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	

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

- 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	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**	**13**	**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")*		2	
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): • 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): • 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): • 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	Earth Fault Tripped	The information reported here is maintained even when the condition that generated it ends. The "restore" conditions can be (equivalent, in alternative): • 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
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): • 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
29194	29193	7209	1	Warning Neutral protection disabled (0 = no warning, 1 = warning on - Neutral = not protected)	The information reported here "self-resets" when the condition that generated it ends.	2	
29195	29194	720A	1	Warning Neutral protection reduced (0 = no warning, 1 = warning on - Neutral = 50%)	The information reported here "self-resets" when the condition that generated it ends.	2	
29196	29195	720B	1	Warning Instantaneaus Shortcircuit protection (0 = no warning, 1 = warning on - Ii = Icw)	The information reported here "self-resets" when the condition that generated it ends.	2	
29197	29196	720C	1	Warning Ground fault disabled (0 = no warning, 1 = warning on - Ig = OFF)	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	Note	Read Function Code (Dec)	Data Storing
16385	**16384**	**4000**	**6**		**State of Breaker**							
16385	*16384*	*4000*	*1*		*RESERVED (returns error 84h)*							
16386	16385	4001	1		Operations counter		1			Total value, may not be zeroed	4	Y
16387	16386	4002	1		*RESERVED (return "8000h")*							
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							
				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			4	Y
20481	**20480**	**5000**	**70**		**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	1		Neutral current value	unsigned integer		A		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	
20485	20484	5004	1		Earth current value	unsigned integer		A		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	
20486	20485	5005	1		Differential current value	unsigned integer		mA		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	
20487	*20486*	*5006*	*3*		*RESERVED (return "8000h")*							
20490	20489	5009	1		1-N Voltage	unsigned integer		V		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	
20491	20490	500A	1		2-N Voltage	unsigned integer		V		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	
20492	20491	500B	1		3-N Voltage	unsigned integer		V		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	
20493	20492	500C	1		1-2 Voltage	unsigned integer		V		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	
20494	20493	500D	1		1-3 Voltage	unsigned integer		V		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	
20495	20494	500E	1		2-3 Voltage	unsigned integer		V		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	
20496	*20495*	*500F*	*4*		*RESERVED (return "8000h")*			*V*			*4*	
20500	20499	5013	1		Three-phase active power	signed integer		kW		Expressed in "numeric coding"; with mark (more significant bit = mark)	4	
20501	20500	5014	1		Three-phase reactive power	signed integer		kvar		Expressed in "numeric coding"; with mark (more significant bit = mark)	4	
20502	20501	5015	1		Three-phase apparent power	signed integer		kVA		Expressed in "numeric coding"; with mark (more significant bit = mark)	4	
20503	20502	5016	1		Three-phase power factor (PF)	signed integer	0,01			Expressed in "numeric coding"; with mark (more significant bit = mark)	4	
20504	20503	5017	1		Three-phase frequency	signed integer		Hz		Expressed in "numeric coding"; with mark (more significant bit = mark)	4	
20505	20504	5018	2		Positive three-phase active energy	unsigned integer		kWh		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	Y
20507	20506	501A	2		Negative three-phase active energy	unsigned integer		kWh		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	Y
20509	20508	501C	2		Positive three-phase reactive energy	unsigned integer		kvarh		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	Y
20511	20510	501E	2		Negative three-phase reactive energy	unsigned integer		kvarh		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	Y
20513	*20512*	*5020*	*2*		*RESERVED (return "8000h")*							
20515	20514	5022	1		Phase 1 active power (R)	signed integer		kW		Expressed in "numeric coding"; with mark (more significant bit = mark)	4	
20516	20515	5023	1		Phase 2 active power (S)	signed integer		kW		Expressed in "numeric coding"; with mark (more significant bit = mark)	4	
20517	20516	5024	1		Phase 3 active power (T)	signed integer		kW		Expressed in "numeric coding"; with mark (more significant bit = mark)	4	
20518	20517	5025	1		Phase 1 reactive power (R)	signed integer		kvar		Expressed in "numeric coding"; with mark (more significant bit = mark)	4	
20519	20518	5026	1		Phase 2 reactive power (S)	signed integer		kvar		Expressed in "numeric coding"; with mark (more significant bit = mark)	4	
20520	20519	5027	1		Phase 3 reactive power (T)	signed integer		kvar		Expressed in "numeric coding"; with mark (more significant bit = mark)	4	
20521	20520	5028	1		Phase 1 apparent power (R)	signed integer		kVA		Expressed in "numeric coding"; with mark (more significant bit = mark)	4	
20522	20521	5029	1		Phase 2 apparent power (S)	signed integer		kVA		Expressed in "numeric coding"; with mark (more significant bit = mark)	4	
20523	20522	502A	1		Phase 3 apparent power (T)	signed integer		kVA		Expressed in "numeric coding"; with mark (more significant bit = mark)	4	
20524	20523	502B	1		Phase 1 power factor (PF)	signed integer	0,01			Expressed in "numeric coding"; with mark (more significant bit = mark)	4	
20525	20524	502C	1		Phase 2 power factor (PF)	signed integer	0,01			Expressed in "numeric coding"; with mark (more significant bit = mark)	4	
20526	20525	502D	1		Phase 3 power factor (PF)	signed integer	0,01			Expressed in "numeric coding"; with mark (more significant bit = mark)	4	
20527	20526	502E	2		Positive phase 1 active energy (R)	unsigned integer		kWh		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	Y
20529	20528	5030	2		Positive phase 2 active energy (S)	unsigned integer		kWh		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	Y
20531	20530	5032	2		Positive phase 3 active energy (T)	unsigned integer		kWh		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	Y
20533	20532	5034	2		Negative phase 1 active energy (R)	unsigned integer		kWh		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	Y
20535	20534	5036	2		Negative phase 2 active energy (S)	unsigned integer		kWh		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	Y
20537	20536	5038	2		Negative phase 3 active energy (T)	unsigned integer		kWh		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	Y
20539	20538	503A	2		Positive phase 1 reactive energy (R)	unsigned integer		kvarh		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	Y
20541	20540	503C	2		Positive phase 2 reactive energy (S)	unsigned integer		kvarh		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	Y
20543	20542	503E	2		Positive phase 3 reactive energy (T)	unsigned integer		kvarh		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	Y
20545	20544	5040	2		Negative phase 1 reactive energy (R)	unsigned integer		kvarh		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	Y
20547	20546	5042	2		Negative phase 2 reactive energy (S)	unsigned integer		kvarh		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	Y
20549	20548	5044	2		Negative phase 3 reactive energy (T)	unsigned integer		kvarh		Expressed on "numeric coding"; without mark (fixed more significant bit = 0)	4	Y
29185	**29184**	**7200**	**29**		**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		Earth Fault P. Relay (total) Tripped Counter						4	Y
29189	29188	7204	1		Over-temperature P. Relay (total) Tripped Counter						4	Y
29190	29189	7205	2		Last Release data Buffer: Interrupted current or temperature			mA, °C		Expressed in "numeric coding"	4	Y
29192	29191	7207	1		Last Release data Buffer: "Tripped" type reading only bit reply						4	Y
				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/%		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	*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/%		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	*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 instantanous: level			A			4	Y
29202	29201	7211	1		G1 - short circuit instantanous: times			msec			4	Y
29203	29202	7212	1		G1 - short circuit instantanous: options						4	Y
				0	*RESERVED (returns "0")*							
				1	measure unity (0=%, 1=A)							
				15..2	*RESERVED (returns "0")*							
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	*RESERVED (returns "0")*							
				1	absolute value(1)/%In(0)							
				15..2	*RESERVED (returns "0")*							
29208	29207	7217	1		G1 – earth: levels			A/%		Expressed in "numeric coding"	4	Y
29209	29208	7218	1		G1 – earth: times			msec			4	Y
29210	29209	7219	1		G1 – earth: options						4	Y
				0	disabled(1)/active(0)						4	Y
				1	absolute value(1)/%In(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 Ig						4	Y
29211	29210	721A	1		G1 – neutral protection: levels			%		Expressed in "numeric coding"	4	Y
29212	29211	721B	1		G1 – neutral protection: options						4	Y
				0	disabled(1)/active(0)							
				15..1	*RESERVED (returns "0")*							
29213	29212	721C	1		G1 – over-temperature protection: levels			°C		Expressed in "numeric coding"	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 availables)								