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SWITCH TO THE FUTURE

MODBUS COMMUNICATION PROTOCOL 7M24 - 7M38

MODBUS COMMUNICATION PROTOCOL

Modbus protocol enables operation of device on Modbus networks.
For 7M.38.8.400.XXXX with serial communication the Modbus protocol enables multi drop communication via RS485 communication. Modbus protocol is a widely supported open interconnect originally designed by Modicon.
The memory reference for input and holding registers is 30000 and 40000 respectively.

PLASE NOTE

The Modbus table is subject to change without notice.

Communication operates on a master-slave basis where only one device (the master) can initiate transactions called 'Requests'. The other devices (slaves) respond by supplying the requested data to the master.
This is called the 'Request - Response Cycle'.
The master could send the MODBUS request to the slaves in two modes:

Unicast mode, where the master sends the request to an individual slave. It returns a replay to the master after the request is received and processed. A MODBUS transaction consists of two messages.
Each slave should have an unique address.
Broadcast mode, where the master sends a request to all slaves and an answer is never followed. All devices should accept the broadcast request function. The Modbus address 0 is reserved to identify the broadcast request.

Master to Slave Request

Device address	Function Code	nx8 bit data bytes	Error check

Slave to Master Response

Device address	Function Code	nx8 bit data bytes	Error check

Request

This Master to Slave transaction takes the form:

- **Device address:** master addressing a slave (Address 0 is used for the broadcast address, which all slave devices recognize.)
- **Function code** e.g. 03 asks the slave to read its registers and respond with their contents.
- **Data bytes:** tells the slave which register to start at and how many registers to read.

Response

This Slave to Master transaction takes the form:

- **Device address:** to let the master know which slave is responding.
- **Function code:** this is an echo of the request function code.
- **Data bytes:** contains the data collected from the slave.

Request Frame

		Starting Register	Register Count	CRC
Slave Address	Function Code	HI LO	HI LO	LO HI
21	04	00 6B	00 02	

Response Frame

		Starting Register	Register Count	CRC
Slave Address	Function Code	HI LO	HI LO	LO HI
21	04	00 6B	00 02	

Request- response cycle example

Address number of slave: 21

Function code: 04 ➔ 30000

Starting register HI…LO: $00…6B_{(16)}$ ➔ $107_{(10)}$ +$30000_{(10)}$ = **$30107_{(10)}$** (Meaning that actual measurement is U1. For further informations see REGISTER TABLE FOR THE ACTUAL MEASUREMENTS.)

Register count HI…LO: $00…02_{(16)}$ ➔ $2_{(10)}$ (Two registers: 30107 and 30108)

Data type: T5 (Unsigned Measurement (32 bit) – see table of DATA types decoding)

Register data: FE 00 59 74 $_{(16)}$ ➔ 22934 * $10^{\wedge(-2)}$ V = **229,34 V**

REGISTER TABLE FOR THE ACTUAL MEASUREMENTS

The tables below represent the complete set of MODBUS register map. Register refresh frequency for actual measurement from register 30105 to register 30190 is one second. Register refresh frequency for energy counters (from 30406 to 30441) is 40 ms. The registers from 30426 to 30441 (1000 x Energy Counter from 30406 to 30413 and from 30418 to 30425) represent the same energy counters at 1000-times higher resolution. This registers cam be read to calculate the energy difference in the time interval more accurate.

MODBUS COMMUNICATION PROTOCOL 7M24

MODBUS INFO

Read with Function Code	Register Addresses		Contents	Data Type	Ind	Values / Dependencies
			Input Registers			
	30000		Memory Reference			
			READ ONLY INFO			
4	30001	30008	Model Number	T_Str16		
4	30009	30012	Serial Number	T_Str8		
4	30013		Software Reference	T1		Software version
4	30014		Hardware Reference	T_Str2		Hardware version
4	30015		Calibration voltage	T16		V/100
4	30017		Calibration current	T16		A/100
4	30019		Accuracy class	T17		100=1,00
4	30020		MiNet Flag	T1	0	
4	30024		COM1: Communication Type	T1	0	No Communication
					2	RS485
					13	M-bus
4	30029		I/O 1	T1	0	No I/O
					5	Tariff Input
					10	Digital input
					12	Pulse Output (SO)
4	30030		I/O 2	T1		See I/O 1
4	30044		Status register	T1	Bit-0	Locked
					Bit-4	Clock not set
4	30070		Measurement module Software ref.	T17		100=1,0
4	30071		Measurement module CheckSum	T1		
4	30072		Meas. m. Calibration Data CheckSum	T1		
4	30073		MID Setting Data CheckSum	T1		
4	30074		Setting Data CheckSum	T1		
4	30075		Software Checksum	T1		
4	30076		MID lock status	T1	0	unlocked
					1	locked
4	30077	30078	Calibration Time Stamp	T_unix		
4	30079		MID unlock counter	T1		
4	30080		FW upgrade counter	T1		
4	30098		Active Communication Port	T1	1	COM1
4	30099		Modbus Max. Register Read at Once	T1		
	30100	38999	MEASUREMENTS			
			READ ONLY INFO			
4	39000		Device group	T1	5	7M

MODBUS MEASUREMENTS

Read with Function Code	Register Addresses		Contents	Data	Ind	Values / Dependencies	Multiplicator and Unit
			Input Registers				
	30000		Memory Reference				
			ACTUAL MEASUREMENTS				
4	30101		Phase valid measurement	T1	Bit 0	Invalid measurement phase 1	
4	30103	30104	Run time	T3		seconds	x 1 seconds
4	30105	30106	Frequency	T5			x 1 Hz
4	30107	30108	U1	T5			x 1 V
4	30113	30114	Uavg (phase to neutral)	T5			x 1 V
4	30126	30127	I1	T5			x 1 A
4	30136	30137	Iavg	T5			x 1 A
4	30138	30139	S I	T5			x 1 A
4	30140	30141	Active Power Total (Pt)	T6			x 1 W
4	30142	30143	Active Power Phase L1 (P1)	T6			x 1 W
4	30148	30149	Reactive Power Total (Qt)	T6			x 1 var
4	30150	30151	Reactive Power Phase L1 (Q1)	T6			x 1 var
4	30156	30157	Apparent Power Total (St)	T5			x 1 VA
4	30158	30159	Apparent Power Phase L1 (S1)	T5			x 1 VA
4	30164	30165	Power Factor Total (PFt)	T7			x 1
4	30166	30167	Power Factor Phase 1 (PF1)	T7			x 1
4	30172		Power Angle Total (atan2(Pt,Qt))	T17			x 1 °
4	30173		j1 (angle between U1 and I1)	T17			x 1 °
4	30181		Internal Temperature	T17			x 1 °C
4	30182		U1 THD%	T16			x 1 %
4	30188		I1 THD%	T16			x 1 %
			I/O STATUS				
4	30191		Alarm Status Flags(G1, G2	T1	Bit 0..4	Group 1 Limit 1 .. 4	
					Bit 8..12	Group 2 Limit 1 .. 4	
4	30193		I/O 1 Value	T17			
4	30197		External relay status	T1	0	Off	
					1	On	
					250	Comm. Error	
					255	Not connected	
4	30200		Alarm Status Flags(GE	T1	Bit 0..4	Group E Limit 1 .. 4	
4	30201		Logic functions values	T1	Bit 0	Logic function 1	
					Bit 1	Logic function 2	
4	30396	30399	Actual time	T_ Time			

4	30400		CheckSum Status	T1	0	No Error (OK)	
					Bit 0	Error Parameter CRC	
					Bit 1	Error Firmware CRC	
					Bit 2	Error MID-lock	
					Bit 6	Error Measurement module CheckSum	
					Bit 7	Error Software Check-sum	
					Bit 8	Error Calibration Data CheckSum	
					Bit 9	Error MID Setting Data CheckSum	
					Bit 10	Error Setting Data CheckSum	
4	30401		Energy Counter n1 Exponent	T2		Exponent	
4	30402		Energy Counter n2 Exponent	T2		Exponent	
4	30403		Energy Counter n3 Exponent	T2		Exponent	
4	30404		Energy Counter n4 Exponent	T2		Exponent	
4	30405		Current Active Tariff	T1			
4	30406	30407	Energy Counter n1	T3		Mantissa	x EXP(Register 30401) x 1 Wh
4	30408	30409	Energy Counter n2	T3		Mantissa	x EXP(Register 30402) x 1 Wh
4	30410	30411	Energy Counter n3	T3		Mantissa	x EXP(Register 30403) x 1 varh
4	30412	30413	Energy Counter n4	T3		Mantissa	x EXP(Register 30404) x 1 varh
4	30414	30415	Energy Counter 1	T3		Mantissa	x EXP(Register 30446) x 1 VAh/ varh/Wh
4	30416	30417	Energy Counter 2	T3		Mantissa	x EXP(Register 30447) x 1 VAh/ varh/Wh
4	30418	30419	Energy Counter 3	T3		Mantissa	x EXP(Register 30448) x 1 VAh/ varh/Wh
4	30420	30421	Energy Counter 4	T3		Mantissa	x EXP(Register 30449) x 1 VAh/ varh/Wh
4	30422	30423	Energy Counter 5	T3		Mantissa	x EXP(Register 30450) x 1 VAh/ varh/Wh
4	30424	30425	Energy Counter 6	T3		Mantissa	x EXP(Register 30451) x 1 VAh/ varh/Wh
4	30426	30427	Energy Counter 7	T3		Mantissa	x EXP(Register 30452) x 1 VAh/ varh/Wh
4	30428	30429	Energy Counter 8	T3		Mantissa	x EXP(Register 30453) x 1 VAh/ varh/Wh
4	30446		Energy Counter 1 Exponent	T2		Exponent	
4	30447		Energy Counter 2 Exponent	T2		Exponent	
4	30448		Energy Counter 3 Exponent	T2		Exponent	
4	30449		Energy Counter 4 Exponent	T2		Exponent	

4	30450		Energy Counter 5 Exponent	T2		Exponent	
4	30451		Energy Counter 6 Exponent	T2		Exponent	
4	30452		Energy Counter 7 Exponent	T2		Exponent	
4	30453		Energy Counter 8 Exponent	T2		Exponent	
4	30462	30463	1000 x Energy Counter n1	T3			x 0,1 Wh
4	30464	30465	1000 x Energy Counter n2	T3			x 0,1 varh
4	30466	30467	1000 x Energy Counter n3	T3			x 0,1 Wh
4	30468	30469	1000 x Energy Counter n4	T3			x 0,1 varh
4	30470	30471	1000 x Energy Counter 1	T3			x 0,1 VAh/varh/ Wh
4	30472	30473	1000 x Energy Counter 2	T3			x 0,1 VAh/varh/ Wh
4	30474	30475	1000 x Energy Counter 3	T3			x 0,1 VAh/varh/ Wh
4	30476	30477	1000 x Energy Counter 4	T3			x 0,1 VAh/varh/ Wh
4	30478	30479	1000 x Energy Counter 5	T3			x 0,1 VAh/varh/ Wh
4	30480	30481	1000 x Energy Counter 6	T3			x 0,1 VAh/varh/ Wh
4	30482	30483	1000 x Energy Counter 7	T3			x 0,1 VAh/varh/ Wh
4	30484	30485	1000 x Energy Counter 8	T3			x 0,1 VAh/varh/ Wh
			MEASUREMENTS (IEEE 754)				
4	32480	32481	Run time	T_float			x 1 seconds
4	32484	32485	Uavg (phase to neutral)	T_float			x 1 V
4	32488	32489	S I	T_float			x 1 A
4	32490	32491	Active Power Total (Pt)	T_float			x 1 W
4	32492	32493	Reactive Power Total (Qt)	T_float			x 1 var
4	32494	32495	Apparent Power Total (St)	T_float			x 1 VA
4	32496	32497	Power Factor Total (PFt)	T_float			x 1
4	32498	32499	Frequency	T_float			x 1 Hz
4	32500	32501	U1	T_float			x 1 V
4	32516	32517	I1	T_float			x 1 A
4	32530	32531	Active Power Phase L1 (P1)	T_float			x 1 W
4	32536	32537	Active Power Total (Pt)	T_float			x 1 W
4	32538	32539	Reactive Power Phase L1 (Q1)	T_float			x 1 var
4	32544	32545	Reactive Power Total (Qt)	T_float			x 1 var
4	32546	32547	Apparent Power Phase L1 (S1)	T_float			x 1 VA
4	32552	32553	Apparent Power Total (St)	T_float			x 1 VA
4	32554	32555	Power Factor Phase 1 (PF1)	T_float			x 1
4	32560	32561	Power Factor Total (PFt)	T_float			x 1
4	32562	32563	CAP/IND P. F. Phase 1 (PF1)	T_float			x 1
4	32568	32569	CAP/IND P. F. Total (PFt)	T_float			x 1
4	32570	32571	j1 (angle between U1 and I1)	T_float			x 1 °
4	32576	32577	Power Angle Total (atan2(Pt,Qt))	T_float			x 1 °
4	32584	32585	Frequency	T_float			x 1 Hz
4	32588	32589	I1 THD%	T_float			x 1 %
4	32594	32595	U1 THD%	T_float			x 1 %
	32638	32639	Energy Counter n1	T_float			x 1 Wh

	32640	32641	Energy Counter n2	T_float			x 1 varh
	32642	32643	Energy Counter n3	T_float			x 1 Wh
	32644	32645	Energy Counter n4	T_float			x 1 varh
4	32658	32659	Internal Temperature	T_float			x 1 °C
			ENERGY				
4	32750	32751	Aktiv Tariff	T_float			x 1
4	32752	32753	Energy Counter n1	T_float			x 1 Wh
4	32754	32755	Energy Counter n2	T_float			x 1 varh
4	32756	32757	Energy Counter n3	T_float			x 1 Wh
4	32758	32759	Energy Counter n4	T_float			x 1 varh
4	32760	32761	Energy Counter 1	T_float			x 1 VAh/varh/Wh
4	32762	32763	Energy Counter 2	T_float			x 1 VAh/varh/Wh
4	32764	32765	Energy Counter 3	T_float			x 1 VAh/varh/Wh
4	32766	32767	Energy Counter 4	T_float			x 1 VAh/varh/Wh
4	32768	32769	Energy Counter 5	T_float			x 1 VAh/varh/Wh
4	32770	32771	Energy Counter 6	T_float			x 1 VAh/varh/Wh
4	32772	32773	Energy Counter 7	T_float			x 1 VAh/varh/Wh
4	32774	32775	Energy Counter 8	T_float			x 1 VAh/varh/Wh
			NOMINAL VALUES				
	32981	32982	Reserved for nominal aux voltage	T_float		Unomx	
	32983	32984	Reserved for nominal aux current	T_float		Inomx	
4	32985	32986	nominal phase voltage	T_float		Unom	x 1 V
4	32987	32988	nominal phase current	T_float		Inom	x 1 A
4	32989	32990	nominal phase power	T_float		Pnom	x 1 W
4	32991	32992	nominal total power	T_float		Ptot	x 1 W
4	32993	32994	nominal total current	T_float		Itot	x 1 A
4	32995	32996	nominal frequency	T_float		Fnom	x 1 Hz
4	34999	35000	Run time	T3		seconds	x 1 seconds
			INTERVAL MEASUREMENTS				
			AVERAGE MEASUREMENTS				
4	35500		The last Average interval duration	T1			x 0,1 seconds
4	35501		Time since the last average meaure-ments	T1			x 0,1 seconds
4	35502		Average measurements counter	T1			
4	35503	35504	Timestamp	T_unix		'= 0 after reset	
4	35505	35506	Frequency	T5			x 1 Hz
4	35507	35508	U1	T5			x 1 V
4	35526	35527	I1	T5			x 1 A
4	35540	35541	Active Power Total (Pt)	T6			x 1 W
4	35542	35543	Active Power Phase L1 (P1)	T6			x 1 W
4	35548	35549	Reactive Power Total (Qt)	T6			x 1 var
4	35550	35551	Reactive Power Phase L1 (Q1)	T6			x 1 var
4	35556	35557	Apparent Power Total (St)	T5			x 1 VA
4	35558	35559	Apparent Power Phase L1 (S1)	T5			x 1 VA
4	35564	35565	Power Factor Total (PFt)	T7			x 1
4	35566	35567	Power Factor Phase 1 (PF1)	T7			x 1
4	35572		Power Angle Total (atan2(Pt,Qt))	T17			x 1 °
4	35573		j1 (angle between U1 and I1)	T17			x 1 °
4	35581		Internal Temperature	T17			x 1 °C

			THD HARMONIC DATA				
4	35582		U1 THD%	T16			x 1 %
4	35588		I1 THD%	T16			x 1 %
			MAXIMUM MEASUREMENTS				
4	35600	35604	Reserved				
4	35605	35606	Frequency	T5			x 1 Hz
4	35607	35608	U1	T5			x 1 V
4	35626	35627	I1	T5			x 1 A
4	35640	35641	Active Power Total (Pt)	T6			x 1 W
4	35642	35643	Active Power Phase L1 (P1)	T6			x 1 W
4	35648	35649	Reactive Power Total (Qt)	T6			x 1 var
4	35650	35651	Reactive Power Phase L1 (Q1)	T6			x 1 var
4	35656	35657	Apparent Power Total (St)	T5			x 1 VA
4	35658	35659	Apparent Power Phase L1 (S1)	T5			x 1 VA
4	35664	35665	Power Factor Total (PFt)	T7			x 1
4	35666	35667	Power Factor Phase 1 (PF1)	T7			x 1
4	35672		Power Angle Total (atan2(Pt,Qt))	T17			x 1 °
4	35673		j1 (angle between U1 and I1)	T17			x 1 °
4	35681		Internal Temperature	T17			x 1 °C
			THD HARMONIC DATA				
4	35682		U1 THD%	T16			x 1 %
4	35688		I1 THD%	T16			x 1 %
			MINIMUM MEASUREMENTS				
4	35700	35704	Reserved				
4	35705	35706	Frequency	T5			x 1 Hz
4	35707	35708	U1	T5			x 1 V
4	35726	35727	I1	T5			x 1 A
4	35740	35741	Active Power Total (Pt)	T6			x 1 W
4	35742	35743	Active Power Phase L1 (P1)	T6			x 1 W
4	35748	35749	Reactive Power Total (Qt)	T6			x 1 var
4	35750	35751	Reactive Power Phase L1 (Q1)	T6			x 1 var
4	35756	35757	Apparent Power Total (St)	T5			x 1 VA
4	35758	35759	Apparent Power Phase L1 (S1)	T5			x 1 VA
4	35764	35765	Power Factor Total (PFt)	T7			x 1
4	35766	35767	Power Factor Phase 1 (PF1)	T7			x 1
4	35772		Power Angle Total (atan2(Pt,Qt))	T17			x 1 °
4	35773		j1 (angle between U1 and I1)	T17			x 1 °
4	35781		Internal Temperature	T17			x 1 °C
			THD HARMONIC DATA				
4	35782		U1 THD%	T16			x 1 %
4	35788		I1 THD%	T16			x 1 %
			RAM logger				
4	36000		Measurement parameter	T1		See OutTypes	
4	36001		Time interval	T1		minutes	
4	36002		Number of valid results	T1			
4	36003		Time stamp of last result	T2		minutes since mid-night (<0 if no time)	
4	36004	36131	Logger table (newest to oldest)	T17		Normalised values	

MODBUS SETTINGS

Valid with Function Codes	Register Addresses		Contents	Data	Ind	Values / Dependencies	Min	Max	P. Level
			Holding Registers						
	40000		Memory Reference						
			SYSTEM COMMANDS						
16	40001	40002	User Password (L1, L2)	T_Str4	A…Z	Password to attempt user access level upgrade			0
16	40003	40005	Factory Password (FAC)	T_Str6	A…Z	Password to attempt factory access level upgrade			0
16	40006	40007	Lavel 1 - User password	T_Str4	A…Z				1
16	40008	40009	Lavel 2 - User password	T_Str4	A…Z				2
3 , 6	40010		Active Acces Level	T1	0	Full protection	0	0	0
6	40011		Manual password activation	T1	1	Lock instrument			0
6	40012		Operator Command Register	T1	1	Save Settings	1	5	1
					2	Abort Settings			
					3	Restart Instrument			
6	40014		Reset command register 2	T1	Bit-0	Reset alarm ouptut relay 1			1
					Bit-8	Reset alarm ouptut IR			
3 , 6	40015		IR external relay command action	T1	0	Off	0	1	0
					1	On			
3 , 6	40030		Select Active Tariff	T1			1	6	1
6	40031		Reset energy command register 1	T1	Bit-0..7	Reset counter 1 .. 8	0	65535	1
			GENERAL SETTINGS						
3, 6, 16	40101	40120	Description	T_Str40					2
3, 6, 16	40121	40140	Location	T_Str40					2
					1	1b - Single Phase			
3 , 6	40148		Current input range (%)	T16		10000 for 100%	5,00	260,00	2
3 , 6	40149		Voltage input range (%)	T16		10000 for 100%	2,50	100,00	2
3 , 6	40150		Frequency nominal value	T1		Hz	10	1000	2
3, 6, 16	40161	40162	Time	T9					1
3, 6, 16	40163	40164	Date	T10					1
3 , 6	40166		Automatic change S/W time	T1	0	No	0	1	1
3 , 6	40170		LCD configurations	T1	Bit 0	Counter description mode (*0=OBIS code; 1=letters)	0	1	2
3 , 6	40172		LCD Back Light Intesnity	T1		0=No Backlight	0	10	2
3 , 6	40173		LCD Back Light Time Off	T1		Minutes (0=Always on)	0	60	2
3 , 6	40174		LCD scroll interval	T1		Seconds	5	60	2
3 , 6	40184		LCD scroll parameters 1	T1	Bit 0	Counter n1 (Allways)	1	65535	2
					Bit 1	Counter n2			
					Bit 2	Counter n3			
					Bit 3	Counter n4			
3 , 6	40185		LCD scroll parameters 2		Bit 0..7	Counter 1 .. 8	0	65535	2

3 , 6	40186		LCD scroll parameters 3		Bit 0	Active Power Total (Pt)	0	65535	2
					Bit 2	Reactive Power Total (Qt)			
					Bit 4	Apparent Power Total (St)			
					Bit 6	Uavg (phase to neutral)			
					Bit 10	Curent Total			
					Bit 12	Frequency			
					Bit 13	Active Tariff			
					Bit 14	Power Factor Total (PFt)			
3 , 6	40187		LCD scroll parameters 4		Bit 0	Power Angle Total (atan2(Pt,Qt))	0	15	2
					Bit 2	THD of voltage			
					Bit 3	THD of current			
3 , 6	40188		LCD return mode	T1	0	Auto scroll	0	2	2
					1	Counter n1			
					2	Hold page			
3 , 6	40192		Comm. & LCD average interval	T1		10=1,0 sec	0,1	5,0	2
			COMMUNICATION						
3 , 6	40202		Port 1: Device Adress (Modbus)	T1			1	247	2
3 , 6	40203		Port 1: Baud Rate	T1	0	Baud rate 1200	1	7	2
					1	Baud rate 2400			
					2	Baud rate 4800			
					3	Baud rate 9600			
					4	Baud rate 19200			
					5	Baud rate 38400			
					6	Baud rate 57600			
					7	Baud rate 115200			
3 , 6	40204		Port 1: Stop Bit	T1	0	1 Stop bit	0	1	2
					1	2 Stop bits			
3 , 6	40205		Port 1: Parity	T1	0	No parity	0	2	2
					1	Odd parity			
					2	Even parity			
3 , 6	40206		Port 1: Data Bits	T1	0	8 bits	0	0	2
3 , 6	40207		Port 1: TCP Port	T1			1	65535	2
3, 6, 16	40208	40227	Port 1: IP Host name	T_ Str40					2
3, 6, 16	40228	40229	Port 1: IP Address	T_ Hex4					0
3, 6, 16	40230	40231	Port 1: Subnet Mask	T_ Hex4					0
3, 6, 16	40232	40233	Port 1: Default Router	T_ Hex4					2
3, 6, 16	40234	40241	WIFI password	T_ Str16					2
3, 6, 16	40242	40249	WIFI SSID	T_ Str16					2
3 , 6	40250		Bluetooth ON/OFF	T1	0	Off	0	1	2
					1	On			
			IR						

3 , 6	40252		Port 2: Device Adress (Modbus)	T1			1	247	2
3 , 6	40253		Port 2: Baud Rate	T1		see Port 1: Baud Rate	3	7	2
3 , 6	40254		Port 2: Stop Bit	T1		see Port 1: Stop Bit	0	1	2
3 , 6	40255		Port 2: Parity	T1		see Port 1: Parity	0	2	2
3 , 6	40256		Port 2: Data Bits	T1		see Port 1: Data Bits	0	0	2
			M-bus						
3 , 6	40271		M-bus Primary address	T1			0	250	2
3 , 6	40272		M-bus: Baud Rate	T1	0	Baud rate 300	1	5	2
					1	Baud rate 600			
					2	Baud rate 1200			
					3	Baud rate 2400			
					4	Baud rate 4800			
					5	Baud rate 9600			
3 , 6	40273	40274	M-bus Secondary address	T3		Digits only (Default = Serial number)	0	9999 9999	2
			ENERGY						
					1..4	Tariff 1..4			
			NON-RESETABLE COUNTERS						
3 , 6	40421		Energy Counter n1 Parameter	T1	0	No Parameter	0	95	2
					1	Active Power			
					2	Reactive pover			
					3	Apparent Power			
					5	Active Power Phase 1			
					6	Reactive pover Phase 1			
					7	Apparent Power Phase 1			
3 , 6	40422		Energy Counter n1 Configuration	T1	Bit-0	Quadrant I Enabled	0	63	2
					Bit-1	Quadrant II Enabled			
					Bit-2	Quadrant III Enabled			
					Bit-3	Quadrant IIII Enabled			
					Bit-4	Absolute Value			
					Bit-5	Invert Value			
3 , 6	40423		Energy Counter n1 Exponent	T2			-3	6	2
3 , 6	40424		Energy Counter n1 Tarif Selector	T1	Bit-0	Tarif 1 Enabled	0	63	2
					Bit-1	Tarif 2 Enabled			
					Bit-2	Tarif 3 Enabled			
					Bit-3	Tarif 4 Enabled			
3 , 6	40425		Energy Counter n2 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40426		Energy Counter n2 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40427		Energy Counter n2 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40428		Energy Counter n2 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40429		Energy Counter n3 Parameter	T1		see Energy Counter n1 Parameter	0	95	2

3 , 6	40430		Energy Counter n3 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40431		Energy Counter n3 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40432		Energy Counter n3 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40433		Energy Counter n4 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40434		Energy Counter n4 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40435		Energy Counter n4 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40436		Energy Counter n4 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40437		Energy Counter 1 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40438		Energy Counter 1 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40439		Energy Counter 1 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40440		Energy Counter 1 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40441		Energy Counter 2 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40442		Energy Counter 2 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40443		Energy Counter 2 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40444		Energy Counter 2 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40445		Energy Counter 3 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40446		Energy Counter 3 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40447		Energy Counter 3 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40448		Energy Counter 3 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40449		Energy Counter 4 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40450		Energy Counter 4 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40451		Energy Counter 4 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40452		Energy Counter 4 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40453		Energy Counter 5 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40454		Energy Counter 5 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40455		Energy Counter 5 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40456		Energy Counter 5 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2

3 , 6	40457		Energy Counter 6 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40458		Energy Counter 6 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40459		Energy Counter 6 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40460		Energy Counter 6 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40461		Energy Counter 7 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40462		Energy Counter 7 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40463		Energy Counter 7 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40464		Energy Counter 7 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40465		Energy Counter 8 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40466		Energy Counter 8 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40467		Energy Counter 8 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40468		Energy Counter 8 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
			ALARMS						
3 , 6	41001		Alarm Enable Flags G1, G2	T1	Bit 0..4	Group 1 Limit 1 .. 4			2
			ALARM GROUP 1						
3 , 6	41004		Compare time delay	T1		seconds	0	900	2
3 , 6	41005		Hysteresis	T16		% of compare value, if 0 then % of nominal value	0,00	10,00	2
			GROUP 1 Limit 1						
3 , 6	41008		Limit 1 Parameter	T1		See OutTypes	0	1023	2
3 , 6	41009		Limit 1 Function	T1	Bit-1	Reserved: Store into memory (all)	0	80	2
					Bit-4	Activate Alarm Output			
					Bit-6	Limit Condition > (< if 0)			
			GROUP 1 Limit 2						
3 , 6	41011		Limit 2 Parameter	T1		see Limit 1 Parameter	0	127	2
3 , 6	41012		Limit 2 Function	T1		see Limit 1 Function	0	80	2
3 , 6	41013		Limit 2 Compare value	T16		see Limit 1 Compare value	-300 .00	+300. 00	2
			GROUP 1 Limit 3						
3 , 6	41014		Limit 3 Parameter	T1		see Limit 1 Parameter	0	127	2
3 , 6	41015		Limit 3 Function	T1		see Limit 1 Function	0	80	2
3 , 6	41016		Limit 3 Compare value	T16		see Limit 1 Compare value	-300. 00	+300. 00	2
			GROUP 1 Limit 4						
3 , 6	41017		Limit 4 Parameter	T1		see Limit 1 Parameter	0	127	2
3 , 6	41018		Limit 4 Function	T1		see Limit 1 Function	0	80	2

3 , 6	41019		Limit 4 Compare value	T16		see Limit 1 Compare value	-300.00	+300.00	2
			ALARM GROUP 2			See ALARM GROUP 1			2
3 , 6	41033		Compare time delay	T1		seconds	0	900	2
3 , 6	41034		Hysteresis	T16		% of compare value, if 0 then % of nominal value	0,00	10,00	2
			GROUP 2 Limit 1						
3 , 6	41037		Limit 1 Parameter	T1		see GROUP 1 Limit 1 Parameter	0	127	2
3 , 6	41038		Limit 1 Function	T1		see GROUP 1 Limit 1 Function	0	80	2
3 , 6	41039		Limit 1 Compare value	T16		see GROUP 1 Limit 1 Compare value	-300.Ø0	+300.00	2
3 , 6	41040	41042	GROUP 2 Limit 2			See GROUP 1 Limit 1			
3 , 6	41043	41045	GROUP 2 Limit 3			See GROUP 1 Limit 1			
3 , 6	41046	41048	GROUP 2 Limit 4			See GROUP 1 Limit 1			
			Logic Function 1						
3 , 6	41131		Input 1	T1	0	disabled	0	50	2
					1	GROUP 1 Limit 1			
					2	GROUP 1 Limit 2			
					3	GROUP 1 Limit 3			
					4	GROUP 1 Limit 4			
					9	GROUP 2 Limit 1			
					10	GROUP 2 Limit 2			
					11	GROUP 2 Limit 3			
					12	GROUP 2 Limit 4			
					33	Group E Limit 1			
					34	Group E Limit 2			
					35	Group E Limit 3			
					36	Group E Limit 4			
					41	Group 1 (OR all)			
					42	Group 2 (OR all)			
					45	Group E (OR all)			
					46	Group 1 (AND all)			
					47	Group 2 (AND all)			
					50	Group E (AND all)			
3 , 6	41132		Input 2	T1		see Input 1	0	50	2
3 , 6	41133		Input 3	T1		see Input 1	0	50	2
3 , 6	41134		Input 4	T1		see Input 1	0	50	2
3 , 6	41135		Function 1	T1	0	AND	0	1	2
					1	OR			
3 , 6	41136		Function 2	T1		see Function 1	0	1	2
3 , 6	41137		Function 3	T1		see Function 1	0	1	2
			Logic Function 2						
3 , 6	41139		Input 1	T1		see Logic Function 1 Input 1	0	50	2
3 , 6	41140		Input 2	T1		see Logic Function 1 Input 1	0	50	2
3 , 6	41141		Input 3	T1		see Logic Function 1 Input 1	0	50	2
3 , 6	41142		Input 4	T1		see Logic Function 1 Input 1	0	50	2
3 , 6	41143		Function 1	T1		see Logic Function 1 Function 1	0	1	2

3,6	41144		Function 2	T1		see Logic Function 1 Function 1	0	1	2
3,6	41145		Function 3	T1		see Logic Function 1 Function 1	0	1	2
			ALARM GROUP Energy						
3,6	41161		Limit 1 Parameter	T1	0	disabled	0	44	2
					1..8	Counter 1 .. 8			
					33..36	Counter n1 .. n4			
3,6	41162		Limit 1 Function	T1	Bit-1	Reserved: Store into memory (all)	0	80	2
					Bit-4	Activate Alarm Output			
					Bit-6	Alarm Condition > (< if 0)			
3,6	41163	41164	Limit 1 Compare value	T3		digits in the counter resolution	0	99999 9999	2
3,6	41165		Limit 2 Parameter	T1		see Limit 1 Parameter	0	44	2
3,6	41166		Limit 2 Function	T1		see Limit 1 Function	0	1	2
3,6	41167	41168	Limit 2 Compare value	T3		see Limit 1 Compare value	0	99999 9999	2
3,6	41169		Limit 3 Parameter	T1		see Limit 1 Parameter	0	44	2
3,6	41170		Limit 3 Function	T1		see Limit 1 Function	0	1	2
3,6	41171	41172	Limit 3 Compare value	T3		see Limit 1 Compare value	0	99999 9999	2
3,6	41173		Limit 4 Parameter	T1		see Limit 1 Parameter	0	44	2
3,6	41174		Limit 4 Function	T1		see Limit 1 Function	0	1	2
3,6	41175	41176	Limit 4 Compare value	T3		see Limit 1 Compare value	0	99999 9999	2
			OUTPUTS						
3,6	41200		Pulse LED Operation mode		0	Normal mode	0	6	0
					1	Test mode P - Fast			
					2	Test mode P - Fast (Counter only)			
					3	Test mode P			
					4	Test mode Q			
					5	Test mode Q - Fast			
					6	Test mode Q - Fast (Counter only)			
3,6	41201		Pulse LED Parameter	T1	0	Not set	0	95	2
					1..95	see Energy Counter n1 Parameter			
3,6	41202		Pulse LED Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3,6	41203		Pulse LED No. Of pulses	T1			1	65535	2
3,6	41204		Pulse LED Energy unit	T1		* 10^(Common Energy Counter Exponent)	1	65535	2
3,6	41205		Pulse LED Pulse lenght	T1		ms	2	1000	2
			PULSE OUTPUTS						
3,6	41207		Output 1 Function	T1	0	Alarm output	0	1	2
					1	Pulse output			
3,6	41211		Pulse Output 1 Parameter	T1	0	Not set	0	95	2
					1..95	see Energy Counter n1 Parameter			
3,6	41212		Pulse Output 1 Configuration	T1		see Energy Counter n1 Configuration	0	63	2

3 , 6	41213		Pulse Output 1 No. Of pulses	T1			1	65535	2
3 , 6	41214		Pulse Output 1 Energy unit	T1		* 10^(Common Energy Counter Exponent)	1	65535	2
3 , 6	41215		Pulse Output 1 Pulse lenght	T1		ms	2	1000	2
3 , 6	41216		Pulse Output 1 Tarif Selector	T1	Bit-0	Tarif 1 enabled	0	63	2
					Bit-1	Tarif 2 enabled			
					Bit-2	Tarif 3 enabled			
					Bit-3	Tarif 4 enabled			
			ALARM OUTPUTS						
			ALARM OUTPUT IR						
3 , 6	41235		IR External relay operating mode	T1	0	Not connected	0	2	2
					1	Manual			
					2	Alarm output control			
3 , 6	41236		Enabled Alarm groups	T1		See ALARM OUTPUT 1	0	255	2
3 , 6	41237		Output signal	T1		See ALARM OUTPUT 1	0	7	2
3 , 6	41238		Output pulse length	T1		Seconds	1	999	2
			ALARM OUTPUT 1						
3 , 6	41239		Enabled Alarm groups	T1	Bit-0	Group 1	0	255	2
					Bit-1	Group 2			
					Bit-4	Group E			
					Bit-5	Logic Function 1			
					Bit-6	Logic Function 2			
3 , 6	41240		Output signal	T1	0	Normal	0	7	2
					1	Permanent			
					2	Pulsed			
					3	Always ON			
					4	Always OFF			
					5	Normal inverse			
					6	Permanent inverse			
					7	Pulsed inverse			
3 , 6	41241		Output pulse length	T1		Seconds	1	999	2
			ENERGY snapshot registers						
3, 6	41901		Auto freeze interval [minutes]	T1			0	65536	0
3, 6	41902		time to freeze [s]	T1			0	65536	0
3	41903	41904	time from freeze [s]	T3u					
3, 6	41905		Freeze STATUS	T1	0	at reset	1	65533	0
					65534	at interval			
					65535	at time to freeze			
3	41906		Current Active Tariff	T1					
3	41907	41908	Energy Counter n1	T3					
3	41909	41910	Energy Counter n2	T3					
3	41911	41912	Energy Counter n3	T3					
3	41913	41914	Energy Counter n4	T3					
3	41915	41916	Energy Counter 1	T3					
3	41917	41918	Energy Counter 2	T3					
3	41919	41920	Energy Counter 3	T3					
3	41921	41922	Energy Counter 4	T3					
3	41923	41924	Energy Counter 5	T3					

3	41925	41926	Energy Counter 6	T3					
3	41927	41928	Energy Counter 7	T3					
3	41929	41930	Energy Counter 8	T3					
			INTERVAL MEASUREMENTS						
3, 6	41990		Interval duration [s/10]	T1		600=60,0 sec	0,1	3600	0
3, 6	41991		Time to calculate interval meas. [s/10]	T1			0,1	3600	0

MODBUS DATA TYPES

Type	Value / Bit Mask	Description
T1		Unsigned Value (16 bit)
		Example: 12345 stored as 12345 = 3039(16)
T2		Signed Value (16 bit)
		Example: -12345 stored as -12345 = CFC7(16)
T3		Signed Long Value (32 bit)
		Example: 123456789 stored as 123456789 = 075B CD 15(16)
T4		Short Unsigned float (16 bit)
	bits # 15..14	Decade Exponent(Unsigned 2 bit)
	bits # 13..00	Binary Unsigned Value (14 bit)
		Example: 10000*102 stored as A710(16)
T5		Unsigned Measurement (32 bit)
	bits # 31..24	Decade Exponent(Signed 8 bit)
	bits # 23..00	Binary Unsigned Value (24 bit)
		Example: 123456*10-3 stored as FD01 E240(16)
T6		Signed Measurement (32 bit)
	bits # 31..24	Decade Exponent (Signed 8 bit)
	bits # 23..00	Binary Signed value (24 bit)
		Example: - 123456*10-3 stored as FDFE 1DC0(16)
T7		Power Factor (32 bit)
	bits # 31..24	Sign: Import/Export (00/FF)
	bits # 23..16	Sign: Inductive/Capacitive (00/FF)
	bits # 15..00	Unsigned Value (16 bit), 4 decimal places
		Example: 0.9876 CAP stored as 00FF 2694(16)
T8		Time stamp (32 bit)
	bits # 31..24	Minutes 00 - 59 (BCD)
	bits # 23..16	Hours 00 - 23 (BCD)
	bits # 15..08	Day of month 01 - 31 (BCD)
	bits # 07..00	Month of year 01 - 12 (BCD)
		Example: 15:42, 1. SEP stored as 4215 0109(16)
T9		Time (32 bit)
	bits # 31..24	1/100s 00 - 99 (BCD)
	bits # 23..16	Seconds 00 - 59 (BCD)
	bits # 15..08	Minutes 00 - 59 (BCD)
	bits # 07..00	Hours 00 - 24 (BCD)
		Example: 15:42:03.75 stored as 7503 4215(16)
T10		Date (32 bit)
	bits # 31..24	Day of month 01 - 31 (BCD)
	bits # 23..16	Month of year 01 - 12 (BCD)
	bits # 15..00	Year (unsigned integer) 1998..4095
		Example: 10, SEP 2000 stored as 1009 07D0(16)
T_Str4		Text String 4 characters
(T11)		Two characters per 16 bit register
T_Str6		Text String 6 characters
(T12)		Two charcters per 16 bit register

T_Str8		Text String 8 characters
		Two characters per 16 bit register.
T_Str16		Text String 16 characters
		Two characters per 16 bit register.
T_Str20		Text String 20 characters
		Two characters per 16 bit register.
T16		Unsigned Value (16 bit), 2 decimal places
		Example: 123.45 stored as 123.45 = 3039(16)
T17		Signed Value (16 bit), 2 decimal places
		Example: -123.45 stored as -123.45 = CFC7(16)
T_Time		Time and Date (64 bit)
	bits # 63..56	1/100s 00 - 99 (BCD)
	bits # 55..48	Seconds 00 - 59 (BCD)
	bits # 47..40	Minutes 00 - 59 (BCD)
	bits # 39..32	Hours 00 - 24 (BCD)
	bits # 31..24	Day of month 01 - 31 (BCD)
	bits # 23..16	Month of year 01 - 12 (BCD)
	bits # 15..00	Year (unsigned integer) 1998..4095
		Example: 15:42:03.75, 10. SEP 2000 stored as 7503 4215 1009 07D0(16)
T_TimeIEC		Time and Date (64 bit) = IEC870-5-4 "Binary Time 2a"
	bits # 63..55	Reserved
	bits # 54..48	Years (0 .. 99)
	bits # 47..44	Reserved
	bits # 43..40	Months (1 .. 12)
	bits # 39..37	Day of Week (1 .. 7)
	bits # 36..32	Day of Month (1 .. 31)
	bit # 31	Summer Time (0 .. 1): Summer time (1), Standard time (0)
	bits # 30..29	Reserved
	bits # 28..24	Hours (0 .. 23)
	bit # 23	Invalid (0 .. 1): Invalid (1), Valid (0)
	bit # 22	Reserved
	bits # 21..16	Minutes (0 .. 59)
	bits # 15..00	Miliseconds (0 .. 59999)
		Example: 15:42, 1. SEP stored as 4215 0109(16)
T_Data		Record Data
		Size and SubTypes depends on the Actual Memory Part
T_Str40		Text String 40 characters
		Two characters per 16 bit register.
T_float		IEEE 754 Floating-Point Single Precision Value (32 bit)
	bits # 31	Sign Bit (1 bit)
	bits # 30..23	Exponent Field (8 bit)
	bits # 22..0	Significand (23 bit)
		Example: 123.45 stored as 123.45000 = 42F6 E666(16)
T9A		Time (16 bit)

	bits # 15..08	Minutes 00 - 59 (BCD)
	bits # 07..00	Hours 00 - 24 (BCD)
		Example: 15:42 stored as 4215(16)
T10A		Date (16 bit)
	bits # 15..08	Day of month 00 - 31 (BCD)
	bits # 07..00	Month of year 00 - 12 (BCD)
		Example: 30, SEP stored as 3009(16)
T18		Signed Value (16 bit), 4 decimal places
		Example: -0.2345 stored as -2345 = F6D7(16)
T_unix		Unix time (32 bit)
	Bits # 31..00	Seconds since January 1, 1970
		Example: 16 May 2012 10:36:46 GMT stored as 4FB3 833E(16)

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MODBUS INFO

Read with Function Code	Register Addresses		Contents	Data Type	Ind	Values / Dependencies
			Input Registers			
	30000		Memory Reference			
			READ ONLY INFO			
4	30001	30008	Model Number	T_Str16		
4	30009	30012	Serial Number	T_Str8		
4	30013		Software Reference	T1		Software version
4	30014		Hardware Reference	T_Str2		Hardware version
4	30015		Calibration voltage	T16		V/100
4	30017		Calibration current	T16		A/100
4	30019		Accuracy class	T17		100=1,00
4	30020		MiNet Flag	T1	0	
4	30024		COM1: Communication Type	T1	0	No Communication
					2	RS485
					13	M-bus
					15	WiFi
4	30029		I/O 1	T1	0	No I/O
					5	Tariff Input
					10	Digital input
					12	Pulse Output (SO)
4	30030		I/O 2	T1		See I/O 1
4	30031		I/O 3	T1		See I/O 1
4	30044		Status register	T1	Bit-0	Locked
					Bit-4	Clock not set
4	30055	30057	Ethernet MAC Address	T_Hex6		
4	30058		Ethernet Software Reference	T1		Ethernet Software version
4	30059	30060	Ethernet: IP Address	T_Hex4		Actual Ethernet IP Address
4	30061		phase module 1 Software reference	T17		100=1,0
4	30062		phase module 2 Software reference	T17		100=1,0
4	30063		phase module 3 Software reference	T17		100=1,0
4	30064		phase module 1 CheckSum	T1		
4	30065		phase module 2 CheckSum	T1		
4	30066		phase module 3 CheckSum	T1		
4	30067		phase m. 1 Calibration Data CheckSum	T1		

4	30068		phase m. 2 Calibration Data CheckSum	T1		
4	30069		phase m. 3 Calibration Data CheckSum	T1		
4	30070		Measurement module Software ref.	T17		100=1,0
4	30071		Measurement module CheckSum	T1		
4	30072		Meas. m. Calibration Data CheckSum	T1		
4	30073		MID Setting Data CheckSum	T1		
4	30074		Setting Data CheckSum	T1		
4	30075		Software Checksum	T1		
4	30076		MID lock status	T1	0	unlocked
					1	locked
4	30077	30078	Calibration Time Stamp	T_unix		
4	30079		MID unlock counter	T1		
4	30080		FW upgrade counter	T1		
4	30098		Active Communication Port	T1	1	COM1
4	30099		Modbus Max. Register Read at Once	T1		
	30100	38999	MEASUREMENTS			
			READ ONLY INFO			
4	39000		Device group	T1	5	7M

MODBUS MEASUREMENTS

Read with Function Code	Register Addresses		Contents	Data	Ind	Values / Dependencies	Multiplicator and Unit
			Input Registers				
	30000		Memory Reference				
			ACTUAL MEASUREMENTS				
4	30101		Phase valid measurement	T1	Bit 0	Invalid measurement phase 1	
					Bit 1	Invalid measurement phase 2	
					Bit 2	Invalid measurement phase 3	
4	30103	30104	Run time	T3		seconds	x 1 seconds
4	30105	30106	Frequency	T5			x 1 Hz
4	30107	30108	U1	T5			x 1 V
4	30109	30110	U2	T5			x 1 V
4	30111	30112	U3	T5			x 1 V
4	30113	30114	Uavg (phase to neutral)	T5			x 1 V
4	30115		j12 (angle between U1 and U2)	T17			x 1 °
4	30116		j23 (angle between U2 and U3)	T17			x 1 °
4	30117		j31 (angle between U3 and U1)	T17			x 1 °
4	30118	30119	U12	T5			x 1 V
4	30120	30121	U23	T5			x 1 V
4	30122	30123	U31	T5			x 1 V
4	30124	30125	Uavg (phase to phase)	T5			x 1 V
4	30126	30127	I1	T5			x 1 A
4	30128	30129	I2	T5			x 1 A
4	30130	30131	I3	T5			x 1 A
4	30136	30137	Iavg	T5			x 1 A
4	30138	30139	S I	T5			x 1 A
4	30140	30141	Active Power Total (Pt)	T6			x 1 W
4	30142	30143	Active Power Phase L1 (P1)	T6			x 1 W
4	30144	30145	Active Power Phase L2 (P2)	T6			x 1 W
4	30146	30147	Active Power Phase L3 (P3)	T6			x 1 W
4	30148	30149	Reactive Power Total (Qt)	T6			x 1 var
4	30150	30151	Reactive Power Phase L1 (Q1)	T6			x 1 var
4	30152	30153	Reactive Power Phase L2 (Q2)	T6			x 1 var
4	30154	30155	Reactive Power Phase L3 (Q3)	T6			x 1 var
4	30156	30157	Apparent Power Total (St)	T5			x 1 VA
4	30158	30159	Apparent Power Phase L1 (S1)	T5			x 1 VA
4	30160	30161	Apparent Power Phase L2 (S2)	T5			x 1 VA
4	30162	30163	Apparent Power Phase L3 (S3)	T5			x 1 VA
4	30164	30165	Power Factor Total (PFt)	T7			x 1

4	30166	30167	Power Factor Phase 1 (PF1)	T7			x 1
4	30168	30169	Power Factor Phase 2 (PF2)	T7			x 1
4	30170	30171	Power Factor Phase 3 (PF3)	T7			x 1
4	30172		Power Angle Total (atan2(Pt,Qt))	T17			x 1 °
4	30173		j1 (angle between U1 and I1)	T17			x 1 °
4	30174		j2 (angle between U2 and I2)	T17			x 1 °
4	30175		j3 (angle between U3 and I3)	T17			x 1 °
4	30181		Internal Temperature	T17			x 1 °C
			THD HARMONIC DATA				
4	30182		U1 THD%	T16			x 1 %
4	30183		U2 THD%	T16			x 1 %
4	30184		U3 THD%	T16			x 1 %
4	30188		I1 THD%	T16			x 1 %
4	30189		I2 THD%	T16			x 1 %
4	30190		I3 THD%	T16			x 1 %
			I/O STATUS				
4	30191		Alarm Status Flags(G1, G2	T1	Bit 0..4	Group 1 Limit 1 .. 4	
					Bit 8..12	Group 2 Limit 1 .. 4	
4	30192		Alarm Status Flags(G3, G4	T1	Bit 0..4	Group 3 Limit 1 .. 4	
					Bit 8..12	Group 4 Limit 1 .. 4	
4	30193		I/O 1 Value	T17			
4	30194		I/O 2 Value	T17			
4	30195		I/O 3 Value	T17			
4	30197		External relay status	T1	0	Off	
					1	On	
					250	Comm. Error	
					255	Not connected	
4	30200		Alarm Status Flags(GE	T1	Bit 0..4	Group E Limit 1 .. 4	

4	30201		Logic functions values	T1	Bit 0	Logic function 1	
					Bit 1	Logic function 2	
					Bit 2	Logic function 3	
4	30396	30399	Actual time	T_ Time			
4	30400		CheckSum Status	T1	0	No Error (OK)	
					Bit 0	Error Parameter CRC	
					Bit 1	Error Firmware CRC	
					Bit 2	Error MID-lock	
					Bit 3	Error phase module 1 CheckSum	
					Bit 4	Error phase module 2 CheckSum	
					Bit 5	Error phase module 3 CheckSum	
					Bit 6	Error Measurement module CheckSum	
					Bit 7	Error Software Checksum	
					Bit 8	Error Calibration Data CheckSum	
					Bit 9	Error MID Setting Data CheckSum	
					Bit 10	Error Setting Data CheckSum	
					Bit 11	Error phase m. 1 Cal. Data CheckSum	
					Bit 12	Error phase m. 2 Cal. Data CheckSum	
					Bit 13	Error phase m. 3 Cal. Data CheckSum	
4	30401		Energy Counter n1 Exponent	T2		Exponent	
4	30402		Energy Counter n2 Exponent	T2		Exponent	
4	30403		Energy Counter n3 Exponent	T2		Exponent	
4	30404		Energy Counter n4 Exponent	T2		Exponent	
4	30405		Current Active Tariff	T1			
4	30406	30407	Energy Counter n1	T3		Mantissa	x EXP(Register 30401) x 1 Wh
4	30408	30409	Energy Counter n2	T3		Mantissa	x EXP(Register 30402) x 1 Wh

4	30410	30411	Energy Counter n3	T3		Mantissa	x EXP(Register 30403) x 1 varh
4	30412	30413	Energy Counter n4	T3		Mantissa	x EXP(Register 30404) x 1 varh
4	30414	30415	Energy Counter 1	T3		Mantissa	x EXP(Register 30446) x 1 VAh/ varh/Wh
4	30416	30417	Energy Counter 2	T3		Mantissa	x EXP(Register 30447) x 1 VAh/ varh/Wh
4	30418	30419	Energy Counter 3	T3		Mantissa	x EXP(Register 30448) x 1 VAh/ varh/Wh
4	30420	30421	Energy Counter 4	T3		Mantissa	x EXP(Register 30449) x 1 VAh/ varh/Wh
4	30422	30423	Energy Counter 5	T3		Mantissa	x EXP(Register 30450) x 1 VAh/ varh/Wh
4	30424	30425	Energy Counter 6	T3		Mantissa	x EXP(Register 30451) x 1 VAh/ varh/Wh
4	30426	30427	Energy Counter 7	T3		Mantissa	x EXP(Register 30452) x 1 VAh/ varh/Wh
4	30428	30429	Energy Counter 8	T3		Mantissa	x EXP(Register 30453) x 1 VAh/ varh/Wh
4	30430	30431	Energy Counter 9	T3		Mantissa	x EXP(Register 30454) x 1 VAh/ varh/Wh
4	30432	30433	Energy Counter 10	T3		Mantissa	x EXP(Register 30455) x 1 VAh/ varh/Wh
4	30434	30435	Energy Counter 11	T3		Mantissa	x EXP(Register 30456) x 1 VAh/ varh/Wh
4	30436	30437	Energy Counter 12	T3		Mantissa	x EXP(Register 30457) x 1 VAh/ varh/Wh
4	30438	30439	Energy Counter 13	T3		Mantissa	x EXP(Register 30458) x 1 VAh/ varh/Wh
4	30440	30441	Energy Counter 14	T3		Mantissa	x EXP(Register 30459) x 1 VAh/ varh/Wh
4	30442	30443	Energy Counter 15	T3		Mantissa	x EXP(Register 30460) x 1 VAh/ varh/Wh
4	30444	30445	Energy Counter 16	T3		Mantissa	x EXP(Register 30461) x 1 VAh/ varh/Wh
4	30446		Energy Counter 1 Exponent	T2		Exponent	

4	30447		Energy Counter 2 Exponent	T2		Exponent	
4	30448		Energy Counter 3 Exponent	T2		Exponent	
4	30449		Energy Counter 4 Exponent	T2		Exponent	
4	30450		Energy Counter 5 Exponent	T2		Exponent	
4	30451		Energy Counter 6 Exponent	T2		Exponent	
4	30452		Energy Counter 7 Exponent	T2		Exponent	
4	30453		Energy Counter 8 Exponent	T2		Exponent	
4	30454		Energy Counter 9 Exponent	T2		Exponent	
4	30455		Energy Counter 10 Exponent	T2		Exponent	
4	30456		Energy Counter 11 Exponent	T2		Exponent	
4	30457		Energy Counter 12 Exponent	T2		Exponent	
4	30458		Energy Counter 13 Exponent	T2		Exponent	
4	30459		Energy Counter 14 Exponent	T2		Exponent	
4	30460		Energy Counter 15 Exponent	T2		Exponent	
4	30461		Energy Counter 16 Exponent	T2		Exponent	
4	30462	30463	1000 x Energy Counter n1	T3			x 0,1 Wh
4	30464	30465	1000 x Energy Counter n2	T3			x 0,1 varh
4	30466	30467	1000 x Energy Counter n3	T3			x 0,1 Wh
4	30468	30469	1000 x Energy Counter n4	T3			x 0,1 varh
4	30470	30471	1000 x Energy Counter 1	T3			x 0,1 VAh/varh/Wh
4	30472	30473	1000 x Energy Counter 2	T3			x 0,1 VAh/varh/Wh
4	30474	30475	1000 x Energy Counter 3	T3			x 0,1 VAh/varh/Wh
4	30476	30477	1000 x Energy Counter 4	T3			x 0,1 VAh/varh/Wh
4	30478	30479	1000 x Energy Counter 5	T3			x 0,1 VAh/varh/Wh
4	30480	30481	1000 x Energy Counter 6	T3			x 0,1 VAh/varh/Wh
4	30482	30483	1000 x Energy Counter 7	T3			x 0,1 VAh/varh/Wh
4	30484	30485	1000 x Energy Counter 8	T3			x 0,1 VAh/varh/Wh
4	30486	30487	1000 x Energy Counter 9	T3			x 0,1 VAh/varh/Wh
4	30488	30489	1000 x Energy Counter 10	T3			x 0,1 VAh/varh/Wh
4	30490	30491	1000 x Energy Counter 11	T3			x 0,1 VAh/varh/Wh
4	30492	30493	1000 x Energy Counter 12	T3			x 0,1 VAh/varh/Wh
4	30494	30495	1000 x Energy Counter 13	T3			x 0,1 VAh/varh/Wh
4	30496	30497	1000 x Energy Counter 14	T3			x 0,1 VAh/varh/Wh
4	30498	30499	1000 x Energy Counter 15	T3			x 0,1 VAh/varh/Wh
4	30500	30501	1000 x Energy Counter 16	T3			x 0,1 VAh/varh/Wh
			MEASUREMENTS (IEEE 754)				
4	32480	32481	Run time	T_ float			x 1 seconds
4	32484	32485	Uavg (phase to neutral)	T_ float			x 1 V
4	32486	32487	Uavg (phase to phase)	T_ float			x 1 V
4	32488	32489	S I	T_ float			x 1 A
4	32490	32491	Active Power Total (Pt)	T_ float			x 1 W
4	32492	32493	Reactive Power Total (Qt)	T_ float			x 1 var

4	32494	32495	Apparent Power Total (St)	T_ float			x 1 VA
4	32496	32497	Power Factor Total (PFt)	T_ float			x 1
4	32498	32499	Frequency	T_ float			x 1 Hz
4	32500	32501	U1	T_ float			x 1 V
4	32502	32503	U2	T_ float			x 1 V
4	32504	32505	U3	T_ float			x 1 V
4	32506	32507	Uavg (phase to neutral)	T_ float			x 1 V
4	32508	32509	U12	T_ float			x 1 V
4	32510	32511	U23	T_ float			x 1 V
4	32512	32513	U31	T_ float			x 1 V
4	32514	32515	Uavg (phase to phase)	T_ float			x 1 V
4	32516	32517	I1	T_ float			x 1 A
4	32518	32519	I2	T_ float			x 1 A
4	32520	32521	I3	T_ float			x 1 A
4	32522	32523	S I	T_ float			x 1 A
4	32528	32529	Iavg	T_ float			x 1 A
4	32530	32531	Active Power Phase L1 (P1)	T_ float			x 1 W
4	32532	32533	Active Power Phase L2 (P2)	T_ float			x 1 W
4	32534	32535	Active Power Phase L3 (P3)	T_ float			x 1 W
4	32536	32537	Active Power Total (Pt)	T_ float			x 1 W
4	32538	32539	Reactive Power Phase L1 (Q1)	T_ float			x 1 var
4	32540	32541	Reactive Power Phase L2 (Q2)	T_ float			x 1 var
4	32542	32543	Reactive Power Phase L3 (Q3)	T_ float			x 1 var
4	32544	32545	Reactive Power Total (Qt)	T_ float			x 1 var
4	32546	32547	Apparent Power Phase L1 (S1)	T_ float			x 1 VA
4	32548	32549	Apparent Power Phase L2 (S2)	T_ float			x 1 VA

4	32550	32551	Apparent Power Phase L3 (S3)	T_ float			x 1 VA
4	32552	32553	Apparent Power Total (St)	T_ float			x 1 VA
4	32554	32555	Power Factor Phase 1 (PF1)	T_ float			x 1
4	32556	32557	Power Factor Phase 2 (PF2)	T_ float			x 1
4	32558	32559	Power Factor Phase 3 (PF3)	T_ float			x 1
4	32560	32561	Power Factor Total (PFt)	T_ float			x 1
4	32562	32563	CAP/IND P. F. Phase 1 (PF1)	T_ float			x 1
4	32564	32565	CAP/IND P. F. Phase 2 (PF2)	T_ float			x 1
4	32566	32567	CAP/IND P. F. Phase 3 (PF3)	T_ float			x 1
4	32568	32569	CAP/IND P. F. Total (PFt)	T_ float			x 1
4	32570	32571	j1 (angle between U1 and I1)	T_ float			x 1 °
4	32572	32573	j2 (angle between U2 and I2)	T_ float			x 1 °
4	32574	32575	j3 (angle between U3 and I3)	T_ float			x 1 °
4	32576	32577	Power Angle Total (atan2(Pt,Qt))	T_ float			x 1 °
4	32578	32579	j12 (angle between U1 and U2)	T_ float			x 1 °
4	32580	32581	j23 (angle between U2 and U3)	T_ float			x 1 °
4	32582	32583	j31 (angle between U3 and U1)	T_ float			x 1 °
4	32584	32585	Frequency	T_ float			x 1 Hz
4	32588	32589	I1 THD%	T_ float			x 1 %
4	32590	32591	I2 THD%	T_ float			x 1 %
4	32592	32593	I3 THD%	T_ float			x 1 %
4	32594	32595	U1 THD%	T_ float			x 1 %
4	32596	32597	U2 THD%	T_ float			x 1 %
4	32598	32599	U3 THD%	T_ float			x 1 %
	32638	32639	Energy Counter n1	T_ float			x 1 Wh
	32640	32641	Energy Counter n2	T_ float			x 1 varh

	32642	32643	Energy Counter n3	T_ float			x 1 Wh
	32644	32645	Energy Counter n4	T_ float			x 1 varh
4	32658	32659	Internal Temperature	T_ float			x 1 °C
			ENERGY				
4	32750	32751	Aktiv Tariff	T_ float			x 1
4	32752	32753	Energy Counter n1	T_ float			x 1 Wh
4	32754	32755	Energy Counter n2	T_ float			x 1 varh
4	32756	32757	Energy Counter n3	T_ float			x 1 Wh
4	32758	32759	Energy Counter n4	T_ float			x 1 varh
4	32760	32761	Energy Counter 1	T_ float			x 1 VAh/varh/Wh
4	32762	32763	Energy Counter 2	T_ float			x 1 VAh/varh/Wh
4	32764	32765	Energy Counter 3	T_ float			x 1 VAh/varh/Wh
4	32766	32767	Energy Counter 4	T_ float			x 1 VAh/varh/Wh
4	32768	32769	Energy Counter 5	T_ float			x 1 VAh/varh/Wh
4	32770	32771	Energy Counter 6	T_ float			x 1 VAh/varh/Wh
4	32772	32773	Energy Counter 7	T_ float			x 1 VAh/varh/Wh
4	32774	32775	Energy Counter 8	T_ float			x 1 VAh/varh/Wh
4	32776	32777	Energy Counter 9	T_ float			x 1 VAh/varh/Wh
4	32778	32779	Energy Counter 10	T_ float			x 1 VAh/varh/Wh
4	32780	32781	Energy Counter 11	T_ float			x 1 VAh/varh/Wh
4	32782	32783	Energy Counter 12	T_ float			x 1 VAh/varh/Wh
4	32784	32785	Energy Counter 13	T_ float			x 1 VAh/varh/Wh
4	32786	32787	Energy Counter 14	T_ float			x 1 VAh/varh/Wh
4	32788	32789	Energy Counter 15	T_ float			x 1 VAh/varh/Wh

4	32790	32791	Energy Counter 16	T_ float			x 1 VAh/varh/Wh
			NOMINAL VALUES				
	32981	32982	Reserved for nominal aux voltage	T_ float		Unomx	
	32983	32984	Reserved for nominal aux current	T_ float		Inomx	
4	32985	32986	nominal phase voltage	T_ float		Unom	x 1 V
4	32987	32988	nominal phase current	T_ float		Inom	x 1 A
4	32989	32990	nominal phase power	T_ float		Pnom	x 1 W
4	32991	32992	nominal total power	T_ float		Ptot	x 1 W
4	32993	32994	nominal total current	T_ float		Itot	x 1 A
4	32995	32996	nominal frequency	T_ float		Fnom	x 1 Hz
4	34999	35000	Run time	T3		seconds	x 1 seconds
			INTERVAL MEASUREMENTS				
			AVERAGE MEASUREMENTS				
4	35500		The last Average interval duration	T1			x 0,1 seconds
4	35501		Time since the last average meaurements	T1			x 0,1 seconds
4	35502		Average measurements counter	T1			
4	35503	35504	Timestamp	T_ unix		'= 0 after reset	
4	35505	35506	Frequency	T5			x 1 Hz
4	35507	35508	U1	T5			x 1 V
4	35509	35510	U2	T5			x 1 V
4	35511	35512	U3	T5			x 1 V
4	35513	35514	Uavg (phase to neutral)	T5			x 1 V
4	35515		j12 (angle between U1 and U2)	T17			x 1°
4	35516		j23 (angle between U2 and U3)	T17			x 1°
4	35517		j31 (angle between U3 and U1)	T17			x 1°
4	35518	35519	U12	T5			x 1 V
4	35520	35521	U23	T5			x 1 V
4	35522	35523	U31	T5			x 1 V
4	35524	35525	Uavg (phase to phase)	T5			x 1 V
4	35526	35527	I1	T5			x 1 A
4	35528	35529	I2	T5			x 1 A
4	35530	35531	I3	T5			x 1 A
4	35536	35537	Iavg	T5			x 1 A
4	35538	35539	S I	T5			x 1 A
4	35540	35541	Active Power Total (Pt)	T6			x 1 W
4	35542	35543	Active Power Phase L1 (P1)	T6			x 1 W

4	35544	35545	Active Power Phase L2 (P2)	T6			x 1 W
4	35546	35547	Active Power Phase L3 (P3)	T6			x 1 W
4	35548	35549	Reactive Power Total (Qt)	T6			x 1 var
4	35550	35551	Reactive Power Phase L1 (Q1)	T6			x 1 var
4	35552	35553	Reactive Power Phase L2 (Q2)	T6			x 1 var
4	35554	35555	Reactive Power Phase L3 (Q3)	T6			x 1 var
4	35556	35557	Apparent Power Total (St)	T5			x 1 VA
4	35558	35559	Apparent Power Phase L1 (S1)	T5			x 1 VA
4	35560	35561	Apparent Power Phase L2 (S2)	T5			x 1 VA
4	35562	35563	Apparent Power Phase L3 (S3)	T5			x 1 VA
4	35564	35565	Power Factor Total (PFt)	T7			x 1
4	35566	35567	Power Factor Phase 1 (PF1)	T7			x 1
4	35568	35569	Power Factor Phase 2 (PF2)	T7			x 1
4	35570	35571	Power Factor Phase 3 (PF3)	T7			x 1
4	35572		Power Angle Total (atan2(Pt,Qt))	T17			x 1 °
4	35573		j1 (angle between U1 and I1)	T17			x 1 °
4	35574		j2 (angle between U2 and I2)	T17			x 1 °
4	35575		j3 (angle between U3 and I3)	T17			x 1 °
4	35581		Internal Temperature	T17			x 1 °C
			THD HARMONIC DATA				
4	35582		U1 THD%	T16			x 1 %
4	35583		U2 THD%	T16			x 1 %
4	35584		U3 THD%	T16			x 1 %
4	35588		I1 THD%	T16			x 1 %
4	35589		I2 THD%	T16			x 1 %
4	35590		I3 THD%	T16			x 1 %
			MAXIMUM MEASUREMENTS				
4	35600	35604	Reserved				
4	35605	35606	Frequency	T5			x 1 Hz
4	35607	35608	U1	T5			x 1 V
4	35609	35610	U2	T5			x 1 V
4	35611	35612	U3	T5			x 1 V
4	35613	35614	Uavg (phase to neutral)	T5			x 1 V
4	35615		j12 (angle between U1 and U2)	T17			x 1 °
4	35616		j23 (angle between U2 and U3)	T17			x 1 °
4	35617		j31 (angle between U3 and U1)	T17			x 1 °
4	35618	35619	U12	T5			x 1 V
4	35620	35621	U23	T5			x 1 V
4	35622	35623	U31	T5			x 1 V
4	35624	35625	Uavg (phase to phase)	T5			x 1 V
4	35626	35627	I1	T5			x 1 A
4	35628	35629	I2	T5			x 1 A
4	35630	35631	I3	T5			x 1 A
4	35636	35637	Iavg	T5			x 1 A
4	35638	35639	S I	T5			x 1 A
4	35640	35641	Active Power Total (Pt)	T6			x 1 W

4	35642	35643	Active Power Phase L1 (P1)	T6			x 1 W
4	35644	35645	Active Power Phase L2 (P2)	T6			x 1 W
4	35646	35647	Active Power Phase L3 (P3)	T6			x 1 W
4	35648	35649	Reactive Power Total (Qt)	T6			x 1 var
4	35650	35651	Reactive Power Phase L1 (Q1)	T6			x 1 var
4	35652	35653	Reactive Power Phase L2 (Q2)	T6			x 1 var
4	35654	35655	Reactive Power Phase L3 (Q3)	T6			x 1 var
4	35656	35657	Apparent Power Total (St)	T5			x 1 VA
4	35658	35659	Apparent Power Phase L1 (S1)	T5			x 1 VA
4	35660	35661	Apparent Power Phase L2 (S2)	T5			x 1 VA
4	35662	35663	Apparent Power Phase L3 (S3)	T5			x 1 VA
4	35664	35665	Power Factor Total (PFt)	T7			x 1
4	35666	35667	Power Factor Phase 1 (PF1)	T7			x 1
4	35668	35669	Power Factor Phase 2 (PF2)	T7			x 1
4	35670	35671	Power Factor Phase 3 (PF3)	T7			x 1
4	35672		Power Angle Total (atan2(Pt,Qt))	T17			x 1 °
4	35673		j1 (angle between U1 and I1)	T17			x 1 °
4	35674		j2 (angle between U2 and I2)	T17			x 1 °
4	35675		j3 (angle between U3 and I3)	T17			x 1 °
4	35681		Internal Temperature	T17			x 1 °C
			THD HARMONIC DATA				
4	35682		U1 THD%	T16			x 1 %
4	35683		U2 THD%	T16			x 1 %
4	35684		U3 THD%	T16			x 1 %
4	35688		I1 THD%	T16			x 1 %
4	35689		I2 THD%	T16			x 1 %
4	35690		I3 THD%	T16			x 1 %
			MINIMUM MEASUREMENTS				
4	35700	35704	Reserved				
4	35705	35706	Frequency	T5			x 1 Hz
4	35707	35708	U1	T5			x 1 V
4	35709	35710	U2	T5			x 1 V
4	35711	35712	U3	T5			x 1 V
4	35713	35714	Uavg (phase to neutral)	T5			x 1 V
4	35715		j12 (angle between U1 and U2)	T17			x 1 °
4	35716		j23 (angle between U2 and U3)	T17			x 1 °
4	35717		j31 (angle between U3 and U1)	T17			x 1 °
4	35718	35719	U12	T5			x 1 V
4	35720	35721	U23	T5			x 1 V
4	35722	35723	U31	T5			x 1 V
4	35724	35725	Uavg (phase to phase)	T5			x 1 V
4	35726	35727	I1	T5			x 1 A
4	35728	35729	I2	T5			x 1 A
4	35730	35731	I3	T5			x 1 A
4	35736	35737	Iavg	T5			x 1 A
4	35738	35739	S I	T5			x 1 A

4	35740	35741	Active Power Total (Pt)	T6			x 1 W
4	35742	35743	Active Power Phase L1 (P1)	T6			x 1 W
4	35744	35745	Active Power Phase L2 (P2)	T6			x 1 W
4	35746	35747	Active Power Phase L3 (P3)	T6			x 1 W
4	35748	35749	Reactive Power Total (Qt)	T6			x 1 var
4	35750	35751	Reactive Power Phase L1 (Q1)	T6			x 1 var
4	35752	35753	Reactive Power Phase L2 (Q2)	T6			x 1 var
4	35754	35755	Reactive Power Phase L3 (Q3)	T6			x 1 var
4	35756	35757	Apparent Power Total (St)	T5			x 1 VA
4	35758	35759	Apparent Power Phase L1 (S1)	T5			x 1 VA
4	35760	35761	Apparent Power Phase L2 (S2)	T5			x 1 VA
4	35762	35763	Apparent Power Phase L3 (S3)	T5			x 1 VA
4	35764	35765	Power Factor Total (PFt)	T7			x 1
4	35766	35767	Power Factor Phase 1 (PF1)	T7			x 1
4	35768	35769	Power Factor Phase 2 (PF2)	T7			x 1
4	35770	35771	Power Factor Phase 3 (PF3)	T7			x 1
4	35772		Power Angle Total (atan2(Pt,Qt))	T17			x 1 °
4	35773		j1 (angle between U1 and I1)	T17			x 1 °
4	35774		j2 (angle between U2 and I2)	T17			x 1 °
4	35775		j3 (angle between U3 and I3)	T17			x 1 °
4	35781		Internal Temperature	T17			x 1 °C
			THD HARMONIC DATA				
4	35782		U1 THD%	T16			x 1 %
4	35783		U2 THD%	T16			x 1 %
4	35784		U3 THD%	T16			x 1 %
4	35788		I1 THD%	T16			x 1 %
4	35789		I2 THD%	T16			x 1 %
4	35790		I3 THD%	T16			x 1 %
			RAM logger				
4	36000		Measurement parameter	T1		See OutTypes	
4	36001		Time interval	T1		minutes	
4	36002		Number of valid results	T1			
4	36003		Time stamp of last result	T2		minutes since midnight (<0 if no time)	
4	36004	36131	Logger table (newest to oldest)	T17		Normalised values	

MODBUS SETTINGS

Valid with Function Codes	Register Addresses		Contents	Data	Ind	Values / Dependencies	Min	Max	P. Level
			Holding Registers						
	40000		Memory Reference						
			SYSTEM COMMANDS						
16	40001	40002	User Password (L1, L2)	T_Str4	A…Z	Password to attempt user access level upgrade			0
16	40003	40005	Factory Password (FAC)	T_Str6	A…Z	Password to attempt factory access level upgrade			0
16	40006	40007	Lavel 1 - User password	T_Str4	A…Z				1
16	40008	40009	Lavel 2 - User password	T_Str4	A…Z				2
3 , 6	40010		Active Acces Level	T1	0	Full protection	0	0	0
6	40011		Manual password activation	T1	1	Lock instrument			0
6	40012		Operator Command Register	T1	1	Save Settings	1	5	1
					2	Abort Settings			
					3	Restart Instrument			
					4	Restart Ethernet			
					5	Save Settings and Restart Ethernet			
6	40014		Reset command register 2	T1	Bit-0	Reset alarm ouptut relay 1			1
					Bit-1	Reset alarm ouptut relay 2			
					Bit-8	Reset alarm ouptut IR			
3 , 6	40015		IR external relay command action	T1	0	Off	0	1	0
					1	On			
3 , 6	40030		Select Active Tariff	T1			1	6	1
6	40031		Reset energy command register 1	T1	Bit-0..7	Reset counter 1 .. 8	0	65535	1
					Bit-8..15	Reset counter 9 .. 16			
			GENERAL SETTINGS						
3, 6, 16	40101	40120	Description	T_Str40					2
3, 6, 16	40121	40140	Location	T_Str40					2
3 , 6	40143		Conection Mode	T1	0	No mode	1	5	2
					1	1b - Single Phase			
					2	3b - 3 phase 3 wire balanced			
					3	4b - 3 phase 4 wire balanced			
					4	3u - 3 phase 3 wire unbalanced			
					5	4u - 3 phase 4 wire unbalanced			
3 , 6	40148		Current input range (%)	T16		10000 for 100%	5,00	260,00	2
3 , 6	40149		Voltage input range (%)	T16		10000 for 100%	2,50	100,00	2
3 , 6	40150		Frequency nominal value	T1		Hz	10	1000	2

3 , 6	40156		Language	T1	0	English	0	0	0
					1	Francais			
					2	Deutsch			
					3	Español			
					4	Slovenski			
					5	Pycck			
					6	Dansk			
					7	Italiano			
					8	English US			
					9	Hrvatski			
					10	Polski			
					11	Portuguese			
					12	Hebrew			
					13	Serbian			
					14	Türkçe			
	40159		Temperature unit	T1	0	°C	0	1	2
					1	°F			
3, 6, 16	40161	40162	Time	T9					1
3, 6, 16	40163	40164	Date	T10					1
3 , 6	40166		Automatic change S/W time	T1	0	No	0	1	1
3 , 6	40170		LCD configurations	T1	Bit 0	Counter description mode (*0=OBIS code; 1=letters)	0	1	2
3 , 6	40171		LCD Contrast	T2			-10	10	2
3 , 6	40172		LCD Back Light Intesnity	T1		0=No Backlight	0	10	2
3 , 6	40173		LCD Back Light Time Off	T1		Minutes (0=Always on)	0	60	2
3 , 6	40174		LCD scroll interval	T1		Seconds	5	60	2
3 , 6	40175		LCD Custom screen 1 - Line 1	T1		See OutTypes	0	100	2
3 , 6	40176		LCD Custom screen 1 - Line 2	T1		See OutTypes	0	100	2
3 , 6	40177		LCD Custom screen 1 - Line 3	T1		See OutTypes	0	100	2
3 , 6	40178		LCD Custom screen 2 - Line 1	T1		See OutTypes	0	100	2
3 , 6	40179		LCD Custom screen 2 - Line 2	T1		See OutTypes	0	100	2
3 , 6	40180		LCD Custom screen 2 - Line 3	T1		See OutTypes	0	100	2
3 , 6	40181		LCD Custom screen 3 - Line 1	T1		See OutTypes	0	100	2
3 , 6	40182		LCD Custom screen 3 - Line 2	T1		See OutTypes	0	100	2
3 , 6	40183		LCD Custom screen 3 - Line 3	T1		See OutTypes	0	100	2
3 , 6	40184		LCD scroll parameters 1	T1	Bit 0	Counter n1 (Allways)	1	65535	2
					Bit 1	Counter n2			
					Bit 2	Counter n3			
					Bit 3	Counter n4			
3 , 6	40185		LCD scroll parameters 2		Bit 0..7	Counter 1 .. 8	0	65535	2
					Bit 8..15	Counter 9 .. 16			

3 , 6	40186		LCD scroll parameters 3		Bit 0	Active Power Total (Pt)	0	65535	2
					Bit 1	Active Power P1 .. P3 (P12)			
					Bit 2	Reactive Power Total (Qt)			
					Bit 3	Reactive Power Q1 .. Q3 (Q12)			
					Bit 4	Apparent Power Total (St)			
					Bit 5	Apparent Power S1 .. S3 (S12)			
					Bit 6	Uavg (phase to neutral)			
					Bit 7	Voltage U1 .. U3			
					Bit 8	Uavg (phase to phase)			
					Bit 9	Voltage U12 .. U31			
					Bit 10	Curent Total			
					Bit 11	Curent I1 .. I3 (I12)			
					Bit 12	Frequency			
					Bit 13	Active Tariff			
					Bit 14	Power Factor Total (PFt)			
					Bit 15	Power Factor PF1 .. PF3 (PF12)			
3 , 6	40187		LCD scroll parameters 4		Bit 0	Power Angle Total (atan2(Pt,Qt))	0	15	2
					Bit 1	Power Angle 1 .. 3 (12)			
					Bit 2	THD of voltage			
					Bit 3	THD of current			
3 , 6	40188		LCD return mode	T1	0	Auto scroll	0	2	2
					1	Counter n1			
					2	Hold page			
3 , 6	40192		Comm. & LCD average interval	T1		10=1,0 sec	0,1	5,0	2
			COMMUNICATION						
3 , 6	40202		Port 1: Device Adress (Modbus)	T1			1	247	2
3 , 6	40203		Port 1: Baud Rate	T1	0	Baud rate 1200	1	7	2
					1	Baud rate 2400			
					2	Baud rate 4800			
					3	Baud rate 9600			
					4	Baud rate 19200			
					5	Baud rate 38400			
					6	Baud rate 57600			
					7	Baud rate 115200			
3 , 6	40204		Port 1: Stop Bit	T1	0	1 Stop bit	0	1	2
					1	2 Stop bits			
3 , 6	40205		Port 1: Parity	T1	0	No parity	0	2	2
					1	Odd parity			
					2	Even parity			
3 , 6	40206		Port 1: Data Bits	T1	0	8 bits	0	0	2
3 , 6	40207		Port 1: TCP Port	T1			1	65535	2
3, 6, 16	40208	40227	Port 1: IP Host name	T_ Str40					2
3, 6, 16	40228	40229	Port 1: IP Address	T_ Hex4					0

3, 6, 16	40230	40231	Port 1: Subnet Mask	T_ Hex4					0
3, 6, 16	40232	40233	Port 1: Default Router	T_ Hex4					2
3, 6, 16	40234	40241	WIFI password	T_ Str16					2
3, 6, 16	40242	40249	WIFI SSID	T_ Str16					2
3 , 6	40250		Bluetooth ON/OFF	T1	0	Off	0	1	2
					1	On			
			IR						
3 , 6	40252		Port 2: Device Adress (Modbus)	T1			1	247	2
3 , 6	40253		Port 2: Baud Rate	T1		see Port 1: Baud Rate	3	7	2
3 , 6	40254		Port 2: Stop Bit	T1		see Port 1: Stop Bit	0	1	2
3 , 6	40255		Port 2: Parity	T1		see Port 1: Parity	0	2	2
3 , 6	40256		Port 2: Data Bits	T1		see Port 1: Data Bits	0	0	2
			M-bus						
3 , 6	40271		M-bus Primary address	T1			0	250	2
3 , 6	40272		M-bus: Baud Rate	T1	0	Baud rate 300	1	5	2
					1	Baud rate 600			
					2	Baud rate 1200			
					3	Baud rate 2400			
					4	Baud rate 4800			
					5	Baud rate 9600			
3 , 6	40273	40274	M-bus Secondary address	T3		Digits only (Default = Serial number)	0	99999999	2
			ENERGY						
3 , 6	40401		Active Tariff	T1	0	Tariff input	0	6	1
					1..4	Tariff 1..4			
					5..6	Tariff 5..6			
3 , 6	40419		Total Energy Calculation	T1	0	Evaluation of the sum of phases	0	1	2
					1	Evaluation of individual phases			
			NON-RESETABLE COUNTERS						

3 , 6	40421		Energy Counter n1 Parameter	T1	0	No Parameter	0	95	2
					1	Active Power			
					2	Reactive pover			
					3	Apparent Power			
					5	Active Power Phase 1			
					6	Reactive pover Phase 1			
					7	Apparent Power Phase 1			
					9	Active Power Phase 2			
					10	Reactive pover Phase 2			
					11	Apparent Power Phase 2			
					13	Active Power Phase 3			
					14	Reactive pover Phase 3			
					15	Apparent Power Phase 3			
					33	Active Power individual phases			
					34	Reactive Power individual phases			
					35	Apparent Power individual phases			
3 , 6	40422		Energy Counter n1 Configuration	T1	Bit-0	Quadrant I Enabled	0	63	2
					Bit-1	Quadrant II Enabled			
					Bit-2	Quadrant III Enabled			
					Bit-3	Quadrant IIII Enabled			
					Bit-4	Absolute Value			
					Bit-5	Invert Value			
3 , 6	40423		Energy Counter n1 Exponent	T2			-3	6	2
3 , 6	40424		Energy Counter n1 Tarif Selector	T1	Bit-0	Tarif 1 Enabled	0	63	2
					Bit-1	Tarif 2 Enabled			
					Bit-2	Tarif 3 Enabled			
					Bit-3	Tarif 4 Enabled			
					Bit-4	Tarif 5 Enabled			
					Bit-5	Tarif 6 Enabled			
3 , 6	40425		Energy Counter n2 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40426		Energy Counter n2 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40427		Energy Counter n2 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40428		Energy Counter n2 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40429		Energy Counter n3 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40430		Energy Counter n3 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40431		Energy Counter n3 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40432		Energy Counter n3 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40433		Energy Counter n4 Parameter	T1		see Energy Counter n1 Parameter	0	95	2

3 , 6	40434		Energy Counter n4 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40435		Energy Counter n4 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40436		Energy Counter n4 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40437		Energy Counter 1 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40438		Energy Counter 1 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40439		Energy Counter 1 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40440		Energy Counter 1 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40441		Energy Counter 2 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40442		Energy Counter 2 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40443		Energy Counter 2 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40444		Energy Counter 2 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40445		Energy Counter 3 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40446		Energy Counter 3 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40447		Energy Counter 3 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40448		Energy Counter 3 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40449		Energy Counter 4 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40450		Energy Counter 4 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40451		Energy Counter 4 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40452		Energy Counter 4 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40453		Energy Counter 5 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40454		Energy Counter 5 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40455		Energy Counter 5 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40456		Energy Counter 5 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40457		Energy Counter 6 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40458		Energy Counter 6 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40459		Energy Counter 6 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40460		Energy Counter 6 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2

3 , 6	40461		Energy Counter 7 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40462		Energy Counter 7 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40463		Energy Counter 7 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40464		Energy Counter 7 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40465		Energy Counter 8 Parameter	T1		see Energy Counter n1 Parameter	0	95	2
3 , 6	40466		Energy Counter 8 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	40467		Energy Counter 8 Exponent	T2		see Energy Counter n1 Exponent	0	6	2
3 , 6	40468		Energy Counter 8 Tarif Selector	T1		see Energy Counter n1 Tarif Selector	0	63	2
3 , 6	40469	40472	Energy Counter 9			see Energy Counter n1			2
3 , 6	40473	40476	Energy Counter 10			see Energy Counter n1			2
3 , 6	40477	40480	Energy Counter 11			see Energy Counter n1			2
3 , 6	40481	40484	Energy Counter 12			see Energy Counter n1			2
3 , 6	40485	40488	Energy Counter 13			see Energy Counter n1			2
3 , 6	40489	40492	Energy Counter 14			see Energy Counter n1			2
3 , 6	40493	40496	Energy Counter 15			see Energy Counter n1			2
3 , 6	40497	40500	Energy Counter 16			see Energy Counter n1			2
			ALARMS						
3 , 6	41001		Alarm Enable Flags G1, G2	T1	Bit 0..4	Group 1 Limit 1 .. 4			2
3 , 6	41002		Alarm Enable Flags G3, G4	T1	Bit 0..4	Group 3 Limit 1 .. 4			2
			ALARM GROUP 1						
3 , 6	41004		Compare time delay	T1		seconds	0	900	2
3 , 6	41005		Hysteresis	T16		% of compare value, if 0 then % of nominal value	0,00	10,00	2
			GROUP 1 Limit 1						
3 , 6	41008		Limit 1 Parameter	T1		See OutTypes	0	1023	2
3 , 6	41009		Limit 1 Function	T1	Bit-1	Reserved: Store into memory (all)	0	80	2
					Bit-3	Activate LED (red backlight)			
					Bit-4	Activate Alarm Output			
					Bit-6	Limit Condition > (< if 0)			
			GROUP 1 Limit 2						
3 , 6	41011		Limit 2 Parameter	T1		see Limit 1 Parameter	0	127	2
3 , 6	41012		Limit 2 Function	T1		see Limit 1 Function	0	80	2
3 , 6	41013		Limit 2 Compare value	T16		see Limit 1 Compare value	-300.00	+300.Ø0	2
			GROUP 1 Limit 3						
3 , 6	41014		Limit 3 Parameter	T1		see Limit 1 Parameter	0	127	2
3 , 6	41015		Limit 3 Function	T1		see Limit 1 Function	0	80	2
3 , 6	41016		Limit 3 Compare value	T16		see Limit 1 Compare value	-300.00	+300.00	2
			GROUP 1 Limit 4						
3 , 6	41017		Limit 4 Parameter	T1		see Limit 1 Parameter	0	127	2

3 , 6	41018		Limit 4 Function	T1		see Limit 1 Function	0	80	2
3 , 6	41019		Limit 4 Compare value	T16		see Limit 1 Compare value	-300.00	+300.00	2
			ALARM GROUP 2			See ALARM GROUP 1			2
3 , 6	41033		Compare time delay	T1		seconds	0	900	2
3 , 6	41034		Hysteresis	T16		% of compare value, if 0 then % of nominal value	0,00	10,00	2
			GROUP 2 Limit 1						
3 , 6	41037		Limit 1 Parameter	T1		see GROUP 1 Limit 1 Parameter	0	127	2
3 , 6	41038		Limit 1 Function	T1		see GROUP 1 Limit 1 Function	0	80	2
3 , 6	41039		Limit 1 Compare value	T16		see GROUP 1 Limit 1 Compare value	-300.00	+300.00	2
3 , 6	41040	41042	GROUP 2 Limit 2			See GROUP 1 Limit 1			
3 , 6	41043	41045	GROUP 2 Limit 3			See GROUP 1 Limit 1			
3 , 6	41046	41048	GROUP 2 Limit 4			See GROUP 1 Limit 1			
			ALARM GROUP 3			See ALARM GROUP 1			
3 , 6	41062		Compare time delay	T1		seconds	0	900	2
3 , 6	41063		Hysteresis	T16		% of compare value, if 0 then % of nominal value	0,00	10,00	2
3 , 6	41066	41068	GROUP 3 Limit 1			See GROUP 1 Limit 1			
3 , 6	41069	41071	GROUP 3 Limit 2			See GROUP 1 Limit 1			
3 , 6	41072	41074	GROUP 3 Limit 3			See GROUP 1 Limit 1			
3 , 6	41075	41077	GROUP 3 Limit 4			See GROUP 1 Limit 1			
			ALARM GROUP 4			See ALARM GROUP 1			
3 , 6	41091		Compare time delay	T1		seconds	0	900	2
3 , 6	41092		Hysteresis	T16		% of compare value, if 0 then % of nominal value	0,00	10,00	2
3 , 6	41095	41097	GROUP 4 Limit 1			See GROUP 1 Limit 1			
3 , 6	41098	41100	GROUP 4 Limit 2			See GROUP 1 Limit 1			
3 , 6	41101	41103	GROUP 4 Limit 3			See GROUP 1 Limit 1			
3 , 6	41104	41106	GROUP 4 Limit 4			See GROUP 1 Limit 1			
			Logic Function 1						

3 , 6	41131		Input 1	T1	0	disabled	0	50	2
					1	GROUP 1 Limit 1			
					2	GROUP 1 Limit 2			
					3	GROUP 1 Limit 3			
					4	GROUP 1 Limit 4			
					9	GROUP 2 Limit 1			
					10	GROUP 2 Limit 2			
					11	GROUP 2 Limit 3			
					12	GROUP 2 Limit 4			
					17	GROUP 3 Limit 1			
					18	GROUP 3 Limit 2			
					19	GROUP 3 Limit 3			
					20	GROUP 3 Limit 4			
					25	GROUP 4 Limit 1			
					26	GROUP 4 Limit 2			
					27	GROUP 4 Limit 3			
					28	GROUP 4 Limit 4			
					33	Group E Limit 1			
					34	Group E Limit 2			
					35	Group E Limit 3			
					36	Group E Limit 4			
					41	Group 1 (OR all)			
					42	Group 2 (OR all)			
					43	Group 3 (OR all)			
					44	Group 4 (OR all)			
					45	Group E (OR all)			
					46	Group 1 (AND all)			
					47	Group 2 (AND all)			
					48	Group 3 (AND all)			
					49	Group 4 (AND all)			
					50	Group E (AND all)			
3 , 6	41132		Input 2	T1		see Input 1	0	50	2
3 , 6	41133		Input 3	T1		see Input 1	0	50	2
3 , 6	41134		Input 4	T1		see Input 1	0	50	2
3 , 6	41135		Function 1	T1	0	AND	0	1	2
					1	OR			
3 , 6	41136		Function 2	T1		see Function 1	0	1	2
3 , 6	41137		Function 3	T1		see Function 1	0	1	2
			Logic Function 2						
3 , 6	41139		Input 1	T1		see Logic Function 1 Input 1	0	50	2
3 , 6	41140		Input 2	T1		see Logic Function 1 Input 1	0	50	2
3 , 6	41141		Input 3	T1		see Logic Function 1 Input 1	0	50	2
3 , 6	41142		Input 4	T1		see Logic Function 1 Input 1	0	50	2
3 , 6	41143		Function 1	T1		see Logic Function 1 Function 1	0	1	2
3 , 6	41144		Function 2	T1		see Logic Function 1 Function 1	0	1	2
3 , 6	41145		Function 3	T1		see Logic Function 1 Function 1	0	1	2

			Logic Function 3						
3 , 6	41147		Input 1	T1		see Logic Function 1 Input 1	0	50	2
3 , 6	41148		Input 2	T1		see Logic Function 1 Input 1	0	50	2
3 , 6	41149		Input 3	T1		see Logic Function 1 Input 1	0	50	2
3 , 6	41150		Input 4	T1		see Logic Function 1 Input 1	0	50	2
3 , 6	41151		Function 1	T1		see Logic Function 1 Function 1	0	1	2
3 , 6	41152		Function 2	T1		see Logic Function 1 Function 1	0	1	2
3 , 6	41153		Function 3	T1		see Logic Function 1 Function 1	0	1	2
			ALARM GROUP Energy						
3 , 6	41161		Limit 1 Parameter	T1	0	disabled	0	44	2
					1..8	Counter 1 .. 8			
					9..16	Counter 9 .. 16			
					33..36	Counter n1 .. n4			
3 , 6	41162		Limit 1 Function	T1	Bit-1	Reserved: Store into memory (all)	0	80	2
					Bit-4	Activate Alarm Output			
					Bit-6	Alarm Condition > (< if 0)			
3 , 6	41163	41164	Limit 1 Compare value	T3		digits in the counter resolution	0	99999 9999	2
3 , 6	41165		Limit 2 Parameter	T1		see Limit 1 Parameter	0	44	2
3 , 6	41166		Limit 2 Function	T1		see Limit 1 Function	0	1	2
3 , 6	41167	41168	Limit 2 Compare value	T3		see Limit 1 Compare value	0	99999 9999	2
3 , 6	41169		Limit 3 Parameter	T1		see Limit 1 Parameter	0	44	2
3 , 6	41170		Limit 3 Function	T1		see Limit 1 Function	0	1	2
3 , 6	41171	41172	Limit 3 Compare value	T3		see Limit 1 Compare value	0	9999 99999	2
3 , 6	41173		Limit 4 Parameter	T1		see Limit 1 Parameter	0	44	2
3 , 6	41174		Limit 4 Function	T1		see Limit 1 Function	0	1	2
3 , 6	41175	41176	Limit 4 Compare value	T3		see Limit 1 Compare value	0	999 999999	2
			OUTPUTS						
3 , 6	41200		Pulse LED Operation mode		0	Normal mode	0	6	0
					1	Test mode P - Fast			
					2	Test mode P - Fast (Counter only)			
					3	Test mode P			
					4	Test mode Q			
					5	Test mode Q - Fast			
					6	Test mode Q - Fast (Counter only)			
3 , 6	41201		Pulse LED Parameter	T1	0	Not set	0	95	2
					1..95	see Energy Counter n1 Parameter			
3 , 6	41202		Pulse LED Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	41203		Pulse LED No. Of pulses	T1			1	65535	2
3 , 6	41204		Pulse LED Energy unit	T1		* 10^(Common Energy Counter Exponent)	1	65535	2

3 , 6	41205		Pulse LED Pulse lenght	T1		ms	2	1000	2
			PULSE OUTPUTS						
3 , 6	41207		Output 1 Function	T1	0	Alarm output	0	1	2
					1	Pulse output			
3 , 6	41208		Output 2 Function	T1		see Pulse Output 1 Function	0	1	2
3 , 6	41211		Pulse Output 1 Parameter	T1	0	Not set	0	95	2
					1..95	see Energy Counter n1 Parameter			
3 , 6	41212		Pulse Output 1 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	41213		Pulse Output 1 No. Of pulses	T1			1	65535	2
3 , 6	41214		Pulse Output 1 Energy unit	T1		* 10^(Common Energy Counter Exponent)	1	65535	2
3 , 6	41215		Pulse Output 1 Pulse lenght	T1		ms	2	1000	2
3 , 6	41216		Pulse Output 1 Tarif Selector	T1	Bit-0	Tarif 1 enabled	0	63	2
					Bit-1	Tarif 2 enabled			
					Bit-2	Tarif 3 enabled			
					Bit-3	Tarif 4 enabled			
					Bit-4	Tarif 5 enabled			
					Bit-5	Tarif 6 enabled			
3 , 6	41217		Pulse Output 2 Parameter	T1		see Pulse Output 1 Parameter	0	95	2
3 , 6	41218		Pulse Output 2 Configuration	T1		see Energy Counter n1 Configuration	0	63	2
3 , 6	41219		Pulse Output 2 No. Of pulses	T1			1	65535	2
3 , 6	41220		Pulse Output 2 Energy unit	T1		* 10^(Common Energy Counter Exponent)	1	65535	2
3 , 6	41221		Pulse Output 2 Pulse lenght	T1		ms	2	1000	2
3 , 6	41222		Pulse Output 2 Tarif Selector	T1			0	63	2
			ALARM OUTPUTS						
			ALARM OUTPUT IR						
3 , 6	41235		IR External relay operating mode	T1	0	Not connected	0	2	2
					1	Manual			
					2	Alarm output control			
3 , 6	41236		Enabled Alarm groups	T1		See ALARM OUTPUT 1	0	255	2
3 , 6	41237		Output signal	T1		See ALARM OUTPUT 1	0	7	2
3 , 6	41238		Output pulse length	T1		Seconds	1	999	2
			ALARM OUTPUT 1						
3 , 6	41239		Enabled Alarm groups	T1	Bit-0	Group 1	0	255	2
					Bit-1	Group 2			
					Bit-2	Group 3			
					Bit-3	Group 4			
					Bit-4	Group E			
					Bit-5	Logic Function 1			
					Bit-6	Logic Function 2			
					Bit-7	Logic Function 3			

3 , 6	41240		Output signal	T1	0	Normal	0	7	2
					1	Permanent			
					2	Pulsed			
					3	Always ON			
					4	Always OFF			
					5	Normal inverse			
					6	Permanent inverse			
					7	Pulsed inverse			
3 , 6	41241		Output pulse length	T1		Seconds	1	999	2
3 , 6	41242	41244	ALARM OUTPUT 2			See ALARM OUTPUT 1			2
			ENERGY snapshot registers						
3, 6	41901		Auto freeze interval [minutes]	T1			0	65536	0
3, 6	41902		time to freeze [s]	T1			0	65536	0
3	41903	41904	time from freeze [s]	T3u					
3, 6	41905		Freeze STATUS	T1	0	at reset	1	65533	0
					65534	at interval			
					65535	at time to freeze			
3	41906		Current Active Tariff	T1					
3	41907	41908	Energy Counter n1	T3					
3	41909	41910	Energy Counter n2	T3					
3	41911	41912	Energy Counter n3	T3					
3	41913	41914	Energy Counter n4	T3					
3	41915	41916	Energy Counter 1	T3					
3	41917	41918	Energy Counter 2	T3					
3	41919	41920	Energy Counter 3	T3					
3	41921	41922	Energy Counter 4	T3					
3	41923	41924	Energy Counter 5	T3					
3	41925	41926	Energy Counter 6	T3					
3	41927	41928	Energy Counter 7	T3					
3	41929	41930	Energy Counter 8	T3					
3	41931	41932	Energy Counter 9	T3					
3	41933	41934	Energy Counter 10	T3					
3	41935	41936	Energy Counter 11	T3					
3	41937	41938	Energy Counter 12	T3					
3	41939	41940	Energy Counter 13	T3					
3	41941	41942	Energy Counter 14	T3					
3	41943	41944	Energy Counter 15	T3					
3	41945	41946	Energy Counter 16	T3					
			INTERVAL MEASUREMENTS						
3, 6	41990		Interval duration [s/10]	T1		600=60,0 sec	0,1	3600	0
3, 6	41991		Time to calculate interval meas. [s/10]	T1			0,1	3600	0

MODBUS DATA TYPES

Type	Value / Bit Mask	Description
T1		Unsigned Value (16 bit)
		Example: 12345 stored as 12345 = 3039(16)
T2		Signed Value (16 bit)
		Example: -12345 stored as -12345 = CFC7(16)
T3		Signed Long Value (32 bit)
		Example: 123456789 stored as 123456789 = 075B CD 15(16)
T4		Short Unsigned float (16 bit)
	bits # 15..14	Decade Exponent(Unsigned 2 bit)
	bits # 13..00	Binary Unsigned Value (14 bit)
		Example: 10000*102 stored as A710(16)
T5		Unsigned Measurement (32 bit)
	bits # 31..24	Decade Exponent(Signed 8 bit)
	bits # 23..00	Binary Unsigned Value (24 bit)
		Example: 123456*10-3 stored as FD01 E240(16)
T6		Signed Measurement (32 bit)
	bits # 31..24	Decade Exponent (Signed 8 bit)
	bits # 23..00	Binary Signed value (24 bit)
		Example: - 123456*10-3 stored as FDFE 1DC0(16)
T7		Power Factor (32 bit)
	bits # 31..24	Sign: Import/Export (00/FF)
	bits # 23..16	Sign: Inductive/Capacitive (00/FF)
	bits # 15..00	Unsigned Value (16 bit), 4 decimal places
		Example: 0.9876 CAP stored as 00FF 2694(16)
T8		Time stamp (32 bit)
	bits # 31..24	Minutes 00 - 59 (BCD)
	bits # 23..16	Hours 00 - 23 (BCD)
	bits # 15..08	Day of month 01 - 31 (BCD)
	bits # 07..00	Month of year 01 - 12 (BCD)
		Example: 15:42, 1. SEP stored as 4215 0109(16)
T9		Time (32 bit)
	bits # 31..24	1/100s 00 - 99 (BCD)
	bits # 23..16	Seconds 00 - 59 (BCD)
	bits # 15..08	Minutes 00 - 59 (BCD)
	bits # 07..00	Hours 00 - 24 (BCD)
		Example: 15:42:03.75 stored as 7503 4215(16)
T10		Date (32 bit)
	bits # 31..24	Day of month 01 - 31 (BCD)
	bits # 23..16	Month of year 01 - 12 (BCD)
	bits # 15..00	Year (unsigned integer) 1998..4095
		Example: 10, SEP 2000 stored as 1009 07D0(16)
T_Str4		Text String 4 characters
(T11)		Two characters per 16 bit register
T_Str6		Text String 6 characters

(T12)		Two charcters per 16 bit register
T_Str8		Text String 8 characters
		Two characters per 16 bit register.
T_Str16		Text String 16 characters
		Two characters per 16 bit register.
T_Str20		Text String 20 characters
		Two characters per 16 bit register.
T16		Unsigned Value (16 bit), 2 decimal places
		Example: 123.45 stored as 123.45 = 3039(16)
T17		Signed Value (16 bit), 2 decimal places
		Example: -123.45 stored as -123.45 = CFC7(16)
T_Time		Time and Date (64 bit)
	bits # 63..56	1/100s 00 - 99 (BCD)
	bits # 55..48	Seconds 00 - 59 (BCD)
	bits # 47..40	Minutes 00 - 59 (BCD)
	bits # 39..32	Hours 00 - 24 (BCD)
	bits # 31..24	Day of month 01 - 31 (BCD)
	bits # 23..16	Month of year 01 - 12 (BCD)
	bits # 15..00	Year (unsigned integer) 1998..4095
		Example: 15:42:03.75, 10. SEP 2000 stored as 7503 4215 1009 07D0(16)
T_TimeIEC		Time and Date (64 bit) = IEC870-5-4 "Binary Time 2a"
	bits # 63..55	Reserved
	bits # 54..48	Years (0 .. 99)
	bits # 47..44	Reserved
	bits # 43..40	Months (1 .. 12)
	bits # 39..37	Day of Week (1 .. 7)
	bits # 36..32	Day of Month (1 .. 31)
	bit # 31	Summer Time (0 .. 1): Summer time (1), Standard time (0)
	bits # 30..29	Reserved
	bits # 28..24	Hours (0 .. 23)
	bit # 23	Invalid (0 .. 1): Invalid (1), Valid (0)
	bit # 22	Reserved
	bits # 21..16	Minutes (0 .. 59)
	bits # 15..00	Miliseconds (0 .. 59999)
		Example: 15:42, 1. SEP stored as 4215 0109(16)
T_Data		Record Data
		Size and SubTypes depends on the Actual Memory Part
T_Str40		Text String 40 characters
		Two characters per 16 bit register.
T_float		IEEE 754 Floating-Point Single Precision Value (32 bit)
	bits # 31	Sign Bit (1 bit)
	bits # 30..23	Exponent Field (8 bit)

	bits # 22..0	Significand (23 bit)
		Example: 123.45 stored as 123.45000 = 42F6 E666(16)
T9A		Time (16 bit)
	bits # 15..08	Minutes 00 - 59 (BCD)
	bits # 07..00	Hours 00 - 24 (BCD)
		Example: 15:42 stored as 4215(16)
T10A		Date (16 bit)
	bits # 15..08	Day of month 00 - 31 (BCD)
	bits # 07..00	Month of year 00 - 12 (BCD)
		Example: 30, SEP stored as 3009(16)
T18		Signed Value (16 bit), 4 decimal places
		Example: -0.2345 stored as -2345 = F6D7(16)
T_unix		Unix time (32 bit)
	Bits # 31..00	Seconds since January 1, 1970
		Example: 16 May 2012 10:36:46 GMT stored as 4FB3 833E(16)

EQUATIONS

Number	Symbol	Definition
1	MP	Average interval
2	U_f	Phase voltage (U_1, U_2 or U_3)
3	U_{ff}	Phase-to-phase voltage (U_{12}, U_{23} or U_{31})
4	N	Total number of samples in a period
5	n	Sample number ($0 \le n \le N$)
6	x, y	Phase number (1, 2 or 3)
7	i_n	Current sample n
8	u_{fn}	Phase voltage sample n
9	u_{ffn}	Phase-to-phase voltage sample n
10	ϕ_f	Power angle between current and phase voltage f (ϕ_1, ϕ_2 or ϕ_3)

Voltage

$$U_f = \sqrt{\frac{\sum_{n=1}^{N} u_n^2}{N}}$$

Phase voltage

N – samples in averaging interval (up to 65 Hz)

$$U_{xy} = \sqrt{\frac{\sum_{n=1}^{N} (u_{xn} - u_{yn})^2}{N}}$$

Phase-to-phase voltage

u_x, u_y – phase voltages (U_f)

N – a number of samples in averaging interval

Current

$$I_{TRMS} = \sqrt{\frac{\sum_{n=1}^{N} i_n^2}{N}}$$

Phase current

N – samples in averaging interval (up to 65 Hz)

Power

$P_f = \frac{1}{N}\sum_{n=1}^{N}(u_{fn} \times i_{fn})$	**Active power by phases** N – a number of periods n – index of sample in a period f – phase designation
$P_t = P_1 + P_2 + P_3$	**Total active power** t – total power 1, 2, 3 – phase designation
$\mathrm{SignQ_f}(\varphi)$ $\varphi \in [0° - 180°] \rightarrow \mathrm{SignQ}_f(\varphi) = +1$ $\varphi \in [180° - 360°] \rightarrow \mathrm{SignQ}_f(\varphi) = -1$	**Reactive power sign** Q_f – reactive power (by phases) □ – power angle
$S = U_f \cdot I_f$	**Apparent power by phases** U_f – phase voltage I_f – phase current
$S_t = S_1 + S_2 + S_3$	**Total apparent power** S_t – apparent power by phases
$Q_f = SignQ(\varphi) \times \sqrt{{S_f}^2 - {P_f}^2}$	**Reactive power by phases** S_f – apparent power by phases P_f – active power by phases
$Q_f = \frac{1}{N} \cdot \sum_{n=1}^{N}(u_{fn} \times i_{f[n+N/4]})$	**Reactive power by phases (displacement method)** N – a number of samples in a period n – sample number (0 ≤ n ≤ N) f – phase designation
$Q_t = Q_1 + Q_2 + Q_3$	**Total reactive power** Q_t – reactive power by phases
$\varphi_s = a\,tan2\,(P_f, Q_f)$ $\varphi_s = [-180°, 179{,}99°]$	**Total power angle** P_t – total active power Q_t – total reactive power
$PF = \frac{\lvert P \rvert}{S}$	**Distortion power factor** P – active power S –apparent power

THD

$I_f\ THD(\%) = \frac{\sqrt{\sum_{n=2}^{63} I_{fn}^2}}{I_{f1}} 100$	**Current THD** I_1 – value of first harmonic n – number of harmonic
$U_f\ THD(\%) = \frac{\sqrt{\sum_{n=2}^{63} U_{fn}^2}}{U_{f1}} 100$	**Phase voltage THD** U_1 – value of first harmonic n – number of harmonic