

**ME440 Handheld Power Analyzer
MODBUS TCP/IP
Communication Protocol
V1.0**

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Modbus communication overview

ME440 adopts standard protocol— Modbus-TCP/IP.

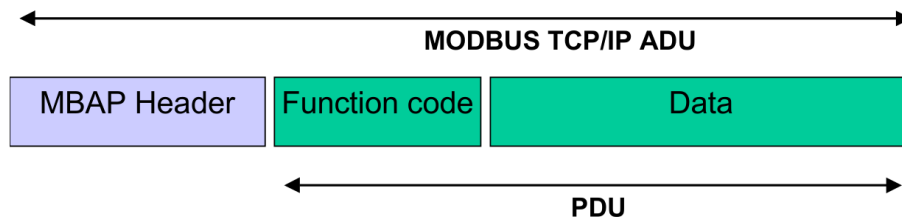
Modbus communication settings

Before communicating with the device using Modbus-TCP/IP protocol, use the HMI to configure the following settings:

Parameters	Available Values	Default Value
IP Address		192.168.1.5
Port	502	502

MODBUS On TCP/IP Application Data Unit

For transmission over TCP/IP Ethernet, the Modbus TCP/IP data frame contains three parts: MBAP header, function code and data.



A dedicated header is used on TCP/IP to identify the MODBUS Application Data Unit. It is called the MBAP header (MODBUS Application Protocol header).

The MBAP Header contains 4 fields, total 7 Bytes:

Fields	Length	Description -	Client	Server
Transaction Identifier	2 Bytes	Identification of a MODBUS Request / Response transaction.	Initialized by the client	Recopied by the server from the received request
Protocol Identifier	2 Bytes	0 = MODBUS protocol	Initialized by the client	Recopied by the server from the received request
Length	2 Bytes	Number of following bytes	Initialized by the client (request)	Initialized by the server (Response)
Unit Identifier	1 Byte	Identification of a remote slave connected on a serial line or on other buses.	Initialized by the client	Recopied by the server from the received request

The header is 7 bytes long:

- Transaction Identifier - It is used for transaction pairing, the MODBUS server copies in the response the transaction identifier of the request.
- Protocol Identifier – It is used for intra-system multiplexing. The MODBUS protocol is identified by the value 0.
- Length - The length field is a byte count of the following fields, including the Unit Identifier and data fields.
- Unit Identifier – This field is used for intra-system routing purpose. It is typically used to communicate to a MODBUS+ or a MODBUS serial line slave through a gateway between an Ethernet TCP-IP network and a MODBUS serial line. This field is set by the MODBUS Client in the request and must be returned with the same value in the response by the server.

PDU Request

Function Code	Command Block
8-Bits	Nx8-Bits

Functional code

Functional code tells what function addressed terminal equipment can execute. The following table lists the functional code that used by this instrument, as well as their significance and function.

Function Code		Function Name	Behavior
Decimal	Hexadecimal		
3	03H	Read Holding Registers	Read present HEX from one or more registers.
16	10H	Write Multiple Registers	Write present HEX on multiple registers.

Register table

Register tables have the following columns:

Register Alias	Register Address	Action R/WC	Size	Type	Units	Description
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- **Register Alias:** The meaning of the register
- **Register Address:** Modbus address of register encoded in the Modbus frame, in decimal (dec)
- **Action:** The read/write by command register
- **Size:** The data size in Int16
- **Type:** The encoding data type
- **Units:** The unit of the register value
- **Range:** The permitted values for this variable, usually a subset of what the format allows
- **Description:** Provides information about the register and the values that apply

Unit Table

The following data types appear in the Modbus register list:

Type	Description	Range
UInt16	16-bit unsigned integer	0–65535
Int16	16-bit signed integer	-32768–+32767
UInt32	32-bit unsigned integer	0–4 294 967 295
UInt64	64 bit unsigned integer	0–18 446 744 073 709 551 615
UTF8	8-bit field	multibyte character encoding for Unicode
Float32	32-bit value	Standard representation IEEE for floating number (with single precision)
Bitmap	–	–
Date Time	–	-

Date Time Format:

Word	Units															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	Reserved (0)								Year (0–99,year from 2000)							
2	Month (1–12)								Day (1–31)							
3	Hour (0–23)								Minute (0–59)							
4	Millisecond (0–59999)															

Configure Meter

You can configure the power meter by writing command and command parameters to corresponding" command registers" using Modbus function 16.

Command Result

The command result can be obtained by reading registers 424and 425.

The following table describes the command result:

Register Address	Content	Size (Int16)	Data (example)
424	Requested Command Number	1	1001(set Date Time)
425	Result	1	0 = Valid Operation 80 = Invalid Command 81 = Invalid Parameter 82 = Invalid Number of Parameters 83= Operation Not Performed

Function code (0x10=16) Operation

Function code (0x10=16) is used to configure meter, it requests and Responses data format

Request data format:

No.	Alias	Type	Range (decimal)	Description
1	Transaction Identifier	UInt16		Big-Endian (Sending order)
2	Protocol Identifier	UInt16	0=MODBUS	Big-Endian (Sending order)
3	Length	UInt16		Big-Endian (Sending order)
4	Unit Identifier	UInt8		
5	Function code	UInt8	16	
6	Registers Start address	UInt16	-	Big-Endian (Sending order)
7	Registers Numbers	UInt16	1-123	Big-Endian (Sending order)
8	Bytes of Registers Values	UInt8		Registers Numbers *2
9	Value of Register 1	UInt16	-	Big-Endian (Sending order)
10	...	UInt16	-	Big-Endian (Sending order)
11	Value of Register n	UInt16	-	Big-Endian (Sending order)

Response data format :

No.	Alias	Type	Range (decimal)	Description
1	Transaction Identifier	UInt16		Big-Endian (Sending order)
2	Protocol Identifier	UInt16	0=MODBUS	Big-Endian (Sending order)
3	Length	UInt16		Big-Endian (Sending order)
4	Unit Identifier	UInt8		
5	Function code	UInt8	16	
6	Registers Start address	UInt16	300	Big-Endian
7	Registers Numbers	UInt16	1-123	Big-Endian

Attention!

Function code (0x10=16) can only write data to "Command Register", that is to say, only registers start from 300 can be written data.

For example :

Configure "Date time"(command=1000,set 2019-5-9 12:01:00)

No.	Alias	Type	Range (decimal)	Range (hexadecimal)	Description
1	Transaction Identifier	UInt16	0	0000	
2	Protocol Identifier	UInt16	0	0000	
3	Length	UInt16	21	0015	
4	Unit Identifier	UInt8	1	01	
5	Function code	UInt8	16	10	
6	Registers Start address	UInt16	300	012C	write register start 300
7	Registers Numbers	UInt16	7	0007	
8	Bytes of Registers Values	UInt8	14	0D	
9	Value of Register 300	UInt16	1000	03E8	set date time command 1000
10	Value of Register 301	UInt16	2019	07E3	year=2019
11	Value of Register 302	UInt16	5	0005	month=5
12	Value of Register 303	UInt16	9	0009	day=9
13	Value of Register 304	UInt16	12	000C	hour=12
14	Value of Register 305	UInt16	1	0001	minute=1
15	Value of Register 306	UInt16	0	0000	second=0

Request data send as follows :

00 00 00 00 00 15 01 10 01 2C 00 07 0E 03 E8 07 E3 00 05 00 09 00 0C 00 01 00 00

if configure data is right, the meter will response data as follows :

00 00 00 00 00 06 01 10 01 2C 00 07

No.	Alias	Type	Range (hexadecimal)	Range (decimal)
1	Transaction Identifier	UInt16	0000	0
2	Protocol Identifier	UInt16	0000	0
3	Length	UInt16	0006	6
4	Unit Identifier	UInt8	01	1
5	Function code	UInt8	10	16
6	Registers Start address	UInt16	012C	300
7	Registers Numbers	UInt16	0007	7

Function code (0x03=3) Operation

Function code (0x03=3) is used to read registers values, it requests and Responses data format as

follows :

Request data format:

No.	Alias	Type	Range(decimal)	Description
1	Transaction Identifier	UInt16		Big-Endian (Sending order)
2	Protocol Identifier	UInt16	0=MODBUS	Big-Endian (Sending order)
3	Length	UInt16		Big-Endian (Sending order)
4	Unit Identifier	UInt8		
5	Function code	UInt8	3	
6	Registers Start address	UInt16	-	Big-Endian (Sending order)
7	Registers Numbers	UInt16	1-125	Big-Endian (Sending order)

Response data format :

No.	Alias	Type	Range(decimal)	Description
1	Transaction Identifier	UInt16		Big-Endian (Sending order)
2	Protocol Identifier	UInt16	0=MODBUS	Big-Endian (Sending order)
3	Length	UInt16		Big-Endian (Sending order)
4	Unit Identifier	UInt8		
5	Function code	UInt8	3	
6	Bytes of Registers Values	UInt8	-	Registers Numbers *2
7	Value of Register 1		-	Big-Endian
8	...		-	Big-Endian
9	Value of Register n		-	Big-Endian

For example :

Read Volatage A,B,C value (Address starts 1010)

No.	Alias	Type	Range (decimal)	Range (hexadecimal)	Description
1	Transaction Identifier	UInt16	0	0000	
2	Protocol Identifier	UInt16	0	0000	
3	Length	UInt16	6	0006	
4	Unit Identifier	UInt8	1	01	
5	Function code	UInt8	3	03	
6	Registers Start address	UInt16	1010	03F2	
7	Registers Numbers	UInt16	6	0006	

Request data send as follows :

00 00 00 00 00 06 01 03 03 F2 00 06

Response data as follows :

00 00 00 00 00 0F 01 03 0C 43 5C 00 00 43 5C 00 00 43 5C 00 00

No.	Alias	Type	hexadecimal	decimal
1	Transaction Identifier	UInt16	0000	0
2	Protocol Identifier	UInt16	0000	0
3	Length	UInt16	0006	6
4	Unit Identifier	UInt8	01	1
5	Function code	UInt8	03	3
6	Bytes of Registers Values	UInt8	0C	12
7	Voltage A	float32	435C0000	220V
8	Voltage B	float32	435C0000	220V
9	Voltage C	float32	435C0000	220V

Exception Response

Exception response frame format

No.	Alias	Type	Range (decimal)	Range (hexadecimal)	Description
1	Transaction Identifier	UInt16	0	0	
2	Protocol Identifier	UInt16	0	0	
3	Length	UInt16	3	0003	
4	Unit Identifier	UInt8	1	01	
5	Function code	UInt8	(128+3) (128+16)	(0x80+0x03) (0x80+0x10)	
6	Exception code	UInt8			

Exception code of MODBUS

Code (hexadecimal)	Name	Meaning
0x01	ILLEGAL FUNCTION	The function code received in the query is not an allowable action for the meter
0x02	ILLEGAL DATA ADDRESS	The data address received in the query is not an allowable address for the meter
0x03	ILLEGAL DATA VALUE	A value contained in the query data field is not an allowable value for the meter
0x04	DEVICE FAILURE	An unrecoverable error occurred while the server was attempting to perform the requested action.

Command List

Set System Date Time

Command Number	Action R/W	Size	Type	Units	Range	Description
1000	W	1	UInt16	-	2000-2099	Year
	W	1	UInt16	-	1-12	Month
	W	1	UInt16	-	1-31	Day
	W	1	UInt16	-	0-23	Hour
	W	1	UInt16	-	0-59	Minute
	W	1	UInt16	-	0-59	Second

Set Power System

Command Number	Action R/W	Size	Type	Units	Range	default	Description
1001	W	1	UInt16	-	0,1,2,3,4	0	Wire Type: 0=3PH4W 1=3PH3W 2=1PH2W_LN 3=1PH2W_LL 4=1PH3W_LL
	W	1	UInt16	Hz	50,60	50	Nominal Frequency

Set IABC current

Command Number	Action R/W	Size	Type	Units	Range	default	Description
1002	W	1	UInt16	-	0,1	0	IABC Current Connection 0 = Rogowski coil 1 = CT
	W	1	UInt16	-	0,1,2	0	IABC Rcoil Rated Current 0=600A(50mV/kA@50Hz) 1=3000A(85mV/kA @50Hz) 2=6000A(50mV/kA@50Hz)
	W	2	UInt32	A	1-999999	1000	IABC CT Primary
	W	2	UInt32	mV	1-707000	333000	IABC CT Secondary =realvalue*1000

Set IN current

Command Number	Action R/W	Size	Type	Units	Range	default	Description
1003	W	1	UInt16	-	0,1	0	IN Current Connection 0 = Rogowski coil 1 = CT
	W	1	UInt16	-	0,1,2	0	IN Rcoil Rated Current 0=600A(50mV/kA@50Hz) 1=3000A(85mV/kA @50Hz) 2=6000A(50mV/kA@50Hz)
	W	2	UInt32	A	1-999999	1000	IN CT Primary
	W	2	UInt32	mV	1-707000	333000	IN CT Secondary =realvalue*1000

Set UABC voltage

Command Number	Action R/W	Size	Type	Units	Range	default	Description
1004	W	1	UInt16	-	0,1	0	UABC Voltage Connection 0 = Direct Connect 1 = VT
	W	2	UInt32	V	1-999999	10000	UABC VT Primary
	W	2	UInt32	V	1-500000	100000	UABC VT Secondary =realvalue*1000

Set UN voltage

Command Number	Action R/W	Size	Type	Units	Range	default	Description
1005	W	1	UInt16	-	0,1	0	UN Voltage Connection 0 = Direct Connect 1 = VT
	W	2	UInt32	V	1-999999	10000	UN VT Primary
	W	2	UInt32	V	1-500000	100000	UN VT Secondary =realvalue*1000

Set demand

Command Number	Action R/W	Size	Type	Units	Range	Description
1006	W	1	UInt16	-	0,1	method 0=fixed 1=sliding
	W	1	UInt16	minute	1-60	Interval

Set Storage

Command Number	Action R/W	Size	Type	Units	Range	Description
1007	W	1	UInt16	-	0,1	Switch 0=disable 1=enable
	W	1	UInt16	second	1-65535	store interval

Reset Energy

Command Number	Action R/W	Size	Type	Units	Range	Description
2000	W	1	UInt16	-	100-103	100 : Reset Phase A 101 : Reset Phase B 102 : Reset Phase C 103 : Reset Phase ABC

Reset Peak Demand

Command Number	Action R/W	Size	Type	Units	Range	Description
2002	W	1	UInt16	-	1	1 : Reset Peak Demand

Reset Min. Max. Value

Command Number	Action R/W	Size	Type	Units	Range	Description
2003	W	1	UInt16	-	1	1 :Reset Min. Max. Value

Modbus Register List

Meter

Register Alias	Register Address	Action R/W/C	Size	Type	Units	Description
Meter Model	50	R	20	UTF8	-	
Serial Number	70	R	2	UInt32	-	
Firmware Version	72	R	1	UInt16	-	DLF format: X.Y.ZTT
Date time	73	R/W/C	4	Date time	-	Date/Time Reg.73: Year00-99 (year from 2000 to 2099) Reg.74: Month (b15:b8), day (b7:b0) Reg. 75: Hour (b15:b8) ,Minute (b7:b0) Reg. 76: Millisecond

Power System

Register Alias	Register Address	Action R/W/C	Size	Type	Units	Description
Wiring Type	80	R/W/C	1	UInt16	-	0 = 3PH4W 1 = 3PH3W 2 = 1PH2W L-N 3 = 1PH2W L-L 4= 1PH3W_LLN
Nominal Frequency	81	R/W/C	1	UInt16	Hz	
IABC Current Connection	82	R/W/C	1	UInt16	-	0 = Rogowski coil 1 = CT
IABC Rcoil Rated Current	83	R/W/C	1	UInt16	-	0=600A(50mV/kA@50Hz) 1=3000A(85mV/kA @50Hz) 2=6000A(50mV/kA@50Hz)
IABC CT Primary	84	R/W/C	2	UInt32	A	
IABC CT Secondary	86	R/W/C	2	UInt32	mV	=realvalue*1000
IN Current Connection	88	R/W/C	1	UInt16	-	0 = Rogowski coil 1 = CT
IN Rcoil Rated Current	89	R/W/C	1	UInt16	-	0=600A(50mV/kA@50Hz) 1=3000A(85mV/kA @50Hz) 2=6000A(50mV/kA@50Hz)
IN CT Primary	90	R/W/C	2	UInt32	A	
IN CT Secondary	92	R/W/C	2	UInt32	mV	=realvalue*1000
UABC Voltage Connection	94	R/W/C	1	UInt16	-	0 = Direct Connect 1 = VT
UABC VT Primary	95	R/W/C	2	UInt32	V	
UABC VT Secondary	97	R/W/C	2	UInt32	V	=realvalue*1000

UN Voltage Connection	99	R/WC	1	UInt16	-	0 = Direct Connect 1 = VT
UN VT Primary	100	R/WC	2	UInt32	V	
UN VT Secondary	102	R/WC	2	UInt32	V	=realvalue*1000

Storage

Register Alias	Register Address	Action R/WC	Size	Type	Units	Description
Storage Switch	110	R/WC	1	-	-	0=Disable 1=Enable
Storage Interval	111	R/WC	1	-	second	range : 1-65535

Command Register

Register Alias	Register Address	Action R/WC	Size	Type	Units	Description
Command Code	300	R/W	1	UInt16	-	
Parameter 001	301	R/W	1	UInt16	-	
Parameter 002	302	R/W	1	UInt16	-	
...	...	R/W	1	UInt16	-	
Parameter 123	423	R/W	1	UInt16	-	
Requested Command	424	R	1	UInt16	-	
Command Result	425	R	1	UInt16	-	0 = Valid Operation 80 = Invalid Command 81 = Invalid Parameter 82 = Invalid Number of Parameters 83= Operation Not Performed

Basic Data

Current, Voltage, Power, Power factor ,Frequency

Register Alias	Register Address	Action R/WC	Size	Type	Units	Description
Current						
IA	1000	R	2	Float32	A	Current Phase A
IB	1002	R	2	Float32	A	Current Phase B
IC	1004	R	2	Float32	A	Current Phase C
IN	1006	R	2	Float32	A	Current Phase N
Current Avg	1008	R	2	Float32	A	Average of IA, IB, IC
Voltage						
UA	1010	R	2	Float32	V	Voltage UA-UN
UB	1012	R	2	Float32	V	Voltage UB-UN
UC	1014	R	2	Float32	V	Voltage UC-UN
UN	1016	R	2	Float32	V	Voltage UN-UE
Phase Voltage Avg	1018	R	2	Float32	V	Average of UA, UB, UC

UAB	1020	R	2	Float32	V	Voltage UA-UB
UBC	1022	R	2	Float32	V	Voltage UB-UC
UCA	1024	R	2	Float32	V	Voltage UC-UA
Line Voltage Avg	1026	R	2	Float32	V	Average of UAB, UBC, UCA
Power						
PA	1028	R	2	Float32	kW	Active Power Phase A
PB	1030	R	2	Float32	kW	Active Power Phase B
PC	1032	R	2	Float32	kW	Active Power Phase C
PTotal	1034	R	2	Float32	kW	Total Active Power
QA	1036	R	2	Float32	kVAR	Reactive Power Phase A
QB	1038	R	2	Float32	kVAR	Reactive Power Phase B
QC	1040	R	2	Float32	kVAR	Reactive Power Phase C
QTotal	1042	R	2	Float32	kVAR	Total Reactive Power
SA	1044	R	2	Float32	kVA	Apparent Power Phase A
SB	1046	R	2	Float32	kVA	Apparent Power Phase B
SC	1048	R	2	Float32	kVA	Apparent Power Phase C
STotal	1050	R	2	Float32	kVA	Total Apparent Power
Power Factor						
PFA	1052	R	2	Float32	-	Power Factor Phase A
PFB	1054	R	2	Float32	-	Power Factor Phase B
PFC	1056	R	2	Float32	-	Power Factor Phase C
PFTotal	1058	R	2	Float32	-	Total Power Factor
DPFA	1060	R	2	Float32	-	Displacement Power Factor Phase A
DPFB	1062	R	2	Float32	-	Displacement Power Factor Phase B
DPFC	1064	R	2	Float32	-	Displacement Power Factor Phase C
DPFTotal	1066	R	2	Float32	-	Total Displacement Power Factor
Frequency						
FreqA	1068	R	2	Float32	Hz	Frequency Phase A
FreqB	1070	R	2	Float32	Hz	Frequency Phase B
FreqC	1072	R	2	Float32	Hz	Frequency Phase C
FreqAvg	1074	R	2	Float32	Hz	Average of FreqA, FreqB, FreqC

Energy

The energy values automatically resets to 0 when total energy reaches the limit of 1.0×10^9 kWh, 1.0×10^9 kVarh, or 1.0×10^9 kVah

the energy registers have two types: UInt32 and UInt64.

Register Alias	Register Address	Action R/WC	Size	Type	Units	Description
UInt32 Energy						
Active Energy						
EPAImp	2000	R	2	UInt32	kWh	Active Energy Import Phase A
EPBImp	2002	R	2	UInt32	kWh	Active Energy Import Phase B
EPCImp	2004	R	2	UInt32	kWh	Active Energy Import Phase C

EPImp	2006	R	2	UInt32	kWh	Total Active Energy Import Phase All
EPAExp	2008	R	2	UInt32	kWh	Active Energy Export Phase A
EPBExp	2010	R	2	UInt32	kWh	Active Energy Export Phase B
EPCExp	2012	R	2	UInt32	kWh	Active Energy Export Phase C
EPExp	2014	R	2	UInt32	kWh	Total Active Energy Export Phase All
Reactive Energy						
EQAImp	2016	R	2	UInt32	kVARh	Reactive Energy Import Phase A
EQBImp	2018	R	2	UInt32	kVARh	Reactive Energy Import Phase B
EQCImp	2020	R	2	UInt32	kVARh	Reactive Energy Import Phase C
EQImp	2022	R	2	UInt32	kVARh	Reactive Active Energy Import Phase All
EQAExp	2024	R	2	UInt32	kVARh	Reactive Energy Export Phase A
EQBExp	2026	R	2	UInt32	kVARh	Reactive Energy Export Phase B
EQCExp	2028	R	2	UInt32	kVARh	Reactive Energy Export Phase C
EQExp	2030	R	2	UInt32	kVARh	Total Reactive Energy Export Phase All
Apparent Energy						
ESAImp	2032	R	2	UInt32	kVAh	Apparent Energy Import Phase A
ESBImp	2034	R	2	UInt32	kVAh	Apparent Energy Import Phase B
ESCImp	2036	R	2	UInt32	kVAh	Apparent Energy Import Phase C
ESImp	2038	R	2	UInt32	kVAh	Apparent Active Energy Import Phase All
ESAExp	2040	R	2	UInt32	kVAh	Apparent Energy Export Phase A
ESBExp	2042	R	2	UInt32	kVAh	Apparent Energy Export Phase B
ESCExp	2044	R	2	UInt32	kVAh	Apparent Energy Export Phase C
ESExp	2046	R	2	UInt32	kVAh	Total Apparent Energy Export Phase All

Register Alias	Register Address	Action R/W/C	Size	Type	Units	Description
UInt64 Energy						
Active Energy						
EPAImp	2500	R	4	UInt64	Wh	Active Energy Import Phase A
EPBImp	2504	R	4	UInt64	Wh	Active Energy Import Phase B
EPCImp	2508	R	4	UInt64	Wh	Active Energy Import Phase C
EPImp	2512	R	4	UInt64	Wh	Total Active Energy Import Phase All
EPAExp	2516	R	4	UInt64	Wh	Active Energy Export Phase A
EPBExp	2520	R	4	UInt32	Wh	Active Energy Export Phase B
EPCExp	2524	R	4	UInt64	Wh	Active Energy Export Phase C
EPExp	2528	R	4	UInt64	Wh	Total Active Energy Export Phase All
Reactive Energy						
EQAImp	2532	R	4	UInt64	VARh	Reactive Energy Import Phase A
EQBImp	2536	R	4	UInt64	VARh	Reactive Energy Import Phase B
EQCImp	2540	R	4	UInt64	VARh	Reactive Energy Import Phase C
EQImp	2544	R	4	UInt64	VARh	Reactive Active Energy Import Phase All
EQAExp	2548	R	4	UInt64	VARh	Reactive Energy Export Phase A
EQBExp	2552	R	4	UInt64	VARh	Reactive Energy Export Phase B

EQCExp	2556	R	4	UInt64	VARh	Reactive Energy Export Phase C
EQExp	2560	R	4	UInt64	VARh	Total Reactive Energy Export Phase All
Apparent Energy						
ESAImp	2564	R	4	UInt64	VAh	Apparent Energy Import Phase A
ESBImp	2568	R	4	UInt64	VAh	Apparent Energy Import Phase B
ESCImp	2572	R	4	UInt64	VAh	Apparent Energy Import Phase C
ESImp	2576	R	4	UInt64	VAh	Apparent Active Energy Import Phase All
ESAExp	2580	R	4	UInt64	VAh	Apparent Energy Export Phase A
ESBExp	2584	R	4	UInt64	VAh	Apparent Energy Export Phase B
ESCExp	2588	R	4	UInt64	VAh	Apparent Energy Export Phase C
ESExp	2592	R	4	UInt64	VAh	Total Apparent Energy Export Phase All

Demand

Register Alias	Register Address	Action R/W/C	Size	Type	Units	Description
Demand Basic Para						
DMDMethod	3000	R/W/C	1	UInt16	-	0=fixed 1=sliding
DMDInterval	3001	R/RC	1	UInt16	minute	Interval
PDMD Reset Time	3002	R	4	Date time	-	Peak Demand Reset Date Time
Power Demand						
PADemand	3020	R	2	Float32	kW	Active Power Demand Phase A
PAPeakDemand	3022	R	2	Float32	kW	Peak Active Power Demand Phase A
PAPeakDemandDate	3024	R	4	Date time	-	Peak Active Power Demand Date Phase A
PBDemand	3028	R	2	Float32	kW	Active Power Demand Phase B
PBPeakDemand	3030	R	2	Float32	kW	Peak Active Power Demand Phase B
PBPeakDemandDate	3032	R	4	Date time	-	Peak Active Power Demand Date Phase B
PCDemand	3036	R	2	Float32	kW	Active Power Demand Phase C
PCPeakDemand	3038	R	2	Float32	kW	Peak Active Power Demand Phase C
PCPeakDemandDate	3040	R	4	Date time	-	Peak Active Power Demand Date Phase C
PSUMDemand	3044	R	2	Float32	kW	Total Active Power Demand
PSUMPeakDemand	3046	R	2	Float32	kW	Peak Total Active Power Demand
PSUMPeakDemandDate	3048	R	4	Date time	-	Peak Total Active Power Demand Date
QADemand	3052	R	2	Float32	kVar	Reactive Power Demand Phase A
QAPeakDemand	3054	R	2	Float32	kVar	Peak Reactive Power Demand

						Phase A
QAPeakDemandDate	3056	R	4	Date time	-	Peak Reactive Power Demand Date Phase A
QBDemand	3060	R	2	Float32	kVar	Reactive Power Demand Phase B
QBPeakDemand	3062	R	2	Float32	kVar	Peak Reactive Power Demand Phase B
QBPeakDemandDate	3064	R	4	Date time	-	Peak Reactive Power Demand Date Phase B
QCDemand	3068	R	2	Float32	kVar	Reactive Power Demand Phase C
QCPeakDemand	3070	R	2	Float32	kVar	Peak Reactive Power Demand Phase C
QCPeakDemandDate	3072	R	4	Date time	-	Peak Reactive Power Demand Date Phase C
QSUMDemand	3076	R	2	Float32	kVar	Total Reactive Power Demand
QSUMPeakDemand	3078	R	2	Float32	kVar	Peak Total Reactive Power Demand
QSUMPeakDemandDate	3080	R	4	Date time	-	Peak Total Reactive Power Demand Date
SADemand	3084	R	2	Float32	kVa	Apparent Power Demand Phase A
SAPeakDemand	3086	R	2	Float32	kVa	Peak Apparent Power Demand Phase A
SAPeakDemandDate	3088	R	4	Date time	-	Peak Apparent Power Demand Date Phase A
SBDemand	3092	R	2	Float32	kVa	Apparent Power Demand Phase B
SBPeakDemand	3094	R	2	Float32	kVa	Peak Apparent Power Demand Phase B
SBPeakDemandDate	3096	R	4	Date time	-	Peak Apparent Power Demand Date Phase B
SCDemand	3100	R	2	Float32	kVa	Apparent Power Demand Phase C
SCPeakDemand	3102	R	2	Float32	kVa	Peak Apparent Power Demand Phase C
SCPeakDemandDate	3104	R	4	Date time	-	Peak Apparent Power Demand Date Phase C
SSUMDemand	3108	R	2	Float32	kVa	Total Apparent Power Demand
SSUMPeakDemand	3110	R	2	Float32	kVa	Peak Total Apparent Power Demand
SSUMPeakDemandDate	3112	R	4	Date time	-	Peak Total Apparent Power Demand Date

Current Demand						
IADemand	3116	R	2	Float32	A	Current Demand Phase A
IAPeakDemand	3118	R	2	Float32	A	Peak Current Demand Phase A
IAPeakDemandDate	3120	R	4	Date time	-	Peak Current Demand Date Phase A
IBDemand	3124	R	2	Float32	A	Current Demand Phase B
IBPeakDemand	3126	R	2	Float32	A	Peak Current Demand Phase B
IBPeakDemandDate	3128	R	4	Date time	-	Peak Current Demand Date Phase B
ICDemand	3132	R	2	Float32	A	Current Demand Phase C
ICPeakDemand	3134	R	2	Float32	A	Peak Current Demand Phase C
ICPeakDemandDate	3136	R	4	Date time	-	Peak Current Demand Date Phase C
IAvgDemand	3140	R	2	Float32	A	Average Current Demand
IAvgPeakDemand	3142	R	2	Float32	A	Peak Average Current Demand
IAvgPeakDemand Date	3144	R	4	Date time	-	Peak Average Current Demand Date

Harmonics

Register Alias	Register Address	Action R/WC	Size	Type	Units	Description
Current Harmonic Percentage						
IATHD	4000	R	2	Float32	%	Current Total Harmonic Distortion Phase A
IBTHD	4002	R	2	Float32	%	Current Total Harmonic Distortion Phase B
ICTHD	4004	R	2	Float32	%	Current Total Harmonic Distortion Phase C
IAHD2	4006	R	2	Float32	%	Current 2 Times Harmonic Distortion Phase A
IBHD2	4008	R	2	Float32	%	Current 2 Times Harmonic Distortion Phase B
ICHD2	4010	R	2	Float32	%	Current 2 Times Harmonic Distortion Phase C
...	4012-4298	...	...	...	...	Current 3-50 Times Harmonic Distortion Phase A,Phase B,Phase C
IAHD51	4300	R	2	Float32	%	Current 51 Times Harmonic Distortion Phase A
IBHD51	4302	R	2	Float32	%	Current 51 Times Harmonic Distortion Phase B
ICHD51	4304	R	2	Float32	%	Current 51 Times Harmonic Distortion Phase C
Current Harmonic Value						
IAHDV1	4400	R	2	Float32	A	Current 1 Times Harmonic Value

						Phase A
IBHDV1	4402	R	2	Float32	A	Current 1 Times Harmonic Value Phase A
ICHDV1	4404	R	2	Float32	A	Current 1 Times Harmonic Value Phase A
...	4406-4698	...	...	...	...	Current 2-60 Times Harmonic Value Phase A,Phase B,Phase C
IAHDV51	4700	R	2	Float32	A	Current 51 Times Harmonic Value Phase A
IBHDV51	4702	R	2	Float32	A	Current 51 Times Harmonic Value Phase B
ICHDV51	4704	R	2	Float32	A	Current 51 Times Harmonic Value Phase C
Voltage Harmonic Percentage						
UATHD	5000	R	2	Float32	%	Voltage Total Harmonic Distortion Phase A
UBTHD	5002	R	2	Float32	%	Voltage Total Harmonic Distortion Phase B
UCTHD	5004	R	2	Float32	%	Voltage Total Harmonic Distortion Phase C
UAHD2	5006	R	2	Float32	%	Voltage 2 Times Harmonic Distortion Phase A
UBHD2	5008	R	2	Float32	%	Voltage 2 Times Harmonic Distortion Phase B
UCHD2	5010	R	2	Float32	%	Voltage 2 Times Harmonic Distortion Phase C
...	5012-5298	...	...	...	...	Voltage 3-50 Times Harmonic Distortion Phase A,Phase B,Phase C
UAHD51	5300	R	2	Float32	%	Voltage 51 Times Harmonic Distortion Phase A
UBHD51	5302	R	2	Float32	%	Voltage 51 Times Harmonic Distortion Phase B
UCHD51	5304	R	2	Float32	%	Voltage 51 Times Harmonic Distortion Phase C
Voltage Harmonic Value						
UAHDV1	5400	R	2	Float32	V	Voltage 1 Times Harmonic Value Phase A
UBHDV1	5402	R	2	Float32	V	Voltage 1 Times Harmonic Value Phase B
UCHDV1	5404	R	2	Float32	V	Voltage 1 Times Harmonic Value Phase C

...	5406-5698	...	...	...	...	Voltage 2-60 Times Harmonic Value Phase A,Phase B,Phase C
UAHDV51	5700	R	2	Float32	V	Voltage 51 Times Harmonic Value Phase A
UBHDV51	5702	R	2	Float32	V	Voltage 51 Times Harmonic Value Phase B
UCHDV51	5704	R	2	Float32	V	Voltage 51 Times Harmonic Value Phase C

Min. Max. Value

Register Alias	Register Address	Action R/WC	Size	Type	Units	Description
Current Min./Max.						
IAMax	6000	R	2	Float32	A	Current Max.Value Phase A
IBMax	6002	R	2	Float32	A	Current Max.Value Phase B
ICMax	6004	R	2	Float32	A	Current Max.Value Phase C
IAVGMax	6006	R	2	Float32	A	Current Max.Value Average
IAMin	6010	R	2	Float32	A	Current Min.Value Phase A
IBMin	6012	R	2	Float32	A	Current Min.Value Phase B
ICMin	6014	R	2	Float32	A	Current Min.Value Phase C
IAVGMin	6016	R	2	Float32	A	Current Min.Value Average
Voltage Min./Max.						
UAMax	6020	R	2	Float32	V	Voltage Max.Value UA-UN
UBMax	6022	R	2	Float32	V	Voltage Max.Value UB-UN
UCMax	6024	R	2	Float32	V	Voltage Max.Value UC-UN
Phase UAVGMax	6026	R	2	Float32	V	Voltage Max.Value Average
UAMin	6030	R	2	Float32	V	Voltage Min.Value UA-UN
UBMin	6032	R	2	Float32	V	Voltage Min.Value UB-UN
UCMin	6034	R	2	Float32	V	Voltage Min.Value UC-UN
UAVGMin	6036	R	2	Float32	V	Voltage Min.Value Average
UABMax	6040	R	2	Float32	V	Voltage Max.Value UA-UB
UBCMax	6042	R	2	Float32	V	Voltage Max.Value UB-UC
UCAMax	6044	R	2	Float32	V	Voltage Max.Value UC-UA
LineUAVGMax	6046	R	2	Float32	V	Voltage Max.Value Average
UABMin	6050	R	2	Float32	V	Voltage Min.Value UA-UB
UBCMin	6052	R	2	Float32	V	Voltage Min.Value UB-UC
UCAMin	6054	R	2	Float32	V	Voltage Min.Value UC-UA
LineUAVGMin	6056	R	2	Float32	V	Voltage Min.Value Average
Active Power Min./Max.						
PAMax	6060	R	2	Float32	kW	Active Power Max.Value Phase A
PBMax	6062	R	2	Float32	kW	Active Power Max.Value Phase B
PCMax	6064	R	2	Float32	kW	Active Power Max.Value Phase C
PSUMMax	6066	R	2	Float32	kW	Active Power Max.Value Total

PAMin	6070	R	2	Float32	kW	Active Power Min.Value Phase A
PBMin	6072	R	2	Float32	kW	Active Power Min.Value Phase B
PCMin	6074	R	2	Float32	kW	Active Power Min.Value Phase C
PSUMMin	6076	R	2	Float32	kW	Active Power urrent Min.Value Total
Reactive Power Min./Max.						
QAMax	6080	R	2	Float32	kVar	Reactive Power Max.Value Phase A
QBMax	6082	R	2	Float32	kVar	Reactive Power Max.Value Phase B
QCMax	6084	R	2	Float32	kVar	Reactive Power Max.Value Phase C
QSUMMax	6086	R	2	Float32	kVar	Reactive Power Max.Value Total
QAMin	6090	R	2	Float32	kVar	Reactive Power Min.Value Phase A
QBMin	6092	R	2	Float32	kVar	Reactive Power Min.Value Phase B
QCMin	6094	R	2	Float32	kVar	Reactive Power Min.Value Phase C
QSUMMin	6096	R	2	Float32	kVar	Reactive Power Min.Value Total
Apparent Power Min./Max.						
SAMax	6100	R	2	Float32	kVa	Apparent Power Max.Value Phase A
SBMax	6102	R	2	Float32	kVa	Apparent Power Max.Value Phase B
SCMax	6104	R	2	Float32	kVa	Apparent Power Max.Value Phase C
SSUMMax	6106	R	2	Float32	kVa	Apparent Power Max.Value Total
SAMin	6110	R	2	Float32	kVa	Apparent Power Min.Value Phase A
SBMin	6112	R	2	Float32	kVa	Apparent Power Min.Value Phase B
SCMin	6114	R	2	Float32	kVa	Apparent Power Min.Value Phase C
SSUMMin	6116	R	2	Float32	kVa	Apparent Power Min.Value Total

Unbalance

Register Alias	Register Address	Action R/W/C	Size	Type	Units	Description
Current Unbalance						
IAUbl	7000	R	2	Float32	%	Current Unbalance Phase A
IBUbl	7002	R	2	Float32	%	Current Unbalance Phase B
ICUbl	7004	R	2	Float32	%	Current Unbalance Phase C
lwstUbl	7006	R	2	Float32	%	Current Unbalance Worst
Voltage Unbalance						
UAUbl	7010	R	2	Float32	%	Voltage Unbalance UA-UN
UBUbl	7012	R	2	Float32	%	Voltage Unbalance UB-UN
UCUbl	7014	R	2	Float32	%	Voltage Unbalance UC-UN
PhasewstUbl	7016	R	2	Float32	%	Voltage Unbalance Worst
UABUbl	7020	R	2	Float32	%	Voltage Unbalance UA-UB
UBCUbl	7022	R	2	Float32	%	Voltage Unbalance UB-UC
UCAUbl	7024	R	2	Float32	%	Voltage Unbalance UC-UA
LinewstUbl	7026	R	2	Float32	%	Voltage Unbalance Worst

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V1.0	Creat Doc	20190716	Walter