

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

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	Transmission 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

COMMUNICATION PROTOCOL

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
20481	20480	5000	257		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	23		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 5	4	
20541	20540	503C	2		Three-phase reactive power	signed integer				See Notes 2 and 5	4	
20543	20542	503E	2		RESERVED (all return "8000h")							
20545	20544	5040	2		Three-Phase Apparent Power	signed integer				See Notes 2 and 5	4	
20547	20546	5042	2		RESERVED (all return "8000h")							
20549	20548	5044	1		Three-phase Power Factor (PF)	signed integer	0,01			See Note 2	4	
20550	20549	5045	1		RESERVED (returns "8000h")							
20551	20550	5046	1		Power Factor (PF) 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	17		RESERVED (returns "8000h")							
20593	20592	5070	2		Positive Three-phase Active Energy	unsigned integer				See Notes 1 and 7	4	Y
20595	20594	5072	2		Negative Three-phase Active Energy	unsigned integer				See Notes 1 and 7	4	Y
20597	20596	5074	2		RESERVED (returns "8000000h")							
20599	20598	5076	2		Positive Three-phase Reactive Energy	unsigned integer				See Notes 1 and 7	4	Y
20601	20600	5078	2		Negative Three-phase Reactive Energy	unsigned integer				See Notes 1 and 7	4	Y
20603	20602	507A	2		RESERVED (returns "8000000h")							
20605	20604	507C	2		Positive Three-phase Active Energy (Tariff 1)	unsigned integer				See Notes 1, 7 and 9	4	Y
20607	20606	507E	2		Negative Three-phase Active Energy (Tariff 1)	unsigned integer				See Notes 1, 7 and 9	4	Y
20609	20608	5080	2		Positive Three-phase Reactive Energy (Tariff 1)	unsigned integer				See Notes 1, 7 and 9	4	Y
20611	20610	5082	2		Negative Three-phase Reactive Energy (Tariff 1)	unsigned integer				See Notes 1, 7 and 9	4	Y
20613	20612	5084	2		Positive Three-phase Active Energy (Tariff 2)	unsigned integer				See Notes 1, 7 and 9	4	Y
20615	20614	5086	2		Negative Three-phase Active Energy (Tariff 2)	unsigned integer				See Notes 1, 7 and 9	4	Y
20617	20616	5088	2		Positive Three-phase Reactive Energy (Tariff 2)	unsigned integer				See Notes 1, 7 and 9	4	Y

20619	20618	508A	2		Negative Three-phase Reactive Energy (Tariff 2)	unsigned integer				See Notes 1, 7 and 9	4	Y
20621	20620	508C	18		RESERVED (returns "8000h")							
20639	20638	509E	2		Positive Three-phase Active Energy (secondary)	unsigned integer	0,01	kWh		See Note 1	4	Y
20641	20640	50A0	2		Negative Three-phase Active Energy (secondary)	unsigned integer	0,01	kWh		See Note 1	4	Y
20643	20642	50A2	2		RESERVED (returns "80000000h")							
20645	20644	50A4	2		Positive Three-phase Reactive Energy (secondary)	unsigned integer	0,01	kVarh		See Note 1	4	Y
20647	20646	50A6	2		Negative Three-phase Reactive Energy (secondary)	unsigned integer	0,01	kVarh		See Note 1	4	Y
20649	20648	50A8	2		RESERVED (returns "80000000h")							
20651	20650	50AA	2		Positive Three-phase Active Energy (Tariff 1) (secondary)	unsigned integer	0,01	kWh		See Notes 1 and 9	4	Y
20653	20652	50AC	2		Negative Three-phase Active Energy (Tariff 1) (secondary)	unsigned integer	0,01	kWh		See Notes 1 and 9	4	Y
20655	20654	50AE	2		Positive Three-phase Reactive Energy (Tariff 1) (secondary)	unsigned integer	0,01	kVarh		See Notes 1 and 9	4	Y
20657	20656	50B0	2		Negative Three-phase Reactive Energy (Tariff 1) (secondary)	unsigned integer	0,01	kVarh		See Notes 1 and 9	4	Y
20659	20658	50B2	2		Positive Three-phase Active Energy (Tariff 2) (secondary)	unsigned integer	0,01	kWh		See Notes 1 and 9	4	Y
20661	20660	50B4	2		Negative Three-phase Active Energy (Tariff 2) (secondary)	unsigned integer	0,01	kWh		See Notes 1 and 9	4	Y
20663	20662	50B6	2		Positive Three-phase Reactive Energy (Tariff 2) (secondary)	unsigned integer	0,01	kVarh		See Notes 1 and 9	4	Y
20665	20664	50B8	2		Negative Three-phase Reactive Energy (Tariff 2) (secondary)	unsigned integer	0,01	kVarh		See Notes 1 and 9	4	Y
20667	20666	50BA	59		RESERVED (returns "8000h")							
20726	20725	50F5	1		Phase shift between V1 - V2	unsigned integer	0,1	°		See Note 3	4	
20727	20726	50F6	1		Phase shift between V2 - V3	unsigned integer	0,1	°		See Note 3	4	
20728	20727	50F7	1		Phase shift between V3 - V1	unsigned integer	0,1	°		See Note 3	4	
20729	20728	50F8	1		Phase shift between U12 - U23	unsigned integer	0,1	°		See Note 4	4	
20730	20729	50F9	1		Phase shift between U23 - U31	unsigned integer	0,1	°		See Note 4	4	
20731	20730	50FA	1		Phase shift between U31 - U12	unsigned integer	0,1	°		See Note 4	4	
20732	20731	50FB	1		Phase shift between I1 - I2	unsigned integer	0,1	°		See Note 8	4	
20733	20732	50FC	1		Phase shift between I2 - I3	unsigned integer	0,1	°		See Note 8	4	
20734	20733	50FD	1		Phase shift between I3 - I1	unsigned integer	0,1	°		See Note 8	4	
20735	20734	50FE	1		Phase shift between V1 - I1	unsigned integer	0,1	°		See Note 1	4	
20736	20735	50FF	1		Phase shift between V2 - I2	unsigned integer	0,1	°		See Note 8	4	
20737	20736	5100	1		Phase shift between V3 - I3	unsigned integer	0,1	°		See Note 8	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
$KTA \cdot KTV < 5000$	W/var/VA	0,01
$KTA \cdot KTV \geq 5000$	kW/kvar/kVA	0,01
Note 7		
Transformer ratio	Measurement unit	Scale
$1 \leq KTA \cdot KTV < 10$	kWh/kvarh	0,01
$10 \leq KTA \cdot KTV < 100$	kWh/kvarh	0,1
$100 \leq KTA \cdot KTV < 1000$	kWh/kvarh	1
$1000 \leq KTA \cdot KTV < 10000$	MWh/Mvarh	0,01
$10000 \leq KTA \cdot KTV < 100000$	MWh/Mvarh	0,1
$100000 \leq KTA \cdot KTV$	MWh/Mvarh	1
Note 8		
Expressed on "numeric coding"; without mark (fixed more significant bit = 0); Only with 3N-3E, 3-3E or 3-2E		
Note 9		
Only if the input acts as "Tariff selector"		
Note 10		
Only if the input acts as "Pulse measurement"		

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
1	0	0	1		Modbus settings								
1	0	0	1		Protocol type	unsigned integer				See Note 1	3	16	Y
20481	20480	5000	223		Measure configuration								
20481	20480	5000	1		Measurement System Features	unsigned integer				See Note 3	3	16	Y
20482	20481	5001	1		Phase Currents Transformation Ratio (KTA)	unsigned integer	1		1 ÷ 9999		3	16	Y
20483	20482	5002	2		RESERVED (all return "8000h")								
20485	20484	5004	1		Voltage Transformation Ratio (KTV)	unsigned integer	0,01		100 ÷ 30000		3	16	Y
20486	20485	5005	2		Calculation Settings Requirement	unsigned integer				See Note 4	3	16	Y
20488	20487	5007	71		RESERVED (all return "8000h")								
20559	20558	504E	2		Partial Positive Three-phase Active Energy	unsigned integer				See Notes 5 and 10	3	16	Y
20561	20560	5050	2		Partial Negative Three-phase Active Energy	unsigned integer				See Notes 5 and 10	3	16	Y
20563	20562	5052	2		RESERVED (all return "8000h")								
20565	20564	5054	2		Partial Positive Three-phase Reactive Energy	unsigned integer				See Notes 5 and 10	3	16	Y
20567	20566	5056	2		Partial Negative Three-phase Reactive Energy	unsigned integer				See Notes 5 and 10	3	16	Y
20569	20568	5058	4		RESERVED (all return "8000h")								
20573	20572	505C	2		Partial Positive Three-phase Active Energy (secondary)	unsigned integer	0,01	kWh		See Note 5	3	16	Y
20575	20574	505E	2		Partial Negative Three-phase Active Energy (secondary)	unsigned integer	0,01	kWh		See Note 5	3	16	Y
20577	20576	5060	2		RESERVED (all return "8000h")								
20579	20578	5062	2		Partial Positive Three-phase Reactive Energy (secondary)	unsigned integer	0,01	kvarh		See Note 5	3	16	Y
20581	20580	5064	2		Partial Negative Three-phase Reactive Energy (secondary)	unsigned integer	0,01	kvarh		See Note 5	3	16	Y
20583	20582	5066	54		RESERVED (all return "8000h")								
20637	20636	509C	2		Total Active Power Requirement (MD)	unsigned integer				See Notes 7 and 9	3	16	
20639	20638	509E	2		Maximum Total Active Power Requirement (PMD)	unsigned integer				See Notes 7 and 9	3	16	Y
20641	20640	50A0	32		RESERVED (all return "8000h")								
20673	20672	50C0	2		Maximum Total Active Power Requirement Tariff 1 (PMD T1)	unsigned integer				See Notes 5 and 9	3	16	Y
20675	20674	50C2	4		RESERVED (all return "8000h")								
20679	20678	50C6	2		Maximum Total Active Power Requirement Tariff 2 (PMD T2)	unsigned integer				See Notes 5 and 9	3	16	Y
20681	20680	50C8	16		RESERVED (all return "8000h")								
20697	20696	50D8	1		Run hour meter threshold	unsigned integer	1/100	%	0 ÷ 5000		3	16	Y
20698	20697	50D9	2		Run hour meter (TOT)	unsigned integer		s		See Note 6	3	16	Y
20700	20699	50DB	2		Run hour meter (Tariff 1)	unsigned integer		s		See Note 7	3	16	Y
20702	20701	50DD	2		Run hour meter (Tariff 2)	unsigned integer		s		See Note 7	3	16	Y

Note 1
0: Standard MAP; 1: Basic MAP. This register is shared between the two maps. It's always possible to read and write this register.
Note 3
BYTE1 (MSB): "32": Three-phase system without neutral 3-2E; "33": Three-phase system without neutral 3-3E; "34": 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 4

WORD0 (LSW): calculation method 1: "sliding block interval"		
WORD1 (MSW): calculation window (value in [min] (5, 8, 10, 15, 20, 30, 60), "default"=15)		
Note 5		
This register is writable, but only with zero		
Note 6		
This register is writable, but only with zero. Writing this register you will delete also the two tariffs values.		
Note 7		
Writing this register has no effect.		
Note 9		
Transformer ratio	Measurement unit	Scale
KTA*KTV < 5000	W/var/VA	0,01
KTA*KTV ≥ 5000	kW/kvar/kVA	0,01
Note 10		
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
Note 11		
Only if the input acts as "Tariff selector"		