

# PM-4324

## Smart Power Meter User's Manual



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# Chapter 1 Introduction

## 1.1. PM-4324 introduction

ICP DAS offers PM-4324 family in a full range of Single-phase and Three-phase smart power meters for power monitoring. The products offer a rich feature set combined with easy-to-integrate communications.

With its high accuracy ( $<0.5\%$ ,  $PF=1$ ), the PM-4324 series products can be applied both on low voltage primary side and/or medium/high voltage secondary side and enable the users to obtain in real time the reliable and accurate energy consumption readings from the monitored equipments while in operation. These compact size and cost effective Power Meters are equipped with revolutionary wired clip-on CT (various types support input current up to 400A) and standard Modbus communication RS-485 protocol for easy deployment. It works with input voltages ranging 10V ~ 500V, supporting a wide range of applications.

Features :

- True RMS Power Measurements
- Energy Analysis for 3P4W-3CT, 3P3W-2CT, 3P3W-3CT, 1P2W-1CT, 1P3W-2CT
- Current Measurements Up to 400 A with Different CT Ratio
- Voltage Measurements Up to 500 V
- Clip-on CT for Easy Installation
- W Accuracy Better than 0.5% ( $PF=1$ )
- Supports RS-485, Ethernet Interface
- Supports Modbus RTU, Modbus TCP protocols.
- Supports 2-Power Relay Output (Form A)
- Total Harmonic Distortion (THD)

## 1.2. Caution



### 1.2.1. Danger

The meter contains hazardous voltages, and should never be disassembled. Failing to follow this practice will result in serious injury or death. Any work on or near energized meters, meter sockets, or other metering equipment could induce a danger of electrical shock. It is strongly recommended that all work should be performed only by qualified industrial electricians and metering specialist. ICP DAS assumes no responsibility if your electrical installer does not follow the appropriate national and local electrical codes.

## 1.3. Warning

ICP DAS assumes no liability for any damage resulting from the use of this product. ICP DAS reserves the right to change this manual at any time without notice. The information furnished by ICP DAS is believed to be accurate and reliable. However, no responsibility is assumed by ICP DAS for its use, not for any infringements of patents or other rights of third parties resulting from its use.

## 1.4. Product Warranty & Customer Support

ICP DAS warrants all products free from defects in material and workmanship for a period of one year from the date of shipping. During the warranty period, we will, at our position, either repair or replace any product that proves to be defective. To report any defect, please contact : **+886-3- 597-3366** or **service@icpdas.com**.

Please have the model, serial number and a detailed problem description available when you call. If the problem concerns a particular reading, please have all meter readings available. When returning any merchandise to ICP DAS, a return SN. is required.

### 1.4.1. Limitation of Warranty

This warranty does not apply to defects resulting from unauthorized modification, misuse, or use for reason other than electrical power monitoring. The supplied meter is not a user-serviceable product.

# Chapter 2 Specifications

## 2.1 Specifications

| Model                       |               | PM-4324                                                                                                                                                                                                                           | PM-4324-MTCP |
|-----------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| AC Power Measurement        |               |                                                                                                                                                                                                                                   |              |
| Wiring                      |               | 1P2W-1CT, 1P3W-2CT, 3P3W-2CT, 3P3W-3CT and 3P4W-3CT                                                                                                                                                                               |              |
| Measurement Voltage         |               | 10 ~ 500 V (CAT III)                                                                                                                                                                                                              |              |
| Measurement Current         |               | CT Φ10 mm (60 A); CTΦ16 mm (100 A); CTΦ24 mm (200 A);<br>CTΦ36m (300 A); CTΦ36m (400 A)                                                                                                                                           |              |
| Measurement Frequency       |               | 50-60 Hz                                                                                                                                                                                                                          |              |
| W Accuracy                  |               | Better than 0.5% (PF:1)                                                                                                                                                                                                           |              |
| Starting Current            |               | >0.03A ( 60A ), >0.05A (100A ) , >0.09A( 200A )                                                                                                                                                                                   |              |
| Power Parameter Measurement |               | True RMS voltage (Vrms), True RMS current (Irms), Active Power (kW),<br>Active Energy (kWh), Apparent Power (kVA), Apparent Energy (kVAh),<br>Reactive Power (kVAR), Reactive Energy (kVARh), Power Factor (PF),<br>Frequency(Hz) |              |
| Data Update Rate            |               | 1 Second                                                                                                                                                                                                                          |              |
| Communication               |               |                                                                                                                                                                                                                                   |              |
| RS-485                      | Protocol      | Modbus-RTU                                                                                                                                                                                                                        | -            |
|                             | Baud rate     | 9600,19200 (default), 38400,<br>115200; DIP Switch Selectable                                                                                                                                                                     | -            |
|                             | Data format   | N,8,1 (default); N,8,2; E,8,1; E,8,2;<br>O,8,1; O,8,2                                                                                                                                                                             | -            |
|                             | Isolation     | 3000 VDC                                                                                                                                                                                                                          | -            |
|                             | Bias Resistor | No <b>(Usually supplied by the RS-485 Master. Alternatively, add a tM-SG4 or SG-785)</b>                                                                                                                                          | -            |
| Ethernet                    | Protocol      | -                                                                                                                                                                                                                                 | Modbus TCP   |
| Alarm Output                |               |                                                                                                                                                                                                                                   |              |
| Power Relay                 |               | Form A (Normal Open) x 2; Relay Contact Voltage Range: 5 A @ 250 VAC (47 ~ 63Hz), 5 A @ 30 VDC                                                                                                                                    |              |

| Aux Power              |                         |                |
|------------------------|-------------------------|----------------|
| Input Range            | +85 ~ +264 VAC          | +85 ~ +264 VAC |
| Power Consumption      | 6 W                     |                |
| Dimensions (W x L x H) | 237 mm x 52 mm x 134 mm |                |
| Environment            |                         |                |
| Operating Temperature  | -20 ~ +70 °C            |                |
| Storage Temperature    | -25 ~ +80 °C            |                |

Field Wiring Terminal Markings:

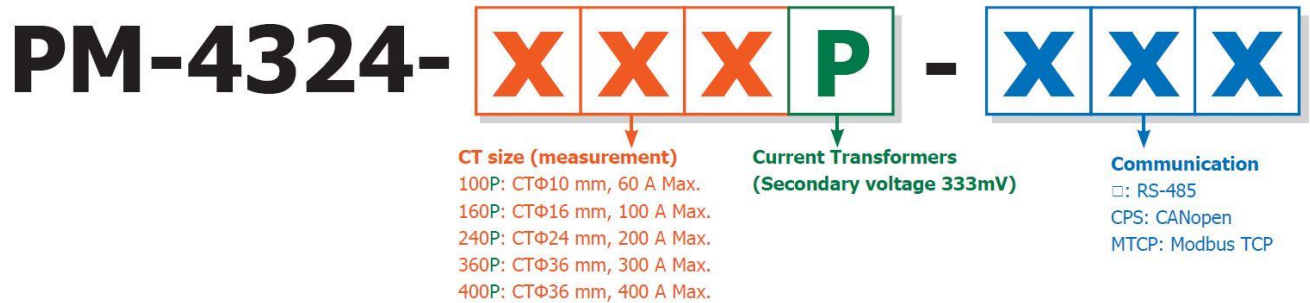
3.81mm (For Measurement Current and Communication): Use Copper Conductors Only, wires range 16-26 AWG, torque value 3.0 lb-in.

5.08mm (For Measurement Voltage, Aux Power and Alarm Output):

Use Copper Conductors Only, wires range 12-24 AWG, torque value 7.0 lb-in.

7.62mm: Use Copper Conductors Only, wires range 12-24 AWG, torque value 4.5 lb-in.

## 2.2 Naming Rules



# Chapter 3 Installation

## 3.1 Inspection

The instrument is no longer safe when,

- a) Shows clear signs of damage
- b) Does not work
- c) Long storage under extreme conditions
- d) Damage during shipment

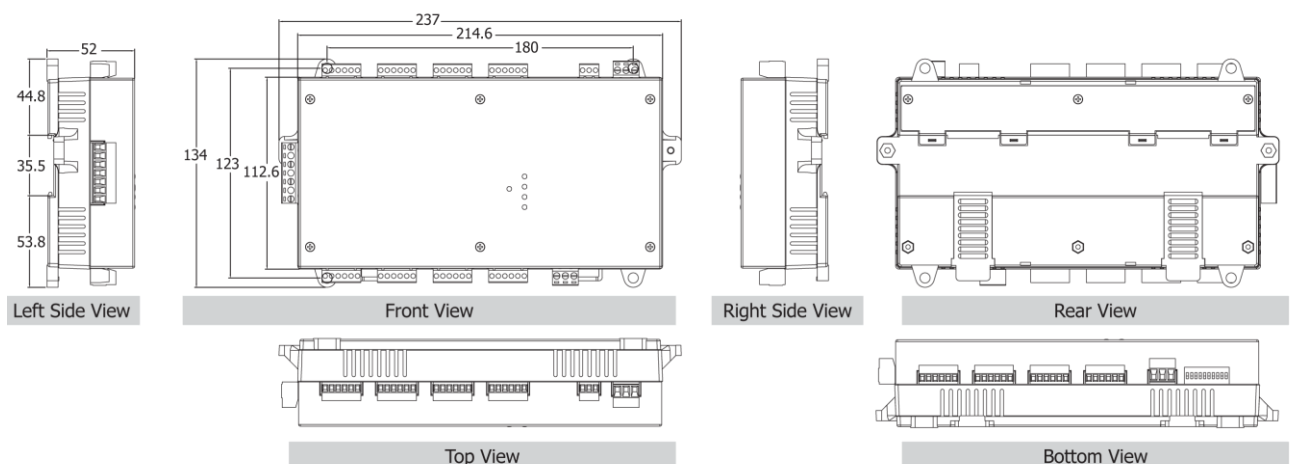
## 3.2 Safety



Please use the soft dry clothes to clean the instrument.

Please do not use any chemical or detergent or volatile solvents to clean the instrument, in order to avoid any possibility of the cover damage.

### 3.2.1 Dimension and Latch



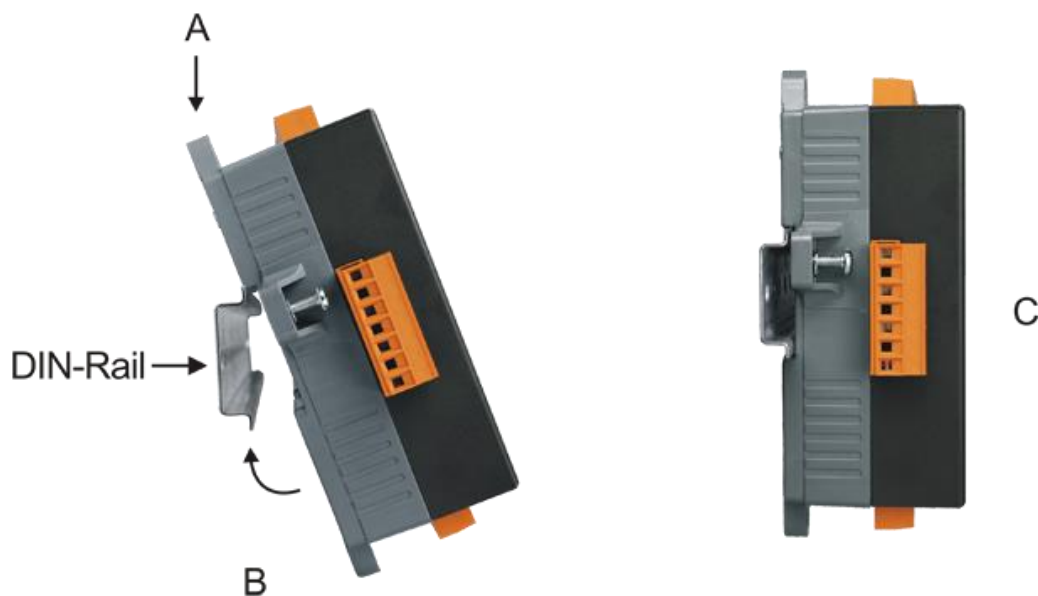
- Products come with external split type clip-on CT's. Disconnect the CT's or use other CT's is highly prohibited.
- Please read this operation manual carefully before using.
- Please re-confirm the measure position.
- PM-4324 series can be installed as rail mounting mode or embedded, no need to drill a hole or screw to fix it (rail mounting width can up to the length of 35 mm).
- Meter auxiliary power is +85 ~ +264 VAC.

### 3.2.2 Mounting and Dismounting

- Mounting

Assembly: Place the PM-4324 on the DIN-Rail. Push the front of the PM-4324 toward the mounting surface until it audibly snaps into place.

Dismantling: Pull out the latch and then remove the PM-4324 from the DIN-Rail.



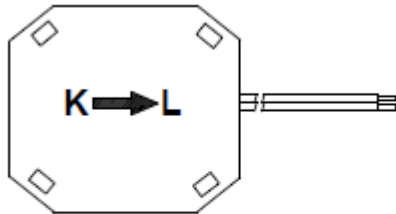
- Wire Disconnection

1. Open the CT clip to detach the CT, do not remove the CT terminal lines if possible

Note: if you need to remove the terminal lines, always detach the CT before removing the CT terminal lines. **Otherwise the CT may develop open-circuit secondary voltages which may be hazardous to personnel or damaging to the CT or equipment connected in the secondary circuit.**

2. Disconnect the voltage input wires from terminals and wrap the wire tips with plastic tape.
3. Disconnect the communication wires from terminal.
4. Disconnect the auxiliary power from terminal and wrap the wire tip with plastic tape.

### 3.2.3 CT's installation steps



Bottom view

- At the bottom of the CT, there is a “K→L” mark.



- Open the CT clip.



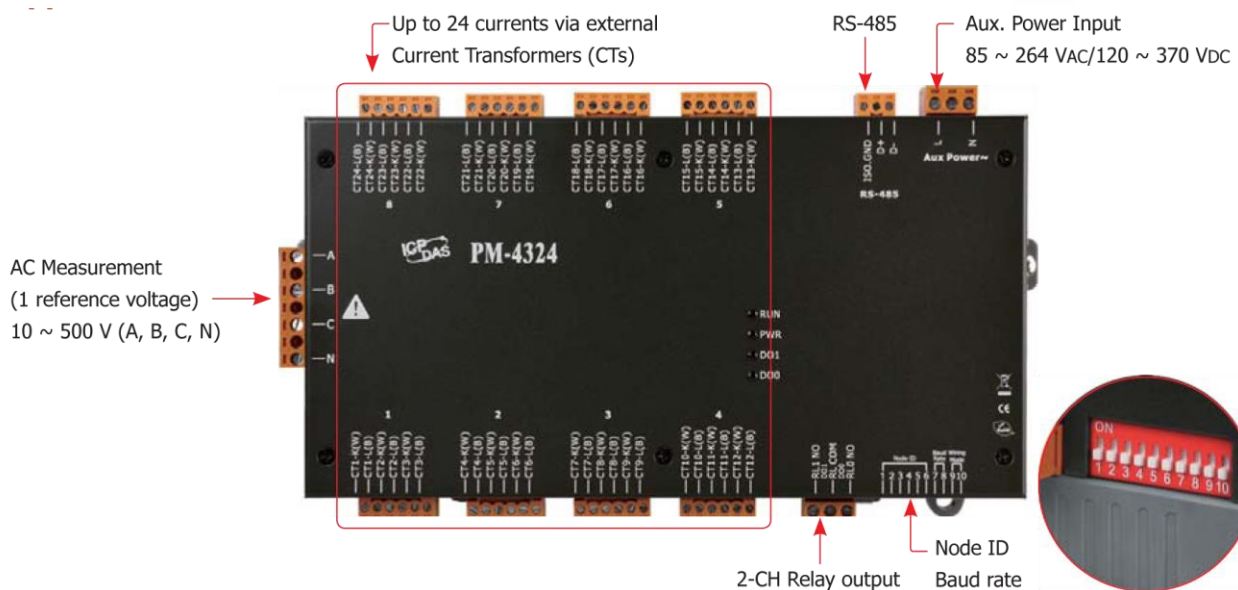
- Make sure the power current direction follow the “K→L” mark on the CT and then close the CT clip.



- Installation steps finished.

# Chapter 4 Wiring Diagrams

## 4.1 Connection



Please firstly check the current input terminal, and then in white black, white black, white black wire sequences (CT1-K, CT1-L, CT2-K, CT2-L, CT3-K, CT3-L). Then connect the CT's, and close the CT clip. Make sure the arrow direction sign on CT's follows current flow direction (K→L)

**Note: it must be in the same direction.**

Connect the voltage input terminal N C B A. for PM-4324, in the three phase order as follows on N C B A.

**Attention please!! For 3P3W-2CT, connect in N C A phase sequence, do not connect phase B (Check the diagram).**

### Voltage Input

1. PM-4324 series: Input Voltage up to 500V.

For any higher Input Voltage large than 500V, please add the PT (power transformer), and Change PT RATIO setup.

2. Confirm the RST (ABC) phase sequence.

### Current Input

1. The external CT's are fragile, please handle with care.
2. The current input of PM-4324 series is in mA range. Only the ex-factory attached CT's can be used. The other CT's, for example, from panel will damage the instrument due to its large current (around 5A)
3. When more than one smart meter (PM-4324 series) are installed, please do not disconnect the CT with its original meter and mix use with each other. Since each set of smart meter (PM-4324 series) and its attached split type clip-on CT are calibrated set by set. The mix use may cause wrong measurements.
4. To install CT's correctly, please ensure the CT lines sequences is right before clip the CT's onto the power cable of the monitoring equipment. (Detail will be found in next section)

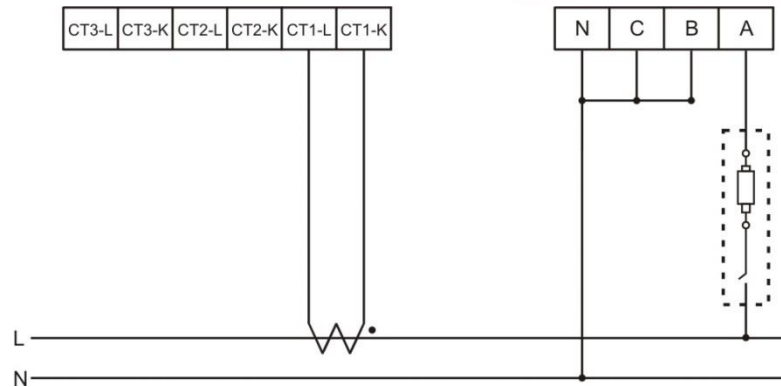


**5. When measuring the current, the secondary circuit of a CT should never be opened when a load is passing through its primary. Make sure you always open the CT clip to detach the CT before removing the terminal lines. Otherwise, it will cause severe injury.**

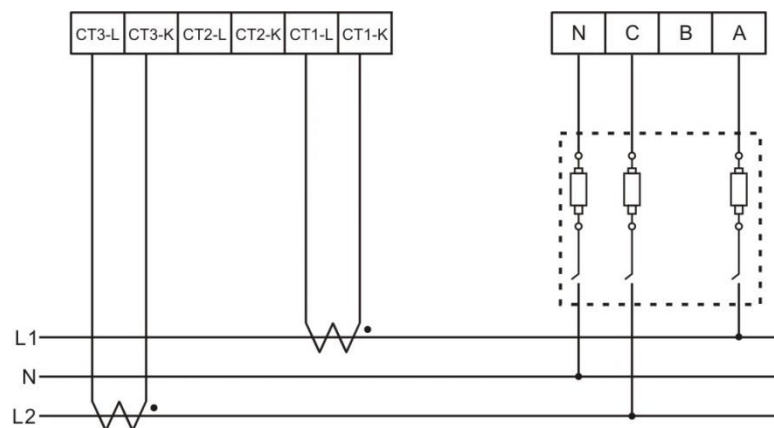
6. Please handle with extra care, especially when the operation space of CT's is limited.
7. The current direction must follow K-L marked on CT's.
8. Please select the right size CT's for different size of monitoring equipment cables:  
power cable diameter <  $\Phi 10$  use 60A CT ,  $\Phi 10 \sim \Phi 16$  use 100A CT ,  $\Phi 16 \sim \Phi 24$  use 200A CT ,  
 ,  $\Phi 36$  use 300A CT ,  $\Phi 36$  use 400A CT
9. The maximum current value cannot exceed the CT rating

## 4.2 Wiring

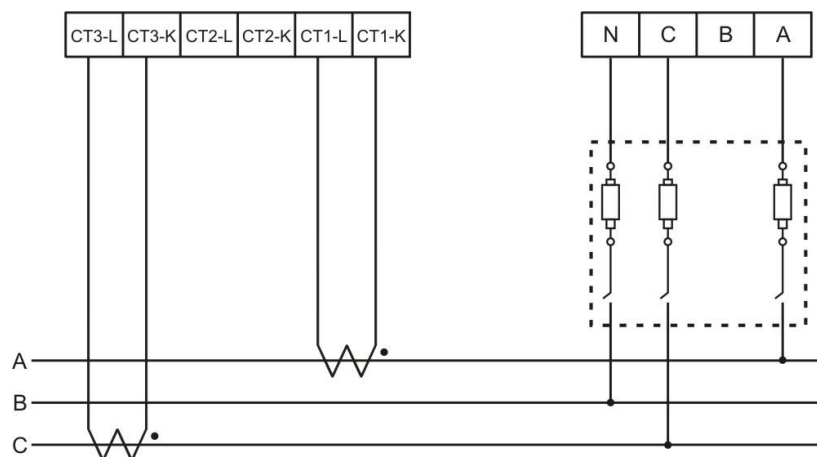
- 1P2W-1CT (PM-4324)



- 1P3W-2CT (PM-4324)

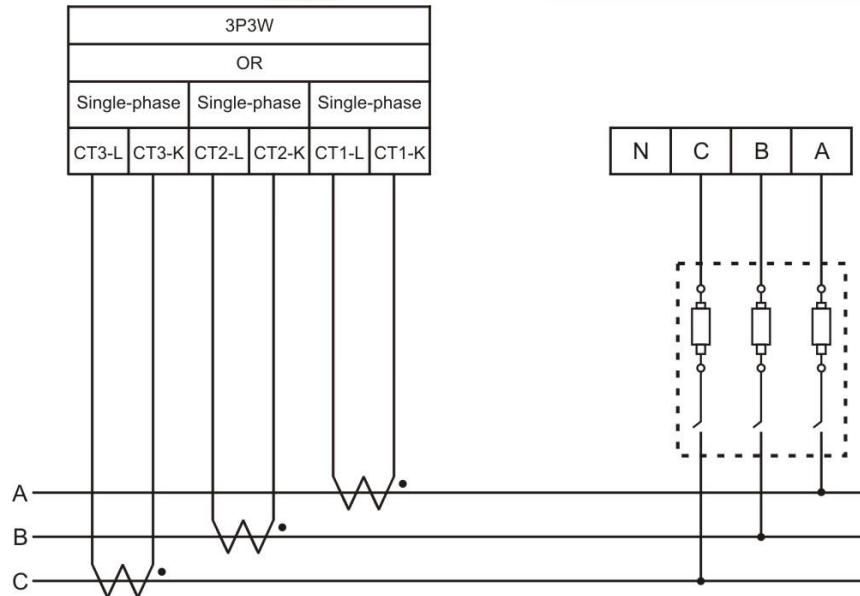


- 3P3W-2CT (PM-4324)



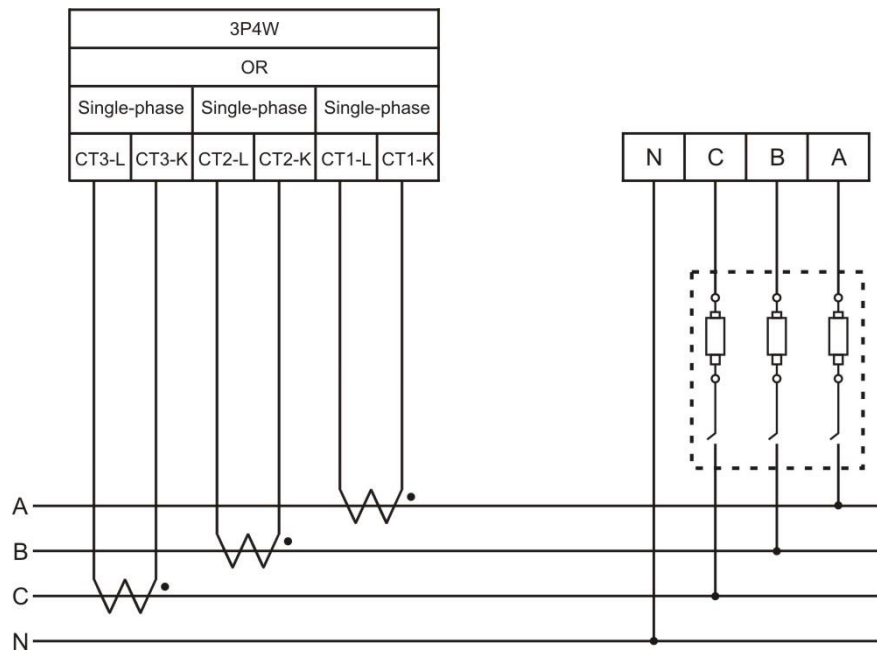
- 3P3W-3CT (PM-4324)

| DIP switch: Wiring mode | SW 9 | SW 10 |
|-------------------------|------|-------|
| 3P3W-3CT                | OFF  | ON    |



- 3P4W-3CT (PM-4324)

| DIP switch: Wiring mode | SW 9 | SW 10 |
|-------------------------|------|-------|
| 3P4W-3CT                | ON   | ON    |



# Chapter 5 Relay output & LED Indicator

## 5.1 Relay

|                         |                                 |
|-------------------------|---------------------------------|
| Relay type              | Power Relay, Form A (SPST N.O.) |
| Operating Voltage Range | 250 VAC/30 VDC                  |
| Max. Load Current       | 5 A at 25 °C                    |
| Operate Time            | 6 ms                            |
| Release Time            | 3 ms                            |

## 5.2 LED Indicator

The PM-4324 has 4 LED to indicate the unit power status, RS-485 communication, and power data calculation.

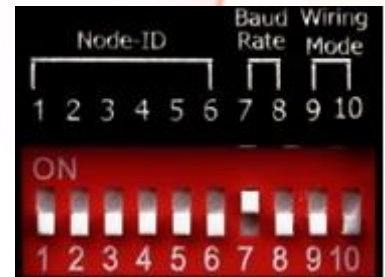
- **RUN:** Green, light up after RS-485 ready. LED will flash when the unit is processing RS-485 communication.
- **PWR:** Red, Power on LED always on.
- **DO0:** Green. LED DO0 will light up, when DO0 is "ON".
- **DO1:** Green. LED DO1 will light up, when DO1 is "ON".

# Chapter 6 Modbus-RTU communication

## 6.1 RS-485 setting

- Default setting for RS-485: **19200, n, 8, 1**
- DIP switch (SW1-SW6) is used for Modbus address setting, default is 1, i.e. all OFF

**For example:** Modbus address is 10 → find the table of DIP switch 1-6 is  
ON, OFF, OFF, ON, OFF, OFF



### 6.1.1 SW1—SW6 setting

Setting Modbus-RTU address for communication (1-64)

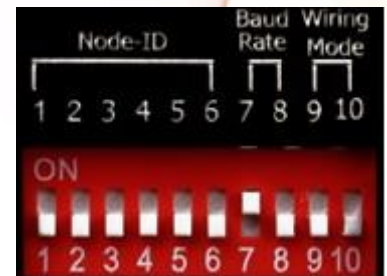
| Modbus Address | SW 1 | SW 2 | SW 3 | SW 4 | SW 5 | SW 6 |
|----------------|------|------|------|------|------|------|
| 1              | OFF  | OFF  | OFF  | OFF  | OFF  | OFF  |
| 2              | ON   | OFF  | OFF  | OFF  | OFF  | OFF  |
| 3              | OFF  | ON   | OFF  | OFF  | OFF  | OFF  |
| 4              | ON   | ON   | OFF  | OFF  | OFF  | OFF  |
| 5              | OFF  | OFF  | ON   | OFF  | OFF  | OFF  |
| 6              | ON   | OFF  | ON   | OFF  | OFF  | OFF  |
| 7              | OFF  | ON   | ON   | OFF  | OFF  | OFF  |
| 8              | ON   | ON   | ON   | OFF  | OFF  | OFF  |
| 9              | OFF  | OFF  | OFF  | ON   | OFF  | OFF  |
| 10             | ON   | OFF  | OFF  | ON   | OFF  | OFF  |
| 11             | OFF  | ON   | OFF  | ON   | OFF  | OFF  |
| 12             | ON   | ON   | OFF  | ON   | OFF  | OFF  |
| 13             | OFF  | OFF  | ON   | ON   | OFF  | OFF  |
| 14             | ON   | OFF  | ON   | ON   | OFF  | OFF  |
| 15             | OFF  | ON   | ON   | ON   | OFF  | OFF  |
| 16             | ON   | ON   | ON   | ON   | OFF  | OFF  |
| 17             | OFF  | OFF  | OFF  | OFF  | ON   | OFF  |
| 18             | ON   | OFF  | OFF  | OFF  | ON   | OFF  |
| 19             | OFF  | ON   | OFF  | OFF  | ON   | OFF  |
| 20             | ON   | ON   | OFF  | OFF  | ON   | OFF  |
| 21             | OFF  | OFF  | ON   | OFF  | ON   | OFF  |
| 22             | ON   | OFF  | ON   | OFF  | ON   | OFF  |
| 23             | OFF  | ON   | ON   | OFF  | ON   | OFF  |
| 24             | ON   | ON   | ON   | OFF  | ON   | OFF  |
| 25             | OFF  | OFF  | OFF  | ON   | ON   | OFF  |
| 26             | ON   | OFF  | OFF  | ON   | ON   | OFF  |
| 27             | OFF  | ON   | OFF  | ON   | ON   | OFF  |

|    |     |     |     |     |     |     |
|----|-----|-----|-----|-----|-----|-----|
| 28 | ON  | ON  | OFF | ON  | ON  | OFF |
| 29 | OFF | OFF | ON  | ON  | ON  | OFF |
| 30 | ON  | OFF | ON  | ON  | ON  | OFF |
| 31 | OFF | ON  | ON  | ON  | ON  | OFF |
| 32 | ON  | ON  | ON  | ON  | ON  | OFF |
| 33 | OFF | OFF | OFF | OFF | OFF | ON  |
| 34 | ON  | OFF | OFF | OFF | OFF | ON  |
| 35 | OFF | ON  | OFF | OFF | OFF | ON  |
| 36 | ON  | ON  | OFF | OFF | OFF | ON  |
| 37 | OFF | OFF | ON  | OFF | OFF | ON  |
| 38 | ON  | OFF | ON  | OFF | OFF | ON  |
| 39 | OFF | ON  | ON  | OFF | OFF | ON  |
| 40 | ON  | ON  | ON  | OFF | OFF | ON  |
| 41 | OFF | OFF | OFF | ON  | OFF | ON  |
| 42 | ON  | OFF | OFF | ON  | OFF | ON  |
| 43 | OFF | ON  | OFF | ON  | OFF | ON  |
| 44 | ON  | ON  | OFF | ON  | OFF | ON  |
| 45 | OFF | OFF | ON  | ON  | OFF | ON  |
| 46 | ON  | OFF | ON  | ON  | OFF | ON  |
| 47 | OFF | ON  | ON  | ON  | OFF | ON  |
| 48 | ON  | ON  | ON  | ON  | OFF | ON  |
| 49 | OFF | OFF | OFF | OFF | ON  | ON  |
| 50 | ON  | OFF | OFF | OFF | ON  | ON  |
| 51 | OFF | ON  | OFF | OFF | ON  | ON  |
| 52 | ON  | ON  | OFF | OFF | ON  | ON  |
| 53 | OFF | OFF | ON  | OFF | ON  | ON  |
| 54 | ON  | OFF | ON  | OFF | ON  | ON  |
| 55 | OFF | ON  | ON  | OFF | ON  | ON  |
| 56 | ON  | ON  | ON  | OFF | ON  | ON  |
| 57 | OFF | OFF | OFF | ON  | ON  | ON  |
| 58 | ON  | OFF | OFF | ON  | ON  | ON  |
| 59 | OFF | ON  | OFF | ON  | ON  | ON  |
| 60 | ON  | ON  | OFF | ON  | ON  | ON  |
| 61 | OFF | OFF | ON  | ON  | ON  | ON  |
| 62 | ON  | OFF | ON  | ON  | ON  | ON  |
| 63 | OFF | ON  | ON  | ON  | ON  | ON  |
| 64 | ON  | ON  | ON  | ON  | ON  | ON  |

## ● SW7—SW8 setting

PM-4324 : For Baud Rate Setting

| Baud Rate           | SW 7      | SW8       |
|---------------------|-----------|-----------|
| 9600 bps            | OFF       | OFF       |
| 19200 bps (Default) | <b>ON</b> | OFF       |
| 38400 bps           | OFF       | <b>ON</b> |
| 115200 bps          | <b>ON</b> | <b>ON</b> |



### Add the Bias Resistor on RS-485 Network for stable signal

The RS-485 master is required to provide the bias for PM-4324 series. Otherwise, the tM-SG4 or SG-785 should be added to provide the bias. All ICP DAS controllers and converters provide the bias.

## ● SW9—SW10 setting

PM-4324 : Select the different wiring mode

(Please select the Software setting, if 1P2W-1CT or 1P3W-2CT is used)

| Wiring           | SW 9      | SW 10     |
|------------------|-----------|-----------|
| Software setting | OFF       | OFF       |
| 3P3W-2CT         | <b>ON</b> | OFF       |
| 3P3W-3CT         | OFF       | <b>ON</b> |
| 3P4W-3CT         | <b>ON</b> | <b>ON</b> |

## 6.2 Modbus-RTU setting

### 6.2.1 Specifications

|                             |                                                                                                                                                                   |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Protocol                    | Modbus-RTU                                                                                                                                                        |
| Transmission Specifications | Bits per Byte :<br>1 start bit<br>8 data bits, least significant bit sent first<br>None Parity<br>1 stop bits<br>Error Check :<br>Cyclical Redundancy Check (CRC) |
| Baud Rate                   | 9600, 19200 (Default), 38400, 115200                                                                                                                              |
| Modbus slave address        | 1-64 (Default = 1)                                                                                                                                                |

- Modbus Function Code : 01h, 03h, 04h, 05h, 06h, 0Fh, 10h

| Code | MODBUS_name              | Description                                  |
|------|--------------------------|----------------------------------------------|
| 01h  | Read Coils               | Read boolean values of read/write location   |
| 05h  | Write Single Coil        | Set one boolean value of read/write location |
| 0Fh  | Write Multiple Coil      | Set boolean values of read/write location    |
| 03h  | Read Holding Registers   | Read the contents of read/write location     |
| 06h  | Write Single Register    | Set the content of one read/write location   |
| 10h  | Write Multiple Registers | Set the contents of read/write location      |
| 04h  | Read Input Registers     | Read the contents of read only location      |

Note: the max. data reading of Function 03 and Function04 is 125 registers

- **Data format**

Integer : 16 bits with sign, each with 1 register

Unsigned Integer : 16 bits without sign, each with 1 register

Float : IEEE 754 Format , each with 2 registers,

Low Word is first priority while transmit

**IEEE 754 Format**

Definition of the floating format of the Bits

|                           |                           |                           |                           |
|---------------------------|---------------------------|---------------------------|---------------------------|
| Data Hi Word ,<br>Hi Byte | Data Hi Word ,<br>Lo Byte | Data Lo Word ,<br>Hi Byte | Data Lo Word ,<br>Lo Byte |
| SEEE EEEE                 | EMMM MMMM                 | MMMM MMMM                 | MMMM MMMM                 |

$$\text{Value} = (-1)^S \times (1.M) \times 2^{E-127} \quad 0 < E < 255$$

**S** represents the sign bit where 1 is negative and 0 is positive

**E** is the two's complement exponent with an offset of 127.

i.e. an exponent of zero is represented by 127, an exponent of 1 by 128 etc.

**M** is the 23-bit normal mantissa. The highest bit is always 1 and, therefore, is not stored.

Transfer sequence (Float)

| 1                            | 2                           | 3                             | 4                            |
|------------------------------|-----------------------------|-------------------------------|------------------------------|
| Data Low Word ,<br>High Byte | Data Low Word ,<br>Low Byte | Data High Word ,<br>High Byte | Data High Word ,<br>Low Byte |

Transfer sequence (Inverse Integer)

| 1                             | 2                            | 3                            | 4                           |
|-------------------------------|------------------------------|------------------------------|-----------------------------|
| Data High Word ,<br>High Byte | Data High Word ,<br>Low Byte | Data Low Word ,<br>High Byte | Data Low Word ,<br>Low Byte |

Transfer sequence (Integer)

| 1                            | 2                           | 3                             | 4                            |
|------------------------------|-----------------------------|-------------------------------|------------------------------|
| Data Low Word ,<br>High Byte | Data Low Word ,<br>Low Byte | Data High Word ,<br>High Byte | Data High Word ,<br>Low Byte |

## 6.2.2 Modbus Register

- Modbus Module #1 – Coil: Relay Value

| Parameter name         | Modbus Register |        | Len  | Data Type | Range             | Default value | Comment |
|------------------------|-----------------|--------|------|-----------|-------------------|---------------|---------|
|                        | Modicom Format  | Hex    |      |           |                   |               |         |
| DO 0                   | 04097           | 0x1000 | Word | Byte      | 0 = OFF<br>1 = ON | 0             |         |
| DO 1                   | 04098           | 0x1001 | Word | Byte      | 0 = OFF<br>1 = ON | 0             |         |
| DO 0<br>Power On Value | 04113           | 0x1010 | Word | Byte      | 0 = OFF<br>1 = ON | 0             |         |
| DO 1<br>Power On Value | 04114           | 0x1011 | Word | Byte      | 0 = OFF<br>1 = ON | 0             |         |

- Modbus Module #2 – Holding Register : System Parameter Setting

| Parameter name    | Modbus Register |        | Len  | Data Type | Range                                        | Default value | Units | Comment                           |
|-------------------|-----------------|--------|------|-----------|----------------------------------------------|---------------|-------|-----------------------------------|
|                   | Modicom Format  | Hex    |      |           |                                              |               |       |                                   |
| PT_Ratio          | 44097           | 0x1000 | Word | UInt      | 1-65535                                      | 100           | 0.01  |                                   |
| CT_Ratio_1        | 44098           | 0x1001 | Word | UInt      | 1-65535                                      | 1             |       | For Submeter1                     |
| CT_Ratio_2        | 44099           | 0x1002 | Word | UInt      | 1-65535                                      | 1             |       | For Submeter2                     |
| CT_Ratio_3        | 44100           | 0x1003 | Word | UInt      | 1-65535                                      | 1             |       | For Submeter3                     |
| CT_Ratio_4        | 44101           | 0x1004 | Word | UInt      | 1-65535                                      | 1             |       | For Submeter4                     |
| CT_Ratio_5        | 44102           | 0x1005 | Word | UInt      | 1-65535                                      | 1             |       | For Submeter5                     |
| CT_Ratio_6        | 44103           | 0x1006 | Word | UInt      | 1-65535                                      | 1             |       | For Submeter6                     |
| CT_Ratio_7        | 44104           | 0x1007 | Word | UInt      | 1-65535                                      | 1             |       | For Submeter7                     |
| CT_Ratio_8        | 44105           | 0x1008 | Word | UInt      | 1-65535                                      | 1             |       | For Submeter8                     |
| Default Frequency | 44106           | 0x1009 | Word | UInt      | 0x0055: Auto<br>0x0064: 50Hz<br>0x0078: 60Hz | 0x0055        |       | Re-power the module after setting |

|                                     |       |        |      |      |                                                                                                                                             |   |  |                                                        |
|-------------------------------------|-------|--------|------|------|---------------------------------------------------------------------------------------------------------------------------------------------|---|--|--------------------------------------------------------|
| Wiring Mode                         | 44107 | 0x100A | Word | UInt | 1: 1P2W<br>2: 1P3W<br>3: 3P3W2CT<br>4: 3P3W3CT<br>5: 3P4W3CT                                                                                | 5 |  | Only work when<br>SW9-SW10 is all<br>off               |
| Set Energy to Zero                  | 44108 | 0x100B | Word | UInt | 1: submeter1<br>2: submeter2<br>3: submeter3<br>4: submeter4<br>5: submeter5<br>6: submeter6<br>7: submeter7<br>8: submeter8<br>0x0055: ALL |   |  | Only Write                                             |
| Reset to Factory<br>Settings        | 44109 | 0x100C | Word | UInt | 0x0055                                                                                                                                      |   |  | Only Write,<br>Re-power the<br>module after<br>setting |
| Parity                              | 44110 | 0x100D | Word | UInt | 0: None<br>1: Odd Parity<br>2: Even Parity                                                                                                  | 0 |  | Only work for<br>RS-485<br>Interface                   |
| Stop Bit                            | 44111 | 0x100E | Word | UInt | 1: 1 stop bit<br>2: 2 stop bits                                                                                                             | 1 |  | Only work for<br>RS-485<br>Interface                   |
| Energy Absolute<br>Accumulated Mode | 44113 | 0x1010 | Word | UInt | 0: Enable<br>1: Disable                                                                                                                     | 0 |  |                                                        |
| Harmonic Phase<br>Select 1          | 44114 | 0x1011 | Word | UInt | 0: Disable<br>1: Phase A<br>2: Phase B<br>3: Phase C                                                                                        | 0 |  | For Submeter1                                          |
| Harmonic Phase<br>Select 2          | 44115 | 0x1012 | Word | UInt | 0: Disable<br>1: Phase A<br>2: Phase B<br>3: Phase C                                                                                        | 0 |  | For Submeter2                                          |

|                |       |        |      |      |            |   |  |               |
|----------------|-------|--------|------|------|------------|---|--|---------------|
| Harmonic Phase | 44116 | 0x1013 | Word | UInt | 0: Disable | 0 |  | For Submeter3 |
|----------------|-------|--------|------|------|------------|---|--|---------------|

|                            |       |        |      |      |                                                      |   |  |               |
|----------------------------|-------|--------|------|------|------------------------------------------------------|---|--|---------------|
| Select 3                   |       |        |      |      | 1: Phase A<br>2: Phase B<br>3: Phase C               |   |  |               |
| Harmonic Phase<br>Select 4 | 44117 | 0x1014 | Word | UInt | 0: Disable<br>1: Phase A<br>2: Phase B<br>3: Phase C | 0 |  | For Submeter4 |
| Harmonic Phase<br>Select 5 | 44118 | 0x1015 | Word | UInt | 0: Disable<br>1: Phase A<br>2: Phase B<br>3: Phase C | 0 |  | For Submeter5 |
| Harmonic Phase<br>Select 6 | 44119 | 0x1016 | Word | UInt | 0: Disable<br>1: Phase A<br>2: Phase B<br>3: Phase C | 0 |  | For Submeter6 |
| Harmonic Phase<br>Select 7 | 44120 | 0x1017 | Word | UInt | 0: Disable<br>1: Phase A<br>2: Phase B<br>3: Phase C | 0 |  | For Submeter7 |
| Harmonic Phase<br>Select 8 | 44121 | 0x1018 | Word | UInt | 0: Disable<br>1: Phase A<br>2: Phase B<br>3: Phase C | 0 |  | For Submeter8 |
| Display Voltage            | 44122 | 0x1019 | Word | UInt | 0: Automatic<br>1: Show as VIn<br>2: Show as Vll     | 0 |  | Refer to Q13  |

● Modbus Module #3 — Input Register : System Information

| Parameter name | Modbus Register |        | Len  | Data Type | Range   | Default value | Units | Comment    |
|----------------|-----------------|--------|------|-----------|---------|---------------|-------|------------|
|                | Modicom Format  | Hex    |      |           |         |               |       |            |
| Wiring Type    | 30513           | 0x0200 | Word | UInt      | 9: 1P2W | 13            |       | (HW) : set |

|                  |       |        |      |      |                                                                                                                            |        |  |                                     |
|------------------|-------|--------|------|------|----------------------------------------------------------------------------------------------------------------------------|--------|--|-------------------------------------|
|                  |       |        |      |      | 10: 1P3W<br>11: 3P3W2CT<br>12: 3P3W3CT<br>13: 3P4W3CT<br>14: 3P3W2CT<br>(HW)<br>15: 3P3W3CT<br>(HW)<br>16: 3P4W3CT<br>(HW) |        |  | wiring by<br>hardware Dip<br>Switch |
| Phase Sequence   | 30514 | 0x0201 | Word | UInt | 0: Negative<br>(ACB)<br>1: Positive<br>(ABC)                                                                               |        |  | Only work<br>when<br>3P4W3CT        |
| Model Name       | 30515 | 0x0202 | Word | UInt | 4324: PM-4324                                                                                                              | 4324   |  |                                     |
| Model Type       | 30516 | 0x0203 | Word | UInt | 0x0001: 50Hz<br>0x0002: 60Hz                                                                                               | 0x0002 |  |                                     |
| Firmware Version | 30517 | 0x0204 | Word | BCD  |                                                                                                                            | 0x0100 |  | Ver. 1.0                            |

● Modbus Module #4 — Input Register :Power value (Float) for Submeter1

| Parameter name | Modbus Register |               | Len   | Data Type | Range | Units | Comment  |
|----------------|-----------------|---------------|-------|-----------|-------|-------|----------|
|                | Modicom Format  | Hex           |       |           |       |       |          |
| V_a            | 34353-34354     | 0x1100-0x1101 | DWord | Float     |       | Volt  | For CT_1 |
| I_a            | 34355-34356     | 0x1102-0x1103 | DWord | Float     |       | Amp   |          |
| kW_a           | 34357-34358     | 0x1104-0x1105 | DWord | Float     |       | kW    |          |
| kvar_a         | 34359-34360     | 0x1106-0x1107 | DWord | Float     |       | kvar  |          |
| kVA_a          | 34361-34362     | 0x1108-0x1109 | DWord | Float     |       | kVA   |          |
| PF_a           | 34363-34364     | 0x110A-0x110B | DWord | Float     |       |       |          |
| kWh_a          | 34365-34366     | 0x110C-0x110D | DWord | Float     |       |       |          |
| kvarh_a        | 34367-34368     | 0x110E-0x110F | DWord | Float     |       |       |          |
| kVAh_a         | 34369-34370     | 0x1110-0x1111 | DWord | Float     |       |       | For CT_2 |
| V_b            | 34371-34372     | 0x1112-0x1113 | DWord | Float     |       | Volt  |          |
| I_b            | 34373-34374     | 0x1114-0x1115 | DWord | Float     |       | Amp   |          |
| kW_b           | 34375-34376     | 0x1116-0x1117 | DWord | Float     |       | kW    |          |
| kvar_b         | 34377-34378     | 0x1118-0x1119 | DWord | Float     |       | kvar  |          |
| kVA_b          | 34379-34380     | 0x111A-0x111B | DWord | Float     |       | kVA   |          |
| PF_b           | 34381-34382     | 0x111C-0x111D | DWord | Float     |       |       |          |
| kWh_b          | 34383-34384     | 0x111E-0x111F | DWord | Float     |       |       |          |
| kvarh_b        | 34385-34386     | 0x1120-0x1121 | DWord | Float     |       |       | For CT_3 |
| kVAh_b         | 34387-34388     | 0x1122-0x1123 | DWord | Float     |       |       |          |
| V_c            | 34389-34390     | 0x1124-0x1125 | DWord | Float     |       | Volt  |          |
| I_c            | 34391-34392     | 0x1126-0x1127 | DWord | Float     |       | Amp   |          |
| kW_c           | 34393-34394     | 0x1128-0x1129 | DWord | Float     |       | kW    |          |
| kvar_c         | 34395-34396     | 0x112A-0x112B | DWord | Float     |       | kvar  |          |
| kVA_c          | 34397-34398     | 0x112C-0x112D | DWord | Float     |       | kVA   |          |
| PF_c           | 34399-34400     | 0x112E-0x112F | DWord | Float     |       |       |          |
| kWh_c          | 34401-34402     | 0x1130-0x1131 | DWord | Float     |       |       |          |
| kvarh_c        | 34403-34404     | 0x1132-0x1133 | DWord | Float     |       |       |          |
| kVAh_c         | 34405-34406     | 0x1134-0x1135 | DWord | Float     |       |       |          |
| V_avg          | 34407-34408     | 0x1136-0x1137 | DWord | Float     |       | Volt  |          |
| I_avg          | 34409-34410     | 0x1138-0x1139 | DWord | Float     |       | Amp   |          |
| kW_tot         | 34411-34412     | 0x113A-0x113B | DWord | Float     |       | kW    |          |
| kvar_tot       | 34413-34414     | 0x113C-0x113D | DWord | Float     |       | kvar  |          |
| kVA_tot        | 34415-34416     | 0x113E-0x113F | DWord | Float     |       | kVA   |          |

|           |             |               |       |       |       |    |                                                     |
|-----------|-------------|---------------|-------|-------|-------|----|-----------------------------------------------------|
| PF_tot    | 34417-34418 | 0x1140-0x1141 | DWord | Float |       |    |                                                     |
| kWh_tot   | 34419-34420 | 0x1142-0x1143 | DWord | Float |       |    |                                                     |
| kvarh_tot | 34421-34422 | 0x1144-0x1145 | DWord | Float |       |    |                                                     |
| kVAh_tot  | 34423-34424 | 0x1146-0x1147 | DWord | Float |       |    |                                                     |
| Freq_a    | 34425-34426 | 0x1148-0x1149 | DWord | Float | 45~65 | Hz | For CT_1                                            |
| Freq_b    | 34427-34428 | 0x114A-0x114B | DWord | Float | 45~65 | Hz | For CT_2                                            |
| Freq_c    | 34429-34430 | 0x114C-0x114D | DWord | Float | 45~65 | Hz | For CT_3                                            |
| Freq_max  | 34431-34432 | 0x114E-0x114F | DWord | Float | 45~65 | Hz |                                                     |
| VTHD      | 34459-34460 | 0x116A-0x116B | DWord | Float | 0~4   |    | Phase set by<br>Harmonic Phase<br>Select 1 Register |
| ITHD      | 34461-34462 | 0x116C-0x116D | DWord | Float | 0~4   |    |                                                     |

● Modbus Module #5 — Input Register :Power value (Float) for Submeter2

| Parameter name | Modbus Register |               | Len   | Data Type | Range | Units | Comment  |
|----------------|-----------------|---------------|-------|-----------|-------|-------|----------|
|                | Modicom Format  | Hex           |       |           |       |       |          |
| V_a            | 34609-34610     | 0x1200-0x1201 | DWord | Float     |       | Volt  | For CT_4 |
| I_a            | 34611-34612     | 0x1202-0x1203 | DWord | Float     |       | Amp   |          |
| kW_a           | 34613-34614     | 0x1204-0x1205 | DWord | Float     |       | kW    |          |
| kvar_a         | 34615-34616     | 0x1206-0x1207 | DWord | Float     |       | kvar  |          |
| kVA_a          | 34617-34618     | 0x1208-0x1209 | DWord | Float     |       | kVA   |          |
| PF_a           | 34619-34620     | 0x120A-0x120B | DWord | Float     |       |       |          |
| kWh_a          | 34621-34622     | 0x120C-0x120D | DWord | Float     |       |       |          |
| kvarh_a        | 34623-34624     | 0x120E-0x120F | DWord | Float     |       |       |          |
| kVAh_a         | 34625-34626     | 0x1210-0x1211 | DWord | Float     |       |       |          |
| V_b            | 34627-34628     | 0x1212-0x1213 | DWord | Float     |       | Volt  | For CT_5 |
| I_b            | 34629-34630     | 0x1214-0x1215 | DWord | Float     |       | Amp   |          |
| kW_b           | 34631-34632     | 0x1216-0x1217 | DWord | Float     |       | kW    |          |
| kvar_b         | 34633-34634     | 0x1218-0x1219 | DWord | Float     |       | kvar  |          |
| kVA_b          | 34635-34636     | 0x121A-0x121B | DWord | Float     |       | kVA   |          |
| PF_b           | 34637-34638     | 0x121C-0x121D | DWord | Float     |       |       |          |
| kWh_b          | 34639-34640     | 0x121E-0x121F | DWord | Float     |       |       |          |
| kvarh_b        | 34641-34642     | 0x1220-0x1221 | DWord | Float     |       |       |          |
| kVAh_b         | 34643-34644     | 0x1222-0x1223 | DWord | Float     |       |       |          |
| V_c            | 34645-34646     | 0x1224-0x1225 | DWord | Float     |       | Volt  | For CT_6 |
| I_c            | 34647-34648     | 0x1226-0x1227 | DWord | Float     |       | Amp   |          |
| kW_c           | 34649-34650     | 0x1228-0x1229 | DWord | Float     |       | kW    |          |

|           |             |               |       |       |       |      |                                                             |
|-----------|-------------|---------------|-------|-------|-------|------|-------------------------------------------------------------|
| kvar_c    | 34651-34652 | 0x122A-0x122B | DWord | Float |       | kvar |                                                             |
| kVA_c     | 34653-34654 | 0x122C-0x122D | DWord | Float |       | kVA  |                                                             |
| PF_c      | 34655-34656 | 0x122E-0x122F | DWord | Float |       |      |                                                             |
| kWh_c     | 34657-34658 | 0x1230-0x1231 | DWord | Float |       |      |                                                             |
| kvarh_c   | 34659-34660 | 0x1232-0x1233 | DWord | Float |       |      |                                                             |
| kVAh_c    | 34661-34662 | 0x1234-0x1235 | DWord | Float |       |      |                                                             |
| V_avg     | 34663-34664 | 0x1236-0x1237 | DWord | Float |       | Volt |                                                             |
| I_avg     | 34665-34666 | 0x1238-0x1239 | DWord | Float |       | Amp  |                                                             |
| kW_tot    | 34667-34668 | 0x123A-0x123B | DWord | Float |       | kW   |                                                             |
| kvar_tot  | 34669-34670 | 0x123C-0x123D | DWord | Float |       | kvar |                                                             |
| kVA_tot   | 34671-34672 | 0x123E-0x123F | DWord | Float |       | kVA  |                                                             |
| PF_tot    | 34673-34674 | 0x1240-0x1241 | DWord | Float |       |      |                                                             |
| kWh_tot   | 34675-34676 | 0x1242-0x1243 | DWord | Float |       |      |                                                             |
| kvarh_tot | 34677-34678 | 0x1244-0x1245 | DWord | Float |       |      |                                                             |
| kVAh_tot  | 34679-34680 | 0x1246-0x1247 | DWord | Float |       |      |                                                             |
| Freq_a    | 34681-34682 | 0x1248-0x1249 | DWord | Float | 45~65 | Hz   | For CT_4                                                    |
| Freq_b    | 34683-34684 | 0x124A-0x124B | DWord | Float | 45~65 | Hz   | For CT_5                                                    |
| Freq_c    | 34685-34686 | 0x124C-0x124D | DWord | Float | 45~65 | Hz   | For CT_6                                                    |
| Freq_max  | 34687-34688 | 0x124E-0x124F | DWord | Float | 45~65 | Hz   |                                                             |
| VTHD      | 34715-34716 | 0x126A-0x126B | DWord | Float | 0~4   |      | Phase set by<br><b>Harmonic Phase<br/>Select 2</b> Register |
| ITHD      | 34717-34718 | 0x126C-0x126D | DWord | Float | 0~4   |      |                                                             |

● Modbus Module #6 — Input Register :Power value (Float) for Submeter3

| Parameter name | Modbus Register |               | Len   | Data Type | Range | Units | Comment  |
|----------------|-----------------|---------------|-------|-----------|-------|-------|----------|
|                | Modicom Format  | Hex           |       |           |       |       |          |
| V_a            | 34865-34866     | 0x1300-0x1301 | DWord | Float     |       | Volt  | For CT_7 |
| I_a            | 34867-34868     | 0x1302-0x1303 | DWord | Float     |       | Amp   |          |
| kW_a           | 34869-34870     | 0x1304-0x1305 | DWord | Float     |       | kW    |          |
| kvar_a         | 34871-34872     | 0x1306-0x1307 | DWord | Float     |       | kvar  |          |
| kVA_a          | 34873-34874     | 0x1308-0x1309 | DWord | Float     |       | kVA   |          |
| PF_a           | 34875-34876     | 0x130A-0x130B | DWord | Float     |       |       |          |
| kWh_a          | 34877-34878     | 0x130C-0x130D | DWord | Float     |       |       |          |
| kvarh_a        | 34879-34880     | 0x130E-0x130F | DWord | Float     |       |       |          |
| kVAh_a         | 34881-34882     | 0x1310-0x1311 | DWord | Float     |       |       |          |
| V_b            | 34883-34884     | 0x1312-0x1313 | DWord | Float     |       | Volt  | For CT_8 |

|           |             |               |       |       |       |      |                                                             |
|-----------|-------------|---------------|-------|-------|-------|------|-------------------------------------------------------------|
| I_b       | 34885-34886 | 0x1314-0x1315 | DWord | Float |       | Amp  |                                                             |
| kW_b      | 34887-34888 | 0x1316-0x1317 | DWord | Float |       | kW   |                                                             |
| kvar_b    | 34889-34890 | 0x1318-0x1319 | DWord | Float |       | kvar |                                                             |
| kVA_b     | 34891-34892 | 0x131A-0x131B | DWord | Float |       | kVA  |                                                             |
| PF_b      | 34893-34894 | 0x131C-0x131D | DWord | Float |       |      |                                                             |
| kWh_b     | 34895-34896 | 0x131E-0x131F | DWord | Float |       |      |                                                             |
| kvarh_b   | 34897-34898 | 0x1320-0x1321 | DWord | Float |       |      |                                                             |
| kVAh_b    | 34899-34900 | 0x1322-0x1323 | DWord | Float |       |      |                                                             |
| V_c       | 34901-34902 | 0x1324-0x1325 | DWord | Float |       | Volt | For CT_9                                                    |
| I_c       | 34903-34904 | 0x1326-0x1327 | DWord | Float |       | Amp  |                                                             |
| kW_c      | 34905-34906 | 0x1328-0x1329 | DWord | Float |       | kW   |                                                             |
| kvar_c    | 34907-34908 | 0x132A-0x132B | DWord | Float |       | kvar |                                                             |
| kVA_c     | 34909-34910 | 0x132C-0x132D | DWord | Float |       | kVA  |                                                             |
| PF_c      | 34911-34912 | 0x132E-0x132F | DWord | Float |       |      |                                                             |
| kWh_c     | 34913-34914 | 0x1330-0x1331 | DWord | Float |       |      |                                                             |
| kvarh_c   | 34915-34916 | 0x1332-0x1333 | DWord | Float |       |      |                                                             |
| kVAh_c    | 34917-34918 | 0x1334-0x1335 | DWord | Float |       |      |                                                             |
| V_avg     | 34919-34920 | 0x1336-0x1337 | DWord | Float |       | Volt |                                                             |
| I_avg     | 34921-34922 | 0x1338-0x1339 | DWord | Float |       | Amp  |                                                             |
| kW_tot    | 34923-34924 | 0x133A-0x133B | DWord | Float |       | kW   |                                                             |
| kvar_tot  | 34925-34926 | 0x133C-0x133D | DWord | Float |       | kvar |                                                             |
| kVA_tot   | 34927-34928 | 0x133E-0x133F | DWord | Float |       | kVA  |                                                             |
| PF_tot    | 34929-34930 | 0x1340-0x1341 | DWord | Float |       |      |                                                             |
| kWh_tot   | 34931-34932 | 0x1342-0x1343 | DWord | Float |       |      |                                                             |
| kvarh_tot | 34933-34934 | 0x1344-0x1345 | DWord | Float |       |      |                                                             |
| kVAh_tot  | 34935-34936 | 0x1346-0x1347 | DWord | Float |       |      |                                                             |
| Freq_a    | 34937-34938 | 0x1348-0x1349 | DWord | Float | 45~65 | Hz   | For CT_7                                                    |
| Freq_b    | 34939-34940 | 0x134A-0x134B | DWord | Float | 45~65 | Hz   | For CT_8                                                    |
| Freq_c    | 34941-34942 | 0x134C-0x134D | DWord | Float | 45~65 | Hz   | For CT_9                                                    |
| Freq_max  | 34943-34944 | 0x134E-0x134F | DWord | Float | 45~65 | Hz   |                                                             |
| VTHD      | 34971-34972 | 0x136A-0x136B | DWord | Float | 0~4   |      | Phase set by<br><b>Harmonic Phase<br/>Select 3</b> Register |
| ITHD      | 34973-34974 | 0x136C-0x136D | DWord | Float | 0~4   |      |                                                             |

● Modbus Module #7 — Input Register :Power value (Float) for Submeter4

| Parameter | Modbus Register | Len | Data Type | Range | Units | Comment |
|-----------|-----------------|-----|-----------|-------|-------|---------|
|-----------|-----------------|-----|-----------|-------|-------|---------|

| name      | Modicom Format | Hex           |       |       |  |      |           |
|-----------|----------------|---------------|-------|-------|--|------|-----------|
| V_a       | 35121-35122    | 0x1400-0x1401 | DWord | Float |  | Volt | For CT_10 |
| I_a       | 35123-35124    | 0x1402-0x1403 | DWord | Float |  | Amp  |           |
| kW_a      | 35125-35126    | 0x1404-0x1405 | DWord | Float |  | kW   |           |
| kvar_a    | 35127-35128    | 0x1406-0x1407 | DWord | Float |  | kvar |           |
| kVA_a     | 35129-35130    | 0x1408-0x1409 | DWord | Float |  | kVA  |           |
| PF_a      | 35131-35132    | 0x140A-0x140B | DWord | Float |  |      |           |
| kWh_a     | 35133-35134    | 0x140C-0x140D | DWord | Float |  |      |           |
| kvarh_a   | 35135-35136    | 0x140E-0x140F | DWord | Float |  |      |           |
| kVAh_a    | 35137-35138    | 0x1410-0x1411 | DWord | Float |  |      |           |
| V_b       | 35139-35140    | 0x1412-0x1413 | DWord | Float |  | Volt | For CT_11 |
| I_b       | 35141-35142    | 0x1414-0x1415 | DWord | Float |  | Amp  |           |
| kW_b      | 35143-35144    | 0x1416-0x1417 | DWord | Float |  | kW   |           |
| kvar_b    | 35145-35146    | 0x1418-0x1419 | DWord | Float |  | kvar |           |
| kVA_b     | 35147-35148    | 0x141A-0x141B | DWord | Float |  | kVA  |           |
| PF_b      | 35149-35150    | 0x141C-0x141D | DWord | Float |  |      |           |
| kWh_b     | 35151-35152    | 0x141E-0x141F | DWord | Float |  |      |           |
| kvarh_b   | 35153-35154    | 0x1420-0x1421 | DWord | Float |  |      |           |
| kVAh_b    | 35155-35156    | 0x1422-0x1423 | DWord | Float |  |      |           |
| V_c       | 35157-35158    | 0x1424-0x1425 | DWord | Float |  | Volt | For CT_12 |
| I_c       | 35159-35160    | 0x1426-0x1427 | DWord | Float |  | Amp  |           |
| kW_c      | 35161-35162    | 0x1428-0x1429 | DWord | Float |  | kW   |           |
| kvar_c    | 35163-35164    | 0x142A-0x142B | DWord | Float |  | kvar |           |
| kVA_c     | 35165-35166    | 0x142C-0x142D | DWord | Float |  | kVA  |           |
| PF_c      | 35167-35168    | 0x142E-0x142F | DWord | Float |  |      |           |
| kWh_c     | 35169-35170    | 0x1430-0x1431 | DWord | Float |  |      |           |
| kvarh_c   | 35171-35172    | 0x1432-0x1433 | DWord | Float |  |      |           |
| kVAh_c    | 35173-35174    | 0x1434-0x1435 | DWord | Float |  |      |           |
| V_avg     | 35175-35176    | 0x1436-0x1437 | DWord | Float |  | Volt |           |
| I_avg     | 35177-35178    | 0x1438-0x1439 | DWord | Float |  | Amp  |           |
| kW_tot    | 35179-35180    | 0x143A-0x143B | DWord | Float |  | kW   |           |
| kvar_tot  | 35181-35182    | 0x143C-0x143D | DWord | Float |  | kvar |           |
| kVA_tot   | 35183-35184    | 0x143E-0x143F | DWord | Float |  | kVA  |           |
| PF_tot    | 35185-35186    | 0x1440-0x1441 | DWord | Float |  |      |           |
| kWh_tot   | 35187-35188    | 0x1442-0x1443 | DWord | Float |  |      |           |
| kvarh_tot | 35189-35190    | 0x1444-0x1445 | DWord | Float |  |      |           |

|          |             |               |       |       |       |    |                                                             |
|----------|-------------|---------------|-------|-------|-------|----|-------------------------------------------------------------|
| kVAh_tot | 35191-35192 | 0x1446-0x1447 | DWord | Float |       |    |                                                             |
| Freq_a   | 35193-35194 | 0x1448-0x1449 | DWord | Float | 45~65 | Hz | For CT_10                                                   |
| Freq_b   | 35195-35196 | 0x144A-0x144B | DWord | Float | 45~65 | Hz | For CT_11                                                   |
| Freq_c   | 35197-35198 | 0x144C-0x144D | DWord | Float | 45~65 | Hz | For CT_12                                                   |
| Freq_max | 35199-35200 | 0x144E-0x144F | DWord | Float | 45~65 | Hz |                                                             |
| VTHD     | 35227-35228 | 0x146A-0x146B | DWord | Float | 0~4   |    | Phase set by<br><b>Harmonic Phase<br/>Select 4</b> Register |
| ITHD     | 35229-35230 | 0x146C-0x146D | DWord | Float | 0~4   |    |                                                             |

● Modbus Module #8 — Input Register :Power value (Float) for Submeter5

| Parameter name | Modbus Register |               | Len   | Data Type | Range | Units | Comment   |
|----------------|-----------------|---------------|-------|-----------|-------|-------|-----------|
|                | Modicom Format  | Hex           |       |           |       |       |           |
| V_a            | 35377-35378     | 0x1500-0x1501 | DWord | Float     |       | Volt  | For CT_13 |
| I_a            | 35379-35380     | 0x1502-0x1503 | DWord | Float     |       | Amp   |           |
| kW_a           | 35381-35382     | 0x1504-0x1505 | DWord | Float     |       | kW    |           |
| kvar_a         | 35383-35384     | 0x1506-0x1507 | DWord | Float     |       | kvar  |           |
| kVA_a          | 35385-35386     | 0x1508-0x1509 | DWord | Float     |       | kVA   |           |
| PF_a           | 35387-35388     | 0x150A-0x150B | DWord | Float     |       |       |           |
| kWh_a          | 35389-35390     | 0x150C-0x150D | DWord | Float     |       |       |           |
| kvarh_a        | 35391-35392     | 0x150E-0x150F | DWord | Float     |       |       |           |
| kVAh_a         | 35393-35394     | 0x1510-0x1511 | DWord | Float     |       |       | For CT_14 |
| V_b            | 35395-35396     | 0x1512-0x1513 | DWord | Float     |       | Volt  |           |
| I_b            | 35397-35398     | 0x1514-0x1515 | DWord | Float     |       | Amp   |           |
| kW_b           | 35399-35400     | 0x1516-0x1517 | DWord | Float     |       | kW    |           |
| kvar_b         | 35401-35402     | 0x1518-0x1519 | DWord | Float     |       | kvar  |           |
| kVA_b          | 35403-35404     | 0x151A-0x151B | DWord | Float     |       | kVA   |           |
| PF_b           | 35405-35406     | 0x151C-0x151D | DWord | Float     |       |       |           |
| kWh_b          | 35407-35408     | 0x151E-0x151F | DWord | Float     |       |       |           |
| kvarh_b        | 35409-35410     | 0x1520-0x1521 | DWord | Float     |       |       | For CT_15 |
| kVAh_b         | 35411-35412     | 0x1522-0x1523 | DWord | Float     |       |       |           |
| V_c            | 35413-35414     | 0x1524-0x1525 | DWord | Float     |       | Volt  |           |
| I_c            | 35415-35416     | 0x1526-0x1527 | DWord | Float     |       | Amp   |           |
| kW_c           | 35417-35418     | 0x1528-0x1529 | DWord | Float     |       | kW    |           |
| kvar_c         | 35419-35420     | 0x152A-0x152B | DWord | Float     |       | kvar  |           |
| kVA_c          | 35421-35422     | 0x152C-0x152D | DWord | Float     |       | kVA   |           |
| PF_c           | 35423-35424     | 0x152E-0x152F | DWord | Float     |       |       |           |

|           |             |               |       |       |       |      |                                                             |
|-----------|-------------|---------------|-------|-------|-------|------|-------------------------------------------------------------|
| kWh_c     | 35425-35426 | 0x1530-0x1531 | DWord | Float |       |      |                                                             |
| kvarh_c   | 35427-35428 | 0x1532-0x1533 | DWord | Float |       |      |                                                             |
| kVAh_c    | 35429-35430 | 0x1534-0x1535 | DWord | Float |       |      |                                                             |
| V_avg     | 35431-35432 | 0x1536-0x1537 | DWord | Float |       | Volt |                                                             |
| I_avg     | 35433-35434 | 0x1538-0x1539 | DWord | Float |       | Amp  |                                                             |
| kW_tot    | 35435-35436 | 0x153A-0x153B | DWord | Float |       | kW   |                                                             |
| kvar_tot  | 35437-35438 | 0x153C-0x153D | DWord | Float |       | kvar |                                                             |
| kVA_tot   | 35439-35440 | 0x153E-0x153F | DWord | Float |       | kVA  |                                                             |
| PF_tot    | 35441-35442 | 0x1540-0x1541 | DWord | Float |       |      |                                                             |
| kWh_tot   | 35443-35444 | 0x1542-0x1543 | DWord | Float |       |      |                                                             |
| kvarh_tot | 35445-35446 | 0x1544-0x1545 | DWord | Float |       |      |                                                             |
| kVAh_tot  | 35447-35448 | 0x1546-0x1547 | DWord | Float |       |      |                                                             |
| Freq_a    | 35449-35450 | 0x1548-0x1549 | DWord | Float | 45~65 | Hz   | For CT_13                                                   |
| Freq_b    | 35451-35452 | 0x154A-0x154B | DWord | Float | 45~65 | Hz   | For CT_14                                                   |
| Freq_c    | 35453-35454 | 0x154C-0x154D | DWord | Float | 45~65 | Hz   | For CT_15                                                   |
| Freq_max  | 35455-35456 | 0x154E-0x154F | DWord | Float | 45~65 | Hz   |                                                             |
| VTHD      | 35483-35484 | 0x156A-0x156B | DWord | Float | 0~4   |      | Phase set by<br><b>Harmonic Phase<br/>Select 5</b> Register |
| ITHD      | 35485-35486 | 0x156C-0x156D | DWord | Float | 0~4   |      |                                                             |

● Modbus Module #9 — Input Register :Power value (Float) for Submeter6

| Parameter name | Modbus Register |               | Len   | Data Type | Range | Units | Comment   |
|----------------|-----------------|---------------|-------|-----------|-------|-------|-----------|
|                | Modicom Format  | Hex           |       |           |       |       |           |
| V_a            | 35633-35634     | 0x1600-0x1601 | DWord | Float     |       | Volt  | For CT_16 |
| I_a            | 35635-35636     | 0x1602-0x1603 | DWord | Float     |       | Amp   |           |
| kW_a           | 35637-35638     | 0x1604-0x1605 | DWord | Float     |       | kW    |           |
| kvar_a         | 35639-35640     | 0x1606-0x1607 | DWord | Float     |       | kvar  |           |
| kVA_a          | 35641-35642     | 0x1608-0x1609 | DWord | Float     |       | kVA   |           |
| PF_a           | 35643-35644     | 0x160A-0x160B | DWord | Float     |       |       |           |
| kWh_a          | 35645-35646     | 0x160C-0x160D | DWord | Float     |       |       |           |
| kvarh_a        | 35647-35648     | 0x160E-0x160F | DWord | Float     |       |       |           |
| kVAh_a         | 35649-35650     | 0x1610-0x1611 | DWord | Float     |       |       |           |

|           |             |               |       |       |       |      |                                                             |
|-----------|-------------|---------------|-------|-------|-------|------|-------------------------------------------------------------|
| V_b       | 35651-35652 | 0x1612-0x1613 | DWord | Float |       | Volt | For CT_17                                                   |
| I_b       | 35653-35654 | 0x1614-0x1615 | DWord | Float |       | Amp  |                                                             |
| kW_b      | 35655-35656 | 0x1616-0x1617 | DWord | Float |       | kW   |                                                             |
| kvar_b    | 35657-35658 | 0x1618-0x1619 | DWord | Float |       | kvar |                                                             |
| kVA_b     | 35659-35660 | 0x161A-0x161B | DWord | Float |       | kVA  |                                                             |
| PF_b      | 35661-35662 | 0x161C-0x161D | DWord | Float |       |      |                                                             |
| kWh_b     | 35663-35664 | 0x161E-0x161F | DWord | Float |       |      |                                                             |
| kvarh_b   | 35665-35666 | 0x1620-0x1621 | DWord | Float |       |      |                                                             |
| kVAh_b    | 35667-35668 | 0x1622-0x1623 | DWord | Float |       |      |                                                             |
| V_c       | 35669-35670 | 0x1624-0x1625 | DWord | Float |       | Volt | For CT_18                                                   |
| I_c       | 35671-35672 | 0x1626-0x1627 | DWord | Float |       | Amp  |                                                             |
| kW_c      | 35673-35674 | 0x1628-0x1629 | DWord | Float |       | kW   |                                                             |
| kvar_c    | 35675-35676 | 0x162A-0x162B | DWord | Float |       | kvar |                                                             |
| kVA_c     | 35677-35678 | 0x162C-0x162D | DWord | Float |       | kVA  |                                                             |
| PF_c      | 35679-35680 | 0x162E-0x162F | DWord | Float |       |      |                                                             |
| kWh_c     | 35681-35682 | 0x1630-0x1631 | DWord | Float |       |      |                                                             |
| kvarh_c   | 35683-35684 | 0x1632-0x1633 | DWord | Float |       |      |                                                             |
| kVAh_c    | 35685-35686 | 0x1634-0x1635 | DWord | Float |       |      |                                                             |
| V_avg     | 35687-35688 | 0x1636-0x1637 | DWord | Float |       | Volt |                                                             |
| I_avg     | 35689-35690 | 0x1638-0x1639 | DWord | Float |       | Amp  |                                                             |
| kW_tot    | 35691-35692 | 0x163A-0x163B | DWord | Float |       | kW   |                                                             |
| kvar_tot  | 35693-35694 | 0x163C-0x163D | DWord | Float |       | kvar |                                                             |
| kVA_tot   | 35695-35696 | 0x163E-0x163F | DWord | Float |       | kVA  |                                                             |
| PF_tot    | 35697-35698 | 0x1640-0x1641 | DWord | Float |       |      |                                                             |
| kWh_tot   | 35699-35700 | 0x1642-0x1643 | DWord | Float |       |      |                                                             |
| kvarh_tot | 35701-35702 | 0x1644-0x1645 | DWord | Float |       |      |                                                             |
| kVAh_tot  | 35703-35704 | 0x1646-0x1647 | DWord | Float |       |      |                                                             |
| Freq_a    | 35705-35706 | 0x1648-0x1649 | DWord | Float | 45~65 | Hz   | For CT_16                                                   |
| Freq_b    | 35707-35708 | 0x164A-0x164B | DWord | Float | 45~65 | Hz   | For CT_17                                                   |
| Freq_c    | 35709-35710 | 0x164C-0x164D | DWord | Float | 45~65 | Hz   | For CT_18                                                   |
| Freq_max  | 35711-35712 | 0x164E-0x164F | DWord | Float | 45~65 | Hz   |                                                             |
| VTHD      | 35739-35740 | 0x166A-0x166B | DWord | Float | 0~4   |      | Phase set by<br><b>Harmonic Phase<br/>Select 6</b> Register |
| ITHD      | 35741-35742 | 0x166C-0x166D | DWord | Float | 0~4   |      |                                                             |

● Modbus Module #10 — Input Register :Power value (Float) for Submeter7

| Parameter name | Modbus Register |               | Len   | Data Type | Range | Units | Comment   |
|----------------|-----------------|---------------|-------|-----------|-------|-------|-----------|
|                | Modicom Format  | Hex           |       |           |       |       |           |
| V_a            | 35889-35890     | 0x1700-0x1701 | DWord | Float     |       | Volt  | For CT_19 |
| I_a            | 35891-35892     | 0x1702-0x1703 | DWord | Float     |       | Amp   |           |
| kW_a           | 35893-35894     | 0x1704-0x1705 | DWord | Float     |       | kW    |           |
| kvar_a         | 35895-35896     | 0x1706-0x1707 | DWord | Float     |       | kvar  |           |
| kVA_a          | 35897-35898     | 0x1708-0x1709 | DWord | Float     |       | kVA   |           |
| PF_a           | 35899-35900     | 0x170A-0x170B | DWord | Float     |       |       |           |
| kWh_a          | 35901-35902     | 0x170C-0x170D | DWord | Float     |       |       |           |
| kvarh_a        | 35903-35904     | 0x170E-0x170F | DWord | Float     |       |       |           |
| kVAh_a         | 35905-35906     | 0x1710-0x1711 | DWord | Float     |       |       |           |
| V_b            | 35907-35908     | 0x1712-0x1713 | DWord | Float     |       | Volt  | For CT_20 |
| I_b            | 35909-35910     | 0x1714-0x1715 | DWord | Float     |       | Amp   |           |
| kW_b           | 35911-35912     | 0x1716-0x1717 | DWord | Float     |       | kW    |           |
| kvar_b         | 35913-35914     | 0x1718-0x1719 | DWord | Float     |       | kvar  |           |
| kVA_b          | 35915-35916     | 0x171A-0x171B | DWord | Float     |       | kVA   |           |
| PF_b           | 35917-35918     | 0x171C-0x171D | DWord | Float     |       |       |           |
| kWh_b          | 35919-35920     | 0x171E-0x171F | DWord | Float     |       |       |           |
| kvarh_b        | 35921-35922     | 0x1720-0x1721 | DWord | Float     |       |       |           |
| kVAh_b         | 35923-35924     | 0x1722-0x1723 | DWord | Float     |       |       |           |
| V_c            | 35925-35926     | 0x1724-0x1725 | DWord | Float     |       | Volt  | For CT_21 |
| I_c            | 35927-35928     | 0x1726-0x1727 | DWord | Float     |       | Amp   |           |
| kW_c           | 35929-35930     | 0x1728-0x1729 | DWord | Float     |       | kW    |           |
| kvar_c         | 35931-35932     | 0x172A-0x172B | DWord | Float     |       | kvar  |           |
| kVA_c          | 35933-35934     | 0x172C-0x172D | DWord | Float     |       | kVA   |           |
| PF_c           | 35935-35936     | 0x172E-0x172F | DWord | Float     |       |       |           |
| kWh_c          | 35937-35938     | 0x1730-0x1731 | DWord | Float     |       |       |           |
| kvarh_c        | 35939-35940     | 0x1732-0x1733 | DWord | Float     |       |       |           |
| kVAh_c         | 35941-35942     | 0x1734-0x1735 | DWord | Float     |       |       |           |
| V_avg          | 35943-35944     | 0x1736-0x1737 | DWord | Float     |       | Volt  |           |
| I_avg          | 35945-35946     | 0x1738-0x1739 | DWord | Float     |       | Amp   |           |
| kW_tot         | 35947-35948     | 0x173A-0x173B | DWord | Float     |       | kW    |           |
| kvar_tot       | 35949-35950     | 0x173C-0x173D | DWord | Float     |       | kvar  |           |
| kVA_tot        | 35951-35952     | 0x173E-0x173F | DWord | Float     |       | kVA   |           |
| PF_tot         | 35953-35954     | 0x1740-0x1741 | DWord | Float     |       |       |           |

|           |             |               |       |       |       |    |                                                             |
|-----------|-------------|---------------|-------|-------|-------|----|-------------------------------------------------------------|
| kWh_tot   | 35955-35956 | 0x1742-0x1743 | DWord | Float |       |    |                                                             |
| kvarh_tot | 35957-35958 | 0x1744-0x1745 | DWord | Float |       |    |                                                             |
| kVAh_tot  | 35959-35960 | 0x1746-0x1747 | DWord | Float |       |    |                                                             |
| Freq_a    | 35961-35962 | 0x1748-0x1749 | DWord | Float | 45~65 | Hz | For CT_19                                                   |
| Freq_b    | 35963-35964 | 0x174A-0x174B | DWord | Float | 45~65 | Hz | For CT_20                                                   |
| Freq_c    | 35965-35966 | 0x174C-0x174D | DWord | Float | 45~65 | Hz | For CT_21                                                   |
| Freq_max  | 35967-35968 | 0x174E-0x174F | DWord | Float | 45~65 | Hz |                                                             |
| VTBD      | 35995-35996 | 0x176A-0x176B | DWord | Float | 0~4   |    | Phase set by<br><b>Harmonic Phase<br/>Select 7</b> Register |
| ITHD      | 35997-35998 | 0x176C-0x176D | DWord | Float | 0~4   |    |                                                             |

● Modbus Module #11 – Input Register :Power value (Float) for Submeter8

| Parameter name | Modbus Register |               | Len   | Data Type | Range | Units | Comment   |
|----------------|-----------------|---------------|-------|-----------|-------|-------|-----------|
|                | Modicom Format  | Hex           |       |           |       |       |           |
| V_a            | 36145-36146     | 0x1800-0x1801 | DWord | Float     |       | Volt  | For CT_22 |
| I_a            | 36147-36148     | 0x1802-0x1803 | DWord | Float     |       | Amp   |           |
| kW_a           | 36149-36150     | 0x1804-0x1805 | DWord | Float     |       | kW    |           |
| kvar_a         | 36151-36152     | 0x1806-0x1807 | DWord | Float     |       | kvar  |           |
| kVA_a          | 36153-36154     | 0x1808-0x1809 | DWord | Float     |       | kVA   |           |
| PF_a           | 36155-36156     | 0x180A-0x180B | DWord | Float     |       |       |           |
| kWh_a          | 36157-36158     | 0x180C-0x180D | DWord | Float     |       |       |           |
| kvarh_a        | 36159-36160     | 0x180E-0x180F | DWord | Float     |       |       |           |
| kVAh_a         | 36161-36162     | 0x1810-0x1811 | DWord | Float     |       |       | For CT_23 |
| V_b            | 36163-36164     | 0x1812-0x1813 | DWord | Float     |       | Volt  |           |
| I_b            | 36165-36166     | 0x1814-0x1815 | DWord | Float     |       | Amp   |           |
| kW_b           | 36167-36168     | 0x1816-0x1817 | DWord | Float     |       | kW    |           |
| kvar_b         | 36169-36170     | 0x1818-0x1819 | DWord | Float     |       | kvar  |           |
| kVA_b          | 36171-36172     | 0x181A-0x181B | DWord | Float     |       | kVA   |           |
| PF_b           | 36173-36174     | 0x181C-0x181D | DWord | Float     |       |       |           |
| kWh_b          | 36175-36176     | 0x181E-0x181F | DWord | Float     |       |       |           |
| kvarh_b        | 36177-36178     | 0x1820-0x1821 | DWord | Float     |       |       | For CT_24 |
| kVAh_b         | 36179-36180     | 0x1822-0x1823 | DWord | Float     |       |       |           |
| V_c            | 36181-36182     | 0x1824-0x1825 | DWord | Float     |       | Volt  |           |
| I_c            | 36183-36184     | 0x1826-0x1827 | DWord | Float     |       | Amp   |           |
| kW_c           | 36185-36186     | 0x1828-0x1829 | DWord | Float     |       | kW    | For CT_24 |
| kvar_c         | 36187-36188     | 0x182A-0x182B | DWord | Float     |       | kvar  |           |

|           |             |               |       |       |       |      |                                                             |
|-----------|-------------|---------------|-------|-------|-------|------|-------------------------------------------------------------|
| kVA_c     | 36189-36190 | 0x182C-0x182D | DWord | Float |       | kVA  |                                                             |
| PF_c      | 36191-36192 | 0x182E-0x182F | DWord | Float |       |      |                                                             |
| kWh_c     | 36193-36194 | 0x1830-0x1831 | DWord | Float |       |      |                                                             |
| kvarh_c   | 36195-36196 | 0x1832-0x1833 | DWord | Float |       |      |                                                             |
| kVAh_c    | 36197-36198 | 0x1834-0x1835 | DWord | Float |       |      |                                                             |
| V_avg     | 36199-36200 | 0x1836-0x1837 | DWord | Float |       | Volt |                                                             |
| I_avg     | 36201-36202 | 0x1838-0x1839 | DWord | Float |       | Amp  |                                                             |
| kW_tot    | 36203-36204 | 0x183A-0x183B | DWord | Float |       | kW   |                                                             |
| kvar_tot  | 36205-36206 | 0x183C-0x183D | DWord | Float |       | kvar |                                                             |
| kVA_tot   | 36207-36208 | 0x183E-0x183F | DWord | Float |       | kVA  |                                                             |
| PF_tot    | 36209-36210 | 0x1840-0x1841 | DWord | Float |       |      |                                                             |
| kWh_tot   | 36211-36212 | 0x1842-0x1843 | DWord | Float |       |      |                                                             |
| kvarh_tot | 36213-36214 | 0x1844-0x1845 | DWord | Float |       |      |                                                             |
| kVAh_tot  | 36215-36216 | 0x1846-0x1847 | DWord | Float |       |      |                                                             |
| Freq_a    | 36217-36218 | 0x1848-0x1849 | DWord | Float | 45~65 | Hz   | For CT_22                                                   |
| Freq_b    | 36219-36220 | 0x184A-0x184B | DWord | Float | 45~65 | Hz   | For CT_23                                                   |
| Freq_c    | 36221-36222 | 0x184C-0x184D | DWord | Float | 45~65 | Hz   | For CT_24                                                   |
| Freq_max  | 36223-36224 | 0x184E-0x184F | DWord | Float | 45~65 | Hz   |                                                             |
| VTHD      | 36251-36252 | 0x186A-0x186B | DWord | Float | 0~4   |      | Phase set by<br><b>Harmonic Phase<br/>Select 8</b> Register |
| ITHD      | 36253-36254 | 0x186C-0x186D | DWord | Float | 0~4   |      |                                                             |

## Appendix: Questions & Answers

**Q1. Can we use the other 5A CT's (like 600/5) to directly connect to the input current terminals of PM-4324 series?**

No, because the input current is only mA size on PM-4324 series, definitely not to directly use other 5A CT's to connect and apply (like 100/5...), It could causes the fatal damages. Users can use the PM-4324 series attached split type clip-on CT to connect the other CT's secondary test 5A current.

**Q2. If I want to replace the failed split type clip-on CT, can I just detach it? Anything I should pay more attention to?**

In any circumstance, please make sure the CT had been disconnected with the power cable of monitoring equipments before the CT lines detach from the terminals of the smart meter. Otherwise, it will cause the severe injury.

**Q3. If the turn point of the split type clip-on CT has broken, or inner Ferrite-core has broken, how to settle this condition?**

The measure data will be not accuracy as before, please do not use any more.  
You need the new CT.

**Q4. If multiple set of meters being installed, Can I detach the CT's and mix use with each other?**

Please do not mix use, because each set of smart meter (PM-4324 series) and its attached split type clip-on CT are calibrated set by set. The mix use may cause the wrong measurements.

**Q5. What problem is while the measured readings of the power consumption (kw) is negative?**

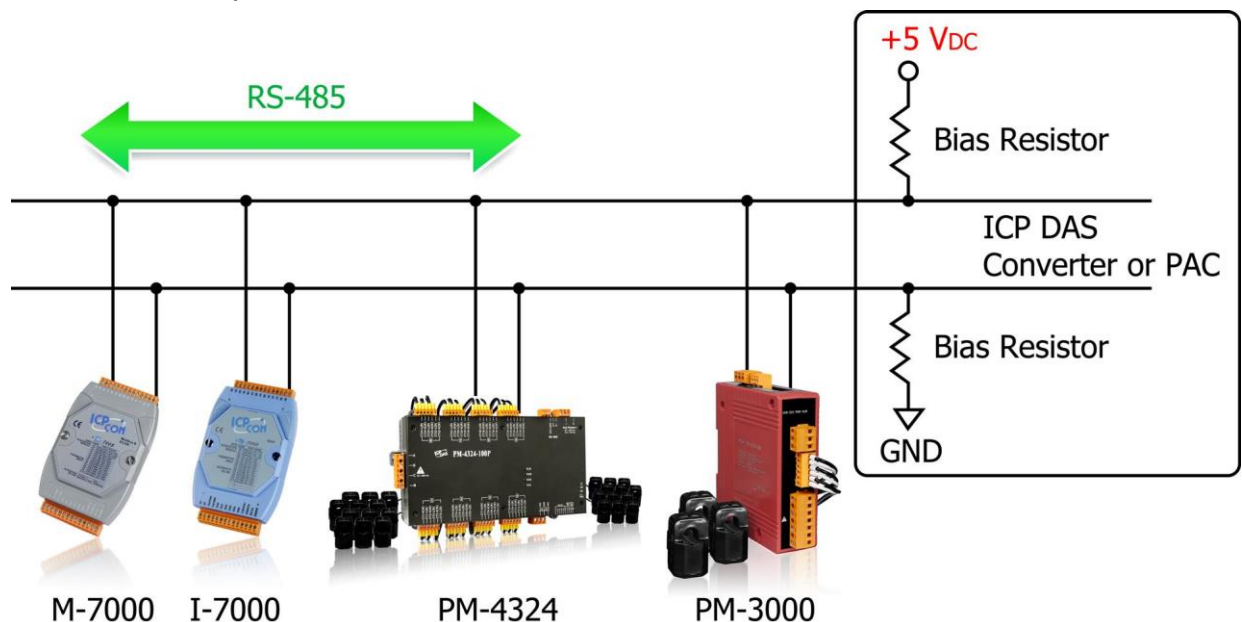
- (1) First check the current input end – line terminal, (check the connection should be **CT1-K, CT1-L, CT2-K, CT2-L, CT3-K, CT3-L**) , base on white black, white black, white black follow the sequence order
- (2) Check the field current direction (K→L) is same as the inner arrow direction of the split type clip-on CT.
- (3) Confirm the RST (ABC) phase sequence.

**Q6. What does negative kW on a motor/pump mean?**

Confirm the pump running at full load. Or are the readings taken at "idle" (negative kW, low power factor)?

**Q7. PC and meter cannot make the connection with RS-485 ?**

- (1) Confirm the Modbus Address, default is 1.
- (2) Confirm the Band Rate, default is 19200.
- (3) Confirm the stop bit, default is 1.
- (4) Confirm the RS-485 connection, make sure the D+/D- is right.
- (5) Confirm the RS-485 master have to provide the bias for PM-4324 series. Otherwise, the tM-SG4 or SG-785 should be added to provide the bias. All ICP DAS controllers and converters provide the bias.

**Q8. What the power cable diameter (mm) of the monitoring equipments should be for the various CT's?**

Power cable diameter <  $\Phi 10$  use 60A CT ,  $\Phi 10 \sim \Phi 16$  use 100A CT ,  $\Phi 16 \sim \Phi 24$  use 200A CT ,  $\Phi 36$  use 300A CT ,  $\Phi 36$  use 400A CT

**Q9. Regarding to the split type clip-on CT's, if the wire is not long enough?**

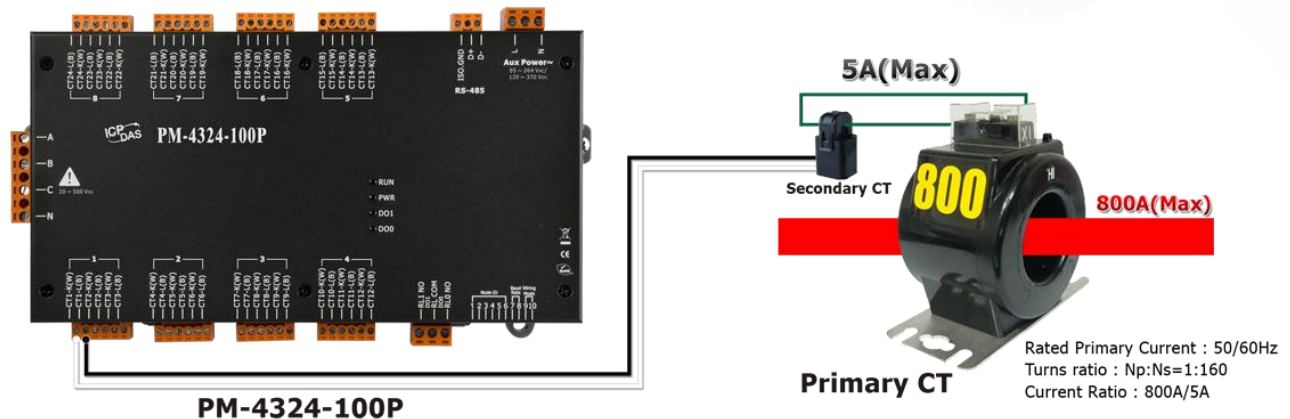
$\Phi 10$ ,  $\Phi 16$ ,  $\Phi 24$ ,  $\Phi 36$  split type CT , the standard length is 4M.

For special length, please contact ICP DAS.

**Q10. How to measure the current large than 400A?**

The CT of PM-4324 maximum range is 400A. If the target is more than 400A, we suggest the solution as follow.

For example the target is to measure maximum 800A current. We can measure big CT output and set a CT Ratio.



**Note:**

- A. Primary CT accuracy will influence the measurement.
- B. Even primary CT output current max is 5A, please don't wire to PM-4324 and PM-4324P directly.

You need to choose primary current Transformers, please refer to

[http://www.omega.com/pptst/MFO\\_RCT.html](http://www.omega.com/pptst/MFO_RCT.html)

**Q11. Can I use CT's that I currently own with PM-4324 Power Meter?**

You can use CT's that you currently own with PM-4324P (without CTs) Power Meter. The CT inputs of the PM-4324P can handle a maximum of 333mV of AC current. PM-4324P's current ratio is always full scale to 5A.

Adding current transformer (333mV Output CTs) has the effect of reducing the measured current by the CT ratio (let's say 40:1 for 200A CT as example). So a current of 200A becomes 5A. Since the meter sees 5A, many of the measurements it reports will be low by a factor of 40 unless they are scaled up by 40.

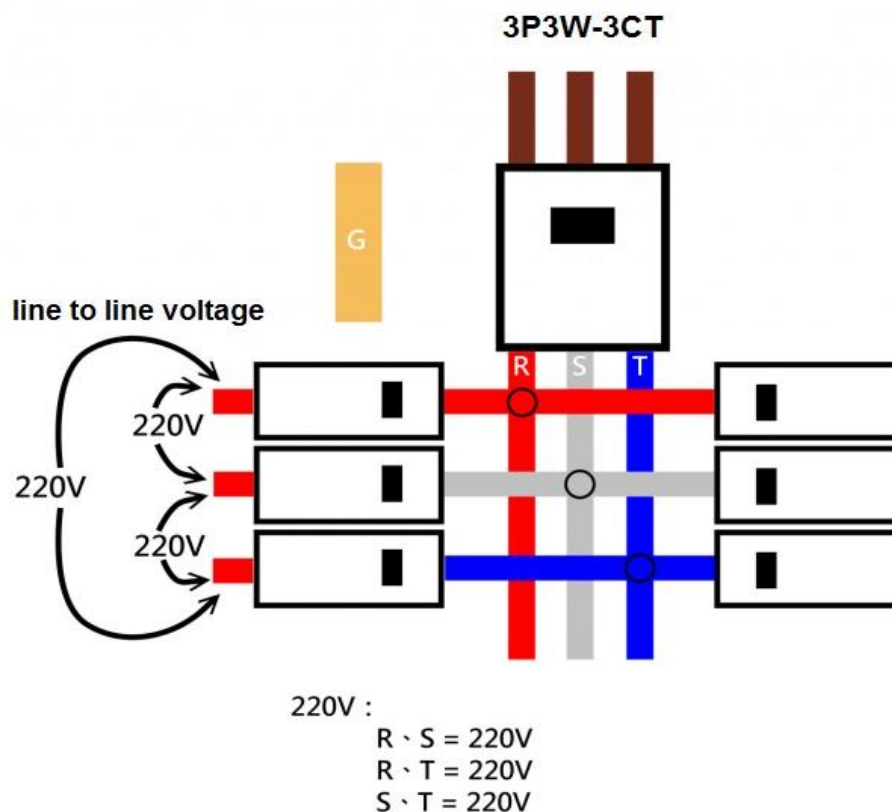
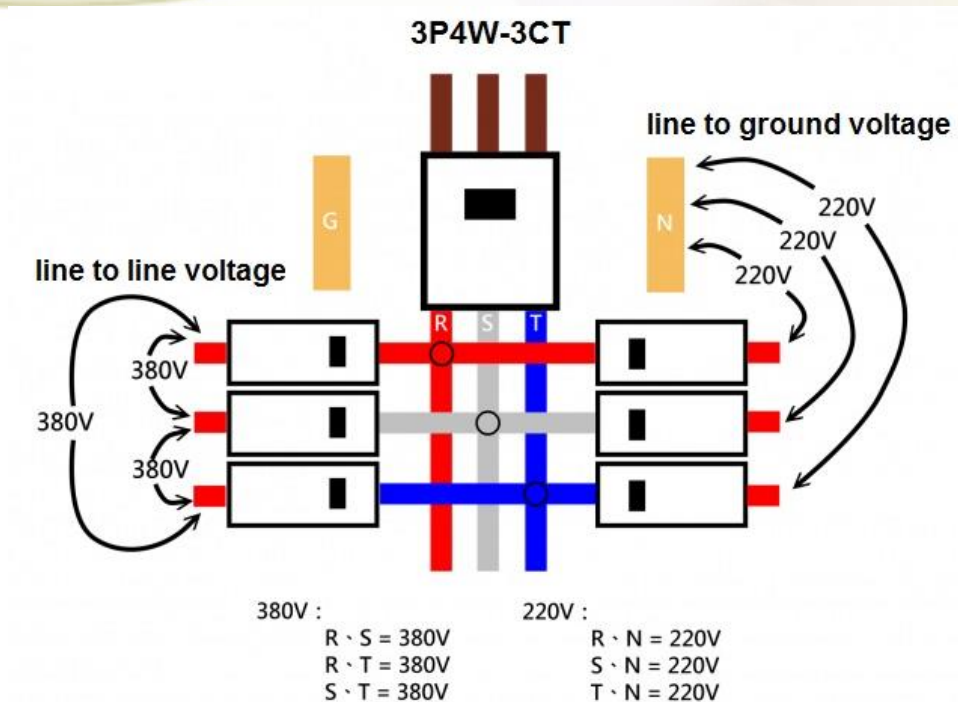
| Current transformer | CT Ratio (PM-4324P) | Current transformer | CT Ratio (PM-4324P) |
|---------------------|---------------------|---------------------|---------------------|
| 50A CT              | 10:1                | 400A CT             | 80:1                |
| 100A CT             | 20:1                | 800A CT             | 160:1               |
| 200A CT             | 40:1                | 1000A CT            | 200:1               |

**Note:**

- A. Please use low phase angle error CTs: essential for accurate power and energy measurements. (Example: phase error  $<2^\circ$ )
- B. Primary CT accuracy will influence the measurement.
- C. PM-4324P only for external 333mV Output CTs.  
Safe: burden resistor built-in, 333 mVac voltage output at rated full scale current, no shorting blocks needed.
- D. This meter requires external CT(s) to operate:  
1P2W-1CT requires 1 CT per meter.  
3P3W-2CT/1P3W-2CT requires 2 CTs per meter.  
3P4W-3CT/3P3W-3CT requires 3 CTs per meter.

**Q12. What is the difference between line to line voltages to line to ground voltage?**

On a three phase wye connected system line to line voltages will be the voltages between the terminals A - B, B - C, A - C. On a three phase wye connected system line to ground voltages will be the voltages between the terminals A - N, B - N, C - N. To calculate the line to ground voltages divide the line voltage by the square root of three which equals 1.73. An example, on a 380 volt wye system, line to line voltage is 380 volts and line to ground voltage is  $380/1.73 = 220$  volts



**Q13. How to set up [Display Voltage] register value to correctly display line to ground voltage or line to line voltage?**

The voltage [V\_x] register in Modbus register table can be used to show line-to-ground voltage or line-to-line voltage value by setting [Display Voltage] register value. According to

different wiring types, it is required to set different [Display Voltage] value. If the voltage is not displayed as expected value, please refer to the table below and check if the setting value is set accurately.

|          | Line to Ground Voltage              | Line to Line Voltage                |
|----------|-------------------------------------|-------------------------------------|
| 3P3W-2CT | [Display Voltage] = 1 (Show as Vln) | [Display Voltage] = 0 (Automatic)   |
| 3P3W-3CT | [Display Voltage] = 0 (Automatic)   | [Display Voltage] = 2 (Show as Vll) |
| 3P4W-3CT | [Display Voltage] = 0 (Automatic)   | [Display Voltage] = 2 (Show as Vll) |

#### **Q14. How about the harmonic (THD) analysis capability?**

The number of harmonics N that can be analyzed within the 2.8 kHz pass band is the whole number of  $2800/f$ . The absolute maximum number of harmonics accepted by the Energy Metering IC is 63.

$$N = \lfloor 2800/f \rfloor, N \leq 63$$

**Q15. How to measure the Voltage large than 500V?**

For service voltage above 600 Vac, voltage transformers (PTs) are used to step down the voltage to a lower range that will work with a PM-4324 meter.

**Selecting a Transformer:**

Selecting the right voltage transformer is simple. Review the following considerations to determine the best fit for your application.

**Input Voltage:**

Select a transformer that will operate on the supply voltage available at your facility (Example: PRI. Voltage 720V; SEC. Voltage 120V). Check the connection diagram (three-phase Y and delta; phase sequence) to ensure compatibility.

Adding potential transformers has the effect of reducing the measured line voltage by the PT ratio (let's say 6:1 for this example). So a voltage of 720 Vac becomes 120 Vac. Since the meter sees 120 Vac, many of the measurements it reports will be low by a factor of 6 unless they are scaled up by 6.

**Frequency:**

If you are operating in the United States, you will most likely be operating on 60 Hz. However should you need a 50 Hz rated transformer.

**Accuracy:** Transformer (PT) accuracy (Example: 1% or 3%) will influence the measurement.

**Rated Output (VA):** Example: 150 VA (50VA per phase).