EW9L Series 3 Phase Coulometer User's Manual

The coulometers are widely applied to control system, SCADA system and energy management system, transformer substation automation, distributing net automation, small district electrical power monitor, industrial automation, intelligent construction, intelligent switchboard, switch cabinet, etc. It is esay to install and maintain, simple connection, filed programmable setting input parameters.

Features:
Measurement Parameters: Voltage/Current/Active power/Reactive power/Frequency/Power factor ect , 28 parameters.
Two On-Off input/output, isolation for input and output.
True effective value measuring.
With programmable analog output function , analog output for voltage/current/active power/reactive power/fequency/power factor.
With RS485 connection and Modbus RTU communication protocol.
With 2 energy pulse output, 2 programmable alarm, display programmable setted parameters.
With power failure function for display menu select/KWH/KvarH

Model

EW9L – □□□□

- Input Range: B: 5AX450V D: Others
- Input: 30: 3 phase 3 wire or 3 phase 4 wire input; 38: 3 phase 3 wire or 3 phase 4 wire input with Communication
- Alarm Function: C: 2 alarm output A: No alarm output
- Output: R: No transformed analog output D: With transformed analog output (4-20mA)
- L: LCD Display
- Dimension: 9: 96H*96W*100L(mm)
- EW Series 3 phase coulometer

Model Indication

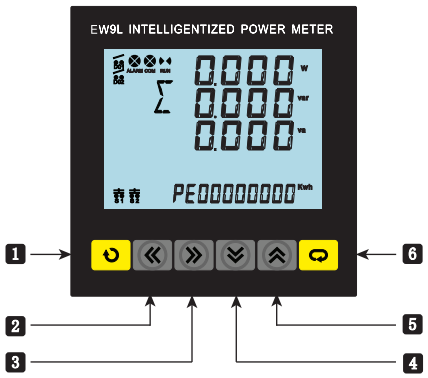
Model	Alarm	Transformed analog output	Communication	Pulse output	On-Off input
EW9L-A30B	No	No	No	Yes	Yes
EW9L-A38B	No	No	RS485		
EW9L-RC30B	2	No	No		
EW9L-RC38B	2	No	RS485		
EW9L-DC30B	2	4～20mA	No		
EW9L-DC38B	2	4～20mA	RS485		

Technical Parameters

Connection	3 phase 3 wires, 3 phase 4 wires
Rated Voltage Value	AC 50-260V phase voltage/ AC 50-450V Line voltage
Voltage Overload	Continuous: 1.2 times Instantaneous: 2 times/10S
Voltage Consumption	<1VA (each phase)

Voltage Imdepance	≥300KΩ
Voltage Accuracy	RMS measurement , Accuracy : 0.5
Current Range	AC 0.025～5A
Current Overload	Continuous: 1.2 times Instantaneous: 10 times/10S
Current Consumption	<0.4VA (each phase)
Current Imdepance	<20mΩ
Current Accuracy	RMS measurement, Accuracy 0.5
Frequency	45-60Hz , Accuracy: 0.1Hz
Power	Active power/Reactive power/Apparent power, accuracy: 0.5%F.S
Energy	Active power/Reactive power accuracy 1%
Display	LCD Display
Power Supply	AC/DC 100～240V （85～265V）
Power Supply Consumption	≤7VA
Output Digit Interface	RS-485 Modbus-RTU Protocol
Pulse Output	2 energy pulse output(optical coupler relay) Normal Pulse Number: 7200imp/kwh
On/Off Input	2 On/Off input (connection without voltage or current signal)
Alarm Output	2 On/Off output, 250VAC/3A or 30V DC/5A
Analog Output	1 transformed analog output, 4-20mA DC Load ＜500Ω
Working Environment	Temperature: -10～55℃ , Humidity: ＜85% RH
Storage Environment	-20～75℃
Isolation&puncture	Input signal and power 1600V AC , Input and output 1600VAC , power and transformed analog output, RS485 connection , DI connection , Pulse output connection≥DC 2000V
Insulation	Input/output/power supply to Meter cover＞5MΩ
Dimension	96W×96H×100L（mm）
Weight	0.6kg

■ Panel Indication



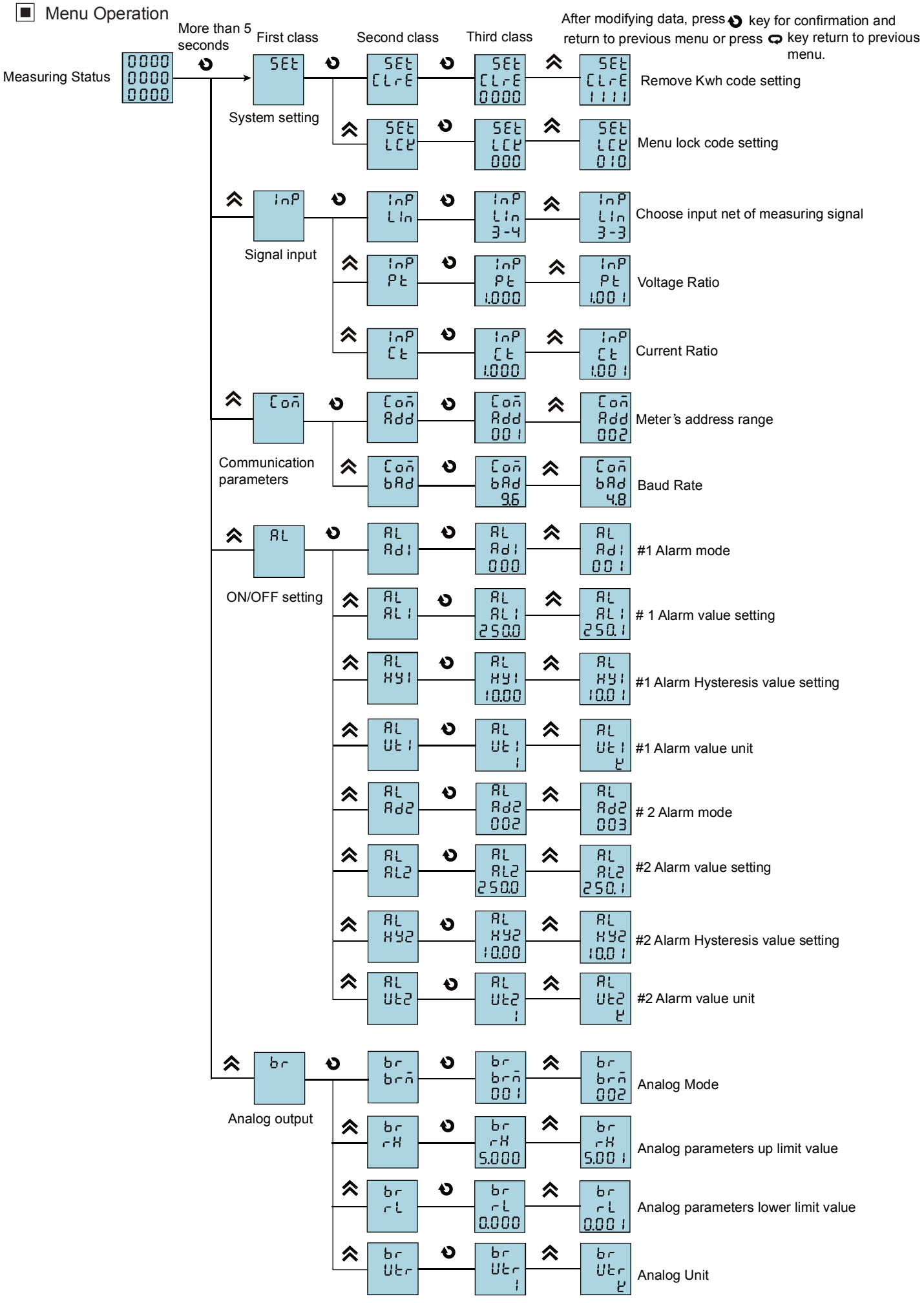
symbol	Meaning
U	voltage
A	current
P	active power
Q	reactive power
S	apparent power
PF	power factor
F	Frequency
TOT	Total
PE	Kwh
QE	KvarH

No.	symbol	Name	Function
1		Set Key	Confirmed the setted value , can be used to change kwh display in measuring status
2		Left Key	Chang to display left page and measure parameters
3		Right Key	Change to display right page and measure parameters
4		Decrease Key	Change menu or increase value
5		Increase Key	Change menu or decrease value
6		Return Key	Return to upper menu in operation

Check measuring value and working status indication:

1. Under measuring status , Press ≪/≫ key to shift display of 3 phase voltage , 3 phase current , active power, power factor , apparent power , reactive power , apparent power , total power ect.
2. Press ≪ / ≫ key to shift display of Kwh and KvarH.
3. Under alarm mode , DO1 and DO2 is used as alarm output status indication. Under ON/OFF remote control mode , DO1 and DO2 is used as ON/OFF output status indication.
4. S1, S2 indicate ON/OFF remote control input status.
5. Alarm flash means alarm output, COM flash means communicating, RUN move means the meter is under measuring status.
6. Σ means measuring 3 phase total active power, reactive power, appearant power, PE means the total active energy , QE means total reactive energy.

▣ Menu Operation



■ Menu Operation Illustration

Under customer menu status

1. Press key more than 3 seconds to enter customer menu , set each parameter.
2. If the display is the first class or second class, press set key to enter next class display. Press ⌄⌃ to change other parameters.
3. If the display is second or third class , press key to return previous display.
4. If the display is third class , press set key to flash digit , press « key to shift place. Keep pressing ⌄⌃ to change value . Press to save value. If press , do not save the set value and return to second class.
5. When data flashing , short press » to move the decimal point.
6. After modifying the parameters , press confirm key more than 5 seconds , exit user menu , return to measuring status.

Menu Structure and Function Description

No.	Level 1	Level 2	Level 3	Description
1	SEt System Setting	Clear Energy CLrE	Password 0000	Energy can only be cleraed when enter into correct passsword.(password: 1111)
		Function Shield Code LCY	Shield Code 000	If the second digit is 1, (ie 010) , the value in the menu can be read but cannot be changed.
2	InP Signal input	Network LIn	3-3 3-4	To select the input network of the measured signal
		Voltage transform Pt Pt	1-9999	To set the voltage signal ratio=Primary coil voltage/ secondary coil voltage
		Current transform Ct Ct	1-9999	To set the current signal ratio=primary coil current/ Secondary coil current
3	Con Communication Parameters	Address Add	0-255	Coulometer address range
		Baud rate bAd	4.8-9.6	Baud rate: 4.8 means 4800, 9.6 means 9600
4	AL ON/OFF Value setting	1st alarm mode Ad1	1-52	When the value is 0 , it is for DO1 function , otherwise it is for alarm mode. Please refer to table 1.
		1st alarm value AL1	-1999-9999	1st alarm value setting
		1st alarm hysteresis value HY1	-1999-9999	1st alarm hysteresis value setting
		1st alarm value unit Ut1	1-Y	1: means international standard unit . K: means1000 times of standard unit. The unit of alarm value is the same as alarm hysteresis value.
		2nd alarm mode Ad2	1-52	When the value is 0 , it isfor DO2 function ,otherwise it is for alarm mode. Please refer to table 1.
		2nd alarm value AL2	-1999-9999	2nd alarm value setting
		2nd alarm hysteresis value HY2	-1999-9999	2nd alarm hysteresis value setting
		2nd alarm value unit Ut2	1-Y	1: means international standard unit . K: means1000 times of standard unit. The unit of alarm value is the same as alarm hysteresis value.
5	br Analog output	Transform mode selection brn	1-26	Please refer to table 1
		Transform upper limit rH	-1999-9999	transform analog output 20mA
		Transform low limit rL	-1999-9999	transform analog output 4mA
		Transform value unit Utr	1-Y	1 means international standard unit . K means 1000 times of international standard unit.

■ Output Function

1. Energy pulse

EW9L provides the function of 4 quadrant energy calculation, 2 energy pluse output and RS485 interface for display and transmit of energy data. The energy pulse of optical couple relay with open collector enables the long distance transmit of active&reactive energy. Remote PC terminal , PLC, DI On-Off output and collector module are applied to collect the pulse of coulometer to enable the energy cumulation calculation. Besides , this output mode is also the energy accuracy check way(National metrology regulations: Standard meter pulse tolerance comparison method)

(1). Electrical characteristic: the output of optical couple relay with open collector , V≤ 48V, Iz≤ 50mA

(2). Pulse constant: 7200imp/kwh. It means the impulse output No. is 7200 when the coulometer counts up to 1KWH. The piont should be emphasized is that the above 1kwh is for the 2nd coil energy. Supposed that PT and CT is connected , the primary coil energy that 7200 pulse refer to is equal to 1kwhX voltage transform PT X current transform CT.

2.DI/DO function 2 way S1-S2 be used to remote control electric ON/OFF status , 2 DO function be used to control electric devices , when using Do function and alarm mode is setted as 0 , otherwise DO1 and DO2 will be as AL1 , AL2 output. DO1 DO2 function control value is writn via RS485 interface.

3. Communication function (please refer to the communication protocol)
4. Transform output(please refer to table 1)
5. Alarm function (please refer to table 1)

■ Communication protocol

EW9L series coulometer adopts Modbus RTU communication protocol RS485 half duplex communication , read function code 0x03 , write function code 0x10 , adopts 16 digit CRC check, the coulometer does not feedback check error.

Start bit	Data bit	Stop bit	Check bit
1	8	1	No

Communication abnormal solution:

When abnormal answer , the highest bit of function code will be set to 1. For example , if the request function code from host is 0x04,

Error type code

0x01--Function code error: Meter does not support the function code it receives

0x02--Data position error: The data position assigned by host is out of the range of meter.

0x03--Data value error: The data value sent from host is out of the range of meter.

1. Read multi-register

For example , host reads float data AL1 (1st alarm value 241.5)

The address code of AL1 is 0x0000, because AL1 is float data (4 byte), seizes 2 data register. According to IEEE-754, the standard hexadecimal memory code of decimalist float data 241.5 is 0x00807143.

Host request(Read multi-register)							
1	2	3	4	5	6	7	8
Meter address	Function Code	Start address high bit	Start address low bit	Data byte length High bit	Data byte length low bit	CRC code low bit	CRC code high bit
0x01	0x03	0x00	0x00	0x00	0x02	0xC4	0x0B

Meter normal answer (write multi-register)								
1	2	3	4	5	6	7	8	9
Meter address	Function Code	Data byte number	Data 1 high bit	Data 1 low bit	Data 2 high bit	Data 2 low bit	CRC code low bit	CRC code high bit
0x01	0x03	0x04	0x00	0x80	0x71	0x43	0x9E	0x7A

Function code abnormal answer:(for example, host request function code is 0x04)

Meter abnormal answer(Read multi-register)				
1	2	3	4	5
Meter address	Function code	Error code	CRC code low bit	CRC code high bit
0x01	0x84	0x01	0x82	0xC0

2. Write multi-register

For example: Host reads float data HY1(1st alarm hysteresis value 20.5). The address code of HY1 is 0x0001, becasue HY1 is float data(4 bytes) , seizes 2 data registers. According to IEEE-754 standard, the hexadecimal memory code of decimalist float data 20.5 is 0x0000A441

Host request(Write multi-register)												
1	2	3	4	5	6	7	8	9	10	11	12	13
Meter address	Function code	Start address high 8 bit	Start address low 8 bit	Data byte length high bit	Data byte length low bit	Data byte length	Data 1 high bit	Data 1 low bit	Data 2 high bit	Data 2 low bit	CRC code Low bit	CRC code high bit
0x01	0x10	0x00	0x01	0x00	0x02	0x04	0x00	0x00	0xA4	0x41	0x88	0x93

Meter normal answer(write multi-register)							
1	2	3	4	5	6	7	8
Meter address	Function code	Start address high 8 bit	Start address low 8 bit	Data byte length high bit	Data byte length low bit	CRC code low bit	CRC code high bit
0x01	0x10	0x00	0x01	0x00	0x02	0x10	0x08

Data position error answer:(for example, host request write address index is 0x0050)

Meter abnormal answer(write multi-register)				
1	2	3	4	5
Meter address	Function code	Error code	CRC code low bit	CRC code high bit
0x01	0x90	0x02	0xCD	0xC1

3. EW9L parameter address reflection table

No.	Address reflection	Variable name	Default value	Byte length	Value range	Read/Write	Remark
0	0x0000	1st alarm value AL1	250	2	-1999～9999	R/W	
1	0x0001	1st alarm hysteresis HY1	10	2	-1999～9999	R/W	
2	0x0002	2nd alarm value AL2	250	2	-1999～9999	R/W	
3	0x0003	2nd alarm hysteresis HY2	10	2	-1999～9999	R/W	
4	0x0004	Voltage transform PT	1.0	2	1～9999	R/W	
5	0x0005	Current transform CT	1.0	2	1～9999	R/W	
6	0x0006	Analog output highest value RH	250	2	-1999～9999	R/W	
7	0x0007	Analog output lowest value RL	0.0	2	-1999～9999	R/W	
8	0x0008	Phase Voltage Ua		2	0～9999	R	
9	0x0009	Phase voltage Ub		2	0～9999	R	
10	0x000A	Phase voltage Uc		2	0～9999	R	
11	0x000B	Line voltage Uab		2	0～9999	R	
12	0x000C	Line voltage Ubc		2	0～9999	R	
13	0x000D	Line voltage Uca		2	0～9999	R	
14	0x000E	Phase current Ia		2	0～9999	R	
15	0x000F	Phase current Ib		2	0～9999	R	
16	0x0010	Phase current Ic		2	0～9999	R	
17	0x0011	Phase A active power Pa		2	0.000～9999	R	
18	0x0012	Phase B active power Pb		2	0.0000～9999	R	
19	0x0013	Phase C reactive power Pc		2	0.000～9999	R	
20	0x0014	Total reactive power Ps		2	0.000～9999	R	
21	0x0015	Phase A reactive power Qa		2	0.000～9999	R	
22	0x0016	Phase B reactive power Qb		2	0.000～9999	R	
23	0x0017	Phase C reactive power Qc		2	0.000～9999	R	
24	0x0018	Total reactive power Qs		2	0.000～9999	R	
25	0x0019	Phase A apparent power VAa		2	0.000～9999	R	
26	0x001A	Phase B apparent power VAb		2	0.000～9999	R	
27	0x001B	Phase C apparent power VAc		2	0.000～9999	R	
28	0x001C	Total apparent power VAs		2	0.000～9999	R	
29	0x001D	Power factor PFa		2	0～1.0	R	
30	0x001E	Power factor PFb		2	0～1.0	R	
31	0x001F	Power factor PFc		2	0～1.0	R	
32	0x0020	Total power factor PFs		2	0～1.0	R	
33	0x0021	Frequency		2	45～60	R	
34	0x0022	KWH		2	0.00-999999.99	R	
35	0x0023	KVarH		2	0.00-999999.99	R	
Reserve							
36	0x0050	1st Alarm mode Ad1	2	1	0～52	R/W	Table 1
37	0x0051	2nd Alarm mode Ad2	2	1	0～52	R/W	
38	0x0052	Analog output mode brM	1	1	1～26	R/W	
39	0x0053	1st Alarm value unit	0	1	0～1	R/W	
40	0x0054	2nd Alarm value unit	0	1	0～1	R/W	note 4
41	0x0055	Analog value unit	0	1	0～1	R/W	
42	0x0056	Wire connection mode Link	0	1	0～1	R/W	note 1
43	0x0057	Baud rate bAUd	1	1	0～1	R/W	note 2
44	0x0058	Meter address Add	1	1	0～255	R/W	
45	0x0059	On-off output DO1 , DO2		1	0～3	R/W	remote control
46	0x005A	On-off input S1 , S2		1	0～3	R	remote measure
47	0x005B	Meter name	0xD9	1	0xD9	R	
48	0x005C	Measure status indication		1	0～16	R	note 3

R/W-Read and Write both R-Read Only

Reference table 1: Reference table for alarm output and analog output

No.	Parameter	ON/IOFF output code low alarm	ON/OFF output code high alarm	Analog output code 4-20mA
1	Ua (A phase voltage)	1	2	1
2	Ub(B phase voltage)	3	4	2
3	Uc(C hase voltage)	5	6	3
4	Uab (AB wire voltage)	7	8	4
5	Ubc (BC wire voltage)	9	10	5
6	Uca (CA wire voltage)	11	12	6
7	Ia(A wire current)	13	14	7
8	Ib(B wire current)	15	16	8
9	Ic (C wire current)	17	18	9
10	Pa (A phase active power)	19	20	10
11	Pb(B phase active power)	21	22	11
12	Pc (C phase active power)	23	24	12
13	Ps(Total active power)	25	26	13
14	Qa(A phase reactive power)	27	28	14
15	Qb(B phase reactive power)	29	30	15
16	Qc (C phase reactive power)	31	32	16
17	Qs (Total reactive power)	33	34	17
18	Sa (A phase apparent power)	35	36	18
19	Sb (B phase apparent power)	37	38	19
20	Sc (C phase reactive power)	39	40	20
21	Ss (Total apparent power)	41	42	21
22	PFa (A phase power factor)	43	44	22
23	PFb(B phase power factor)	45	46	23
24	PFc(C phase power factor)	47	48	24
25	PFs (Total power factor)	49	50	25
26	Frequency	51	52	26

Note: 1. Connection mode

Communication value	0	1
Menu display	3-4	3-3

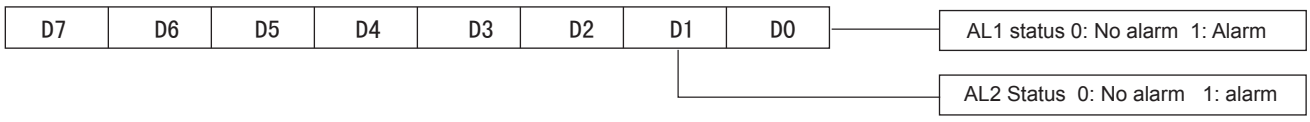
Note:2. Baud rate

Communication value	0	1
Menu display	4. 8	9. 6

Note: 4. Alarm/Analog Unit

Communication value	0	1
Menu display	1	K

Remark 3 : Measure Satus Indication



The program of 4 byte character code float data converting to decimalist float data

```
float BytesToFloat(unsigned char*pch)
{
      float result;
      unsigned char *p;
      p=(unsigned char*)&result;
    * p=*pch;*(p+1)=*(pch+1);*(p+2)=*(pch+2);*(p+3)=*(pch+3);
     return result;
}
```

The program of decimalist float data converting to 4 byte character code float data as per IEEE-754 standard

```
void FloatToChar(float Fvalue,unsigned char*pch)
{
     unsigned char*P;
     p=(unsigned char*)&Fvalue;
    *pch=*p;*(pch+1)=*(p+1);*(pch+2)=*(p+2);*(pch+3)=*(p+3);
}
```

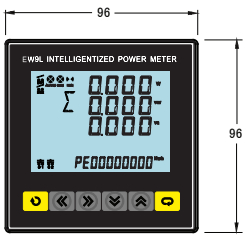
The program of achieving 16 bit CRC check code

```
unsigned int Get_CRC (uchar*pBuf,uchar num)
{
```

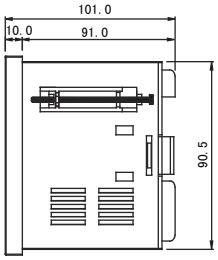
```
    unsigned i,j;
unsigned int wCrc=0xFFFF;
for(i=0;i<num;i++)
    {
wCrc^=(unsigned int)(pBuf[i]);
for(j=0;j<8;j++)
        {
if(wCrc &1){wCrc>>=1;   wCrc=0xA001;}
else wCrc>>=1;
        }
    }
    return wCrc;
}
```

■ Dimension and Mounting Size

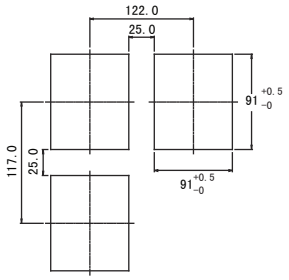
Panel Size



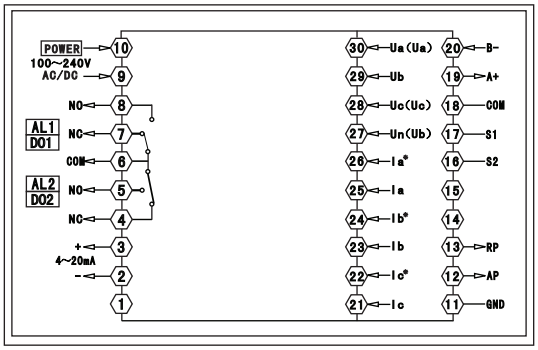
Side-face Size



Mounting Size



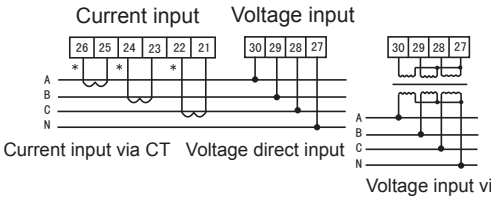
■ Connection Drawing



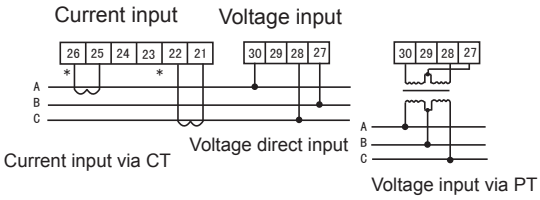
Note: ①Voltage input connection terminal,bracket terminals shows 3 phase 3 wire connection method, if there is any change, please turn to the correct diagram on the meter !

②Current "*" is current input terminal,all input and output must be coincident.

Model 1: (3pcs CT) 3 phase 4 wire working mode with central line



Model 2: (2pcs CT): 3 phase 3 wire working mode



Explanation :

A. Voltage input: Input voltage should not be higher than the rated input voltage of meter, otherwise a PT should be used.

B. Current input: Standard rated input current is 5A. A CT should be used when the input current is bigger than 5A. If some other meters are connected with the same CT , the connection should be serial for all meters.

C. Please make sure that the input voltage is corresponding to the input current, they should have the same phase sequence and direction, otherwise data and sign error may occur (power and energy).

D. The connection mode of meter which is connected to power network should depend on the CT quantity. For 2pcs of CT, it should be 3 phase 3 wire connection. For 3pcs of CT, it shoud be 3 phase 4 wire connection.

E. Please pay high attention on the difference between 3 phase 3 wire and 3 phase 4 wire connection , becasue wrong connection may lead to incorrect calculation of power factor, power and energy .

Caution:

1. Power supply connection must be correct.
2. Pay attention on the phase sequence of voltage signal input.
3. Current signal input shoudl be connected as per the connection drawing.
4. Connection mode should accord to the setting of user menu link.
5. Energy pulse output is open collector output.
6. Isolation between power supply and circuit board, in case of leakage switch mis-action.