROTOCOL DETAILS

| Function Code (Dec) | Exception Codes (Dec) | Data Encoding |
|--------------------------|-----------------------|--|
| 2 (Read Discrete Inputs) | 1, 2, 3 | "Big Endian" (most significant byte first) |
| 4 (Read Input Registers) | 1, 2, 3 | "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 |
|-----------------|------------------------|------------------------|-----------------|---|---|---------------------------|--------------|
| 16385 | 16384 | 4000 | 3 | State of Breaker | | | |
| 16385 | 16384 | 4000 | 1 | Open | The information reported here "self-resets" when the condition that generated it ends. | 2 | |
| 16386 | 16385 | 4001 | 1 | Closed | The information reported here "self-resets" when the condition that generated it ends. | 2 | |
| 16387 | 16386 | 4002 | 1 | Tripped | The information reported here "self-resets" when the condition that generated it ends. | 2 | |
| 29185 | 29184 | 7200 | 9 | Three-phase Electric Protection | | | |
| 29185 | 29184 | 7200 | 1 | Overload pre-alarm (threshold I1) | The information reported here "self-resets" when the condition that generated it ends. | 2 | |
| 29186 | 29185 | 7201 | 1 | Overload pre-alarm (>threshold I2) | The information reported here "self-resets" when the condition that generated it ends. | 2 | |
| 29187 | 29186 | 7202 | 1 | Over-temperature alarm (>threshold T) | The information reported here "self-resets" when the condition that generated it ends. | 2 | |
| 29188 | 29187 | 7203 | 1 | RESERVED (returns "0") | | | |
| 29189 | 29188 | 7204 | 1 | Overload P. Relay Tripped (no phase indication) | The information reported here is maintained even when the condition that generated it ends. The "restore" conditions can be (equivalent, in alternative): <ul style="list-style-type: none"> the detection of the device in Closed state the detection of a minimum current value on the phases. The presence of Switch State Functionality is therefore NOT binding (Example: if the switch goes back to Open => the Tripped Relay signal must be maintained up until the reset condition intervenes) | 2 | Y |
| 29190 | 29189 | 7205 | 1 | Short circuit P. Relay Tripped (no phase indication) | The information reported here is maintained even when the condition that generated it ends. The "restore" conditions can be (equivalent, in alternative): <ul style="list-style-type: none"> the detection of the device in Closed state the detection of a minimum current value on the phases. The presence of Switch State Functionality is therefore NOT binding (Example: if the switch goes back to Open => the Tripped Relay signal must be maintained up until the reset condition intervenes) | 2 | Y |
| 29191 | 29190 | 7206 | 1 | Device Protection Relay Tripped ("III element", no phase indications) | The information reported here is maintained even when the condition that generated it ends. The "restore" conditions can be (equivalent, in alternative): <ul style="list-style-type: none"> the detection of the device in Closed state the detection of a minimum current value on the phases. The presence of Switch State Functionality is therefore NOT binding (Example: if the switch goes back to Open => the Tripped Relay signal must be maintained up until the reset condition intervenes) | 2 | Y |
| 29192 | 29191 | 7207 | 1 | RESERVED (returns "0") | | | |
| 29193 | 29192 | 7208 | 1 | Over-temperature P. Relay tripped | The information reported here is maintained even when the condition that generated it ends. The "restore" conditions can be (equivalent, in alternative): <ul style="list-style-type: none"> the detection of the device in Closed state the detection of a minimum current value on the phases. The presence of Switch State Functionality is therefore NOT binding (Example: if the switch goes back to Open => the Tripped Relay signal must be maintained up until the reset condition intervenes) | 2 | Y |

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

| Register Number | Register Address (Dec) | Register Address (Hex) | Dimension [word] | Bit Position | Description | Type | Scale | Unit | Range | Note | Read Function Code (Dec) | Data Storing |
|-----------------|------------------------|------------------------|------------------|------------------|---|------------------|-------|--------|-------|--|--------------------------|--------------|
| 16385 | 16384 | 4000 | 6 | | State of Breaker | | | | | | | |
| 16385 | 16384 | 4000 | 1 | State of Breaker | RESERVED (returns error 84h) | | | | | | | |
| 16386 | 16385 | 4001 | 1 | | Operations counter | | | | | Total value, may not be zeroed | 4 | Y |
| 16387 | 16386 | 4002 | 1 | | Maximum Number of Operations | | | | | Not configurable | 4 | Y |
| 16388 | 16387 | 4003 | 1 | | Breaker Features - Rated Current | | 1 | A | | | 4 | Y |
| 16389 | 16388 | 4004 | 1 | | Breaker Features - Device Type and number of Poles | | | | | | 4 | Y |
| | | | | 3÷0 | Poles: number | | | | 1÷4 | | 4 | Y |
| | | | | 4 | Poles: neutral position (left(1)/right(0)) | | | | | | 4 | Y |
| | | | | 7÷5 | RESERVED (returns "0") | | | | | | 4 | Y |
| | | | | 8 | Type of device: Isolating switch (0)/ Automatic (1) | | | | | | 4 | Y |
| | | | | 9 | Type of device: Repulsive Breaker (0)/Non Repulsive Breaker (1) | | | | | | 4 | Y |
| | | | | 15÷10 | RESERVED (returns "0") | | | | | | 4 | Y |
| 16390 | 16389 | 4005 | 1 | | Tripping Features - Breaking capacity | | 0,01 | kA | | | 4 | Y |
| 29185 | 29184 | 7200 | 30 | | Three-phase Electric Protection | | | | | | | |
| 29185 | 29184 | 7200 | 1 | | Overload P. relay (total) Tripped Counter (no phase indication) | | | | | | 4 | Y |
| 29186 | 29185 | 7201 | 1 | | Short circuit P. relay (total) Tripped Counter (no phase indication) | | | | | | 4 | Y |
| 29187 | 29186 | 7202 | 1 | | Device Protection Relay (total) Tripped Counter ("III element", no phase indications) | | | | | | 4 | Y |
| 29188 | 29187 | 7203 | 1 | | RESERVED (returns "8000h") | | | | | | | |
| 29189 | 29188 | 7204 | 1 | | Over-temperature P. Relay (total) Tripped Counter | | | | | | 4 | Y |
| 29190 | 29189 | 7205 | 1 | | Last Release data Buffer: "Tripped" type reading only bit reply | | | | | | 4 | |
| | | | | 0 | Overload P. Relay Tripped Reply | | | | | | 4 | |
| | | | | 1 | Short-circuit P. Relay Tripped Reply | | | | | | 4 | |
| | | | | 2 | Device Protection Relay Tripped Reply ("III element") | | | | | | 4 | |
| | | | | 3 | Earth Fault P. Relay Tripped Reply | | | | | | 4 | |
| | | | | 4 | Over-temperature P. Relay Tripped Reply | | | | | | 4 | |
| | | | | 5 | Differential Tripped Reply | | | | | | 4 | |
| | | | | 15÷6 | RESERVED (returns "0") | | | | | | 4 | |
| 29191 | 29190 | 7206 | 2 | | Last Release data Buffer: Interrupted current or temperature | | | mA, °C | | Expressed in "numeric coding" | 4 | |
| 29193 | 29192 | 7208 | 1 | | G1 - overload: levels | | | A/% | | Expressed in "numeric coding" | 4 | Y |
| 29194 | 29193 | 7209 | 1 | | G1 - overload: times | | | msec | | Expressed in "numeric coding" | 4 | Y |
| 29195 | 29194 | 720A | 1 | | G1 - overload: options | | | | | | 4 | Y |
| | | | | 0 | disabled(1)/active(0) | | | | | | 4 | Y |
| | | | | 1 | absolute value(1)/%In(0) | | | | | | 4 | Y |
| | | | | 4÷2 | I2t=k MEM OFF(001)/I2t=k MEM ON(000) | | | | | | 4 | Y |
| | | | | 7÷5 | RESERVED (returns "0") | | | | | | 4 | Y |
| | | | | 15÷8 | point of work, Ir multiple | | | | | | 4 | Y |
| 29196 | 29195 | 720B | 2 | | G1 - short circuit which may be delayed: levels | | | A/% | | Expressed in "numeric coding" | 4 | Y |
| 29198 | 29197 | 720D | 1 | | G1 - short circuit which may be delayed: times | | | msec | | Expressed in "numeric coding" | 4 | Y |
| 29199 | 29198 | 720E | 1 | | G1 - short circuit which may be delayed: options | | | | | | 4 | Y |
| | | | | 0 | Bit0=disabled(1)/active(0) | | | | | | 4 | Y |
| | | | | 1 | absolute value(1)/%Ir(0) | | | | | | 4 | Y |
| | | | | 4÷2 | curve t=k(001)/I2t=k(000) | | | | | | 4 | Y |
| | | | | 7÷5 | RESERVED (returns "0") | | | | | | 4 | Y |
| | | | | 15÷8 | Point of work for I2t curve, multiple of Ir | | | | | | 4 | Y |
| 29200 | 29199 | 720F | 4 | | RESERVED (returns "8000000h", "8000", "8000") | | | | | | | |
| 29204 | 29203 | 7213 | 2 | | G1 - device protection: levels | | | A/% | | Expressed in "numeric coding" | 4 | Y |
| 29206 | 29205 | 7215 | 1 | | G1 - device protection: times | | | msec | | Expressed in "numeric coding" | 4 | Y |
| 29207 | 29206 | 7216 | 1 | | G1 - device protection: options | | | | | | 4 | Y |
| | | | | 0 | disabled(1)/active(0) | | | | | | 4 | Y |
| | | | | 1 | absolute value(1)/%In(0) | | | | | | 4 | Y |
| | | | | 15÷2 | RESERVED (returns "0") | | | | | | 4 | Y |
| 29208 | 29207 | 7217 | 5 | | RESERVED (all return "8000h") | | | | | | | |
| 29213 | 29212 | 721C | 1 | | G1 - over-temperature protection: levels | | | °C | | Expressed in "numeric coding" | 4 | Y |
| 29214 | 29213 | 721D | 1 | | G1 - over-temperature protection: times | | | msec | | Expressed in "numeric coding" | 4 | Y |
| 20481 | 20480 | 5000 | 58 | | 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) | 4 | |
| 20482 | 20481 | 5001 | 1 | | Phase 2 Current Value (S) | unsigned integer | | A | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 4 | |
| 20483 | 20482 | 5002 | 1 | | Phase 3 Current Value (T) | unsigned integer | | A | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 4 | |
| 20484 | 20483 | 5003 | 14 | | RESERVED (all return "8000h") | unsigned integer | | | | | | |
| 20498 | 20497 | 5011 | 1 | | 1-2 Voltage | unsigned integer | | V | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 4 | |
| 20499 | 20498 | 5012 | 1 | | 1-3 Voltage | unsigned integer | | V | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 4 | |



| | | | | | | | | | | | | |
|--------------|--------------|-------------|----------|--|---|------------------|------|-------|--|--|---|---|
| 20500 | 20499 | 5013 | 1 | | 2-3 Voltage | unsigned integer | | V | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 4 | |
| 20501 | 20500 | 5014 | 12 | | <i>RESERVED (all return "8000h")</i> | | | | | | | |
| 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 | 1 | | Phase 2 (S) THD Current vs. fundamental | unsigned integer | | % | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 4 | |
| 20515 | 20514 | 5022 | 1 | | Phase 3 (T) THD Current vs. fundamental | unsigned integer | | % | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 4 | |
| 20516 | 20515 | 5023 | 4 | | <i>RESERVED (all return "8000h")</i> | | | | | | | |
| 20520 | 20519 | 5027 | 1 | | 1-2 Voltage THD vs. fundamental | unsigned integer | | % | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 4 | |
| 20521 | 20520 | 5028 | 1 | | 1-3 Voltage THD vs. fundamental | unsigned integer | | % | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 4 | |
| 20522 | 20521 | 5029 | 1 | | 2-3 Voltage THD vs. fundamental | unsigned integer | | % | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 4 | |
| 20523 | 20522 | 502A | 1 | | Three-phase Active Power | signed integer | | kW | | Expressed in "numeric coding"; with mark (more significant bit = mark) | 4 | |
| 20524 | 20523 | 502B | 1 | | Three-phase reactive power | signed integer | | kvar | | Expressed in "numeric coding"; with mark (more significant bit = mark) | 4 | |
| 20525 | 20524 | 502C | 3 | | <i>RESERVED (all return "8000h")</i> | | | | | | | |
| 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 | | <i>RESERVED (returns "8000h")</i> | | | | | | | |
| 20530 | 20529 | 5031 | 1 | | Three-phase frequency | signed integer | | Hz | | Expressed in "numeric coding"; with mark (more significant bit = mark) | 4 | |
| 20531 | 20530 | 5032 | 2 | | <i>RESERVED (returns "80000000h")</i> | | | | | | | |
| 20533 | 20532 | 5034 | 2 | | Positive Three-phase Active Energy | unsigned integer | | kWh | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 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) | 4 | Y |
| 20537 | 20536 | 5038 | 2 | | <i>RESERVED (returns "80000000h")</i> | | | | | | | |
| 20539 | 20538 | 503A | 2 | | Positive Three-phase Reactive Energy | unsigned integer | | kvarh | | Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 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) | 4 | Y |
| 32769 | 32768 | 8000 | 1 | | Single-channel Thermal Measurement | | | | | | | |
| 32769 | 32768 | 8000 | 1 | | Sensor 1 Temperature Value | signed integer | | °C | | Expressed in "numeric coding" | 4 | |

| 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 |
|-----------------|------------------------|------------------------|------------------|--------------|----------------------------------|------|-------|------|-------|------|---------------------------|----------------------------|--------------|
| | | | | | (no HOLDING REGISTERS available) | | | | | | | | |