3-phase AC current digital transducer manual

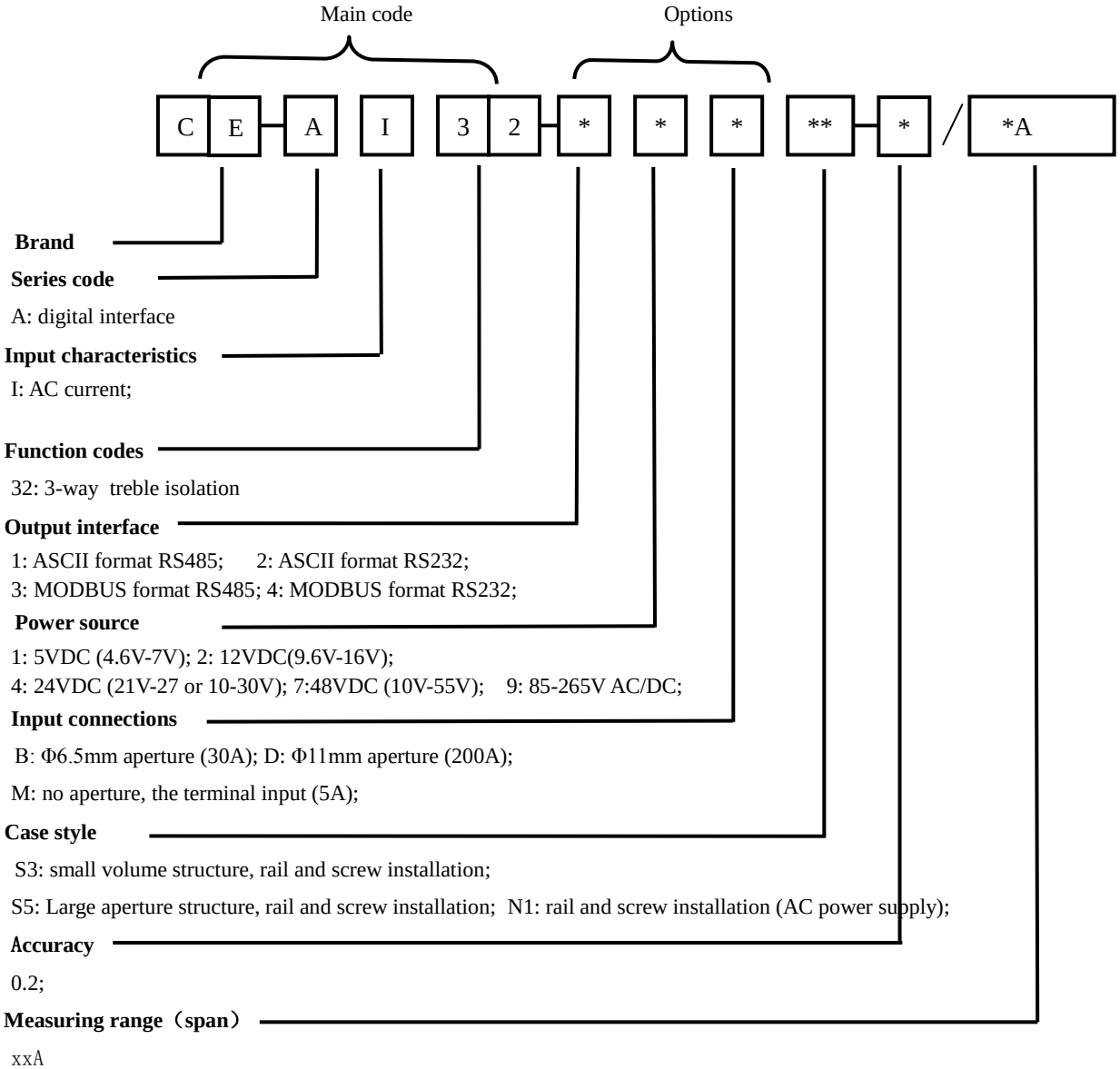
CE-AI32-*****-0.2

1 Overview

This product is a 3-channel AC current acquisition and measurement digital isolation transducer. It can measure the 3-channel current of the AC circuit. Using high-precision 24-bit dedicated AD chip, the ratio dynamic range can be up to 1000: 1 True RMS measurement of current is with high accuracy, good stability and high communication speed, the completely isolated processing technology is with anti-interference ability. Measurement of electrical parameters through the RS-485 digital interface output to achieve long-distance transmission, the product MODBUS protocol is complete compatible with a variety of configuration software or PLC equipment MODBUS (RTU) protocol. It can be applied to power, room monitoring, industrial measurement and other fields.

2 Part Number

CE-A product selection is as follows, in order to make your selected products accurate application, please read carefully.



3 Product Features

- ✧ Available with wide power supply: DC: 10-30V or 10-55V.
- ✧ With odd parity, even parity, no parity, 2 stop bits and other communication methods are free to set.

- ✧ Communication speed optional, the maximum communication speed to 115200 bps.
- ✧ The intelligent transducer with the smallest size and wide current measurement range in the peer
- ✧ Electroplating has a positive and negative cumulative, and power-down storage function.
- ✧ With red and green light-emitting diode instructions function, the red light indicates the normal operation of the product (100mS flashing), the green light indicates the product communication.
- ✧ High anti-interference ability, the input, output and power port to resist the surge voltage up to 2KV or more.

4 Specifications

NO,	Item	Date	Unite	Remarks
1	Accuracy	0.2	%	
	Input range	S3 case: 30A; S5case: 800A; N1case: 5A;		The maximum range for each specification
	Frequency	Frequency response: 20Hz-1KHz; Frequency measurement: 20-600Hz		
2	Baud rate	115.2K, 57.6K, 38.4K, 19.2K, 9600(default) 4800, 2400, 1200	bps	Factory default communication format: 9600, N / 8/1, address 1; S5 type up to 19.2K;
	Communication	RS-485(twisted pair line) , RS-232C(treble line, only for N style parts)		RS422 optional
	Parity	None, Even, Odd, Space		
	Max. number of nodes	64	node	Only for RS-485
	Bus protection	400W transient voltage		ESD protection and thermosnap
3	A/D SPEED	100	mS	
4	Working temperature	-20℃~+60℃		
5	Isolation voltage	Input/output: 2500V DC for 1 min Input/power supply：2500V for 1 min Output/power supply：2500V for 1 min	V	The double isolation part numbers, their output and power supply are grounded together, there is only between the input and output isolation voltage
6	Overload	2 x voltage span 1 sec. 10 for times with interval of 10 sec. 10 x current span for 1 sec. 5 times with an interval of 300 sec (only for hole thru. parts)		The input outside the linear range will result in poor accuracy
7	MTBF	>30000	hour	
8	Auxiliary power supply	+5V/+12V/+24V/+48V/ AC220V	V	220VAC,DC only for N case parts
9	Power consumption	≤250mW(+12V)，≤500mW(+24V)	mW	Power consumption depends on power supply to be used
10	Temperature drift	≤300	ppm/℃	(-20℃~+60℃)

5 Case Style (marked in the figure Unit: mm)

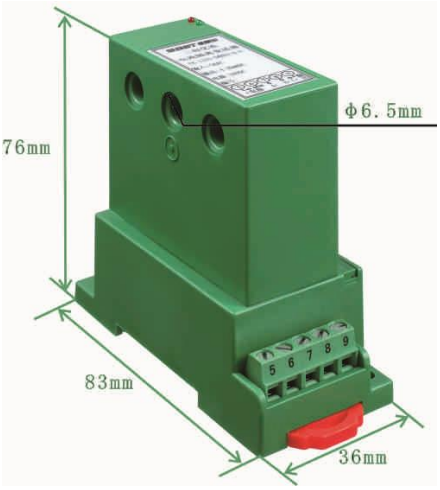


Figure 5.1 CE-AI3*-**BS3 type product shape

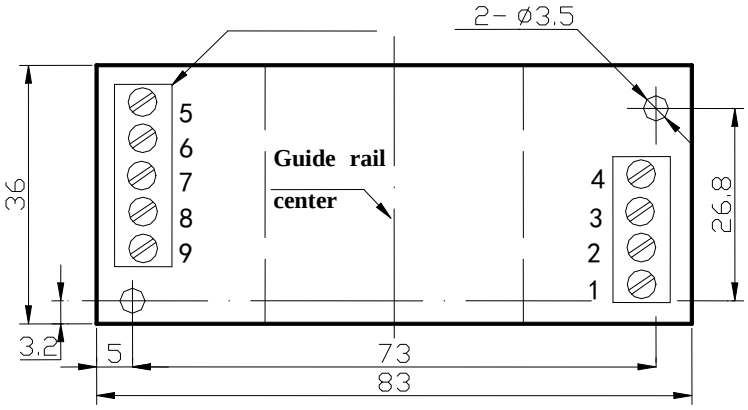


Figure 5.2 CE-AI3*-**BS3 product installation diagram

Figure 5.3 CE-AI3*-**MN1 type product shape(220VAC power supply）

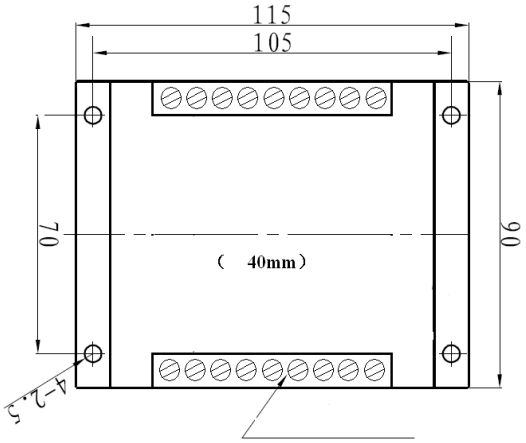


Figure 5.4 CE-AI3*-**MN1 product installation diagram

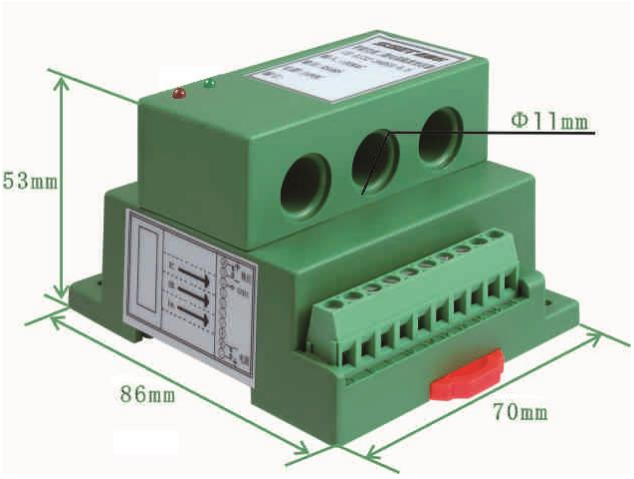


Figure 5.5 CE-AI3*-**DS5 type product shape

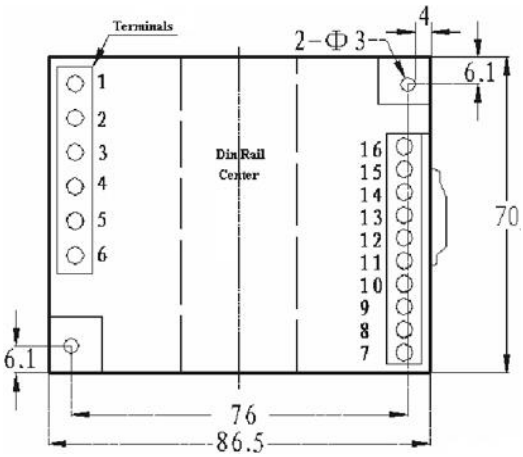


Figure 5.6 CE-AI2*-**DS5 product installation diagram

6 Terminal definition and connection diagrams

S3 case 3-phase current connection diagram reference figure 6.1(Current punch input, Φ6.5mm, max. 30A)

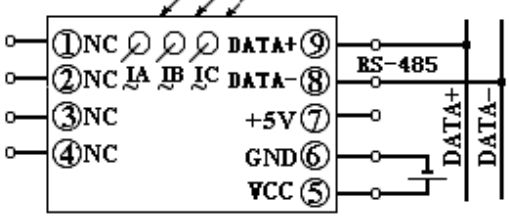


Figure 6.1 3-way current CE-AI32-**BS3 type wiring diagram

(Terminal 7 output is +5 V to provide 5V output (<20mA) in common ground with power supply)

N case 3-way current wiring diagram is shown in Figure 6.2; (current terminal input, the maximum 5A)

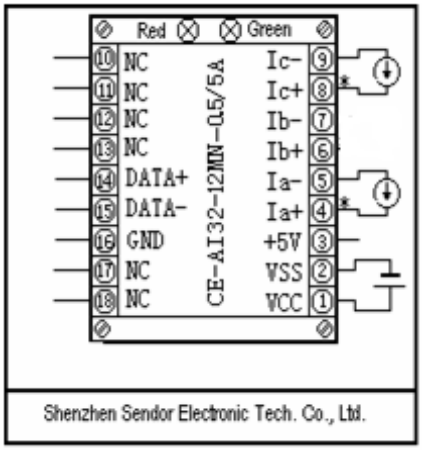


Figure 6.2 3-way Current CE-AI32 - ** MN1 Product Wiring Reference Drawing

Refer to Figure 6.3 for the 3-way current wiring diagram of S5 (current input, Φ11mm, max. 200A; Φ20mm, max. 800A))

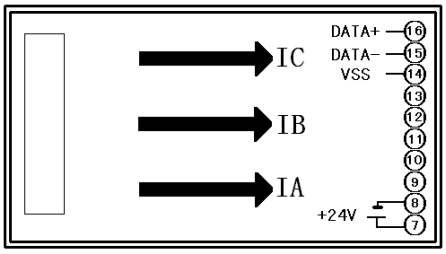


Figure 6.3 3-way Current CE-AI32 - ***S5 caser product wiring diagram

7 ASCII command set for single-phase digital isolation transducer

There are six ASCII format commands for communications between master and CE-A transducer, in addition there are four internal commands as follows：

- To read the transducer's name: $(Addr)M<CR>
- To read the configuration: $(Addr)2<CR>
- To set the configuration: %(OldAddr)(NewAddr)(InpntRange)(BaudRate)(DataFormat)<CR>
- To read all date: #(Addr) A<CR>

  Address (Addr): 00~FF (hex indicated by two bit ASCII code)

  Date format: 1bit for start bit"0", 8bits for date, 1bit for stop bit"1"

1 To read the transducer's name

To read the transducer's name from a specified address.

Command format:$（Addr）M<CR>

$:	Command symbol	1byte	(24H)
(Addr):	Address	2 bytes	(30H 31H)
M:	To read the transducer's name	1byte	(4DH)
<CR>:	Enter, end mark	1byte	（0DH）

Response: !（Addr）（ModuleName）<CR>

!:	Delimiter
(Addr):	Address of the transducer

Module Name: Name code of the transducer

<CR>: Enter, end mark

Example: command: $01M<CR> （24H 30H 31H 4DH 0DH）

Response: !01I321<CR>（21H 30H 31H 49H 33H 32H 31H 0DH）

!: Delimiter

01: Address

I221: CE-AI32-11 he name code of the transducer (different name code for different transducer)

2To read the configuration

To read the configuration of a transducer by a specified address

Command format: $（Addr）2〈CR〉

$:	Command symbol	1byte	(24H)
(Addr):	Address of the transducer	2bytes	（30H 31）
2::	To read the configuration	1byte	(32H)
<CR>:	Enter, end mark	1byte	（0DH）

Response:!（Addr）（InputRange）（BaudRate）（DataFormat）〈CR〉

Example: Command: $012<CR> （21H 30H 31H 32H 0DH）

Response: ！01000601〈CR〉

！ （21H） Delimiter

01 （30H 31H） Address

00 （30H 30H） Input range (reserved codes)

06 （30H 36H） Communication Baudrate 9600bps

01 （30H 31H） No checksum

<CR> （0DH） End mark

3To set configuration

To set the configuration of the transducer including address and baurdrate

Command: **%（OldAddr）（NewAddr）（InputRange）（BaudRate）（DataFormat）〈CR〉**

（OldAddr）	Old address 00~FFH	2bytes	（30H 31H）
（NewAddr）	New address 00~FFH	2bytes	（30H 32H）
（InputRange）	Must be 00	2bytes	（30H 30H）
（BaudRate）	The communication baurdrate 03~0A	2bytes	（30H 33H----30H 41H）

NO.	Baudrate code	baudrate	NO.	Baudrate code	baudrate
03	30H 33H	1200bps	07	30H 37H	19200bps
04	30H 34H	2400bps	08	30H 38H	38400bps
05	30H 35H	4800bps	09	30H 39H	57600bps
06	30H 36H	9600bps	0A	30H 41H	115200bps

(DataFormat) 01~05 2bytes （30H 31H----30H 35H）

NO.	Baudrate code	Data Format
01	30H 31H	No parity
02	30H 32H	Odd parity
03	30H 33H	Even parity
04	30H 34H	2stop bits, must be 1
05	30H 35H	2stop bits, must be 0

<CR> Enter, end mark 1byte (0DH)

Response: **！（Addr）〈CR〉**

Example: command: %0102000701〈CR〉(25H 30H 31H 30H 32H 30H 30H 30H 37H 30H 31H 0DH)

Response: ！02〈CR〉(21H 30H 32H 0DH)

This command successfully changed the address of the transducer from 01 to 02,its new baudrate is 19200bps.

4 To read all date

To read all real-time data from a specified transducer. The sequence of data is: Ia, Ib Ic

Command: **#(Addr)A<CR>** (23H 30H 31H 41H 0DH) Assume the address is 01

Response: >(Data Ia)(Data Ib)(Data Ic)<CR>

For example: I nominal range is 100A; If the output data is +1.0000 the actual value I=+1.0000×100I=+100.000A

Example: suppose the standard current range Io=100I

Command: #01A<CR> (23H 30H 31H 41H 0DH)

Response: >+1.0000+1.0000+1.0000<CR>

Then: Ia=+1.0000×Io=+1.0000×100A=100.00A

Ib=+1.0000×Io=+1.0000×100A=100.00A

Ic=+1.0000×Io=+1.0000×100A=100.00A

7 Internal commands

A group of internal calibrating commands was set for calibration of the CE-AJ product: (Note: the second byte and the third byte of following four commands are address codes of transducer, the default address codes of all transducers were set to "01" before they are delivered.

Command format &(Addr)(Order)<CR>

- Calibrating command of zero adjusting for DC: $011<CR>(24H 30H 31H 31H 0DH)
- Calibrating command of zero adjusting for AC: $013<CR>(24H 30H 31H 33H 0DH)

For above two commands, each return 22 bytes of data.

- Reset command: @ C E A F W CR (40H 43H 45H 41H 46H 57H 0DH)

Whatever the previous address codes and buad rate of the transducers are. Four bytes of data will be responded from the transducer after receiving the reset command. This command can not be used in the network; otherwise it will cause bus conflict.

- Data Acquisition AD reset command: @ C E A A D CR (40H 43H 45H 41H 41H 44H 0DH)

When the product is subject to interference, read the data anomalies do not update the situation can try to use this command to reset the AD chip, so that the data acquisition chip to work again.

Please contact your shipper when user needs recalibrate the product. Our technicians will help you to recalibrate by using other internal command.

8 1-phase intelligent power isolation transducer MODBUS communication protocol

1 Format of message

(1)Function code 03H--- to read the contents of registers from the slave equipment

The message from the master equipment:

Address of the slave equipment	(01H-FFH	1byte)
Function code	(03H	1byte)
Address of the first register		(2bytes)
Quantity of registers		(2bytes)
CRC code		(2bytes)

The correct responded message from the slave equipment

Address of the slave equipment	(01H-FFH	1byte)
Function code	(03H	1byte)
Byte count	(2xN*	1byte)
Data section		(N*x 2 bytes)
CRC code		(2bytes)

(2) Function code10H---to set data of registers of the slave equipment

The message from the master equipment

Address of the slave equipment	(01H-FFH	1byte)
Function code	(10H	1byte)
Address of the first register		(2bytes)
Quantity of registers		(2bytes)
Byte count	(2xN*	1byte)
The data written to the register		(2x N*)
CRC code		(2bytes)

The correct responded message from the slave equipment

Address of the slave equipment	(01H-FFH	1byte)
Function code	(10H	1byte)
Address of the first register		(2bytes)
Quantity of registers		(2bytes)
CRC code		(2bytes)
CRC code		(2bytes)

Note: 1 For all address of registers, quantity of registers and contents of registers (data), the high order byte is before their low order byte. But the low order byte of CRC code is before its high order byte.

2 the length of the register is 16bits (2 bytes).

2Format of commands and explanation of the registers

(1)List of definitions of registers for electrical parameters data:

Address of register (Hex)	Contents of registers	Quantity of registers	Attribute if registers	Range of data
0010H	A phase current	1	Read only	0~12000
0011H	B phase current	1	Read only	0~12000
0012H	C phase current	1	Read only	0~12000

(2) List of definitions of registers for transducer's name, address and baudrate:

Address of register (Hex)	Contents of registers	Quantity of registers	Attribute if registers	Range of data
0020H	Address and baudrate	1	Read/ write	Address (0-256) Baudrate (03-10)
0021H	Transducer's name	2	Read only	Depend on part number (4bytes)
0023H	Parity check	1	Read/write	0 - no parity; 1 - odd parity; 2 - even parity; 3-2 stop bit, flag bit; 4-2 stop bit, space bit;
0024H	Voltage range	1	Read/write	0-65536(Not involved in the calculation)
0025H	Current range	1	Read/write	0-65536(Not involved in the calculation)

(3) The explanation of register " to clear the data of energy"

Address of register (Hex)	Contents of registers	Quantity of registers	Attribute if registers	Range of data
00A8H	Broadcast address	1	Write	1 the broadcast address FAH

	change			
00A9H	Reset AD	1	Write	0

(4)Example:

For all address of registers, quantity of registers and contents of registers (data), the high order byte is before their low order byte. But the low order byte of CRC code is before its high order byte.

A: Example of the commands “to read all data”

Address of the slave equipment	Function code	Address of the first register		Quantity of registers		CRC-L	CRC-H
01H	03H	00H	10H	00H	03H	04H	0EH

Note: 00H is the high order byte of the register, 10H is the low order byte of the register

The data output sequence is shown in the ‘Electrical Parameter Data Register Definition Table’

B: Example for the commands “to modify the address and baudrate”:

(Change the address from 01 to 02, set new baudrate to 9600pbs <code 06>)

Address of the slave equipment	Function code	Address of the first register		Quantity of registers		Data bytes count	Data written to register		CRC-L	CRC-H
01H	10H	00H	20H	00H	01H	02H	02H	06H	20H	52H

Note: Code for baudrate setting: 03--1200bps 04--2400bps 05--4800bps 06--9600bps 07--19200bps 08--38400bps 09--57600bps 0A--115200bps

C: Example for the command “to read the transducer’s name and configuration”

Address of the slave equipment	Function code	Address of the first register		Quantity of registers		CRC-L	CRC-H
01H	03H	00H	20H	00H	03H	04H	01H

D: Example for the command “to modify the parity mode” (to odd parity mode)

Address of the slave equipment	Function code	Address of the first register		Quantity of registers		Data bytes count	Data written to register		CRC-L	CRC-H
01H	10H	00H	23H	00H	01H	02H	00H	01H	60H	C3H

E: Example for the broadcast command: “to modify the address to 1”

Address of the slave equipment	Function code	Address of the first register		Quantity of registers		Data bytes count	Data written to register		CRC-L	CRC-H
FAH	10H	00H	A8H	00H	01H	02H	00H	01H	09H	4CH

3 Data

List of the format of data responded after the read command(suppose the read value of voltage is 380V)

NO.	Parameter Name	Input value	Hex date (100%)		1decimal data (100%)	Note
			High byte	Low byte		
1	IA	100A	27	10	10000	True RMS
2	IB	100A	27	10	10000	True RMS
4	IC	100A	27	10	10000	True RMS

（(1) Format of the data of current

2 bytes sign + data (no sign for AC voltage and AC current)

Range of the data: -12000~+12000

Meaning of the data: 10000 correspond to the rated value. For example, when the maximum value of input current is 5.000A, the expected output value is 10000D or 2710H and 25.000A correspond to 5000D or 1388H of the expected output value.

8-bit low order byte （responded data）

7	6	5	4	3	2	1	LSB

8-bit high order byte

Sign 1=negative 0=positive	MSB	13	12	11	10	9	8

(2) Calculation of current:

i=I/10000* current range (A)

Thereinto: I---- the data of current received by the master equipment.（2 bytes, high order byte ahead, the MSB is sign bit）

Please contact us if you need some internal calibrating commands for zero input calibration.

9 Frequently Asked Questions

No.	Related questions	Instructions and answers
1	Red light state	1 Normally the red light flashes frequency 100mS after power on 2 Red light flashing slowly and flashing frequency is 1.6 seconds or so, the module watchdog reset, site interference or product anomalies. 3 When power on, the red light does not shine and first to test power supply current (normal work 30mA), no work current or a large current, the power supply is abnormal.
2	Green light state	1、 When the communication is normal, the green light will be on from the start of receiving first byte to end of sending the last byte (about 1ms for 96-bit communication). 2、 When green light quickly turn and off (micro-bright), there is a wrong with communication address, baud rate or commands, and the serial port is frequently interrupted exit。 3、 Sending a command without any flashing of the green light, the communication circuit or wiring is error, the hardware line nowhere.
3	Test software	1 If running the software without the "* .ocx" file, please run the installation software on the CD-ROM or download the plug-in from www.sset.cn/tech_down.htm to run the installation program. 2Test software is for the ASCII protocol and MODBUS protocol, please select according to the product model. Running the software after searching the module and select the searched module, Click the Tools menu to modify the address and baud rate.