DS9 series 3 Phase Voltage Ampere Meter user manual

Features:

⊙ True effective value measurement
⊙ Isolation between input / output
⊙ 2 settable alarm output
⊙ 1 analog output
⊙ With RS485 interface，Modbus RTU communication protocol

Our 3 phase meters 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 easy to install and maintain, simple connection, field programmable setting input parameters.

For your safe, please read the below content carefully before you use the temperature controller!

▣ Safe Caution

※ Please read the manual carefully before you use the temperature controller.
※ Please comply with the below important points. ⚠ Warning An accident may happen if the operation does not comply with the instruction. ⚠ Notice An operation that does not comply with the instruction may lead to product damage.
※ The instruction of the symbol in the manual is as below. ⚠ An accident danger may happen in a special condition.

⚠ Warning

1. A safty protection equipment must be installed or please contact with us for the relative information if the product is used under the circumstance such as nuclear control, medical treatment equipment, automobile, train, airplane, aviation and equipment etc.. Otherwise, it may cause serious loss, fire or person injury.
2. A panel must be installed, otherwise it may cause creepage (leakage).
3. Do not touch wire connectors when the power is on, otherwise you may get an electric shock.
4. Do not dismantle or modify the product. If you have to do so, please contact with us first. Otherwise it may cause electric shock and fire.
5. Please check the connection number while you connect the power supply wire or input signal, otherwise it may cause fire.

⚠ Caution

1. This product cannot be used outdoors. Otherwise the working life of the product will become shorter, or an electric shock accident may happen.
2. When you connect wire to the power input connectors or signal input connectors, the moment of the No.20 AWG (0.50 mm2) screw tweaked to the connector is 0.74n.m - 0.9n.m. Otherwise the connectors may be damaged or get fire.
3. Please comply with the rated specification. Otherwise it may cause electric shock or fire, and damage the product.
4. Do not use water or oil base cleaner to clean the product. Otherwise it may cause electric shock or fire and damage the product.
5. This product should be avoid working under the circumstance that is flammable, explosive, moist, under sunshine, heat radiation and vibration. Otherwise it may cause explosion.
6. In this unit it must not have dust or deposit, otherwise it may cause fire or mechanical malfunction.
7. Do not use gasoline, chemical solvent to clean the cover of the product because such solvent can damage it. Please use some soft cloth with water or alcohol to clean the plastic cover.

1. Model

DS□ -□ □ □ □□
- Range code
  - A：AC current input
  - V：AC voltage input
- 30：3 phase input without RS485 communication
- 38：3 phase input with RS485 communication
- B：1 alarm C：2 alarm
- D: Transformed analog output R：Relay alarm
- Dimension（mm）：9: 96H×96W×100L
- DS series 3 phase voltage ampere meter

2. Model Indication

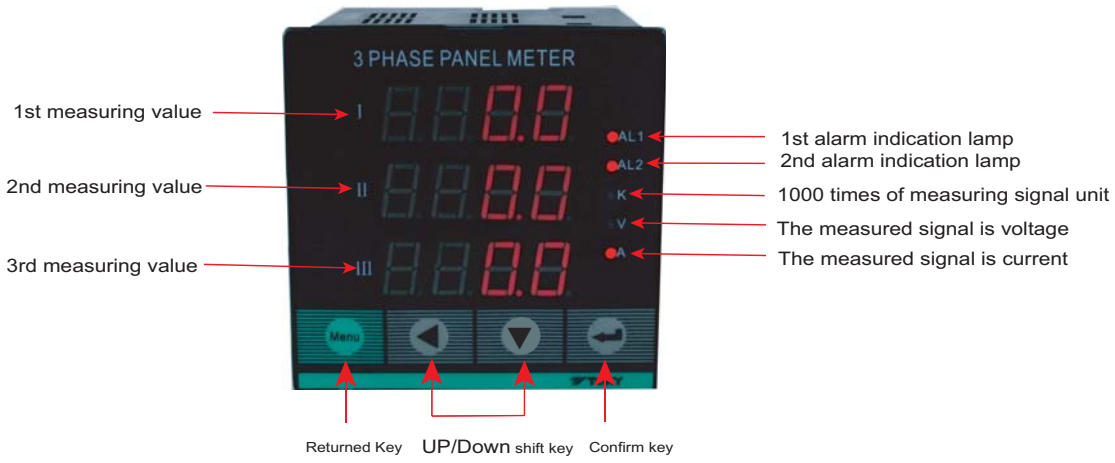
Model	Alarm	Communication	Accuracy	Analog Output
DS9-DC38V450	2	Yes	±0.5%FS	Yes
DS9-RC38V450	2	Yes		No
DS9-RC30V450	2	No		No
DS9-DC38A5	2	Yes		Yes
DS9-RC38A5	2	Yes		No
DS9-RC30A5	2	No		No

3. Technical Parameters

Rated voltage	AC 450V or 5A
Voltage overload	continuous: 1.2 times instantaneous: 2 times / 10S
Voltage comsuption	<1VA (each phase)
Voltage impedance	≥300kΩ
Voltage accuracy	RMS measurement, accuracy class 0.5
Rated current	AC 3A, 5A（Please indicate when order）
Current overload	continuous: 1.2 times instantaneous: 10 times / 10S
Current consumption	<0.4VA (each phase)
Current resisitance	<20mΩ
Current accuracy	RMS measurement, accuracy class 0.5
Power supply range	AC/DC 85-260V
Power supply consumption	≤5VA
Communication	Standard RS485, Modbus-RTU Protocol
Alarm output	Two On-Off output，250VAC/3A or 30VDC/5A
Analog output	One transformed analog output，4-20mA DC
Working environment	Temperature：-10～55℃ Humidity：＜85% R.H
Storage environment	-20～75℃
Dielectric strength	Input to Power supply: 1600VAC, Input to Output: 1600VAC，Power supply to Output:1600VAC
Insulation	Input / output / power supply to meter cover＞5MΩ
Dimension(mm)	96W×96H×110L
Weight	0.3kg

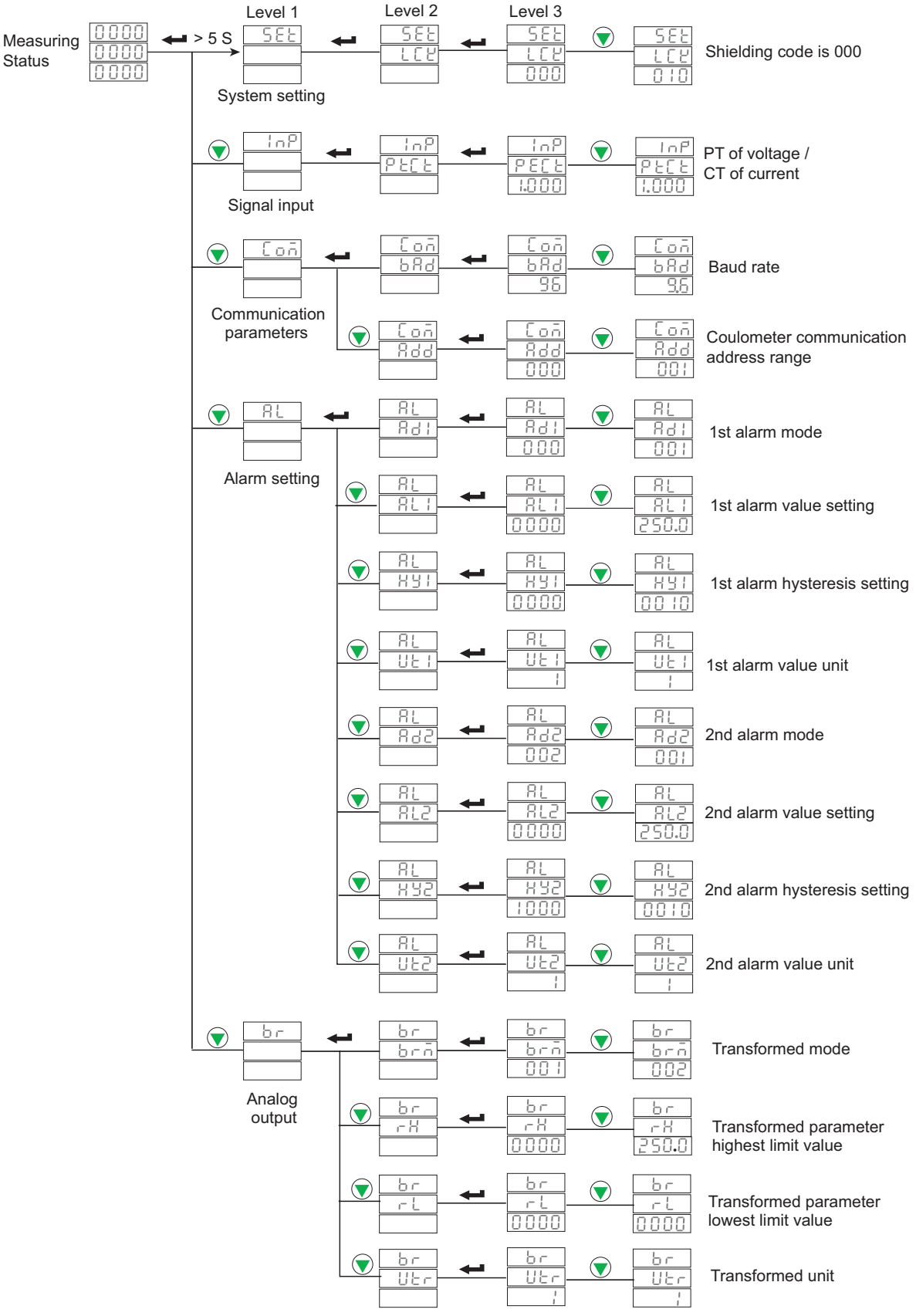
Note：DS series 3 phase voltage / ampere meter measures AC signal only.

4.Panel Indication



5. Operation Menu

Explanation for the below operation: In the measuring status, press ↵ key for more than 5 seconds to show the setting menu.
The 1st menu is SET. Press ▼ key to shift the menu, from SET, to InP, CoM, AL, br, and then circle display.
When it is Level 1 menu, press ↵ key to show Level 2 menu. If the 1st Level 2 menu is COM / bAd, press ▼ key to show the 2nd Level 2 menu Add.
When it is Level 2 menu, press ↵ key to show Level 3 menu. It shows the value on the 3rd line LED.
Press ▼ key to change the value, and then press ↵ key to save the value. Press MENU key to return to the last level.
At Level 1 menu, press ↵ key for more than 5 seconds to return to measuring status.



6. Operation indication

In the measuring status, press confirm key " ↵ " for more than 5S, meter shows the setting menu. The operation is as below:

In the setting menu status

1. If the current menu is 1st or 2nd level, press confirm key "↵" to show the next level menu. Press "◀" , "▼" to change menu value or sub-menu value.
2. If the current menu is 2nd or 3rd level, press " Menu " key to return to last level (1st or 2nd level).
3. If the current menu is 3rd level, press "◀" , "▼" key to change the value. Press "◀" or "▼" (not release) to change the value continuously.
   Press confirm key "↵" to save the setting value and return to level 2. Press " Menu " key to return to level 2 but setting value is not saved.
4. If the current menu is at level 3, press "◀" and "▼" key at the same time to shift the decimal point.
5. After value change, press confirm key "↵" for more than 5 seconds to exit the user menu and return back to measuring status.

The keys for program operation are as below:

i.e.: Return key " MENU " , Confirm key " ↵ " .

"◀", "▼", Shift / Change key, to shift the menu or increase / decrease value.

Press "◀" or "▼" without release to change value continuously.

Menu Structure

No.	Level 1	Display	Level 2	Level 3	Indication
1	SEt System setting	LCK	Function shielding password	Password 000	When the 2nd digit is 1 (for example, 010), the data in the menu can be read but not changed.
2	InP Signal input	PtCt	Voltage transform Pt Current transform Ct	1-9999	To set the voltage signal ratio= Primary coil voltage / Secondary coil voltage (VoltageTransformer) To set the current signal ratio= Primary coil current / Secondary coil current (Current Transformer)
3	Con Communication parameters	Add	Address Add	0-255	Coulometer address range
		bAd	Baud rate bAd	4.8-9.6	Baud rate: 4.8 means 4800，9.6 means 9600
4	AL Alarm setting	Ad1	1st alarm mode Ad1	0-5	Please refer to Table 1 on page 6.
		AL1	1st alarm value AL1	-1999-9999	1st alarm value setting
		HY1	1st alarm hysteresis value HY1	-1999-9999	1st alarm hysteresis value setting
		Ut1	1st alarm value unit	1-K	1：means international standard unit， K：means 1000 times of international standard unit， the unit of alarm value is the same as alarm hysteresis value.
		Ad2	2nd alarm mode Ad2	0-5	Please refer to Table 1 on page 6.
		AL2	2nd alarm value AL2	-1999-9999	2nd alarm value setting
		HY2	2nd alarm hysteresis value HY2	-1999-9999	2nd alarm hysteresis value setting
		Ut2	2nd alarm value unit	1-K	1：means international standard unit， K：means 1000 times of international standard unit， the unit of alarm value is the same as alarm hysteresis value.
5	br Analog output	brn	Transform mode selection	0-2	Please refer to Table 1 on page 6.
		rH	Transform highest value	-1999-9999	Transform analog output 20mA
		rL	Transform lowest value	-1999-9999	Transform analog output 4mA
		Utr	Transform value unit	1-K	1：means international standard unit， K：means 1000 times of international standard unit.

7. Output function

1. Communication function (Please refer to the communication protocol)
2. Transformed analog output（Please refer to Table 1）
3. Alarm function（Please refer to Table 1）

8. Communication protocol

DS9 series 3 phase meter adpots Modbus RTU communication protocol, RS485 half duplex communication, read function code 0x03, write function code 0x10, adpots 16 digit CRC check, the meter does not feedback check error.

Data frame format:

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, the return function code from meter is 0x84.

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 registers. 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 (Read 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, because 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 bit	Start address Low 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. DS9 parameter address reflection table

Note: address code is the index of variable array

Table 1

No.	Address reflection	Variable name	Default value	Byte length	Value range	Read / Write allowed	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 or Current transform (PT or CT)	1.0	2	1～9999	R/W	
5	0x0005	Analog output highest value RH	250	2	-1999～9999	R/W	
6	0x0006	Analog output lowest value RL	0.0	2	-1999～9999	R/W	
7	0x0007	Full scale FSV	0-9999	2	0～9999	R	
8	0x0008	Phase A value (Ua or Ia)	0-9999	2	0～9999	R	
9	0x0009	Phase B value (Ub or Ib)	0-9999	2	0～9999	R	
10	0x000A	Phase C value (Uc or Ic)	0-9999	2	0～9999	R	
Reserved							
37	0x0050	1st alarm mode Ad1	2	1	0-5	R/W	Remark 1
38	0x0051	2nd alarm mode Ad2	2	1	0-5	R/W	
39	0x0052	Analog output mode brM	1	1	0-2	R/W	Remark 1
40	0x0053	1st alarm value unit	0	1	1-1	R/W	
41	0x0054	2nd alarm value unit	0	1	0-1	R/W	
42	0x0055	Analog output value unit	0	1	0-1	R/W	
43	0x0056	Baud rate bAUd	1	1	0-1	R/W	Remark 2
44	0x0057	Meter address Add	1	1	0-255	R/W	
45	0x0058	Meter name	0xE9	1	0XE9	R	
46	0x0059	Measuring status indication		1	0-16	R	Remark 3
Reserved							

R/W----Read & Write R----Read Only

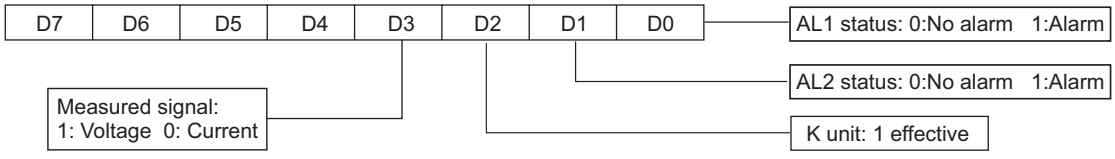
Remark ①:The reference table of alarm output & transformed analog output parameters

No.	Signal	On-Off value output (low alarm) code	On-Off value output (high alarm) code	Transformed analog output（4-20mA）code
1	Phase A	0	1	0
2	Phase B	2	3	1
3	Phase C	4	5	2

Remark ②: Baud rate

Communication value	0	1
Menu display	4.8	9.6

Remark ③: Measure status indication



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

```
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;
}
```

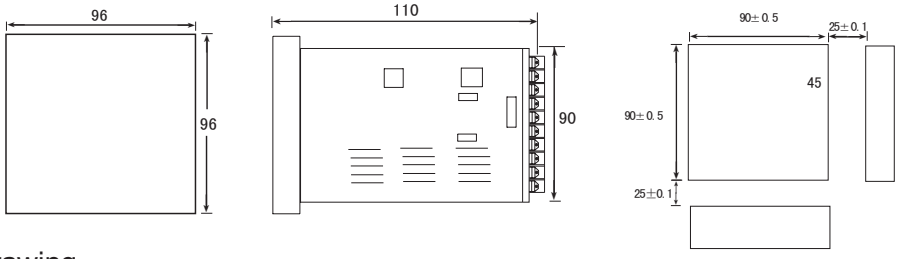
The program of decimalist float data converting to 4 byte character code float data as per IEEE-754 standard

```
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);
}
```

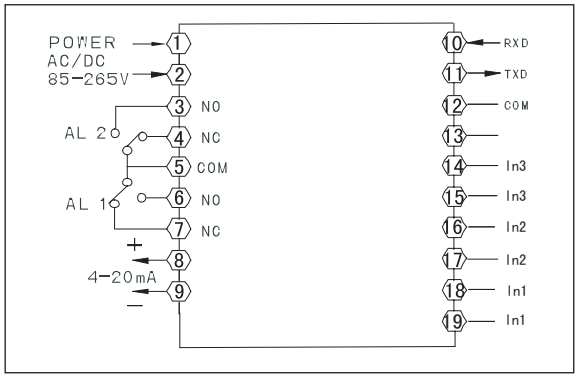
The program of achieving 16 bit CRC check code

```
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;
}
```

9. Installation mounting dimension

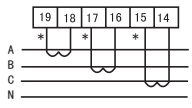


10. Connection drawing

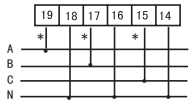


Note: Please subject to the drawing on the meter if any changes.

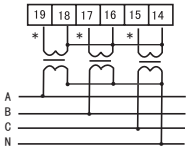
3 phase current meter connection



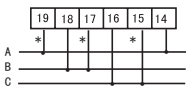
3 phase 4 wire direct input voltage



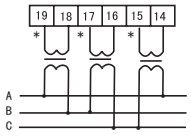
3 phase 4 wire voltage input with PT



3 phase 3 wire direct input voltage



3 phase 3 wire voltage input with PT



Explanation：

A.Voltage input：Input voltage should not be higher than the rated input voltage of meter (450V)，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.

Caution：

1.Power supply connection must be correct.

2.Pay attention on the phase sequence of voltage signal input.

3.Current signal input should be connected as per the connection drawing.