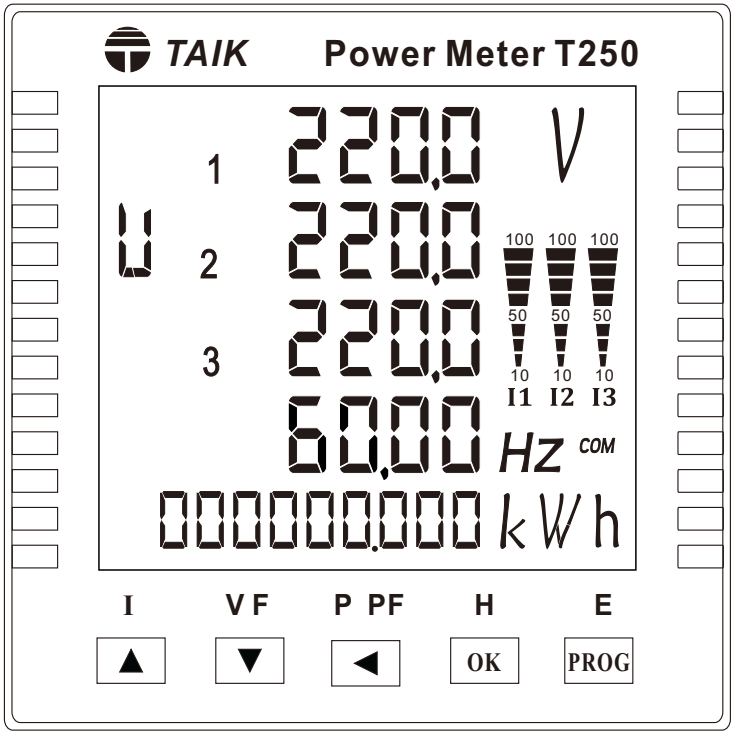
# T250

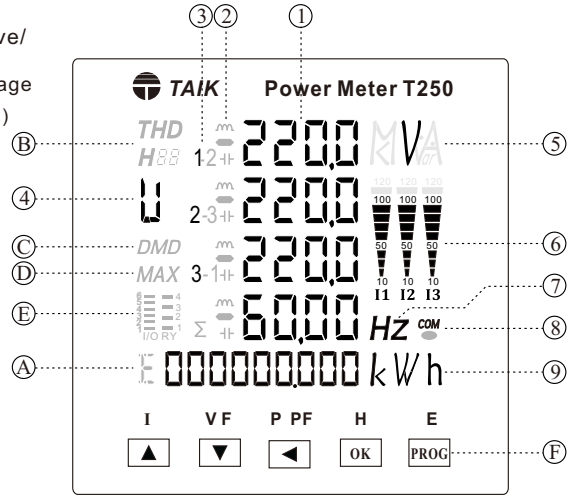
# Instruction Manual



# 1. Hardware Structure:

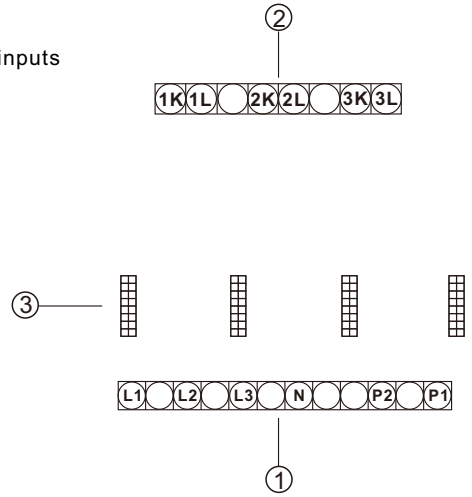
## 1.1 Display Screen:

① 4 rows of 4 digits
② Inductive/capacitive load or positive/ negative value
③ Values in line-neutral or line-line voltage
1 : L1 Value 1-2 : L1-2 Voltage (line to lin)
Σ: System Value
④ Measured electrical parameters
U : Voltage I : Current P : Watt
PF : PF Q : Var S : VA
⑤ Measured units
⑥ Load in current (%)
⑦ System frequency
⑧ COM: RS 485 module ●: Flashing as the communication is in progress
⑨ 9 digits, the unit in measured energy, and decimal point
Ⓐ Measured energy
I : Import WH or Ind VarH
E : Export WH C : Cap VarH
Ⓑ Individual harmonic rate (%)
Ⓒ Actual demand
Ⓓ Max.memorized values
Ⓔ Connecting status for the extended modules
Ⓕ 5 push buttons




## 1.2 Terminals Configuration:

① Auxiliary power supply and voltage inputs
② Current inputs
③ Extended modules

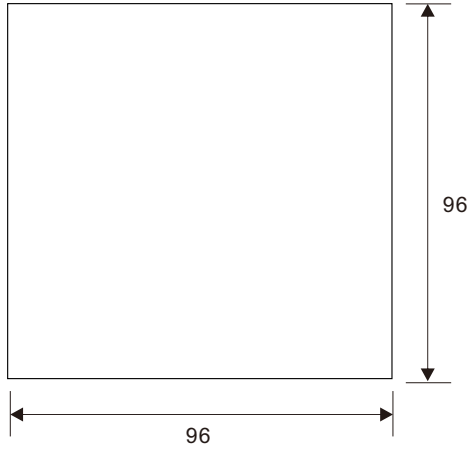





# 2. Installation /Wiring:

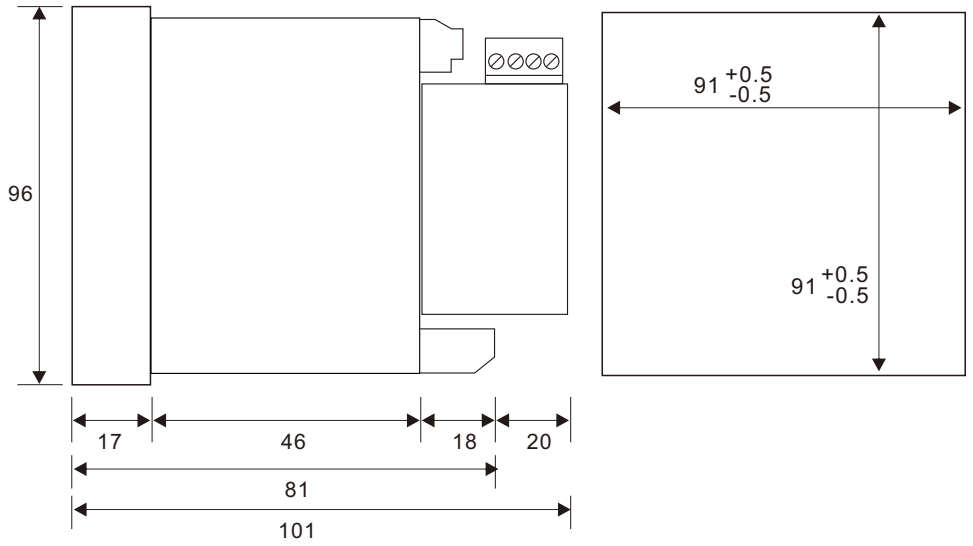
## 2.1 Dimension and Panel Cut-out (Unit: mm)

● Front View



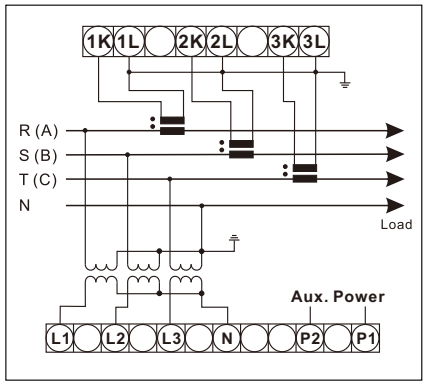

● Side View

● Cut-Out Size

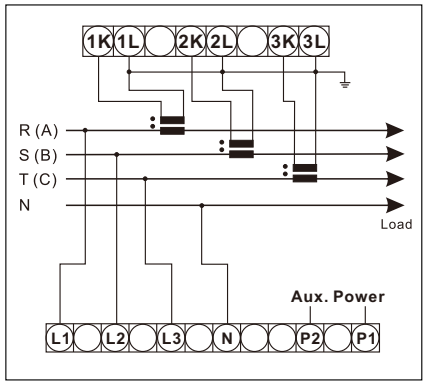


## 2.2 Connection Diagrams:

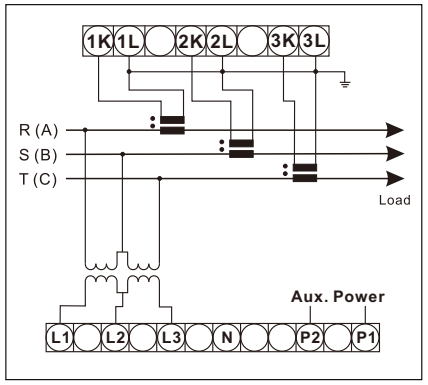
- 3 Phase 4 Wire (3 PTs, 3 CTs) SYS nEt = 3P4L




- 3 Phase 4 Wire (Only 3 CTs) SYS nEt = 3P4L

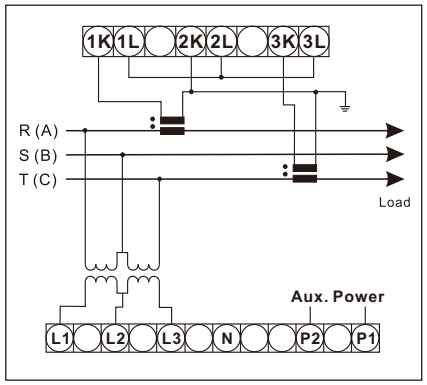



- 3 Phase 3 Wire (2 PTs, 3 CTs) SYS nEt = 3P3L

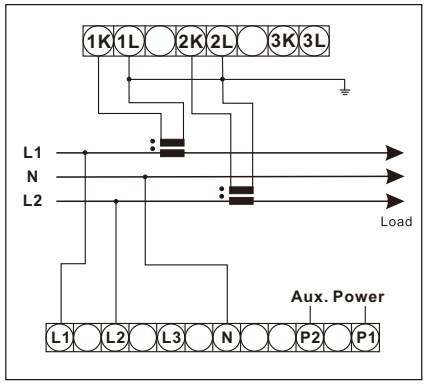




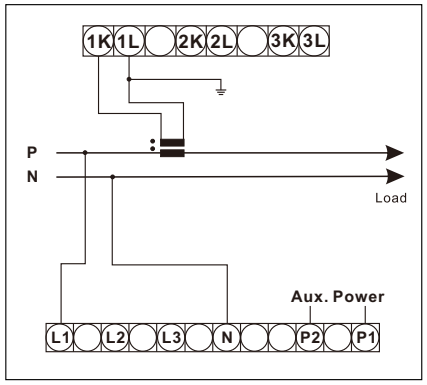

- 3 Phase 3 Wire (2 PTs, 2 CTs) SYS nEt = 3P3L




- 1 Phase 3 wire (Only 2 CTs) SYS nEt = 1P3L




- 1 Phase 2 Wire (Only 1 CT) SYS nEt = 1P2L



## 3. Functions of Buttons:

### 3.1 Keys Programming

I
▲

**Display**
Current demand and max. current demand

V F
▼

**Display**
Frequency, voltage and max. voltage

P PF
◀

**Display**
Apparent power, active power, reactive power, power factor, watt demand and max. watt demand

H
OK

**Display**

THD voltage and THD current
At the presence of THD display mode, press two buttons simultaneously:
Hold H OK + I ▲ or H OK + V F ▼ to select individual harmonic distortion rate

At the presence of individual harmonic distortion rate:

Hold H OK to return THD display mode

Formulation of THD

Hold simultaneously P PF ◀ + H OK to change by either default formula

$$THD = \sqrt{\frac{Vrms^2 - V_{(1)}rms^2}{V_{(1)}rms^2}} \times 100\%$$ Temporarily displayed legends T/ 1-5

$$THD = \sqrt{\frac{Vrms^2 - V_{(1)}rms^2}{Vrms^2}} \times 100\%$$ Temporarily displayed legends T/RMS

E
PROG

Press once : Displaying values in VAH, WH and VarH

Hold : Access to set up mode (Refer to 4.1)



#### 3.1.1 Symbols of Phase Sequence (Refer to 1.1)

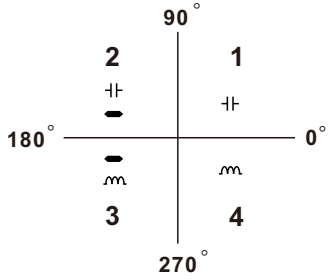
**Display**: 4 digits at the maximum figures up to 9999
**Decimal point position of The M/K unit**: The position of the decimal point in the M/K unit will automatically be varied with the rated inputs (CT and PT ratio set-up)

**Values in line-neutral or line-line voltage** :

1 : L1 values in line-neutral; 1-2: L1-L2 line-line voltage
2 : L2 values in line-neutral; 2-3: L2-L3 line-line voltage
3 : L3 values in line-neutral; 3-1: L3-L1 line-line voltage
Σ : System Values

**Symbols** :

: Inductive load
: Capacitive load
: Negative watt (Reverse current flow)



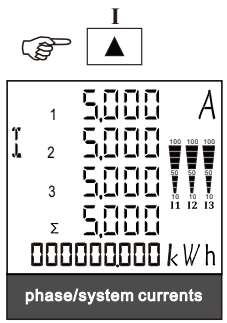

The angle lain between a base of measured voltage and the current is divided into 4 quadrants.

**Vrms:** The RMS Volt waveform
**$V_{(1)}$rms:** The RMS Volt on fundamental frequency waveform

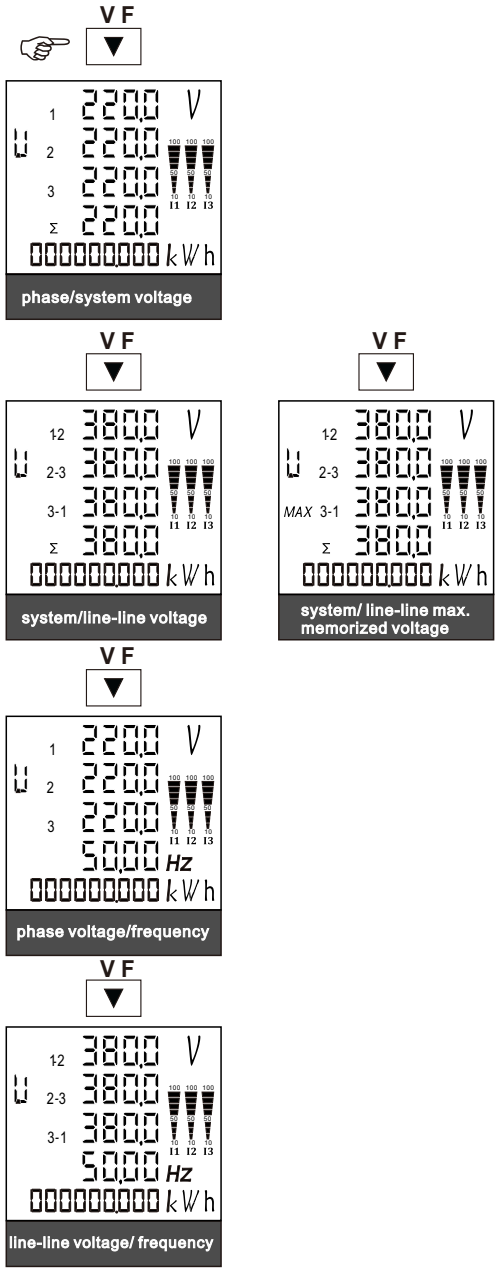
## 3. Display Mode and Button Functions : Appearing the bargraph rate at % for the measured current on each display

### 3.2 Display in 3P4W: SYS nEt = 3P4L

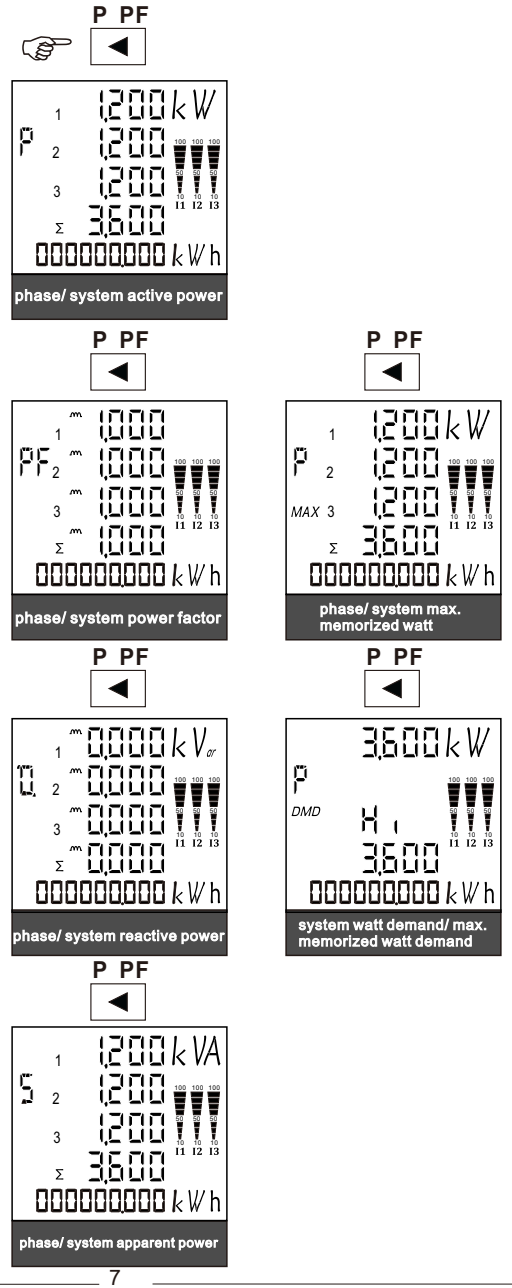
**Current**



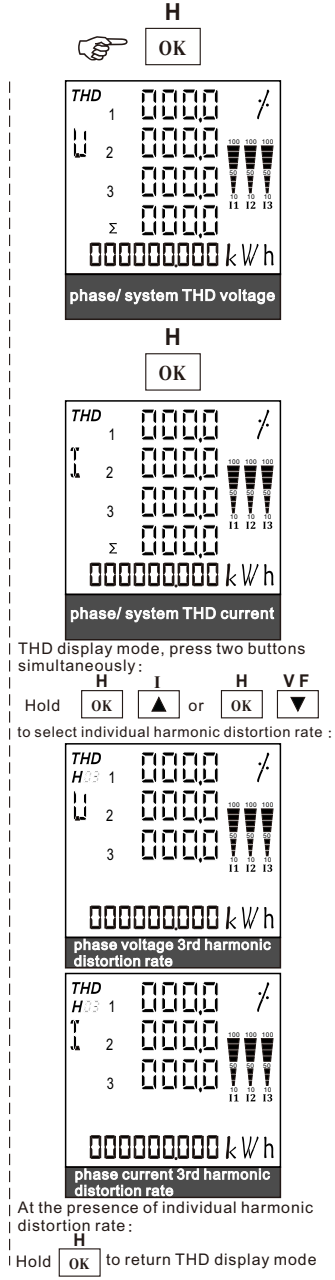

**Volt/Frequency**



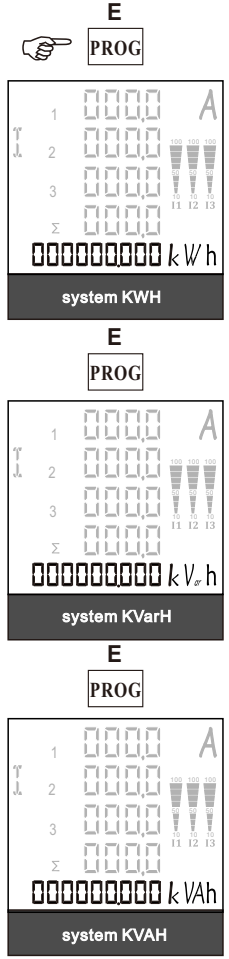

**VA/W/Var/PF/Demand**




**Individ. harmonic rate/THD**




**Energy**




***Set-up Flowchart**

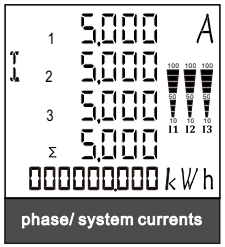
In sub-menus mode, access to Hour Hour i_E :(set to YES) can be shown as follows
Import/ Export KWH
Ind/Cap KVarH

Appearing the bargraph rate at % for the measured current on each display

### 3.3 Display in 3P3W: SYS nEt = 3P3L

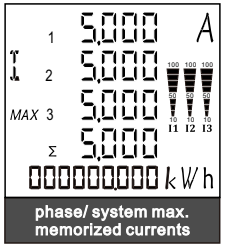
**Current**

I ▲



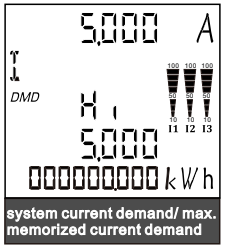

phase/ system currents

I ▲




phase/ system max. memorized currents

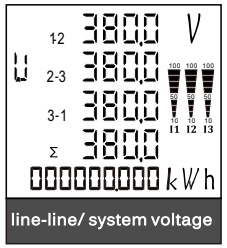
I ▲




system current demand/ max. memorized current demand

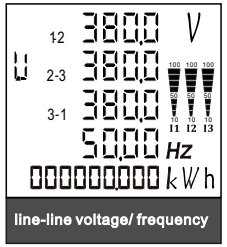
**Volt/Frequency**

V F ▼



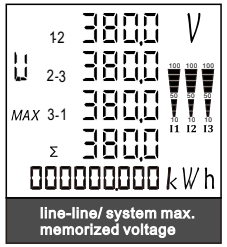

line-line/ system voltage

V F ▼




line-line voltage/ frequency

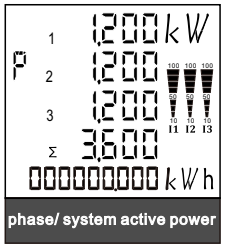
V F ▼




line-line/ system max. memorized voltage

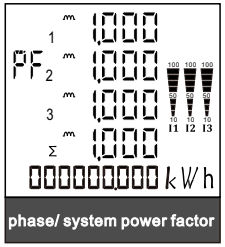
**VA/W/Var/PF/Demand**

P PF ◄



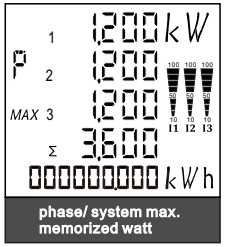

phase/ system active power

P PF ◄



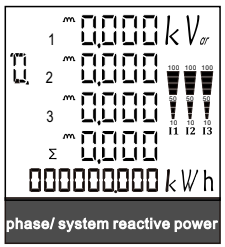

phase/ system power factor

P PF ◄



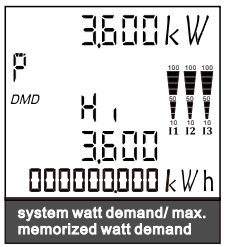

phase/ system max. memorized watt

P PF ◄



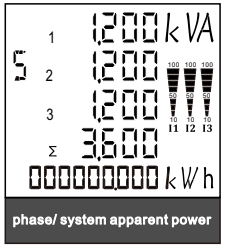

phase/ system reactive power

P PF ◄




system watt demand/ max. memorized watt demand

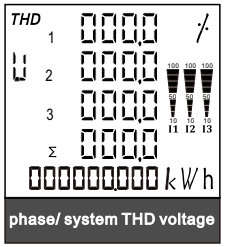
P PF ◄




phase/ system apparent power

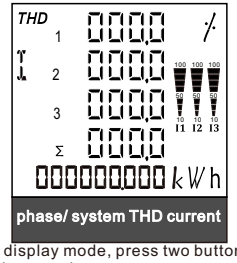
**Individ. harmonic rate/THD**

H OK




phase/ system THD voltage

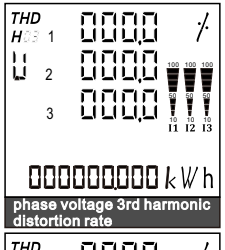
H OK



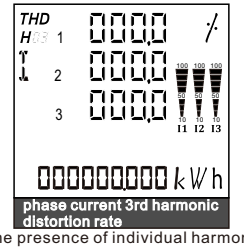

phase/ system THD current

THD display mode, press two buttons simultaneously:

Hold H OK + I ▲ or H OK + V F ▼ to select individual harmonic distortion rate:




phase voltage 3rd harmonic distortion rate



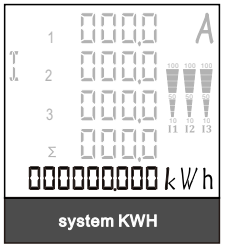

phase current 3rd harmonic distortion rate

At the presence of individual harmonic distortion rate:

Hold H OK to return THD display mode

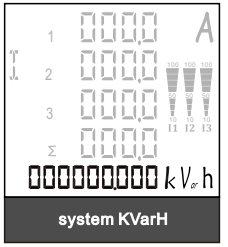
**Energy**

E PROG



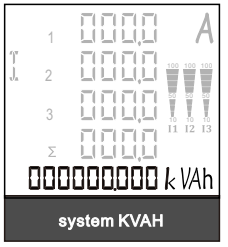

system KWH

E PROG




system KVarH

E PROG




system KVAH

***Set-up Flowchart**

In sub-menus mode, access to Hour Hour i_E :(set to YES) can be shown as follows

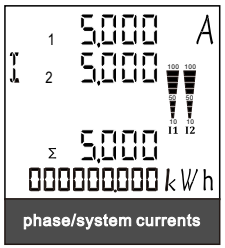
Import/ Export KWH

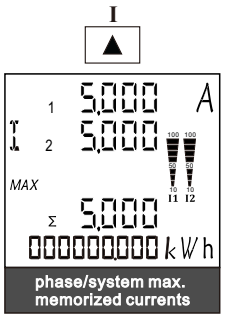
Ind/Cap KVarH

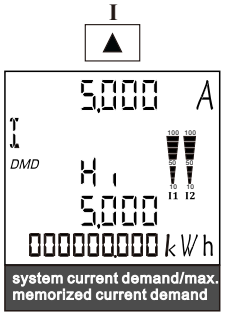
Appearing the bargraph rate at % for the measured current on each display

### 3.4 Display in 1P3W: SYS nEt = 1P3L

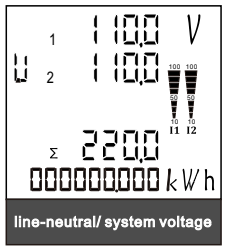
**Current**

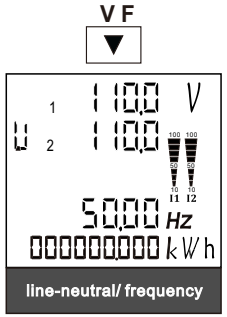


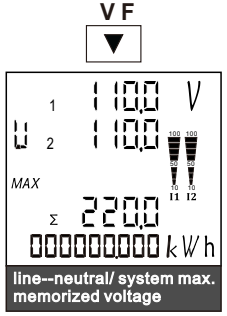



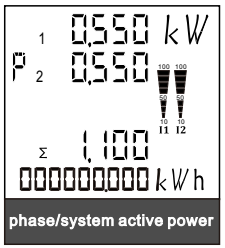

**Volt/Frequency**

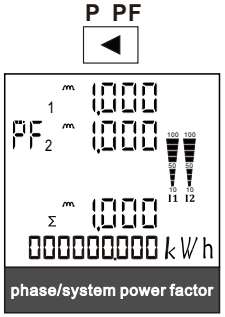


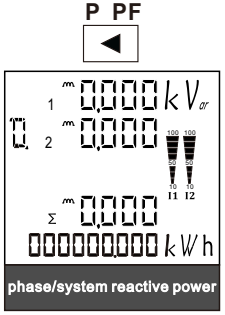



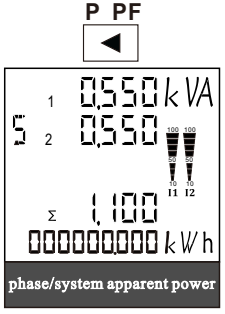



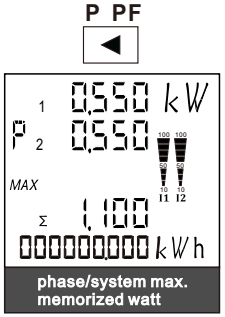

**VA/W/Var/PF/Demand**

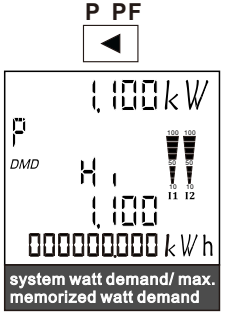


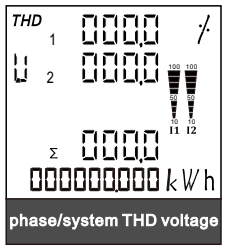



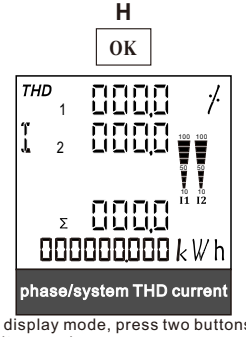




**Individ. harmonic rate/THD**

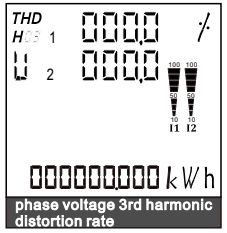


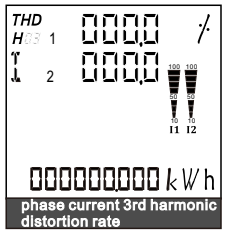




THD display mode, press two buttons simultaneously:

Hold H OK ▲ or H OK V F ▼

to select individual harmonic distortion rate :

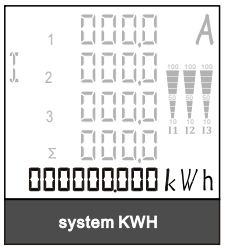


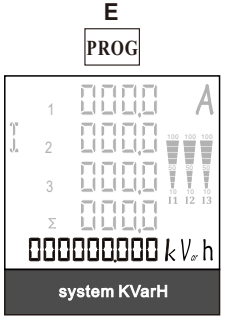



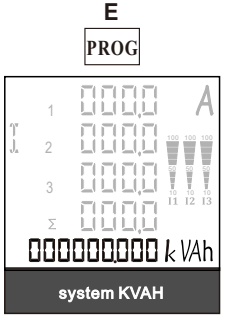

At the presence of individual harmonic distortion rate:

Hold H OK to return THD display mode

**Energy**




***Set-up Flowchart**

In sub-menus mode, access to Hour Hour i_E :(set to YES) can be shown as follows

Import/ Export KWH

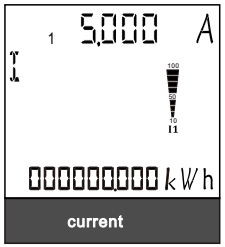
Ind/Cap KVarH

Appearing the bargraph rate at % for the measured current on each display

**3.5 Display in 1P2W**: SYS nEt = 1P2L

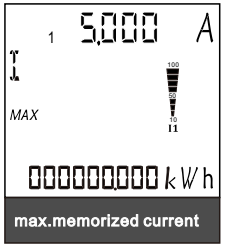
## Current

I ▲



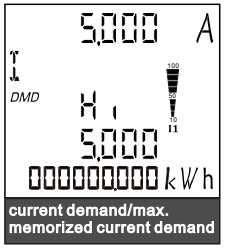

current

I ▲




max.memorized current

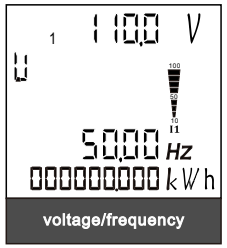
I ▲




current demand/max. memorized current demand

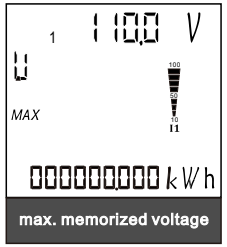
## Volt/Frequency

V F ▼




voltage/frequency

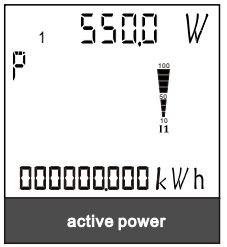
V F ▼




max. memorized voltage

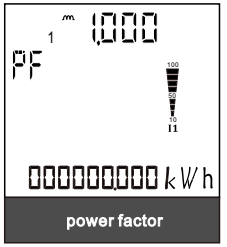
## VA/W/Var/PF/Demand

P PF ◄



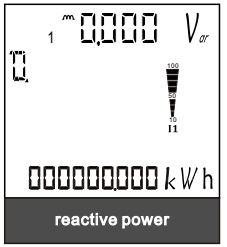

active power

P PF ◄



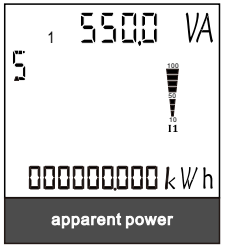

power factor

P PF ◄



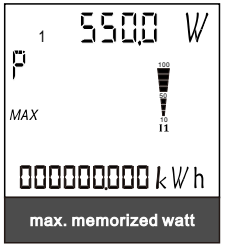

reactive power

P PF ◄



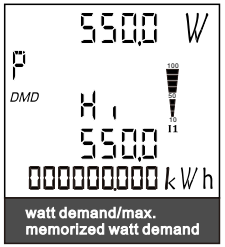

apparent power

P PF ◄




max. memorized watt

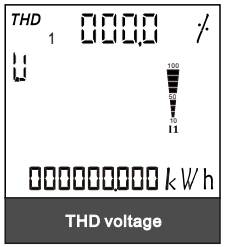
P PF ◄




watt demand/max. memorized watt demand

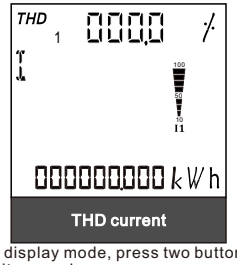
## Individ. harmonic rate/THD

H OK




THD voltage

H OK

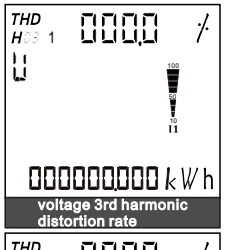



THD current

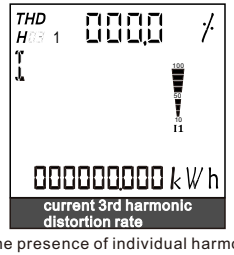
THD display mode, press two buttons simultaneously:

Hold H OK + I ▲ or H OK + V F ▼

to select individual harmonic distortion rate :




voltage 3rd harmonic distortion rate



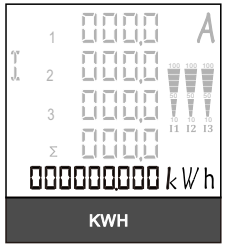

current 3rd harmonic distortion rate

At the presence of individual harmonic distortion rate:

Hold H OK to return THD display mode

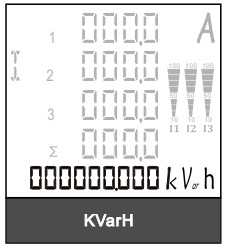
## Energy

E PROG



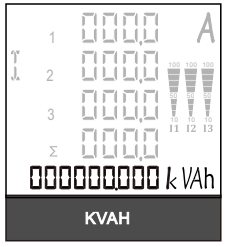

KWH

E PROG




KVarH

E PROG




KVAH

***Set-up Flowchart**

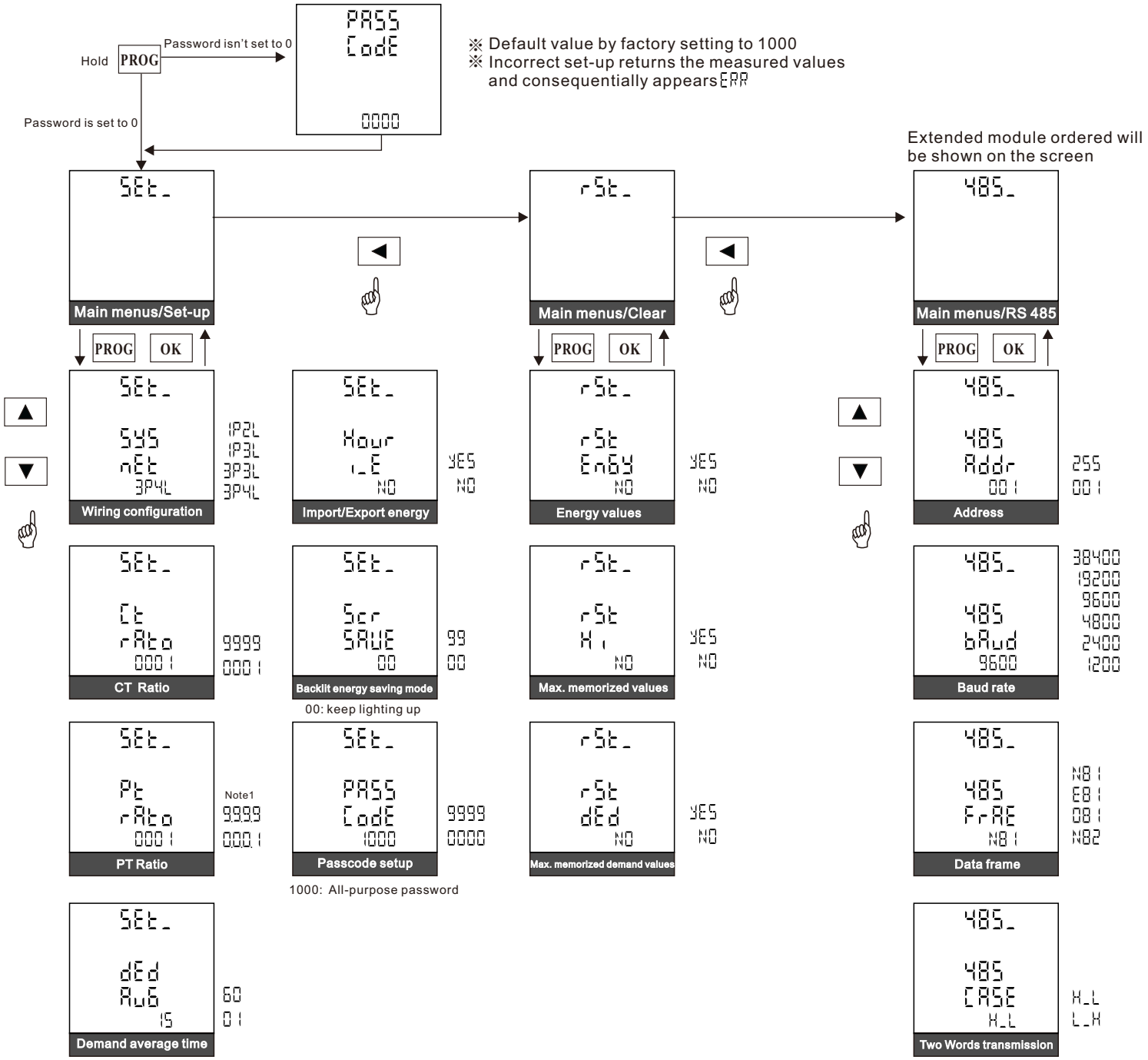
In sub-menus mode, access to Hour Hour i_E :(set to YES) can be shown as follows

Import/ Export KWH

Ind/Cap KVarH

# 4. Set-up Flowchart/ Buttons:

## 4.1 Set-up Flowchart:




## 4.2 Buttons:

● Functions:

### Main menus:

- PROG Access to sub-menus
- ◄ Advance to the next menus
- OK Return to measured values
- ▲ Disable
- ▼ Disable

### Sub-menus :

- PROG Access to values set-up
- OK Return to main menus
- ▲ Advance to next sub-menus
- ▼ Advance to next sub-menus
- ◄ Disable

### Values Set-up:

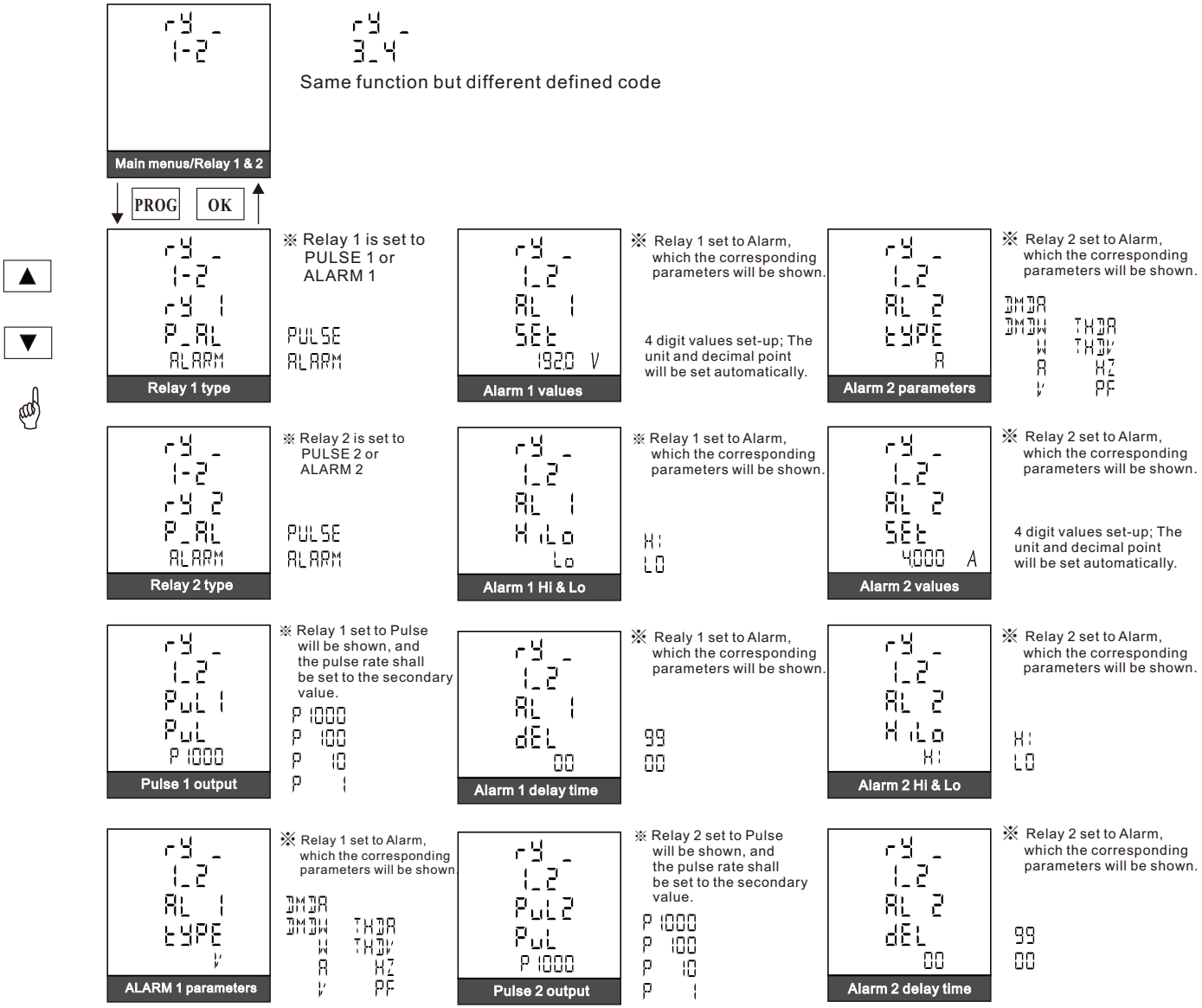
- ▲ Increased value
- ▼ Decreased value
- ◄ Vary digits position
- OK Confirm then return to sub-menus
- PROG Disable

Note 1: At the presence of PT ratio set-up, press simultaneously for setting the decimal point position.

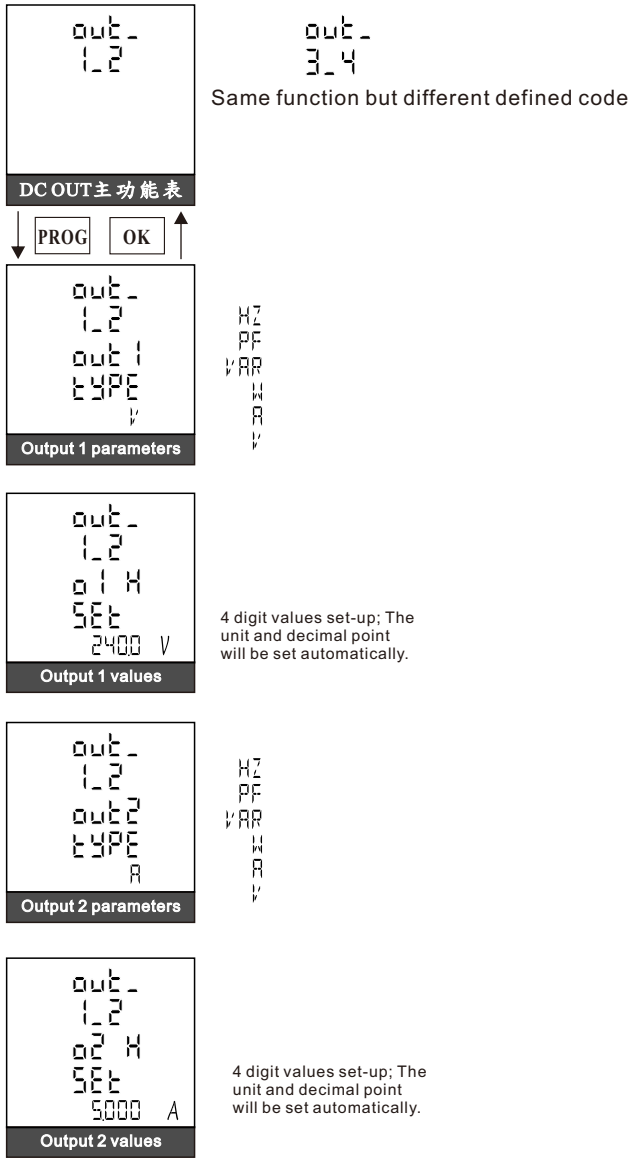
## 4.3 Relay Contact & Analog Output (Extended modules) :

※Having an associated module can be shown on the screen, the I/O module is unavailable shown on the screen.

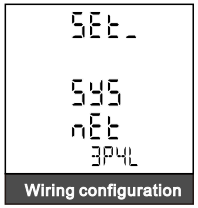
### Relay module




### Analog module



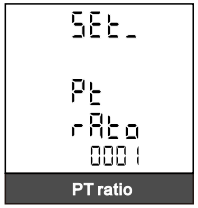
## 4.4 The reminders of Sub-Menus Set-up :



Wiring configuration

3P2L
3P3L
3P3L
3P4L

: The electrical connection shall correspond with the set wiring configuration



PT ratio

At the presence of PT ratio set-up, press ◄ OK simultaneously for setting the decimal point position.

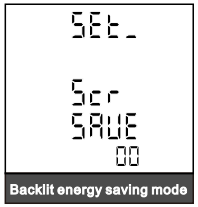
9999
000.1

Import/Export energy

YES
no

: WH :Import/Export values
VarH : Ind/Cap values

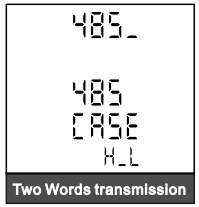
I : Import WH or Ind VarH
E : Export WH C : Cap VarH



Backlit energy saving mode

99
00

: Time set-up for backlit energy saving . After a touch on any of buttons, the backlit will automatically be lit up
00:keep lighting up

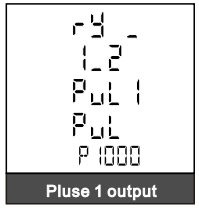


Two Words transmission

Being applied to Double Words" transmission

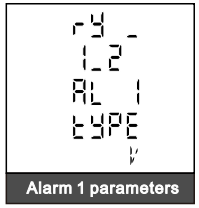
H_L : Hi word is set ahead, Low word is set behind
It is defined as "Swapped Float"

L_H : Low word is set ahead, Hi word is set behind
It is defined as "Float"



Pluse 1 output

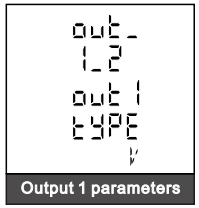
Example: Setting the pulse rate as P100
which corresponds to the secondary value.



Alarm 1 parameters

* Adopting "absolute value" for comparison

THDA : system THD current
THDV : system THD voltage
HZ : system frequency
PF : system power factor
DMDA : system current demand
DMDW : system watt demand
W : system watt
A : system current
V : system voltage (3P3W line-line voltage)



Output 1 parameters

HZ : system frequency
PF : system power factor
(bidirectional 4-12-20mA)
VAR : system reactive power
(bidirectional 4-12-20mA)
W : system active power
(unidirectional 4-20mA)
A : system current
V : system voltage (3P3W line-line voltage)

# 5. Specifications:

## 5.1 Measured Parameters and Accuracy:

| Display | SYS | L1 | L2 | L3 | Accuracy |
|---|---|---|---|---|---|
| L-L volt | ●* | ● | ● | ● | 0.2% |
| L-N volt | ●* | ● | ● | ● | 0.2% |
| Current | ●* | ● | ● | ● | 0.2% |
| Active power | ● | ● | ● | ● | 0.5% |
| Reactive power | ● | ● | ● | ● | 0.5% |
| Apparent power | ● | ● | ● | ● | 0.5% |
| Power factor | ●* | ● | ● | ● | 0.5% |
| Frequency | ● | | | | 0.05Hz |
| Import (KWH) | ● | ● | ● | ● | 0.5% |
| Ind (KVarH) | ● | ● | ● | ● | 0.5% |
| Export (KWH) | ● | ● | ● | ● | 0.5% |
| Cap (KVarH) | ● | ● | ● | ● | 0.5% |
| THD | ●* | ● | ● | ● | 2% |
| Demand | ● | | | | 0.5% |

* Average Value  Accuracy：F.S.%

## 5.2 Characteristics:

- **Accuracy performance range:**
  - Voltage ..... 0.6 ~ 120%
  - Current ..... 0.2 ~ 120%
  - Power energy ..... Volt: 0.6 ~ 120%, Amp: 0.2 ~ 120%
  - Power factor ..... COSΘ(SINΘ) 0.5 ~ 1
  - Frequency ..... 45 ~ 70Hz
  - Distortion level ..... 31st
- **Input Voltage:**
  - Line-line Voltage ..... 3 ~ 500V
  - Line-neutral Voltage ..... 2 ~ 288V
  - Maximum overload ..... 750V
  - Input impedance ..... ≥ 800KΩ
  - Power consumption ..... ≤ 0.1VA
- **Input Current:**
  - Current ..... 5A，1A(Option)
  - Power consumption ..... ≤ 0.1VA
  - Isolation ..... Phase to phase 600V
  - Starting current ..... 0.2%F.S.



- **THD % display:**
  - Current ..... ≥ 1% F.S.
  - Voltage ..... ≥ 10% F.S.
- **Power supply:**
  - Auxiliary power supply ..... AC/DC85~265V
    DC 20~60V (OPTION )
  - Power consumption ..... ≤ 4.5VA(Without extended module)
    ≤ 9VA(All extended modules)
  - Frequency Range ..... 45 ~ 65Hz
- **Display screen:**
  - Format ..... LCD blue backlit
  - Digit height ..... 3 rows of 4 digits 0.39"，10.0mm
    One row of 9 digits accumulative values
- **Set-up/Memorized Value:**
  - Memory method ..... FRAM
  - Memory time ..... 20 years at least
- **Communication:**
  - Interface ..... RS485
  - Protocol ..... MODBUS ，RTU frame
  - Baud rate ..... 1200 ~ 38400 programmable
  - Address ..... 1 ~ 255 progtammable
  - Data format ..... N,8,1 / N,8,2 / O,8,1 / E,8,1 programmable
  - Parallel connection ..... 32 meters
- **Installation of pluggable modules：Max. 4 modules**
  - RS 485 ..... 1 module
  - Relay contacts ..... 2 modules
  - Digital inputs ..... 2 modules
  - Analog outputs ..... 2 modules

# 6.COMMUNICATIONS

## 6.1 Communication protocol

Utilizing MODBUS communication shall use a repeater as the meters are in parallel connection more than 30pcs.

## 6.2 Transmission Mode

RTU

## 6.3 Transmission Method

RS 485 (Half-Duplex)

## 6.4 Modbus Frame

### 6.4.1 Basic Command Framing：Hexadecimal Code

| Start of frame | Address Field | Function Code | Data Field | Error Check | End of Frame |
|---|---|---|---|---|---|

Start of frame：The data is not transmitted by a silent period of at least 4 characters

Address field ：The valid MODBUS addresses are in the range of 1-255, the address 0 for broadcast command is only valid for Function Code ⇨ 06H, but it doesn't reply to any message

Function code ：03H⇨Read Data
06H⇨Write Date

Data field ：The start address of a register. Reading N Words and Writing N values

Error check ：A 16 bit CRC

End of frame ：The data is not transmitted by a silent period of at least 4 characters

### 6.4.2 Bit Per Byte：Access to sub-menus for set-up

| Start Bit | Data Bit | Parity | Stop | Frame | Setting values |
|---|---|---|---|---|---|
| 1 | 8 | None | 2 | N，8，2 | 0 |
| 1 | 8 | Odd | 1 | O，8，1 | 1 |
| 1 | 8 | Even | 1 | E，8，1 | 2 |
| 1 | 8 | None | 1 | N，8，1 | 3 |

## 6.5 Reading Register Command：

Query：

| Start of Frame | Address Field | Function Code | Start Address Hi | Start Address Lo | Number of Word Hi | Number of Word Lo | Error Check | | End of Frame |
|---|---|---|---|---|---|---|---|---|---|
| | 01H~FFH | 03H | 0~nnH | 0 ~ nnH | 0H | 1~nnH | CRC Lo | CRC Hi | |
| | 1 Byte | 1 Byte | 2Byte | | 2Byte | | 2Byte | | |

Response：(Command is correct)

| Start of Frame | Address Field | Function Code | Number of Data Byte Count | D0、D1.. Dn (Hi,Lo,Hi,Lo....) | Error Check | | End of Frame |
|---|---|---|---|---|---|---|---|
| | 01H~FFH | 03H | | | CRC Lo | CRC Hi | |
| | 1 Byte | 1 Byte | 1Byte | | 2 Byte | | |



## 6.6 Writing Register Command: A single writing WORD command

Query：

| Start of Frame | Address Field | Function Code | Start Address Hi | Start Address Lo | Value Hi.. | Value ..Lo | Error Check | | End of Frame |
|---|---|---|---|---|---|---|---|---|---|
| | 01H~FFH | 06H | 0~nnH | 0 ~ nnH | Setting Value | | CRC Lo | CRC Hi | |
| | 1 Byte | 1 Byte | 2Byte | | 2 or 4 Byte | | 2 Byte | | |

Response：(Response to the writing data if the command is correct)

| Start of Frame | Address Field | Function Code | Start Address Hi | Start Address Lo | Value Hi.. | Value .. Lo | Error Check | | End of Frame |
|---|---|---|---|---|---|---|---|---|---|
| | 01H~FFH | 06H | 0~nnH | 0 ~ nnH | Setting Value | | CRC Lo | CRC Hi | |
| | 1 Byte | 1 Byte | 2Byte | | 2 or 4 Byte | | 2 Byte | | |

## 6.7 Message Error: (A command is error)

| Start of Frame | Address Field | Function Code | Error Code | Error Check | | End of Frame |
|---|---|---|---|---|---|---|
| | 01H~FFH | 83H or 86H | | CRC Lo | CRC Hi | |
| | 1 Byte | 1 Byte | 1 Byte | 2 Byte | | |

- Function Code：Response to the received Function Code but MSB is set to 1, it functions like 03H⇨83H
- Error Code：
  - 01：Error Function
  - 02：Error Data Address
  - 03：Error Data Value

## 6.8 The CRC Calculation：

The CRC is calculated on all bytes of a message from the address to the last data byte inclusively. The CRC field is the result of a CRC calculation performed on the message contents. The meter will not reply to commands with a CRC in error and the host should re-transmit the command after a preset time-out period. If the host receives a string with a CRC in error, the transaction should be retransmitted. A message is represented for being from the address field to the data field.

The calculation is performed as follows：

1.Load a CRC register with 0xFFFF

2.Exclusive-OR the first 8 bytes of the message with the low-order of the CRC register. Put the result in the CRC register

3.Shift the CRC register one bit to the right, filling the MSB with a zero, and comparing the bit shifted out

4. Repeat step 3 if the SLSB=0; Exclusive-OR the CRC register with the value A001 Hex, and put the result in the CRC register if the SLSB=1

5. Repeat steps 3 and 4 until the 8 bits have been performed and tested

6. Repeat steps 2 to 5 until all bytes have been processed

7. Swap a message with the low and high order bytes after calculating the CRC register

The CRC Checking：

The returned CRC register is as unsigned short int.
The star address and the field of the data are transmitted, the returned CRC registered with the low and high byte has been swapped.

```
/*CRC Generation Function with 'C' language*/
/* Msg:*message to calculate CRC upon*/
/* usDatalen: number of bytes in message*/
unsigned int CRC16(char *Msg,unsigned char usDatalen)
{
    unsigned char uchCRCHi=0xFF ; /*CRC high byte*/
    unsigned char uchCRCLo=0xFF ;  /*CRC low byte*/
    unsigned char uIndex ;
    while(usDatalen--)/*pass through message buffer*/
    {
        uIndex=uchCRCHi^*Msg++ ; /*calculate the CRC*/
        uchCRCHi=uchCRCLO^auchCRCHi[uIndex] ;
        uchCRCLo=auchCRClo[uIndex] ;
    }
}
return (uchCRCHi<<8|uchCRCLo) ;
```



```
static unsigned char auchCRCHi[]={
0x00,0xc1,0x81,0x40,0x01,0xc0,0x80,0x41,0x01,0xc0,
0x80,0x41,0x00,0xc1,0x81,0x40,0x01,0xc0,0x80,0x41,
0x00,0xc1,0x81,0x40,0x00,0xc1,0x81,0x40,0x01,0xc0,
0x80,0x41,0x01,0xc0,0x80,0x41,0x00,0xc1,0x81,0x40,
0x00,0xc1,0x81,0x40,0x01,0xc0,0x80,0x41,0x00,0xc1,
0x81,0x40,0x01,0xc0,0x80,0x41,0x01,0xc0,0x80,0x41,
0x00,0xc1,0x81,0x40,0x01,0xc0,0x80,0x41,0x00,0xc1,
0x81,0x40,0x00,0xc1,0x81,0x40,0x01,0xc0,0x80,0x41,
0x00,0xc1,0x81,0x40,0x01,0xc0,0x80,0x41,0x01,0xc0,
0x80,0x41,0x00,0xc1,0x81,0x40,0x00,0xc1,0x81,0x40,
0x01,0xc0,0x80,0x41,0x01,0xc0,0x80,0x41,0x00,0xc1,
0x81,0x40,0x01,0xc0,0x80,0x41,0x00,0xc1,0x81,0x40,
0x00,0xc1,0x81,0x40,0x01,0xc0,0x80,0x41,0x01,0xc0,
0x80,0x41,0x00,0xc1,0x81,0x40,0x01,0xc0,0x80,0x41,
0x00,0xc1,0x81,0x40,0x00,0xc1,0x81,0x40,0x01,0xc0,
0x80,0x41,0x00,0xc1,0x81,0x40,0x01,0xc0,0x80,0x41,
0x01,0xc0,0x80,0x41,0x00,0xc1,0x81,0x40,0x01,0xc0,
0x80,0x41,0x00,0xc1,0x81,0x40,0x00,0xc1,0x81,0x40,
0x01,0xc0,0x80,0x41,0x01,0xc0,0x80,0x41,0x00,0xc1,
0x81,0x40,0x00,0xc1,0x81,0x40,0x01,0xc0,0x80,0x41,
0x00,0xc1,0x81,0x40,0x01,0xc0,0x80,0x41,0x01,0xc0,
0x80,0x41,0x00,0xc1,0x81,0x40};

static unsigned char auchCRCLo[]={
0x00,0xc0,0xc1,0x01,0xc3,0x03,0x02,0xc2,0xc6,0x06,
0x07,0xc7,0x05,0xc5,0xc4,0x04,0xcc,0x0c,0x0d,0xcd,
0x0f,0xcf,0xce,0x0e,0x0a,0xca,0xcb,0x0b,0xc9,0x09,
0x08,0xc8,0xd8,0x18,0x19,0xd9,0x1b,0xdb,0xda,0x1a,
0x1e,0xde,0xdf,0x1f,0xdd,0x1d,0x1c,0xdc,0x14,0xd4,
0xd5,0x15,0xd7,0x17,0x16,0xd6,0xd2,0x12,0x13,0xd3,
0x11,0xd1,0xd0,0x10,0xf0,0x30,0x31,0xf1,0x33,0xf3,
0xf2,0x32,0x36,0xf6,0xf7,0x37,0xf5,0x35,0x34,0xf4,
0x3c,0xfc,0xfd,0x3d,0xff,0x3f,0x3e,0xfe,0xfa,0x3a,
0x3b,0xfb,0x39,0xf9,0xf8,0x38,0x28,0xe8,0xe9,0x29,
0xeb,0x2b,0x2a,0xea,0xee,0x2e,0x2f,0xef,0x2d,0xed,
0xec,0x2c,0xe4,0x24,0x25,0xe5,0x27,0xe7,0xe6,0x26,
0x22,0xe2,0xe3,0x23,0xe1,0x21,0x20,0xe0,0xa0,0x60,
0x61,0xa1,0x63,0xa3,0xa2,0x62,0x66,0xa6,0xa7,0x67,
0xa5,0x65,0x64,0xa4,0x6c,0xac,0xad,0x6d,0xaf,0x6f,
0x6e,0xae,0xaa,0x6a,0x6b,0xab,0x69,0xa9,0xa8,0x68,
0x78,0xb8,0xb9,0x79,0xbb,0x7b,0x7a,0xba,0xbe,0x7e,
0x7f,0xbf,0x7d,0xbd,0xbc,0x7c,0xb4,0x74,0x75,0xb5,
0x77,0xb7,0xb6,0x76,0x72,0xb2,0xb3,0x73,0xb1,0x71,
0x70,0xb0,0x50,0x90,0x91,0x51,0x93,0x53,0x52,0x92,
0x96,0x56,0x57,0x97,0x55,0x95,0x94,0x54,0x9c,0x5c,
0x5d,0x9d,0x5f,0x9f,0x9e,0x5e,0x5a,0x9a,0x9b,0x5b,
0x99,0x59,0x58,0x98,0x88,0x48,0x49,0x89,0x4b,0x8b,
0x8a,0x4a,0x4e,0x8e,0x8f,0x4f,0x8d,0x4d,0x4c,0x8c,
0x44,0x84,0x85,0x45,0x87,0x47,0x46,0x86,0x82,0x42,
0x43,0x83,0x41,0x81,0x80,0x40};
```

## 6.9 Data Address: (Integers)

### 6.9.1 Set-up：

| Address | (Hex) | Contents | Format | Word | Access | Range & Unit |
|---|---|---|---|---|---|---|
| 0000 | 0000H | Display Page | Integer | 1 | R/W | 0 - n (Note) |
| 0001 | 0001H | Display Item | Integer | 1 | R/W | 0 - n (Note) |
| 0002 | 0002H | Power on Page | Integer | 1 | R/W | 0 - n (Note) |
| 0003 | 0003H | Power on Item | Integer | 1 | R/W | 0 - n (Note) |
| 0004 | 0004H | Reserve | Integer | 1 | R/W | |
| 0005 | 0005H | Reserve | Integer | 1 | R/W | |
| 0006 | 0006H | Reserve | Integer | 1 | R/W | |
| 0007 | 0007H | System Net | Integer | 1 | R/W | 0 - 3 (Note) |
| 0008 | 0008H | Demand Average Times | Integer | 1 | R/W | 1 - 60 (Note) |
| 0009 | 0009H | 485 Address | Integer | 1 | R/W | 1-255 |
| 0010 | 000AH | 485 Baud Rate | Integer | 1 | R/W | 0 - 5 |
| 0011 | 000BH | 485 Frame | Integer | 1 | R/W | 0 - 3 |
| 0012 | 000CH | 485 Case (HiLo\|\|LoHi) | Integer | 1 | R/W | 0 - 1 (Note) |
| 0013 | 000DH | CT Ratio | Integer | 1 | R/W | 1 - 9999 |
| 0014 | 000EH | PT Ratio | Integer | 1 | R/W | 1 - 9999 |
| 0015 | 000FH | Password | Integer | 1 | R/W | 0 - 9999 |
| 0016 | 0010H | Reset High | Integer | 1 | R/W | 0 - 1 (1:Clear) |
| 0017 | 0011H | Reset Energy | Integer | 1 | R/W | 0 - 1 (1:Clear) |
| 0018 | 0012H | Reset Demand High | Integer | 1 | R/W | 0 - 1 (1:Clear) |
| 0019 | 0013H | Display High Function | Integer | 1 | R/W | 0 - 1 (1:YES) |
| 0020 | 0014H | Display Hour I,E | Integer | 1 | R/W | 0 - 1 (1:YES) |
| 0021 | 0015H | Screen Save | Integer | 1 | R/W | 0 - 99 (Note) |
| The extended modules correspond to the variables | | | | | | |
| 0022 | 0016H | Out1 Type | Integer | 1 | R/W | 0 - 5 (Note) |
| 0023 | 0017H | Out1 Hi Set | Integer | 1 | R/W | 0 - 9999 (Note) |
| 0024 | 0018H | Out2 Type | Integer | 1 | R/W | 0 - 5 |
| 0025 | 0019H | Out2 Hi Set | Integer | 1 | R/W | 0 - 9999 |
| 0026 | 001AH | Out3 Type | Integer | 1 | R/W | 0 - 5 |
| 0027 | 001BH | Out3 Hi Set | Integer | 1 | R/W | 0 - 9999 |
| 0028 | 001CH | Out4 Type | Integer | 1 | R/W | 0 - 5 |
| 0029 | 001DH | Out4 Hi Set | Integer | 1 | R/W | 0 - 9999 |
| 0030 | 001EH | RY1 Type | Integer | 1 | R/W | 0 - 1 (Note) |
| 0031 | 001FH | RY2 Type | Integer | 1 | R/W | 0 - 1 |
| 0032 | 0020H | PUL1 Pulse Numbers | Integer | 1 | R/W | 0 - 3 (Note) |
| 0033 | 0021H | Alarm1 Type | Integer | 1 | R/W | 0 - 8 (Note) |
| 0034 | 0022H | Alarm1 Set | Integer | 1 | R/W | 0 - 9999 (Note) |
| 0035 | 0023H | Alarm1 HiLo Set | Integer | 1 | R/W | 0 - 1 (Note) |
| 0036 | 0024H | Alarm1 Delay Sec. | Integer | 1 | R/W | 0 - 99 sec. |
| 0037 | 0025H | PUL2 Pulse Numbers | Integer | 1 | R/W | 0 - 3 |
| 0038 | 0026H | Alarm2 Type | Integer | 1 | R/W | 0 - 8 |
| 0039 | 0027H | Alarm2 Set | Integer | 1 | R/W | 0 - 9999 |
| 0040 | 0028H | Alarm2 HiLo Set | Integer | 1 | R/W | 0 - 1 |
| 0041 | 0029H | Alarm2 Delay Sec. | Integer | 1 | R/W | 0 - 99 sec. |

| Address | (Hex) | Contents | Format | Word | Access | Range & Unit |
|---|---|---|---|---|---|---|
| 0042 | 002AH | Ry3 Type | Integer | 1 | R/W | 0 - 1 |
| 0043 | 002BH | Ry4 Type | Integer | 1 | R/W | 0 - 1 |
| 0044 | 002CH | PUL3 Pulse Numbers | Integer | 1 | R/W | 0 - 3 |
| 0045 | 002DH | Alarm3 Type | Integer | 1 | R/W | 0 - 8 |
| 0046 | 002EH | Alarm3 Set | Integer | 1 | R/W | 0 - 9999 |
| 0047 | 002FH | Alarm3 HiLo Set | Integer | 1 | R/W | 0 - 1 |
| 0048 | 0030H | Alarm3 Delay Sec. | Integer | 1 | R/W | 0 - 99 |
| 0049 | 0031H | PUL4 Pulse Numbers | Integer | 1 | R/W | 0 - 3 |
| 0050 | 0032H | Alarm4 Type | Integer | 1 | R/W | 0 - 8 |
| 0051 | 0033H | Alarm4 Set | Integer | 1 | R/W | 0 - 9999 |
| 0052 | 0034H | Alarm4 HiLo Set | Integer | 1 | R/W | 0 - 1 |
| 0053 | 0035H | Alarm4 Delay Sec. | Integer | 1 | R/W | 0 - 99 |
| 0054 | 0036H | Module status RY 1 2 | Integer | 1 | R | 0 - 3 (Note) |
| 0055 | 0037H | Modbule status RY 3-4 | Integer | 1 | R | 0 - 3 |
| 0056 | 0038H | Modbule D/I status IO 1-3 | Integer | 1 | R | 0 - 7 (Note) |
| 0057 | 0039H | Modbule D/I status IO 4-6 | Integer | 1 | R | 0 - 7 |

**Remarkable descriptions**：

| Contents | Description |
|---|---|
| Display Page | 0：V，1：A，2：P，3：THD |
| Display Item | Corresponding the displayed parameters and wiring configuration |
| Power On Page | The desired parameters in system as the meter is powered on：V，1：A，2：P，3：THD |
| Power On Item | Corresponding the displayed parameters |
| System Net | System nEt : Wiring configuration, 0: 3P4L,1:3P3L,2:1P3L,3:1P2L |
| Demand Average Times | The average demand time setting: 1-60 min. |
| 485 Baud Rate | 0:1200,1:2400,2:4800,3:9600,4:19200,5:38400 |
| 485 Frame | 0:n,8,2,1:o,8,1,2:e,8,1,3:n,8,1 |
| 485 CASE | Two Words for transmission (Float/Long) 0:Lo_Hi,1:Hi_Lo |
| Screen Save | Backlit energy saving mode 00:Keep lighting up 1-99: Backlit disabled |
| Out x Type | 0:V,1:A,2:W,3:Var,4:PF,5:HZ |
| Out x Hi Set | Corresponding the parameter unit and decimal point digit.<br>Example：240V-->240.0, the values as 2400 |
| RY x Type | 0:PULSE,1:ALARM |
| PUL x Pulse Numbers | 0:P 1,1:P 10,2:P 100,3:P1000 |
| Alarm x Type | 0:V,1:A,2:W,3:DMDW,4:DMDA,5:PF,6:HZ,7:THDV,8:THDA |
| Alarm x Set | Corresponding the parameter unit and decimal point digit.<br>Example：240V-->240.0, the values as 2400 |
| Alarm x HiLo Set | 0:LO,1:HI |
| Module RY1_2 Status | 0: All in normal open,1:RY1 Close,2:RY2 Close,3:RY1_2 Close |
| Module IO1_3 Status | 0:All in normal open,1:IO1 Close,2:IO2 Close,4:IO3 Close |

### 6.9.2 Values: Floating Point, Word transmission refers to 485 CASE for set-up

| Address | (Hex) | Contents | Format | Word | Access | Range & Unit |
|---|---|---|---|---|---|---|
| 4096 | 1000H | I_R L1 | Float | 2 | R | A |
| 4098 | 1002H | V_RN | Float | 2 | R | V |
| 4100 | 1004H | V_RS | Float | 2 | R | V |
| 4102 | 1006H | VA_R | Float | 2 | R | VA |
| 4104 | 1008H | W_R | Float | 2 | R | W |
| 4106 | 100AH | Var_R | Float | 2 | R | Var |
| 4108 | 100CH | PF_R | Float | 2 | R | PF |
| 4110 | 100EH | I_S L2 | Float | 2 | R | A |
| 4112 | 1010H | V_SN | Float | 2 | R | V |
| 4114 | 1012H | V_ST | Float | 2 | R | V |
| 4116 | 1014H | VA_S | Float | 2 | R | VA |
| 4118 | 1016H | W_S | Float | 2 | R | W |
| 4120 | 1018H | Var_S | Float | 2 | R | Var |
| 4122 | 101AH | PF_S | Float | 2 | R | PF |
| 4124 | 101CH | I_T L3 | Float | 2 | R | A |
| 4126 | 101EH | V_TN | Float | 2 | R | V |
| 4128 | 1020H | V_TR | Float | 2 | R | V |
| 4130 | 1022H | VA_T | Float | 2 | R | VA |
| 4132 | 1024H | W_T | Float | 2 | R | W |
| 4134 | 1026H | Var_T | Float | 2 | R | Var |
| 4136 | 1028H | PF_T | Float | 2 | R | PF |
| 4138 | 102AH | ΣA (Σ⇨ SYS) | Float | 2 | R | A |
| 4140 | 102CH | ΣVΦ | Float | 2 | R | V |
| 4142 | 102EH | ΣVL | Float | 2 | R | V |
| 4144 | 1030H | ΣVA | Float | 2 | R | VA |
| 4146 | 1032H | ΣW | Float | 2 | R | W |
| 4148 | 1034H | ΣVar | Float | 2 | R | Var |
| 4150 | 1036H | ΣPF | Float | 2 | R | PF |
| 4152 | 1038H | ΣHZ | Float | 2 | R | HZ |
| 4154 | 103AH | ΣVAH | Float | 2 | R | VAH |
| 4156 | 103CH | ΣWH(Import) | Float | 2 | R | WH |
| 4158 | 103EH | ΣWH(Export) | Float | 2 | R | WH |
| 4160 | 1040H | ΣWH(Total) | Float | 2 | R | WH |
| 4162 | 1042H | ΣVarH(Ind) | Float | 2 | R | VarH |
| 4164 | 1044H | ΣVarH(Cap) | Float | 2 | R | VarH |
| 4166 | 1046H | ΣVarH(Total) | Float | 2 | R | VarH |
| 4168 | 1048H | ΣAn | Float | 2 | R | A |
| 4170 | 104AH | Maximum I_R L1 | Float | 2 | R | A |
| 4172 | 104CH | Maximum V_RS | Float | 2 | R | V |
| 4174 | 104EH | Maximum W_R | Float | 2 | R | W |
| 4176 | 1050H | Maximum I_S L2 | Float | 2 | R | A |
| 4178 | 1052H | Maximum V_ST | Float | 2 | R | V |
| 4180 | 1054H | Maximum W_S | Float | 2 | R | W |
| 4182 | 1056H | Maximum I_T L3 | Float | 2 | R | A |
| 4184 | 1058H | Maximum V_TR | Float | 2 | R | V |
| 4186 | 105AH | Maximum W_T | Float | 2 | R | W |

| Address | (Hex) | Contents | Format | Word | Access | Range & Unit |
|---|---|---|---|---|---|---|
| 4188 | 105CH | MaximumΣ (Σ⇨ | Float | 2 | R | A |
| 4190 | 105EH | MaximumΣVL | Float | 2 | R | V |
| 4192 | 1060H | Maximum ΣW | Float | 2 | R | W |
| 4194 | 1062H | Demand Σ | Float | 2 | R | W |
| 4196 | 1064H | Maximun DemandΣ | Float | 2 | R | W |
| 4198 | 1066H | DemandΣ | Float | 2 | R | A |
| 4200 | 1068H | Maximun DemandΣ | Float | 2 | R | A |
| 4202 | 106AH | I_R THD L1 | Float | 2 | R | % |
| 4204 | 106CH | V_RN THD | Float | 2 | R | % |
| 4206 | 106EH | V_RS THD | Float | 2 | R | % |
| 4208 | 1070H | I_S THD L2 | Float | 2 | R | % |
| 4210 | 1072H | V_SN THD | Float | 2 | R | % |
| 4212 | 1074H | V_ST THD | Float | 2 | R | % |
| 4214 | 1076H | I_T THD L3 | Float | 2 | R | % |
| 4216 | 1078H | V_TN THD | Float | 2 | R | % |
| 4218 | 107AH | V_TR THD | Float | 2 | R | % |
| 4220 | 107CH | ΣA THD (Σ⇨ SYS) | Float | 2 | R | % |
| 4222 | 107EH | ΣV THD | Float | 2 | R | % |

### 6.9.3 Values: Long Integers, Word transmission refers to 485 CASE for set-up

| Address | (Hex) | Contents | Format | Word | Access | Range & Unit |
|---|---|---|---|---|---|---|
| 256 | 100H | Hour Scale | Long | 2 | R | |
| 258 | 102H | ΣVAH (Σ⇨ SYS) | Long | 2 | R | VAH |
| 260 | 104H | ΣWH(Import) | Long | 2 | R | WH |
| 262 | 106H | ΣWH(Export) | Long | 2 | R | WH |
| 264 | 108H | ΣWH(Total) | Long | 2 | R | WH |
| 266 | 10AH | ΣVarH(Ind) | Long | 2 | R | VarH |
| 268 | 10CH | ΣVarH(Cap) | Long | 2 | R | VarH |
| 270 | 10EH | ΣVarH(Total) | Long | 2 | R | VarH |

**Hour Scale**：The values will be re-calculated if the ratio of primary to secondary has been changed.

**Value=Received Data** * 10 ^ (Hour Scale - 3)。

Example：The address **132H** is represented as 12345678，and the **Hour Scale** is 5, thus the hour reading is calculated as follows.

ΣWH = 12345678 * 10 ^ ( 5 - 3) = 12345678 * 10 ^ 2

= 12345678 * 100 = 1234567800。

= 1234567800 WH = 1234567.800 KWH = 1234.5678 MWH。

If Hour scale = 5，put 5 in the given formula then get (5-3 = **2**)，and the unit for energy register is programmed as WH, so (**2-3 = -1)** is represented as **0.1KWH**，**or (2-6 = -4) as 0.0001 MWH**.



### 6.9.4 Value: Integers

| Address | (Hex) | Contents | Format | Word | Access | Range & Unit |
|---|---|---|---|---|---|---|
| 504 | 1F8H | V Unit | Integer | 1 | R | See 6.9.5 |
| 505 | 1F9H | V Dot | Integer | 1 | R | See 6.9.5 |
| 506 | 1FAH | A Unit | Integer | 1 | R | See 6.9.5 |
| 507 | 1FBH | A Dot | Integer | 1 | R | See 6.9.5 |
| 508 | 1FCH | Power_Unit | Integer | 1 | R | See 6.9.5 |
| 509 | 1FDH | Power_Dot | Integer | 1 | R | See 6.9.5 |
| 510 | 1FEH | Energy Unit | Integer | 1 | R | See 6.9.5 |
| 511 | 1FFH | Energy Dot | Integer | 1 | R | See 6.9.5 |
| 512 | 200H | I_R L1 | Integer | 1 | R | A |
| 513 | 201H | V_RN | Integer | 1 | R | V |
| 514 | 202H | V_RS | Integer | 1 | R | V |
| 515 | 203H | VA_R | Integer | 1 | R | VA |
| 516 | 204H | W_R | Integer | 1 | R | W |
| 517 | 205H | Var_R | Integer | 1 | R | Var |
| 518 | 206H | PF_R | Integer | 1 | R | PF/1000 |
| 519 | 207H | I_S L2 | Integer | 1 | R | A |
| 520 | 208H | V_SN | Integer | 1 | R | V |
| 521 | 209H | V_ST | Integer | 1 | R | V |
| 522 | 20AH | VA_S | Integer | 1 | R | VA |
| 523 | 20BH | W_S | Integer | 1 | R | W |
| 524 | 20CH | Var_S | Integer | 1 | R | Var |
| 525 | 20DH | PF_S | Integer | 1 | R | PF/1000 |
| 526 | 20EH | I_T L3 | Integer | 1 | R | A |
| 527 | 20FH | V_TN | Integer | 1 | R | V |
| 528 | 210H | V_TR | Integer | 1 | R | V |
| 529 | 211H | VA_T | Integer | 1 | R | VA |
| 530 | 212H | W_T | Integer | 1 | R | W |
| 531 | 213H | Var_T | Integer | 1 | R | Var |
| 532 | 214H | PF_T | Integer | 1 | R | PF/1000 |
| 533 | 215H | ΣA (Σ⇨ SYS) | Integer | 1 | R | A |
| 534 | 216H | ΣVΦ | Integer | 1 | R | V |
| 535 | 217H | ΣVL | Integer | 1 | R | V |
| 536 | 218H | ΣVA | Integer | 1 | R | VA |
| 537 | 219H | ΣW | Integer | 1 | R | W |
| 538 | 21AH | ΣVar | Integer | 1 | R | Var |
| 539 | 21BH | ΣPF | Integer | 1 | R | PF/1000 |
| 540 | 21CH | ΣHZ | Integer | 1 | R | HZ/100 |
| 541 | 21DH | ΣVAH Hi Word | Integer | 1 | R | VAH |
| 542 | 21EH | ΣVAH Lo Word | Integer | 1 | R | VAH |
| 543 | 21FH | ΣWH (Import) Hi Word | Integer | 1 | R | WH |
| 544 | 220H | ΣWH (Import) Lo Word | Integer | 1 | R | WH |
| 545 | 221H | ΣWH (Export) Hi Word | Integer | 1 | R | WH |
| 546 | 222H | ΣWH (Export) Lo Word | Integer | 1 | R | WH |
| 547 | 223H | ΣWH (Total) Hi Word | Integer | 1 | R | WH |
| 548 | 224H | ΣWH(Total) Lo Word | Integer | 1 | R | WH |

### 6.9.4 Value: Integers

| Address | (Hex) | | Format | Word | Access | Range & Unit |
|---|---|---|---|---|---|---|
| 549 | 225H | ΣVarH (Ind) Hi Word | Integer | 1 | R | VarH |
| 550 | 226H | ΣVarH (Ind) Lo Word | Integer | 1 | R | VarH |
| 551 | 227H | ΣVarH (Cap) Hi Word | Integer | 1 | R | VarH |
| 552 | 228H | ΣVarH (Cap) Lo Word | Integer | 1 | R | VarH |
| 553 | 229H | ΣVarH (Total) Hi Word | Integer | 1 | R | VarH |
| 554 | 22AH | ΣVarH (Total) Lo Word | Integer | 1 | R | VarH |
| 555 | 22BH | ΣAn | Integer | 1 | R | A |
| 556 | 22CH | Maximum I_R L1 | Integer | 1 | R | A |
| 557 | 22DH | Maximum V_RS | Integer | 1 | R | V |
| 558 | 22EH | Maximum W_R | Integer | 1 | R | W |
| 559 | 22FH | Maximum I_S L2 | Integer | 1 | R | A |
| 560 | 230H | Maximum V_ST | Integer | 1 | R | V |
| 561 | 231H | Maximum W_S | Integer | 1 | R | W |
| 562 | 232H | Maximum I_T L3 | Integer | 1 | R | A |
| 563 | 233H | Maximum V_TR | Integer | 1 | R | V |
| 564 | 234H | Maximum W_T | Integer | 1 | R | W |
| 565 | 235H | Maximum ΣA (Σ⇨ SYS) | Integer | 1 | R | A |
| 566 | 236H | Maximum ΣVL | Integer | 1 | R | V |
| 567 | 237H | Maximum ΣW | Integer | 1 | R | W |
| 568 | 238H | Demand ΣW | Integer | 1 | R | W |
| 569 | 239H | Maximun Demand ΣW | Integer | 1 | R | W |
| 570 | 23AH | Demand ΣA | Integer | 1 | R | A |
| 571 | 23BH | Maximun Demand ΣA | Integer | 1 | R | A |
| 572 | 23CH | I_R THD L1 | Integer | 1 | R | 0.1% |
| 573 | 23DH | V_RN THD | Integer | 1 | R | 0.1% |
| 574 | 23EH | V_RS THD | Integer | 1 | R | 0.1% |
| 575 | 23FH | I_S THD L2 | Integer | 1 | R | 0.1% |
| 576 | 240H | V_SN THD | Integer | 1 | R | 0.1% |
| 577 | 241H | V_ST THD | Integer | 1 | R | 0.1% |
| 578 | 242H | I_T THD L3 | Integer | 1 | R | 0.1% |
| 579 | 243H | V_TN THD | Integer | 1 | R | 0.1% |
| 580 | 244H | V_TR THD | Integer | 1 | R | 0.1% |
| 581 | 245H | ΣA THD (Σ⇨ SYS) | Integer | 1 | R | 0.1% |
| 582 | 246H | ΣV THD | Integer | 1 | R | 0.1% |



### 6.9.5 Unit and Decimal Point

The received integer data as the primary values. And the set-up in unit and decimal point must be completed after receiving data.
**The received values will be correct after the set-up in CT & PT ratio has completed. **

| Data Address | Contents | Descriptions |
|---|---|---|
| 1FAH | V Unit | Display unit in volt. 0：None，3：K,6：M, 9：G . |
| 1FBH | V Dot | The decimal point position for voltage. 0：None,1：One, others for analogy. |
| The displayed voltage includes phase volt, line volt, max/min values and so on. | | |
| 1FCH | A Unit | Display unit in amp. 0：None, 3：K , 6：M, 9：G . |
| 1FDH | A Dot | Display decimal point position for amp. 0：None,1：One, others for analogy. |
| The displayed current includes current, neutral current, max/min values, current demand and so on. | | |
| 1FEH | Power Unit | Display unit in power. 0：None, 3：K , 6：M, 9：G . |
| 1FFH | Power Dot | The decimal point position for power. 0：None,1：One, other for analogy. |
| The displayed power includes VA, Watt, Var, Max/Min Watt, Demand Watt and Var and so on. | | |

Others：
PF：Fixed decimal point position at 3 digits.
Hz：Fixed decimal point position at 2 digits.
** If the **Unit** set to 6 represents M, and the **Dot** set to 3 represents 000, and then it can also be regarded as **Unit=K** and **Dot=0**. The other collocation can be analogized as well.**

Examples：11.4KV/114V、100/5A. 3P4W.
PT Ratio：100times, CT Ratio：20 times.
V Unit：3. V Dot：2. A Unit：0. A Dot：2. Power Unit：6. Power Dot：3.

If the fed volt is at 11.4kV, the fed amp is at 65A, the fed power factor is at 0.95, and the fed frequency is at 60, and therefore, the values in VA derives from 11.4KVx65Ax3=2223000=2.223MVA =2223kVA. And the values in W derives from VAxPF=223000x0.95=2111850.

The RS485 receives the following values：
V：1140. A：6500. HZ：6000.

Detailed explanations for the above values are below：
V：11.4KV, Unit in K (V unit=3), Decimal point at 2 digits (V Dot=2)
A：65.00A (A Unit=0), Decimal point at 2 digits (A Dot=2)
VA： 2.223 MVA or 2223 KVA
Unit in M (decimal point at 3 digits) or Unit in K (without decimal point)
W：2.111MW or 2111KW. Please refer to the description of VA
Unit in K (Energy Unit=3), without decimal point (Energy Dot=0)
PF：0.950. Decimal point at 3 digits
Hz：60.00Hz. Decimal point at 2 digits
Notice：The Unsigned Int is non-symbol, but the Signed Int is a value with positive/negative.
The values will be measured correctly if the corresponsive signals are matched.
Furthermore, some parameter units (kW, Var, Pf) display positive or negative.
Examples：PF=0.95：RS 485 values：950；PF= -0.95：RS 485 values：-(65536-64586)= -950