AHM1

Multifunction Power Meter

Modbus-RTU

Menu

1. Overview

This user manual is the operation instruction for AHM1 multifunction power meter with Modbus-RTU protocol, which is used to help thirty party to operate and develop this meter.

2. Communication

2.1 Physical layer

Communication interface should be connected by shielded twisted-pair. Thirty-two meters are supposed to be connected to a same busbar at most. Terminal resistance should be connected to both ends of busbar. Communication speed is 1200～38400bps which can be set. Defaulted communication speed is 9600bps. Byte transmission format is composed of one start bit, eight data bits, no check bit or one odd bit or one even check bit, one or two stop bits.

2.2 Communication protocol

Message format

Address field	Function code field	Data field	Check field
one byte	one byte	N bytes	two bytes

◆ **Address code**

Address code is slave address with range of 1-247. Other addresses are reserved.

◆ **Function code field**

Function code field indicates the executive function of addressed terminal. Meaning and function of function codes supported by meter is shown in the following list.

Code	Meaning
0x01	Read coils
0x02	Read input discretes
0x03/0x04	Read data register value
0x05	Write Single Coil
0x06	Write Single Register
0x0F	Write Multiple Coils
0x10	Write Multiple Registers
0x14	Read File record
0x0E	Reset Data

◆ **Data code**

Data code includes the data which is needed by a terminal device when it performs a function or the data collected from a terminal device when it responses to an inquiry. These data may be numbers, referenced address or setting value. For example, when the function code tells a terminal device to read a register, the data field should indicate the terminal device that which register it should begin from and how much data it should read. The data code sent back from a terminal device includes data length and corresponding data. Data adopts BIG END mode which means low byte is after high byte.

◆ **Check code**

Cyclical Redundancy Check (CRC16) field occupies two bytes including a 16-bit binary value. CRC value will be calculated by transmission equipment and be added to a data frame. When the receiving equipment receives the data, it will calculate CRC value again, and then it compares the two CRC values. If the two values are not equal to each other, an error will be detected.

2.3 Modbus-RTU communication protocol format

2.3.1 Read coils (FC 0x01)

Request					
Frame structure	Address code	Function code	data code		CRC
			Start address	Number of relay	
Byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes
Data range	1~247	0x01	0x0000 (fixed)	0x0001~0x0002	CRC
Message example	0x01	0x01	0x00 0x00	0x00 0x02	0xBD 0xCB
Response					
frame structure	address code	function code	data code		CRC
			byte of register	register value	
Byte	1 byte	1 byte	1 byte	1 byte	2 bytes
Message example	0x01	0x01	0x01	0x03	0x11 0x89

Remark: The register value in the slave response indicates the status of the relay. Beginning from the lowest bit of the byte, each number corresponds to the status of a relay output. “1” indicates the relay is closed, while “0” indicates the relay is cut off. In the upper list, the register value “0x03” corresponds to “0000 0011” in binary system which means the first and second relays are closed.

2.3.2 Read input discretes (FC 0x02)

Request					
Frame structure	address	function code	data		CRC
			start address	number	
Byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes
Data range	1~247	0x02	0x0000 （fixed）	0x0001~0x000C	CRC16
Message example	0x01	0x02	0x00 0x00	0x00 0x01	0x79 0xC9
Response					
Data structure	address data	function code	data		CRC
			byte of register	register value	
Byte	1 byte	1 byte	1 byte	1 byte	2 bytes
Message example	0x01	0x02	0x01	0x01	0x20 0x49

Remark: The register value in the slave response indicates the status of digital input. Beginning from the lowest bit of the byte, each number corresponds to the status of a digital input. “1” indicates the switch is closed, while “0” indicates the switch is open. In the upper list the register value “0x01” is “0000 0001” in binary system which means first loop of digital input is closed.

2.3.3 Read data register value (FC 0x03/0x04)

Request					
Frame structure	address code	function code	data		CRC
			Start address	number of register	
Byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes
data range	1~247	0x03/ 0x04		Max. 100	CRC16
message example	0x01	0x03	0x00 0x06	0x00 0x06	0Xe4 0x36
Response					
frame structure	address code	function code	data		CRC
			byte of register	register value	
byte	1 byte	1 byte	1 byte	12 bytes	2 bytes
message example	0x01	0x03	0x0C	12-byte data	CRC16

Remark: The initial register address in host inquiry is the initial address of the data collected from primary or secondary power grid. The number of register indicates the length of the data. In the upper list the register address "0x00 0x00" indicates the initial address of phase voltage float data of three phases, and the number of register "0x00 0x06" indicates the length of the data is 6 (three float data occupies six registers).

2.3.4 Write Single Coil (FC 0x05)

Request					
frame structure	address code	function code	data code		CRC
			Start address	relay action value	
byte	1byte	1byte	2 bytes	2 bytes	2 bytes
data range	1~247	0x05	0x0000~0x0003	0xFF00/0x0000	CRC16
message example	0x01	0x05	0x00 0x00	0xFF 0x00	0x8C 0x3A
Response					
frame structure	address code	function code	data code		CRC
			initial relay address	relay action value	
byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes
message example	0x01	0x05	0x00 0x00	0xFF 0x00	0x8C 0x3A

Remark: In host request, the relay action value “0xFF00” indicates the relay is closed, while “0x0000” indicates the relay is open. If user wants to perform remotely control operation, please make sure the relay is working in “remotely control” mode.

2.3.5 Write Single Register (FC 0x06)

Request					
frame structure	address code	function code	data code		CRC
			Register Address	preset data	
byte	1byte	1byte	2 bytes	2 bytes	2 bytes
data range	1~247	0x06	0x0000~0xFFFF	0x0000~0xFFFF	CRC16
message example	0x01	0x06	0x00 0x00	0xAA 0x55	0x37 0x55
Response					
frame structure	address code	function code	data code		CRC
			Register Address	preset data	
byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes
message example	0x01	0x06	0x00 0x00	0xAA 0x55	0x37 0x55

Remark: Not all registers can be modified. As for specific information, please refer to communication address list.

2.3.6 Write Multiple Coils (FC 0x0F)

Request							
frame structure	address code	function code	data code				CRC
			initial relay address	number of relay	number of data byte	relay action value	
byte	1 byte	1 byte	2 bytes	2 bytes	1 byte	1 byte	2 bytes
data range	1~247	0x0F	0x0000 (fixed)	0x0001~0 x0004	0x01		CRC16
message example	0x01	0x0F	0x00 0x00	0x00 0x02	0x01	0x03	0x9E 0x96
Response							
frame structure	address code	function code	data code				CRC check code
			initial relay address	number of relay			
byte	1 byte	1byte	2bytes	2bytes			2 bytes
message example	0x01	0x0F	0x00 0x00	0x00 0x02			0Xd4 0x0A

Remark: In the host inquiry, beginning from the lowest bit of relay action value, each bit corresponds to a relay output. “1” indicates the relay is closed, while “0” indicates the relay is open. In the upper list, relay action value “0x03”is “0000 0111”in binary system, which means the first and second relays are closed.

2.3.7 Write Multiple Registers (FC 0x10)

Request							
frame structure	address code	function code	data code				CRC
			initial relay address	relay length	relay byte	written value	
byte	1 byte	1 byte	2 bytes	2 bytes	1 byte	2N bytes	2 byte
data range	1~247	0x10	0x080A	0x0001	N		CRC16
message example	0x01	0x10	0x08 0x0A	0x00 0x01	0x02	0x0064	0x2ED1

Request					
frame structure	address code	function code	data code		CRC
			initial relay address	relay length	
byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes
message example	0x01	0x10	0x08 0x0A	0x00 0x01	0x2ED1

Remark: Please strictly follow the Meter setting information address list in appendix when writing setting register. Do not change the reserved data. Written data should not exceed set range. Wrong operation may cause meter damaged.

2.3.8 Read File record (FC 0x14)

Request

Function	1 byte	0x14
Byte counting	1 byte	0x07
Sub-request x, parameter type	1 byte	0x06
Sub-request x, file number	2 bytes	0x0000-0x0007
Sub-request x, event log number	2 bytes	0x0000-0xFDE7
Sub-request x, event log length	2 bytes	N

Response

Function code	1 byte	0x14
Response data length	1 byte	0x07~0xF5
Sub-request x, file length	1 byte	0x07~0xF5
Sub-request x, parameter type	1 byte	6
Sub-request x, event log data	N×2 bytes	...

Send sub-request file number, event log number and event log length description of message

Event log	File number	Event log number	Event log length
Data log	0x0004	0x0000~0x000F: 0: latest piece of data log 1: second piece of data log from the latest piece of data log ... 32000: 32001th piece of data log from the latest piece of data log	1~32

Example for reading file

Request								
frame structure	address code	function code	data code					CRC
			byte counting	parameter type	file number	event log number	event log length	
byte	1 byte	1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes	2 bytes
data range	1~247	0x14	0x07	0x06	0x0004	0~65000	1～32	CRC
message	0x01	0x14	0x07	0x06	0x0004	0x0000	0x0020	0x093C

Response							
frame structure	address code	function code	data code				CRC
			response data length	response file length	parameter type	log data	
byte	1 byte	1 byte	1 byte	1 byte	1 byte	64 bytes	2 bytes
message	0x01	0x14	0x42	0x41	0x06	log data	CRC

Read electric data log format

Meter supports 32000 pieces of data log at most. Each data log contains eight electric parameter data. The interval of data log is set by pressing buttons on meter or through communication. Please refer to communication address list.

Historical data frame contains thirty-two words. First three words are time data. The other twenty-nine words are electric parameter data. Electric parameter data is secondary value. Description of data frame is shown in following list.

Parameter	**Format**	**Unit**
Recording time	Int	High byte:year low byte:month

Recording time	Int	High byte: day low byte:hour
Recording time	Int	High byte: minute low byte:second
V1	Int	0.1V
V2	Int	0.1V
V3	Int	0.1V
V12	Int	0.1V
V23	Int	0.1V
V31	Int	0.1V
I1	Int	0.001A
I2	Int	0.001A
I3	Int	0.001A
P	Int	1W
Q	Int	1var
S	Int	1VA
F	Int	0.01Hz
THDv1	Int	0.01%
THDv2	Int	0.01%
THDv3	Int	0.01%
THDI1	Int	0.01%
THDI2	Int	0.01%
THDI3	Int	0.01%
kWh+	Long	1Wh
kWh-	Long	1Wh
kvarh+	Long	1varh
kvarh-	Long	1varh
kVAh	Long	1VAh
User set1	Int	
User set2	Int	
User set3	Int	

User set4	Int	
User set5	Int	
User set6	Int	

Take reading the latest piece of log as example. Data type is hexadecimal.

Host request: 01 14 07 06 00 04 00 00 00 20 09 3C

Slave response: 01 14 42 41 06

0E 0A 17 0D 04 09 00 00 00 00 00 00 00 00 00 00

y:m d:h m:s V1 V2 V3 V12 V23

00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

V31 I1 I2 I3 P Q S F

00 00 00 00 00 00 00 00 00 00 00 00 00 00 0F 20

THDv1 THDv2 THDv3 THDI1 THDI2 THDI3 kWh+

00 00 00 00 00 00 1A 28 00 00 00 00 00 00 1E 37 74 89

kWh- kvarh+ kvarh- kVAh CRC

2.3.9 Reset data (FC 0x0E)

Request							
frame structure	address code	function code	data code				CRC
			initial relay address	Password	ID Reset	ID value	
byte	1 byte	1 byte	2 bytes	2 bytes	1 byte	1 bytes	2 byte
data range	1~247	0x0E	0xAACC	0x0001	N	0xFF	CRC16
message example	0x01	0x0E	0xAA0xCC	0x00 x01	0x01	0xFF	0x760D
Request							
frame structure	address code	function code	data code				CRC
			initial relay address	Password	ID Reset	ID value	
byte	1 byte	1 byte	2 bytes	2 bytes	1 byte	1 bytes	2 byte
data range	1~247	0x0E	0xAACC	0x0001	N	0xFF	CRC16
message example	0x01	0x0E	0xAACC	0x00 x01	0x01	0xFF	0x760D

Remark: This code can reset date of energy, Demand, MaxMin, Event , Pulses, and so on.

Password: This value should equal User's Password;

Id Reset:

0x01: Clear Energy 0x02: Clear Demand 0x03: Clear MaxMin

0x04: Clear Event 0x05: Clear Pulses 0x06: Clear Counters

0x07: Clear Record

Id value:

The value must be 0xff.

2.4 Data format

2.4.1 32-bit float format

32-bit float type data follows IEEE-754 format. Byte sequence of data adopts big-end mode which means low byte is after high byte.

Float type data of three phase voltages are shown in the following list.

Address(Hex)	Data(Hex)	Description
0006-0007	435C-8000	V1 = 0x435C8000 = 220.5V
0008-0009	4360-4CCD	V2 = 0x43604CCD = 224.3V
000A-000B	435E-B333	V3 = 0x435EB333 = 222.7V

2.4.2 16-bit integer format

16-bit integer type data adopts two's complement storage mode. Byte sequence of data adopts big-endian mode which means low byte is after high byte.

Int data of three phase voltages harmonic are shown in the following list.

Address(Hex)	Data(Hex)	Description
0210	0230	THDv1 = 0x0230 = 5.6%
0211	0172	THDv2 = 0x0172 = 3.7%
0212	0096	THDv3 = 0x0096 = 1.5%

2.4.3 32-bit long integer format

32-bit integer type data adopts two's complement storage mode. Byte sequence of data adopts big-end mode which means low byte is after high byte.

Long data of energy accumulation time are shown in the following list.

Address(Hex)	Data(Hex)	Description
0054-0055	0020-152A	Hour meter-EP+ = 2102570s
0056-0057	0000-37CD	Hour meter-EP- = 14285s

3. Communication address information list

3.1 Basic parameters

Address	Format	Description	Unit	R/W
0006-0007	Float	V1	V	R
0008-0009	Float	V2	V	R
000A-000B	Float	V3	V	R
000C-000D	Float	V12	V	R
000E-000F	Float	V23	V	R
0010-0011	Float	V31	V	R
0012-0013	Float	I1	A	R
0014-0015	Float	I2	A	R
0016-0017	Float	I3	A	R
0018-0019	Float	In(3P4W)	A	R
001A-001B	Float	P1	kW	R
001C-001D	Float	P2	kW	R
001E-001F	Float	P3	kW	R
0020-0021	Float	P	kW	R
0022-0023	Float	Q1	kvar	R
0024-0025	Float	Q2	kvar	R
0026-0027	Float	Q3	kvar	R
0028-0029	Float	Q	kvar	R
002A-002B	Float	S1	kVA	R
002C-002D	Float	S2	kVA	R

002E-002F	Float	S3	kVA	R
0030-0031	Float	S	kVA	R
0032-0033	Float	PF1		R
0034-0035	Float	PF2		R
0036-0037	Float	PF3		R
0038-0039	Float	PF		R
003A-003B	Float	F	Hz	R
003C-003D	Float	Average value of Vph-n	V	R
003E-003F	Float	Average value of Vph-ph	V	R
0040-0041	Float	Average current	A	R
0042-0043	Float	Import Active Energy	kWh	R
0044-0045	Float	Export Active Energy	kWh	R
0046-0047	Float	Import Reactive Energy	kvarh	R
0048-0049	Float	Export Reactive Energy	kvarh	R
004A-004B	Float	Apparent Energy	kVAh	R
004C-004D	Float	1st Quadrant Reactive Energy - EQL+	kvarh	R
004E-004F	Float	2nd Quadrant Reactive Energy - EQC+	kvarh	R
0050-0051	Float	3rd Quadrant Reactive Energy - EQL-	kvarh	R
0052-0053	Float	4th Quadrant Reactive Energy - EQC-	kvarh	R
0054-0055	Float	Hour meter - EP+	s	R
0056-0057	Float	Hour meter - EP-	s	R
0058-0059	Float	Alternative Import Active Energy	kWh	R
005A-005B	Float	Alternative Export Active Energy	kWh	R

005C-005D	Float	Alternative Import Reactive Energy	kvarh	R
005E-005F	Float	Alternative Export Reactive Energy	kvarh	R
0060-0061	Float	Alternative Apparent Energy	kVAh	R
0062-0063	Float	Alternative Energy - EQL+	kvarh	R
0064-0065	Float	Alternative Energy - EQC+	kvarh	R
0066-0067	Float	Alternative Energy - EQL-	kvarh	R
0068-0069	Float	Alternative Energy - EQC-	kvarh	R
006A-006B	Float	Hour meter - Alternative EP+	s	R
006C-006D	Float	Hour meter - Alternative EP-	s	R
006E-006F	Float	Total tariff import energy	kWh	R
0070-0071	Float	Tariff #1 import energy	kWh	R
0072-0073	Float	Tariff #2 import energy	kWh	R
0074-0075	Float	Tariff #3 import energy	kWh	R
0076-0077	Float	Tariff #4 import energy	kWh	R
0078-0079	Float	Total tariff export energy	kWh	R
007A-007B	Float	Tariff #1 export energy	kWh	R
007C-007D	Float	Tariff #2 export energy	kWh	R
007E-007F	Float	Tariff #3 export energy	kWh	R
0080-0081	Float	Tariff #4 export energy	kWh	R
0082-0083	Float	Max. value-V1	V	R
0084-0085	Float	Max. value-V2	V	R
0086-0087	Float	Max. value-V3	V	R
0088-0089	Float	Max. value-V12	V	R
008A-008B	Float	Max. value-V23	V	R

008C-008D	Float	Max. value-V31	V	R
008E-008F	Float	Max. value-I1	A	R
0090-0091	Float	Max. value-I2	A	R
0092-0093	Float	Max. value-I3	A	R
0094-0095	Float	Max. value-In	A	R
0096-0097	Float	Max. value-P1	kW	R
0098-0099	Float	Max. value-P2	kW	R
009A-009B	Float	Max. value-P3	kW	R
009C-009D	Float	Max. value-P	kW	R
009E-009F	Float	Max. value-Q1	kvar	R
00A-00A1	Float	Max. value-Q2	kvar	R
00A2-00A3	Float	Max. value-Q3	kvar	R
00A4-00A5	Float	Max. value-Q	kvar	R
00A6-00A7	Float	Max. value-S1	kVA	R
00A8-00A9	Float	Max. value-S2	kVA	R
00AA-00AB	Float	Max. value-S3	kVA	R
00AC-00AD	Float	Max. value-S	kVA	R
00AE-00AF	Float	Max. value-PF		R
00B0-00B1	Float	Max. value-F	Hz	R

00B2-00B3	Float	Max. value-Average Vph-n	V	R
00B4-00B5	Float	Max. value-Average Vph-ph	V	R
00B6-00B7	Float	Max. value-Average I	A	R
00B8-00B9	Float	Min. value-V1	A	R
00BA-00BB	Float	Min. value-V2	A	R
00BC-00BD	Float	Min. value-V3	A	R
00BE-00BF	Float	Min. value-V12	V	R
00C0-00C1	Float	Min. value-V23	V	R
00C2-00C3	Float	Min. value-V31	V	R
00C4-00C5	Float	Min. value-I1	A	R
00C6-00C7	Float	Min. value-I2	A	R
00C8-00C9	Float	Min. value-I3	A	R
00CA-00CB	Float	Min. value-In	A	R
00CC-00CD	Float	Min. value-P1	kW	R
00CE-00CF	Float	Min. value-P2	kW	R

00D0-00D1	Float	Min. value-P3	kW	R
00D2-00D3	Float	Min. value-P	kW	R
00D4-00D5	Float	Min. value-Q1	kvar	R
00D6-00D7	Float	Min. value-Q2	kvar	R
00D8-00D9	Float	Min. value-Q3	kvar	R
00DA-00DB	Float	Min. value-Q	kvar	R
00DC-00DD	Float	Min. value-S1	kVA	R
00DE-00DF	Float	Min. value-S2	kVA	R
00E0-00E1	Float	Min. value-S3	kVA	R
00E2-00E3	Float	Min. value-S	kVA	R
00E4-00E5	Float	Min. value-PF		R
00E6-00E7	Float	Min. value-F	Hz	R
00E8-00E9	Float	Min. value-Average Vph-n	V	R
00EA-00EB	Float	Min. value-Average Vph-ph	V	R
00EC-00ED	Float	Min. value-Average I	A	R

00EE-00EF	Float	Max. demand value -I1	A	R
00F0-00F1	Float	Max. demand value -I2	A	R
00F2-00F3	Float	Max. demand value -I3	A	R
00F4-00F5	Float	Max. demand value -P	W	R
00F6-00F7	Float	Max. demand value -Q	var	R
00F8-00F9	Float	Max. demand value -S	VA	R
00FA-00FD	--	--		
00FE-00FF	Float	Present demand value -I1	A	R
0100-0101	Float	Present demand value -I2	A	R
0102-0103	Float	Present demand value -I3	A	R
0104-0105	Float	Present demand value -P	kW	R
0106-0107	Float	Present demand value -Q	kvar	R
0108-0109	Float	Present demand value -S	kVA	R
010A-010D	--	--	--	
010E-010F	Float	Previous demand value -I1	A	R
0110-0111	Float	Previous demand value -I2	A	R
0112-0113	Float	Previous demand value -I3	A	R
0114-0115	Float	Previous demand value -P	kW	R
0116-0117	Float	Previous demand value -Q	kvar	R
0118-0119	Float	Previous demand value -S	kVA	R
011A-011D	--	--	--	
011E-011F	Float	Load percentage	%	R
0120	Int	High byte-year,Low byte-month		R
0121	Int	High byte-day,Low byte-hour		R
0122	Int	High byte-minute,Low byte-second		R
0123	Int	High byte-week		R

01244	Int	State of digital input,0:off,1:on Bit0:DI1 Bit1:DI2		R
0125	Int	State of relay output,0:off,1:on Bit0:DO1 Bit1:DO2		R
0126-0127	Long	Pulse counter: #1 Digital input		R
0128-0129	Long	Pulse counter: #2 Digital input		R

3.2 Harmonic data

Address	Format	Description	Unit	R/W
0200	Int	Phase angle of V1(default 0°)	0.1º	R
0201	Int	Phase angle of V2	0.1º	R
0202	Int	Phase angle of V3	0.1º	R
0203	Int	Phase angle of I1	0.1º	R
0204	Int	Phase angle of I2	0.1º	R
0205	Int	Phase angle of I3	0.1º	R
0206	Int	Positive-sequence component of voltage	0.1V	R
0207	Int	Negative-sequence component of voltage	0.1V	R
0208	Int	Zero-sequence component of voltage	0.1V	R
0209	Int	Unbalance factor of voltage		R
020A	--	--	--	
020B	Int	Positive-sequence component of current	0.001A	R
020C	Int	Negative-sequence component of current	0.001A	R
020D	Int	Zero-sequence component of current	0.001A	R
020E	Int	Unbalance factor of current		R
020F	--	--	--	
0210	Int	THD-V1	0.01%	R
0211	Int	THD-V2	0.01%	R

0212	Int	THD-V3	0.01%	R
0213	Int	THD-I1	0.01%	R
0214	Int	THD-I1	0.01%	R
0215	Int	THD-I1	0.01%	R
0216	Int	Fundamental value -V1	0.1V	R
0217	Int	Fundamental value -V2	0.1V	R
0218	Int	Fundamental value -V3	0.1V	R
0219	Int	Fundamental value -I1	0.001A	R
021A	Int	Fundamental value -I2	0.001A	R
021B	Int	Fundamental value -I3	0.001A	R
021C	Int	Harmonic content -V1	0.1V	R
021D	Int	Harmonic content -V2	0.1V	R
021E	Int	Harmonic content -V3	0.1V	R
021F	Int	Harmonic content -I1	0.001A	R
0220	Int	Harmonic content -I2	0.001A	R
0221	Int	Harmonic content -I3	0.001A	R
0222	Int	2^{ND} harmonic ratio-V1	0.01%	R
0223	Int	3^{rd} harmonic ratio-V1	0.01%	R
0224	Int	4^{th} harmonic ratio-V1	0.01%	R
0225	Int	5^{th} harmonic ratio-V1	0.01%	R
0226	Int	6^{th} harmonic ratio-V1	0.01%	R
0227	Int	7^{th} harmonic ratio-V1	0.01%	R
0228	Int	8^{th} harmonic ratio-V1	0.01%	R
0229	Int	9^{th} harmonic ratio-V1	0.01%	R
022A	Int	10^{th} harmonic ratio-V1	0.01%	R
022B	Int	11^{th} harmonic ratio-V1	0.01%	R
022C	Int	12^{th} harmonic ratio-V1	0.01%	R
022D	Int	13^{th} harmonic ratio-V1	0.01%	R
022E	Int	14^{th} harmonic ratio-V1	0.01%	R

022F	Int	15th harmonic ratio-V1	0.01%	R
0230	Int	16th harmonic ratio-V1	0.01%	R
0231	Int	17th harmonic ratio-V1	0.01%	R
0232	Int	18th harmonic ratio-V1	0.01%	R
0233	Int	19th harmonic ratio-V1	0.01%	R
0234	Int	20th harmonic ratio-V1	0.01%	R
0235	Int	21th harmonic ratio-V1	0.01%	R
0236	Int	22th harmonic ratio-V1	0.01%	R
0237	Int	23th harmonic ratio-V1	0.01%	R
0238	Int	24th harmonic ratio-V1	0.01%	R
0239	Int	25th harmonic ratio-V1	0.01%	R
023A	Int	26th harmonic ratio-V1	0.01%	R
023B	Int	27th harmonic ratio-V1	0.01%	R
023C	Int	28th harmonic ratio-V1	0.01%	R
023D	Int	29th harmonic ratio-V1	0.01%	R
023E	Int	30th harmonic ratio-V1	0.01%	R
023F	Int	31th harmonic ratio-V1	0.01%	R
0240	Int	2nd harmonic ratio-V2	0.01%	R
0241	Int	3rd harmonic ratio-V2	0.01%	R
0242	Int	4th harmonic ratio-V2	0.01%	R
0243	Int	5th harmonic ratio-V2	0.01%	R
0244	Int	6th harmonic ratio-V2	0.01%	R
0245	Int	7th harmonic ratio-V2	0.01%	R
0246	Int	8th harmonic ratio-V2	0.01%	R
0247	Int	9th harmonic ratio-V2	0.01%	R
0248	Int	10th harmonic ratio-V2	0.01%	R
0249	Int	11th harmonic ratio-V2	0.01%	R
024A	Int	12th harmonic ratio-V2	0.01%	R
024B	Int	13th harmonic ratio-V2	0.01%	R

024C	Int	14th harmonic ratio-V2	0.01%	R
024D	Int	15th harmonic ratio-V2	0.01%	R
024E	Int	16th harmonic ratio-V2	0.01%	R
024F	Int	17th harmonic ratio-V2	0.01%	R
0250	Int	18th harmonic ratio-V2	0.01%	R
0251	Int	19th harmonic ratio-V2	0.01%	R
0252	Int	20th harmonic ratio-V2	0.01%	R
0253	Int	21th harmonic ratio-V2	0.01%	R
0254	Int	22th harmonic ratio-V2	0.01%	R
0255	Int	23th harmonic ratio-V2	0.01%	R
0256	Int	24th harmonic ratio-V2	0.01%	R
0257	Int	25th harmonic ratio-V2	0.01%	R
0258	Int	26th harmonic ratio-V2	0.01%	R
0259	Int	27th harmonic ratio-V2	0.01%	R
025A	Int	28th harmonic ratio-V2	0.01%	R
025B	Int	29th harmonic ratio-V2	0.01%	R
025C	Int	30th harmonic ratio-V2	0.01%	R
025D	Int	31th harmonic ratio-V2	0.01%	R
025E	Int	2nd harmonic ratio-V3	0.01%	R
025F	Int	3rd harmonic ratio-V3	0.01%	R
0260	Int	4th harmonic ratio-V3	0.01%	R
0261	Int	5th harmonic ratio-V3	0.01%	R
0262	Int	6th harmonic ratio-V3	0.01%	R
0263	Int	7th harmonic ratio-V3	0.01%	R
0264	Int	8th harmonic ratio-V3	0.01%	R
0265	Int	9th harmonic ratio-V3	0.01%	R
0266	Int	10th harmonic ratio-V3	0.01%	R
0267	Int	11th harmonic ratio-V3	0.01%	R
0268	Int	12th harmonic ratio-V3	0.01%	R

0269	Int	13th harmonic ratio-V3	0.01%	R
026A	Int	14th harmonic ratio-V3	0.01%	R
026B	Int	15th harmonic ratio-V3	0.01%	R
026C	Int	16th harmonic ratio-V3	0.01%	R
026D	Int	17th harmonic ratio-V3	0.01%	R
026E	Int	18th harmonic ratio-V3	0.01%	R
026F	Int	19th harmonic ratio-V3	0.01%	R
0270	Int	20th harmonic ratio-V3	0.01%	R
0271	Int	21th harmonic ratio-V3	0.01%	R
0272	Int	22th harmonic ratio-V3	0.01%	R
0273	Int	23th harmonic ratio-V3	0.01%	R
0274	Int	24th harmonic ratio-V3	0.01%	R
0275	Int	25th harmonic ratio-V3	0.01%	R
0276	Int	26th harmonic ratio-V3	0.01%	R
0277	Int	27th harmonic ratio-V3	0.01%	R
0278	Int	28th harmonic ratio-V3	0.01%	R
0279	Int	29th harmonic ratio-V3	0.01%	R
027A	Int	30th harmonic ratio-V3	0.01%	R
027B	Int	31th harmonic ratio-V3	0.01%	R
027C	Int	2ND harmonic ratio-I1	0.01%	R
027D	Int	3rd harmonic ratio-I1	0.01%	R
027E	Int	4th harmonic ratio-I1	0.01%	R
027F	Int	5th harmonic ratio-I1	0.01%	R
0280	Int	6th harmonic ratio-I1	0.01%	R
0281	Int	7th harmonic ratio-I1	0.01%	R
0282	Int	8th harmonic ratio-I1	0.01%	R
0283	Int	9th harmonic ratio-I1	0.01%	R
0284	Int	10th harmonic ratio-I1	0.01%	R
0285	Int	11th harmonic ratio-I1	0.01%	R

0286	Int	12th harmonic ratio-I1	0.01%	R
0287	Int	13th harmonic ratio-I1	0.01%	R
0288	Int	14th harmonic ratio-I1	0.01%	R
0289	Int	15th harmonic ratio-I1	0.01%	R
028A	Int	16th harmonic ratio-I1	0.01%	R
028B	Int	17th harmonic ratio-I1	0.01%	R
028C	Int	18th harmonic ratio-I1	0.01%	R
028D	Int	19th harmonic ratio-I1	0.01%	R
028E	Int	20th harmonic ratio-I1	0.01%	R
028F	Int	21th harmonic ratio-I1	0.01%	R
0290	Int	22th harmonic ratio-I1	0.01%	R
0291	Int	23th harmonic ratio-I1	0.01%	R
0292	Int	24th harmonic ratio-I1	0.01%	R
0293	Int	25th harmonic ratio-I1	0.01%	R
0294	Int	26th harmonic ratio-I1	0.01%	R
0295	Int	27th harmonic ratio-I1	0.01%	R
0296	Int	28th harmonic ratio-I1	0.01%	R
0297	Int	29th harmonic ratio-I1	0.01%	R
0298	Int	30th harmonic ratio-I1	0.01%	R
0299	Int	31th harmonic ratio-I1	0.01%	R
029A	Int	2nd harmonic ratio-I2	0.01%	R
029B	Int	3rd harmonic ratio-I2	0.01%	R
029C	Int	4th harmonic ratio-I2	0.01%	R
029D	Int	5th harmonic ratio-I2	0.01%	R
029E	Int	6th harmonic ratio-I2	0.01%	R
029F	Int	7th harmonic ratio-I2	0.01%	R
02A0	Int	8th harmonic ratio-I2	0.01%	R
02A1	Int	9th harmonic ratio-I2	0.01%	R
02A2	Int	10th harmonic ratio-I2	0.01%	R

02A3	Int	11th harmonic ratio-I2	0.01%	R
02A4	Int	12th harmonic ratio-I2	0.01%	R
02A5	Int	13th harmonic ratio-I2	0.01%	R
02A6	Int	14th harmonic ratio-I2	0.01%	R
02A7	Int	15th harmonic ratio-I2	0.01%	R
02A8	Int	16th harmonic ratio-I2	0.01%	R
02A9	Int	17th harmonic ratio-I2	0.01%	R
02AA	Int	18th harmonic ratio-I2	0.01%	R
02AB	Int	19th harmonic ratio-I2	0.01%	R
02AC	Int	20th harmonic ratio-I2	0.01%	R
02AD	Int	21th harmonic ratio-I2	0.01%	R
02AE	Int	22th harmonic ratio-I2	0.01%	R
02AF	Int	23th harmonic ratio-I2	0.01%	R
02B0	Int	24th harmonic ratio-I2	0.01%	R
02B1	Int	25th harmonic ratio-I2	0.01%	R
02B2	Int	26th harmonic ratio-I2	0.01%	R
02B3	Int	27th harmonic ratio-I2	0.01%	R
02B4	Int	28th harmonic ratio-I2	0.01%	R
02B5	Int	29th harmonic ratio-I2	0.01%	R
02B6	Int	30th harmonic ratio-I2	0.01%	R
02B7	Int	31th harmonic ratio-I2	0.01%	R
02B8	Int	2nd harmonic ratio-I3	0.01%	R
02B9	Int	3rd harmonic ratio-I3	0.01%	R
02BA	Int	4th harmonic ratio-I3	0.01%	R
02BB	Int	5th harmonic ratio-I3	0.01%	R
02BC	Int	6th harmonic ratio-I3	0.01%	R
02BD	Int	7th harmonic ratio-I3	0.01%	R
02BE	Int	8th harmonic ratio-I3	0.01%	R
02BF	Int	9th harmonic ratio-I3	0.01%	R

02C0	Int	10th harmonic ratio-I3	0.01%	R
02C1	Int	11th harmonic ratio-I3	0.01%	R
02C2	Int	12th harmonic ratio-I3	0.01%	R
02C3	Int	13th harmonic ratio-I3	0.01%	R
02C4	Int	14th harmonic ratio-I3	0.01%	R
02C5	Int	15th harmonic ratio-I3	0.01%	R
02C6	Int	16th harmonic ratio-I3	0.01%	R
02C7	Int	17th harmonic ratio-I3	0.01%	R
02C8	Int	18th harmonic ratio-I3	0.01%	R
02C9	Int	19th harmonic ratio-I3	0.01%	R
02CA	Int	20th harmonic ratio-I3	0.01%	R
02CB	Int	21th harmonic ratio-I3	0.01%	R
02CC	Int	22th harmonic ratio-I3	0.01%	R
02CD	Int	23th harmonic ratio-I3	0.01%	R
02CE	Int	24th harmonic ratio-I3	0.01%	R
02CF	Int	25th harmonic ratio-I3	0.01%	R
02D0	Int	26th harmonic ratio-I3	0.01%	R
02D1	Int	27th harmonic ratio-I3	0.01%	R
02D2	Int	28th harmonic ratio-I3	0.01%	R
02D3	Int	29th harmonic ratio-I3	0.01%	R
02D4	Int	30th harmonic ratio-I3	0.01%	R
02D5	Int	31th harmonic ratio-I3	0.01%	R

3.3 Records

Address	Format	Description 1	Description 2	R/W
06B8	Int	High byte-year, Low byte-month	Record of power on	R
06B9	Int	High byte-day, Low byte-hour		R
06BA	Int	High byte-minute, Low byte-second		R

06BB	Int	Numbers of power on		R
06BC	Int	High byte-year, Low byte-month	Record of power off	R
06BD	Int	High byte-day, Low byte-hour		R
06BE	Int	High byte-minute, Low byte-second		R
06BF	Int	Numbers of power off		R
06C0	Int	High byte-year, Low byte-month	Record of setting	R
06C1	Int	High byte-day, Low byte-hour		R
06C2	Int	High byte-minute, Low byte-second		R
06C3	Int	Numbers of setting		R
06C4	Int	High byte-year, Low byte-month	Record of reset max/min	R
06C5	Int	High byte-day, Low byte-hour		R
06C6	Int	High byte-minute, Low byte-second		R
06C7	Int	Numbers of reset max/min		R
06C8	Int	High byte-year, Low byte-month	Record of reset demand	R
06C9	Int	High byte-day, Low byte-hour		R
06CA	Int	High byte-minute, Low byte-second		R
06CB	Int	Numbers of reset demand		R
06CC	Int	High byte-year, Low byte-month	Record of reset energy	R
06CD	Int	High byte-day, Low byte-hour		R
06CE	Int	High byte-minute, Low byte-second		R
06CF	Int	Numbers of reset energy		R
06D0-06D5	--	--	--	
06D6	Int	High byte-Numbers of SOE		R
06D7-06DB	--	--	--	

06DC	Int	Numbers of data record		R

3.4Setup Parameters

Address	Format	Description 1	Description 2	R/W
0802	Int	Password	0-9999	R
0803	--	--	--	--
0804	Int	High byte	Langue 0: English 1: Spanish	R/W
		Low byte	Contrast:0-5	R/W
0805	Int	High byte	Back light delay time:0-255s 0:usually ON	R/W
		Low byte	Data recording interval 1-255min	
0806	Int	High byte	Address: 1-247	R/W
		Low byte	Baud rate 0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps	
0807	Int	High byte	Parity 0: N,8,1 1: O,8,1 2: E,8,1 3: N,8,2	R/W
0808-0809	--	--	--	
080A	Int	High byte	Wiring 0: 3P4W	R/W

			1: 3P3W 2:1P2W 3:1P3W	
080B	--	--	--	
080C-080D	Long	PT primary	1~999999V	R/W
080E-080F	Long	CT primary	1~999999A	R/W
0810	Int	PT secondary	1~999V	R/W
0811	Int	CT secondary	1~6A	R/W
0812	Int	Item of Record 1#	0: V1 1: V2 2: V3 3: V12 4: V23 5: V31 6: I1 7: I2 8: I3 9: In 10: P1 11: P2 12: P3 13: P 14: Q1 15: Q2 16: Q3 17: Q 18: S1 19: S2 20: S3 21: S	R

			22: PF1 23: PF2 24: PF3 25: PF 26: F 27: Unavg 28: Ulavg 29: Iavg 30: Phase angle of V1 31: Phase angle of V2 32: Phase angle of V3 33: Phase angle of I1 34: Phase angle of I2 35: Phase angle of I3 36: Positive-sequence component of voltage 37: Negative-sequence component of voltage 38: Zero-sequence component of voltage 39: Unbalance factor of voltage 40: Reserved 41: Positive-sequence component of current 42: Negative-sequence component of current 43: Zero-sequence component of current 44: Unbalance factor of	

			current 45: Reserved 46: THD-V1 47: THD-V2 48: THD-V3 49: THD-I1 50: THD-I2 51: THD-I3	
0813	Int	Item of Record 2#	the same as above	R
0814	Int	Item of Record 3#	the same as above	R
0815	Int	Item of Record 4#	the same as above	R
0816	Int	Item of Record5#	the same as above	R
0817	Int	Item of Record 6#	the same as above	R
0818	Int	Item of Demand	0: Default(I1/I2/I3/P/Q/S)	R/W
0819	Int	Mode of demand	0: slip block mode 1: fixed block mode	R/W
081A	Int	Slip time(t)	1-9999s	R/W
081B	Int	Demand period(T)	1-30t	R/W
081C	Int	High byte-DI1 Low byte-DI2	0: state monitor 1: pulse counter 2: Alternative energy 3: tariff energy 4: synchronous demand	R/W
081D	Int	Relay output-DO1 mode	0: OFF 1: remote control 2: alarm 3: energy pulse	R/W
081E	Int	Relay output -DO1 Pulse width	0.1~99.9ms 0.0: no pulse	R/W

081F	Int	Relay output-DO1 Alarm item select	0: V1 > 1: V1 < 2: V2 > 3: V2 < 4: V3 > 5: V3 < 6: Vn > 7: Vn < 8: V12 > 9: V12 < 10: V23 > 11: V23 < 12: V31 > 13: V31 < 14: Vl > 15: Vl < 16:Uavg> 17:Uavg< 18:Vavg> 19:Vavg< 20: I1 > 21: I1 < 22: I2 > 23: I2 < 24: I3 > 25: I3 < 26: I > 27: I < 28: Iavg >	R/W

			29: Iavg < 30: In > 31: In< 32: P > 33: P < 34: Q > 35: Q < 26: S > 37: S < 38: PF> 39: PF< 40: F > 41: F < 42: Uunb > 43: Uunb < 44: Iunb > 45: Iunb < 46: THDu > 47: THDu < 48: THDi > 49: THDi < 50: DIx	
			Energy pulse select: 0: kWh+ 1: kWh- 2: kvarh+ 3: kvarh-	

0820-0821	Long	Relay output-DO1 limit value	primary grid data： 0-9999*10^n (n=0,3,6) ratio: voltage: 0.1V current: 0.001A power: 1W/var/VA, PF: 0.001 F: 0.01Hz Uunb /Iunb :0.1% THDu /THDi : 0.01% If it is switch linkage, this value corresponds to the No. of digital input. 0:D1 1:DI2	R/W
			Energy pulse constant: 0~9999, secondary grid data.(Wh/imp)/(varh/imp)	
0822-0823	Long	Relay output -DO1 hysteresis	primary grid data 0-9999*10^n (n=0,3,6) ratio: voltage: 0.1V current: 0.001A power: 1W/var/VA, PF: 0.001 F: 0.01Hz Uunb /Iunb :0.1% THDu /THDi : 0.01% Setting parameter value should be smaller than two times of rated value.	R/W
0824	Int	Relay output -DO1 Alarm delay time	0~99.99s	R/W

0825	Int	Relay output Main body-DO1 Alarm interlock	0:OFF 1:ON	R/W
0826		Relay output-DO2 mode	0: OFF 1: remote control 2: alarm 3: energy pulse	R/W
0827		Relay output -DO2 Pulse width	0.1~99.9ms 0.0: no pulse	R/W
0828	Int	Relay output-DO2 Alarm item select	0: V1 > 1: V1 < 2: V2 > 3: V2 < 4: V3 > 5: V3 < 6: Vn > 7: Vn < 8: V12 > 9: V12 < 10: V23 > 11: V23 < 12: V31 > 13: V31 < 14: Vl > 15: Vl < 16:Uavg> 17:Uavg< 18:Vavg> 19:Vavg< 20: I1 >	R/W

			21: I1 < 22: I2 > 23: I2 < 24: I3 > 25: I3 < 26: I > 27: I < 28: Iavg > 29: Iavg < 30: In > 31: In< 32: P > 33: P < 34: Q > 35: Q < 26: S > 37: S < 38: PF> 39: PF< 40: F > 41: F < 42: Uunb > 43: Uunb < 44: Iunb > 45: Iunb < 46: THDu > 47: THDu < 48: THDi > 49: THDi < 50: DIx	

			Energy pulse select: 0: kWh+ 1: kWh- 2: kvarh+ 3: kvarh-	
0829-082A	Long	Relay output-DO2 limit value	primary grid data： 0-9999*10^n (n=0,3,6) ratio: voltage: 0.1V current: 0.001A power: 1W/var/VA, PF: 0.001 F: 0.01Hz Uunb /Iunb :0.1% THDu /THDi : 0.01% If it is switch linkage, this value corresponds to the No. of digital input. 0:D1 1:DI2	R/W
			Energy pulse constant: 0~9999, secondary grid data.(Wh/imp)/(varh/imp)	
082B-082C	Long	Relay output -DO2 hysteresis	primary grid data 0-9999*10^n (n=0,3,6) ratio: voltage: 0.1V current: 0.001A power: 1W/var/VA, PF: 0.001 F: 0.01Hz Uunb /Iunb :0.1% THDu /THDi : 0.01%	R/W

			Setting parameter value should be smaller than two times of rated value.	
082D	Int	Relay output -DO2 Alarm delay time	0~99.99s	R/W
082E	Int	Relay output Main body-DO2 Alarm interlock	0:OFF 1:ON	R/W
082F-0830	Char	Ethernet	Local IP	R/W
0831-0832	Char		Subnet mask	R/W
0833-0834	Char		Gateway address	R/W
0835-0837	Char		MAC Address	R/W
0838	Int	DHCP	0:OFF 1:ON	R/W