AMC16Z-FD Manual

Contents

1. Technical parameters

Model	Functions
AMC16Z-FD	Measuring A+B independent 12 channel dc outlet voltage,current,active power and active energy+1 channel RS485

DC outgoing line

Model		AMC16Z-FD
Measuring parameters		voltage,current,power and energy
Busbar voltage	Rated voltage	48VDC
	Measuring range	±20%
	overload	instant voltage 2 times/second
current outlet circuit	Rated	5V（hall effect current sensor AHKC-EKA，Needs power supply ±12V）
	range	
	overload	sustained 1.2times,instantaneous current 10times/second
accuracy	outlet	current,voltage class: 0.5 power,energy: 1
Auxiliary power supply		DC12V
Communication		RS485/Modbus-RTU
Installation		DIN35mm or panel type
Waterproof level		IP20

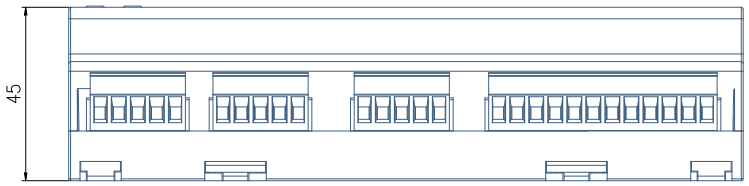
Remark：

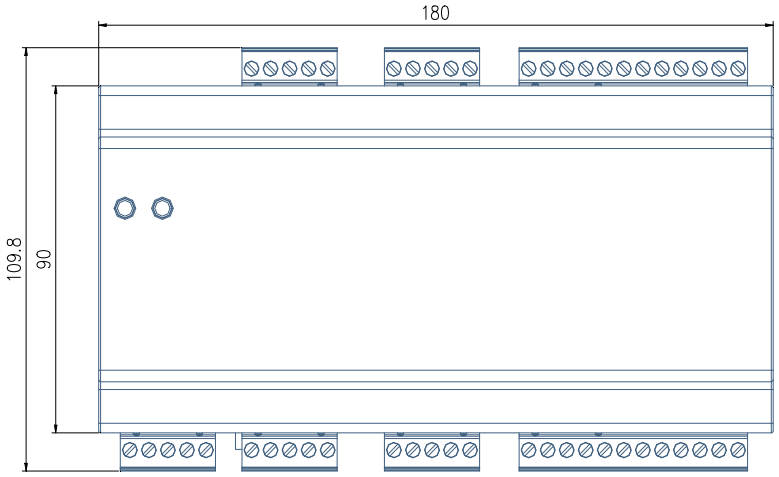
DC secondary input voltage is 5V,the primary default value is 50A.If the current is not 50A,the customer needs to calculate current read by multiples of 50A. For example if input current is 100A,the data read should be doubled.

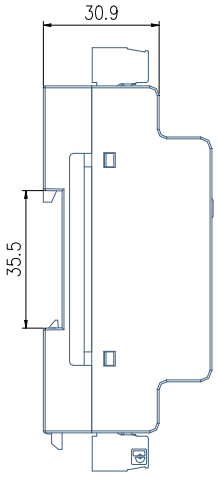
2. Structure and Dimensions

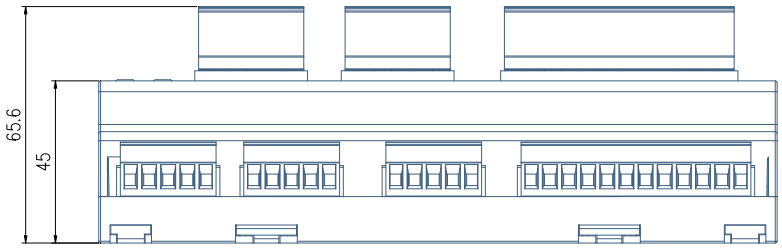
Unit：mm

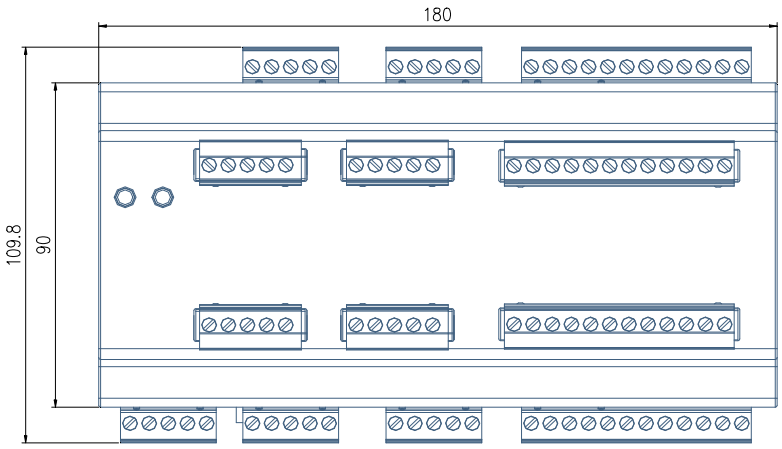
AMC16Z series dc multi circuit power meter

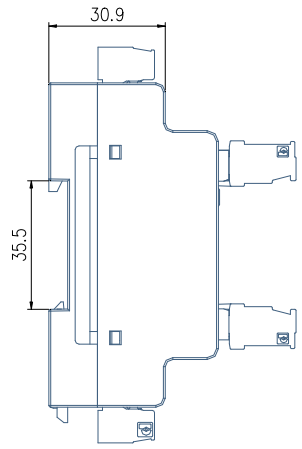




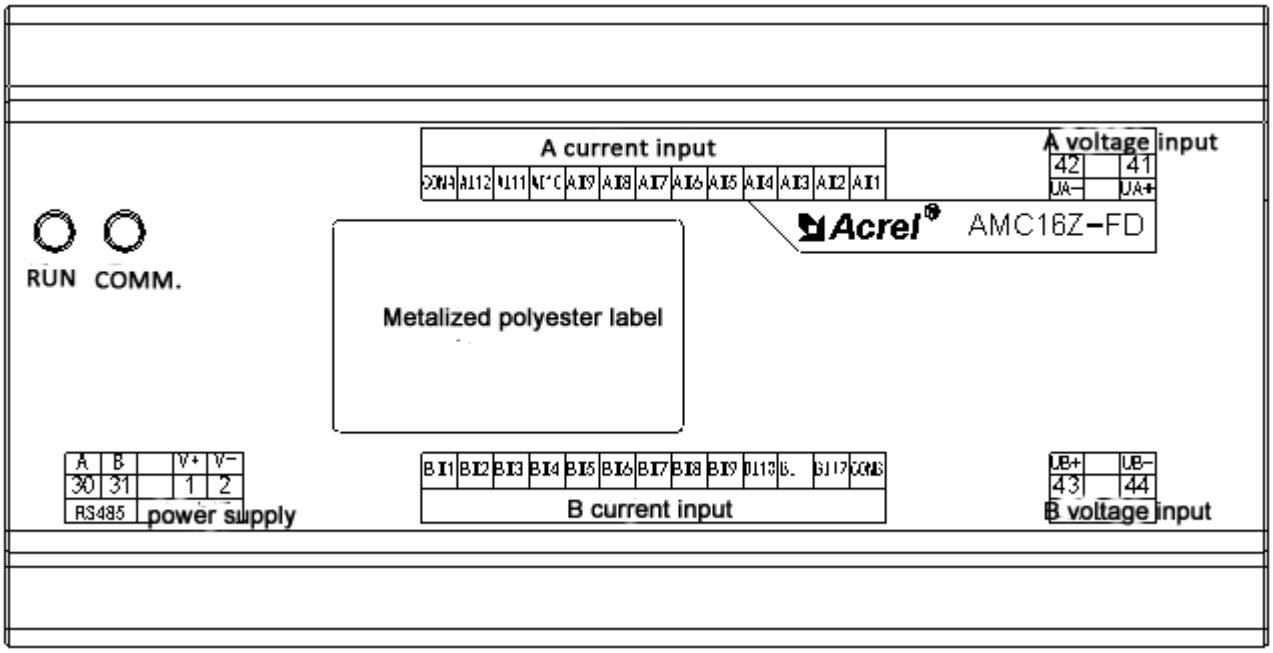








AMC16Z-FD



Terminal No.	definition	Description	Remark
1	V+	Auxiliary power supply	DC12V
2	V-		
30	A	RS485	connect to touch screen or RS485 concentrator
31	B		
41	UA+	A channel voltage input	A channel outlet dc voltage input
42	UA-		
43	UB+	B channel voltage input	B channel outlet dc voltage input
44	UB-		
AI1-AI12		A channel current input	A channel outlet dc current input(12 hall current clamps)
COMA			
BI1-BI12		B channel current input	B channel outlet dc current input(12 hall current clamps)
COMB			

3. Communication protocol

This agreement specifies the physical connection and communication protocol for data exchange between AMC16Z series DC precision
power distribution monitoring device and data terminal equipment.The protocol mode is similar to Modbus_RTU communication
protocol.

3.1 Protocol overview

The communication protocol used by AMC16Z series ac device defines data sequence definition of address code,function code and check code.These are necessary elements for specific data exchange.The protocol uses a master-slave acknowledgment connection (half-duplex) on a single communication line, which means that signals are transmitted in opposite directions on a single communication line.Firstly, the signal of the host computer is addressed to a unique terminal device (slave), and then the response signal from the terminal device is transmitted to the host in the opposite direction.

This protocol only allows communication between the host (PC, PLC, etc.) and the terminal device, and does not allow data exchange between independent terminal devices, so that each terminal device does not occupy the communication line when they initialize, but only responds. Arrival signal to the machine.

3.2 transmission mode

The information transmission is asynchronous, and the communication information transmitted between the master and the slave is in 11-word format, including 1 start bit and 8 data bits (the smallest valid bit is sent first). Parity check digit (no parity), 1 stop bits.

3.2.1 data frame format

Address code	Function code	Data area	CRC check code
1 byte	1 byte	N bytes	2 bytes

3.2.2 Address field

The address field is composed of 1 byte (8-bit binary code) at the beginning of the frame, and the decimal is from 0 to 255. In our system, only 1 to 247 are used, and other addresses are reserved.These bits indicate the address of the user-specified terminal device that will receive the host data from it.The address of each terminal device must be unique, and only the addressed terminal will respond to the query containing the address.When the terminal sends back a response, the slave address data in the response tells the host which terminal is communicating with it.

3.2.3 Function domain

Function domain code tells the addressed terminals what functions to perform.The following table lists

the function codes used in this series of devices, as well as their meaning and function

Code	meaning	behavior
03	data register read	acquire current binary value of one or several registers
16	multi-register Preset	Set binary values into a series of multiple register

3.2.4 Data domain

The data field contains the data required by the terminal to perform a specific function or the data collected by the terminal in response to the query. The contents of these data may be numeric values, reference addresses, or set values. For example, the function field code tells the terminal to read a register, and the data field needs to indicate which register to start and how many data to read. The embedded address and data vary according to the type and the different content between the slaves.

3.2.5 error check field

This field allows hosts and terminals to check for errors during transmission. Sometimes, due to electrical noise and other disturbances,a set of data may change on the line while transferring from one device to another. Error checking ensures that the host or terminal does not respond to data that has changed during transmission. This improves the security and efficiency of the system. The error check uses the 16-bit cyclic redundancy method (CRC16).

3.2.6 Error check methods

Error check field occupied 2 bytes including a 16-bit binary value. The CRC value is calculated by the transmission device and then appended to the data frame. The receiving device recalculates the CRC value when receiving the data and then compares it with the value in the received CRC field.If these two values are not equal, an error has occurred.

During CRC operation, first preset a 16-bit register to all 1, and then continuously calculate the 8 bits in each byte of the data frame and the current value of the register, only 8 data per byte The bit participates in generating the CRC, the start bit, the stop bit, and the possible parity bits do not affect the CRC.When generating the CRC, the 8 bits of each byte are XORed with the contents of the register, and then the result is shifted to the low bit, the high bit is supplemented with "0", the least significant bit (LSB) is shifted out and detected. This register performs an exclusive OR operation with a preset fixed value (0A001H). If the lowest bit is 0, no processing is performed.

The above processing is repeated until 8 shift operations are performed. After the last bit (the 8th bit) has been shifted, the next 8-bit byte is XORed with the current value of the register, and the other 8 above is also performed. XOR operation of secondary shift, when all bytes in the data frame are processed, the final value generated is the CRC value.

The process of generating a CRC：

(1) Preset a 16-bit register as FFFFH (all 1), called CRC register.

XOR the 8-bit of the first byte in the data frame with the low byte in the CRC register, and store the result in the CRC register.

Move the CRC register one bit to the right, fill the highest bit with 0, and shift out the lowest bit to

detect.

If the lowest bit is 0: repeat the third step (the next shift); if the lowest bit is 1: the CRC register is XORed with a preset fixed value (0A001H).

Repeat steps 3 and 4 until 8 shifts. This completes a complete eight bits.

(2) Repeat steps 2 to 5 to process the next octet until all bytes are processed

The final CRC register value is the CRC value

In addition, there is a method for calculating CRC using a preset table. Its main feature is that the calculation speed is fast, but the table requires a large storage space.

The error check field occupies two bytes and contains a 16-bit binary value. The CRC value is calculated by the transmitting device and then appended to the data frame. The receiving device recalculates the CRC value when receiving the data, and then compares it with the value in the received CRC field. If the two values are not equal, error occurs.

In the CRC operation, a 16-bit register is first preset to all ones, and then 8 bits in each byte of the data frame are successively operated with the current value of the register, only 8 data per byte. Bit participation in generating the CRC, the start and stop bits and possibly the parity bits do not affect the CRC. When generating the CRC, the 8 bits of each byte are XORed with the contents of the register, and then the result is shifted to the low bit. The high bit is complemented by "0", the least significant bit (LSB) is shifted out and detected. If it is 1, This register is XORed with a preset fixed value (0A001H). If the lowest bit is 0, no processing is performed.

The above processing is repeated until 8 shift operations are performed. When the last bit (bit 8) is shifted, the next 8-bit byte is XORed with the current value of the register, and the other 8 is also performed. The sub-shift XOR operation, when all the bytes in the data frame are processed, the final value generated is the CRC value.

The process of generating a CRC is：

1)Preset a 16-bit register to 0FFFFH (all 1), called the CRC register

The 8-bit of the first byte in the data frame is XORed with the low byte in the CRC register and the result is stored back in the CRC register. Move the CRC register one bit to the right, fill the highest bit with 0, and the lowest bit is out and detected.

If the least significant bit is 0: repeat the third step (next shift); if the lowest bit is 1: the XOR register is XORed with a preset fixed value (0A001H).

Repeat steps 3 and 4 until 8 shifts. This completes a complete eight-bit.

2)Repeat steps 2 through 5 to process the next eight bits until all byte processing ends

The value of the final CRC register is the value of the CRC.

In addition, there is a method for calculating the CRC by using a preset table. The main feature is that the calculation speed is fast, but

the table requires a large storage space. The method is not described here, please refer to related materials.

3.3 Function code introduction

3.3.1 Function code 01H、02H：discrete input read

This function code reads from 1 to 2000 continuous state of discrete input.Request PDU specifies the starting address,namely the first input address and input number specified.Address input is from zero.Indication state are 1=0N and 0=OFF.The LSB (least significant bit) of the first data byte includes the input addressed in the query.The other inputs are analogized in order until the high end of this byte, and the order from low to high in the subsequent bytes.If the number of inputs returned is not a multiple of eight, the remaining bits in the last data byte will be padded with zeros (up to the high end of the byte).The number of bytes field specifies the number of complete bytes of data.

The following example is from the 01 machine read DI7 ~ DI16 consecutive 10 digital state.

Host send		Message send
Address code		01H
Function code		02H
Start address	High byte	00H
	Low byte	06H
Output quantity	High byte	00H
	Low byte	0AH
CRC check code	Low byte	18H
	High byte	0CH

Return from the slave		Return message
Address code		01H
Function code		02H
Bytes		02H
Input state 14-7		3FH
Input state 16-15		02H
CRC check code	Low byte	29H
	High byte	89H

Divide input state 14-7 as hexadecimal byte value 3F, or binary 0011 1111.Input 14 is the MSB of this byte, and input 7 is the LSB of this

byte.

The discrete input state 16-15 is represented as a hexadecimal byte value of 02, or a binary 0000 0010. Input 15 is the LSB, zero padding the remaining bits in the last data byte.

3.3.2 function code 03H：read register

This function allows the use to get data and system parameters collected and recorded by the device.Number of data requested by the host at one time is not limited,but can not exceed the defined range.

The following example is the basic data collected from machine reading from No. 01 (each address in the data frame occupies 2 bytes) Uab, Ubc, Uca, where Uab address is 03H, Ubc address is 04H, Uca The

address is 05H.

Host send		Message send
Address code		01H
Function code		03H
Start address	High byte	00H
	Low byte	03H
Register quantity	High byte	00H
	Low byte	03H
CRC check code	Low byte	F5H
	High byte	CBH

Return from the slave		Return message
Address code		01H
Function code		03H
Bytes		06H
Register data	High byte	0EH
	Low byte	EEH
Register data	High byte	0EH
	Low byte	E8H
Register data	High byte	0EH
	Low byte	E9H
CRC check code	Low byte	8FH
	High byte	7EH

3.3.3 Function code 10H:Write multiple registers

Function code 10H allows the user to change the contents of multiple registers. The system parameters, switch output status, etc. in this instrument can be written with this function number. The host can write up to 16 (32 bytes) data at a time.

The following example is that the meter with preset address 01 simultaneously outputs switching value DO. The switch output status indicates that the register address is 0045H, and the first bit corresponds to DO.

Host send		Message send
Address code		01H
Function code		10H
Start address	High byte	00H
	Low byte	45H
Register quantity	High byte	00H
	Low byte	01H
bytes		02H

Return from the slave		Return message
Address code		01H
Function code		10H
Start address	High byte	00H
	Low byte	45H
Register quantity	High byte	00H
	Low byte	01H
CRC check	Low byte	10H

0045H Data to be written	High byte	00H
	Low byte	01H
CRC check code	Low byte	69H
	High byte	05H

code	High byte	1CH

3.4 Modbus address

AMC16Z-FD

Remote measure and remote control

Parameter table（0x00～0x2F）

No.	Variable value	Address	R/W	Word length	unit	Data type	remark
1	Address	00H	R/W	1	NONE	Uint16	1～247
2	Baud rate	01H	R/W	1	NONE	Uint16	0:115200 1:2400 2:4800 3:9600 4:19200 5:38400 6:57600
3	Check Digit	02H	R/W	1	NONE	Uint16	0:无校验 2:奇校验 3:偶校验
4	Wiring method	03H	R/W	1	NONE	Uint16	reserve
5	Rated voltage	04H	R/W	1	V	Uint16	48、240
6	Rated current	05H	R/W	1	A	Uint16	reserve
7	Outgoing line voltage ratio	06H	R/W	1	NONE	Uint16	reserve
8	Outgoing line current ratio	07H	R/W	1	NONE	Uint16	reserve
9	reserve	08H	R/W	1	NONE	Uint16	
10	reserve	09H	R/W	1	NONE	Uint16	
11	reserve	0AH	R/W	1	NONE	Uint16	
12	Zero shielding value set	0BH	R/W	1	%	Uint16	1 decimal
13	Current calibration	0CH	R/W	1	NONE	Uint16	0x8801:the 1st channel

							0x8802:The 2nd channel …… 0x88FF:whole
14	Energy zero clearance	0DH	R/W	1	NONE	Uint16	06601:The 1ST channel 0x6602:The 2nd channel …… 0x66FF:whole

Electrical parameter data table（0x30～0xEF）

No.	Variable value	Address	R/W	Word length	Unit	Data type	Remark
1	A dc outgoing line 1 voltage	30H-31H	R	2	V	float	
2	A dc outgoing line 2 voltage	32H-33H	R	2	V	float	
3	A dc outgoing line 3 voltage	34H-35H	R	2	V	float	
4	A dc outgoing line 4 voltage	36H-37H	R	2	V	float	
5	A dc outgoing line 5 voltage	38H-39H	R	2	V	float	
6	A dc outgoing line 6 voltage	3AH-3BH	R	2	V	float	
7	A dc outgoing line 7 voltage	3CH-3DH	R	2	V	float	
8	A dc outgoing line 8 voltage	3EH-3FH	R	2	V	float	
9	A dc outgoing line 9	40H-41	R	2	V	float	

	voltage	H					
10	A dc outgoing line 10 voltage	42H-43H	R	2	V	float	
11	A dc outgoing line 11 voltage	44H-45H	R	2	V	float	
12	A dc outgoing line 12 voltage	46H-47H	R	2	V	float	
13	B dc outgoing line 1 voltage	48H-49H	R	2	V	float	
14	B dc outgoing line 2 voltage	4AH-4BH	R	2	V	float	
15	B dc outgoing line 3 voltage	4CH-4DH	R	2	V	float	
16	B dc outgoing line 4 voltage	4EH-4FH	R	2	V	float	
17	B dc outgoing line 5 voltage	50H-51H	R	2	V	float	
18	B dc outgoing line 6 voltage	52H-53H	R	2	V	float	
19	B dc outgoing line 7 voltage	54H-55H	R	2	V	float	
20	B dc outgoing line 8 voltage	56H-57H	R	2	V	float	
21	B dc outgoing line 9 voltage	58H-59H	R	2	V	float	
22	B dc outgoing line 10 voltage	5AH-5BH	R	2	V	float	
23	B dc outgoing line 11 voltage	5CH-5DH	R	2	V	float	
24	B dc outgoing line 12 voltage	5EH-5FH	R	2	V	float	
25	A dc outgoing line 1 current	60H-61H	R	2	A	float	
26	A dc outgoing line 2 current	62H-63H	R	2	A	float	
27	A dc outgoing line 3 current	64H-65H	R	2	A	float	

28	A dc outgoing line 4 current	66H-67H	R	2	A	float	
29	A dc outgoing line 5 current	68H-69H	R	2	A	float	
30	A dc outgoing line 6 current	6AH-6BH	R	2	A	float	
31	A dc outgoing line 7 current	6CH-6DH	R	2	A	float	
32	A dc outgoing line 8 current	6EH-6FH	R	2	A	float	
33	A dc outgoing line 9 current	70H-71H	R	2	A	float	
34	A dc outgoing line 10 current	72H-73H	R	2	A	float	
35	A dc outgoing line 11 current	74H-75H	R	2	A	float	
36	A dc outgoing line 12 current	76H-77H	R	2	A	float	
37	B dc outgoing line 1 current	78H-79H	R	2	A	float	
38	B dc outgoing line 2 current	7AH-7BH	R	2	A	float	
39	B dc outgoing line 3 current	7CH-7DH	R	2	A	float	
40	B dc outgoing line 4 current	7EH-7FH	R	2	A	float	
41	B dc outgoing line 5 current	80H-81H	R	2	A	float	
42	B dc outgoing line 6 current	82H-83H	R	2	A	float	
43	B dc outgoing line 7 current	84H-85H	R	2	A	float	
44	B dc outgoing line 8 current	86H-87H	R	2	A	float	
45	B dc outgoing line 9 current	88H-89H	R	2	A	float	
46	B dc outgoing line 10	8AH-8B	R	2	A	float	

	current	H					
47	B dc outgoing line 11 current	8CH-8DH	R	2	A	float	
48	B dc outgoing line 12 current	8EH-8FH	R	2	A	float	
49	A dc outgoing line 1 power	90H-91H	R	2	W	float	
50	A dc outgoing line 2 power	92H-93H	R	2	W	float	
51	A dc outgoing line 3 power	94H-95H	R	2	W	float	
52	A dc outgoing line 4 power	96H-97H	R	2	W	float	
53	A dc outgoing line 5 power	98H-99H	R	2	W	float	
54	A dc outgoing line 6 power	9AH-9BH	R	2	W	float	
55	A dc outgoing line 7 power	9CH-9DH	R	2	W	float	
56	A dc outgoing line 8 power	9EH-9FH	R	2	W	float	
57	A dc outgoing line 9 power	A0H-A1H	R	2	W	float	
58	A dc outgoing line 10 power	A2H-A3H	R	2	W	float	
59	A dc outgoing line 11 power	A4H-A5H	R	2	W	float	
60	A dc outgoing line 12 power	A6H-A7H	R	2	W	float	
61	B dc outgoing line 1 power	A8H-A9H	R	2	W	float	
62	B dc outgoing line 2 power	AAH-ABH	R	2	W	float	
63	B dc outgoing line 3 power	ACH-ADH	R	2	W	float	
64	B dc outgoing line 4 power	AEH-AFH	R	2	W	float	

65	B dc outgoing line 5 power	B0H-B1H	R	2	W	float	
66	B dc outgoing line 6 power	B2H-B3H	R	2	W	float	
67	B dc outgoing line 7 power	B4H-B5H	R	2	W	float	
68	B dc outgoing line 8 power	B6H-B7H	R	2	W	float	
69	B dc outgoing line 9 power	B8H-B9H	R	2	W	float	
70	B dc outgoing line 10 power	BAH-BBH	R	2	W	float	
71	B dc outgoing line 11 power	BCH-BDH	R	2	W	float	
72	B dc outgoing line 12 power	BEH-BFH	R	2	W	float	
73	A dc outgoing line 1 energy	C0H-C1H	R	2	0.01kWh	Uint32	
74	A dc outgoing line 2 energy	C2H-C3H	R	2	0.01kWh	Uint32	
75	A dc outgoing line 3 energy	C4H-C5H	R	2	0.01kWh	Uint32	
76	A dc outgoing line 4 energy	C6H-C7H	R	2	0.01kWh	Uint32	
77	A dc outgoing line 5 energy	C8H-C9H	R	2	0.01kWh	Uint32	
78	A dc outgoing line 6 energy	CAH-CBH	R	2	0.01kWh	Uint32	
79	A dc outgoing line 7 energy	CCH-CDH	R	2	0.01kWh	Uint32	
80	A dc outgoing line 8 energy	CEH-CFH	R	2	0.01kWh	Uint32	
81	A dc outgoing line 9 energy	D0H-D1H	R	2	0.01kWh	Uint32	
82	A dc outgoing line 10 energy	D2H-D3H	R	2	0.01kWh	Uint32	
83	A dc outgoing line 11	D4H-D	R	2	0.01k	Uint32	

	energy	5H			Wh		
84	A dc outgoing line 12 energy	D6H-D7H	R	2	0.01kWh	Uint32	
85	B dc outgoing line 1 energy	D8H-D9H	R	2	0.01kWh	Uint32	
86	B dc outgoing line 2 energy	DAH-DBH	R	2	0.01kWh	Uint32	
87	B dc outgoing line 3 energy	DCH-DDH	R	2	0.01kWh	Uint32	
88	B dc outgoing line 4 energy	DEH-DFH	R	2	0.01kWh	Uint32	
89	B dc outgoing line 5 energy	E0H-E1H	R	2	0.01kWh	Uint32	
90	B dc outgoing line 6 energy	E2H-E3H	R	2	0.01kWh	Uint32	
91	B dc outgoing line 7 energy	E4H-E5H	R	2	0.01kWh	Uint32	
92	B dc outgoing line 8 energy	E6H-E7H	R	2	0.01kWh	Uint32	
93	B dc outgoing line 9 energy	E8H-E9H	R	2	0.01kWh	Uint32	
94	B dc outgoing line 10 energy	EAH-EBH	R	2	0.01kWh	Uint32	
95	B dc outgoing line 11 energy	ECH-EDH	R	2	0.01kWh	Uint32	
96	B dc outgoing line 12 energy	EEH-EFH	R	2	0.01kWh	Uint32	

4. Cautions

4.1 The device should be installed in a dry, clean place away from heat sources and strong electromagnetic fields.

4.2 Communication cable should use shielded twisted pair.

5. Diagnosis and troubleshooting methods for common faults

5.1 Voltage and current measurement are correct but power factor measurement is not accurate

*Check if current input direction is correct；

*Check if the phase corresponding to each current loop is correct；The outgoing circuit needs to be adjusted according to the actual access.

5.2 Abnormal communication

*Check if the communication cable is connected properly.

*Check if the A and B terminals of the communication are staggered

*Check if the address of the device is set correctly and the communication baud rate is set correctly.

*When the multi-device communication is abnormal, try to check whether the single-machine communication is normal.