

# GBS Series 3 phase Electric Power Transmitter Operation Manual

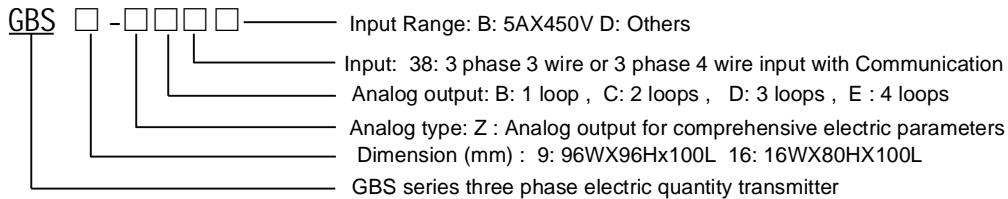


## Feature:

- ⊙ Measure parameters: Voltage/current/active power/reactive power/frequency/power factor/Kwh ect totally 28 parameters.
- ⊙ Input and output are isolated completely.
- ⊙ Measure true effective value.
- ⊙ Voltage/current/active power/reactive power/frequency/power factor are transmitted output optionally.
- ⊙ With RS485 Communication Modbus RTU.
- ⊙ Two loops electric energy pulse output.

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 easy to install and maintain, simple connection, filed programmable setting input parameters

## I. Model



## II. Technical Parameters

Connection	3 phase 3 wires, 3 phase 4 wires
Rated Voltage Value	AC 100V , 400V(please noted when making order)
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
Rated current	AC 3A 5A
Current Overload	Continuous: 1.2 times Instantaneous: 10 times/10S
Current Consumption	<0.4VA (each pahse)
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%
Power Supply	AC/DC 100 ~240V ;85 ~265V ;
Power Supply Consumption	≤5VA
Output Digit Interface	RS-485 Modbus-RTU Protocol
Pulse Output	2 energy pulse output(optical coupler relay)
Analog Output	4 analog output , 4-20mA DC
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 , Pulse output connection≥DC 2000V
Insulation	Input/output/power supply to Meter cover ≥5MΩ
Dimension	96W×96H×100L 160W×80H×100L
Weight	0.6kg

### III. Output Function

#### 1. Energy pulse

EW9L provides the function of 4 quadrant energy calculation, 2 energy pulse 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 ,  $V \leq 48V$ ,  $I_z \leq 50mA$

(2). Pulse constant: 7200imp/kwh. It means the impulse output No. is 7200 when the coulometer counts up to 1KWH. The point 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. Communication function ( please refer to the communication protocol)

#### 3. Transform output( please refer to table 1)

### IV. Communication protocol

GBS9 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, 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 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. GBS parameter address reflection table

No.	Address reflection	Variable name	Default value	Byte length	Value range	Read/Write	Remark
1	0X0000	Voltage transform PT	1.0	2	1~9999	R/W	
2	0X0001	Current transform CT	1.0	2	1~9999	R/W	
3	0X0002	Analog output upper limit value RH1	250	2	-1999~9999	R/W	
4	0X0003	Analog output lower limit value RL1	0.0	2	-1999~9999	R/W	
5	0X0004	Analog output upper limit value RH2	250	2	-1999~9999	R/W	
6	0X0005	Analog output lower limit value RL2	0.0	2	-1999~9999	R/W	
7	0x0006	Analog output upper limit value RH3	250	2	-1999~9999	R/W	
8	0X0007	Analog output lower limit value RL3	0.0	2	-1999~9999	R/W	
9	0X0008	Analog output upper limit value RH4	250	2	-1999~9999	R/W	
10	0X0009	Analog output lower limit value RL4	0.0	2	-1999~9999	R/W	
11	0X000A	Phase voltage Ua		2	0-9999	R	
12	0x000B	Phase voltage Ub		2	0-9999	R	
13	0X000C	Phase voltage Uc		2	0-9999	R	
14	0x000D	Phase voltage Uab		2	0-9999	R	
15	0x000E	Phase voltage Ubc		2	0-9999	R	
16	0X000F	Phase voltage Uca		2	0-9999	R	
17	0x0010	Phase current Ia		2	0-9999	R	
18	0x0011	Phase current Ib		2	0-9999	R	
19	0x0012	Phase current Ic		2	0-9999	R	
20	0x0013	Phase A active power Pa		2	0.000-9999	R	
21	0x0014	Phase B active power Pb		2	0.000-9999	R	
22	0x0015	Phase C active power Pc		2	0.000-9999	R	
23	0x0016	Total active power Ps		2	0.000-9999	R	
24	0X0017	Phase A reactive power Qa		2	0.000-9999	R	
25	0X0018	Phase B reactive power Qb		2	0.000-9999	R	
26	0X0019	Phase C reactive power Qc		2	0.000-9999	R	
27	0X001A	Total reactive power Qs		2	0.000-9999	R	
28	0X001B	Phase A apparent power VAa		2	0.000-9999	R	
29	0x001C	Phase B apparant Power VAb		2	0.000-9999	R	
30	0X001D	Phase C apparent Power VAc		2	0.000-9999	R	
31	0x001E	Total apparent power VAs		2	0.000-9999	R	
32	0X001F	Power factor PFa		2	0-1.0	R	
33	0x0020	Power factor PFb		2	0-1.0	R	
34	0x0021	Power factor PFc		2	0-1.0	R	

35	0x0022	Total power factor PFs		2	0-1.0	R	
36	0x0023	Frequency		2	0.0-500	R	
37	0x0024	Kwh		2	0.00Kwh-99.999999Mwh	R	
38	0x0025	KVarH		2	0.00Kvarh-99.999999Mvarh	R	
Reserve							
39	0x0050	Analog output brM1	1	1	1-26	R/W	
40	0x0051	Analog output brM2	1	1	1-26	R/W	
41	0x0052	Analog output brM3	1	1	1-26	R/W	
42	0x0053	Analog output brM4	1	1	1-26	R/W	
43	0x0054	Connection Link	0	1	0-1	R/W	
44	0x0055	Baud	1	1	0-1	R/W	
45	0x0056	meter address	1	1	0-255	R/W	
46	0x0057	Meter Name	0xDBA	1	0xDB	R	
48	0x0058	Kwh clearance to Zero	No	1	0	W	

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

Note: When user forget the meter address or Baud , please use the following communication data form to set the meter address as 1 , and baud rate 9600bps.

1	2	3	4	5	6	7	8	9	10	11
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 high bit	Data low bit	CRC code Low bit	CRC code high bit
0xFF	0xEE	0X00	0X00	0X00	0X01	0X02	0X00	0X01	0XA1	0X3C

Note: Analog output electric parameter address reflection table

No.	Parameter	Analog output code 4-20mA
1	Ua (A phase voltage)	1
2	Ub(B phase voltage)	2
3	Uc(C hase voltage)	3
4	Uab (AB wire voltage)	4
5	Ubc (BC wire voltage)	5
6	Uca (CA wire voltage)	6
7	Ia(A wire current)	7
8	Ib( B wire current)	8
9	Ic ( C wire current)	9
10	Pa ( A phase active power )	10
11	Pb(B phase active power)	11
12	Pc ( C phase active power)	12
13	Ps( Total active power)	13
14	Qa( A phase reactive power)	14
15	Qb( B phase reactive power)	15
16	Qc ( C phase reactive power)	16
17	Qs (Total reactive power)	17
18	Sa ( A phase apparent power )	18
19	Sb ( B phase apparent power)	19
20	Sc ( C phase reactive power)	20
21	Ss ( Total apparent power)	21
22	PFa ( A phase power factor)	22
23	PFb( B phase power factor)	23
24	PFc( C phase power factor)	24
25	PFs (Total power factor)	25
26	Frequency	26
27	Eps(total Kwh)	27
28	Eqs(total KVarH)	28

Note ②: connection

Communication	0	1
Menu Display	3-4	3-3

Note ③: Baud

Communication baud	0	1
Menu display	4.8	9.6

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

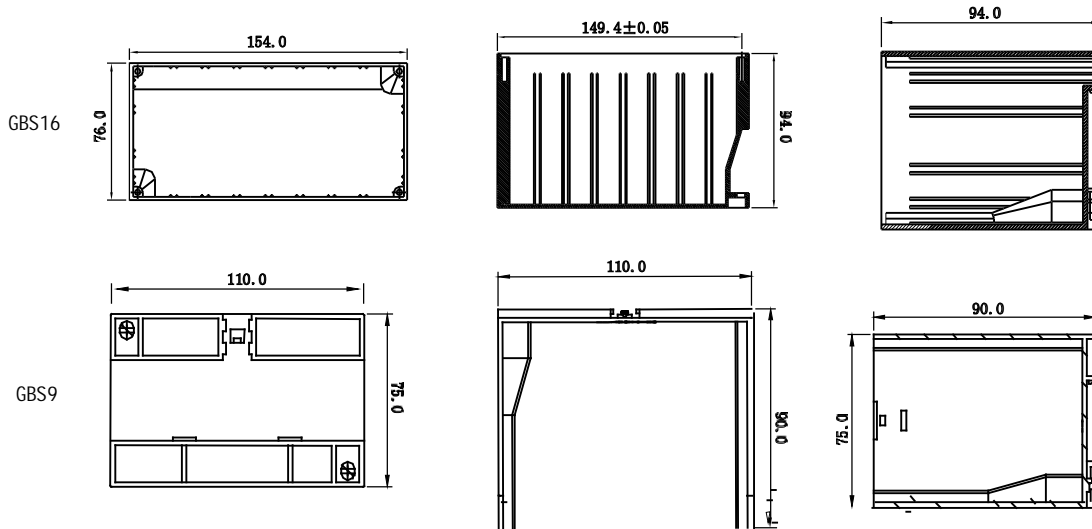
```
void FloatToChar(float Fvalue, unsigned char*pch)
{
    unsigned char*P;
    p=(unsigned char*)&Fvalue;
    *pch=*p; *(pch+1)=*(p+1); *(pch+2)=*(p+2); *(pch+3)=*(p+3);
}

```

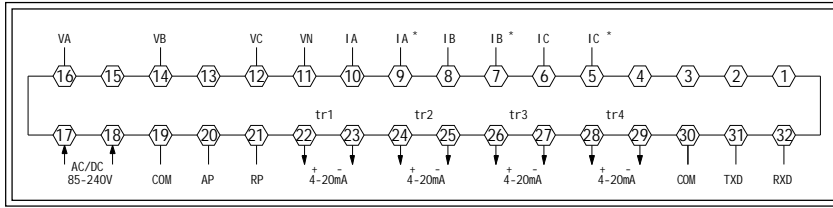
The program of achieving 16 bit CRC check code

```
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;
}
```

## V. Dimension

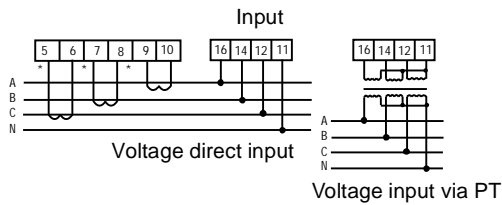


## VI. Connection

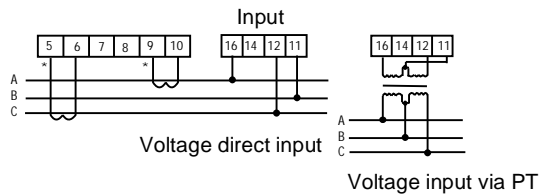


Note: If there is any difference with the connection on the back side of the meter, please base on the connection on the meter.

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 should 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 , because 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 should 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.













