PMC-512-A

AC Multi-Circuit Power Monitor

User Manual

Version: V1.11

December 12, 2019

The information contained in this manual is believed to be accurate at the time of publication; however, CET assumes no responsibility for any errors which may appear here and reserves the right to make changes without notice. Please consult CET or your local representative for the latest product specifications.

DANGER

This symbol indicates the presence of danger that may result in severe injury or death and permanent equipment damage if proper precautions are not taken during the installation, operation or maintenance of the device.

CAUTION

This symbol indicates the potential of personal injury or equipment damage if proper precautions are not taken during the installation, operation or maintenance of the device.

DANGER

Failure to observe the following instructions may result in severe injury or death and/or equipment damage.

- Installation, operation and maintenance of the meter should only be performed by qualified, competent personnel that have the appropriate training and experience with high voltage and current devices. The meter must be installed in accordance with all local and national electrical codes.
- Ensure that all incoming AC power and other power sources are turned OFF before performing any work on the meter.
- Before connecting the meter to the power source, check the label on top of the meter to ensure that it is equipped with the appropriate power supply, and the correct voltage and current input specifications for your application.
- During normal operation of the meter, hazardous voltages are present on its terminal strips and throughout the connected potential transformers (PT) and current transformers (CT). PT and CT secondary circuits are capable of generating lethal voltages and currents with their primary circuits energized. Follow standard safety precautions while performing any installation or service work (i.e. removing PT fuses, shorting CT secondaries…etc).
- Do not use the meter for primary protection functions where failure of the device can cause fire, injury or death. The meter should only be used for shadow protection if needed.
- Under no circumstances should the meter be connected to a power source if it is damaged.
- To prevent potential fire or shock hazard, do not expose the meter to rain or moisture.
- Setup procedures must be performed only by qualified personnel familiar with the instrument and its associated electrical equipment.
- DO NOT open the instrument under any circumstances.

Limited warranty

- CET offers the customer a minimum of 12-month functional warranty on the meter for faulty parts or workmanship from the date of dispatch from the distributor. This warranty is on a return to factory for repair basis.
- CET does not accept liability for any damage caused by meter malfunctions. CET accepts no responsibility for the suitability of the meter to the application for which it was purchased.
- Failure to install, set up or operate the meter according to the instructions herein will void the warranty.
- Only CET's duly authorized representative may open your meter. The unit should only be opened in a fully anti-static environment. Failure to do so may damage the electronic components and will void the warranty.

Table of Contents

Glossary

CET	= Cet Electric Technology
1-Ø	= Single Phase
3-Ø	= Three Phase
SM	= Sub Meter
VM	= Virtual Meter
LCD	= Liquid Crystal Display
DMD	= Present Demand
PQ	= Power Quality
Fund.	= Fundamental
THD	= Total Harmonic Distortion
TOHD	= Total Odd Harmonic Distortion
TEHD	= Total Even Harmonic Distortion
Hn	= nth order Harmonic, integer multiple (n) of the Fundamental Frequency (50Hz or 60Hz)
HDn	= nth order Harmonic Distortion
DR	= Data Recorder
SOE	= Sequence Of Events
DI	= Digital Input
DO	= Digital Output
SSR	= Solid State Relay
FIFO	= First In First Out
MB	= Mega Byte
RTC	= Real Time Clock
Ung	= Neutral to Ground Voltage
U1/2/3	= 3-phase Line to Neutral Voltage
U12/23/31	= 3-phase Line to Line Voltage
I1/2/3	= 3-phase Current

Chapter 1 Introduction

This manual explains how to use the PMC-512-A AC Multi-Circuit Power Monitor.

This chapter provides an overview of the PMC-512-A and summarizes many of its key features.

1.1 Overview

The PMC-512-A is CET's latest offer for the economical multi-circuit monitoring of Data Centers, Telecom Base Stations and Industrial & Commercial Buildings. Housed in a compact DIN Rail Mountable enclosure, the PMC-512-A is perfectly suited for high-density metering applications. The PMC-512-A features quality construction with multifunction and high-accuracy measurements with an optional color touch-screen HMI that supports up to 16 devices simultaneously over a RS-485 network. The PMC-512-A comes standard with 12xDIs for status monitoring or pulse counting, 1xDO for control or alarming as well as 1xAI for temperature measurement or other analogue input applications. The standard SOE Log records all setup changes, alarms and DI/DO operations in 1ms resolution. With dual RS-485 as standard feature supporting Modbus RTU, the PMC-512-A can easily be deployed in a stand-alone system with its Touch Screen HMI or simultaneously with a centralized monitoring and control system for an AC power distribution network.

Typical Applications

- Power/Energy Monitoring for Data Centers' PDUs
- Utility Substation Multi-Circuit Monitoring
- Power Quality Monitoring
- Maximum Demand Indicator

The above are just a few of the many applications. Contact CET Technical Support should you require further assistance with your application.

1.2 Features

Ease of use

- Status LEDs - Run, Pulse and Comm. Activities
- Self-Diagnostic function
- Password-protected setup via the Front Panel
- Compact, DIN Rail Mount for easy installation

Measurements

- Class 0.5S Accuracy for Energy measurements
- ULN & ULL per phase and average, ULN Phase Angles, Ung
- Frequency

Sub Meters (SM)

- Support 1-Ø and 3-Ø Sub Meters without configuration
- 12x1-Ø SM
  - Current Magnitude and Phase Angles
  - kW, kvar, kVA and PF
  - Current Loading Factor (%) and THD
  - kWh/kvarh Import/Export and kVAh
  - Current/kW/kvar/kVA Demand and Max. Demand with Timestamp

- Operating Time (Run Hour)
- 4x3-Ø SM
  - I per phase, I average and In (Calculated)
  - I Unbalance
  - Frequency
  - kW/kvar/kVA Total and PF total
  - kWh/kvarh Import/Export/Total and kVAh Total
  - kW/kvar/kVA Total Demand and Max. Demand with Timestamp
  - Operating Time (Run Hour)

Virtual Meters (VM)

- Up to 4 Virtual Meters for arbitrary aggregation of 1-Ø SMs
- kW/kvar/kVA Total (via communications only)
- kWh/kvarh Import/Export and kVAh Total
- kW/kvar/kVA Total Demand and Max. Demand with Timestamp (via communications only)

Power Quality Features

- U and I THD/TOHD/TEHD
- U and I Individual Harmonics up to 31st (via communications only)
- U and I Unbalance

Logs

Data Recording Log

- 4MB Log Memory
- Up to 60 parameters @ min. 1-min recording interval for 5,000 logs with timestamps

Daily Freeze Logs

- 1000 Daily Freeze Logs
- 1-Ø SM: Current, kW, kvar, kVA, kWh, kvarh Import/Export & kVAh
- 3-Ø SM and VM: kW, kvar, kVA Total, kWh, kvarh Import/Export & kVAh

Monthly Freeze Logs

- 24 Monthly Freeze Logs
- 1-Ø SM: kWh/kvarh Import, kWh/kvarh Export, kVAh
- 3-Ø SM and VM: kWh/kvarh Total Import, kWh/kvarh Total Export, kVAh Total

SOE Log

- 512 FIFO events time-stamped to ±1ms resolution
- Setup changes, Alarms, Setpoint events, Self-Diagnosis and I/O operations

Alarming

- Support High-High, High, Low, Low-Low and OFF Alarms
- Configurable Threshold and Time Delay for each branch
- Support Current, Voltage, Frequency, Unbalance, Phase Reversal, Phase Loss, AI and DI Alarms
- All alarms are recorded in the SOE Log

Digital Inputs and Digital Outputs

- 12xDIs with external excitation @ 48VDC with programmable debounce
- 1xDO, mechanical relay @ 250VAC/5A or 30VDC/5A

- 1xAI, 0~20mA

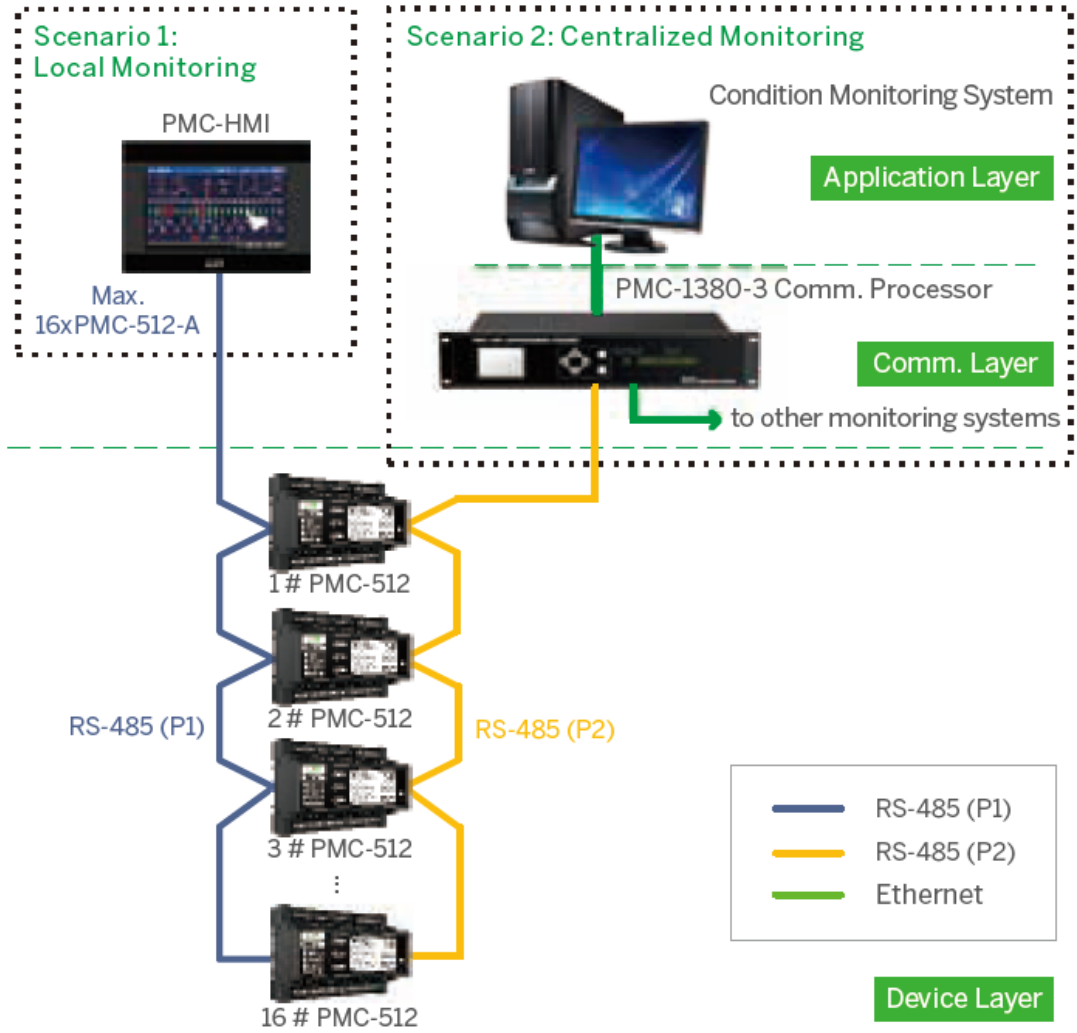
Communications

- 2xRS-485, optically isolated
- Modbus RTU protocol
- Baud rate @ 1,200 to 57,600

System Integration

The PMC-512-A is supported by CET's PecStar iEMS. In addition, it can be easily integrated into other 3rd party Automation, Energy Management or SCADA systems because of its support of multiple communications ports and Modbus RTU protocol.

1.3 PMC-512-A' application in Monitoring Management Systems



1.4 Getting more information

Additional information is available from CET via the following sources:

- Visit www.cet-global.com
- Contact your local representative
- Contact CET directly via email or telephone

Chapter 2 Installation

Caution

Installation of the PMC-512-A should only be performed by qualified, competent personnel that have the appropriate training and experience with high voltage and current devices. The meter must be installed in accordance with all local and national electrical codes.

During the operation of the meter, hazardous voltages are present at the input terminals. Failure to observe precautions can result in serious or even fatal injury and equipment damage.

2.1 Appearance

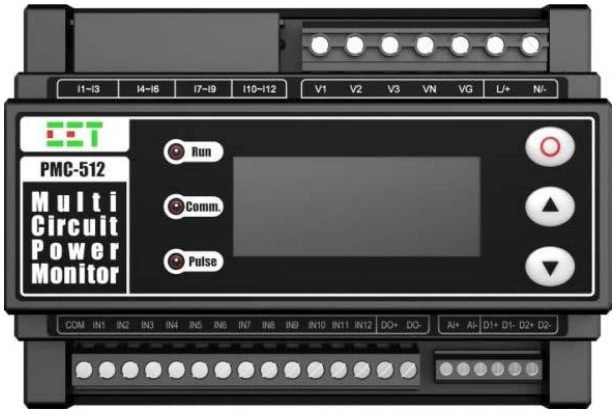


Figure 2-1 Appearance

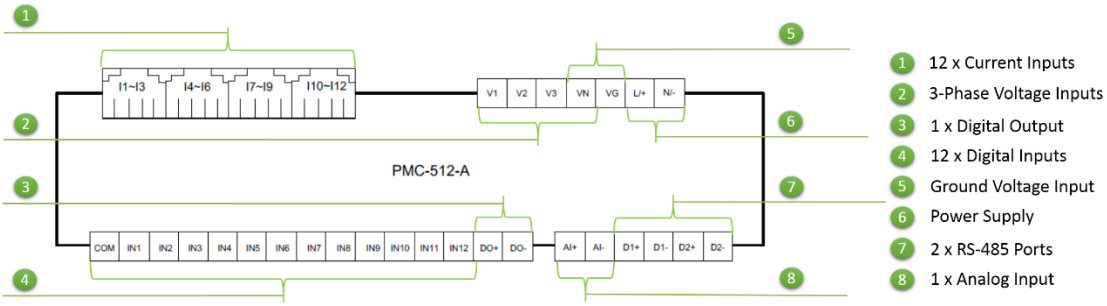
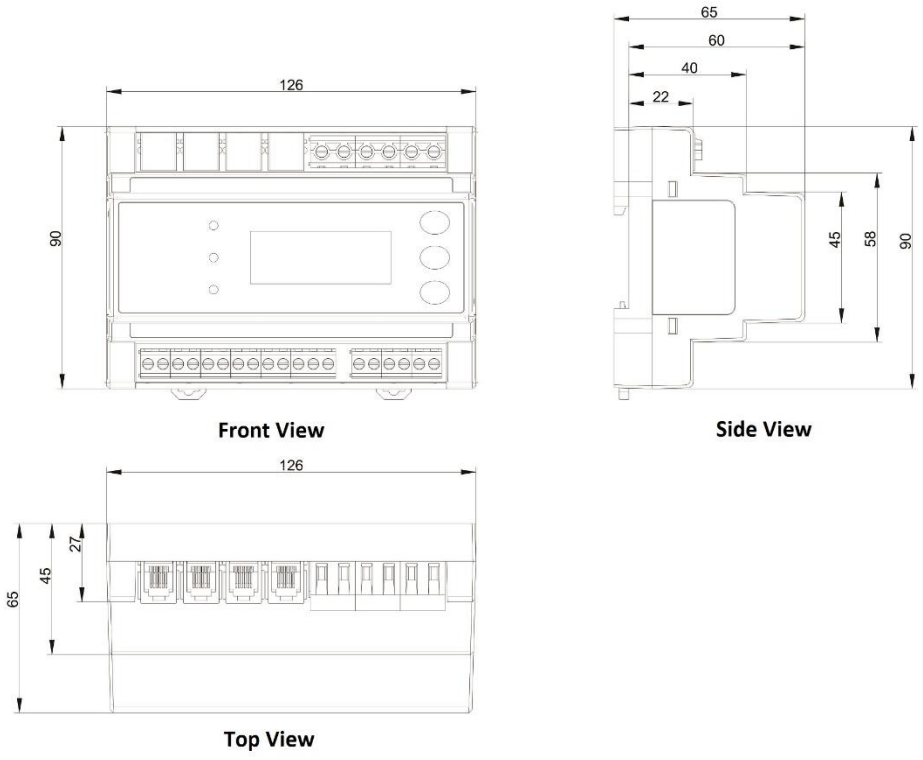


Figure 2-2 Terminal Diagram

2.2 Unit Dimensions

2.2.1 Main Unit

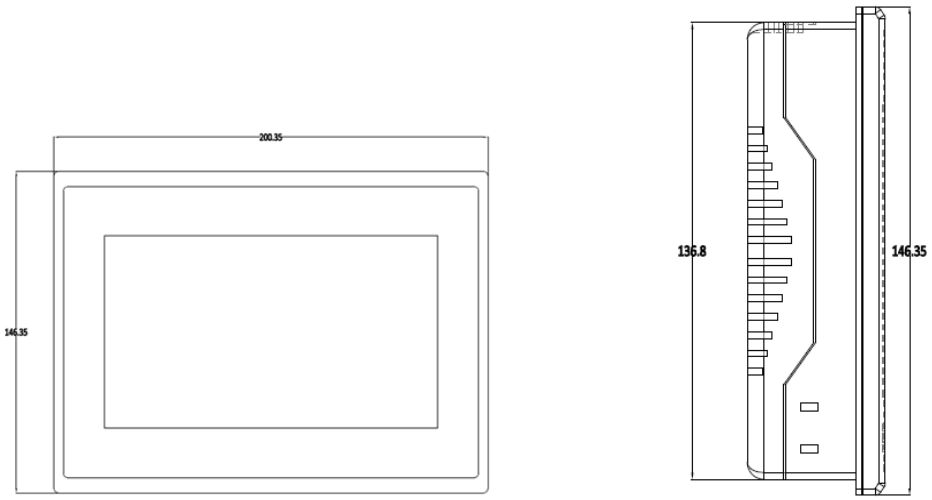


Front View　　Side View

Top View

Figure 2-3 Main Unit Dimension

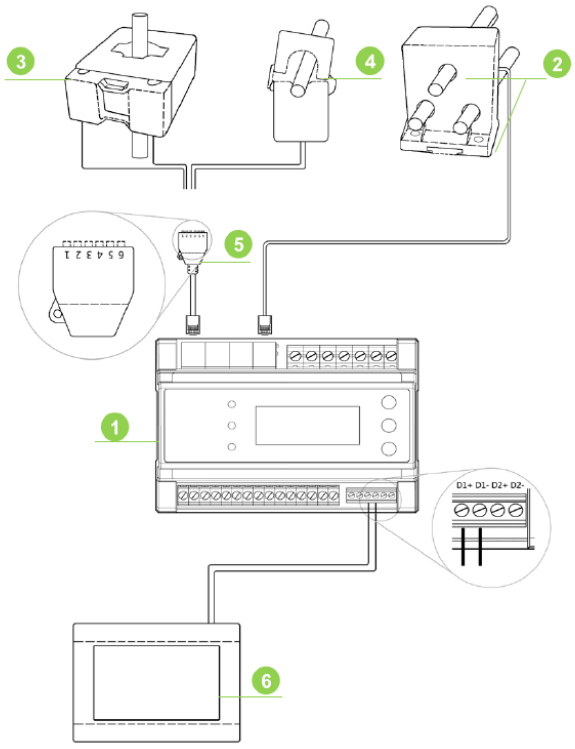
2.2.1 HMI



Front View　　Side View

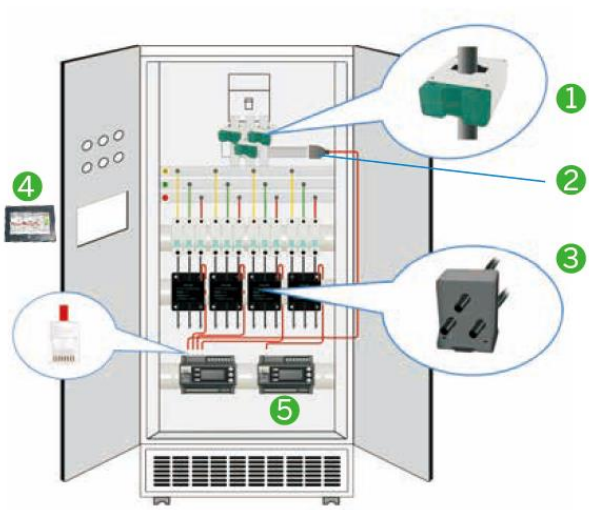
Figure 2-4 HMI Dimensions

2.3 Overall Setup



1. PMC-512-A
2. Molded Case 3-Ø CT
   (PMC-CT-100A-40mA-3P-A)
3. Solid-Core CT
   (PMC-CT-250A-40mA-A
   or
   PMC-CT-400A-40mA-A
   or
   PMC-CT-800A-40mA-A)
4. Split-Core CT
   (PMC-SCCT-5A-1.6mA-10-A
   or
   PMC-SCCT-100A-40mA-16-A
   or
   PMC-SCCT-200A-40mA-24-A
   or
   PMC-SCCT-400A-40mA-35-A
   or
   PMC-SCCT-800A-40mA-A)
5. CT Termination Connector
   (PMC-BCC-3CT)
6. PMC-HMI, Color Touch Screen Display

Figure 2-5 Overall Setup



1. **Mains Solid-Core/Split-Core CTs**
   1 for each phase
2. **CT Termination Connector**
   1 for 3 CTs
3. **Molded Case 3-Ø CT**
   Max. 100A (for 3x1-Ø Circuits or 1x3-Ø Circuit)
4. **PMC-HMI, Color Touch Screen Display**
   Supports 16 x PMC-512-A
5. **PMC-512-A**

Figure 2-6 Overall Installation

2.4 Mounting

The PMC-512-A should be installed in a dry environment without dust and kept away from heat, radiation and electrical noise sources. The PMC-512-A is usually installed inside the PDU cabinet. Please reserve enough room for other accessories and make it convenient for future maintenance.

2.4.1 Mounting PMC-512-A

Installation steps:

- Before installation, make sure that the DIN rail is already in place.

- Move the installation clips at the back of the PMC-512-A downward to the “unlock” position.
- Align the top of the mounting channel at the back of the PMC-512-A at an angle against the top of the DIN rail as shown in figure below.
- Rotate the bottom of the PMC-512-A towards the back while applying a slight pressure to make sure that the device is completely and securely fixed on to the DIN rail.
- Push the installation clips upward to the “lock” position to secure the PMC-512-A on to the DIN rail.

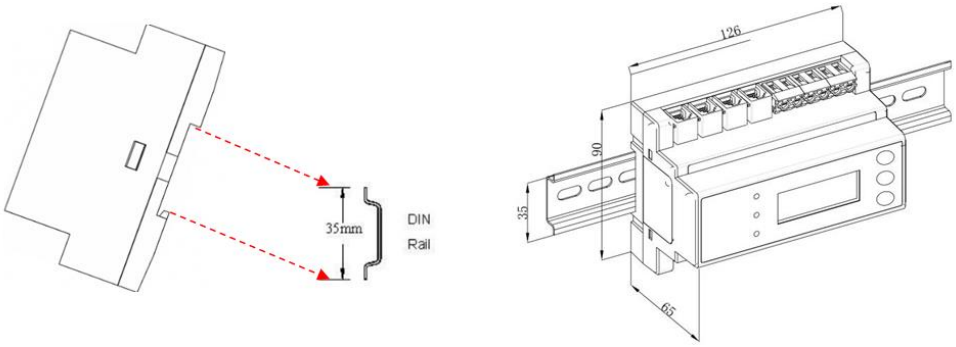


Figure 2-7 Mounting the Main Unit

2.4.2 Branch CTs and other Accessories

There are different types of Branch CTs available for the PMC-512-A. Please refer to **Appendix D** for their complete specifications. Select the appropriate Branch CTs for your applications.

2.4.2.1 PMC-CT-100A-40mA-3P-A (Molded Case 3-Phase 100A CT)

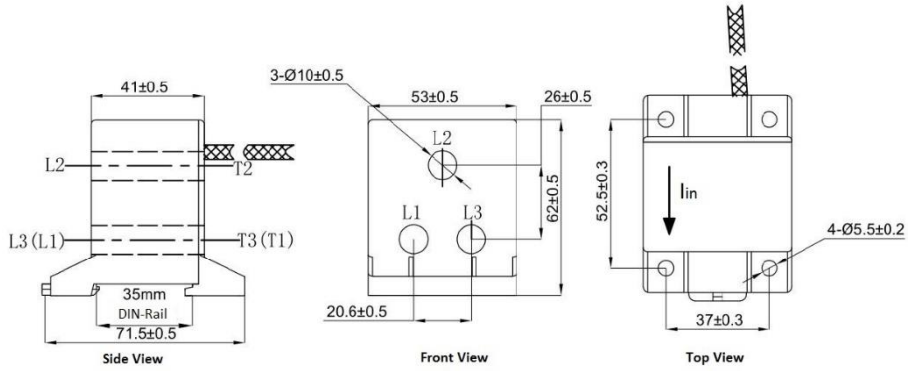


Figure 2-8 PMC-CT-100A-40mA-3P-A Dimensions

2.4.2.2 PMC-CT-250A-40mA-A (Solid-Core 1-Phase 250A CT)

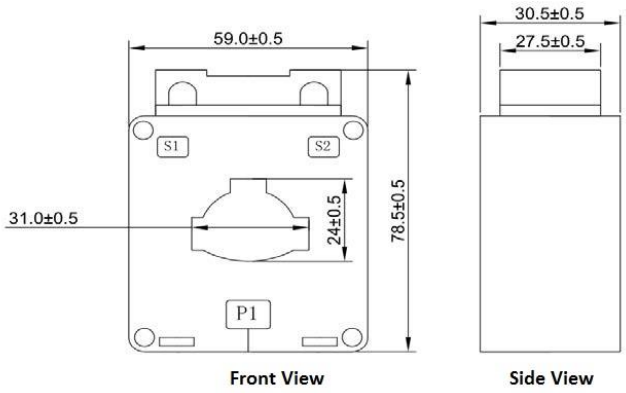


Figure 2-9 PMC-CT-250A-40mA-A Dimensions

2.4.2.3 PMC-CT-400A-40mA-A (Solid-Core 1-Phase 400A CT)

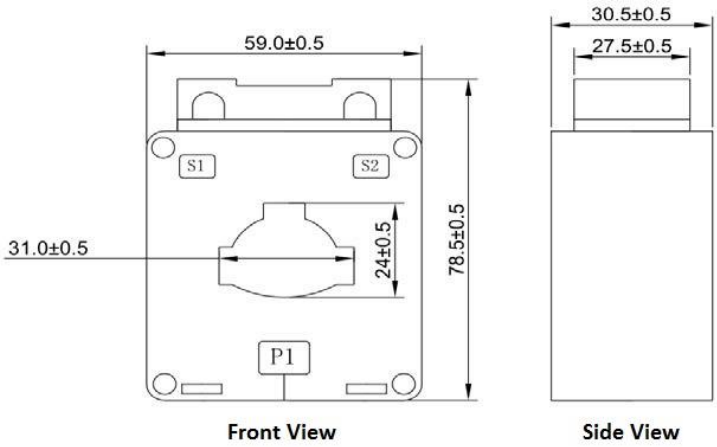


Figure 2-10 PMC-CT-400A-40mA-A Dimensions

2.4.2.4 PMC-CT-800A-40mA-A (Solid-Core 1-Phase 800A CT)

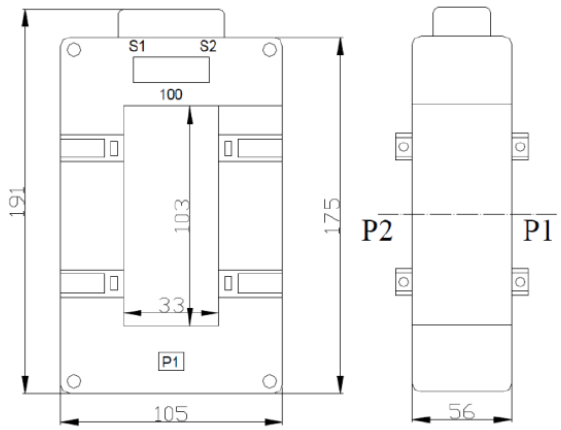


Figure 2-11 PMC-CT-800A-40mA-A Dimensions

2.4.2.5 PMC-SCCT-5A-1.667mA-10-A (Split-Core 1-Phase 5A CT)

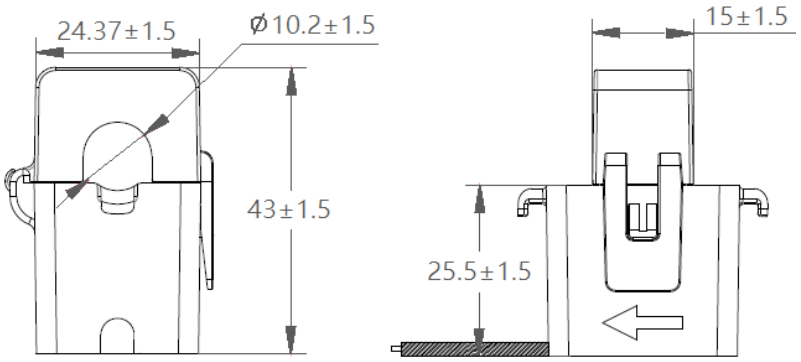


Figure 2-12 PMC-SCCT-5A-1.667mA-10-A Dimensions

2.4.2.6 PMC-SCCT-100A-40mA-16-A (Split-Core 1-Phase 100A CT)

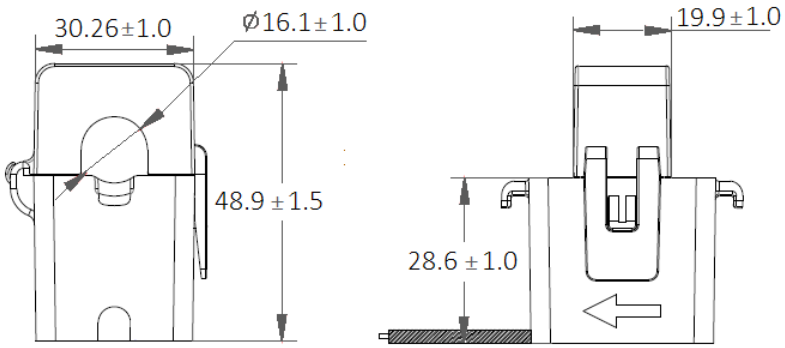


Figure 2-13 PMC-SCCT-100A-40mA-16-A Dimensions

2.4.2.7 PMC-SCCT-200A-40mA-24-A (Split-Core 1-Phase 200A CT)

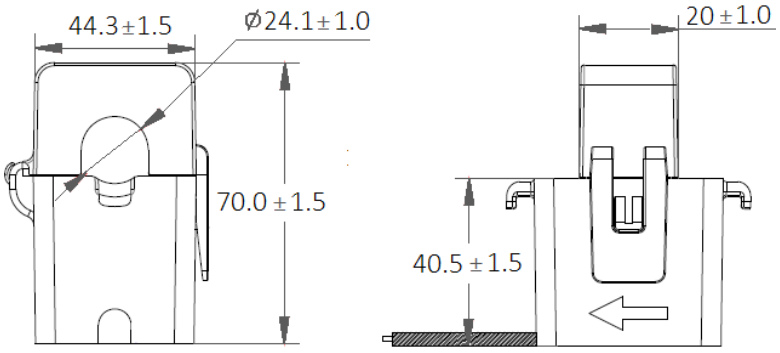


Figure 2-14 PMC-SCCT-200A-40mA-24-A Dimensions

2.4.2.8 PMC-SCCT-400A-40mA-35-A (Split-Core 1-Phase 400A CT)

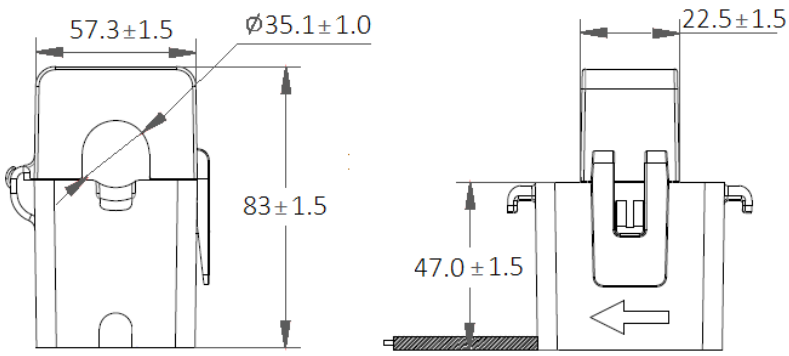
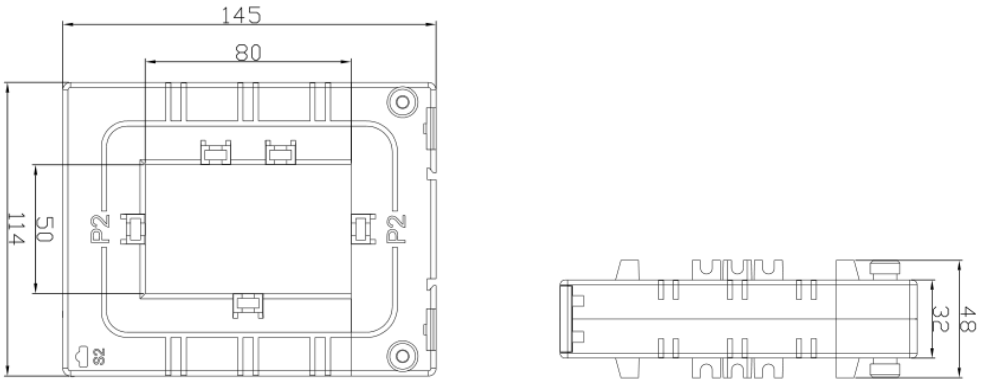


Figure 2-15 PMC-SCCT-400A-40mA-35-A Dimensions

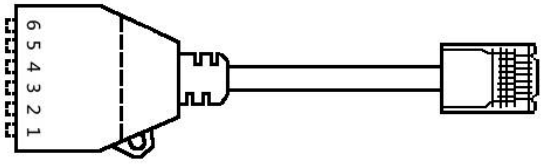
2.4.2.9 PMC-SCCT-800A-40mA-A (Split-Core 1-Phase 800A CT)



Front View **Side View**

Figure 2-16 PMC-SCCT-800A-40mA-A Dimensions

2.4.2.10 PMC-BCC-3CT (3-Phase Termination Connector)



P1 Side P2 Side

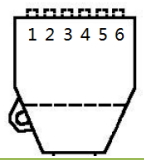
P1 Side	Pin	CT	PMC-512-A
	1	1# S1 (+)	I1 or I4 or I7 or I10
	2	1# S2 (-)	
	3	2# S1 (+)	I2 or I5 or I8 or I11
	4	2# S2 (-)	
	5	3# S1 (+)	I3 or I6 or I9 or I12
	6	3# S2 (-)	

Table 2-1 PMC-BCC-3CT

2.4.3 Mounting the HMI

The HMI should be mounted on the cabinet door with a minimum clearance of 105cm from the door to the inside components.

1. Put the HMI through the cutout.

2. Install the installation clips as per the diagram below.
3. Affix the supplied screws through the hole of the installation clips.
4. Tighten the screws against the back of the panel until the HMI is mounted securely in place.

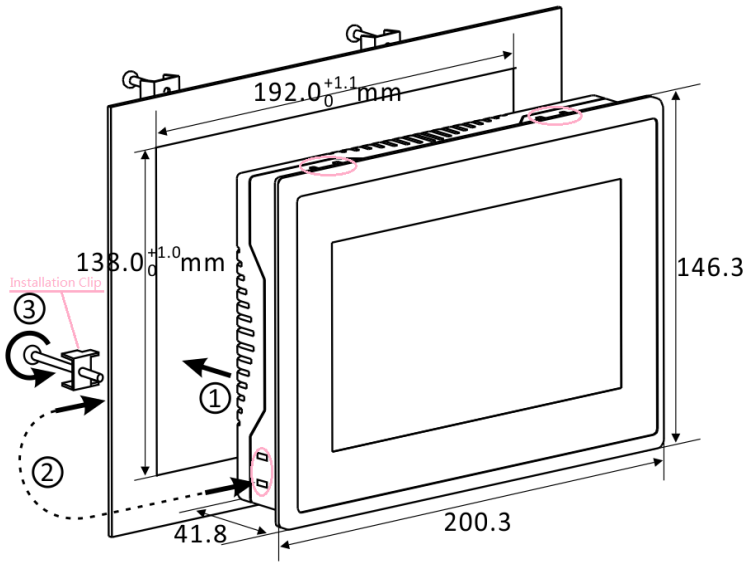


Figure 2-17 Mounting the HMI

2.5 Wiring Connections

The PMC-512-A provides 12 Current Inputs which can be configured as 12x1-Ø SM, 4x3-Ø SM or a combination of 1-Ø SMs or 3-Ø SMs. Regardless of the **Wiring Mode**, the PMC-512-A always relies on the relationship illustrated in Table 2-2 between Voltage Inputs (V1, V2, V3) and Current Inputs (I1 – I12) for its Power and Energy calculations for the various 1-Ø and 3-Ø SMs. 2-Ø SM (or 1P3W Wiring Mode) is not supported by the PMC-512-A. The SM assignment principle is not programmable. Therefore, it is extremely important to allocate the 1-Ø and 3-Ø circuits during installation that meet this fixed assignment principle.

3-Ø SM1			3-Ø SM2			3-Ø SM3			3-Ø SM4		
1-Ø SM1	1-Ø SM2	1-Ø SM3	1-Ø SM4	1-Ø SM5	1-Ø SM6	1-Ø SM7	1-Ø SM8	1-Ø SM9	1-Ø SM10	1-Ø SM11	1-Ø SM12
V1	V2	V3	V1	V2	V3	V1	V2	V3	V1	V2	V3
I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12

Table 2-2 Relationship between V*x* and I*x*

2.5.1 Wiring Modes

DANGER

Please make sure that the Voltage and Current circuits are not energized while connecting Voltage inputs to the PMC-512-A.

The PMC-512-A supports the following **Wiring Modes**:

- Single Phase (1P2W) Wiring with or without VG
- 3-Wire Delta (3P3W) Wiring with open N connection or with PTs

- 4-Wire Wye (3P4W) Wiring with or without VG, 4-Wire Wye (3P4W) Wiring with VG and PTs

2.5.1.1 Single Phase (1P2W) Wiring

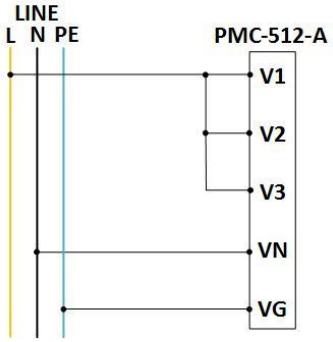


Figure 2-18 1P2W with VG

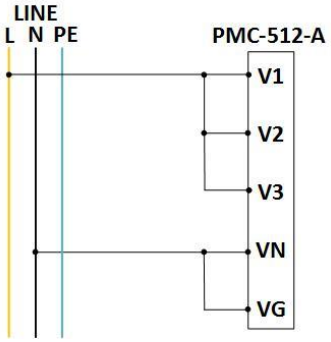


Figure 2-19 1P2W without VG

2.5.1.2 3-Wire Delta (3P3W) Wiring

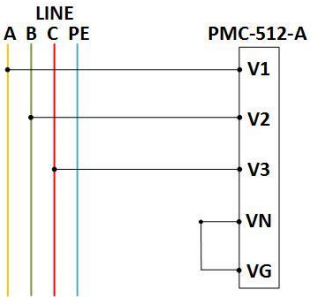


Figure 2-20 3P3W without PTs

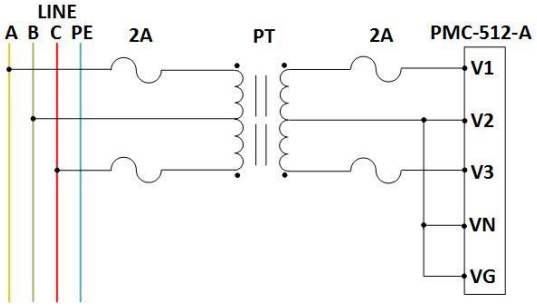


Figure 2-21 3P3W with PTs

2.5.1.3 4-Wire Wye (3P4W) Wiring

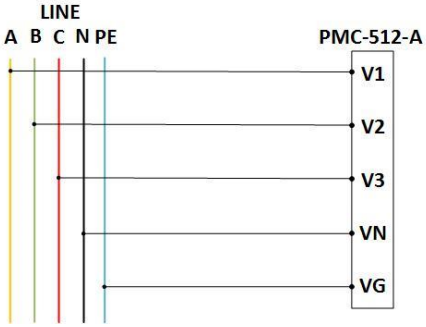


Figure 2-22 3P4W without PTs & with VG

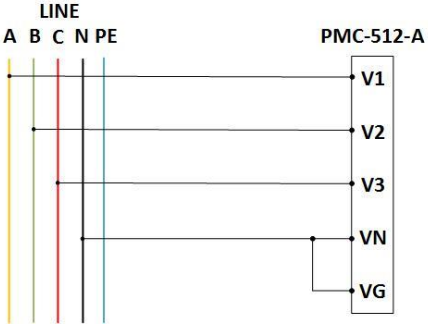


Figure 2-23 3P4W without PTs & VG

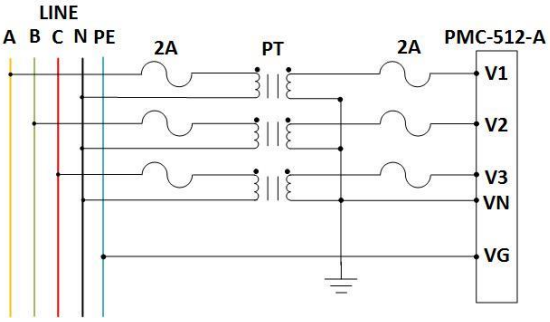


Figure 2-24 3P4W with VG and PTs

2.5.2 Typical Application Wiring

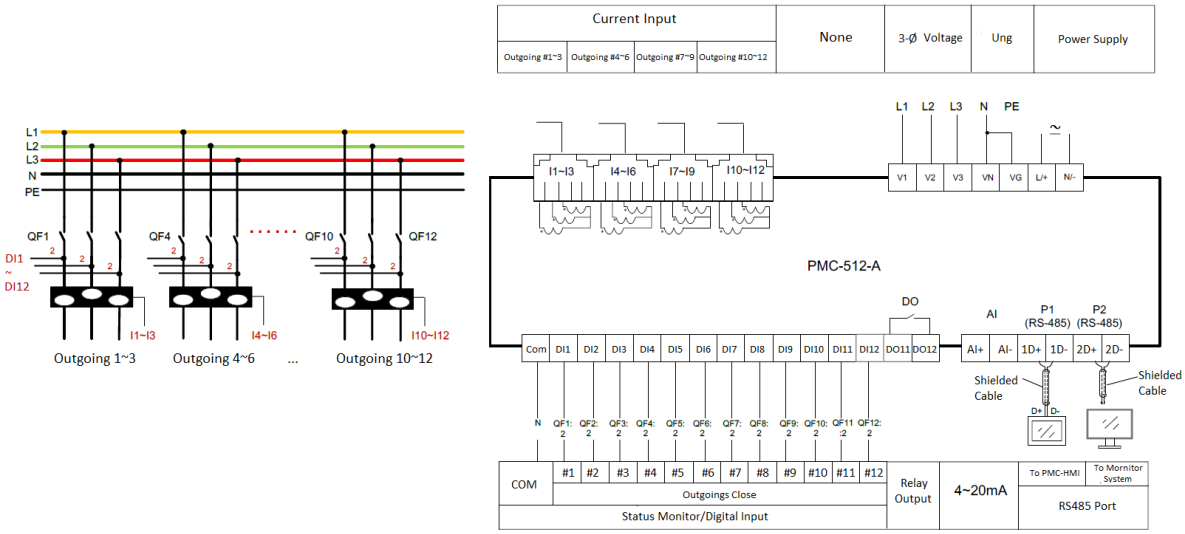


Figure 2-25 Typical 4x3-Ø Circuits Wiring

2.5.3 CT Wiring

DANGER

Please make sure that the Voltage and Current circuits are not energized while installing the CTs and connecting them to the PMC-512-A.

2.5.3.1 Molded-Case 3-Ø 100A CT

1. The Molded-Case 3-Ø 100A CT comes standard with a 2m cable with a RJ12 connector.
2. Connect the RJ12 connector to the appropriate Current Inputs of the PMC-512-A.
3. Put the 3-phase primary conductors through the hole of the Solid-Core CT.

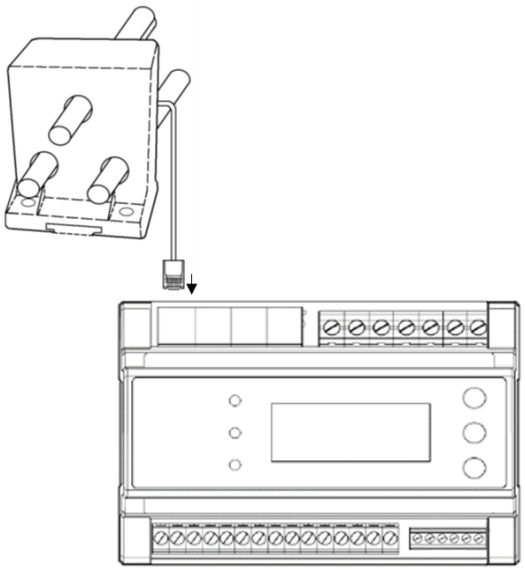


Figure 2-26 Molded-Case 3-Ø 100A CT Wiring

2.5.3.2 Solid-Core CT (250A/400A/800A)

1. Remove the CT's output terminal cover, exposing the S1 and S2 terminals.
2. Connect S1 and S2 to Terminals 1 & 2, 3 & 4 or 5 & 6, respectively, of the PMC-BCC-3CT Termination Adapter using a 0.5 to 1.0 mm^2 wire (not included).
3. Connect the RJ12 connector to the appropriate Current Inputs of the PMC-512-A.
4. Re-install the CT's output terminal cover.
5. Put the primary conductor through the hole of the Solid-Core CT.

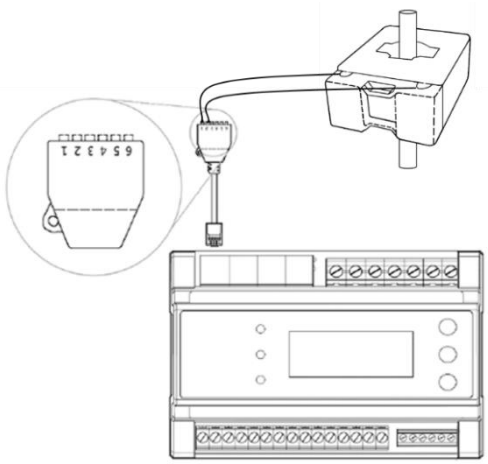


Figure 2-27 Solid-Core CT Wiring

2.5.3.3 Split-Core CT (5A/100A/200A/400A)

1. Connect the SCCT's output wires, white (S1) and black (S2) to Terminals 1 & 2, 3 & 4 or 5 & 6, respectively, of the PMC-BCC-3CT Termination Adapter.
2. Connect the RJ12 connector to the appropriate Current Inputs of the PMC-512-A.
3. Open the Split-Core CT.
4. Put the primary conductor through the opening of the Split-Core CT, close it and then make sure the locking clip is securely latched.
5. Secure the primary conductor to the Split-Core CT with a wire strap.

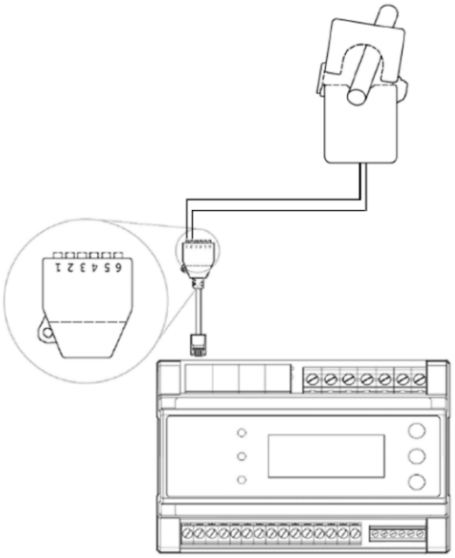


Figure 2-28 Split-Core CT Wiring

2.5.4 Communications Wiring

The PMC-512-A provides two standard RS485 ports and supports the Modbus RTU protocol. Up to 32 devices can be connected on each RS485 bus. The overall length of the RS485 cable connecting all devices should not exceed 1200m.

If the master station does not have a RS485 communications port, a RS232/RS485 or USB/RS485 converter with optically isolated output and surge protection should be used.

If the RS485 bus is very long and approaches the 1200m limit as defined by the standard, it's recommended that a 120Ω termination resistor be added to the end of the RS485 cable (but only on one end) to improve the communication reliability

The following figure illustrates the RS485 communications connections on the PMC-512-A:

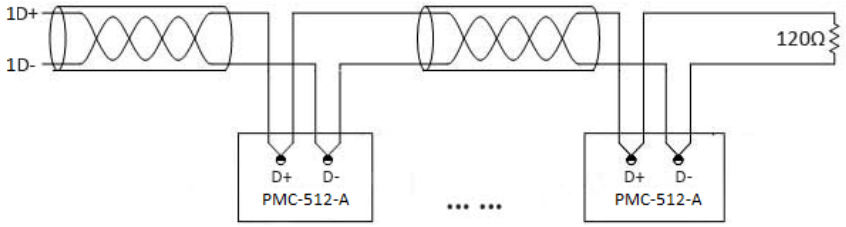


Figure 2-29 Communications Wiring

2.5.5 Digital Input Wiring

The following figure illustrates the Digital Input connections on the PMC-512-A:

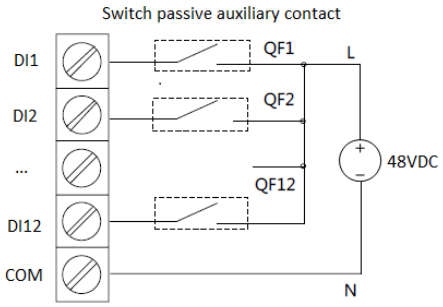


Figure 2-30 DI Wiring

2.5.6 Analog Input Wiring

The following figure illustrates the Analog Input connections on the PMC-512-A:

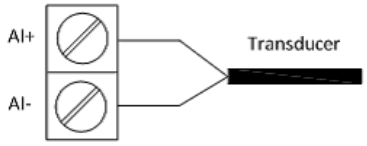


Figure 2-31 AI Wiring

2.5.7 Digital Output Wiring

The following figure illustrates the Digital Output connections on the PMC-512-A:

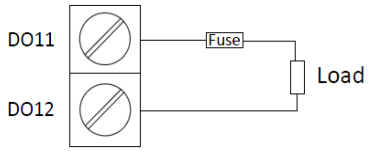


Figure 2-32 DO Wiring

2.5.8 PMC-512-A Power Supply Wiring

For AC supply, connect the live wire to the L/+ terminal and the neutral wire to the N/- terminal.

For DC supply, connect the positive wire to the L/+ terminal and the negative wire to the N/- terminal.

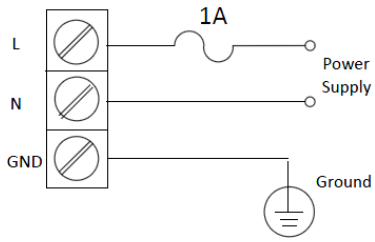


Figure 2-33 Power Supply Connections

2.5.9 HMI Power Supply Wiring

The optional Touch Screen HMI requires a 24VDC power supply to operate. Connect the positive wire to the L/+ terminal and the negative wire to the N/- terminal.

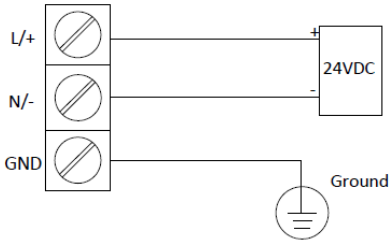


Figure 2-34 HMI Power Supply Wiring

Chapter 3 Front Panel

The PMC-512-A has an easy to read LCD display and three buttons for both data display and setup configuration purposes.

Figure 3-1 Front Panel

3.1 Front Panel LED Indicators

There are three LED indicators on the PMC-512-A's front panel as described in the following table.

LED Indicator	Color	Status	Description
Run	Green	Blinking once per second	Device is running normally
	Red	Blinking once per 0.5 second	Alarm Active
		On	Abnormal Diagnostics
Comm.	Green	Blinking	Receiving or Transmitting data
		Off	No Communication
Pulse	Red	Pulsing based on the rate of Energy Consumption	Energy Pulse Output

Table 3-1 Front Panel LED Indicators

3.2 Using the Front Panel Buttons

Button	Auto-Scroll Mode	Main Menu	Setup Configuration Mode
<○>	Pressing this button momentarily enters the **Main Menu**.	• Pressing this button enters the highlighted sub-menu. • Pressing this button at the **Setup** menu enters the **Setup Configuration Mode**. • Holding this button for 2s returns to the **Auto-Scroll** mode from the **Main Menu** or returns to the previous menu level from inside a sub-menu.	• While inside the **Setup** menu, pressing this button enters the sub-menu. • While inside a sub-menu, pressing this button enters the next sub-menu or selects a parameter to modify. • After the parameter has been modified, pressing this button saves the changes. • Holding this button for 2s returns to the previous menu level.
<◀>	Pressing this button scrolls through the following **Parameter Categories** if the respective option has been enabled in the **Auto Scroll** setup under the **Maintenance** menu:	• Pressing this button inside the **Metering** sub-menu scrolls through the following **Parameter Categories**: ▪ U ▪ 1-Ø SM1 to SM12 ▪ 3-Ø SM1 to SM4 ▪ VM1 to VM4 ▪ AI	• While inside the **Setup** menu or a sub-menu, pressing this button scrolls to the previous menu item or setup parameter. • After a setup parameter has been selected, pressing this button moves the cursor one position to the left if it

	▪ U ▪ 1-Ø SM1 to SM12 ▪ 3-Ø SM1 to SM4 ▪ VM1 to VM4 ▪ AI	• Pressing this button inside the **Alarm Status** sub-menu scrolls through the following **Alarm Categories**: ▪ U ▪ 1-Ø SM1 to SM12 ▪ 3-Ø SM1 to SM4 ▪ AI ▪ DI1 to DI12 • While inside other sub-menus, pressing this button scrolls to the previous item.	is a numeric value. Once the cursor has reached the left most digit, pressing this button again will move the cursor to the right most digit. This button is ignored if the selected parameter is an enumerated value.
<▼>	Pressing this button scrolls to the next parameter in a certain **Parameter Category**.	• Pressing this button scrolls to the next sub-menu, the next parameter in a certain sub-menu, the next parameter in a certain **Parameter Category** inside the **Metering** sub-menu or the next alarm parameter in a certain **Alarm Category** inside the **Alarm status** sub-menu.	• While inside the **Setup** menu or a sub-menu, pressing this button scrolls to the next menu item or setup parameter. • After a setup parameter has been selected, pressing this button increments the selected digit if it is a numeric value or scrolls through the selection list if it is an enumerated value.

Table 3-2 Buttons Description

3.3 Data Display

The PMC-512-A's LCD defaults to an **Auto-Scroll** display mode where measurements in each of the selected **Parameter Categories** illustrated in Table 3-3 below are automatically scrolled through at a fixed 5-second interval. If the user wishes to see all the available parameters, one can manually do so by entering the **Main Menu** by pressing the <○> button and then selecting one of the following sub-menus for the desired information. The available sub-menus are: **Metering**, **Alarm status**, **DI/DO Status**, **Event Log**, **Setup**, **Maintenance**, and **Information**. The following sections describe the available information for each of the sub-menus in detail.

3.3.1 Auto-Scroll

The **Parameter Categories** and their measurements are listed in the table below, and all of them are **Enabled** in **Auto-Scroll Mode** by default. Please refer to **Auto-Scroll Setup** in **Section 3.4.4 Maintenance** about how to enable or disable the display of a certain SM or VM in **Auto-Scroll.**

Parameter Categories	Measurements			
U	U1[1]	U2[1]	U3[1]	Uln avg[1]
	U12	U23	U31	Ull avg
	Ung	U Unbal.	Freq.	
	U1 THD[1]	U2 THD[1]	U3 THD[1]	
1-Ø SMx (x=1-12)	Current	kW	kvar	kVA
	PF	%Loading	I THD	kWh Imp
	kWh Exp	kvarh Imp	kvarh Exp	kVAh
	I Dmd	I Max. Dmd	kW Dmd	kW Max. Dmd
	kvar Dmd	kvar Max. Dmd	kVA Dmd	kVA Max. Dmd
	Operating Time			
3-Ø SMx (x=1-4)	Ia	Ib	Ic	I avg
	In	I Unbal.	kW Total	kvar Total
	kVA Total	PF Total	kWh Imp	kWh Exp
	kvarh Imp	kvarh Exp	kVAh	kW Dmd
	kW Max. Dmd	kvar Dmd	kvar Max. Dmd	kVA Dmd
	kVA Max. Dmd		Operating Time	
VM (1-4)	kWh Imp	kWh Exp	kvarh Imp	kvarh Exp
	kVAh			
AI	AI Scaled		AI Raw	

Table 3-3 Auto-Scroll Display Pages

Notes:

1) When the **Wiring Mode** is **3P3W**
   a. U1/U2/U3 phase voltages are not available.
   b. U1/U2/U3 THD represent the THD values from U12/U23/U31

3.3.2 Metering

The following table illustrates the available measurements under the **Metering** sub-menu.

Menu	Parameter Categories	Measurements			
Metering	U	U1[1]	U2[1]	U3[1]	Uln avg[1]
		U12	U23	U31	Ull avg
		Ung	U Unbal.	Freq.	
		U1 THD[1]	U2 THD[1]	U3 THD[1]	
	1-Ø SMx (x=1-12)	I	kW	kvar	kVA
		PF	%Loading	I THD	
		kWh Imp	kWh Exp	kvarh Imp	kvarh Exp
		kVAh	I Dmd	I Max. Dmd	kW Dmd
		kW Max. Dmd	kvar Dmd	kvar Max Dmd	kVA Dmd
		kVA Max Dmd	Operating Time		
	3-Ø SMx (x=1-4)	Ia	Ib	Ic	I avg
		In	I Unbal.	kW Total	kvar Total
		kVA Total	PF Total	kWh Imp	kWh Exp
		kvarh Imp	kvarh Exp	kVAh	
		kW Dmd	kW Max. Dmd	kvar Dmd	kvar Max Dmd
		kVA Dmd	kVA Max Dmd	Op. Time	
	VMx (x=1-4)	kWh Imp	kWh Exp	kvarh Imp	kvarh Exp
		kVAh			
	AI	AI Scaled		AI Raw	

Table 3-4 Metering Display Pages

Notes:

1) When the **Wiring Mode** is **3P3W**
   a. U1/U2/U3 phase voltages are not available.
   b. U1/U2/U3 THD represent the THD values from U12/U23/U31

3.3.3 Alarm Status

Menu	Alarm Categories	Measurements			
Alarm Status	U	U1	U2	U3	
		U12	U23	U31	Ung
		Freq.	U Unbal.	Phase Rev.	Phase Loss
	1-Ø SMx (x=1-12)	I Alarm			
	3-Ø SMx (x=1-4)	I Unbal.		I Reversal	
	AI	AI Alarm			
	DI (1-12)	DIx (x=1 to 12)			

Table 3-5 Alarm Display Pages

3.3.4 DI/DO Status

Menu	Sub-Menu	Measurements
DI/DO Status	DI (1-12)	DIx (x=1 to 12)
	DI (1-12) Counter	DIx (x=1 to 12)
	DO	DO

Table 3-6 DI/DO Status Display Pages

3.3.5 SOE Log

The PMC-512-A supports the display of the SOE Log with its relevant parameter values and its timestamp. The users can scroll through the SOE Log by pressing <◄> or <▼>.

Two examples of SOE Log Display:

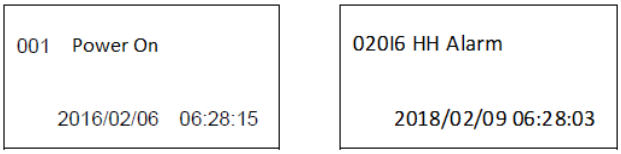


Figure 3-2 Examples of Event Log Display

3.3.6 Information

Menu Parameters	Description
Info	Meter Information
Firmware	Firmware Version
Modbus	Modbus Protocol Version
Ver. Date	Firmware Version Date
S/N	Serial Number
Diagnostics	
AD	A/D Diagnostics
FRAM	FRAM Diagnostics
FLASH	FLASH Diagnostics
Setup Param.	Setup Parameters Diagnostics

Table 3-7 DI/DO Status Display Pages

3.4 Setup and Maintenance via the Front Panel

3.4.1 Making Setup Changes

1) Entering the Password:

- Press <○> to enter the **Main Menu**.
- Press <▼> to advance to the **Setup** menu.
- A correct password must be entered before changes are allowed. The factory default password is "0000".
- Press <◀> to shift the cursor to the left and <▼> to increment the numeric value for the password.
- When the password has been entered, pressing <○> will enter the **Setup** sub-menu if the password is correct.

2) Selecting a parameter to change:

- Press <▼> to scroll to the desired sub-menu or parameter.
- Press <○> to select the sub-menu or parameter for configuration.
- Hold <○> for 2 seconds to return to the previous menu level.
- Repeat Step 2 until all the desired setup parameters have been selected.

3) Changing and saving a setup parameter:

- For a numeric parameter, press <◀> to shift the cursor to the left by one position or <▼> to increment the numeric value.
- For an enumerated parameter, press <◀> or <▼> to scroll backward and forward in the selection list.
- After modification, press <○> to save the change into memory or hold <○> for 2 seconds to exit the currently selected parameter without change.
- Repeat steps 2) and 3) if necessary.

4) Exiting the Setup Configuration Mode

- Hold <○> for 2 seconds to return to the **Main Menu**.

- Also, the **Setup Configuration Mode** will be automatically exited if there is a period of inactivity of 5 minutes or longer.

3.4.2 Setup Menu

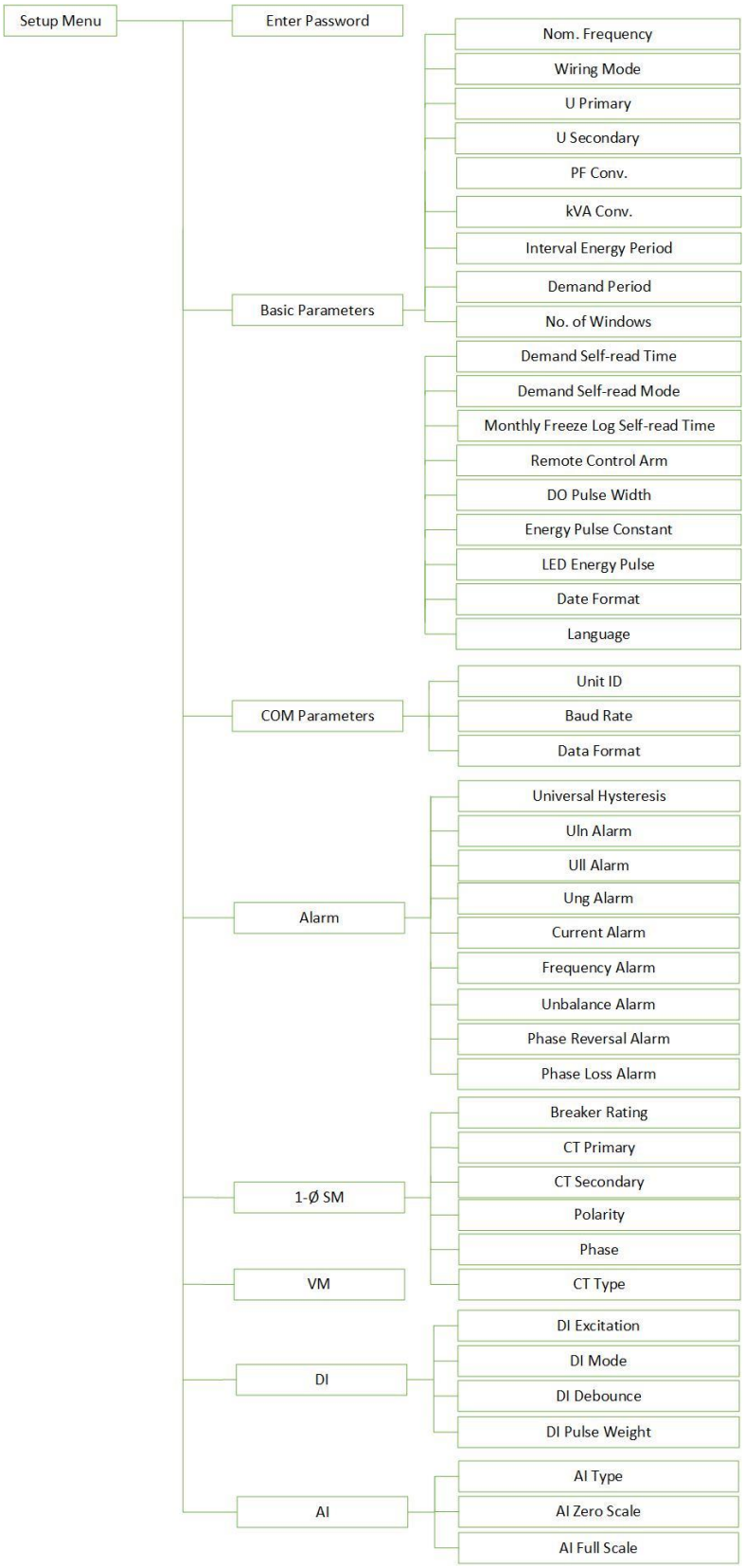


Figure 3-3 Setup Menu

3.4.3 Configuration

The **Setup Configuration Mode** provides access to the following setup parameters:

Label Menu 1st 2nd 3rd	Description	Range	Default
Setup			
Basic			
Nom. Freq.	Nominal Frequency	50Hz/60Hz	50Hz
Wiring Mode	Meter's Wiring Connection	3P4W/3P3W/ 1P2W/DEMO	3PH4W
U Primary	PT Primary	1 to 1,000,000V	380V
U Secondary	PT Secondary	1 to 450V	380V
PF Conv.	PF Convention	IEC/IEEE/-IEEE	IEC
kVA Calc.	kVA Calculation Method	Vector/Scalar	Vector
IE Period	Interval Energy Period	5 to 60 min	60
Dmd Period	Demand Interval	1 to 60 min	15
No. of Windows	Number of Sliding Windows	1 to 15	1
Dmd S.R. Time	Self-Read Time for Demand	See Note 1)	0
Dmd S.R. Mode	Self-Read Mode for Demand	Auto/Manual	Manual
Mthly Freeze Time	Self-Read Time for Monthly Freeze Log	See Note 1)	0
R.C. Arm	Enable Arm before Execute Remote Control	Enabled/Disabled	Disabled
DO Pulse	Specifies the duration for which the relay output will be active when a remote control command is received to activate it. The DO is in Latched mode if it's set to zero.	0.0 ~600.0s	0s
EN Pulse CNST	LED Energy Pulse Constant	1/10/100/400/ 1000/3200 imp/kWh	400
LED EN Pulse	Specifies which kWh will be enabled as the LED Energy Pulse	0 to 32^2	0 (Disabled)
Date Format	Set Date Format	YYYY/MM/DD MM/DD/YYYY DD/MM/YYYY	YYYY/MM/DD
Language	System language	EN/SC/TC	EN
Comm.			
COM1 Unit ID	COM1 Modbus Address	1 to 254	100
COM1 Baud Rate	COM1 Data rate in bits per COM1 second	1200/2400/4800/9600 19200/38400/57600	38400
COM1Config	COM1 Data Format	8N2/8O1/8E1/8N1	8E1
COM2 Unit ID	COM2 Modbus Address	1 to 254	100
COM2 Baud Rate	COM2 Data rate in bits per second	1200/2400/4800/9600/ 19200/38400/57600	9600
COM2 Config	COM2 Data Format	8N2/8O1/8E1/8N1	8E1
Alarm			
Global Alarm			
Uni. Hys.	Universal Hysteresis	0 to 10%	2%
ON/OFF Threshold	Current ON Threshold	0 to 10%	5%
ON Time	Current ON Delay	0 to 9999(s)	10s
OFF Time	Current OFF Delay	0 to 9999(s)	30s
Uln Alarm			
Enable	Uln Alarm Enable	U1/U2/U3	None
HH Limit	Uln HH Alarm Threshold	0~300.0V	0
HH Delay	Uln HH Alarm Delay	0~9999s	0
H Limit	Uln H Alarm Threshold	0~300.0V	0
H Delay	Uln H Alarm Delay	0~9999s	0
L Limit	Uln L Alarm Threshold	0~300.0V	0
L Delay	Uln L Alarm Delay	0~9999s	0
LL Limit	Uln LL Alarm Threshold	0~300.0V	0
LL Delay	Uln LL Alarm Delay	0~9999s	0
Trigger	Uln Alarm Trigger	None/RO/Alarm LED/RO & Alarm LED	None
Ull Alarm			

Enable	Ull Alarm Enable	U12/U23/U31	None
HH Limit	Ull HH Alarm Threshold	0~500.0 (V)	0
HH Delay	Ull HH Alarm Delay	0~9999 (s)	0
H Limit	Ull H Alarm Threshold	0~500.0 (V)	0
H Delay	Ull H Alarm Delay	0~9999 (s)	0
L Limit	Ull L Alarm Threshold	0~500.0 (V)	0
L Delay	Ull L Alarm Delay	0~9999 (s)	0
LL Limit	Ull LL Alarm Threshold	0~500.0 (V)	0
LL Delay	Ull LL Alarm Delay	0~9999 (s)	0
Trigger	Ull Alarm Trigger	None/RO/Alarm LED/RO & Alarm LED	None
Ung Alarm			
HH Limit	Ung HH Alarm Threshold	0~100.0 (V)	0
HH Delay	Ung HH Alarm Delay	0~9999 (s)	0
H Limit	Ung H Alarm Threshold	0~100.0 (V)	0
H Delay	Ung H Alarm Delay	0~9999 (s)	0
Trigger	Ung Alarm Trigger	None/RO/Alarm LED/RO & Alarm LED	None
I Alarm			
Enable	Current Alarm Enable	Off/On	Off
HH Limit	Current HH Alarm Threshold	0 to 100 (%)	0
HH Delay	Current HH Alarm Delay	0 to 9999 (s)	0
H Limit	Current H Alarm Threshold	0 to 100 (%)	0
H Delay	Current H Alarm Delay	0 to 9999 (s)	0
L Limit	Current L Alarm Threshold	0 to 100 (%)	0
L Delay	Current L Alarm Delay	0 to 9999 (s)	0
LL Limit	Current LL Alarm Threshold	0 to 100 (%)	0
LL Delay	Current LL Alarm Delay	0 to 9999 (s)	0
Trigger	Current Alarm Trigger	None/RO/Alarm LED/RO & Alarm LED	None
Freq. Alarm			
H Limit	Freq. H Alarm Threshold	45.00~65.00 (Hz)	65.00
H Delay	Freq. H Alarm Delay	0~9999 (s)	10
L Limit	Freq. L Alarm Threshold	45.00~65.00 (Hz)	45.00
L Delay	Freq. L Alarm Delay	0~9999s	10
Trigger	Frequency Alarm Trigger	None/RO/Alarm LED/RO & Alarm LED	None
Unbal. Alarm			
I Enable[3]	I Unb. Alarm Enable	1 2 3 4 □□□□	Off
I Unbal. Limit	I Unbal. Alarm Threshold	0 to 100 (%)	0
I Unbal. Delay	I Unbal. Alarm Delay	0 to 9999 (s)	0
I Unbal. Trigger	I Unbal. Alarm Trigger	None/RO/Alarm LED/RO & Alarm LED	None
U Enable	U Unbal. Enable	Off/On	Off
U Unbal. Limit	U Unbal. Alarm Threshold	0 to 100 (%)	0
U Unbal. Delay	U Unbal. Alarm Delay	0 to 9999 (s)	0
U Unbal. Trigger	U Unbal. Alarm Trigger	Off	None
Phase Rev. Alarm			
I Enable[3]	I Phase Reversal Alarm Enable	1 2 3 4 □□□□	None
U Enable	U Phase Reversal Alarm Enable	Off/On	Off/On
Trigger	Phase Reversal Alarm Trigger	None/RO/Alarm LED/RO & Alarm LED	None
Phase Loss. Alarm			
Enable	Phase Loss. Alarm Enable	Off/On	Off
Alarm Delay	Phase Loss. Alarm Delay	0 to 9999 (s)	0s
Trigger	Phase Loss. Alarm Trigger	None/RO/Alarm LED/RO & Alarm LED	None
1-Ø SM Setup (1-12)			
Breaker Rating	Breaker Rating	1~30,000	32
CT Primary	CT Primary	1~60,000A	100
CT Secondary	CT Secondary[4]	0~60,000 (x0.1) mA	See Note 4)
Polarity	Polarity	Normal/Reverse	Normal
U Phase	Voltage Phase	Not Used/U1/U2/U3 U12/U23/U31	U1

CT Type	CT Type	Solid/Split	Solid
VM Setup (1-6)			
Enable 1-6	Select SM1-SM6 to be included in a VM's aggregation	1 2 3 4 5 6 ☐☐☐☐☐☐	
Enable 7-12	Select SM7-SM12 to be included in a VM's aggregation	7 8 9 10 11 12 ☐☐☐☐☐☐	
DI Setup (x=1-12)			
DIx Excitation	Excitation Voltage	DC48V	DC48V
DIx Mode	DI or Pulse Counter	DI/Pulse	DI
DIx Debo.	Debounce Time	1 to 9999 (ms)	20 ms
DIx Pulse Weight	DI Pulse Weight	1 to 1,000,000	1
Analog Input			
Type	Select between 0-20mA or 4-20mA input	4-20mA / 0-20 mA	4-20mA
Zero Scale	The value that corresponds to the minimum Analog Input of 0 or 4 mA	-999,999 to 999,999	400
Full Scale	The value that corresponds to the maximum Analog Input of 20 mA	-999,999 to 999,999	2000

Table 3-8 Setup Parameters

Notes:

1) The **Dmd S.R. Time** and **Mthly Freeze Time** support the following two options:
   a. A zero value means that the Self-Read will take place at 00:00 of the first day of each month.
   b. A non-zero value means that the Self-Read will take place at a specific time and day based on the formula: Self-Read Time = (Day x 100 + Hour) where 0 ≤ Hour ≤ 23 and 1 ≤ Day ≤ 28. For example, the value 1512 means that the Self-Read will take place at 12:00pm on the 15th day of each month.

2) The **LED Energy Pulse Modes** are listed in the table below:

Value	Parameter	Value	Parameter	Value	Parameter
0	Disabled	6	3-Ø SM3 kvarh Imp.	12	1-Ø SM2 kvarh Imp.
1	3-Ø SM1 kWh Imp.	7	3-Ø SM4 kWh Imp.	13	1-Ø SM3 kWh Imp.
2	3-Ø SM1 kvarh Imp.	8	3-Ø SM4 kvarh Imp.	14	1-Ø SM3 kvarh Imp.
3	3-Ø SM2 kWh Imp.	9	1-Ø SM1 kWh Imp.	…	…
4	3-Ø SM2 kvarh Imp.	10	1-Ø SM1 kvarh Imp.	31	1-Ø SM12 kWh Imp.
5	3-Ø SM3 kWh Imp.	11	1-Ø SM2 kWh Imp.	32	1-Ø SM12 kvarh Imp.

Table 3-9 LED Energy Pulse Modes

3) For Unbal. Alarm and Phase Rev. Alarm's **I Enable**:
   - Bit 1 = 3-Ø SM1
   - Bit 2 = 3-Ø SM2
   - Bit 3 = 3-Ø SM3
   - Bit 4 = 3-Ø SM4

4) The default value of the **SMx CT Secondary Current** depends on the type of selected CT specification (see **Appendix D Mains Circuits CT**):

CT Rating	CT Primary	Default CT Secondary
800A/40mA	800	400 (x0.1mA)
400A/40mA	400	400 (x0.1mA)
200A/40mA	200	400 (x0.1mA)
100A/40mA	100	400 (x0.1mA)
5A/1.667mA	Primary Rating of the External CT	50000 (x0.1mA)

Table 3-10 Default SM CT Secondary

3.4.4 Maintenance

Parameters	Descriptions	Range	Default
Clock Setup	Time and Date	YYYY/MM/DD hh:mm:ss	-
Password Setup	Set New Password	-	-
BLTO	Backlight Time Out[1]	0 to 60 min.	5
Contrast	LCD Contrast	0 to 9	5
Auto-Scroll	Auto Scroll Setup[2]	See Note 2)	
Clear Energy	Clear all Energy registers	Yes/No	No
Clear Max Demands	Clear Peak Demand Log of This Month	Yes/No	No

	(Since Last Reset)		
Clear All Demands	Clear all Demand Logs	Yes/No	No
Clear SOE	Clear SOE Logs	Yes/No	No
Clear DR Log	Clear DR Logs	Yes/No	No
Clear All Data	Clear All of the above	Yes/No	No
Factory Reset	Reset factory default settings	Yes/No	No

Table 3-11 Maintenance Parameters

Notes:

1) If the BLTO is set to 0, the Time Out is disabled, which means that the Backlight will always be on.

2) **Auto-Scroll** Setup allows users to select which **1-Ø SM, 3-Ø SM** or **VM** would be displayed in **Auto-Scroll Mode**. For example, if the PMC-512-A is used to monitor three 3-Ø circuits with I1 to I9, three 1-Ø circuits with I10 to I12 and without any virtual metering, the 1-Ø SM1 to SM9, 3-Ø SM4 as well as VM1 to VM4 can be disabled in the **Auto-Scroll Mode** to prevent un-necessary information from being displayed and thus simplifying the HMI access. The **Parameter Categories** and their measurements are listed in the table below, and all of them are **Enabled** in **Auto-Scroll Mode** by default. The **Parameter Category U** (Voltage) is always shown and cannot be disabled in **Auto-Scroll** mode.

Parameter Categories	Measurements			
U	U1[1]	U2[1]	U3[1]	Uln avg[1]
	U12	U23	U31	Ull avg
	Ung	U Unbal.	Freq.	
	U1 THD[1]	U2 THD[1]	U3 THD[1]	
1-Ø SMx (x=1-12)	Current	kW	kvar	kVA
	PF	%Loading	I THD	kWh Imp
	kWh Exp	kvarh Imp	kvarh Exp	kVAh
	I Dmd	I Max. Dmd	kW Dmd	kW Max. Dmd
	kvar Dmd	kvar Max. Dmd	kVA Dmd	kVA Max. Dmd
	Operating Time			
3-Ø SMx (x=1-4)	Ia	Ib	Ic	I avg
	In	I Unbal.	kW Total	kvar Total
	kVA Total	PF Total	kWh Imp	kWh Exp
	kvarh Imp	kvarh Exp	kVAh	kW Dmd
	kW Max. Dmd	kvar Dmd	kvar Max. Dmd	kVA Dmd
	kVA Max. Dmd		Operating Time	
VM (1-4)	kWh Imp	kWh Exp	kvarh Imp	kvarh Exp
	kVAh			
AI	AI Scaled		AI Raw	

Table 3-12 Auto-Scroll Parameter Categories

2) When the **Wiring Mode** is **3P3W**

   a. U1/U2/U3 phase voltages are not available.

   b. U1/U2/U3 THD represent the THD values from U12/U23/U31

Chapter 4 Applications

4.1 Inputs and Outputs

4.1.1 Digital Inputs

The PMC-512-A is equipped with 12 wet contact Digital Inputs (DIs) that can be used for the status monitoring which can help if a circuit is energized, detect breaker status or prevent misoperation to equipment. The real-time statues of the Digital Inputs are available from the front panel or through communications. Changes in Digital Input status are stored as events in the SOE Log in 1 ms resolution.

The following table describes the DI's setup parameters:

Setup Parameter	Definition	Options/Default*
DIx Excitation	Specifies the voltage excitation level.	DC48V*
DIx Mode	Specifies the mode of the DI.	0 = Digital Input* 1 = Pulse Counter
DIx Debounce	Specifies the minimum duration the **DI** must remain in the Active or Inactive state before a DI state change is considered to be valid.	1 to 9999 (ms) (Default = 20ms)
DI*x* Pulse Weight	Specifies pulse weight of the DI.	1* to 1,000,000

Table 4-1 DI Setup Parameters

4.1.2 Analog Input

The PMC-512-A comes standard with an Analog Input which can be programmed as 0mA to 20mA or 4mA to 20mA input. There are 3 setup parameters:

Setup Parameter	Definition	Options/Default*
AI Type	Select between 0-20mA or 4-20mA input.	0 = 4-20mA* 1 = 0-20mA
AI Zero	This value corresponds to the minimum Analog Input of 4 mA (for 4-20mA input) and has a range of -999,999 to +999,999.	-999,999 to +999,999 Default=400
AI Full	This value corresponds to the maximum Analog Input of 20 mA and has a range of -999,999 to +999,999.	-999,999 to +999,999 Default=2000

Table 4-2 AI Setup Parameters

For example, to measure the oil temperature of a transformer, connect the outputs of the temperature sensor to the AI terminals of the PMC-512-A. The temperature sensor outputs 4mA when the temperature is -25°C and 20mA when the temperature is 100°C. As such, the Type parameter should be programmed as 4-20mA. The AI FULL parameter should be programmed with the value 100, and the AI ZERO parameter should be programmed with the value -25. Therefore, when the output of the sensor is 20mA, the reading will be 100.00°C. When the output is 4mA, the reading will be -25.00°C. When the output is 12mA, the reading will be (100°C - (-25°C)) x (12mA-4mA) / (20mA-4mA) + (-25°C) = 37.50°C.

4.1.3 Energy Pulse Outputs

The PMC-512-A comes standard with one front panel LED Pulse Output for kWh/kvarh pulsing. Energy pulsing mode can be programmed from the Front Panel or through communications via the LED EN Pulse setup parameter. Energy Pulse Outputs are typically used for accuracy testing. The pulse constant can be configured as 1/10/100/400/1000/3200 imp/kxh (kWh/kvarh). However, it's recommended that the pulse constant should be set based on the CT specifications:

CT Specification	Recommended Pulse Constant	Energy Pulse Constant

5A[1]	3200 imp/kxh	0=1 imp/kxh 1=10 imp/kxh 2=100 imp/kxh 3=400 imp/kxh 4=1000 imp/kxh 5=3200 imp/kxh
100A	400 imp/kxh	
200A	400 imp/kxh	
250A	400 imp/kxh	
400A	100 imp/kxh	
800A	100 imp/kxh	

Table 4-3 Recommended Pulse Constant

Notes:

1) For 5A CT, the recommended **Energy Pulse Constant** is 3200 imp/kxh if it is directly connected to the system. Otherwise, the **Energy Pulse Constant** should be set based on the primary rating of the external CT. For example, if the primary rating of the external CT is 100A, then it is recommended to set the **Energy Pulse Constant** to 400 imp/kxh.

4.2 Power, Energy and Demand

4.2.1 Basic Measurements

The PMC-512-A provides the following basic measurements which can be accessed via the Front Panel or through the communication:

Parameter	1-Ø SMs	3-Ø SMs	VMs
ULN	●	●	○
ULL	●	●	○
Ung	●	●	○
Current	●	●	○
Loading Factor	●	○	○
kW	●	●	●
kvar	●	●	●
kVA	●	●	●
PF	●	●	○
Frequency	●	●	○

Table 4-4 Basic Measurements

4.2.2 Energy Measurements

The PMC-512-A provides Energy parameters for active energy (kWh), reactive energy (kvarh) and apparent energy (kVAh) with a resolution of 0.01 and a maximum value of 1,000,000.00. When the maximum value is reached, the energy registers will automatically roll over to zero. The energy registers can be reset manually through communications for all SMs.

The PMC-512-A provides the following energy measurements:

- 1-Ø SMs: kWh Import/Export, kvarh Import/Export, kVAh
- 3-Ø SMs: kWh Import/Export Total, kvarh Import/Export Total, kVAh Total
- VMs: kWh Import/Export, kvarh Import/Export, kVAh

4.2.3 Interval Energy Measurements

The PMC-512-A provides Interval Energy measurements of kWh Import/Export, kvarh Import/Export and kVAh for 1-Ø SMs and VMs, kWh Import/Export total, kvarh Import/Export total and kVAh for 3-Ø SMs. The Interval Energy registers can only be retrieved through communications.

The **Interval Energy Period** setup parameter can be programmed from the Front Panel or through communications and allows the user to specify the latest interval for which real-time energy consumption should be recorded. Please note that changing **Interval Energy Period** would clear the present Interval Energy measurements.

4.2.4 Demands

Demand is defined as the average power consumption over a fixed interval (usually 15 minutes) based on the sliding window method. The PMC-512-A provides Present Demand of Current for 1-Ø SMs and Present Demand of kW, kvar and kVA for 1-Ø SMs, 3-Ø SMs as well as VMs.

The PMC-512-A provides the following Demand setup parameters:

Setup Parameter	Definition	Options
Demand Period	1 to 60 minutes. For example, if the **# of Sliding Windows** is set as 1 and the **Demand Period** is 15, the demand cycle will be 1×15=15min.	1 to 60 minutes Default=15
# of Sliding Windows	Number of Sliding Windows.	1 to 15 Default=1
Self-Read Time	The **Self-Read Time** allows the user to specify the time and day of the month for the Peak Demand Self-Read operation. The **Self-Read Time** supports two options: • A zero value means that the **Self-Read** will take place at 00:00 of the first day of each month. • A non-zero value means that the **Self-Read** will take place at a specific time and day based on the formula: **Self-Read Time** = Day x 100 + Hour where 0 ≤ Hour ≤ 23 and 1 ≤ Day ≤ 28. For example, the value 1512 means that the Self-Read will take place at 12:00pm on the 15th day of each month.	Default=0
Self-Read Mode	• 0=Auto • 1=Manual	Default=1 (Manual)

Table 4-5 Demand Setup

4.3 Alarm Setpoints

The PMC-512-A provides powerful alarming functions for the 1-Ø SMs, 3-Ø SMs as well as for different parameters. Each Alarm Type can be independently enabled, and a particular alarm within each Alarm Type may also be disabled individually by setting its **Alarm Threshold** to 0.

4.3.1 Alarm Status

The PMC-512-A supports both **Instantaneous Alarm** and **Latched Alarm**, which are defined below.

Instantaneous Alarm

The status of an Instantaneous Alarm becomes active when the alarm condition is met and is automatically reset to NORMAL when the alarm condition is no longer met. Instantaneous Alarm cannot be reset manually.

Latched Alarm

On the other hand, the status of a Latched Alarm becomes **Active** when the alarm condition is met and will remain in the **Active** state even after the alarm condition is no longer met. The Latched Alarm must be reset manually. However, the Latched Alarm cannot be reset while the alarm condition remains active.

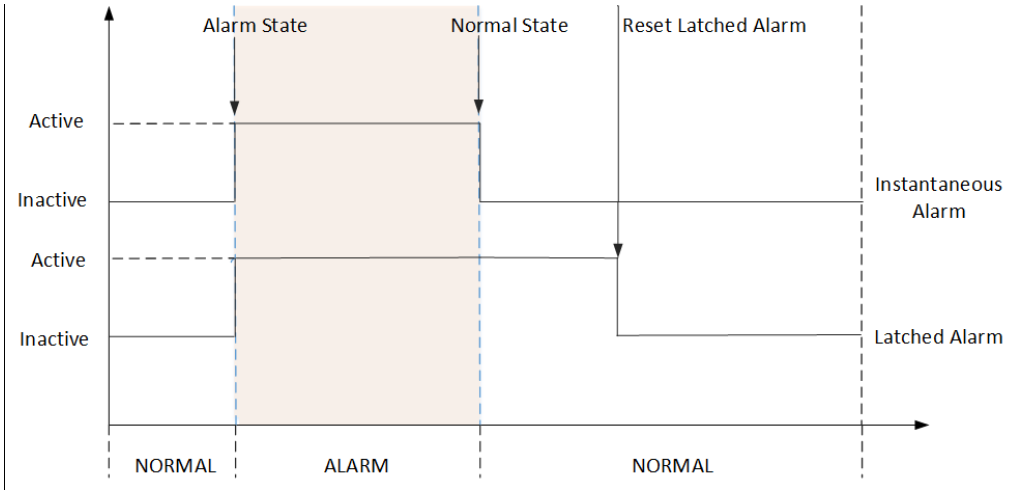


Figure 4-1 Alarm Status

4.3.2 Universal Hysteresis and Current ON/OFF Status

The Universal Hysteresis, Current ON Threshold, Current ON Delay and Current OFF Delay are global parameters that are valid for all relevant alarms.

Parameters	Description	Range	Default
Universal Hysteresis	The hysteresis rate for calculating the Return Threshold for all Alarms.	0 to 10%	2%
Current ON Threshold	The **ON Threshold** applies to all Current channels for switching from the **OFF** to **ON** state.	0 to 10%	5%
Current ON Delay	The minimum duration that the Current of a particular channel must exceed the **ON Threshold** before the Status would switch from OFF to ON.	0 to 9999(s)	10s
Current OFF Delay	The minimum duration that the Current of a particular channel must fall below the **OFF Threshold** before the Status would switch from ON to OFF.	0 to 9999(s)	30s

Table 4-6 Global Parameters

The Universal Hysteresis is a global parameter that is used to prevent measurement fluctuation around the threshold point from causing an alarm to fluctuate between the **Active** and **Inactive** states.

It should be noted that the absolute value of the Alarm Threshold is calculated based on the Breaker Rating parameters. Therefore, it's critical to set the Breaker Rating correctly for each Current channel for the Current Alarms to work properly.

| Channel Alarm Threshold | = Channel's Breaker Rating x Alarm Threshold (%)

For Current On, High and High-High Alarms, which are conceptually similar to Over Setpoint:

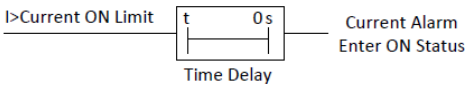
Return Threshold = Alarm Threshold x (1 – Universal Hysteresis)

For Low and Low-Low Alarms, which are conceptually similar to Under Setpoint:

Return Threshold = Alarm Threshold x (1 + Universal Hysteresis)

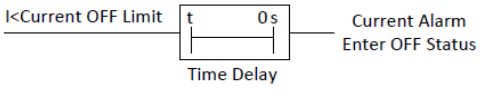
The PMC-512-A provides the ON/OFF status for each Current channel to indicate whether the channel is **ON** (Loaded) or **OFF** (No Load). If the Channel status is **OFF**, it means that the channel has no load and would prevent the Low and Low-Low alarms from activating.

The following figures illustrate the logic diagram of the Current ON/OFF status, respectively.



Current ON = True

Figure 4-2 Current ON Logic Diagram



Current OFF = True

Figure 4-3 Current OFF Logic Diagram

Where

OFF Threshold = On Threshold x (1 – Universal Hysteresis)

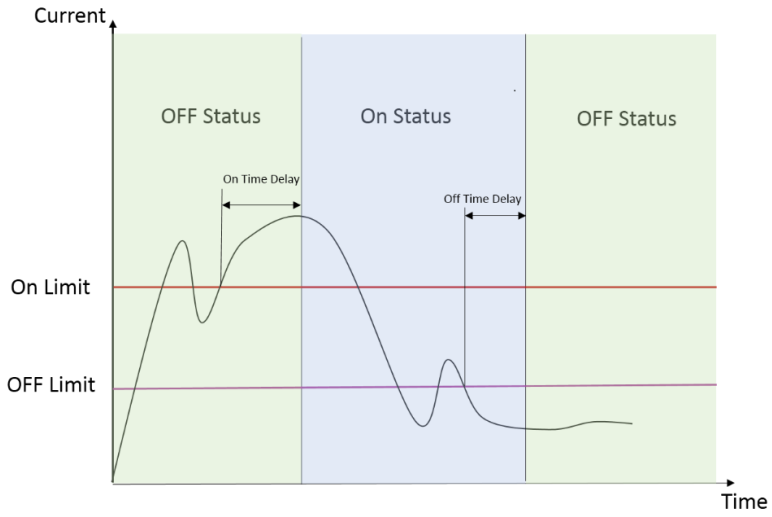


Figure 4-4 Current ON/OFF Status

4.3.3 Current Alarms

PMC-512-A provides the **Current On/OFF** status as well as four Current Alarm Levels (High-High, High, Low and Low-Low) for the 12x1-Ø SM. The Current Alarms will only be evaluated if it's determined that the **Current ON** status is true.

*It should be noted that the **absolute value** of the Alarm Threshold is* calculated *based on the Breaker Rating parameters. **Therefore, it's critical to set the Breaker Rating correctly for each Current channel for the Current Alarms to work properly.***

| Channel Alarm Threshold | = Channel's Breaker Rating x Alarm Threshold (%)

The following table illustrates the Current Alarm parameters.

Parameters	Description	Range/Option	Default
Current Alarm Enable	Bit 0 = 1-Ø SM1 Bit 1 = 1-Ø SM2 … Bit 11 = 1-Ø SM12	0 = Disabled 1 = Enabled	0
Current HH Alarm Threshold (%)	Current HH Alarm Limit	0 to 100%	0%
Current HH Alarm Time Delay	Current HH Alarm Time Delay	0 to 9999(s)	0s
Current H Alarm Threshold (%)	Current H Alarm Limit	0 to 100%	0%
Current H Alarm Time Delay	Current H Alarm Time Delay	0 to 9999(s)	0s
Current L Alarm Threshold (%)	Current L Alarm Limit	0 to 100%	0%
Current L Alarm Time Delay	Current L Alarm Time Delay	0 to 9999(s)	0s
Current LL Alarm Threshold (%)	Current LL Alarm Limit	0 to 100%	0%
Current LL Alarm Time Delay	Current LL Alarm Time Delay	0 to 9999(s)	0s
Current Alarm Trigger	Specifies what action would trigger when the Current Alarm becomes Active.	0=None, 1=RO, 2=Alarm LED, 3=RO & Alarm LED	0=None

Table 4-7 Current Alarm Parameters

The logic diagram of the Current HH Alarm is illustrated in Figure 4-5.

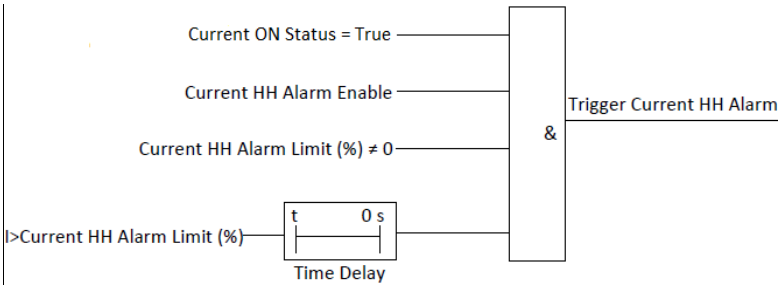


Figure 4-5 Current HH Alarm Logic Diagram

The logic diagram of the Current H Alarm is illustrated in Figure 4-6.

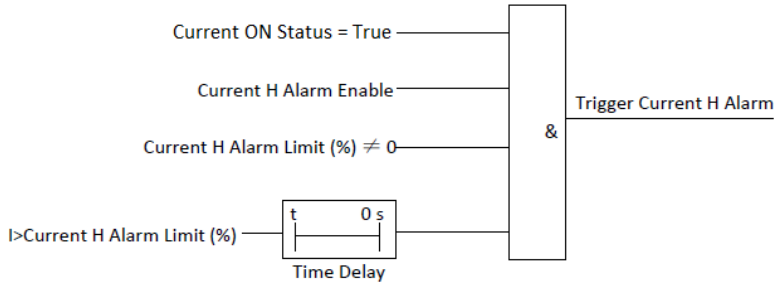


Figure 4-6 Current H Alarm Logic Diagram

The logic diagram of Current L Alarm is illustrated in Figure 4-7.

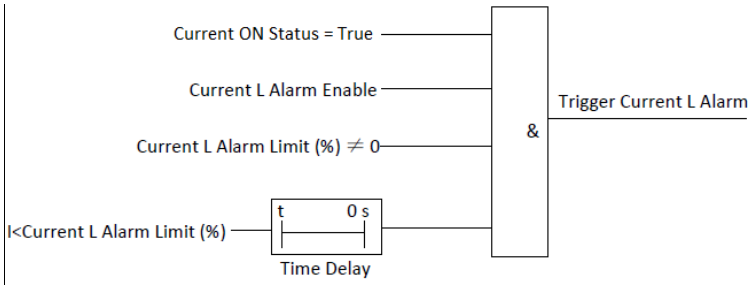


Figure 4-7 Current L Alarm Logic Diagram

The logic diagram of the Current LL Alarm is illustrated in Figure 4-8.

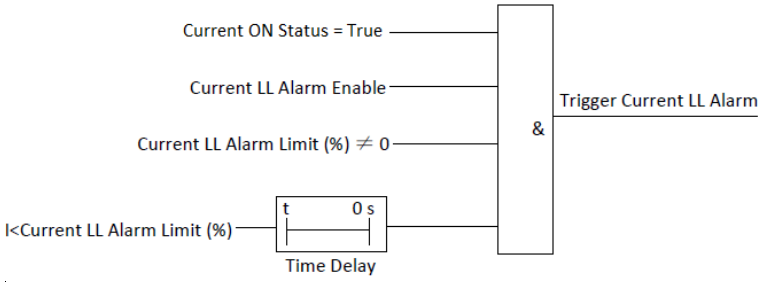


Figure 4-8 Current LL Alarm Logic Diagram

4.3.4 Voltage Alarm

The following table illustrates the Voltage Alarm parameters.

Parameters	Description	Range/Option	Default
ULN Alarm Enable	Bit 0 = U1, Bit 1 = U2 Bit 2= U3, Bits 3 - 15=Reserved	0 = Disabled 1 = Enabled	0
ULN HH Alarm Threshold	ULN HH Alarm Limit	0 to 300V	0

ULN HH Alarm Time Delay	ULN HH Alarm Time Delay	0 to 9999(s)	0
ULN H Alarm Threshold	ULN H Alarm Limit	0 to 300V	0
ULN H Alarm Time Delay	ULN H Alarm Time Delay	0 to 9999(s)	0
ULN L Alarm Threshold	ULN L Alarm Limit	0 to 300V	0
ULN L Alarm Time Delay	ULN L Alarm Time Delay	0 to 9999(s)	0
ULN LL Alarm Threshold	ULN LL Alarm Limit	0 to 300V	0
ULN LL Alarm Time Delay	ULN LL Alarm Time Delay	0 to 9999(s)	0
ULN Alarm Trigger	ULN Alarm Trigger	0=None, 1=RO, 2=Alarm LED, 3=RO & Alarm LED	0
ULL Alarm Enable	Bit 0 = U12 Bit 1 = U23 Bit 2= U31 Bits 3 - 15=Reserved	0 = Disabled 1 = Enabled	0
ULL HH Alarm Threshold	ULL HH Alarm Limit	0 to 500V	0
ULL HH Alarm Time Delay	ULL HH Alarm Time Delay	0 to 9999(s)	0
ULL H Alarm Threshold	ULL H Alarm Limit	0 to 500V	0
ULL H Alarm Time Delay	ULL H Alarm Time Delay	0 to 9999(s)	0
ULL L Alarm Threshold	ULL L Alarm Limit	0 to 500V	0
ULL L Alarm Time Delay	ULL L Alarm Time Delay	0 to 9999(s)	0
ULL LL Alarm Threshold	ULL LL Alarm Limit	0 to 500V	0
ULL LL Alarm Time Delay	ULL LL Alarm Time Delay	0 to 9999(s)	0
ULL Alarm Trigger	ULL Alarm Trigger	0=None, 1=RO, 2=Alarm LED, 3=RO & Alarm LED	0
Ung HH Alarm Threshold	Ung HH Alarm Limit	0 to 100V	0
Ung HH Alarm Time Delay	Ung HH Alarm Time Delay	0 to 9999(s)	0
Ung H Alarm Threshold	Ung H Alarm Limit	0 to 100V	0
Ung H Alarm Time Delay	Ung H Alarm Time Delay	0 to 9999(s)	0
Ung Alarm Trigger	Ung Alarm Trigger	0=None, 1=RO, 2=Alarm LED, 3=RO & Alarm LED	0

Table 4-8 Voltage Alarm Parameters

The logic diagram of Voltage HH/H Alarm is illustrated in Figure 4-9.

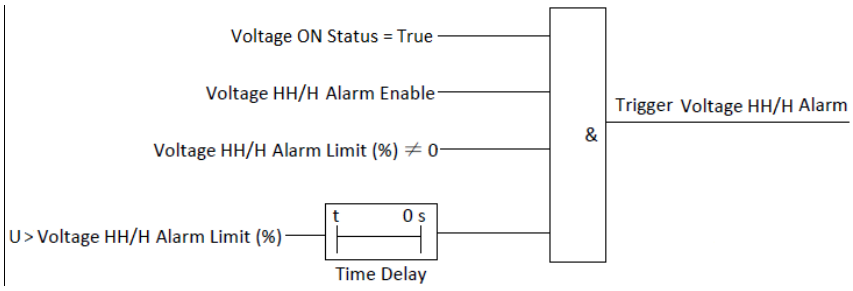


Figure 4-9 Voltage HH/H Alarm Logic Diagram

The logic diagram of Voltage L/LL Alarm is illustrated in Figure 4-10.

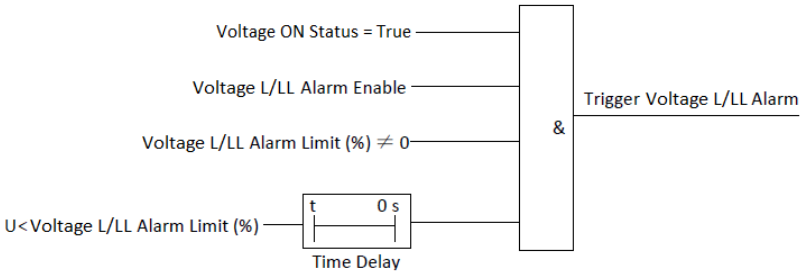


Figure 4-10 Voltage L/LL Alarm Logic Diagram

4.3.5 Frequency Alarm

PMC-512-A provides two Frequency Alarm levels (High, Low). Since PMC-512-A measures its frequency

based on Ua or Uab only, the Frequency Alarm is activated when Ua/Uab when the Voltage ON status is true.

The FREQ H/L Alarm Return Thresholds are illustrated below:

FREQ H Alarm Return Threshold = FREQ H Alarm Threshold – 0.1Hz

FREQ L Alarm Return Threshold = FREQ L Alarm Threshold + 0.1Hz

The following table illustrates the Frequency Alarm parameters.

Parameters	Description	Range/Option	Default
FREQ H Alarm Threshold	FREQ H Alarm Limit	45.00 to 65.00Hz	65.00Hz
FREQ H Alarm D Time Delay	FREQ H Alarm Time Delay	0 to 9999(s)	10s
FREQ L Alarm Threshold	FREQ L Alarm Limit	45.00 to 65.00Hz	45.00Hz
FREQ L Alarm Time Delay	FREQ L Alarm Time Delay	0 to 9999(s)	10s
FREQ Alarm Trigger	FREQ Alarm Trigger	0=None, 1=RO, 2=Alarm LED, 3=RO & Alarm LED	None

Table 4-9 Frequency Alarm Parameters

The logic diagram of FREQ H Alarm is illustrated in Figure 4-11.

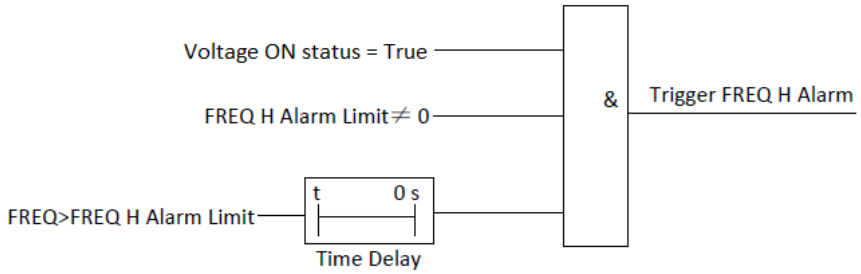


Figure 4-11 FREQ H Alarm Logic Diagram

The logic diagram of FREQ L Alarm is illustrated in Figure 4-12.

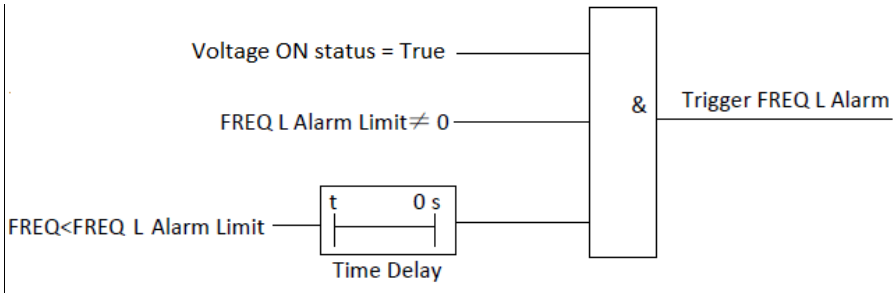


Figure 4-12 FREQ L Alarm Logic Diagram

4.3.6 Unbalance Alarm

The PMC-512-A provides Current Unbalance Alarm for 4x3-Ø SMs. The following table illustrates the Unbalance Alarm parameters.

Parameters	Description	Range/Option	Default
I Unb. Alarm Enable	Bit0=3-Ø SM1, Bit1=3-Ø SM2 Bit2=3-Ø SM3, Bit3=3-Ø SM4 Bits 4 - 15=Reserved Where 0 = Disabled, 1 = Enabled	0 = Disabled 1 = Enabled	0
I Unb. Alarm Threshold (%)	Current Unb. Alarm Limit	0 to 100%	0
I Unb. Alarm Time Delay	Current Unb. Alarm Time Delay	0 to 9999(s)	0
I Unb. Alarm Trigger	I Unbalance Alarm Trigger	0=None, 1=RO, 2=Alarm LED, 3=RO & Alarm LED	0

U Unb. Alarm Enable	U Unbalance Alarm Enable	0 = Disabled 1 = Enabled	0
U Unb. Alarm Threshold (%)	Voltage Unb. Alarm Limit	0 to 100%	0
U Unb. Alarm Time Delay	Voltage Unb. Alarm Time Delay	0 to 9999(s)	0
U Unb. Alarm Trigger	U Unbalance Alarm Trigger	0=None, 1=RO, 2=Alarm LED, 3=RO & Alarm LED	0

Table 4-10 Unbalance Alarm Parameters

The logic diagram of Unbalance Alarm is illustrated in Figure 4-13.

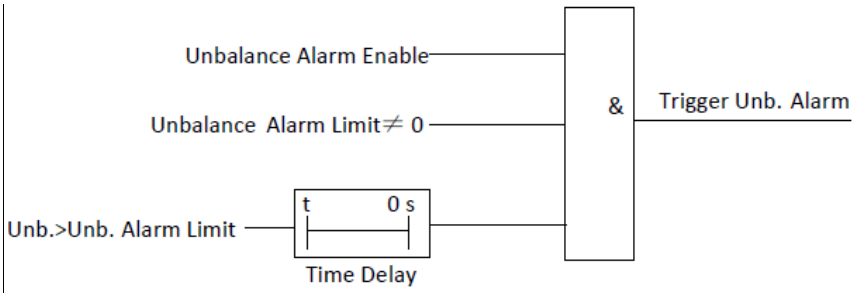


Figure 4-13 Unbalance Alarm Logic Diagram

4.3.7 Phase Reversal Alarm

The PMC-512-A supports Phase Reversal Setpoint Alarms for 4x3-Ø SM. The following table illustrates the Phase Reversal Alarm parameters and their respective default values.

Parameters	Range/Option	Default
Phase Reversal Alarm Enable	Bit0=3-Ø SM1, Bit1=3-Ø SM2 Bit2=3-Ø SM3, Bit3=3-Ø SM4 Bits 4 - 15=Reserved Where 0 = Disabled, 1 = Enabled	0
Phase Reversal Alarm Time Delay	Fixed at 10s	10s
Phase Reversal Alarm Trigger	0=None, 1=RO, 2=Alarm LED, 3=RO & Alarm LED	0

Table 4-11 Phase Reversal Alarm Parameters

Please be informed that the Phase Reversal Alarm assumes that the phase sequencing is based on **Positive** or **Clockwise** rotation (ABC).

The logic diagram of Phase Reversal Alarm is illustrated in Figure 4-14.

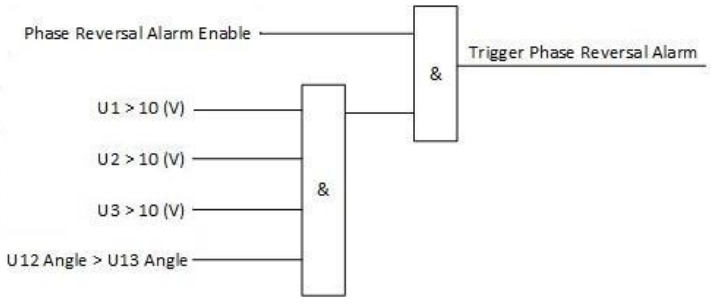


Figure 4-14 Phase Reversal Alarm Logic Diagram

4.3.8 Phase Loss Alarm

The PMC-512-A supports Phase Loss Alarm. The following table illustrates the Phase loss Alarm parameters.

Parameters	Range/Option	Default
Phase Loss Alarm Enable	Bit0=3-Ø SM1, Bit1=3-Ø SM2 Bit2=3-Ø SM3, Bit3=3-Ø SM4	0

	Bits 4 - 15=Reserved Where 0 = Disabled, 1 = Enabled	
Phase Loss Alarm Time Delay	0 to 9999(s)	0s
Phase Loss Alarm Trigger	0=None, 1=RO, 2=Alarm LED, 3=RO & Alarm LED	0

Table 4-12 Phase loss Sequence Alarm Parameters

The logic diagram of Phase Loss Alarm is illustrated in Figure 4-15.

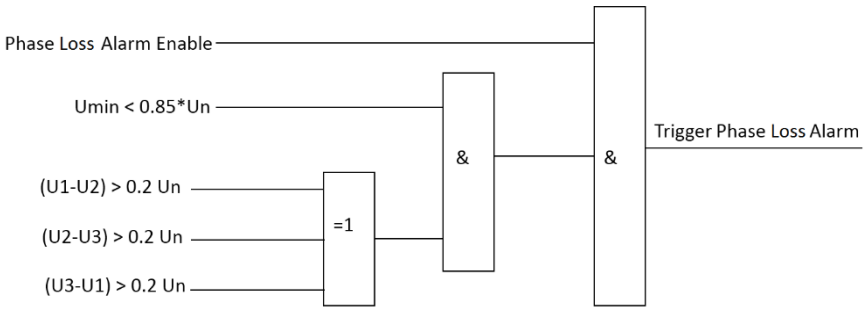


Figure 4-15 Phase Loss Alarm Logic Diagram

4.3.9 AI Alarm

PMC-512-A provides four AI Alarm Levels (High-High, High, Low, Low-Low). The following table illustrates the AI Alarm parameters.

Parameters	Range/Option	Default
AI Alarm Enable	Bit0=HH Alarm, Bit1=H Alarm Bit2=L Alarm, Bit3=LL Alarm Bits 4 - 15=Reserved Where 0 = Disabled, 1 = Enabled	0
AI HH Alarm Threshold	-999999~999999	0
AI HH Alarm Time Delay	0 to 9999(s)	0
AI H Alarm Threshold	-999999~999999	0
AI H Alarm Time Delay	0 to 9999(s)	0
AI L Alarm Threshold	-999999~999999	0
AI L Alarm Time Delay	0 to 9999(s)	0
AI LL Alarm Threshold	-999999~999999	0
AI LL Alarm Time Delay	0 to 9999(s)	10
AI Alarm Trigger	0=None, 1=RO, 2=Alarm LED, 3=RO & Alarm LED	0

Table 4-13 AI Alarm Parameters

The logic diagram of AI H/HH Alarm is illustrated in Figure 4-16.

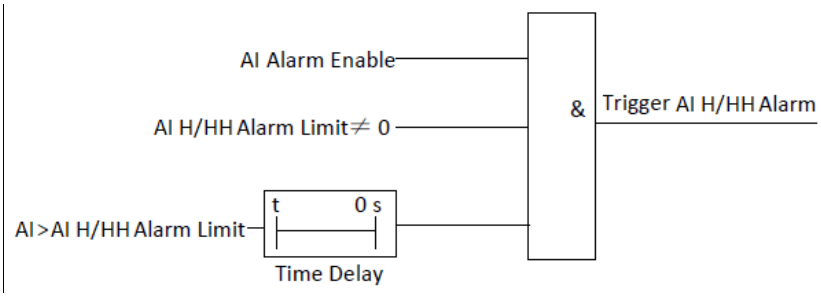


Figure 4-16 AI H/HH Alarm Logic Diagram

The logic diagram of AI L/LL Alarm is illustrated in Figure 4-17.

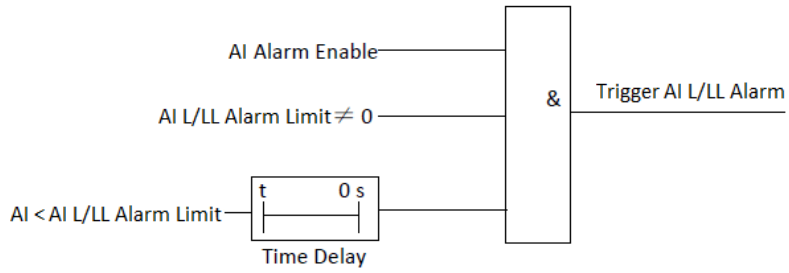


Figure 4-17 AI L/LL Alarm Logic Diagram

4.3.10 DI Alarm

The following table illustrates the DI Alarm parameters.

Parameters	Range/Option	Default
DIx Alarm Type	0=Disabled, 1=DIx Closed Trigger, 2=DIx Open Trigger	Disabled
DIx Alarm Time Delay	0 to 9999(s)	0
DIx Alarm Trigger	0=None, 1=RO, 2=Alarm LED, 3=RO & Alarm LED	0

x indicates 1 to 12

Table 4-14 DI Alarm Parameters

The logic diagram of DI Closed Alarm is illustrated in Figure 4-18.

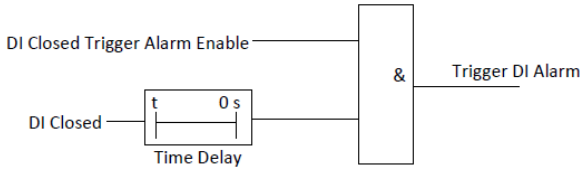


Figure 4-18 DI Closed Alarm Logic Diagram

The logic diagram of DI Open Alarm is illustrated in Figure 4-19.

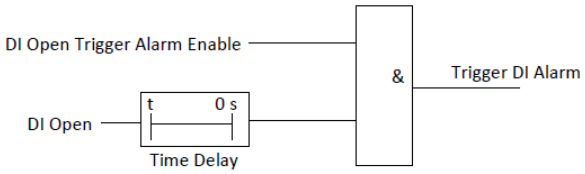


Figure 4-19 DI Open Alarm Logic Diagram

4.4 Power Quality

4.4.1 Phase Angles

The PMC-512-A provides Voltage and Current Phase Angle measurements for 1-Ø SMs and 3-Ø SMs. Phase analysis is used to identify the angle relationship between voltages and currents.

For WYE connected systems, the per phase difference of the current and voltage angles should correspond to the per phase PF. For example, if the power factor is 0.5 Lag and the voltage phase angles are 0.0°, 240.0° and 120.0°, the current phase angles should have the values of -60.0°, 180.0° and 60.0°.

4.4.2 Unbalance

The PMC-512-A provides Voltage and Current Unbalance measurements for 3-Ø SMs. The calculation method of Voltage and Current Unbalances are listed below:

$$\text{Voltage Unbalance} = \frac{V2}{V1} \times 100\% \qquad \text{Current Unbalance} = \frac{I2}{I1} \times 100\%$$

where

V1, V2 are the Positive and Negative Sequence Components for Voltage, respectively.

and

I1, I2 are the Positive and Negative Sequence Components for Current, respectively.

4.4.3 Harmonics

The PMC-512-A provides harmonic analysis for THD, TOHD, TEHD and individual harmonics up to the 31st order. All harmonic parameters are available through communications except for THD, which is also available from the front panel.

The following equations illustrate how to calculate the individual harmonic distortion:

$$\text{Voltage } K^{th} \text{ Harmonic Distortion} = \frac{V_K}{V_1} \times 100\% \qquad \text{Current } K^{th} \text{ Harmonic Distortion} = \frac{I_k}{I_1} \times 100\%$$

Where

V_1 / I_1 are the Fundamental Voltage/Current RMS and

V_k / I_k is the k_{th} Harmonic Voltage/Current RMS

The following table illustrates the available Voltage and Current Harmonics measurements on the PMC-512-A.

	Phase A	Phase B	Phase C
Harmonics-Voltage	THD	THD	THD
	TEHD	TEHD	TEHD
	TOHD	TOHD	TOHD
	2nd Harmonic	2nd Harmonic	2nd Harmonic
	…		
	31st Harmonic	31st Harmonic	31st Harmonic
Harmonics-Current (1-Ø SM1 to SM12)	THD		
	TEHD		
	TOHD		
	2nd Harmonic		
	…		
	31st Harmonic		

Table 4-15 Harmonics Measurements

4.5 Sub-Meters (SM)

The PMC-512-A provides 12 Current Inputs which can be configured as 12x1-Ø SM, 4x3-Ø SM or a combination of 1-Ø SMs or 3-Ø SMs. The SM assignment principle is illustrated in Tables 4-16.

The assignment principle is not programmable. Therefore, it is extremely important to allocate the 1-Ø and 3-Ø circuits during installation that meet this fixed assignment principle.

Current Input	Voltage Input	1-Ø SMx	3-Ø SMx
I1	V1	1	1
I2	V2	2	
I3	V3	3	
I4	V1	4	2
I5	V2	5	
I6	V3	6	

I7	V1	7	3
I8	V2	8	
I9	V3	9	
I10	V1	10	4
I11	V2	11	
I12	V3	12	

Table 4-16 Sub-Meters Configuration

The PMC-512-A provides the following parameters for 1-Ø SMs and 3-Ø SMs:

1) Real-time Measurements:
   - Voltage: Per phase ULN, ULL and Phase Angle, ULN and ULL average, Ung (Ground Voltage), Unbalance, Frequency and per phase U THD
   - 1-Ø SMs: Current and its Phase Angle, kW, kvar, kVA, PF, %Loading, I THD and Operating Time
   - 3-Ø SMs: Per-phase Current and Average, In (Calculated), I Unbalance, kW Total, kvar Total, kVA Total, PF Total and Operating Time
2) Demands and Max Demands with Timestamp:
   - 1-Ø SMs: Current, kW, kvar, kVA
   - 3-Ø SMs: kW, kvar, kVA
3) Energy:
   - 1-Ø SMs: kWh Import/Export, kvarh Import/Export, kVAh
   - 3-Ø SMs: kWh Import/Export Total, kvarh Import/Export Total, kVAh Total

4.6 Virtual Meters (VM)

The PMC-512-A supports up to four Virtual Meters, VM1 to VM4, which can be used to perform arbitrary aggregation from any of the 12 individual 1-Ø SMs, please refer to **Section 5.8.7 VM Setup** for more information**.**

Each VM provides the following parameters kW Total, kvar Total, kVA Total, kWh Import/Export Total, kvarh Import/Export Total and kVAh. VM's energy measurements are separated from the SM's energy measurements so clearing the energy measurements of one SM would not affect the energy measurements of the VM that consists of that particular SM.

4.7 Data Logging

4.7.1 Peak Demand Log

The PMC-512-A records the **Peak Demand** of **This Month (Since Last Reset)** and **Last Month (Before Last Reset)** with timestamp for Current for 1-Ø SMs as well as kW, kvar and kVA for 1-Ø SMs, 3-Ø SMs and VMs. All Demand and Peak Demand information except for VMs can be accessed via the front panel or through communications. Please refer to Section 4.2.4 for a complete description of the **Self-Read Time** and its operation. The Peak Demand Log of a certain SM or VM can be reset through the optional HMI Display or via communications.

Peak Demand Logs of This Month (Since Last Reset) and Last Month (Before Last Reset)
Current for 1-Ø SM1-SM12
kW for 1-Ø SM1-SM12, 3-Ø SM1-SM4, VM1-VM4
kvar for 1-Ø SM1-SM12, 3-Ø SM1-SM4, VM1-VM4
kVA for 1-Ø SM1-SM12, 3-Ø SM1-SM4, VM1-VM4

Table 4-17 Peak Demand Log

4.7.2 SOE Log

The PMC-512-A's **SOE Log** can store up to 512 events such as Power-On, Power-Off, Alarms, Relay actions, Digital Input status changes, Diagnostics and Setup changes in its non-volatile memory. Each event record includes the event classification, its relevant parameter values and a timestamp in ±1 ms resolution. All events can be retrieved from the Front Panel or through communications. If there are more than 512 events, the newest event will replace the oldest event on a First-In-First-Out basis. The SOE Log can be reset through the Front Panel, the optional HMI Display or via communications.

4.7.3 Daily Freeze Log

The PMC-512-A provides a **Daily Freeze Log** of Current, Power and Energy parameters for 1-Ø SMs, 3-Ø SMs and VMs for the last 1000 days. The Daily Freeze Log is stored in the meter's non-volatile memory and will not suffer any loss in the event of power failure, and they are stored on a First-In-First-Out (FIFO) basis where the newest log will overwrite the oldest. The Daily Freeze Logs can only be accessed through communications and contain the following parameters:

Circuits	Parameters
1-Ø SMs	Current, kW, kvar, kVA, kWh/kvarh Import, kWh/kvarh Export, kVAh Total
3-Ø SMs	kW Total, kvar Total, kVA Total, kWh/kvarh Import, kWh/kvarh Export, kVAh Total
VMs	kWh/kvarh Import, kWh/kvarh Export, kVAh Total

Table 4-18 Freeze Log

The Daily Freeze Log's Self-Read operation will take place at 00:00 every day. If there are more than 1000 logs, the newest log will replace the oldest log on a FIFO basis.

4.7.4 Monthly Freeze Log

The PMC-512-A provides a **Monthly Freeze Log** of Energy parameters for 1-Ø SMs, 3-Ø SMs and VMs for the last 24 months. The **Monthly Freeze Log** is stored in the meter's non-volatile memory and will not suffer any loss in the event of power failure, and they are stored on a FIFO basis where the newest log will overwrite the oldest. The Monthly Freeze Logs can be reset manually via the front panel or through communications.

The **Monthly Freeze Log Self-read Time** setup parameter allows the user to specify the time and day of the month for the Self-read operation and supports two options:

- A zero value means that the Self-Read will take place at 00:00 of the first day of each month.
- A non-zero value means that the Self-Read will take place at a specific time and day based on the formula: Self-Read Time = Day x 100 + Hour where 0 ≤ Hour ≤ 23 and 1 ≤ Day ≤ 28. For example, the value 1512 means that the Self-Read will take place at 12:00pm on the 15th day of each month.

The PMC-512-A's Monthly Freeze Log can only accessed through communications and contains the following parameters:

Circuits	Parameters
1-Ø SMs	kWh/kvarh Import, kWh/kvarh Export, kVAh
3-Ø SMs	kWh/kvarh Total Import, kWh/kvarh Total Export, kVAh Total
VMs	kWh/kvarh Total Import, kWh/kvarh Total Export, kVAh Total

Table 4-19 Monthly Freeze Log Parameters

4.7.5 Data Recorder Log (DR Log)

The PMC-512-A provides one DR capable of recording a maximum 60 parameters. The DR Log is stored in the meter's non-volatile memory and will not suffer any loss in the event of a power failure.

The programming of the DR is only supported over communications. The DR provides the following setup parameters:

Setup Parameters	Value/Option	Default
Trigger Mode	0=Disabled / 1=Enabled	0
Recording Mode	0=Stop-When-Full / 1=First-In-First-Out	1
Recording Depth	1 to 5000 (entry)	5000
Recording Interval	60 to 345,600 seconds	900 s
Recording Offset	0 to 43,200 seconds, 0 indicates no offset.	0
Number of Parameters	0 to 60	55
Parameter 1 to 60	See **Appendix B**	

Table 4-20 Setup Parameters for Data Recorder

Notes:

1) The DR Log is only operational when the values of **Trigger Mode**, **Recording Depth**, **Recording Interval**, and **Number of Parameters** are all non-zero.
2) The **Recording Offset** parameter can be used to delay the recording by a fixed time from the **Recording Interval**. For example, if the **Recording Interval** parameter is set to 3600 (hourly) and the **Recording Offset** parameter is set to 300 (5 minutes), the recording will take place at 5 minutes after the hour every hour, i.e. 00:05, 01:05, 02:05…etc. The value of the **Recording Offset** parameter must be less than the **Recording Interval** parameter.

Chapter 5 Modbus Register Map

This chapter provides a complete description of the Modbus register map (**Protocol Versions 2.1**) for the PMC-512-A to facilitate the development of 3rd party communications driver for accessing information on the PMC-512-A. For a complete Modbus Protocol Specification, please visit www.modbus.org.

The PMC-512-A supports the following Modbus functions:

1) Read Holding Registers (Function Code 0x03)
2) Force Single Coil (Function Code 0x05)
3) Preset Multiple Registers (Function Code 0x10)
4) Read Energy Files (Function Code 0x14)

The following table provides a description of the different data formats used for the Modbus registers. The PMC-512-A uses the Big Endian byte ordering system.

Format	Description
UINT16/INT16	Unsigned/Signed 16-bit Integer
UINT32/INT32	Unsigned/Signed 32-bit Integer
Float	IEEE 754 32-bit Single Precision Floating Point Number

5.1 Status Register

5.1.1 General Status

Register	Property	Description	Format	Note
0000	RO	DI Status[1]	UINT16	
0001	RO	DO Status[2]	UINT16	
0002	RO	Diagnostics[3]	Bitmap	
0004	RO	SOE Pointer[4]	UINT32	
0006	RO	Daily Freeze Log Pointer[4]	UINT32	
0008	RO	DR Log Pointer[4]	UINT32	
0010	RO	Monthly Freeze Log Pointer[4]	UINT32	
0012	RO	Global Alarm Status	UINT16	0=Normal, 1=Alarm

Table 5-1 General Status

Notes:

1) For the **DI Status** register, the bit values of Bit 0 to Bit 11 represent the states of DI1 to DI12, respectively, with "1" meaning Active (Closed) and "0" meaning Inactive (Open). The remaining bits are reserved.
2) For the **DO Status** register, the bit value of Bit 0 represents the state of the DO, with "1" meaning Active (Closed) and "0" meaning Inactive (Open). The remaining bits are reserved.
3) The **Diagnostics** register indicates the various system statuses with a bit value of 0 meaning Normal and 1 meaning Abnormal. The following table illustrates the details of the Diagnostics register.

Bit	Alarm Event
Bit 0	NVRAM Fault
Bit 1	Disk Fault
Bit 2	A/D Chips Fault
Bit 3	Internal Power Supply Fault
Bit 4	System Parameters Error
Bit 5	Internal Parameters Error
Bit 6-31	Reserved

Table 5-2 Diagnostics Register (Reg. # 0002)

4) The range of the SOE, Daily Freeze, DR, and Monthly Freeze Log Pointer is between 0 and 0xFFFFFFFFH. The pointer is incremented by one for every new log generated and will roll over to 0 if its current value is 0xFFFFFFFFH. A value of zero indicates that the specific Log does not contain any record. If a **Clear Log** is performed from the Front Panel or via communications, its **Log Pointer** will be reset to zero. Use the following equation to determine the latest log location:

Latest Log Location = Modulo [**SOE Pointer** / **Log Depth**]

where Log Depth = 512 for SOE Log, 1000 for Daily Freeze Log, 24 for Monthly Freeze Log and DR's Recording Depth for the DR Log.

5.1.2 Instantaneous Alarms

Register	Property	Description	Format	Note
0030	RO	Instantaneous Alarm Status #1	Bitmap	
0031	RO	Instantaneous Alarm Status #2	Bitmap	
0032	RO	Instantaneous Alarm Status #3	Bitmap	
0033	RO	Instantaneous Alarm Status #4	Bitmap	
0034	RO	Instantaneous Alarm Status #5	Bitmap	
0035	RO	Instantaneous Alarm Status #6	Bitmap	
0036	RO	Instantaneous Alarm Status #7	Bitmap	
0037~0045	RO	Reserved	Bitmap	

Table 5-3 Instantaneous Alarm Status Registers

Notes:

1) For the **Instantaneous Alarm Status #x** register, the bit values of B0 to B15 represent different alarms, with "1" meaning Active (Closed) and "0" meaning Inactive (Open).

Bit	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Status	1-Ø SM1 I LL	1-Ø SM1 I HH	1-Ø SM1 I L	1-Ø SM1 I H
Bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**
Status	1-Ø SM2 I LL	1-Ø SM2 I HH	1-Ø SM2 I L	1-Ø SM2 I H
Bit	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**
Status	1-Ø SM3 I LL	1-Ø SM3 I HH	1-Ø SM3 I L	1-Ø SM3 I H
Bit	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**
Status	1-Ø SM4 I LL	1-Ø SM4 I HH	1-Ø SM4 I L	1-Ø SM4 I H

Table 5-4 Instantaneous Alarm Status #1 (Register 0030)

Bit	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Status	1-Ø SM5 I LL	1-Ø SM5 I HH	1-Ø SM5 I L	1-Ø SM5 I H
Bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**
Status	1-Ø SM6 I LL	1-Ø SM6 I HH	1-Ø SM6 I L	1-Ø SM6 I H
Bit	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**
Status	1-Ø SM7 I LL	1-Ø SM7 I HH	1-Ø SM7 I L	1-Ø SM7 I H
Bit	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**
Status	1-Ø SM8 I LL	1-Ø SM8 I HH	1-Ø SM8 I L	1-Ø SM8 I H

Table 5-5 Instantaneous Alarm Status #2 (Register 0031)

Bit	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Status	1-Ø SM9 I LL	1-Ø SM9 I HH	1-Ø SM9 I L	1-Ø SM9 I H
Bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**
Status	1-Ø SM10 I LL	1-Ø SM10 I HH	1-Ø SM10 I L	1-Ø SM10 I H
Bit	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**
Status	1-Ø SM11 I LL	1-Ø SM11 I HH	1-Ø SM11 I L	1-Ø SM11 I H
Bit	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**
Status	1-Ø SM12 I LL	1-Ø SM12 I HH	1-Ø SM12 I L	1-Ø SM12 I H

Table 5-6 Instantaneous Alarm Status #3 (Register 0032)

Bit	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Status	U1 LL	U1 HH	U1 L	U1 H
Bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**
Status	U2 LL	U2 HH	U2 L	U2 H
Bit	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**
Status	U3 LL	U3 HH	U3 L	U3 H
Bit	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**
Status	U12 LL	U12 HH	U12 L	U12 H

Table 5-7 Instantaneous Alarm Status #4 (Register 0033)

Bit	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Status	U23 LL	U23 HH	U23 L	U23 H
Bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**
Status	U31 LL	U31 HH	U31 L	U31 H
Bit	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**
Status	U Phase Reversal	U Unbalance	Freq. L	Freq. H

Bit	Bit 15	Bit 14	Bit 13	Bit 12
Status	Reserved	Ung HH	Ung H	Phase Loss

Table 5-8 Instantaneous Alarm Status #5 (Register 0034)

Bit	Bit 3	Bit 2	Bit 1	Bit 0
Status	3-Ø SM2 I Phase Reversal	3-Ø SM2 I Unbal.	3-Ø SM1 I Phase Reversal	3-Ø SM1 I Unbal.
Bit	Bit 7	Bit 6	Bit 5	Bit 4
Status	3-Ø SM4 I Phase Reversal	3-Ø SM4 I Unbal.	3-Ø SM3 I Phase Reversal	3-Ø SM3 I Unbal.
Bit	Bit 11	Bit 10	Bit 9	Bit 8
Status	AI LL	AI HH	AI L	AI H
Bit	Bit 15	Bit 14	Bit 13	Bit 12
Status	Reserved	Reserved	Reserved	Reserved

Table 5-9 Instantaneous Alarm Status #6 (Register 0035)

Bit	Bit 3	Bit 2	Bit 1	Bit 0
Status	DI4	DI3	DI2	DI1
Bit	Bit 7	Bit 6	Bit 5	Bit 4
Status	DI8	DI7	DI6	DI5
Bit	Bit 11	Bit 10	Bit 9	Bit 8
Status	DI12	DI11	DI10	DI9
Bit	Bit 15	Bit 14	Bit 13	Bit 12
Status	Reserved	Reserved	Reserved	Reserved

Table 5-10 Instantaneous Alarm Status #7 (Register 0036)

5.1.3 Latched Alarms

Register	Property	Description	Format	Note
0130	RO	Latched Alarm Status #1	Bitmap	
0131	RO	Latched Alarm Status #2	Bitmap	
0132	RO	Latched Alarm Status #3	Bitmap	
0133	RO	Latched Alarm Status #4	Bitmap	
0134	RO	Latched Alarm Status #5	Bitmap	
0135	RO	Latched Alarm Status #6	Bitmap	
0136	RO	Latched Alarm Status #7	Bitmap	
0137~0145	RO	Reserved	Bitmap	

Table 5-11 Latched Alarm Status Registers

Notes:

1) For the **Latched Alarm Status #x** register, the bit values of B0 to B15 represent different alarms, with "1" meaning Active (Closed) and "0" meaning Inactive (Open).

Bit	Bit 3	Bit 2	Bit 1	Bit 0
Status	1-Ø SM1 I LL	1-Ø SM1 I HH	1-Ø SM1 I L	1-Ø SM1 I H
Bit	Bit 7	Bit 6	Bit 5	Bit 4
Status	1-Ø SM2 I LL	1-Ø SM2 I HH	1-Ø SM2 I L	1-Ø SM2 I H
Bit	Bit 11	Bit 10	Bit 9	Bit 8
Status	1-Ø SM3 I LL	1-Ø SM3 I HH	1-Ø SM3 I L	1-Ø SM3 I H
Bit	Bit 15	Bit 14	Bit 13	Bit 12
Status	1-Ø SM4 I LL	1-Ø SM4 I HH	1-Ø SM4 I L	1-Ø SM4 I H

Table 5-12 Latched Alarm Status #1 (Register 0130)

Bit	Bit 3	Bit 2	Bit 1	Bit 0
Status	1-Ø SM5 I LL	1-Ø SM5 I HH	1-Ø SM5 I L	1-Ø SM5 I H
Bit	Bit 7	Bit 6	Bit 5	Bit 4
Status	1-Ø SM6 I LL	1-Ø SM6 I HH	1-Ø SM6 I L	1-Ø SM6 I H
Bit	Bit 11	Bit 10	Bit 9	Bit 8
Status	1-Ø SM7 I LL	1-Ø SM7 I HH	1-Ø SM7 I L	1-Ø SM7 I H
Bit	Bit 15	Bit 14	Bit 13	Bit 12
Status	1-Ø SM8 I LL	1-Ø SM8 I HH	1-Ø SM8 I L	1-Ø SM8 I H

Table 5-13 Latched Alarm Status #2 (Register 0131)

Bit	Bit 3	Bit 2	Bit 1	Bit 0
Status	1-Ø SM9 I LL	1-Ø SM9 I HH	1-Ø SM9 I L	1-Ø SM9 I H
Bit	Bit 7	Bit 6	Bit 5	Bit 4

Status	1-Ø SM10 I LL	1-Ø SM10 I HH	1-Ø SM10 I L	1-Ø SM10 I H
Bit	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**
Status	1-Ø SM11 I LL	1-Ø SM11 I HH	1-Ø SM11 I L	1-Ø SM11 I H
Bit	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**
Status	1-Ø SM12 I LL	1-Ø SM12 I HH	1-Ø SM12 I L	1-Ø SM12 I H

Table 5-14 Latched Alarm Status #3 (Register 0132)

Bit	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Status	U1 LL	U1 HH	U1 L	U1 H
Bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**
Status	U2 LL	U2 HH	U2 L	U2 H
Bit	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**
Status	U3 LL	U3 HH	U3 L	U3 H
Bit	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**
Status	U12 LL	U12 HH	U12 L	U12 H

Table 5-15 Latched Alarm Status #4 (Register 0133)

Bit	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Status	U23 LL	U23 HH	U23 L	U23 H
Bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**
Status	U31 LL	U31 HH	U31 L	U31 H
Bit	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**
Status	U Phase Reversal	U Unbalance	Frequency L	Frequency H
Bit	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**
Status	Reserved	Ung HH	Ung H	Phase Loss

Table 5-16 Latched Alarm Status #5 (Register 0134)

Bit	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Status	3-Ø SM2 I Phase Reversal	3-Ø SM2 I Unbal.	3-Ø SM1 I Phase Reversal	3-Ø SM1 I Unbal.
Bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**
Status	3-Ø SM4 I Phase Reversal	3-Ø SM4 I Unbal.	3-Ø SM3 I Phase Reversal	3-Ø SM3 I Unbal.
Bit	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**
Status	AI LL	AI HH	AI L	AI H
Bit	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**
Status	Reserved	Reserved	Reserved	Reserved

Table 5-17 Latched Alarm Status #6 (Register 0135)

Bit	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Status	DI4	DI3	DI2	DI1
Bit	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**
Status	DI8	DI7	DI6	DI5
Bit	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**
Status	DI12	DI11	DI10	DI9
Bit	**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**
Status	Reserved	Reserved	Reserved	Reserved

Table 5-18 Latched Alarm Status #7 (Register 0136)

5.2 Basic Measurements

5.2.1 Measurements

Register	Property	Description	Format	Scale	Unit
0500	RO	U1	FP32	x1	V
0502	RO	U2	FP32		
0504	RO	U3	FP32		
0506	RO	Uln Average	FP32		
0508	RO	U12	FP32		
0510	RO	U23	FP32		
0512	RO	U31	FP32		
0514	RO	Ull Average	FP32		
0516	RO	Ung	FP32		
0518	RO	Voltage Unbalance	FP32		
0520	RO	Frequency	FP32		Hz

0522	RO	U1 Angle	FP32		°
0524	RO	U2 Angle	FP32		
0526	RO	U3 Angle	FP32		
0528	RO	U12 Angle	FP32		
0530	RO	U23 Angle	FP32		
0532	RO	U31 Angle	FP32		
0534	RO	1-Ø SM1 Current	FP32		A
0536	RO	1-Ø SM2 Current	FP32		
…		…	FP32		
0556	RO	1-Ø SM12 Current	FP32		
0558	RO	1-Ø SM1 kW	FP32		W
0560	RO	1-Ø SM2 kW	FP32		
…		…	FP32		
0580	RO	1-Ø SM12 kW	FP32		
0582	RO	1-Ø SM1 kvar	FP32		var
0584	RO	1-Ø SM2 kvar	FP32		
…		…	FP32		
0604	RO	1-Ø SM12 kvar	FP32		
0606	RO	1-Ø SM1 kVA	FP32		VA
0608	RO	1-Ø SM2 kVA	FP32		
…		…	FP32		
0628	RO	1-Ø SM12 kVA	FP32		
0630	RO	1-Ø SM1 PF	FP32		-
0632	RO	1-Ø SM2 PF	FP32		
…		…	FP32		
0652	RO	1-Ø SM12 PF	FP32		
0654	RO	1-Ø SM1 %Loading	FP32		-
0656	RO	1-Ø SM2 %Loading	FP32		
…		…	FP32		
0676	RO	1-Ø SM12 %Loading	FP32		
0678	RO	1-Ø SM1 Current Angle	FP32		°
0680	RO	1-Ø SM2 Current Angle	FP32		
…		…	FP32		
0700	RO	1-Ø SM12 Current Angle	FP32		
0702	RO	3-Ø SM1 kW Total	FP32		w
0704	RO	3-Ø SM2 kW Total	FP32		
0706	RO	3-Ø SM3 kW Total	FP32		
0708	RO	3-Ø SM4 kW Total	FP32		
0710	RO	3-Ø SM1 kvar Total	FP32		var
0712	RO	3-Ø SM2 kvar Total	FP32		
0714	RO	3-Ø SM3 kvar Total	FP32		
0716	RO	3-Ø SM4 kvar Total	FP32		
0718	RO	3-Ø SM1 kVA Total	FP32		VA
0720	RO	3-Ø SM2 kVA Total	FP32		
0722	RO	3-Ø SM3 kVA Total	FP32		
0724	RO	3-Ø SM4 kVA Total	FP32		
0726	RO	3-Ø SM1 PF Total	FP32		-
0728	RO	3-Ø SM2 PF Total	FP32		
0730	RO	3-Ø SM3 PF Total	FP32		
0732	RO	3-Ø SM4 PF Total	FP32		
0734	RO	3-Ø SM1 I Average	FP32		A
0736	RO	3-Ø SM2 I Average	FP32		
0738	RO	3-Ø SM3 I Average	FP32		
0740	RO	3-Ø SM4 I Average	FP32		
0742	RO	3-Ø SM1 I Unbalance	FP32		-
0744	RO	3-Ø SM2 I Unbalance	FP32		
0746	RO	3-Ø SM3 I Unbalance	FP32		
0748	RO	3-Ø SM4 I Unbalance	FP32		
0750	RO	VM1 kW	FP32		W
0752	RO	VM2 kW	FP32		
0754	RO	VM3 kW	FP32		
0756	RO	VM4 kW	FP32		
0758	RO	VM1 kvar	FP32		var
0760	RO	VM2 kvar	FP32		
0762	RO	VM3 kvar	FP32		
0764	RO	VM4 kvar	FP32		

0766	RO	VM1 kVA	FP32		VA
0768	RO	VM2 kVA	FP32		
0770	RO	VM3 kVA	FP32		
0772	RO	VM4 kVA	FP32		
0774	RO	AI (Raw)	UINT16	x0.01	mA
0775	RO	AI (Scaled)	FP32	x1	

Table 5-19 Real-time Measurements

5.2.2 Measurements for HMI

Register	Property	Description	Format	Scale	Unit
0800	RO	DI Status	UINT16	-	-
0801	RO	DO Status	UINT16	-	-
0802	RO	Diagnostic Status	UINT32	-	-
0804	RO	AI (Scaled)	FP32	-	-
0806~0809	RO	Reserved	UINT32	-	-
0810	RO	1-Ø SM1 Current	FP32	x1	A
0812	RO	1-Ø SM1 %Loading	FP32	-	%
0814	RO	1-Ø SM1 kW	FP32	x1	W
0816	RO	1-Ø SM1 PF	FP32	x1	-
0818	RO	1-Ø SM1 kWh Import	INT32	x0.01	kWh
0820	RO	1-Ø SM1 Current THD	FP32	-	-
0822	RO	1-Ø SM1 kvar	FP32	x1	var
0824	RO	1-Ø SM1 kVA	FP32	x1	VA
0826	RO	1-Ø SM1 Current Angle	FP32	x1	°
0828	RO	Reserved	UINT32	-	-
…		…			
1030	RO	1-Ø SM12 Current	FP32	x1	A
1032	RO	1-Ø SM12 %Loading	FP32	-	%
1034	RO	1-Ø SM12 kW	FP32	x1	W
1036	RO	1-Ø SM12 PF	FP32	-	-
1038	RO	1-Ø SM12 kWh Import	INT32	x0.01	kWh
1040	RO	1-Ø SM12 Current THD	FP32	-	-
1042	RO	1-Ø SM12 kvar	FP32	x1	var
1044	RO	1-Ø SM12 kVA	FP32	x1	VA
1046	RO	1-Ø SM12 Current Angle	FP32	x1	°
1048	RO	Reserved	UINT32	-	-
1050	RO	3-Ø SM1 kW Total	FP32	x1	W
1052	RO	3-Ø SM1 kvar Total	FP32	x1	var
1054	RO	3-Ø SM1 kVA Total	FP32	x1	VA
1056	RO	3-Ø SM1 PF Total	FP32	x1	-
1058	RO	3-Ø SM1 Current Average	FP32	x1	A
1060	RO	3-Ø SM1 Current Unbalance	FP32	x1	-
1062	RO	3-Ø SM1 kWh Import	INT32	x0.01	kWh
…		…			
1092	RO	3-Ø SM4 kW Total	FP32	x1	W
1094	RO	3-Ø SM4 kvar Total	FP32	x1	var
1096	RO	3-Ø SM4 kVA Total	FP32	x1	VA
1098	RO	3-Ø SM4 PF Total	FP32	x1	-
1100	RO	3-Ø SM4 Current Average	FP32	x1	A
1102	RO	3-Ø SM4 Current Unbalance	FP32	x1	-
1104	RO	3-Ø SM4 kWh Import	INT32	x0.01	kWh
1106	RO	VM1 kW	FP32	x1	W
1108	RO	VM1 kvar	FP32	x1	var
1110	RO	VM1 kVA	FP32	x1	VA
1112	RO	VM2 kW	FP32	x1	W
1114	RO	VM2 kvar	FP32	x1	var
1116	RO	VM2 kVA	FP32	x1	VA
1118	RO	VM3 kW	FP32	x1	W
1120	RO	VM3 kvar	FP32	x1	var
1122	RO	VM3 kVA	FP32	x1	VA
1124	RO	VM4 kW	FP32	x1	W
1126	RO	VM4 kvar	FP32	x1	var
1128	RO	VM4 kVA	FP32	x1	VA

Table 5-20 Real-time Measurements for HMI

5.2.3 Operating Time

Register	Property	Description	Format	Scale	Unit
1500	RO	1-Ø SM1 Operating Time	UINT32	x0.1	Hour
1502	RO	1-Ø SM2 Operating Time	UINT32		
...	RO	...	UINT32		
1522	RO	1-Ø SM12 Operating Time	UINT32		
1524	RO	3-Ø SM1 Operating Time	UINT32		
1526	RO	3-Ø SM2 Operating Time	UINT32		
1528	RO	3-Ø SM3 Operating Time	UINT32		
1530	RO	3-Ø SM4 Operating Time	UINT32		

Table 5-21 Operating Time

5.3 Energy Measurements

5.3.1 Complete Energy Measurements based on kWh, kvarh and kVAh

Register	Property	Description	Format	Scale	Unit
2000	RO	1-Ø SM1 kWh Import	INT32	x0.01	kWh
2002	RO	1-Ø SM2 kWh Import	INT32		
...	RO	...	INT32		
2022	RO	1-Ø SM12 kWh Import	INT32		
2024	RO	1-Ø SM1 kWh Export	INT32		
2026	RO	1-Ø SM2 kWh Export	INT32		
...	RO	...	INT32		
2046	RO	1-Ø SM12 kWh Export	INT32		
2048	RO	1-Ø SM1 kvarh Import	INT32	x0.01	kvarh
2050	RO	1-Ø SM2 kvarh Import	INT32		
...	RO	...	INT32		
2070	RO	1-Ø SM12 kvarh Import	INT32		
2072	RO	1-Ø SM1 kvarh Export	INT32		
2074	RO	1-Ø SM2 kvarh Export	INT32		
...	RO	...	INT32		
2094	RO	1-Ø SM12 kvarh Export	INT32		
2096	RO	1-Ø SM1 kVAh	INT32	x0.01	kVAh
2098	RO	1-Ø SM2 kVAh	INT32		
...	RO	...	INT32		
2118	RO	1-Ø SM12 kVAh	INT32		
2120	RO	3-Ø SM1 kWh Total	INT32	x0.01	kWh
2122	RO	3-Ø SM2 kWh Total	INT32		
2124	RO	3-Ø SM3 kWh Total	INT32		
2126	RO	3-Ø SM4 kWh Total	INT32		
2128	RO	3-Ø SM1 kvarh Total	INT32	x0.01	kvarh
2130	RO	3-Ø SM2 kvarh Total	INT32		
2132	RO	3-Ø SM3 kvarh Total	INT32		
2134	RO	3-Ø SM4 kvarh Total	INT32		
2136	RO	3-Ø SM1 kWh Import Total	INT32	x0.01	kWh
2138	RO	3-Ø SM2 kWh Import Total	INT32		
2140	RO	3-Ø SM3 kWh Import Total	INT32		
2142	RO	3-Ø SM4 kWh Import Total	INT32		
2144	RO	3-Ø SM1 kWh Export Total	INT32		
2146	RO	3-Ø SM2 kWh Export Total	INT32		
2148	RO	3-Ø SM3 kWh Export Total	INT32		
2150	RO	3-Ø SM4 kWh Export Total	INT32		
2152	RO	3-Ø SM1 kvarh Import Total	INT32	x0.01	kvarh
2154	RO	3-Ø SM2 kvarh Import Total	INT32		
2156	RO	3-Ø SM3 kvarh Import Total	INT32		
2158	RO	3-Ø SM4 kvarh Import Total	INT32		
2160	RO	3-Ø SM1 kvarh Export Total	INT32		
2162	RO	3-Ø SM2 kvarh Export Total	INT32		
2164	RO	3-Ø SM3 kvarh Export Total	INT32		
2166	RO	3-Ø SM4 kvarh Export Total	INT32		
2168	RO	3-Ø SM1 kVAh Total	INT32	x0.01	kVAh
2170	RO	3-Ø SM2 kVAh Total	INT32		
2172	RO	3-Ø SM3 kVAh Total	INT32		
2174	RO	3-Ø SM4 kVAh Total	INT32		

2176	RO	VM1 kWh Import	INT32	x0.01	kWh
2178	RO	VM2 kWh Import	INT32		
2180	RO	VM3 kWh Import	INT32		
2182	RO	VM4 kWh Import	INT32		
2184	RO	VM1 kWh Export	INT32		
2186	RO	VM2 kWh Export	INT32		
2188	RO	VM3 kWh Export	INT32		
2190	RO	VM4 kWh Export	INT32		
2192	RO	VM1 kvarh Import	INT32	x0.01	kvarh
2194	RO	VM2 kvarh Import	INT32		
2196	RO	VM3 kvarh Import	INT32		
2198	RO	VM4 kvarh Import	INT32		
2200	RO	VM1 kvarh Export	INT32		
2202	RO	VM2 kvarh Export	INT32		
2204	RO	VM3 kvarh Export	INT32		
2206	RO	VM4 kvarh Export	INT32		
2208	RO	VM1 kVAh	INT32	x0.01	kVAh
2210	RO	VM2 kVAh	INT32		
2212	RO	VM3 kVAh	INT32		
2214	RO	VM4 kVAh	INT32		

Table 5-22 Complete Energy Measurement based on kWh, kvarh and kVAh

5.3.2 Complete Energy Measurements based on SMs and VMs

Register	Property	Description	Format	Scale	Unit
2300	RO	1-Ø SM1 kWh Import	INT32	x0.01	kWh
2302	RO	1-Ø SM1 kWh Export	INT32		
2304	RO	1-Ø SM1 kvarh Import	INT32	x0.01	kvarh
2306	RO	1-Ø SM1 kvarh Export	INT32		
2308	RO	1-Ø SM1 kVAh	INT32	x0.01	kVAh
…		…			
2410	RO	1-Ø SM12 kWh Import	INT32	x0.01	kWh
2412	RO	1-Ø SM12 kWh Export	INT32		
2414	RO	1-Ø SM12 kvarh Import	INT32	x0.01	kvarh
2416	RO	1-Ø SM12 kvarh Export	INT32		
2418	RO	1-Ø SM12 kVAh	INT32	x0.01	kVAh
2420	RO	3-Ø SM1 kWh Total	INT32	x0.01	kWh
2422	RO	3-Ø SM1 kvarh Total	INT32	x0.01	kvarh
2424	RO	3-Ø SM1 kWh Import Total	INT32	x0.01	kWh
2426	RO	3-Ø SM1 kWh Export Total	INT32		
2428	RO	3-Ø SM1 kvarh Import Total	INT32	x0.01	kvarh
2430	RO	3-Ø SM1 kvarh Export Total	INT32		
2432	RO	3-Ø SM1 kVAh Total	INT32	x0.01	kVAh
…		…			
2462	RO	3-Ø SM4 kWh Total	INT32	x0.01	kWh
2464	RO	3-Ø SM4 kvarh Total	INT32	x0.01	kvarh
2466	RO	3-Ø SM4 kWh Import Total	INT32	x0.01	kWh
2468	RO	3-Ø SM4 kWh Export Total	INT32		
2470	RO	3-Ø SM4 kvarh Import Total	INT32	x0.01	kvarh
2472	RO	3-Ø SM4 kvarh Export Total	INT32		
2474	RO	3-Ø SM4 kVAh Total	INT32	x0.01	kVAh
2476	RO	VM1 kWh Import	INT32	x0.01	kWh
2478	RO	VM1 kWh Export	INT32		
2480	RO	VM1 kvarh Import	INT32	x0.01	kvarh
2482	RO	VM1 kvarh Export	INT32		
2484	RO	VM1 kVAh	INT32	x0.01	kVAh
2486	RO	VM2 kWh Import	INT32	x0.01	kWh
2488	RO	VM2 kWh Export	INT32		
2490	RO	VM2 kvarh Import	INT32	x0.01	kvarh
2492	RO	VM2 kvarh Export	INT32		
2494	RO	VM2 kVAh	INT32	x0.01	kVAh
2496	RO	VM3 kWh Import	INT32	x0.01	kWh
2498	RO	VM3 kWh Export	INT32		
2500	RO	VM3 kvarh Import	INT32	x0.01	kvarh
2502	RO	VM3 kvarh Export	INT32		
2504	RO	VM3 kVAh	INT32	x0.01	kVAh

2506	RO	VM4 kWh Import	INT32	x0.01	kWh
2508	RO	VM4 kWh Export	INT32		
2510	RO	VM4 kvarh Import	INT32	x0.01	kvarh
2512	RO	VM4 kvarh Export	INT32		
2514	RO	VM4 kVAh	INT32	x0.01	kVAh

Table 5-23 Complete Energy Measurement based on SMs and VMs

5.3.3 kWh and kvarh Energy Measurements for SMs and VMs

Register	Property	Description	Format	Scale	Unit
2600	RO	1-Ø SM1 kWh Total	INT32	x0.01	kWh
2602	RO	1-Ø SM1 kvarh Total	INT32	x0.01	kvarh
2604	RO	1-Ø SM2 kWh Total	INT32	x0.01	kWh
2606	RO	1-Ø SM2 kvarh Total	INT32	x0.01	kvarh
..	RO	...			
2644	RO	1-Ø SM12 kWh Total	INT32	x0.01	kWh
2646	RO	1-Ø SM12 kvarh Total	INT32	x0.01	kvarh
2648	RO	3-Ø SM1 kWh Total	INT32	x0.01	kWh
2650	RO	3-Ø SM1 kvarh Total	INT32	x0.01	kvarh
..	RO	...			
2660	RO	3-Ø SM4 kWh Total	INT32	x0.01	kWh
2662	RO	3-Ø SM4 kvarh Total	INT32	x0.01	kvarh
2664	RO	VM1 kWh Total	INT32	x0.01	kWh
2666	RO	VM1 kvarh Total	INT32	x0.01	kvarh
...	RO	...			
2676	RO	VM4 kWh Total	INT32	x0.01	kWh
2678	RO	VM4 kvarh Total	INT32	x0.01	kvarh

Table 5-24 SMs & VMs Energy Measurements for SMs and VMs

5.3.4 Interval Energy Measurements

Register	Property	Description	Format	Scale	Unit
3100	RO	1-Ø SM1 kWh Import	INT32	x0.01	kWh
3102	RO	1-Ø SM1 kWh Export	INT32		
3104	RO	1-Ø SM1 kvarh Import	INT32	x0.01	kvarh
3106	RO	1-Ø SM1 kvarh Export	INT32		
3108	RO	1-Ø SM1 kVAh	INT32	x0.01	kVAh
...	RO	...	INT32		
3210	RO	1-Ø SM12 kWh Import	INT32	x0.01	kWh
3212	RO	1-Ø SM12 kWh Export	INT32		
3214	RO	1-Ø SM12 kvarh Import	INT32	x0.01	kvarh
3216	RO	1-Ø SM12 kvarh Export	INT32		
3218	RO	1-Ø SM12 kVAh	INT32	x0.01	kVAh
3220	RO	3-Ø SM1 kWh Total	INT32	x0.01	kWh
3222	RO	3-Ø SM1 kvarh Total	INT32	x0.01	kvarh
3224	RO	3-Ø SM1 kWh Import Total	INT32	x0.01	kWh
3226	RO	3-Ø SM1 kWh Export Total	INT32		
3228	RO	3-Ø SM1 kvarh Import Total	INT32	x0.01	kvarh
3230	RO	3-Ø SM1 kvarh Export Total	INT32		
3232	RO	3-Ø SM1 kVAh	INT32	x0.01	kVAh
...	RO	...	INT32		
3262	RO	3-Ø SM4 kWh Total	INT32	x0.01	kWh
3264	RO	3-Ø SM4 kvarh Total	INT32	x0.01	kvarh
3266	RO	3-Ø SM4 kWh Import Total	INT32	x0.01	kWh
3268	RO	3-Ø SM4 kWh Export Total	INT32		
3270	RO	3-Ø SM4 kvarh Import Total	INT32	x0.01	kvarh
3272	RO	3-Ø SM4 kvarh Export Total	INT32		
3274	RO	3-Ø SM4 kVAh	INT32	x0.01	kVAh
3276	RO	VM1 kWh Import	INT32	x0.01	kWh
3278	RO	VM1 kWh Export	INT32		
3280	RO	VM1 kvarh Import	INT32	x0.01	kvarh
3282	RO	VM1 kvarh Export	INT32		
3284	RO	VM1 kVAh	INT32	x0.01	kVAh
3286	RO	VM2 kWh Import	INT32	x0.01	kWh
3288	RO	VM2 kWh Export	INT32		
3290	RO	VM2 kvarh Import	INT32	x0.01	kvarh

3292	RO	VM2 kvarh Export	INT32		
3294	RO	VM2 kVAh	INT32	x0.01	kVAh
3296	RO	VM3 kWh Import	INT32	x0.01	kWh
3298	RO	VM3 kWh Export	INT32		
3300	RO	VM3 kvarh Import	INT32	x0.01	kvarh
3302	RO	VM3 kvarh Export	INT32		
3304	RO	VM3 kVAh	INT32	x0.01	kVAh
3306	RO	VM4 kWh Import	INT32	x0.01	kWh
3308	RO	VM4 kWh Export	INT32		
3310	RO	VM4 kvarh Import	INT32	x0.01	kvarh
3312	RO	VM4 kvarh Export	INT32		
3314	RO	VM4 kVAh	INT32	x0.01	kVAh

Table 5-25 Interval Energy Measurements

5.4 DI Pulse Counter

Register	Property	Description	Format	Scale	Unit
3400	RW	DI #1 Counter	UINT32	x1	-
3402	RW	DI #2 Counter	UINT32		
3404	RW	DI #3 Counter	UINT32		
3406	RW	DI #4 Counter	UINT32		
3408	RW	DI #5 Counter	UINT32		
3410	RW	DI #6 Counter	UINT32		
3412	RW	DI #7 Counter	UINT32		
3414	RW	DI #8 Counter	UINT32		
3416	RW	DI #9 Counter	UINT32		
3418	RW	DI #10 Counter	UINT32		
3420	RW	DI #11 Counter	UINT32		
3422	RW	DI #12 Counter	UINT32		

Table 5-26 Pulse Counter

Notes:

1) DI Counter = Pulse Number x DI Pulse Weight
2) The Counter registers have a maximum value of 1,000,000,000 and will roll over to zero automatically when it is reached.

5.5 Demands

5.5.1 Present Demands

Register	Property	Description	Format	Scale	Unit
3500	RO	1-Ø SM1 Current	FP32	x1	A
3502	RO	1-Ø SM2 Current	FP32		
...		...			
3522	RO	1-Ø SM12 Current	FP32		
3524	RO	1-Ø SM1 kW	FP32	x1	W
3526	RO	1-Ø SM2 kW	FP32		
...		...			
3546	RO	1-Ø SM12 kW	FP32		
3548	RO	1-Ø SM1 kvar	FP32	x1	var
3550	RO	1-Ø SM2 kvar	FP32		
...		...			
3570	RO	1-Ø SM12 kvar	FP32		
3572	RO	1-Ø SM1 kVA	FP32	x1	VA
3574	RO	1-Ø SM2 kVA	FP32		
...		...			
3594	RO	1-Ø SM12 kVA	FP32		
3596	RO	3-Ø SM1 kW	FP32	x1	W
3598	RO	3-Ø SM2 kW	FP32		
3600	RO	3-Ø SM3 kW	FP32		
3602	RO	3-Ø SM4 kW	FP32		
3604	RO	3-Ø SM1 kvar	FP32	x1	var
3606	RO	3-Ø SM2 kvar	FP32		
3608	RO	3-Ø SM3 kvar	FP32		
3610	RO	3-Ø SM4 kvar	FP32		
3612	RO	3-Ø SM1 kVA	FP32	x1	VA

3614	RO	3-Ø SM2 kVA	FP32		
3616	RO	3-Ø SM3 kVA	FP32		
3618	RO	3-Ø SM4 kVA	FP32		
3620	RO	VM1 kW	FP32	x1	W
3622	RO	VM2 kW	FP32		
3624	RO	VM3 kW	FP32		
3626	RO	VM4 kW	FP32		
3628	RO	VM1 kvar	FP32	x1	var
3630	RO	VM2 kvar	FP32		
3632	RO	VM3 kvar	FP32		
3634	RO	VM4 kvar	FP32		
3636	RO	VM1 kVA	FP32	x1	VA
3638	RO	VM2 kVA	FP32		
3640	RO	VM3 kVA	FP32		
3642	RO	VM4 kVA	FP32		

Table 5-27 Present Demand Measurements

5.5.2 Peak Demand Log of This Month (Since Last Reset)

Register	Property	Description	Format	Scale	Unit
4000	RO	1-Ø SM1 Current	FP32	x1	A
4002	RO	Timestamp	UINT32		s
4004	RO	1-Ø SM2 Current	FP32	x1	A
4006	RO	Timestamp	UINT32		s
…		…			
4044	RO	1-Ø SM12 Current	FP32	x1	A
4046	RO	Timestamp	UINT32		s
4048	RO	1-Ø SM1 kW	FP32	x1	W
4050	RO	Timestamp	UINT32		s
4052	RO	1-Ø SM2 kW	FP32	x1	W
4054	RO	Timestamp	UINT32		s
…		…			
4092	RO	1-Ø SM12 kW	FP32	x1	W
4094	RO	Timestamp	UINT32		s
4096	RO	1-Ø SM1 kvar	FP32	x1	var
4098	RO	Timestamp	UINT32		s
4100	RO	1-Ø SM2 kvar	FP32	x1	var
4102	RO	Timestamp	UINT32		s
…		…			
4140	RO	1-Ø SM12 kvar	FP32	x1	var
4142	RO	Timestamp	UINT32		s
4144	RO	1-Ø SM1 kVA	FP32	x1	VA
4146	RO	Timestamp	UINT32		s
4148	RO	1-Ø SM2 kVA	FP32	x1	VA
4150	RO	Timestamp	UINT32		s
…		…			
4188	RO	1-Ø SM12 kVA	FP32	x1	VA
4190	RO	Timestamp	UINT32		s
4192	RO	3-Ø SM1 kW	FP32	x1	W
4194	RO	Timestamp	UINT32		s
4196	RO	3-Ø SM2 kW	FP32	x1	W
4198	RO	Timestamp	UINT32		s
4200	RO	3-Ø SM3 kW	FP32	x1	W
4202	RO	Timestamp	UINT32		s
4204	RO	3-Ø SM4 kW	FP32	x1	W
4206	RO	Timestamp	UINT32		s
4208	RO	3-Ø SM1 kvar	FP32	x1	var
4210	RO	Timestamp	UINT32		s
4212	RO	3-Ø SM2 kvar	FP32	x1	var
4214	RO	Timestamp	UINT32		s
4216	RO	3-Ø SM3 kvar	FP32	x1	var
4218	RO	Timestamp	UINT32		s
4220	RO	3-Ø SM4 kvar	FP32	x1	var
4222	RO	Timestamp	UINT32		s
4224	RO	3-Ø SM1 kVA	FP32	x1	VA
4226	RO	Timestamp	UINT32		s

4228	RO	3-Ø SM2 kVA	FP32	x1	VA
4230	RO	Timestamp	UINT32		s
4232	RO	3-Ø SM3 kVA	FP32	x1	VA
4234	RO	Timestamp	UINT32		s
4236	RO	3-Ø SM4 kVA	FP32	x1	VA
4238	RO	Timestamp	UINT32		s
4240	RO	VM1 kW	FP32	x1	W
4242	RO	Timestamp	UINT32		s
4244	RO	VM2 kW	FP32	x1	W
4246	RO	Timestamp	UINT32		s
4248	RO	VM3 kW	FP32	x1	W
4250	RO	Timestamp	UINT32		s
4252	RO	VM4 kW	FP32	x1	W
4254	RO	Timestamp	UINT32		s
4256	RO	VM1 kvar	FP32	x1	var
4258	RO	Timestamp	UINT32		s
4260	RO	VM2 kvar	FP32	x1	var
4262	RO	Timestamp	UINT32		s
4264	RO	VM3 kvar	FP32	x1	var
4266	RO	Timestamp	UINT32		s
4268	RO	VM4 kvar	FP32	x1	var
4270	RO	Timestamp	UINT32		s
4272	RO	VM1 kVA	FP32	x1	VA
4274	RO	Timestamp	UINT32		s
4276	RO	VM2 kVA	FP32	x1	VA
4278	RO	Timestamp	UINT32		s
4280	RO	VM3 kVA	FP32	x1	VA
4282	RO	Timestamp	UINT32		s
4284	RO	VM4 kVA	FP32	x1	VA
4286	RO	Timestamp	UINT32		s

Table 5-28 Peak Demand Log of This Month (Since Last Reset)

5.5.3 Peak Demand Log of Last Month (Before Last Reset)

Register	Property	Description	Format	Scale	Unit
4288	RO	1-Ø SM1 Current	FP32	x1	A
4290	RO	Timestamp	UINT32		s
4294	RO	1-Ø SM2 Current	FP32	x1	A
4296	RO	Timestamp	UINT32		s
…		…			
4332	RO	1-Ø SM12 Current	FP32	x1	A
4334	RO	Timestamp	UINT32		s
4336	RO	1-Ø SM1 kW	FP32	x1	W
4338	RO	Timestamp	UINT32		s
4340	RO	1-Ø SM2 kW	FP32	x1	W
4342	RO	Timestamp	UINT32		s
…		…			
4380	RO	1-Ø SM12 kW	FP32	x1	W
4382	RO	Timestamp	UINT32		s
4384	RO	1-Ø SM1 kvar	FP32	x1	var
4386	RO	Timestamp	UINT32		s
4388	RO	1-Ø SM2 kvar	FP32	x1	var
4390	RO	Timestamp	UINT32		s
…		…			
4428	RO	1-Ø SM12 kvar	FP32	x1	var
4430	RO	Timestamp	UINT32		s
4432	RO	1-Ø SM1 kVA	FP32	x1	VA
4434	RO	Timestamp	UINT32		s
4436	RO	1-Ø SM2 kVA	FP32	x1	VA
4438	RO	Timestamp	UINT32		s
…		…			
4476	RO	1-Ø SM12 kVA	FP32	x1	VA
4478	RO	Timestamp	UINT32		s
4480	RO	3-Ø SM1 kW	FP32	x1	W
4482	RO	Timestamp	UINT32		s
4484	RO	3-Ø SM2 kW	FP32	x1	W

4486	RO	Timestamp	UINT32		s
4488	RO	3-Ø SM3 kW	FP32	x1	W
4490	RO	Timestamp	UINT32		s
4492	RO	3-Ø SM4 kW	FP32	x1	W
4494	RO	Timestamp	UINT32		s
4496	RO	3-Ø SM1 kvar	FP32	x1	var
4498	RO	Timestamp	UINT32		s
4500	RO	3-Ø SM2 kvar	FP32	x1	var
4502	RO	Timestamp	UINT32		s
4504	RO	3-Ø SM3 kvar	FP32	x1	var
4506	RO	Timestamp	UINT32		s
4508	RO	3-Ø SM4 kvar	FP32	x1	var
4510	RO	Timestamp	UINT32		s
4512	RO	3-Ø SM1 kVA	FP32	x1	VA
4514	RO	Timestamp	UINT32		s
4516	RO	3-Ø SM2 kVA	FP32	x1	VA
4518	RO	Timestamp	UINT32		s
4520	RO	3-Ø SM3 kVA	FP32	x1	VA
4522	RO	Timestamp	UINT32		s
4524	RO	3-Ø SM4 kVA	FP32	x1	VA
4526	RO	Timestamp	UINT32		s
4528	RO	VM1 kW	FP32	x1	W
4520	RO	Timestamp	UINT32		s
4532	RO	VM2 kW	FP32	x1	W
4534	RO	Timestamp	UINT32		s
4536	RO	VM3 kW	FP32	x1	W
4538	RO	Timestamp	UINT32		s
4540	RO	VM4 kW	FP32	x1	W
4542	RO	Timestamp	UINT32		s
4544	RO	VM1 kvar	FP32	x1	var
4546	RO	Timestamp	UINT32		s
4548	RO	VM2 kvar	FP32	x1	var
4550	RO	Timestamp	UINT32		s
4552	RO	VM3 kvar	FP32	x1	var
4554	RO	Timestamp	UINT32		s
4556	RO	VM4 kvar	FP32	x1	var
4558	RO	Timestamp	UINT32		s
4560	RO	VM1 kVA	FP32	x1	VA
4562	RO	Timestamp	UINT32		s
4564	RO	VM2 kVA	FP32	x1	VA
4566	RO	Timestamp	UINT32		s
4568	RO	VM3 kVA	FP32	x1	VA
4570	RO	Timestamp	UINT32		s
4572	RO	VM4 kVA	FP32	x1	VA
4574	RO	Timestamp	UINT32		s

Table 5-29 Peak Demand Log of Last Month (Before Last Reset)

5.6 Harmonics Measurements

5.6.1 Voltage THD Measurements

Register	Property	Description	Format	Scale	Unit
4700	RO	U1/U12 THD	FP32	x1	-
4702	RO	U1/U12 TOHD	FP32		
4704	RO	U1/U12 TEHD	FP32		
4706	RO	U2/U23 THD	FP32		
4708	RO	U2/U23 TOHD	FP32		
4710	RO	U2/U23 TEHD	FP32		
4712	RO	U3/U31 THD	FP32		
4714	RO	U3/U31 TOHD	FP32		
4716	RO	U3/U31 TEHD	FP32		

Table 5-30 Voltage Harmonic Measurements

5.6.2 Current THD Measurements

Register	Property	Description	Format	Scale	Unit
4718	RO	1-Ø SM1 THD	FP32	x1	-
4720	RO	1-Ø SM1 TOHD	FP32		
4722	RO	1-Ø SM1 TEHD	FP32		
4724	RO	1-Ø SM2 THD	FP32		
4726	RO	1-Ø SM2 TOHD	FP32		
4728	RO	1-Ø SM2 TEHD	FP32		
4730	RO	1-Ø SM3 THD	FP32		
4732	RO	1-Ø SM3 TOHD	FP32		
4734	RO	1-Ø SM3 TEHD	FP32		
4736	RO	1-Ø SM4 THD	FP32		
4738	RO	1-Ø SM4 TOHD	FP32		
4740	RO	1-Ø SM4 TEHD	FP32		
4742	RO	1-Ø SM5 THD	FP32		
4744	RO	1-Ø SM5 TOHD	FP32		
4746	RO	1-Ø SM5 TEHD	FP32		
4748	RO	1-Ø SM6 THD	FP32		
4750	RO	1-Ø SM6 TOHD	FP32		
4752	RO	1-Ø SM6 TEHD	FP32		
4754	RO	1-Ø SM7 THD	FP32		
4756	RO	1-Ø SM7 TOHD	FP32		
4758	RO	1-Ø SM7 TEHD	FP32		
4760	RO	1-Ø SM8 THD	FP32		
4762	RO	1-Ø SM8 TOHD	FP32		
4764	RO	1-Ø SM8 TEHD	FP32		
4766	RO	1-Ø SM9 THD	FP32		
4768	RO	1-Ø SM9 TOHD	FP32		
4770	RO	1-Ø SM9 TEHD	FP32		
4772	RO	1-Ø SM10 THD	FP32		
7744	RO	1-Ø SM10 TOHD	FP32		
4776	RO	1-Ø SM10 TEHD	FP32		
4778	RO	1-Ø SM11 THD	FP32		
4780	RO	1-Ø SM11 TOHD	FP32		
4782	RO	1-Ø SM11 TEHD	FP32		
4784	RO	1-Ø SM12 THD	FP32		
4786	RO	1-Ø SM12 TOHD	FP32		
4788	RO	1-Ø SM12 TEHD	FP32		

Table 5-31 Current Harmonic Measurements

5.6.3 Individual Harmonics

Register	Property	Description	Format
4790~4849	RO	U1/U12	See Note 1)
4850~4909	RO	U2/U23	
4910~4969	RO	U3/U31	
4970~5029	RO	1-Ø SM1 Current	
5030~5089	RO	1-Ø SM2 Current	
5090~5149	RO	1-Ø SM3 Current	
5150~5209	RO	1-Ø SM4 Current	
5210~5269	RO	1-Ø SM5 Current	
5270~5329	RO	1-Ø SM6 Current	
5330~5389	RO	1-Ø SM7 Current	
5390~5449	RO	1-Ø SM8 Current	
5450~5509	RO	1-Ø SM9 Current	
5510~5569	RO	1-Ø SM10 Current	
5570~5629	RO	1-Ø SM11 Current	
5630~5689	RO	1-Ø SM12 Current	

Table 5-32 Individual Harmonic Measurements

Notes:

1) The following table illustrates the HD Data Structure for the Individual Harmonics measurements.

Offset	Property	Description	Format	Scale/Unit
+0	RO	HD02	FP32	x100, %

+2	RO	HD03	FP32	x100, %
+4	RO	HD04	FP32	x100, %
+6	RO	HD05	FP32	x100, %
…	…	…	FP32	…
+54	RO	HD29	FP32	x100, %
+56	RO	HD30	FP32	x100, %
+58	RO	HD31	FP32	x100, %

Table 5-33 HD Data Structure

5.7 Log Register

5.7.1 SOE Log

Register	Property	Description	Format
10000-10008	RO	Event 1	See Table 5-35 SOE Log Data Structure
10009-10017	RO	Event 2	
10018-10026	RO	Event 3	
10027-10035	RO	Event 4	
….		….	
14599~14607	RO	Event 512	

Table 5-34 SOE Log

Offset	Property	Description	Format	Range/Note
+0	RO	High-order Byte: Event Classification	UINT16	See Appendix A
		Low-order Byte: Sub-Classification		See Appendix A
+1	RO	High-order Byte: Year	UINT16	0-99 (Year-2000)
		Low-order Byte: Month		1 to 12
+2	RO	High-order Byte: Day	UINT16	1 to 31
		Low-order Byte: Hour		0 to 23
+3	RO	High-order Byte: Minute	UINT16	0 to 59
		Low-order Byte: Second		0 to 59
+4	RO	Millisecond	UINT16	
+5	RO	Reserved	UINT8	
		Status	UINT8	1=Inactive (Open) 2=Active (Closed)
+6	RO	Event Value-High Word	INT16	-
+7	RO	Event Value-Low Word		
+8	RO	Channel No.	UINT16	

Table 5-35 SOE Log Data Structure

5.7.2 Daily Freeze Log

Register	Property	Description	Format	Scale	Unit
20000	RW	Index[1]	UINT32	1 to 1000	
20002	RO	High-order Byte: Year (0-99) Low-order Byte: Month (1-12)	UINT16	-	
20003	RO	High-order Byte: Day (1-31) Low-order Byte: Hour (0-23)	UINT16		
20004	RO	High-order Byte: Minute (0-59) Low-order Byte: Second (0-59)	UINT16		
20005	RO	Millisecond	UINT16		
20006	RO	1-Ø SM1 Current	FP32	x1	A
20008	RO	1-Ø SM1 kW	FP32	x1	W
20010	RO	1-Ø SM1 kvar	FP32	x1	var
20012	RO	1-Ø SM1 kVA	FP32	x1	VA
20014	RO	1-Ø SM1 kWh Import	INT32	x0.01	kWh
20016	RO	1-Ø SM1 kWh Export	INT32	x0.01	kWh
20018	RO	1-Ø SM1 kvarh Import	INT32	x0.01	kvarh
20020	RO	1-Ø SM1 kvarh Export	INT32	x0.01	kvarh
20022	RO	1-Ø SM1 kVAh	INT32	x0.01	kVAh
…		…			
20204	RO	1-Ø SM12 Current	FP32	x1	A
20206	RO	1-Ø SM12 kW	FP32	x1	W
20208	RO	1-Ø SM12 kvar	FP32	x1	var
20210	RO	1-Ø SM12 kVA	FP32	x1	VA
20212	RO	1-Ø SM12 kWh Import	INT32	x0.01	kWh

20214	RO	1-Ø SM12 kWh Export	INT32	x0.01	kWh
20216	RO	1-Ø SM12 kvarh Import	INT32	x0.01	kvarh
20218	RO	1-Ø SM12 kvarh Export	INT32	x0.01	kvarh
20220	RO	1-Ø SM12 kVAh	INT32	x0.01	kVAh
20222	RO	3-Ø SM1 kW	FP32	x1	W
20224	RO	3-Ø SM1 kvar	FP32	x1	var
20226	RO	3-Ø SM1 kVA	FP32	x1	VA
20228	RO	3-Ø SM1 kWh Import	INT32	x0.01	kWh
20230	RO	3-Ø SM1 kWh Export	INT32	x0.01	kWh
20232	RO	3-Ø SM1 kvarh Import	INT32	x0.01	kvarh
20234	RO	3-Ø SM1 kvarh Export	INT32	x0.01	kvarh
20236	RO	3-Ø SM1 kVAh	INT32	x0.01	kVAh
…		…			
20270	RO	3-Ø SM4 kW	FP32	x1	W
20272	RO	3-Ø SM4 kvar	FP32	x1	var
20274	RO	3-Ø SM4 kVA	FP32	x1	VA
20276	RO	3-Ø SM4 kWh Import	INT32	x0.01	kWh
20278	RO	3-Ø SM4 kWh Export	INT32	x0.01	kWh
20280	RO	3-Ø SM4 kvarh Import	INT32	x0.01	kvarh
20282	RO	3-Ø SM4 kvarh Export	INT32	x0.01	kvarh
20284	RO	3-Ø SM4 kVAh	INT32	x0.01	kVAh
20286	RO	VM1 kW	FP32	x1	W
20288	RO	VM1 kvar	FP32	x1	var
20290	RO	VM1 kVA	FP32	x1	VA
20292	RO	VM1 kWh Import	INT32	x0.01	kWh
20294	RO	VM1 kWh Export	INT32	x0.01	kWh
20296	RO	VM1 kvarh Import	INT32	x0.01	kvarh
20298	RO	VM1 kvarh Export	INT32	x0.01	kvarh
20300	RO	VM1 kVAh	INT32	x0.01	kVAh
20302	RO	VM2 kW	FP32	x1	W
20304	RO	VM2 kvar	FP32	x1	var
20306	RO	VM2 kVA	FP32	x1	VA
20308	RO	VM2 kWh Import	INT32	x0.01	kWh
20310	RO	VM2 kWh Export	INT32	x0.01	kWh
20312	RO	VM2 kvarh Import	INT32	x0.01	kvarh
20314	RO	VM12 kvarh Export	INT32	x0.01	kvarh
20316	RO	VM2 kVAh	INT32	x0.01	kVAh
20318	RO	VM3 kW	FP32	x1	W
20320	RO	VM3 kvar	FP32	x1	var
20322	RO	VM3 kVA	FP32	x1	VA
20324	RO	VM3 kWh Import	INT32	x0.01	kWh
20326	RO	VM3 kWh Export	INT32	x0.01	kWh
20328	RO	VM3 kvarh Import	INT32	x0.01	kvarh
20330	RO	VM3 kvarh Export	INT32	x0.01	kvarh
20332	RO	VM3 kVAh	INT32	x0.01	kVAh
20334	RO	VM4 kW	FP32	x1	W
20336	RO	VM4 kvar	FP32	x1	var
20338	RO	VM4 kVA	FP32	x1	VA
20340	RO	VM4 kWh Import	INT32	x0.01	kWh
20342	RO	VM4 kWh Export	INT32	x0.01	kWh
20344	RO	VM4 kvarh Import	INT32	x0.01	kvarh
20346	RO	VM4 kvarh Export	INT32	x0.01	kvarh
20348	RO	VM4 kVAh	INT32	x0.01	kVAh

Table 5-36 Daily Freeze Log

Notes:

1) There is no Log Pointer that indicates the current logging position. Writing a value between 1 and 1000 to the **Index** register to retrieve the Daily Freeze Log of the N^{th} entry. For example, writing 1 to the Index register will retrieve the first day's Daily Freeze Log. If N = 0 or N > 1000, an exception response will be returned with the Illegal Data Value error code (0x03) as defined by the Modbus protocol. If all the returned values of the N^{th} Log Record (where $1 \le N \le 1000$) are all 0 (including the timestamp), this indicates that the returned Log Record is invalid and that the end of the Log has been reached. If the software is reading the Log for the very first time, it should start with N^{th} and stop when either N=1 or when the returned Log Record is invalid. After that, all the software has to do is to read the Log on a daily basis with N^{th}.

5.7.3 Monthly Freeze Log

Register	Property	Description	Format	Scale	Unit
2700	RW	Index[1]	UINT16	0 to 24	
2701	RO	High-order Byte: Year (0-99) Low-order Byte: Month (1-12)	UINT16	Time Stamp (20YY/MM/DD HH:MM:SS)	
2702	RO	High-order Byte: Day (1-31) Low-order Byte: Hour (0-23)	UINT16		
2703	RO	High-order Byte: Minute (0-59) Low-order Byte: Second (0-59)	UINT16		
2704	RO	Millisecond	UINT16		
2705	RO	1-Ø SM1 kWh Import	INT32	x0.01	kWh
2707	RO	1-Ø SM1 kWh Export	INT32		
2709	RO	1-Ø SM1 kvarh Import	INT32	x0.01	kvarh
2711	RO	1-Ø SM1 kvarh Export	INT32		
2713	RO	1-Ø SM1 kVAh	INT32	x0.01	kVAh
…	RO	…	INT32		
2815	RO	1-Ø SM12 kWh Import	INT32	x0.01	kWh
2817	RO	1-Ø SM12 kWh Export	INT32		
2819	RO	1-Ø SM12 kvarh Import	INT32	x0.01	kvarh
2821	RO	1-Ø SM12 kvarh Export	INT32		
2823	RO	1-Ø SM12 kVAh	INT32	x0.01	kVAh
2825	RO	3-Ø SM1 kWh Import Total	INT32	x0.01	kWh
2827	RO	3-Ø SM1 kWh Export Total	INT32		
2829	RO	3-Ø SM1 kvarh Import Total	INT32	x0.01	kvarh
2831	RO	3-Ø SM1 kvarh Export Total	INT32		
2833	RO	3-Ø SM1 kVAh Total	INT32	x0.01	kVAh
…	RO	…	INT32		
2855	RO	3-Ø SM4 kWh Import Total	INT32	x0.01	kWh
2857	RO	3-Ø SM4 kWh Export Total	INT32		
2859	RO	3-Ø SM4 kvarh Import Total	INT32	x0.01	kvarh
2861	RO	3-Ø SM4 kvarh Export Total	INT32		
2863	RO	3-Ø SM4 kVAh Total	INT32	x0.01	kVAh
2865	RO	VM1 kWh Import	INT32	x0.01	kWh
2867	RO	VM1 kWh Export	INT32		
2869	RO	VM1 kvarh Import	INT32	x0.01	kvarh
2871	RO	VM1 kvarh Export	INT32		
2873	RO	VM1 kVAh	INT32	x0.01	kVAh
2875	RO	VM2 kWh Import	INT32	x0.01	kWh
2877	RO	VM2 kWh Export	INT32		
2879	RO	VM2 kvarh Import	INT32	x0.01	kvarh
2881	RO	VM2 kvarh Export	INT32		
2883	RO	VM2 kVAh	INT32	x0.01	kVAh
2885	RO	VM3 kWh Import	INT32	x0.01	kWh
2887	RO	VM3 kWh Export	INT32		
2889	RO	VM3 kvarh Import	INT32	x0.01	kvarh
2891	RO	VM3 kvarh Export	INT32		
2893	RO	VM3 kVAh	INT32	x0.01	kVAh
2895	RO	VM4 kWh Import	INT32	x0.01	kWh
2897	RO	VM4 kWh Export	INT32		
2899	RO	VM4 kvarh Import	INT32	x0.01	kvarh
2901	RO	VM4 kvarh Export	INT32		
2903	RO	VM4 kVAh	INT32	x0.01	kVAh

Table 5-37 Monthly Freeze Log

Notes:

1) There is no Log Pointer that indicates the current logging position. Writing a value between 1 and 24 to the **Index** register to retrieve the Monthly Freeze Log of the N^{th} entry. For example, writing 1 to the Index register will retrieve the first month's Monthly Freeze Log. If N = 0 or N > 24, an exception response will be returned with the Illegal Data Value error code (0x03) as defined by the Modbus protocol. If all the returned values of the N^{th} Log Record (where $1 \le N \le 24$) are all 0 (including the timestamp), this indicates that the returned Log Record is invalid and that the end of the Log has been reached. If the software is reading the Log for the very first time, it should start with N^{th} and stop when either N=1 or when the returned Log Record is invalid. After that, all the software has to do is to read the Log on a monthly basis with N^{th}.

5.7.4 Data Recorder Log

Register	Property	Description	Format
21000	RW	DR Log x Index	UINT32
21002	RO	High-order Byte: Year (0-99) Low-order Byte: Month (1-12)	UINT16
21003	RO	High-order Byte: Day (1-31) Low-order Byte: Hour (0-23)	UINT16
21004	RO	High-order Byte: Minute (0-59) Low-order Byte: Second (0-59)	UINT16
21005	RO	Millisecond	UINT16
21006	RO	Parameter #1	FP32
21008	RO	Parameter #2	
…		…	
21124	RO	Parameter #60	

Table 5-38 DR Log

Notes:

1) Writing n to the **DR Log X Index** register will load the Log Record at pointer position n into the DR Log X Buffer from the device's memory.

2) Writing an index value that points to a Log Record that is either already expired or has not been generated yet to the **DR Log X Index** register will generate an exception response with the Illegal Data Value error code (0x03) as defined by the Modbus protocol.

5.8 Device Setup

5.8.1 Basic Setup Parameters

Register	Property	Description	Format	Range, Default*
6000	RW	Nominal Frequency	UINT16	0=50Hz*, 1=60Hz
6001	RW	Wiring Mode	UINT16	0=3PH4W*, 1=3PH3W 2=1PH2W, 3=DEMO
6002	RW	U Primary[1]	UINT32	1 to 1,000,000V, 380*
6004	RW	U Secondary[1]	UINT16	1 to 450V, 380*
6005	RW	PF Convention	UINT16	0=IEC*, 1=IEEE, 2=-IEEE
6006	RW	kVA Calculation	UINT16	0=Vector*, 1=Scalar
6007	RW	SM/VM Energy Calculation	UINT16	0=Net*, 1=Total
6008	RW	Demand Period	UINT16	1 to 60 mins, 15*
6009	RW	Number of Sliding Windows	UINT16	1* to 15
6010	RW	Self-Read Time of Peak Demand Log[2]	UINT16	0*
6011	RW	Self-Read Mode of Peak Demand Log	UINT16	0=Auto, 1=Manual*
6012	RW	Self-Read Time of Monthly Freeze Log[2]	UINT16	0*
6013	RW	kvarh Calculation Method		0=RMS*, 1=Fund
6014	RW	Arm before Execute	UINT16	0=Disabled*, 1=Enabled
6015	RW	RO Pulse Width		0* to 6000 (x0.1s)
6016	RW	Energy Pulse Constant	UINT16	0=1 imp/kxh 1=10 imp/kxh 2=100 imp/kxh 3=400 imp/kxh* 4=1000 imp/kxh 5=3200 imp/kxh
6017	RW	LED EN Pulse Mode[3]	UINT16	0* to 32
6018	RW	Language	UINT16	0=Simple Chinese 1=English* 2=Traditional Chinese
6019	RW	Date Format	UINT16	0=YYYY/MM/DD* 1=MM/DD/YYYY 2=DD/MM/YYYY
6020	RW	RO EN Pulse[3]	UINT16	0* to 32
6021	RW	Interval Energy Period[4]	UINT16	5 to 60* mins
6022	RW	External CT Secondary (Primary 5A)	UINT16	0=None* 1=2.5mA (Reserved now) 2=1.667mA

Table 5-39 Basic Setup

Notes:

1) The value of [PT Primary/PT Secondary] cannot exceed 10000.
2) The **Self-Read Time** applies to both the Peak Demand Log as well as the Monthly Freeze Log and supports the following two options:
   a) A zero value means that the Self-Read will take place at 00:00 of the first day of each month.
   b) A non-zero value means that the Self-Read will take place at a specific time and day based on the formula: Self-Read Time = (Day x 100 + Hour) where 0 ≤ Hour ≤ 23 and 1 ≤ Day ≤ 28. For example, the value 1512 means that the Self-Read will take place at 12:00pm on the 15th day of each month.
3) LED Energy Pulse modes are listed in the table below:

Value	Parameter	Value	Parameter	Value	Parameter
0	Disabled	6	3-Ø SM3 kvarh Imp.	12	1-Ø SM2 kvarh Imp.
1	3-Ø SM1 kWh Imp.	7	3-Ø SM4 kWh Imp.	13	1-Ø SM3 kWh Imp.
2	3-Ø SM1 kvarh Imp.	8	3-Ø SM4 kvarh Imp.	14	1-Ø SM3 kvarh Imp.
3	3-Ø SM2 kWh Imp.	9	1-Ø SM1 kWh Imp.	…	…
4	3-Ø SM2 kvarh Imp.	10	1-Ø SM1 kvarh Imp.	31	1-Ø SM12 kWh Imp.
5	3-Ø SM3 kWh Imp.	11	1-Ø SM2 kWh Imp.	32	1-Ø SM12 kvarh Imp.

Table 5-40 LED Energy Pulse Modes

4) Changing Interval Energy Period would clear present Interval Energy measurements.

5.8.2 AI Setup

Register	Property	Description	Format	Range, Default*
6050	RW	AI Type	UINT16	0=4~20mA*, 1=0~20mA
6051	RW	AI Zero Scale	INT32	-999,999 to +999,999 400*
6053	RW	AI Full Scale	INT32	-999,999 to +999,999 2000*

Table 5-41 AI Setup

5.8.3 DI Setup

Register	Property	Description	Format	Range, Default*
6100	RW	DI Mode	UINT16	DC48V*
6101	RW	DI1 Debounce	UINT16	1 to 9999 ms, 20*
6102	RW	DI2 Debounce	UINT16	
6103	RW	DI3 Debounce	UINT16	
…	RW	…	UINT16	
6112	RW	DI12 Debounce	UINT16	
6113	RW	DI1 Function	UINT32	0=Status Input* 1=Pulse Counter
6114	RW	DI2 Function	UINT32	
6115	RW	DI3 Function	UINT32	
…	RW	…	UINT32	
6124	RW	DI12 Function	UINT32	
6125	RW	DI1 Pulse Weight	UINT32	1* to 1,000,000
6127	RW	DI2 Pulse Weight	UINT32	
6129	RW	DI3 Pulse Weight	UINT32	
…	RW	…	UINT32	
6147	RW	DI12 Pulse Weight	UINT32	

Table 5-42 DI Setup

5.8.4 Communication Setup Parameters

Register	Property	Description	Format	Range, Default*
6200	RW	COM1 Unit ID	UINT16	1 to 254, 100*
6201	RW	COM1 Baud Rate	UINT16	0=1200, 1=2400, 2=4800, 3=9600, 4=19200, 5=38400* 6=57600
6202	RW	COM1 Comm. Config.	UINT16	1=8O1, 2=8E1*, 3=8N1
6203	RW	COM2 Unit ID	UINT16	1 to 247, 100*
6204	RW	COM2 Baud Rate	UINT16	0=1200, 1=2400, 2=4800, 3=9600*, 4=19200, 5=38400
6205	RW	COM2 Comm. Config.	UINT16	1=8O1, 2=8E1*, 3=8N1

Table 5-43 Communication Setup

5.8.5 Alarm Setup

Register	Property	Description	Format	Range, Default*
6400	RW	Universal Hysteresis[1]	UINT16	0 to 100 (x0.1%), 20*
6401	RW	Current ON Threshold	UINT16	0 to 100 (x0.1%), 50*
6402	RW	Current ON Time Delay	UINT16	0 to 9999 (s), 10s*
6403	RW	Current OFF Time Delay	UINT16	0 to 9999 (s), 30s*
6404	RW	Current Alarm Enable[2]	Bitmap	0*~0x0FFF
6405	RW	Current HH Alarm Threshold	UINT16	0* to 1000 (x0.1%)
6406	RW	Current HH Alarm Time Delay	UINT16	0* to 9999 (s)
6407	RW	Current H Alarm Threshold	UINT16	0* to 1000 (x0.1%)
6408	RW	Current H Alarm Time Delay	UINT16	0* to 9999 (s)
6409	RW	Current L Alarm Threshold	UINT16	0* to 1000 (x0.1%)
6410	RW	Current L Alarm Time Delay	UINT16	0* to 9999 (s)
6411	RW	Current LL Alarm Threshold	UINT16	0* to 1000 (x0.1%)
6412	RW	Current LL Alarm Time Delay	UINT16	0* to 9999 (s)
6413	RW	Current Alarm Trigger[3]	UINT16	0*~0x0003
6414	RW	Uln Alarm Enable[4]	UINT16	0*~0x0007 See Notes 4)
6415	RW	Uln HH Alarm Threshold	UINT16	0* to 3000 (x0.1)
6416	RW	Uln HH Alarm Time Delay	UINT16	0* to 9999 (s)
6417	RW	Uln H Alarm Threshold	UINT16	0* to 3000 (x0.1)
6418	RW	Uln H Alarm Time Delay	UINT16	0* to 9999 (s)
6419	RW	Uln L Alarm Threshold	UINT16	0* to 3000 (x0.1)
6420	RW	Uln L Alarm Time Delay	UINT16	0* to 9999 (s)
6421	RW	Uln LL Alarm Threshold	UINT16	0* to 3000 (x0.1)
6422	RW	Uln LL Alarm Time Delay	UINT16	0* to 9999 (s)
6423		Uln Alarm Trigger[3]	UINT16	0*~0x0003
6424	RW	Ull Alarm Enable	Bitmap	0*~0x0007 See Notes 5)
6425	RW	Ull HH Alarm Threshold	UINT16	0* to 5000 (x0.1)
6426	RW	Ull HH Alarm Time Delay	UINT16	0* to 9999 (s)
6427	RW	Ull H Alarm Threshold	UINT16	0* to 5000 (x0.1)
6428	RW	Ull H Alarm Time Delay	UINT16	0* to 9999 (s)
6429	RW	Ull L Alarm Threshold	UINT16	0* to 5000 (x0.1)
6430	RW	Ull L Alarm Time Delay	UINT16	0* to 9999 (s)
6431	RW	Ull LL Alarm Threshold	UINT16	0* to 5000 (x0.1)
6432	RW	Ull LL Alarm Time Delay	UINT16	0* to 9999 (s)
6433	RW	Ull Alarm Trigger[3]	UINT16	0*~0x0003
6434	RW	Ung HH Alarm Threshold	UINT16	0* to 100 (x0.1)
6435	RW	Ung HH Alarm Time Delay	UINT16	0* to 9999 (s)
6436	RW	Ung H Alarm Threshold	UINT16	0* to 100 (x0.1)
6437	RW	Ung H Alarm Time Delay	UINT16	0* to 9999 (s)
6438	RW	Ung Alarm Trigger[3]	UINT16	0*~0x0003
6439	RW	Frequency H Alarm Threshold	UINT16	4500 to 6500* (x0.01Hz)
6440	RW	Frequency H Time Delay	UINT16	0 to 9999 (s), 10*
6441	RW	Frequency L Threshold	UINT16	4500* to 6500 (x0.01Hz)
6442	RW	Frequency L Time Delay	UINT16	0 to 9999 (s), 10*
6443	RW	Frequency Alarm Trigger[3]	UINT16	0*~0x0003
6444	RW	I Unbalance Alarm Enable[6]	Bitmap	0*
6445	RW	I Unbalance Alarm Threshold	UINT16	0* to 1000 (x0.1)
6446	RW	I Unbalance Alarm Time Delay	UINT16	0* to 9999 (s)
6447	RW	I Unbalance Alarm Trigger[3]	UINT16	0*~0x0003
6448	RW	U Unbalance Alarm Enable	UINT16	0 = Disabled* 1 = Enabled
6449	RW	U Unbalance Alarm Threshold	UINT16	0* to 1000 (x0.1)
6450	RW	U Unbalance Alarm Time Delay	UINT16	0* to 9999 (s)
6451	RW	U Unbalance Alarm Trigger[3]	UINT16	0*~0x0003
6452	RW	Phase Reversal Enable[7]	UINT16	0=Disabled*
6453	RW	Phase Reversal Trigger[3]	UINT16	0*~0x0003
6454	RW	Phase Loss Enable	UINT16	0 = Disabled* 1 = Enabled
6455	RW	Phase Loss Time Delay	UINT16	0* to 9999 (s)
6456	RW	Phase Loss Trigger[3]	Bitmap	0*~0x0003
6457	RW	DI1 Alarm Configuration	UINT16	0 = Disabled* 1 = DI1 Closed Trigger

				2 = DI1 Open Trigger
6458	RW	DI1 Alarm Time Delay	UINT16	0* to 9999 (s)
6459	RW	DI1 Alarm Trigger[3]	Bitmap	0*~0x0003
…		…		
6490	RW	DI12 Alarm Configuration	UINT16	0 = Disabled* 1 = DI12 Closed Trigger 2 = DI12 Open Trigger
6491	RW	DI12 Alarm Time Delay	UINT16	0* to 9999 (s)
6492	RW	DI12 Alarm Trigger[3]	UINT16	0*~0x0003
6493	RW	AI Alarm Enable	UINT16	0x00*~0x0F See Notes 8)
6494	RW	AI HH Alarm Threshold	INT32	-999,999 to 999,999, 0*
6496	RW	AI HH Alarm Time Delay	UINT16	0* to 9999 (s)
6497	RW	AI H Alarm Threshold	INT32	-999,999 to 999,999, 0*
6499	RW	AI H Alarm Time Delay	UINT16	0* to 9999 (s)
6500	RW	AI L Alarm Threshold	INT32	-999,999 to 999,999, 0*
6502	RW	AI L Alarm Time Delay	UINT16	0* to 9999 (s)
6503	RW	AI LL Alarm Threshold	INT32	-999,999 to 999,999, 0*
6505	RW	AI LL Alarm Time Delay	UINT16	0* to 9999 (s)
6506	RW	AI Alarm Trigger[3]	UINT16	0*~0x0003

Table 5-44 Alarm Setup Parameters

Notes:

1) The calculation method **Universal Hysteresis** is listed below:

$$\text{Universal Hysteresis} = \frac{\left|\text{Alarm Threshold - Alarm Return Threshold}\right|}{\text{Alarm Threshold}} \times 100\%$$

2) The following table illustrates the details of the **Current Alarm Enable** register with a bit value of 1 meaning enabled and 0 meaning disabled. For example, if enable SM1~SM8 Current Alarm and disable SM9~SM12 Current Alarm, then write 0x00FF (0000000011111111) to the register.

	Bits 4	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Current Alarm Enable	1-Ø SM5	1-Ø SM4	1-Ø SM3	1-Ø SM2	1-Ø SM1
	Bits9	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**
	1-Ø SM10	1-Ø SM9	1-Ø SM8	1-Ø SM7	1-Ø SM6
	Bits 14~15	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**
	Reserved	Reserved	Reserved	1-Ø SM12	1-Ø SM11

Table 5-45 Current Alarm Enabled Register

3) The following table illustrates the details of the ***xx* Alarm Trigger** register with a bit value of 1 meaning enabled and 0 meaning disabled. Therefore, each alarm has three types of trigger if it is enabled: RO, Alarm LED and RO & Alarm LED.

	Bits 2-15	**Bit 1**	**Bit 0**
***xx* Alarm Trigger**	Reserved	Alarm LED	RO

Table 5-46 *xx* Alarm Trigger Register

4) The following table illustrates the details of the **Uln Alarm Enable** register with a bit value of 1 meaning enabled and 0 meaning disabled.

	Bits 3-15	**Bit 2**	**Bit 1**	**Bit 0**
Uln Alarm Enable	Reserved	U3	U2	U1

Table 5-47 Uln Alarm Enable Register

5) The following table illustrates the details of the **Ull Alarm Enable** register with a bit value of 1 meaning enabled and 0 meaning disabled.

	Bits 3-15	**Bit 2**	**Bit 1**	**Bit 0**
Uln Alarm Enable	Reserved	U31	U23	U12

Table 5-48 Ull Alarm Enable Register

6) The following table illustrates the details of the **I Unbalance Alarm Enable** register with a bit value of 1 meaning enabled and 0 meaning disabled.

	Bit 2	**Bit 1**	**Bit 0**
I Unbalance Alarm Enable	3-Ø SM3	3-Ø SM2	3-Ø SM1
	Bits 4-15		**Bit 3**

	Reserved	3-Ø SM4

Table 5-49 I Unbalance Alarm Enabled Register

7) The following table illustrates the details of the **Phase Reversal Alarm Enable** register with a bit value of 1 meaning enabled and 0 meaning disabled.

Phase Reversal Alarm Enable	**Bit 2**	**Bit 1**	**Bit 0**
	3-Ø SM3	3-Ø SM2	3-Ø SM1
	Bits 4-15		**Bit 3**
	Reserved		3-Ø SM4

Table 5-50 Phase Reversal Alarm Enabled Register

8) The following table illustrates the details of the **AI Alarm Enable** register with a bit value of 1 meaning enabled and 0 meaning disabled.

AI Alarm Enable	**Bit 2**	**Bit 1**	**Bit 0**
	L Alarm	H Alarm	HH Alarm
	Bits 4-15		**Bit 3**
	Reserved		LL Alarm

Table 5-51 AI Alarm Enabled Register

5.8.6 1-Ø SMs Setup Parameters

Register	Property	Description	Format	Range, Default*
6600	RW	SM1 Breaker Rating	UINT16	1 to 30,000 (A), 32*
6601	RW	SM1 CT Primary Current	UINT16	1 to 60000 (A), 100*
6602	RW	SM1 CT Secondary Current[1]	UINT16	0 to 60000 mA (x0.1)
6603	RW	SM1 Polarity	UINT16	0=Normal*, 1=Reverse
6604	RW	SM1 Voltage Phase	UINT16	0=Not Use, 1=VA*, 2=VB, 3=VC, 4=VAB, 5=VBC, 6=VCA
6605	RW	SM1 CT Type	UINT16	0=Solid-Core CT* 1=Split-Core CT
6606	RW	SM2 Breaker Rating	UINT16	1 to 30,000 (A), 32*
6607	RW	SM2 CT Primary Current	UINT16	1 to 60000 (A), 100*
6608	RW	SM2 CT Secondary Current[1]	UINT16	0 to 60000 mA (x0.1)
6609	RW	SM2 Polarity	UINT16	0=Normal*, 1=Reverse
6610	RW	SM2 Voltage Phase	UINT16	0=Not Use, 1=VA*, 2=VB, 3=VC, 4=VAB, 5=VBC, 6=VCA
6611	RW	SM2 CT Type	UINT16	0=Solid-Core CT* 1=Split-Core CT
6612	RW	SM3 Breaker Rating	UINT16	1 to 30,000 (A), 32*
…	RW	…	UINT16	…
6618	RW	SM4 Breaker Rating	UINT16	1 to 30,000 (A), 32*
…		…		
6624	RW	SM5 Breaker Rating	UINT16	1 to 30,000 (A), 32*
…		…		
6630	RW	SM6 Breaker Rating	UINT16	1 to 30,000 (A), 32*
…		…		
6636	RW	SM7 Breaker Rating	UINT16	1 to 30,000 (A), 32*
…		…		
6642	RW	SM8 Breaker Rating	UINT16	1 to 30,000 (A), 32*
…		…		
6648	RW	SM9 Breaker Rating	UINT16	1 to 30,000 (A), 32*
…		…		
6654	RW	SM10 Breaker Rating	UINT16	1 to 30,000 (A), 32*
…		…		
6660	RW	SM11 Breaker Rating	UINT16	1 to 30,000 (A), 32*
…		…		
6666	RW	SM12 Breaker Rating	UINT16	1 to 30,000 (A), 32*
6667	RW	SM12 CT Primary Current	UINT16	1 to 60000 (A), 100*
6668	RW	SM12 CT Secondary Current[1]	UINT16	0 to 60000 mA (x0.1)
6669	RW	SM12 Polarity	UINT16	0=Normal*, 1=Reverse
6670	RW	SM12 Voltage Phase	UINT16	0=Not Use, 1=VA*, 2=VB, 3=VC, 4=VAB, 5=VBC, 6=VCA

6671	RW	SM12 CT Type	UINT16	0=Solid-Core CT* 1=Split-Core CT

Table 5-52 1-Ø SMs Parameters Setup

Notes:

1) The default value of the **SMx CT Secondary Current** depends on the type of selected CT Specification. (see **Appendix D Mains Circuits CT**):

CT Rating	CT Primary	Default CT Secondary
800A/40mA	800	400 (x0.1mA)
400A/40mA	400	400 (x0.1mA)
200A/40mA	200	400 (x0.1mA)
100A/40mA	100	400 (x0.1mA)
5A/1.667mA	Primary Rating of the External CT	50000 (x0.1mA)

Table 5-53 Default CT Secondary

5.8.7 VM Setup

Register	Property	Description	Format	Range, Default*
6800	RW	VM1 Configuration	UINT16	See Notes 1)
6801	RW	VM2 Configuration	UINT16	
6802	RW	VM3 Configuration	UINT16	
6803	RW	VM4 Configuration	UINT16	

Table 5-54 Total VM Configuration Group

Notes:

1) Each Bit indicates if a particular SM is included in a VM's aggregation. Setting a particular bit to 1 includes a SM or 0 excludes it from the VM's aggregation. The Virtual Meter configuration is supported via the Front Panel or through communications.

Bit	Bits 12~15	Bit 11	Bit 10	…	Bit 2	Bit 1	Bit 0
SMs	Reserved	SM12	SM11	…	SM3	SM2	SM1

Table 5-55 VMs Configuration

5.8.8 Data Recorder Setup

Register	Property	Description	Format	Range, Default*
6900	RW	Trigger Mode	UINT16	0=Disabled, 1=Enabled
6901	RW	Recording Mode	UINT16	0=Stop-When-Full 1=First-In-First-Out
6902	RW	Recording Depth	UINT16	0 to 5000
6903	RW	Recording Interval	UINT32	60 to 345600s, 900
6905	RW	Recording Offset	UINT16	0* to 43200s
6906	RW	Parameters Number	UINT16	0 to 60, 55
6907	RW	Parameter1	UINT16	Please refer to Appendices B and C for a complete list of the Data Recorder Parameters and the default configuration for each DR, respectively.
6908	RW	Parameter2	UINT16	
6909	RW	Parameter3	UINT16	
…		…	UINT16	
6966	RW	Parameter60	UINT16	

Table 5-56 DR Parameter Setup

5.9 Time Registers

There are two sets of Time registers supported by the PMC-PMC-512-A – Year / Month / Day / Hour / Minute / Second (Registers # 60000 to 60002) and UNIX Time (Register # 60004). When sending time to the PMC-512-A over Modbus communications, care should be taken to only write one of the two Time register sets. All registers within a Time register set must be written in a single transaction. If registers 60000 to 60004 are being written to at the same time, both Time register sets will be updated to reflect the new time specified in the UNIX Time register set (60004) and the time specified in registers 60000-60002 will be ignored. Writing to the Millisecond register (60003) is optional during a Time Set operation. When broadcasting time, the function code must be set to 0x10 (Pre-set Multiple Registers). Incorrect date or time values will be rejected by the meter. In addition, attempting to write a Time value less than

Jan 1, 2000 00:00:00 will be rejected.

Register		Property	Description	Format	Note
60000	9000	RW	High-order Byte: Year	UINT16	0-37 (Year-2000)
			Low-order Byte: Month		1 to 12
60001	9001	RW	High-order Byte: Day	UINT16	1 to 31
			Low-order Byte: Hour		0 to 23
60002	9002	RW	High-order Byte: Minute	UINT16	0 to 59
			Low-order Byte: Second		0 to 59
60003	9003	RW	Millisecond	UINT16	0 to 999
60004 ~ 60005	9004 ~ 9005	RW	UNIX Time	UINT32	0x386D4380 to 0x 7FE8177F The corresponding time is 2000.01.01 00:00:00 to 2037.12.31 23:59:59 (GMT 0:00 Time Zone)

Table 5-57 Time Registers

5.10 Clear/Reset Control

Register	Property	Description	Format	Note
9600	WO	Clear All Latched Alarms	UINT16	Writing "0xFF00" to the register executes the described action
9601	WO	Clear SOE Log	UINT16	
9602	WO	Clear Energy[1]	UINT16	
9603	WO	Clear Peak Demand of This Month (Since Last Reset) [1]	UINT16	
9604	WO	Clear DR Log	UINT16	Writing "0xFF00" to the register executes the described action
9605	WO	Cleary Daily Freeze Log	UINT16	
9606	WO	Clear Monthly Freeze Log	UINT16	
9607	WO	Clear All[2]	UINT16	
9608	WO	Reset to Default	UINT16	

Table 5-58 Clear/Reset Control Setup

Notes:

1) The following table provides a detailed description of the different values that can be written to the **Clear Energy** and **Clear Peak Demand of This Month (Since Last Reset)** registers to clear the different Energy and Peak Demand registers for SMx and VMx.

Key	Clear Energy & Demand		Description
	High Order	Low Order	
1	0x00 (1-Ø SMx)	0x00	Clear 1-Ø SM1 (0x0000)
		0x01	Clear 1-Ø SM2 (0x0001)
		…	…
		0x11	Clear 1-Ø SM12 (0x0011)
2	0x01 (3-Ø SMx)	0x00	Clear 3-Ø SM1 Energy (0x0100)
		0x01	Clear 3-Ø SM2 Energy (0x0101)
		0x02	Clear 3-Ø SM3 Energy (0x0102)
		0x03	Clear 3-Ø SM4 Energy (0x0103)
3	0x02 (Total VMx)	0x00	Clear VM1 Energy (0x0200)
		0x01	Clear VM2 Energy (0x0201)
		0x02	Clear VM3 Energy (0x0202)
		0x03	Clear VM4 Energy (0x0203)
4	0xFF		Clear 1-Ø SMs, 3-Ø SMs and VMs Energy (0xFF)

Table 5-59 Clear Energy Register Values

2) Writing "0xFFFF" to the register clears Energy Measurements that are listed in Section 5.3.1 to 5.3.4, Peak Demand Log of This Month (Since Last Rest), Peak Demand Log of Last Month (Before Last Reset), SOE Log, Daily and Monthly Freeze Logs and DR Log.

5.11 Remote Control

The DO Control registers are implemented as both "Write-Only" Modbus Coil Registers (0XXXXX) and Modbus Holding Registers (4XXXXX), which can be controlled with the Force Single Coil command (Function Code 0x05) or the Preset Multiple Hold Registers (Function Code 0x10). The PMC-512-A does

not support the Read Coils command (Function Code 0x01) because DO Control registers are "Write-Only".

The PMC-512-A adopts the ARM before EXECUTE operation for the remote control of its Digital Outputs if this function is enabled through the **Arm Before Execute Enable** Setup register (6014), which is disabled by default. Before executing an OPEN or CLOSE command on a Digital Output, it must be "Armed" first. This is achieved by writing the value 0xFF00 to the appropriate register to "Arm" a particular DO operation. The DO will be "Disarmed" automatically if an "Execute" command is not received within 15 seconds after it has been "Armed". If an "Execute" command is received without first having received an "Arm" command, the meter ignores the "Execute" command and returns the 0x04 exception code.

Register	Property	Description	Format	Note
9100	WO	Arm DO Close	UINT16	Writing "0xFF00" to the register to perform the described action.
9101	WO	Execute DO Close	UINT16	
9102	WO	Arm DO Open	UINT16	
9103	WO	Execute DO Open	UINT16	

Table 5-60 DO Control

5.12 Meter Information

Register		Property	Description	Format	Note
60200 ~ 60219	9800 ~ 9819	RO	Meter model	UINT16	See Note 1)
60220	9820	RO	Firmware Version	UINT16	e.g. 10000 shows the version is V1.00.00
60221	9821	RO	Modbus Version	UINT16	e.g. 10 shows the version is V1.0
60222	9822	RO	Firmware Update Date: Year-2000	UINT16	e.g. 160110 means January 10, 2016
60223	9823	RO	Firmware Update Date: Month	UINT16	
60224	9824	RO	Firmware Update Date: Day	UINT16	
60225	9825	RO	Serial Number: High-Order Byte	UINT16	e.g. 1701030100 means it is the 100th device that are produced in January 3, 2017
60026	9826	RO	Serial Number: Low-Order Byte	UINT16	
60227	9827	RO	Reserved	UINT16	
60228	9828	RO	Reserved	UINT16	
60229	9829	RO	Feature Code	UINT32	Bit0 ~Bit1: 00=Standard 01=Reserved
					Bit2: 0=Intelligent Meter 1= Reserved
					Bit3~Bit4: 00=100A/40mA CT 01=5A/1.667mA CT
60231	9831	RO	Hardware Version	UINT16	e.g. 10 shows the version is V1.0

Table 5-61 Meter Information

Notes:

1) The Meter Model appears in registers 9800 to 9819 (60200 to60219) and contains the ASCII encoding of the string "PMC-512-A" as shown in the following table.

Register		Value (Hex)	ASCII
60200	9800	0x50	P
60201	9801	0x4D	M
60202	9802	0x43	C
60203	9803	0x2D	-
60204	9804	0x35	5

60205	9805	0x31	1
60206	9806	0x32	2
60207	9807	0x2D	-
60208	9808	0x41	A
60209-60219	9809-9819	0x20	<Null>

Table 5-62 ASCII Encoding of "PMC-512-A"

Appendix A - SOE Event Classification

Event Classification	Sub-Classification	Channel	Event Value	DPI	Description
0	1	-	-	2/1	DI1 Close/DI1 Open
	2	-	-	2/1	DI2 Close/DI2 Open
	3	-	-	2/1	DI3 Close/DI3 Open
	4	-	-	2/1	DI4 Close/DI4 Open
	5	-	-	2/1	DI5 Close/DI5 Open
	6	-	-	2/1	DI6 Close/DI6 Open
	7	-	-	2/1	DI7 Close/DI7 Open
	8	-	-	2/1	DI8 Close/DI8 Open
	9	-	-	2/1	DI9 Close/DI9 Open
	10	-	-	2/1	DI10 Close/DI10 Open
	11	-	-	2/1	DI11 Close/DI11 Open
	12	-	-	2/1	DI12 Close/DI12 Open
1	1	-	-	2/1	DO Close/Open by Remote Control
	2	-	-	2/1	DO Close/Open by Setpoint
2	1	Alarm Channel[1]	Trigger Value (x1000)	Active / Return	Current HH Alarm
	2				Current H Alarm
	3				Current L Alarm
	4				Current LL Alarm
	5		Trigger Value (x100)		Voltage HH Alarm
	6				Voltage H Alarm
	7				Voltage L Alarm
	8				Voltage LL Alarm
	9		Trigger Value (x100)		Frequency H Alarm
	10				Frequency L Alarm
	11		Trigger Value (x1000)		AI HH Alarm
	12				AI H Alarm
	13				AI L Alarm
	14				AI LL Alarm
	15		Trigger Value (x10000)		U Unbalance Alarm
	16				Current Unbalance Alarm
	17		-		Phase Reversal Alarm
	18		-		Phase Loss Alarm
	19		DI Status		DI Alarm
	20		Ung Value (x100)		Ung H Alarm
	21				Ung HH Alarm
3	1	-	Method 0: Front Panel 1:Modbus 2: Reserved 3: Reserved 4: Calibration 5: Power On	-	Power On
	2	-		-	Power Off
	3	-		-	Set Time
	4	-		-	Set Password
	5	-		-	Set System Parameters
	6	-		-	Set Communication Parameters
	7	-		-	Set AI Parameters
	8	-		-	Set DI Parameters
	9	-		-	Set Alarm Parameters
	10	-		-	Set SMs Parameters
	11	-		-	Set Total VM Parameters
	12	-		-	Set DR Parameters
	13	-		-	Set Calibration Parameters
	14	-		-	Reset Alarm
	15	-		-	Clear Energy
	16	-		-	Clear Present Max Demand Logs
	17	-		-	Clear All Demand Logs
	18	-		-	Clear SOE
	19	-		-	Clear DR Logs
	20	-		-	Clear Daily Freeze Logs
	21	-		-	Clear Monthly Energy Logs
	22	-		-	Clear All Recorder
	23	-		-	Reset to Factory Default Configuration
	24	-		-	Reserved
	25	-		-	Preset Energy
	26	-		-	Set First Power On
	27	-		-	Reset to Communication Default

					Configuration
4	1	-	-	2/1	First Power On
	2	-	-		A/D Fault
	3	-	-		Internal Power Fault
	4	-	-		FRAM Fault
	5	-	-		FLASH Fault
	6	-	-		System Parameters Fault
	7	-	-		Internal Parameters Fault

Notes:

1) The following table provides a detailed description of the Channel Number.

Channel Number	Description	Channel Number	Description
1	I1	23	3-Ø SM3
2	I2	24	3-Ø SM4
…	…	25	DI1
11	I11	26	DI2
12	I12	27	DI3
13	U1	28	DI4
14	U2	29	DI5
15	U3	30	DI6
16	U12	31	DI7
17	U23	32	DI8
18	U31	33	DI9
19	Frequency	34	DI10
20	AI	35	DI11
21	3-Ø SM1	36	DI12
22	3-Ø SM2	37	Voltage Circuit

Appendix B - Data Recorder Parameters

1) 1-Ø SMs Real-time and Demand Measurements

Key	Description	Key	Description
1~10	1-Ø SM 1	61~70	1-Ø SM 7
11~20	1-Ø SM 2	71~80	1-Ø SM 8
21~30	1-Ø SM 3	81~90	1-Ø SM 9
31~40	1-Ø SM 4	91~100	1-Ø SM 10
41~50	1-Ø SM 5	101~110	1-Ø SM 11
51~60	1-Ø SM 6	111~120	1-Ø SM 12

1-Ø SM Group Structure

Offset	Description
+0	Current
+1	kW
+2	kvar
+3	kVA
+4	PF
+5	Loading Factor
+6	Current Demand
+7	kW Demand
+8	kvar Demand
+9	kVA Demand

2) Voltage Measurements

Key	Description
150	U1
151	U2
152	U3
153	U12
154	U23
155	U31
156	Frequency
157	AI (Scaled)

3) 3-Ø SMs Real-time and Demand Measurements

Key	Description
200~206	3-Ø SM1
207~213	3-Ø SM2
214~220	3-Ø SM3
221~227	3-Ø SM4

3-Ø SM Group Structure

Offset	Description
+0	kW Total
+1	kvar Total
+2	kVA Total
+3	kW Total Demand
+4	kvar Total Demand
+5	kVA Total Demand
+6	kWh Total

4) VMs Real-time and Demand Measurements

Key	Description
300~305	VM1
306~311	VM2
312~317	VM3
318~323	VM4

VM Group Structure

Offset	Description
+0	kW Total
+1	kvar Total
+2	kVA Total
+3	kW Total Demand
+4	kvar Total Demand
+5	kVA Total Demand

5) Harmonic Measurements

U Harmonic Measurements

Key	Description	Key	Description
350	U1 THD	369	U2 TEHD
351	U1 TOHD	370~383	U2 HD2~ HD15
352	U1 TEHD	384	U3 THD
353~366	U1 HD2~ HD15	385	U3 TOHD
367	U2 THD	386	U3 TEHD
368	U2 TOHD	387~400	U3 HD2~ HD15

1-Ø SM Harmonic Measurements

Key	Description	Key	Description
450~466	1-Ø SM1	552~568	1-Ø SM7
467~483	1-Ø SM2	569~585	1-Ø SM8
484~500	1-Ø SM3	586~602	1-Ø SM9
501~517	1-Ø SM4	603~619	1-Ø SM10
518~534	1-Ø SM5	620~636	1-Ø SM11
535~551	1-Ø SM6	637~653	1-Ø SM12

1-Ø SM Harmonic Group Structure

Offset	Description
+0	I THD
+1	I TOHD
+2	I TEHD
+3	I HD2
+4	I HD3
+5	I HD4
…	…
+16	I HD15

6) Energy Measurements

1-Ø SM Energy Measurements

Key	Description	Key	Description
654~658	1-Ø SM1	684~688	1-Ø SM7
659~663	1-Ø SM2	689~693	1-Ø SM8
664~668	1-Ø SM3	694~698	1-Ø SM9
669~673	1-Ø SM4	699~703	1-Ø SM10
674~678	1-Ø SM5	704~708	1-Ø SM11
679~683	1-Ø SM6	709~713	1-Ø SM12

1-Ø SM Energy Group Structure

Offset	Description
+0	kWh Import
+1	kWh Export
+2	kvarh Import
+3	kvarh Export
+4	kVAh

3-Ø SM Energy Measurements

Key	Description	Key	Description
714~719	3-Ø SM1	726~731	3-Ø SM3
720~725	3-Ø SM2	732~737	3-Ø SM4

3-Ø SM Energy Group Structure

Offset	Description
+0	kvarh Total
+1	kWh Import Total
+2	kWh Export Total
+3	kvarh Import Total
+4	kvarh Export Total
+5	kVAh Total

7) VM Energy Measurements

Key	Description	Key	Description
738~742	VM1	748~752	VM3
743~747	VM2	753~757	VM4

VM Energy Group Structure

Offset	Description
+0	kWh Import
+1	kWh Export
+2	kvarh Import
+3	kvarh Export
+4	kVAh

Appendix C - Data Recorder Default Settings

Register	Property	Description	Format	Range/Options	Default	
6900	RW	Trigger Mode	UINT16	0=Disabled, 1=Enabled	0	
6901	RW	Recording Mode	UINT16	0=Stop-When-Full 1=First In First Out	1=First In First Out	
6902	RW	Recording Depth	UINT16	0 to 5000	5000	
6903	RW	Recording Interval	UINT32	60 to 345600s	900	
6905	RW	Recording Offset	UINT16	0 to 43200s	0	
6906	RW	Parameters Number	UINT16	0 to 60	55	
Register	**Property**	**Description**	**Format**	**Range/Options**	**Key**	**Description**
6907	RW	Parameter 1	UINT16		150	U1
6908	RW	Parameter 2	UINT16		151	U2
6909	RW	Parameter 3	UINT16		152	U3
6910	RW	Parameter 4	UINT16		153	U12
6911	RW	Parameter 5	UINT16		154	U23
6912	RW	Parameter 6	UINT16		155	U31
6913	RW	Parameter 7	UINT16		156	Frequency
6914	RW	Parameter 8	UINT16		200	3-Ø SM1 kW Total
6915	RW	Parameter 9	UINT16		201	3-Ø SM1 kvar Total
6916	RW	Parameter 10	UINT16		202	3-Ø SM1 kVA Total
6917	RW	Parameter 11	UINT16		207	3-Ø SM2 kW Total
6918	RW	Parameter 12	UINT16		208	3-Ø SM2 kvar Total
6919	RW	Parameter 13	UINT16		209	3-Ø SM2 kVA Total
6920	RW	Parameter 14	UINT16		214	3-Ø SM3 kW Total
6921	RW	Parameter 15	UINT16		215	3-Ø SM3 kvar Total
6922	RW	Parameter 16	UINT16		216	3-Ø SM3 kVA Total
6923	RW	Parameter 17	UINT16		221	3-Ø SM4 kW Total
6924	RW	Parameter 18	UINT16		222	3-Ø SM4 kvar Total
6925	RW	Parameter 19	UINT16		223	3-Ø SM4 kVA Total
6926	RW	Parameter 20	UINT16		206	3-Ø SM1 kWh Total
6927	RW	Parameter 21	UINT16		714	3-Ø SM1 kvarh Total
6928	RW	Parameter 22	UINT16		719	3-Ø SM1 kVAh Total
6929	RW	Parameter 23	UINT16		213	3-Ø SM2 kWh Total
6930	RW	Parameter 24	UINT16		720	3-Ø SM2 kvarh Total
6931	RW	Parameter 25	UINT16		725	3-Ø SM2 kVAh Total
6932	RW	Parameter 26	UINT16		220	3-Ø SM3 kWh Total
6933	RW	Parameter 27	UINT16		726	3-Ø SM3 kvarh Total
6934	RW	Parameter 28	UINT16		731	3-Ø SM3 kVAh Total
6935	RW	Parameter 29	UINT16		227	3-Ø SM4 kWh Total
6936	RW	Parameter 30	UINT16		732	3-Ø SM4 kvarh Total
6937	RW	Parameter 31	UINT16		737	3-Ø SM4 kVAh Total
6938	RW	Parameter 32	UINT16		203	1-Ø SM 1 kW Demand
6939	RW	Parameter 33	UINT16		204	1-Ø SM 2 kW Demand
6940	RW	Parameter 34	UINT16		205	1-Ø SM 3 kW Demand
6941	RW	Parameter 35	UINT16		210	1-Ø SM 4 kW Demand
6942	RW	Parameter 36	UINT16		211	1-Ø SM 5 kW Demand
6943	RW	Parameter 37	UINT16		212	1-Ø SM 6 kW Demand
6944	RW	Parameter 38	UINT16		217	1-Ø SM 7 kW Demand
6945	RW	Parameter 39	UINT16		218	1-Ø SM 8 kW Demand
6946	RW	Parameter 40	UINT16		219	1-Ø SM 9 kW Demand
6947	RW	Parameter 41	UINT16		224	1-Ø SM 10 kW Demand
6948	RW	Parameter 42	UINT16		225	1-Ø SM 11 kW Demand
6949	RW	Parameter 43	UINT16		226	1-Ø SM 12 kW Demand
6950	RW	Parameter 44	UINT16		7	1-Ø SM 1 Current Demand
6951	RW	Parameter 45	UINT16		17	1-Ø SM 2 Current Demand
6952	RW	Parameter 46	UINT16		27	1-Ø SM 3 Current Demand
6953	RW	Parameter 47	UINT16		37	1-Ø SM 4 Current Demand
6954	RW	Parameter 48	UINT16		47	1-Ø SM 5 Current Demand
6955	RW	Parameter 49	UINT16		57	1-Ø SM 6 Current Demand
6956	RW	Parameter 50	UINT16		67	1-Ø SM 7 Current Demand
6957	RW	Parameter 51	UINT16		77	1-Ø SM 8 Current Demand
6958	RW	Parameter 52	UINT16		87	1-Ø SM 9 Current Demand
6959	RW	Parameter 53	UINT16		97	1-Ø SM 10 Current Demand
6960	RW	Parameter 54	UINT16		107	1-Ø SM 11 Current Demand

6961	RW	Parameter 55	UINT16		117	1-Ø SM 12 Current Demand
6962	RW	Parameter 56	UINT16		0	None
6963	RW	Parameter 57	UINT16		0	None
6964	RW	Parameter 58	UINT16		0	None
6965	RW	Parameter 59	UINT16		0	None
6966	RW	Parameter 60	UINT16		0	None

Appendix D - Mains Circuit CT

Ordering Guide

CET Electric Technology

Version 20170921

PMC-512-A Accessories				
Mains Circuit CT				
Model #	**Specification**	**Accuracy**	**Dimension (mm)**	**Cable Length**
PMC-CT-100A-40mA-3P-A	100A, 3-phase moulded case CT	0.1	3xϕ10	2m
PMC-CT-250A-40mA-A	250A, 1-phase solid core CT	0.2	31x24	Not included
PMC-CT-400A-40mA-A	400A, 1-phase solid core CT	0.2	31x24	Not included
PMC-CT-800A-40mA-A	800A, 1-phase solid core CT	0.2	103x33	Not included
PMC-SCCT-100A-40mA-16-A	100A, 1-phase SCCT	0.5	ϕ16	2m
PMC-SCCT-200A-40mA-24-A	200A, 1-phase SCCT	0.5	ϕ24	2m
PMC-SCCT-400A-40mA-35-A	400A, 1-phase SCCT	0.5	ϕ35	2m
PMC-SCCT-800A-40mA-A	800A, 1-phase SCCT	0.5	80x50	Not included
PMC-SCCT-5A-1.6mA-A	10A, 1-phase SCCT	1.0	ϕ10	2m
CT Adaptor				
Model #	**Description**			**Cable Length**
PMC-BCC-3CT	3 single-phase CTs can be connected through one Adaptor			0.5m

1) Please refer to Cable Length for details and contact the factory in advance for special requirements.
2) The PMC-BCC-3CT Adaptor must be equipped when using single-phase CTs. The CT cables are not included. The recommended CT cable diameter is 0.5-1.0mm².

Specification

- **PMC-CT-100A-40mA-3P-A**

Environment	Operating Temperature	-40°C~+85°C	Storage Temperature	-40°C to +85°C
	Humidity	≤95%	Atmospheric Pressure	80-110kpa
Technical Specification	Primary Current (In)	10A	Magnitude Nonlinearity	≤0.1%
	Secondary Current	4mA	Phase Nonlinearity	≤10'
	Linearity Range	1%In-10xIn	Internal DC Resistance	160±15Ω
	Max. Overload	200A/1s	Max. Load Resistance	≤20Ω
	Withstand Voltage (Core to Coil)	4000V/min,1mA	Insulation Resistance	1000MΩ/500VDC, 1min
	Frequency	50-400Hz	Temperature Drift	10ppm/℃
	Open-Circuit Protection	Transient Voltage Suppressor: TVS-P6KE6.8CA		
	RJ12 Pins Description	Pins 1 & 2 for L1 (A), Pins 3 & 4 for L2 (B), Pins 5 & 6 for L3 (C)		
Mechanical Structure	Primary Input	1 turn	Enclosure	ABS Flame Retardant
		L1/L2/L3	RoHS	Compliance
	Internal Insulation	Epoxy Resin Sealing	Installation	35mm DIN-Rail
	Secondary Output Cable	6P6C Dark Red Flat wire, pressure connecting with RJ12		
	Cable Length	2000±20mm (includes RJ12)		

- **PMC-CT-250A-40mA-A**

Environment	Operating Temperature	-40°C~+85°C	Storage Temperature	-40°C to +85°C
	Humidity	≤95%	Atmospheric Pressure	80-110kpa
Technical Specification	Primary Current (In)	250A	Magnitude Nonlinearity	≤0.2%
	Secondary Current	40mA	Phase Nonlinearity	≤15'
	Linearity Range	5%In-120xIn	Internal DC Resistance	365±40Ω (20°C)
	Dotted Terminals	P1 and S1	Max. Load Resistance	≤20Ω
	Withstand Voltage (Core to Coil)	4000V/min,1mA	Insulation Resistance	1000MΩ/500VDC, 1min
	Frequency	50-400Hz	Temperature Drift	30ppm/℃
	Open-Circuit Protection	Transient Voltage Suppressor: TVS-P6KE6.8CA		
Mechanical Structure	Primary Input	P1, P2	Enclosure	ABS Flame Retardant
	Secondary Output	S1, S2	RoHS	Compliance
	Internal Insulation	Epoxy Resin Sealing	Installation	Mounting Bolt

- **PMC-CT-400A-40mA-A**

Environment	Operating Temperature	-40°C~+85°C	Storage Temperature	-40°C to +85°C
	Humidity	≤95%	Atmospheric Pressure	80-110kpa
Technical Specification	Primary Current (In)	400A	Magnitude Nonlinearity	≤0.2%
	Secondary Current	40mA	Phase Nonlinearity	≤15'
	Linearity Range	5%In-120xIn	Internal DC Resistance	600±70Ω (20°C)
	Dotted Terminals	P1 and S1	Max. Load Resistance	≤20Ω
	Withstand Voltage (Core to Coil)	4000V/min,1mA	Insulation Resistance	1000MΩ/500VDC, 1min
	Frequency	50-400Hz	Temperature Drift	30ppm/℃
	Open-Circuit Protection	Transient Voltage Suppressor: TVS-P6KE6.8CA		
Mechanical Structure	Primary Input	P1, P2	Enclosure	ABS Flame Retardant
	Secondary Output	S1, S2	RoHS	Compliance
	Internal Insulation	Epoxy Resin Sealing	Installation	Mounting Bolt

- **PMC-CT-800A-40mA-A**

Environment	Operating Temperature	-40°C~+85°C	Storage Temperature	-40°C to +85°C
	Humidity	≤95%	Atmospheric Pressure	80-110kpa
Technical Specification	Primary Current (In)	800A	Magnitude Nonlinearity	≤0.2%
	Secondary Current	40mA	Phase Nonlinearity	≤30'
	Linearity Range	5%In-120xIn	Withstand Voltage (Core to Coil)	4000V/min,1mA
	Dotted Terminals	P1 and S1	Max. Load Resistance	≤20Ω
	Frequency	50-400Hz	Insulation Resistance	1000MΩ/500VDC, 1min
Mechanical Structure	Primary Input	P1, P2	Enclosure	ABS Flame Retardant
	Secondary Output	S1, S2	RoHS	Compliance
	Internal Insulation	Epoxy Resin Sealing	Installation	Mounting Bolt

- **PMC-SCCT-5A-1.667mA-10-A**

Environment	Operating Temperature	-20°C~+50°C	Storage Temperature	-40°C to +85°C
	Humidity	≤85%	Atmospheric Pressure	70-106kpa
Technical Specification	Primary Current (In)	5A	Magnitude Error	±0.8%
	Secondary Current	1.667mA	Phase Error	90±15'
	Max. Current (Imax)	10A, continuous	Rated Load	200Ω
	Withstand Voltage (Core to Coil)	4000V/10s, 1mA	Frequency	50-400Hz
	Open-Circuit Protection Voltage	6-8V	Insulation Resistance	100MΩ/500VDC
	Linearity	1.0L (5%In-120%In)		
Mechanical Structure	Dotted Terminals	P1 and white leads	RoHS	Compliance
	Enclosure	White, Flame Rating 94-V0		
	Secondary Output Cable	AWM1015, 22AWG Black and White Stranded Wire, 2.0±0.05m, Tin plating at the end for 8-10mm		

- **PMC-SCCT-100A-40mA-16-A**

Environment	Operating Temperature	-20°C~+50°C	Storage Temperature	-40°C to +85°C
	Humidity	≤85%	Atmospheric Pressure	70-106kpa
Technical Specification	Primary Current (In)	10A	Magnitude Error	±0.5%
	Secondary Current	4mA	Phase Error	30±15'
	Max. Current (Imax)	120A, continuous	Rated Load	20Ω
	Withstand Voltage (Core to Coil)	4000V/10s, 1mA	Frequency	50-400Hz
	Open-Circuit Protection Voltage	6-8V	Insulation Resistance	100MΩ/500VDC
	Accuracy	Class 1.0 (IEC61869-2)		
	Linearity	0.5L (5A-120A)		
Mechanical Structure	Dotted Terminals	P1 and white leads	RoHS	Compliance
	Enclosure	Black, Flame Rating 94-V0		
	Secondary Output Cable	AWM1015, 22AWG Black and White Stranded Wire, 2.0±0.05m, Tin plating at the end for 8-10mm		

- **PMC-SCCT-200A-40mA-24-A**

Environment	Operating Temperature	-20°C~+50°C	Storage Temperature	-40°C to +85°C
	Humidity	≤85%	Atmospheric Pressure	70-106kpa
Technical Specification	Primary Current (In)	200A	Magnitude Error	±0.5%
	Secondary Current	40mA	Phase Error	20±10'
	Max. Current (Imax)	240A, continuous	Rated Load	10Ω
	Withstand Voltage (Core to Coil)	4000V/10s, 1mA	Frequency	50-400Hz
	Open-Circuit Protection Voltage	6-8V	Insulation Resistance	100MΩ/500VDC
	Accuracy	Class 1.0 (IEC 61869-2)		
	Linearity	0.5L (5%In-120%In)		
Mechanical Structure	Dotted Terminals	P1 and white leads	RoHS	Compliance
	Enclosure	White, Flame Rating 94-V0		
	Secondary Output Cable	AWM1015, 22AWG Black and White Stranded Wire, 2.0±0.05m, Tin plating at the end for 8-10mm		

- **PMC-SCCT-400A-40mA-35-A**

Environment	Operating Temperature	-20°C~+50°C	Storage Temperature	-40°C to +85°C
	Humidity	≤85%	Atmospheric Pressure	70-106kpa
Technical Specification	Primary Current (In)	400A	Magnitude Error	±0.5%
	Secondary Current	40mA	Phase Angle	10±10'
	Max. Current (Imax)	480A, continuous	Rated Load	10Ω
	Withstand Voltage (Core to Coil)	4000V/10s, 1mA	Frequency	50-400Hz
	Open-Circuit Protection Voltage	6-8V	Insulation Resistance	100MΩ/500VDC
	Accuracy	Class 0.5 (IEC 61869-2)		
	Linearity	0.5L (5%In-100%In)		
Mechanical Structure	Dotted Terminals	P1 and white leads	RoHS	Compliance
	Enclosure	White, Flame Rating 94-V0		
	Secondary Output Cable	AWM1015, 22AWG Black and White Stranded Wire, 2.0±0.05m, Tin plating at the end for 8-10mm		

- **PMC-SCCT-800A-40mA-A**

Environment	Operating Temperature	-15°C ~+50°C	Storage Temperature	-25°C to +75°C
	Humidity	≤85%	Atmospheric Pressure	80-110kpa
Technical Specification	Primary Current (In)	800A	Magnitude Nonlinearity	≤0.5%
	Secondary Current	40mA	Phase Nonlinearity	≤30'
	Rated Steady Current	2.5Ith	Rated Load	10Ω
	Rated Short-time Thermal Current (Ith)	20In	Frequency	50-60Hz
	Withstand Voltage (Core to Coil)	3000V/min, 1mA	Insulation Resistance	100MΩ/500VDC, 1min
	Open-Circuit Protection	Transient Voltage Suppressor: TVS-P6KE6.8CA		
	Accuracy	Class 0.5 (IEC61869-2)		
	Linearity	5%In-120%In		
Mechanical Structure	Dotted Terminals	P1 and S1	RoHS	Compliance
	Primary Input	P1, P2	Enclosure	Flame Retardant
	Secondary Output	S1, S2	Installation	Mounting Bolt

Appendix E - Technical Specifications

Voltage Inputs (V1, V2, V3, VN)	
ULN	
Un	240VLN/415VLL
Range	10V to 1.2Un
Start Voltage	10V
Overload	1.2xUn continuous, 2xUn for 10s
Burden	<0.05VA per phase
Ung	
Range	0~5V
Frequency	45-65Hz
Current Inputs (I11, I12, I21, I22, I31, I32)	
In Primary	5A/100A/200A/250A/400A/800A
In Secondary	1.667mA for 5A 40mA for 100A/200A/250A/400A/800A
Range	0.4% to 100% In Primary
Starting Current	0.004In Primary
Solid Core CT Range	
100A Molded Case CT (3-Ø)	0.4~100A
250A Solid Core CT (1-Ø)	1~250A
400A Solid Core CT (1-Ø)	1.6~400A
800A Solid Core CT (1-Ø)	3.2~800A
Split Core CT Range	
5A SCCT (1-phase)	0.02~5A
100A SCCT (1-phase)	0.4~100A
200A SCCT (1-phase)	0.8~200A
400A SCCT (1-phase)	1.4~400A
800A SCCT (1-phase)	3.2~800A
Burden	<0.3VA per phase @ In
Overload	1.0xIn Primary (continuous)
Power Supply (L+, N-, GND)	
Standard	95-250VAC/DC, 47-440Hz
Optional	20-60VDC
Burden	2W
Digital Inputs	
Type	48VDC External Excitation
Digital Outputs	
Type	Form A Mechanical Relay
Loading	5A @ 250VAC or 30VDC
Analog Input	
Type	0-20 mA/4mA-20mA
Overload	24 mA maximum
Installation Torque	
Power Supply / Voltage Input	0.8 N.m
AI / RS485	0.2 N.m
DO / DI	0.4 N.m
Environmental Conditions	
Operating Temp.	-25°C to 70°C
Storage Temp.	-40°C to 85°C
Humidity	5% to 95% non-condensing
Atmospheric Pressure	70 kPa to 106 kPa
Altitude	≤3,000m
Mechanical Characteristics	
Unit Dimensions	126x90x65 mm
IP Rating	IP50

Appendix F - Accuracy Specifications

Parameters	Accuracy	Resolution
Voltage	±0.5%	0.01V
Current	±0.5%	0.001A
Phase Angle	±1°	0.1°
kW, kvar, kVA	±1.0%	0.001kX
kWh	IEC 62053-21: 2003 Class 1	0.01kWh
kvarh	IEC 62053-24: 2014 Class 1	0.001kvar
AI	±1.0%	-
P.F.	±0.5%	0.001
Frequency	±0.02 Hz	0.01Hz
THD	IEC 61000-4-7 Class B	0.1%
Voltage Unbalance	±0.2%	0.01%
Current Unbalance	±1.0%	0.01%

Appendix G - Standards Compliance

Safety Requirements		
CE LVD 2014 / 35 / EU		EN 61010-1: 2010, EN 61010-2-030: 2010
Electrical safety in low voltage distribution systems up to 1000Vac and 1500 Vdc		IEC 61557-12: 2008
Insulation	Dielectric test: 2kV @ 1 minute Insulation resistance: >100MΩ Impulse voltage: 6kV, 1.2/50µs	IEC 60255-5-2000
Electromagnetic Compatibility CE EMC Directive 2014 / 30 / EU (EN 61326: 2013)		
Immunity Tests		
Electrostatic Discharge		EN 61000-4-2: 2009
Radiated Fields		EN 61000-4-3: 2006+A1: 2008+A2: 2010
Fast Transients		EN 61000-4-4: 2012
Surges		EN 61000-4-5: 2006
Conducted Disturbances		EN 61000-4-6: 2009
Magnetic Fields		EN 61000-4-8: 2010
Oscillatory Waves		EN 61000-4-12: 2006
Emission Tests		
Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment		EN 55011: 2009 + A1: 2010 (CISPR 11)
Limits and methods of measurement of radio disturbance characteristics of information technology equipment		EN 55022: 2010+AC: 2011 (CISPR 22)
Limits for harmonic current emissions for equipment with rated current ≤16 A		EN 61000-3-2: 2014
Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤16 A		EN 61000-3-3: 2013
Emission standard for residential, commercial and light-industrial environments		EN 61000-6-4: 2007+A1: 2011
Electromagnetic Emission Tests for Measuring Relays and Protection Equipment		EN 61000-4-12: 2006
Mechanical Tests		
Vibration Test	Response	IEC 62052-11: 2003 Level I
	Endurance	IEC 62052-11: 2003 Level I
Shock Test	Response	IEC 62052-11: 2003 Level I
	Endurance	IEC 62052-11: 2003 Level I
Bump Test		IEC 62052-11: 2003 Level I

Appendix H - Ordering Guide

CET Electric Technology

Version 20170921

Product Code	Description
PMC-512 AC Multi-Circuit Power Monitor	
Basic Function	
A	AC Multi-Circuit Power Monitor with 3-phase voltage, 12 branch circuits, 12xDI, 1xDO, 1xAI and 2xRS485
Display Screen	
L	LCD
Input Current	
A	External CT with 100A-800A Primary and 40mA Secondary
B	External CT with 5A Primary and 1.6mA Secondary
Input Voltage	
3	240VAC (3x240VLN/415VLL)
Power Supply	
2	95-250VAC/DC, 47-440Hz
3	20-60VDC
Frequency	
5	45-65Hz
DI	
A	12xDI, 48VDC External Excitation
Display Language	
E	English

PMC-512	-	A	L	A	3	2	5	A	E	PMC-512-ALA325AE (Standard Model)

1) The CTs and cables are not included, please refer to PMC-512-A Accessories for CT option.
2) Please refer to PMC-512 HMI for HMI option.

Contact us

CET Inc.

8/F, Westside, Building 201, Terra Industrial & Trade park, Che Gong Miao, Shenzhen, Guangdong, P.R.China 518040

Tel: +86.755.8341.5187

Fax: +86.755.8341.0291

Email: sales@cet-global.com

Web: www.cet-global.com