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)
0	0	01	19	Modbus settings	00 01	10	01 00
4096	1000	01	19	External input	10 00	10	01 00
20480	5000	01	19	Three-phase Electric Measurement	71 03	40	01 00
20480	5000	01	19	Measure configuration	71 03	40	01 00
29696	7400	01	19	Pulse measurement	74 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)
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÷255	programmable (4800, 9600, 19200, 38400)	8	Least significant bit first	programmable (NONE, EVEN, ODD)	1

MASTER/SLAVE COMMUNICATION TIMING

Timer Description	Timer Value (msec)
Inter-character time-out	< 1,5 character times
Response delay (from master request)	programmable (0 ÷ 99 ms)
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
4097	**4096**	**1000**	**1**	**External input**			
4097	4096	1000	1	Current active tariff	*See Note 1*	2	

Note 1
0: Tariff 1 1: Tariff 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)
20481	**20480**	**5000**	**262**		**Three-phase Electric Measurement**						
20481	20480	5000	2		Phase 1 Current Value (R)	unsigned integer	1	mA		*See Note 1*	4
20483	20482	5002	2		Phase 2 Current Value (S)	unsigned integer	1	mA		*See Note 1*	4
20485	20484	5004	2		Phase 3 Current Value (T)	unsigned integer	1	mA		*See Note 1*	4
20487	20486	5006	2		Neutral Current Value	unsigned integer	1	mA		*See Note 1*	4
20489	20488	5008	4		*RESERVED (all return "8000h")*						
20493	20492	500C	2		Medium value Im=(R+sec.+T)/3	unsigned integer	1	mA		*See Note 1*	4
20495	20494	500E	4		*RESERVED (all return "8000h")*						
20499	20498	5012	2		*Medium thermal value 1 (R)*	unsigned integer	1	mA		*See Note 1*	4
20501	20500	5014	2		*Medium thermal value 2 (S)*	unsigned integer	1	mA		*See Note 1*	5
20503	20502	5016	2		*Medium thermal value 3 (T)*	unsigned integer	1	mA		*See Note 1*	6
20505	20504	5018	5		*RESERVED (all return "8000h")*						
20510	20509	501D	2		1-N Voltage	unsigned integer	1	mV		*See Note 1*	4
20512	20511	501F	2		2-N Voltage	unsigned integer	1	mV		*See Note 1*	4
20514	20513	5021	2		3-N Voltage	unsigned integer	1	mV		*See Note 1*	4
20516	20515	5023	2		1-2 Voltage	unsigned integer	1	mV		*See Note 1*	4
20518	20517	5025	2		2-3 Voltage	unsigned integer	1	mV		*See Note 1*	4
20520	20519	5027	2		3-1 Voltage	unsigned integer	1	mV		*See Note 1*	4
20522	20521	5029	16		*RESERVED (all return "8000h")*						
20538	20537	5039	1		Three-phase frequency	unsigned integer	0.01	Hz		*See Note 1*	4
20539	20538	503A	2		Three-phase Active Power	signed integer				*See Notes 2 and 6*	4
20541	20540	503C	2		Three-phase reactive power	signed integer				*See Notes 2 and 6*	4
20543	20542	503E	2		*RESERVED (all return "8000h")*						
20545	20544	5040	2		Threee-Phase Apparent Power	signed integer				*See Notes 1 and 6*	4
20547	20546	5042	2		Three-phase Power Distortion	signed integer				*See Notes 2 and 6*	4
20549	20548	5044	1		Three-phase Power Factor (PF)	signed integer	0.001			*See Note 2*	4
20550	20549	5045	1		*RESERVED (all return "8000h")*						
20551	20550	5046	1		Power Factor Sector	unsigned integer				*See Note 5*	4
20552	20551	5047	2		Phase 1 Active Power	signed integer				*See Notes 2 and 6*	4
20554	20553	5049	2		Phase 2 Active Power	signed integer				*See Notes 2 and 6*	4
20556	20555	504B	2		Phase 3 Active Power	signed integer				*See Notes 2 and 6*	4
20558	20557	504D	2		Phase 1 Reactive power	signed integer				*See Notes 2 and 6*	4
20560	20559	504F	2		Phase 2 Reactive power	signed integer				*See Notes 2 and 6*	4
20562	20561	5051	2		Phase 3 Reactive power	signed integer				*See Notes 2 and 6*	4
20564	20563	5053	6		*RESERVED (returns "8000h")*						
20570	20569	5059	2		Phase 1 Apparent Power	unsigned integer				*See Notes 1 and 6*	4
20572	20571	505B	2		Phase 2 Apparent Power	unsigned integer				*See Notes 1 and 6*	4
20574	20573	505D	2		Phase 3 Apparent Power	unsigned integer				*See Notes 1 and 6*	4
20576	20575	505F	6		*RESERVED (returns "8000h")*						
20582	20581	5065	1		Power Factor Phase 1 (R)	signed integer	0.001			*See Note 2*	4
20583	20582	5066	1		Power Factor Phase 2 (S)	signed integer	0.001			*See Note 2*	4
20584	20583	5067	1		Power Factor Phase 3 (T)	signed integer	0.001			*See Note 2*	4
20585	20584	5068	3		*RESERVED (returns "8000h")*						
20588	20587	506B	1		Power Factor Sector Phase 1 (R)	unsigned integer				*See Note 5*	4

20589	20588	506C	1		Power Factor Sector Phase 2 (S)	unsigned integer				*See Note 5*	4
20590	20589	506D	1		Power Factor Sector Phase 3 (T)	unsigned integer				*See Note 5*	4
20591	20590	506E	2		*RESERVED (returns "8000h")*						
20593	20592	5070	2		Positive Three-phase Active Energy	unsigned integer				*See Notes 1 and 7*	4
20595	20594	5072	2		Negative Three-phase Active Energy	unsigned integer				*See Notes 1 and 7*	4
20597	20596	5074	2		*RESERVED (returns "8000h")*						
20599	20598	5076	2		Positive Three-phase Reactive Energy	unsigned integer				*See Notes 1 and 7*	4
20601	20600	5078	2		Negative Three-phase Reactive Energy	unsigned integer				*See Notes 1 and 7*	4
20603	20602	507A	2		*RESERVED (returns "8000h")*						
20605	20604	507C	2		Positive Three-phase Active Energy (Tariff 1)	unsigned integer				*See Notes 1 and 7*	4
20607	20606	507E	6		*RESERVED (returns "8000h")*						
20613	20612	5084	2		Positive Three-phase Active Energy (Tariff 2)	unsigned integer				*See Notes 1 and 7*	4
20615	20614	5086	92		*RESERVED (returns "8000h")*						
20707	20706	50E2	1		THD Phase 1 (R) vs. fundamental	unsigned integer	0.1	%		*See Note 1*	4
20708	20707	50E3	1		THD Phase 2 (S) vs. fundamental	unsigned integer	0.1	%		*See Note 1*	4
20709	20708	50E4	1		THD Phase 3 (T) vs. fundamental	unsigned integer	0.1	%		*See Note 1*	4
20710	20709	50E5	1		*RESERVED (returns "8000h")*						
20711	20710	50E6	1		THD Voltage 1-N vs. fundamental	unsigned integer	0.1	%		*See Note 1*	4
20712	20711	50E7	1		THD Voltage 2-N vs. fundamental	unsigned integer	0.1	%		*See Note 1*	4
20713	20712	50E8	1		THD Voltage 3-N vs. fundamental	unsigned integer	0.1	%		*See Note 1*	4
20714	20713	50E9	25		*RESERVED (returns "8000h")*						
20739	20738	5102	1		Wrap round total positive active energy	unsigned integer	1			*See Note 1*	4
20740	20739	5103	1		Wrap round total positive reactive energy	unsigned integer	1			*See Note 1*	4
20741	20740	5104	1		Wrap round total negative active energy	unsigned integer	1			*See Note 1*	4
20742	20741	5105	1		Wrap round total negative reactive energy	unsigned integer	1			*See Note 1*	4

Note 1

Expressed on "numeric coding"; without mark (fixed more significant bit = 0);

Note 2

Expressed in "numeric coding"; with mark (more significant bit = mark);

Note 3

Expressed on "numeric coding"; without mark (fixed more significant bit = 0);
Only with 3N-3E

Note 4

Expressed on "numeric coding"; without mark (fixed more significant bit = 0);
Only with 3-3E or 3-2E

Note 5

0: power factor = 1
1: inductive
2: capacitive

Note 6

Transformer ratio	Measurement unit	Scale
KTA*KTV < 5000	W/var/VA	0.01
KTA*KTV ≥ 5000	kW/kvar/kVA	0.01

Note 7

Transformer ratio	Measurement unit	Scale
1 ≤ KTA*KTV < 10	kWh/kvarh	0.01
10 ≤ KTA*KTV < 100	kWh/kvarh	0.1
100 ≤ KTA*KTV < 1000	kWh/kvarh	1
1000 ≤ KTA*KTV < 10000	MWh/Mvarh	0.01
10000 ≤ KTA*KTV < 100000	MWh/Mvarh	0.1
100000 ≤ KTA*KTV	MWh/Mvarh	1


Data Storing

Y
Y
Y
Y
Y
Y

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**	**219**		**Measure configuration**								
20481	20480	5000	1		Measurement System Features	unsigned integer				*See Note 1*	3	16	Y
20482	20481	5001	1		Phase Current Transformation Ratio	unsigned integer	1			*See Note 6*	3	16	Y
20483	20482	5002	2		*RESERVED (all return "8000h")*								
20485	20484	5004	1		Voltage Transformation Ratio	unsigned integer	1/100			*See Note 5*	3		Y
20486	20485	5005	2		Calculation Settings Requirement	unsigned integer				*See Note 2*	3	16	Y
20488	20487	5007	121		*RESERVED (all return "8000h")*								
20609	20608	5080	2		Minimum value V1-N	unsigned integer	1	mV		*See Note 3*	3	16	Y
20611	20610	5082	2		Minimum value V2-N	unsigned integer	1	mV		*See Note 3*	3	16	Y
20613	20612	5084	2		Minimum value V3-N	unsigned integer	1	mV		*See Note 3*	3	16	Y
20615	20614	5086	2		Maximum value V1-N	unsigned integer	1	mV		*See Note 3*	3	16	Y
20617	20616	5088	2		Maximum value V2-N	unsigned integer	1	mV		*See Note 3*	3	16	Y
20619	20618	508A	2		Maximum value V3-N	unsigned integer	1	mV		*See Note 3*	3	16	Y
20621	20620	508C	8		*RESERVED (all return "8000h")*								
20629	20628	5094	2		Maximum Phase 1 Current Requirement (R)	unsigned integer	1	mA		*See Note 3*	3	16	Y
20631	20630	5096	2		Maximum Phase 2 Current Requirement (S)	unsigned integer	1	mA		*See Note 3*	3	16	Y
20633	20632	5098	2		Maximum Phase 3 Current Requirement (T)	unsigned integer	1	mA		*See Note 3*	3	16	Y
20635	20634	509A	2		*RESERVED (all return "8000h")*								
20637	20636	509C	2		*RESERVED (all return "8000h")*								
20639	20638	509E	2		*RESERVED (all return "8000h")*								
20641	20640	50A0	2		*RESERVED (all return "8000h")*								
20643	20642	50A2	2		*RESERVED (all return "8000h")*								
20645	20644	50A4	2		*RESERVED (all return "8000h")*								
20647	20646	50A6	26		*RESERVED (all return "8000h")*								
20673	20672	50C0	2		Maximum Total Active Power Requirement Tariff 1	signed integer				*See Note 3 And 4*	3	16	Y
20675	20674	50C2	2		Maximum Total Reactive Power Requirement Tariff 1	signed integer				*See Note 3 And 4*	3	16	Y
20677	20676	50C4	2		Maximum Total Apparent Power Requirement Tariff 1	signed integer				*See Note 3 And 4*	3	16	Y
20679	20678	50C6	2		Maximum Total Active Power Requirement Tariff 2	signed integer				*See Note 3 And 4*	3	16	Y
20681	20680	50C8	2		Maximum Total Reactive Power Requirement Tariff 2	signed integer				*See Note 3 And 4*	3	16	Y
20683	20682	50CA	2		Maximum Total Apparent Power Requirement Tariff 2	signed integer				*See Note 3 And 4*	3	16	Y
20685	20684	50CC	12		*RESERVED (all return "8000h")*								
20697	20696	50D8	1		Run hour meter threshold	unsigned integer	0.01	%	0 ÷ 5000		3	16	Y
20698	20697	50D9	2		Run hour meter (TOT)	unsigned integer	1	minutes		*See Note 3*	3	16	Y

Note 1

BYTE1 (MSB):
"33": Three-phase system without neutral 3-3E;
"43": Three-phase 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);

Note 2

WORD0 (LSW): calculation method
1: "sliding block interval"

WORD1 (MSW): calculation window (value in [min] (5, 8, 10, 15, 20, 30, 60), “default”= 5)

Note 3

This register is writable, but only with zero

Note 4

Transformer ratio	Measurement unit	Scale
KTA*KTV < 5000	W/var/VA	0.01
KTA*KTV ≥ 5000	kW/kvar/kVA	0.01

Note 5

This register is only readable, the writing is considered but it has no effect

Note 6

Current Range	Conversion (*)	Equivalent Current Trasformation Ratio
630 A	/5A	126
1600 A	/5A	320
3200 A	/5A	640
6300 A	/5A	1260

(*) The current range of a Rogowski coil is referred to an equivalent TA /5A (Example: Equivalent KTA = Current Range / 5).