

**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  | 1                        | 5                      | State of Breaker                   | 51 02            | 10                     | 100                 |
| 20480   | 5000  | 1                        | 5                      | Three-phase Electric Measurement   | 71 03            | 20                     | 100                 |
| 29184   | 7200  | 1                        | 5                      | Three-phase Electric Protection    | 73 03            | 10                     | 100                 |
| 32768   | 8000  | 1                        | 5                      | Single-channel Thermal Measurement | 81 00            | 10                     | 100                 |

**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 (9600, 38400, 115200) | 8         | Least significant bit first    | no     | 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

| Register Number | Register Address (Dec) | Register Address (Hex) | Dimension [bit] | Description  |
|-----------------|------------------------|------------------------|-----------------|--|
| <b>16385</b>    | <b>16384</b>           | <b>4000</b>            | <b>3</b>        | <b>State of Breaker</b>  |
| 16385           | 16384                  | 4000                   | 1               | Open   |
| 16386           | 16385                  | 4001                   | 1               | Closed   |
| 16387           | 16386                  | 4002                   | 1               | Tripped  |
| <b>29185</b>    | <b>29184</b>           | <b>7200</b>            | <b>13</b>       | <b>Three-phase Electric Protection</b>   |
| 29185           | 29184                  | 7200                   | 1               | Overload pre-alarm (threshold I1)  |
| 29186           | 29185                  | 7201                   | 1               | Overload pre-alarm (>threshold I2)   |
| 29187           | 29186                  | 7202                   | 1               | Over-temperature alarm (>threshold T)  |
| 29188           | 29187                  | 7203                   | 1               | RESERVED (returns "0")   |
| 29189           | 29188                  | 7204                   | 1               | Overload P. Relay Tripped (no phase indication)  |
| 29190           | 29189                  | 7205                   | 1               | Short circuit P. Relay Tripped (no phase indication)   |
| 29191           | 29190                  | 7206                   | 1               | Device Protection Relay Tripped ("III element", no phase indications)                          |
| 29192           | 29191                  | 7207                   | 1               | Earth Fault Tripped  |
| 29193           | 29192                  | 7208                   | 1               | Over-temperature P. Relay tripped  |
| 29194           | 29193                  | 7209                   | 1               | Warning Neutral protection disabled (0 = no warning, 1 = warning on - Neutral = not protected) |
| 29195           | 29194                  | 720A                   | 1               | Warning Neutral protection reduced (0 = no warning, 1 = warning on - Neutral = 50%)            |
| 29196           | 29195                  | 720B                   | 1               | Warning Instantaneous Shortcircuit protection (0 = no warning, 1 = warning on - Ii = Icw)      |
| 29197           | 29196                  | 720C                   | 1               | Warning Ground fault disabled (0 = no warning, 1 = warning on - Iq = OFF)                      |

| Note  | Read Function Codes (Dec) | Data Storing |
|---|---------------------------|--------------|
| The information reported here "self-resets" when the condition that generated it ends.  | 2                         |              |
| The information reported here "self-resets" when the condition that generated it ends.  | 2                         |              |
| The information reported here "self-resets" when the condition that generated it ends.  | 2                         |              |
| The information reported here "self-resets" when the condition that generated it ends..   | 2                         |              |
| The information reported here "self-resets" when the condition that generated it ends..   | 2                         |              |
| The information reported here "self-resets" when the condition that generated it ends..   | 2                         |              |
| The information reported here "self-resets" when the condition that generated it ends..   | 2                         |              |
| The information reported here is maintained even when the condition that generated it ends. The "restore" conditions can be (equivalent, in alternative):<br><ul style="list-style-type: none"> <li>the detection of the device in Closed state</li> <li>the detection of a minimum current value on the phases.</li> </ul> The presence of Switch State Functionality is therefore NOT binding (Example: if the switch goes back to Open => the <u>Tripped Relay signal must be maintained up until the reset condition intervenes</u> ) | 2                         | Y            |
| The information reported here is maintained even when the condition that generated it ends. The "restore" conditions can be (equivalent, in alternative):<br><ul style="list-style-type: none"> <li>the detection of the device in Closed state</li> <li>the detection of a minimum current value on the phases.</li> </ul> The presence of Switch State Functionality is therefore NOT binding (Example: if the switch goes back to Open => the <u>Tripped Relay signal must be maintained up until the reset condition intervenes</u> ) | 2                         | Y            |
| The information reported here is maintained even when the condition that generated it ends. The "restore" conditions can be (equivalent, in alternative):<br><ul style="list-style-type: none"> <li>the detection of the device in Closed state</li> <li>the detection of a minimum current value on the phases.</li> </ul> The presence of Switch State Functionality is therefore NOT binding (Example: if the switch goes back to Open => the <u>Tripped Relay signal must be maintained up until the reset condition intervenes</u> ) | 2                         | Y            |
| The information reported here is maintained even when the condition that generated it ends. The "restore" conditions can be (equivalent, in alternative):<br><ul style="list-style-type: none"> <li>the detection of the device in Closed state</li> <li>the detection of a minimum current value on the phases.</li> </ul> The presence of Switch State Functionality is therefore NOT binding (Example: if the switch goes back to Open => the <u>Tripped Relay signal must be maintained up until the reset condition intervenes</u> ) | 2                         | Y            |
| The information reported here "self-resets" when the condition that generated it ends.  | 2                         |              |
| The information reported here "self-resets" when the condition that generated it ends.  | 2                         |              |
| The information reported here "self-resets" when the condition that generated it ends.  | 2                         |              |
| The information reported here "self-resets" when the condition that generated it ends.  | 2                         |              |

| 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 |
|-----------------|------------------------|------------------------|------------------|--------------|---|------------------|-------|--------|-------|
| <b>16385</b>    | <b>16384</b>           | <b>4000</b>            | <b>6</b>         |              | <b>State of Breaker</b>   |                  |       |        |       |
| 16385           | 16384                  | 4000                   | 1                |              | RESERVED (returns error 84h)  |                  |       |        |       |
| 16386           | 16385                  | 4001                   | 1                |              | Operations counter  |                  | 1     |        |       |
| 16387           | 16386                  | 4002                   | 1                |              | RESERVED (return "8000h")   |                  |       |        |       |
| 16388           | 16387                  | 4003                   | 1                |              | Breaker Features - Rated Current  |                  | 1     | A      |       |
| 16389           | 16388                  | 4004                   | 1                |              | Breaker Features - Device Type and number of Poles                                    |                  |       |        |       |
|                 |                        |                        |                  | 3..0         | Poles: number   |                  |       |        |       |
|                 |                        |                        |                  | 4            | Poles: neutral position (left(1)/right(0))  |                  |       |        |       |
|                 |                        |                        |                  | 7..5         | RESERVED (returns "0")  |                  |       |        |       |
|                 |                        |                        |                  | 8            | Type of device: Isolating switch (0)/ Automatic (1)                                   |                  |       |        |       |
|                 |                        |                        |                  | 9            | Type of device: Repulsive Breaker (0)/Non Repulsive Breaker (1)                       |                  |       |        |       |
|                 |                        |                        |                  | 15..10       | RESERVED (returns "0")  |                  |       |        |       |
| 16390           | 16389                  | 4005                   | 1                |              | Tripping Features - Breaking capacity   |                  | 0,01  | kA     |       |
| <b>20481</b>    | <b>20480</b>           | <b>5000</b>            | <b>5</b>         |              | <b>Three-phase Electric Measurement</b>   |                  |       |        |       |
| 20481           | 20480                  | 5000                   | 1                |              | Phase 1 current value (R)   | unsigned integer |       | A      |       |
| 20482           | 20481                  | 5001                   | 1                |              | Phase 2 current value (S)   | unsigned integer |       | A      |       |
| 20483           | 20482                  | 5002                   | 1                |              | Phase 3 current value (T)   | unsigned integer |       | A      |       |
| 20484           | 20483                  | 5003                   | 1                |              | Neutral current value   | unsigned integer |       | A      |       |
| 20485           | 20484                  | 5004                   | 1                |              | Earth current value   | unsigned integer |       | A      |       |
| <b>29185</b>    | <b>29184</b>           | <b>7200</b>            | <b>29</b>        |              | <b>Three-phase Electric Protection</b>  |                  |       |        |       |
| 29185           | 29184                  | 7200                   | 1                |              | Overload P. relay (total) Tripped Counter (no phase indication)                       |                  |       |        |       |
| 29186           | 29185                  | 7201                   | 1                |              | Short circuit P. relay (total) Tripped Counter (no phase indication)                  |                  |       |        |       |
| 29187           | 29186                  | 7202                   | 1                |              | Device Protection Relay (total) Tripped Counter ("III element", no phase indications) |                  |       |        |       |
| 29188           | 29187                  | 7203                   | 1                |              | Earth Fault P. Relay (total) Tripped Counter  |                  |       |        |       |
| 29189           | 29188                  | 7204                   | 1                |              | Over-temperature P. Relay (total) Tripped Counter                                     |                  |       |        |       |
| 29190           | 29189                  | 7205                   | 2                |              | Last Release data Buffer: Interrupted current or temperature                          |                  |       | mA, °C |       |
| 29192           | 29191                  | 7207                   | 1                |              | Last Release data Buffer: "Tripped" type reading only bit reply                       |                  |       |        |       |
|                 |                        |                        |                  | 0            | Overload P. Relay Tripped Reply   |                  |       |        |       |
|                 |                        |                        |                  | 1            | Short-circuit P. Relay Tripped Reply  |                  |       |        |       |
|                 |                        |                        |                  | 2            | Device Protection Relay Tripped Reply ("III element")                                 |                  |       |        |       |
|                 |                        |                        |                  | 3            | Earth Fault P. Relay Tripped Reply  |                  |       |        |       |
|                 |                        |                        |                  | 4            | Over-temperature P. Relay Tripped Reply   |                  |       |        |       |
|                 |                        |                        |                  | 15..5        | RESERVED (returns "0")  |                  |       |        |       |
| 29193           | 29192                  | 7208                   | 1                |              | G1 - overload: levels   |                  |       | A/%    |       |
| 29194           | 29193                  | 7209                   | 1                |              | G1 - overload: times  |                  |       | msec   |       |
| 29195           | 29194                  | 720A                   | 1                |              | G1 - overload: options  |                  |       |        |       |
|                 |                        |                        |                  | 0            | RESERVED (returns "0")  |                  |       |        |       |
|                 |                        |                        |                  | 1            | absolute value(1)/%In(0)  |                  |       |        |       |
|                 |                        |                        |                  | 4..2         | I2t=k MEM OFF(001)/I2t=k MEM ON(000)  |                  |       |        |       |
|                 |                        |                        |                  | 7..5         | RESERVED (returns "0")  |                  |       |        |       |
|                 |                        |                        |                  | 15..8        | point of work, Ir multiple  |                  |       |        |       |
| 29196           | 29195                  | 720B                   | 2                |              | G1 - short circuit which may be delayed: levels                                       |                  |       | A/%    |       |
| 29198           | 29197                  | 720D                   | 1                |              | G1 - short circuit which may be delayed: times  |                  |       | msec   |       |
| 29199           | 29198                  | 720E                   | 1                |              | G1 - short circuit which may be delayed: options                                      |                  |       |        |       |
|                 |                        |                        |                  | 0            | RISERVATO (restituisce valore fisso)  |                  |       |        |       |
|                 |                        |                        |                  | 1            | absolute value(1)/%Ir(0)  |                  |       |        |       |
|                 |                        |                        |                  | 4..2         | curve t=k(001)/I2t=k(000)   |                  |       |        |       |
|                 |                        |                        |                  | 7..5         | RESERVED (returns "0")  |                  |       |        |       |
|                 |                        |                        |                  | 15..8        | Point of work for I2t curve, multiple of Ir)  |                  |       |        |       |
| 29200           | 29199                  | 720F                   | 2                |              | G1 - short circuit instantaneous: level   |                  |       | A      |       |
| 29202           | 29201                  | 7211                   | 1                |              | G1 - short circuit instantaneous: times   |                  |       | msec   |       |
| 29203           | 29202                  | 7212                   | 1                |              | G1 - short circuit instantaneous: options   |                  |       |        |       |
|                 |                        |                        |                  | 0            | RESERVED (returns "0")  |                  |       |        |       |
|                 |                        |                        |                  | 1            | measure unity (0=%, 1=A)  |                  |       |        |       |
|                 |                        |                        |                  | 15..2        | RESERVED (returns "0")  |                  |       |        |       |
| 29204           | 29203                  | 7213                   | 2                |              | G1 - device protection: levels  |                  |       | A/%    |       |
| 29206           | 29205                  | 7215                   | 1                |              | G1 - device protection: times   |                  |       | msec   |       |
| 29207           | 29206                  | 7216                   | 1                |              | G1 - device protection: options   |                  |       |        |       |
|                 |                        |                        |                  | 0            | RESERVED (returns "0")  |                  |       |        |       |
|                 |                        |                        |                  | 1            | absolute value(1)/%In(0)  |                  |       |        |       |
|                 |                        |                        |                  | 15..2        | RESERVED (returns "0")  |                  |       |        |       |
| 29208           | 29207                  | 7217                   | 1                |              | G1 - earth: levels  |                  |       | A/%    |       |
| 29209           | 29208                  | 7218                   | 1                |              | G1 - earth: times   |                  |       | msec   |       |
| 29210           | 29209                  | 7219                   | 1                |              | G1 - earth: options   |                  |       |        |       |
|                 |                        |                        |                  | 0            | disabled(1)/active(0)   |                  |       |        |       |



|              |              |             |          |       |   |                |  |    |  |
|--------------|--------------|-------------|----------|-------|---|----------------|--|----|--|
|              |              |             |          | 1     | absolute value(1)/%In(0)                    |                |  |    |  |
|              |              |             |          | 4..2  | curve t=k(001)/I2t=k(000)                   |                |  |    |  |
|              |              |             |          | 7..5  | RESERVED (returns "0")                      |                |  |    |  |
|              |              |             |          | 15..8 | Point of work for I2t curve, multiple of Iq |                |  |    |  |
| 29211        | 29210        | 721A        | 1        |       | G1 – neutral protection: levels             |                |  | %  |  |
| 29212        | 29211        | 721B        | 1        |       | G1 – neutral protection: options            |                |  |    |  |
|              |              |             |          | 0     | disabled(1)/active(0)                       |                |  |    |  |
|              |              |             |          | 15..1 | RESERVED (returns "0")                      |                |  |    |  |
| 29213        | 29212        | 721C        | 1        |       | G1 – over-temperature protection: levels    |                |  | °C |  |
| <b>32769</b> | <b>32768</b> | <b>8000</b> | <b>1</b> |       | <b>Single-channel Thermal Measurement</b>   |                |  |    |  |
| 32769        | 32768        | 8000        | 1        |       | Sensor 1 Temperature Value                  | signed integer |  | °C |  |

| Note   | Read Function Code (Dec) | Data Storing |
|--|--------------------------|--------------|
|  |                          |              |
| Total value, may not be zeroed   | 4                        | Y            |
|  | 4                        | Y            |
|  | 4                        | Y            |
|  |                          |              |
|  |                          |              |
|  |                          |              |
|  | 4                        | Y            |
| Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 4                        |              |
| Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 4                        |              |
| Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 4                        |              |
| Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 4                        |              |
| Expressed on "numeric coding"; without mark (fixed more significant bit = 0) | 4                        |              |
|  | 4                        | Y            |
|  | 4                        | Y            |
|  | 4                        | Y            |
|  | 4                        | Y            |
|  | 4                        | Y            |
| Expressed in "numeric coding"  | 4                        | Y            |
|  | 4                        | Y            |
|  |                          |              |
|  |                          |              |
| Expressed in "numeric coding"  | 4                        | Y            |
| Expressed in "numeric coding"  | 4                        | Y            |
|  | 4                        | Y            |
|  |                          |              |
|  |                          |              |
| Expressed in "numeric coding"  | 4                        | Y            |
| Expressed in "numeric coding"  | 4                        | Y            |
|  | 4                        | Y            |
|  |                          |              |
|  |                          |              |
|  | 4                        | Y            |
|  | 4                        | Y            |
|  | 4                        | Y            |
|  |                          |              |
| Expressed in "numeric coding"  | 4                        | Y            |
| Expressed in "numeric coding"  | 4                        | Y            |
|  | 4                        | Y            |
|  |                          |              |
|  |                          |              |
| Expressed in "numeric coding"  | 4                        | Y            |
|  | 4                        | Y            |
|  | 4                        | Y            |
|  | 4                        | Y            |



|                               |   |   |
|-------------------------------|---|---|
|                               | 4 | Y |
|                               | 4 | Y |
|                               | 4 | Y |
|                               | 4 | Y |
| Expressed in "numeric coding" | 4 | Y |
|                               | 4 | Y |
|                               |   |   |
|                               |   |   |
| Expressed in "numeric coding" | 4 | Y |
|                               |   |   |
| 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) |      |       |      |       |      |                           |                            |              |