

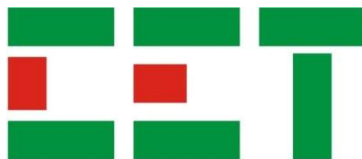
PMC-D726M

Digital Multifunction Meter

User Manual

Version: V1.0

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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.



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.

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Chapter 1 Introduction

This manual explains how to use the PMC-D726M Digital Multifunction Meter. Throughout the manual the term “meter” generally refers to all models. Differences between the models are indicated with the appropriate model number.

This chapter provides an overview of the PMC-D726M meter and summarizes many of its key features.

1.1 Overview

The PMC-D726M Digital Multifunction Meter is CET’s latest offer for the low-cost digital power/energy metering market. Housed in an industry standard DIN form factor measuring 72mmx72mmx71.8mm (LCD) or 72mmx72mmx76.8mm (LED), it is perfectly suited for industrial, commercial and utility metering applications. The PMC-D726M features quality construction, true RMS multifunction measurements and a LED or LCD display. Compliance with the IEC 62053-21 Class 1 kWh Accuracy Standard, it provides optimum Price to Value ratio and is a cost effective replacement for traditional analog instrumentation, capable of displaying 3-phase measurements at once. The PMC-D726M optionally provides Split-Core CT (SCCT) support for retrofit situations, two Digital Inputs for status monitoring, two Digital Output for control, or one 0/4-20mA Analog Output for interfacing with 3rd party SCADA system. The standard SOE Log records meter events such as power-off, setup changes, DI status changes in 1ms resolution. With the optional RS485 port and Modbus protocol support, the PMC-D726M becomes a vital component of an intelligent, multifunction monitoring solution for any Power and Energy Management systems.

You can setup the meter through its front panel or via our free PMC Setup software. The meter is also supported by our PecStar® iEMS Integrated Energy Management System.

Following is a list of typical applications for the PMC-D726M:

- Analog meter replacement
- Industrial, Commercial and Utility panel metering
- Substation, Factory and Building Automation
- Sub-metering and Cost Allocation
- Ideal for retrofitting with SCCT option

Contact CET Technical Support should you require further assistance with your application.

1.2 Features

Ease of use

- Large, bright, backlit LCD or high-contrast LED display
- Front panel kWh and kvarh LED energy pulse outputs
- Password-protected setup via front panel or free PMC Setup software
- Easy installation with mounting clips, no tools required

Measurements

- U_{ln}, U_{ll} per phase and Average
- Current per phase and Average with calculated Neutral
- kW, kvar, kVA, P.F. per phase and Total
- Bi-directional energy measurements
- Frequency

PQ Measurements*

- THD, TOHD, TEHD and Individual Harmonics up to 31st
- TDD, K-Factor and Crest-Factor
- U and I Unbalance and Phase Angles

*Available in Firmware V1.00.04 (LED)/V1.01.04 (LCD) or later

Setpoints*

- 6 user programmable Setpoints with extensive list of monitoring parameters including Voltage, Current, Power and Demand
- Configurable Threshold and Time Delay
- SOE Logging and DO trigger

*Available in Firmware V1.00.04 (LED)/V1.01.04 (LCD) or later

SOE Log

- 16 events time-stamped to ± 1 ms resolution
- Record all setup, Setpoint and Digital Input status changes

TOU and Demand*

- One TOU schedule, providing
 - 6 Seasons
 - 6 Daily Profiles, each with 6 Periods in 15-minute interval
 - 10 Holidays or Alternate Days
 - 4 Tariffs, each providing kWh and kvarh Imp/Exp and kVAh
- Demands and Peak Demands with Timestamp for per phase Current, kW Total, kvar Total and kVA total

*Available in Firmware V1.00.04 (LED)/V1.01.04 (LCD) or later

Optional Inputs and Outputs

- Two Digital Inputs for Status Monitoring
- Two Digital Outputs for Control applications*
- One Analog Output at 0/4-20mA
- Two Solid State Relay Output for Energy Pulsing applications*

*The options of 2DIs + 2DOs and 2DIs + 2SSR Pulse Outputs are available in Firmware V1.00.03 (LED)/V1.01.03 (LCD) or later

Optional Communications

- Optically isolated RS-485 port at 1200 to 19,200 bps
- Modbus RTU support

System Integration

- Supported by CET's PecStar® iEMS and PMC Setup
- Easy integration into other Automation, SCADA or BMS systems via Modbus RTU

1.3 PMC-D726M's Application in Power and Energy Management Systems

The PMC-D726M can be used to monitor Wye or Delta connected power system. Modbus communications allow real-time data, events, DI status and other information to be transmitted across a RS485 network to an Integrated Energy Management system such as the PecStar® iEMS.

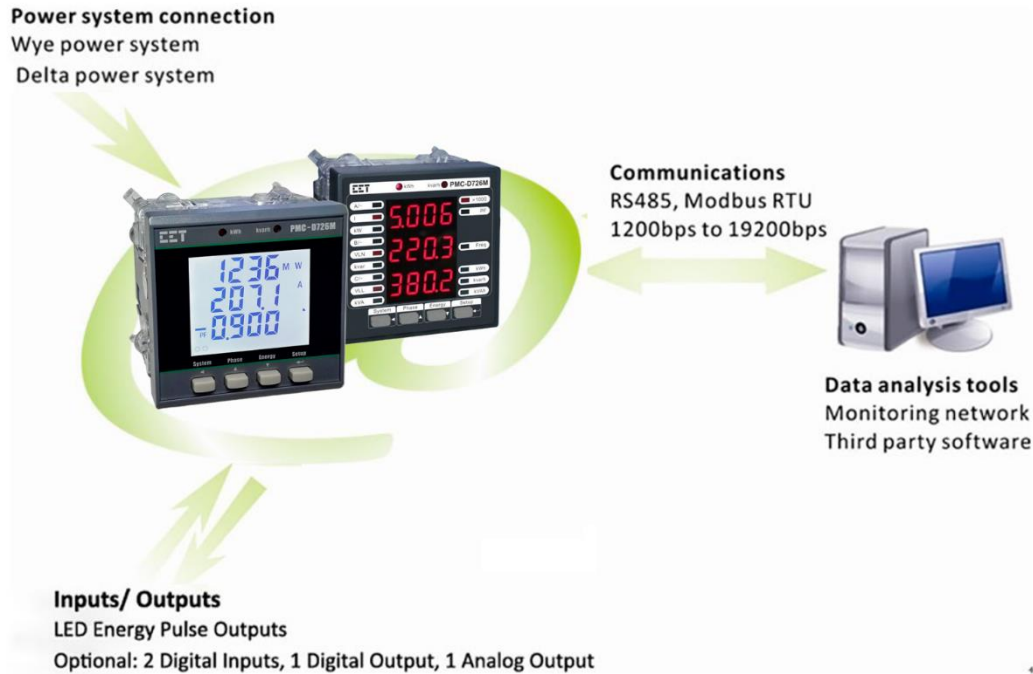


Figure 1-1 PMC-D726M's application

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-D726M 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 (LCD)



Figure 2-2 Appearance (LED)

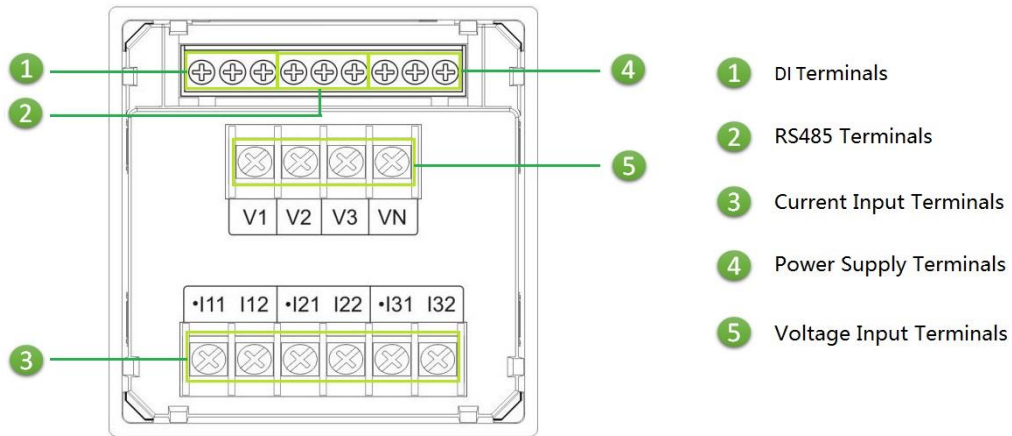


Figure 2-3 Rear Panel (2DI)

2.2 Dimensions

2.2.1 Main Unit

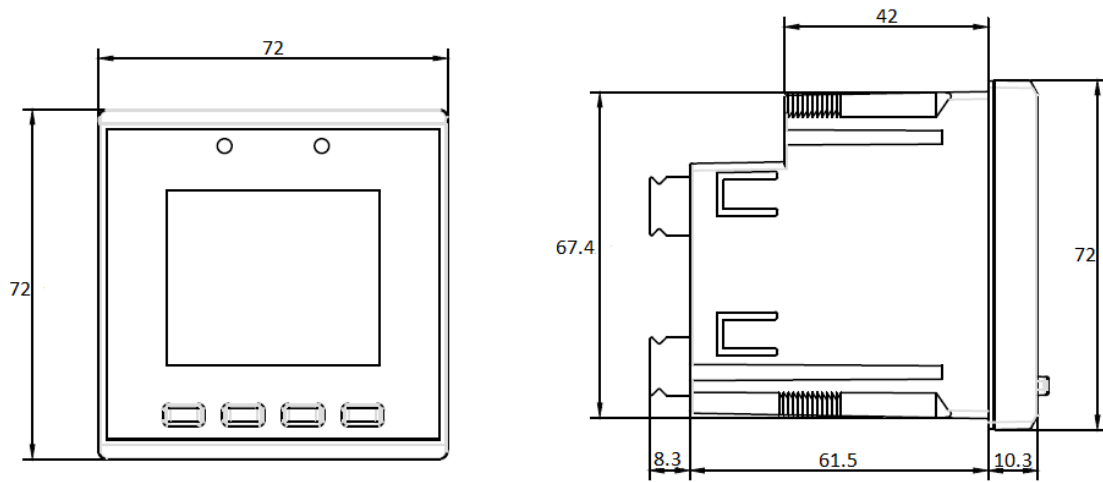


Figure 2-4 Dimension (LCD)

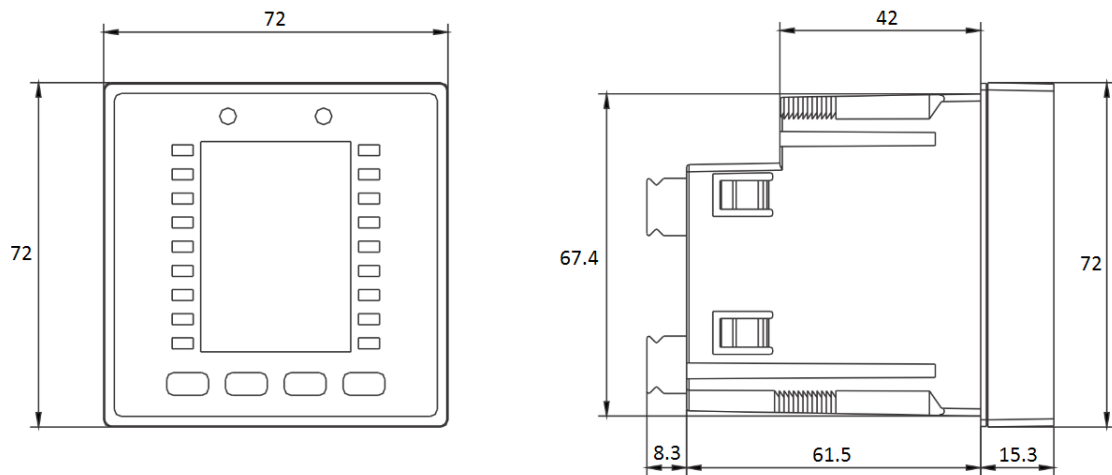


Figure 2-5 Dimensions (LED)

2.2.2 Terminals

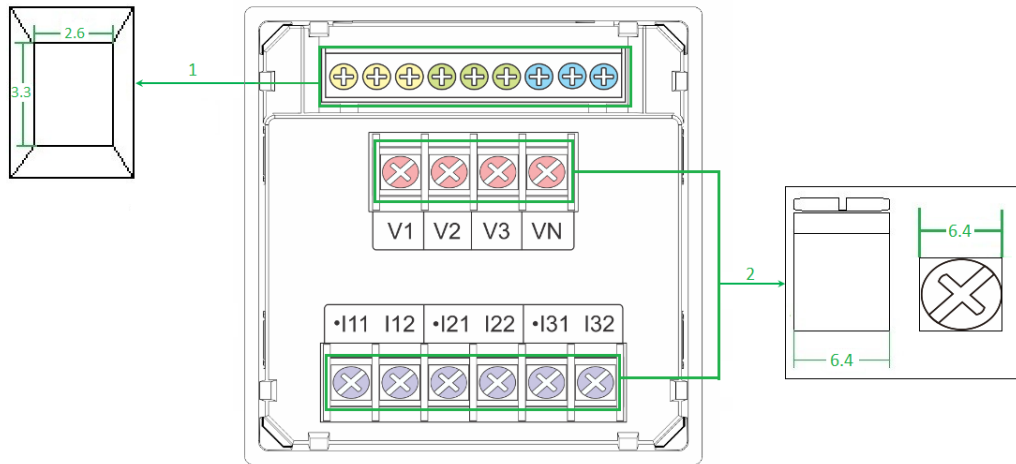


Figure 2-6 Terminal Dimensions

	Terminal	Terminal Dimensions	Wire Size	Max. Torque
1	DI	2.6mm x 3.3mm	1.5mm ²	5 kgf.cm/M3 (4.3 lb-in)
	RS485			
	Power Supply			
2	Current Input/Voltage Input	6.4mm x 6.4mm	1.0mm ² - 2.5mm ² (14AWG - 22AWG)	6.0 kgf.cm/M3 (5.2 lb-in)

Table 2-1 Terminal Dimensions

2.2.3 SCCTs

- **PMC-SCCT-5A-2.5mA-A**

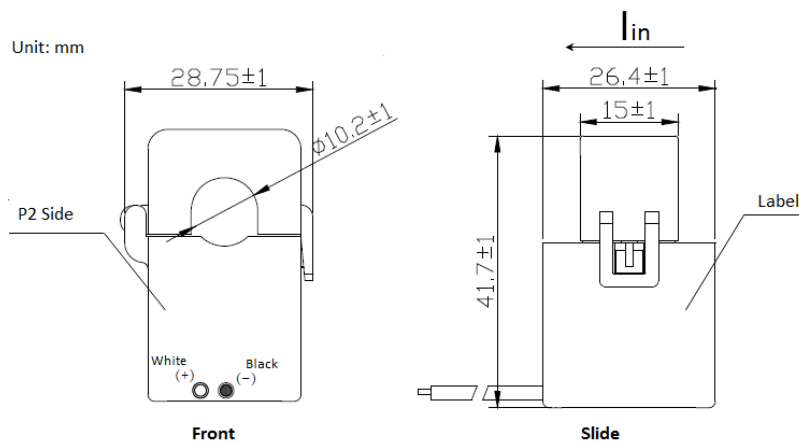


Figure 2-7 PMC-SCCT-5A-2.5mA-A Dimensions

▪ **PMC-SCCT-100A-40mA-16-A**

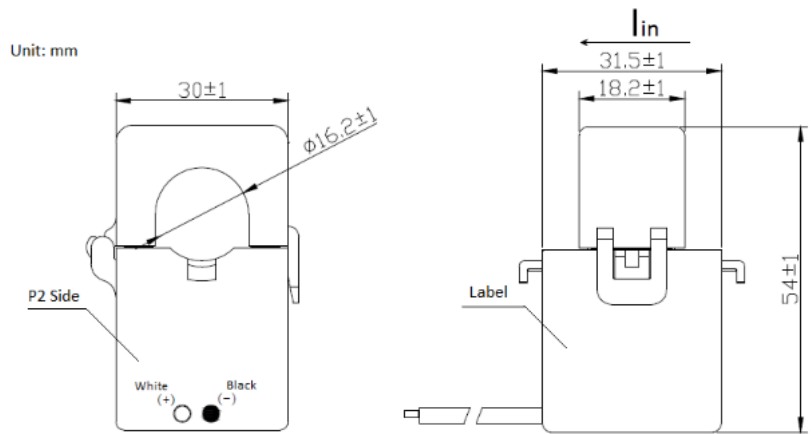


Figure 2-8 PMC-SCCT-100A-40mA-16-A Dimensions

▪ **PMC-SCCT-200A-40mA-24-A**

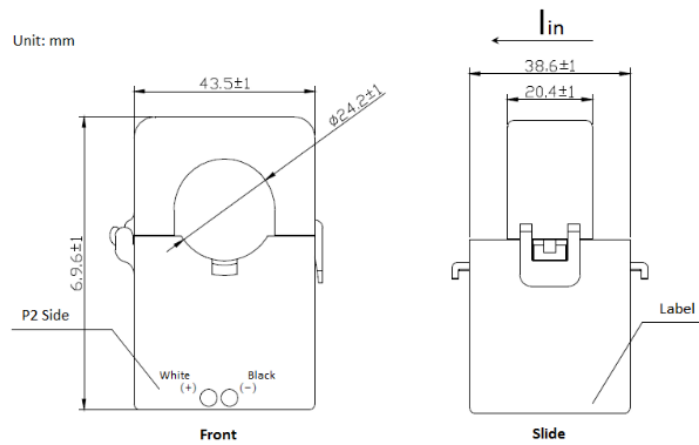


Figure 2-9 PMC-SCCT-200A-40mA-24-A Dimensions

▪ **PMC-SCCT-400A-40mA-35-A**

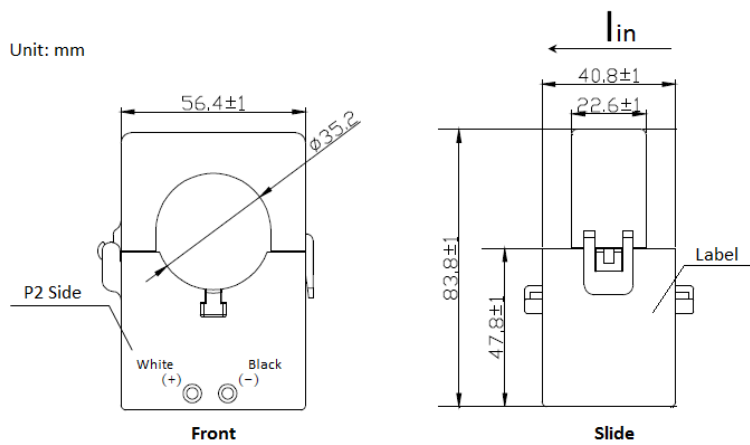


Figure 2-10 PMC-SCCT-400A-40mA-35-A Dimensions

▪ **PMC-SCCT-800A-40mA-A**

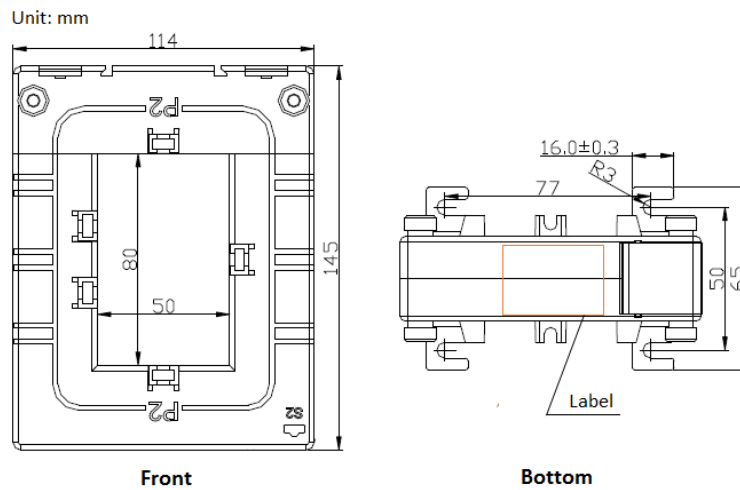


Figure 2-11 PMC-SCCT-800A-40mA-A Dimensions

2.3 Mounting

The PMC-D726M should be installed in a dry environment with no dust and kept away from heat, radiation and electrical noise source.

Installation steps:

- Remove the installation clips from the meter
- Fit the meter through a 68mmx68mm cutout as shown in Figure 2-12 (LCD) or Figure 2-13 (LED)
- Re-install the installation clips and push the clips tightly against the panel to secure the meter

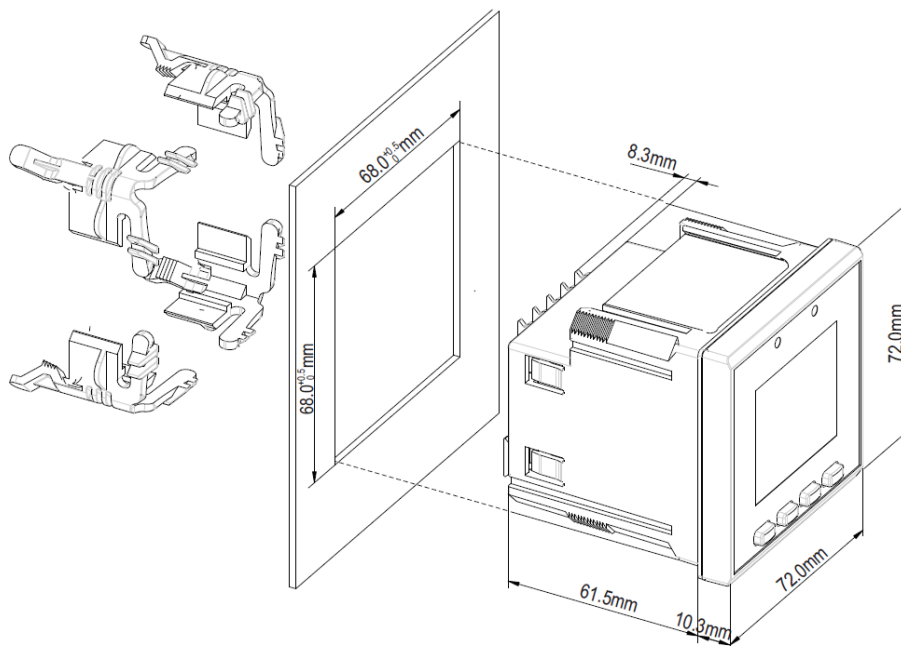


Figure 2-12 Panel Cutout (LCD)

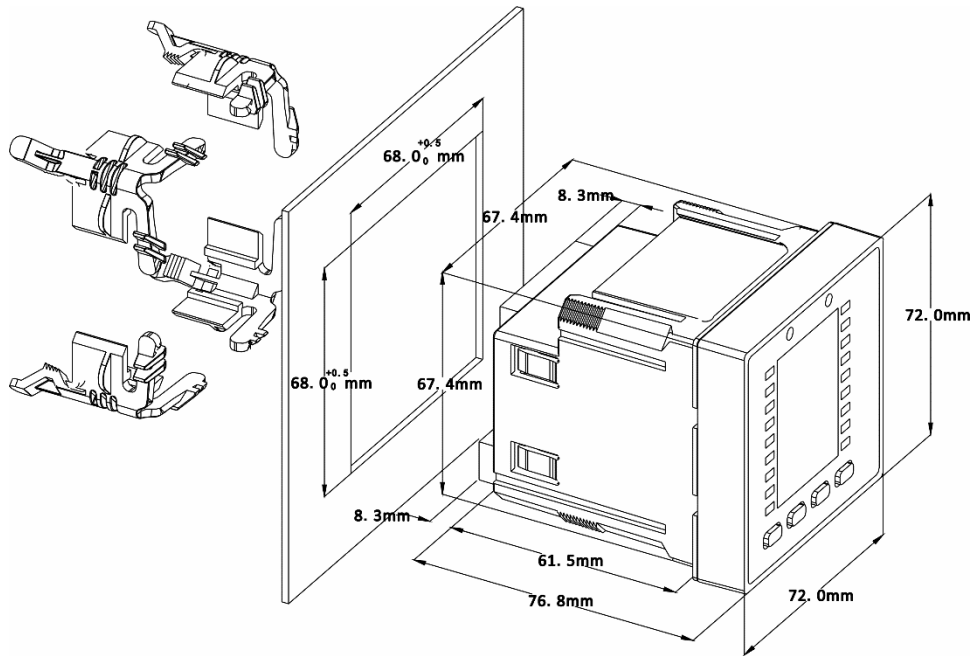


Figure 2-13 Panel Cutout (LED)

2.4 Wiring connections

PMC-D726M can satisfy both Wye and Delta three phase power systems. Please read this section carefully before installation and choose the correct wiring method for your power system. The following Wiring Modes are supported:

- 3-Phase 4-Wire (3P4W) Wye Direct Connection with 3CTs
- 3-Phase 4-Wire (3P4W) Wye Direct Connection with 2CTs
- 3-Phase 3-Wire (3P3W) open Delta with 2PTs and 3CTs.
- 3-Phase 3-Wire (3P3W) open Delta with 2PTs and 2CTs



Caution

Under no circumstances should the PT secondary be shorted.

Under no circumstances should the CT secondary be open when the CT primary is energized. CT shorting blocks should be installed to allow for easy maintenance.

2.4.1 3-Phase 4-Wire (3P4W) Wye Direct Connection with 3CTs

Please consult the serial number label to ensure that the system phase voltage is less than or equal to the meter's voltage input specification.

Set the Wiring Mode to **Wye**.

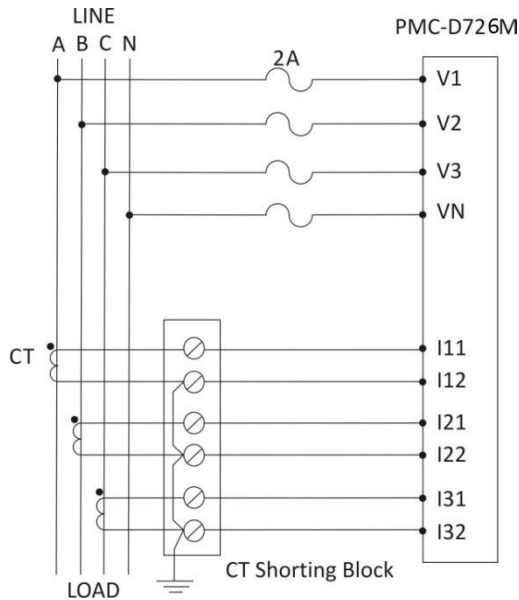


Figure 2-14 3-Phase 4-Wire Wye, no PTs, 3 CTs

2.4.2 3-Phase 4-Wire (3P4W) Wye Direct Connection with 2CTs

Please consult the serial number label to ensure that the system phase voltage is less than or equal to the meter's voltage input specification.

Set the Wiring Mode to **Wye**.

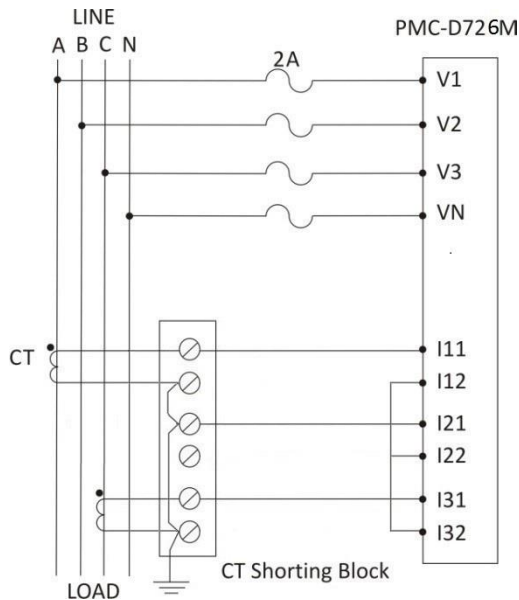


Figure 2-15 4-Wire Wye, no PTs, 2 CTs

2.4.3 3-Phase 3-Wire (3P3W) Open Delta with 2PTs and 3CTs

Please consult the serial number label to ensure that the rated PT secondary voltage is less than or equal to the meter's rated phase voltage input specification.

Set the Wiring Mode to **Delta**.

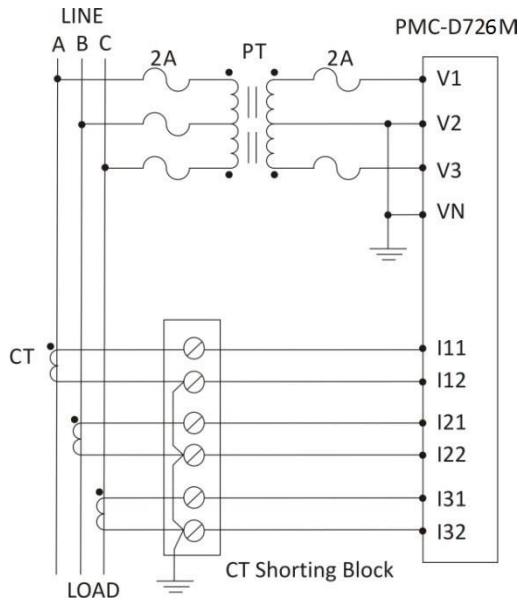


Figure 2-16 3-Phase 3-Wire Delta, 2PTs, 3CTs

2.4.4 3-Phase 3-Wire (3P3W) Open Delta with 2PTs and 2CTs

Please consult the serial number label to ensure that the rated PT secondary voltage is less than or equal to the meter's rated phase voltage input specification.

Set the Wiring Mode to **Delta**.

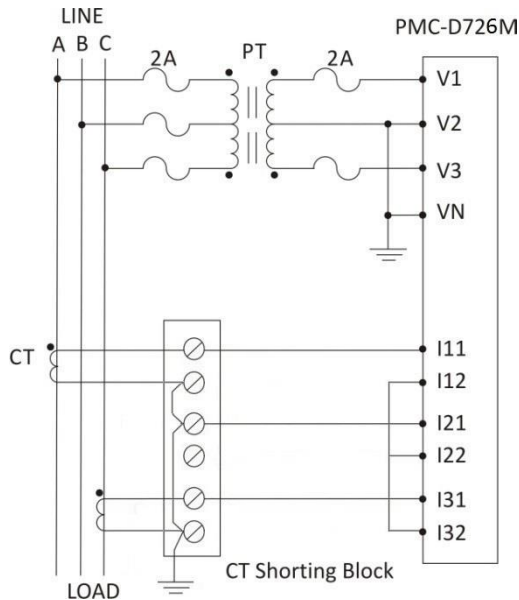


Figure 2-17 3-Phase 3-Wire Delta, 2PTs, 2CTs

2.5 Communications Wiring

The PMC-D726M provides one RS485 port and supports the Modbus RTU protocol. Up to 32 devices can be connected on a 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. The following figure illustrates the RS-485 connections on the PMC-D726M.

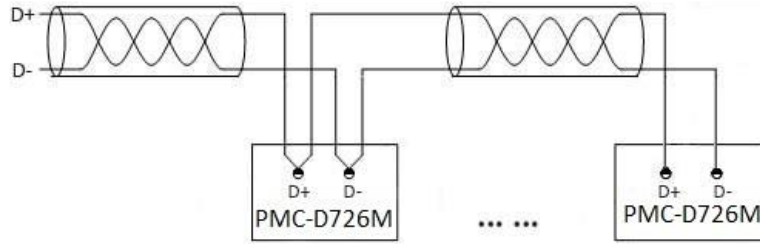


Figure 2-18 Communications Connections

2.6 Digital Input Wiring

The following figure illustrates the Digital Input connections on the PMC-D726M:

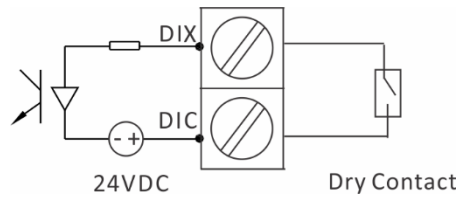


Figure 2-19 DI Connections

2.7 Digital Output Wiring

The following figure illustrates the Digital Output connections on the PMC-D726M:

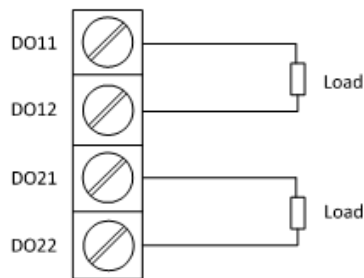


Figure 2-20 DO Connections

2.8 Analog Output Wiring

The following figure illustrates the Analog Output connections on the PMC-D726M:



Figure 2-21 AO Connections

2.9 Pulse Output Wiring

The following figure illustrates the Pulse Output connections on the PMC-D726M:

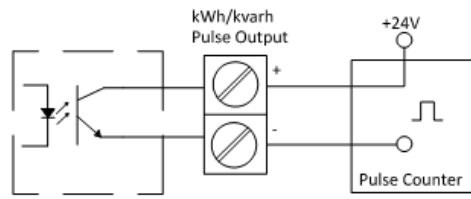


Figure 2-22 Pulse Output Connections

2.10 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.

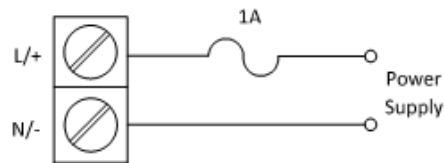


Figure 2-23 Power Supply Connections

Chapter 3 Front Panel

The PMC-D726M meter has a large, bright, backlit LCD or a high-contrast LED display and four buttons for data display and meter configuration. This chapter introduces the front panel operations.



Figure 3-1 Front Panel (LCD)



Figure 3-2 Front Panel (LED)

3.1 Display

3.1.1 LCD/LED Testing

Pressing both the <Phase> and the <Energy> buttons simultaneously for 2 seconds enters the LCD/LED Testing mode. All LCD/LED segments and LED indicators are illuminated during testing. The LCD/LED will return to its normal display mode when any button is pressed.

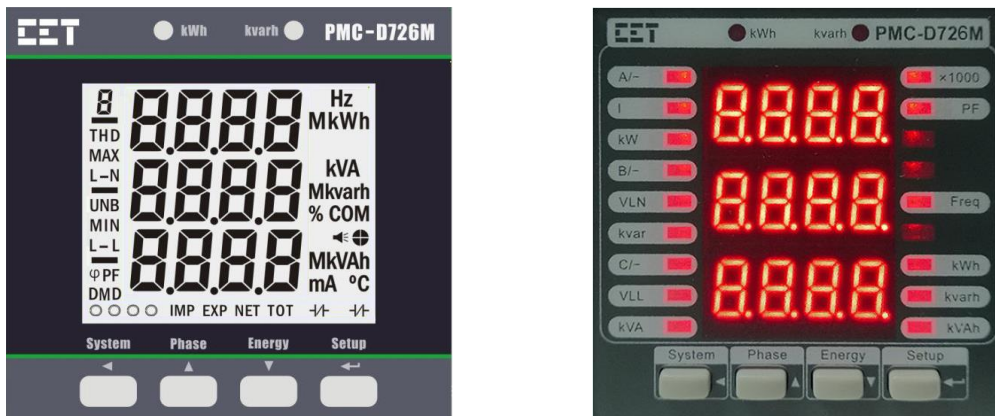


Figure 3-2 Full LED/LCD Display

3.1.2 LCD Display Areas

This section provides a description of the LCD display areas. The PMC-D726M with LCD display can generally be divided into 4 areas:

- A: Measurement values
- B: Measurement symbols for parameters such as Voltage, Current, THD, Unbalance, PF, Voltage Phase Angle, Current Phase Angle and Demand, ..etc.
- C: Measurement Units, Communication indicator and PF Quadrant status
- D: DI Status and DO Status indicators as well as Energy Type such as Imp/Exp/Net/Total

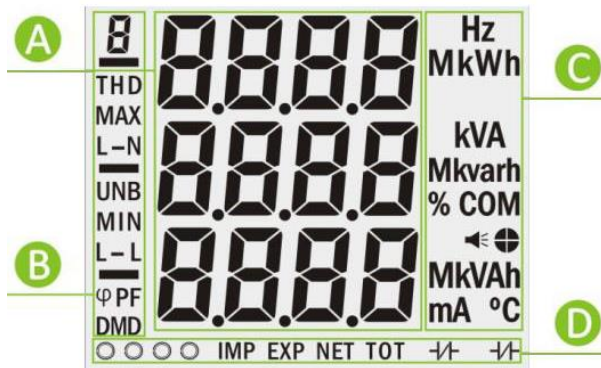


Figure 3-3 LCD Display

The following table shows the special LCD display symbols:

Area	Label	Description			
B	8	U	I	P	Q
		Voltage	Current	kW	kvar
		S	t	F	
		kVA	K-Factor	Frequency	
	THD MAX L-N UNB MIN L-L φ PF DMD	A	b	C	
		Phase A	Phase B	Phase C	
		THD	UNB	DMD	L-N
THD		Unbalance	Demand	Line to Neutral	
	L-L	—	MAX	MIN	
Line to Line	Negative Symbol	Maximum	Minimum		
	φ	PF			
Phase Angle	Power Factor				
C	Hz MkWh kVA Mkvarh % COM ⚠ MkVAh mA °C	Hz MkWh kVA Mkvarh MkVAh mA °C Measurement Units for Frequency (Hz), Power (W, var, VA), Energy (Wh, varh, Vah), Current (mA) and Temperature (°C)			
		%	COM	⚠	Q2 Q1 Q3 Q4
		Harmonic Distortion Unit	COM Port Status	Alarm Symbol	PF Quadrant – Q1/Q2/Q3/Q4

D	 	 DI Open	 DI Close	 DO Open	 DO Close
	IMP EXP NET TOT	IMP Import	EXP Export	NET Net	TOT Total

Table 3-1 LCD Display Symbols

3.1.3 LED Display Symbols

The following table shows the special LED display symbols:




































Label	Description					
	 A	 B	 C	 D	 E	 F
	 G	 H	 I	 J	 K	 L
	 M	 N	 O	 P	 Q	 R
	 S	 T	 U	 V	 W	 Y
	 0	 1	 2	 3	 4	
	 5	 6	 7	 8	 9	

Table 3-2 LED Display Segments

3.2 Using the Front Panel Buttons

The button definitions under **Display Mode** and **Setup Mode** are explained in the following table. **The default password is 0.**

Buttons	Data Display Mode	Setup Configuration Mode
System <◀>	Pressing this button scrolls through the available measurements under the System menu.	Before a parameter is selected for modification, pressing this button goes back to the last menu. If a parameter is already selected, pressing this button moves the cursor to the left by one position for a numeric value and has no effect for an enumerated value.
Phase <▲>	Pressing this button scrolls through the available measurements under the Phase menu.	Before a parameter is selected for modification, pressing this button advances to the last menu or parameter in a particular menu. If a parameter is already selected, pressing this button increments a numeric value or advances to the next enumerated value in the selection list.
Energy <▼>	Pressing this button scrolls through the energy measurements.	Before a parameter is selected for modification, pressing this button advances to the next menu or parameter in a particular menu. If a parameter is already selected, pressing this button decrements a numeric value or goes back to the last enumerated value in the selection list.
Setup <↔>	Pressing this button for two seconds toggles between Data Display and Setup Configuration .	Once inside the Setup Configuration mode, pressing this button selects the parameter for modification. After changing the parameter, pressing this button again saves the new setting into memory.

Table 3-3 Buttons Description

3.3 LED Pulse Outputs

The PMC-D726M comes standard with two LED Pulse Outputs on its front panel, labeled **kWh** and **kvarh**, which can be used for kWh and kvarh energy pulsing if the **EN PULSE** is enabled (see **Section 4.1.3 Energy Pulse Outputs** for more information).

3.4 Display Screen Types

The front panel provides two display modes: Data Display and Setup Configuration. There are four buttons on the front panel: **<System>**, **<Phase>**, **<Energy>** and **<Setup>**. The **<Setup>** button is only used when configuring the meter. The **<System>**, **<Phase>** and **<Energy>** buttons are used in the Data Display mode to view data on the front panel.

The following sections illustrate the display screens for the PMC-D726M model.

3.4.1 LCD Data Screens

Press button	Display screens	First row	Second row	Third row
<System>	Display 1 (default)	kW Total	I average	Total P.F.
	Display 2	Frequency	ULN ¹ average	ULL average
	Display 3	Total kW	Total kvar	Total kVA
	Display 4 [~]	Inc (Calculated Neutral Current)		
	Display 5 [*]	kW Tot Demand	kvar Tot Demand	kVA Tot Demand
	Display 6 [#]	Voltage Unbalance		
	Display 7 [#]	Current Unbalance		
<Phase>	Display 1	Ia	Ib	Ic
	Display 2 ¹	Uan	Ubn	Ucn
	Display 3	Uab	Ubc	Uca
	Display 4 ¹	kWa	kWb	kWc
	Display 5 ¹	kvara	kvarb	kvarc
	Display 6 ¹	kVAa	kVAb	kVAc
	Display 7 ¹	P.F.a	P.F.b	P.F.c
	Display 8 [*]	Ia Demand	Ib Demand	Ic Demand
	Display 9 ^{# 2}	Uan /Uab THD	Ubn /Ubc THD	Ucn /Uca THD
	Display 10 [#]	Ia THD	Ib THD	Ic THD
<Energy>	Display 1	kWh Import		
	Display 2	kWh Export		
	Display 3	kvarh Import		
	Display 4	kvarh Export		
	Display 5	kVAh		
	Display 6 ^{~9#}	kWh Import of T1 to T4		
	Display 10 ^{~13#}	kWh Export of T1 to T4		
	Display 14 ^{~17#}	kvarh Import of T1 to T4		
	Display 18 ^{~21#}	kvarh Export of T1 to T4		

* Available in Firmware V1.01.03 or later.

Available in Firmware V1.01.04 or later

~ Available in Firmware V1.01.07 or later.

Table 3-4 PMC-D726M Data Display Screens

Notes:

- 1) This screen only appears when the **Wiring Mode** is set to **Wye**.
- 2) When the **Wiring Mode** is **Delta**, the phase A/B/C Voltage THD mean phase AB/BC/CA Voltage THD.

3.4.2 LED Data Screens

Press button	Display screens	First row	Second row	Third row
<System>	Display 1 (default)	I average	ULN ¹ average	ULL average
	Display 2	kW Total	kvar Total	kVA Total

	Display 3	P.F. Total	Frequency	
	Display 4~	Inc (Calculated Neutral)		
	Display 5~	COM (Communication Status)		
	Display 6 ²	DI1		DI1 Status (OFF/ON)
	Display 7 ²	DI2		DI2 Status (OFF/ON)
	Display 8 ³	DO1		DO1 Status (OFF/ON)
	Display 9 ³	DO2*		DO2 Status (OFF/ON)
<Phase>	Display 1	Ia	Ib	Ic
	Display 2 ¹	Uan	Ubn	Ucn
	Display 3	Uab	Ubc	Uca
	Display 4 ¹	kWa	kWb	kWc
	Display 5 ¹	kvara	kvarb	kvarc
	Display 6 ¹	kVAa	kVAb	kVAc
	Display 7 ¹	P.F.a	P.F.b	P.F.c
<Energy>	Display 1	kWh Import		
	Display 2	kWh Export		
	Display 3	kvarh Import		
	Display 4	kvarh Export		
	Display 5	kVAh		
	Display 6~9 [#]	kWh Import of T1 to T4		
	Display 10~13 [#]	kWh Export of T1 to T4		
	Display 14~17 [#]	kvarh Import of T1 to T4		
Display 18~21 [#]	kvarh Export of T1 to T4			

* Available in Firmware V1.00.03 or later.

Available in Firmware V1.00.04 or later.

~ Available in Firmware V1.00.07 or later.

Table 3-5 PMC-D726M Data Display Screens

Notes:

- 1) This screen only appears when the **Wiring Mode** is set to **Wye**.
- 2) This screen only displays on Model with the DI options.
- 3) This screen only displays on Model with the DO options.

3.5 Setup Configuration via the Front Panel

Pressing the <Setup> button for more than 2 seconds enters the **Setup Configuration** mode where the setup parameters can be changed. Upon completion, pressing the <Setup> button for more than 2 seconds returns to the **Data Display** mode.

3.5.1 Making Setup Changes

1) Entering the Password:

- Press the <Setup> button for more than 2 seconds to access **Setup Configuration** mode.
- Press the <Energy> button to advance to the Password page.
- A correct password must be entered before changes are allowed. The factory default password is zero. Press the <Setup> button to select the parameter for modification. Use the <System>, <Phase> and <Energy> buttons to enter the correct password.

2) Selecting a parameter to change:

- Use the <Phase> and <Energy> button to scroll to the desired parameter.
- Press the <Setup> button to select the parameter. Once selected, the parameter value will blink.

3) Changing and saving a parameter:

- Use the <System>, <Phase> and <Energy> buttons to make modification to the selected parameter.

- After modification, press the <Setup> button to save the new value into memory.
- If necessary, pressing the <System> button from inside a sub-menu to return to the main menu.

4) Returning to Data Display mode:

- Pressing the <Setup> button for more than 2 seconds to return to the default display screen.

3.5.2 Setup Menu

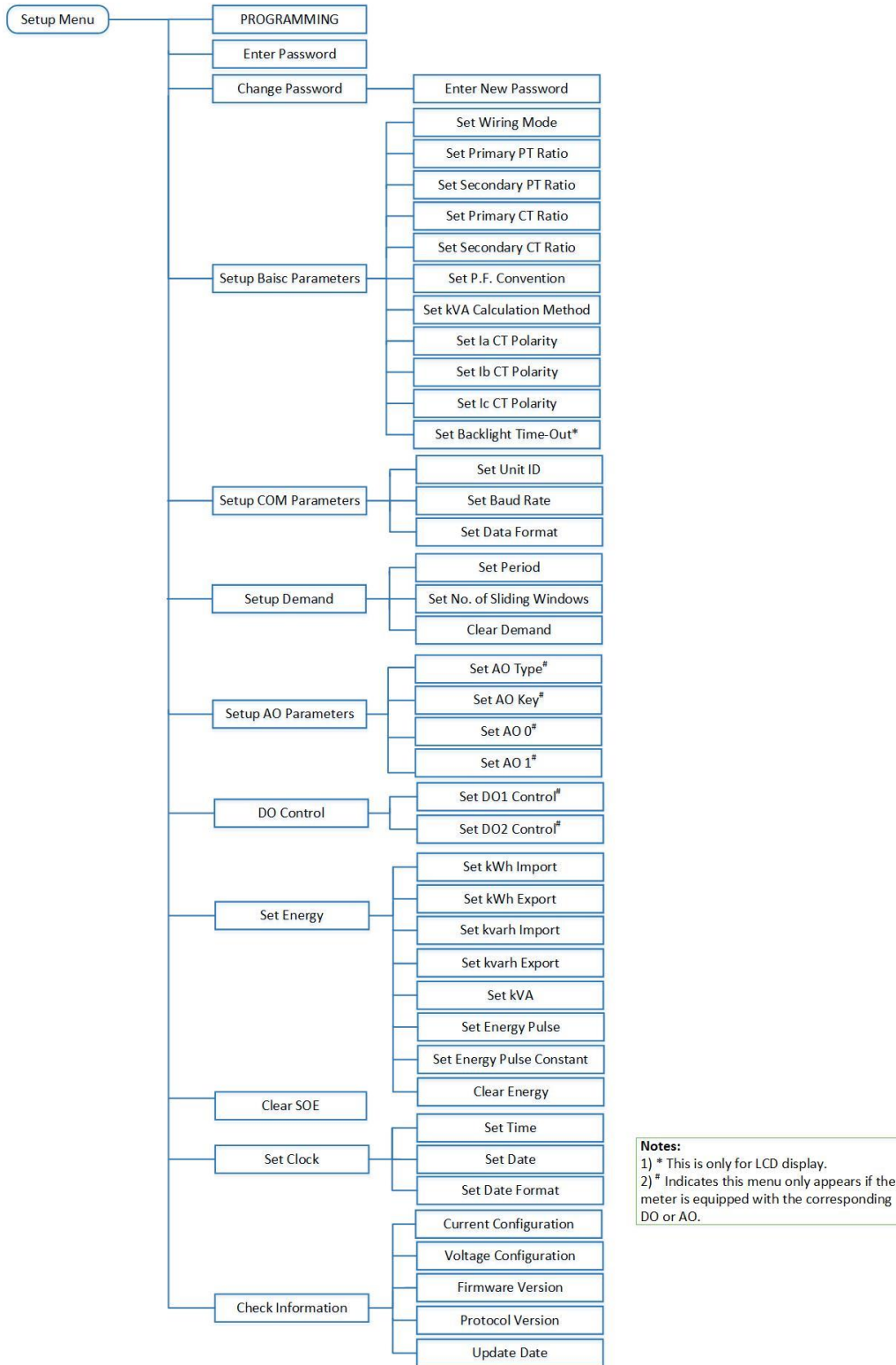


Figure 3-3 Setup Menu

3.5.3 Configuration

The Setup Configuration mode provides access to the following setup parameters:

Label		Parameters	Description	Range	Default
Main	Sub				
PROG		Programming	Setup Configuration Mode	/	/
PASS		Password	Enter Password	0 to 9999	"0"
PASS SET			Enter Sub Menu to change password?	YES/NO	NO
	NEW PASS	New Password	Change Password	0000 to 9999	"0"
SYS SET			Enter sub menu to set system parameters?	YES/NO	NO
	TYPE	Wiring Mode	Wiring connection	WYE/DELTA/DEMO	WYE
	CT1*	CT Primary Current ^{1,2}	CT Primary Current	1 to 30,000 (A)	5A
	CT2*	CT Secondary Current ^{1,2}	CT Secondary Current	1 to 5 (A)	5A
	PT1*	PT Primary Voltage ^{1,3}	PT Primary Voltage	1 to 1,000,000 (V)	100V
	PT2*	PT Secondary Voltage ^{1,3}	PT Secondary Voltage	1 to 690 (V)	100V
	PF	P.F. Convention ⁴	P.F. Convention	IEC/IEEE/-IEEE	IEC
	KVA	kVA Calculation ⁵	kVA Calculation Method	V/S (V=Vector, S=Scalar)	V
	CT A REV	Reverse CT A	Reverse Ia CT Polarity	YES/NO	NO
	CT B REV	Reverse CT B	Reverse Ib CT Polarity	YES/NO	NO
	CT C REV	Reverse CT C	Reverse Ic CT Polarity	YES/NO	NO
	BLTO	Backlit Time-Out	Set Backlight Time-out	0 to 60 min	3
COM SET ⁶			Enter sub menu to set Comm. parameters?	YES/NO	NO
	ID	Meter Address	Meter Address	1-247	100
	BAUD	Baud rate	Data rate in bits per second	1200/2400/4800/ 9600/19200/38400 bps	9600
	CFG	Comm. Port Configuration	Data Format	8N2/8O1/8E1/8N1/ 8O2/ 8E2	8E1
DMD SET~		Set Demand parameters	Enter sub menu to set demand parameters?	YES/NO	NO
	PRD~	Sliding Window Interval	Sliding window Interval	1 to 60 (min)	15
	NMD~	Number of Sliding Windows	Number of Sliding Windows	1 to 15	1
	DMD CLR~	Clear All Demand	Clear Present Demand, Peak Demand Log of This Month (Since Last Reset) and Last Month (Before Last Reset)	YES/NO	NO
AO SET ⁷			Enter sub menu to set AO parameters	YES/NO	NO
	AO TYPE	Analog Output Type	Select between 0-20mA or 4-20mA output	0-20/4-20	4~20
	AO KEY	Analog Output Parameter	The parameter to which the Analog Output is proportional	0-13 (See Table 3-7 for AO Key)	0
	AO 0	AO Zero Scale	The parameter value that corresponds to the minimum Analog Output of 0 mA or 4 mA	-999,999 to 999,999	0
	AO 1	AO Full Scale	The parameter value that corresponds to the maximum Analog	-999,999 to 999,999	0

		Output of 20 mA		
DO SET ⁸	Set DOs Control			
DO1	DO1 Control	DO1 Control	ON/OFF/NRM	NRM
DO2*	DO2 Control	DO2 Control		NRM
ENGY SET	Preset Energy Values	Enter sub menu to preset Energy Values	YES/NO	NO
kWh	kWh Import	Preset kWh Import Value	0 to 99,999,999.9	0
kWh	kWh Export	Preset kWh Export Value	0 to 99,999,999.9	0
kvarh	kvarh Import	Preset kvarh Import Value	0 to 99,999,999.9	0
kvarh	kvarh Export	Preset kvarh Export Value	0 to 99,999,999.9	0
kVAh	kVAh	Preset kVAh Value	0 to 99,999,999.9	0
ENGY PULS	Energy Pulsing	Enable kWh and kvarh Energy Pulsing	YES/NO	YES
ENGY CNST ⁹	Pulse Constant	Pulse Constant	40 [#] /100/400/1000 /3200/5000/6400 /12800	40/3200
ENGY CLR	Clear Energy	Clear all Energy Registers	YES/NO	NO
SOE CLR	Clear SOE	Clear SOE Log	YES/NO	NO
TM SET	Set date and time	Enter sub menu to set date and time?	YES/NO	NO
DATE	Date	Enter the Current Date	YYYY-MM-DD	/
CLK	Clock	Enter the Current Time	HH:MM:SS	/
INFO	Information (Read Only)	Check Meter Information	YES/NO	NO
AMP SCAL	Current Input	Current Configuration	5A ¹⁰ /1A/40mA [#]	5A
VOLT SCAL	Voltage Input	Voltage Configuration	415V	415V
FW	Firmware Version	Firmware Version	e.g. 1.00.00 means V1.00.00	/
PROT VER	Protocol Version	Protocol Version	e.g. 2.1 means V2.1	/
UPDT	Update Date	Firmware Update Date	e.g. 20160603	/

* Available in Firmware Version V1.00.03 (LED)/V1.01.03 (LCD) or later.

~ Available in Firmware Version V1.00.04 (LED)/V1.01.04 (LCD) or later.

Available in Firmware Version V1.00.07 (LED)/V1.01.07 (LCD) or later.

Table 3-6 Setup Parameters

Notes:

- 1) PT Ratio and CT Ratio have been replaced by PT Primary, PT Secondary, CT Primary and CT Secondary since Firmware Version V1.00.03 (LED)/V1.01.03 (LCD).
- 2) When the Current Input is 2.5mA (SCCTA Option for 5A SCCT), the CT Primary Current and CT Secondary Current should be programmed to match the external CT's Primary and Secondary ratings, respectively. When the Current Input is 40mA (SCCT Option for 100A-800A SCCT), the CT Primary Current should be programmed as the selected SCCT's Nominal Current while the CT Secondary Current must be configured as 1.
- 3) PT Primary Voltage/PT Secondary Voltage must be no more than 10000. PT Ratio × CT Ratio × Rated Line Voltage × Rated Current must be less than 790,000,000.
- 4) Power Factor Convention

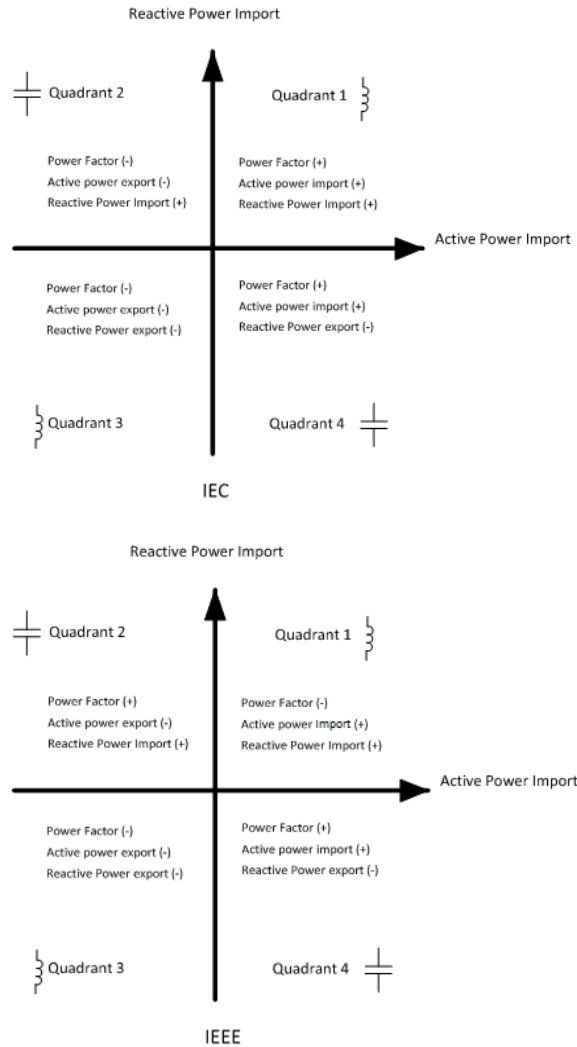


Figure 3-4 P.F. Convention

5) There are two ways to calculate kVA:

Mode V (Vector method): $kVA_{total} = \sqrt{kW_{total}^2 + kvar_{total}^2}$

Mode S (Scalar method): $kVA_{total} = kVA_a + kVA_b + kVA_c$

- 6) COM SET is only available for PMC-D726M with the RS485 option.
- 7) The AO setup parameters are only available for PMC-D726M with the AO option. The AO Keys are shown below.

Value	Parameters	Value	Parameters	Value	Parameters
0	Ia	5	Ubc	10	kWc
1	Ib	6	Uca	11	kW Total
2	Ic	7	ULL avg	12	PF Total
3	I avg	8	kWa	13	FREQ
4	Uab	9	kWb		

Table 3-7 AO Key

- 8) DO SET is only available for PMC-D726M with the DO option.
- 9) The Pulse Constant setup parameter can be configured as 1000/3200/5000/6400/12800 per kXh for a PMC-D726M with 1A Current Input, 1000/3200/5000 per kXh with 5A and 2.5mA Current Inputs, and 40/100/400 per kXh for 40mA Current Input respectively, where kXh may be kWh or kvarh. The default values of 40 and 3200 correspond to a PMC-D726M with 40mA Current Input and other Current Inputs which include 5A, 1A and 2.5mA, respectively.
- 10) For 2.5mA (SCCTA Option for 5A SCCT) Current Input, the **AMP SCL** would be displayed as 5A too.

Chapter 4 Applications

4.1 Inputs and Outputs

4.1.1 Digital Inputs

The PMC-D726M comes optionally with two self-excited Digital Inputs that are internally wetted at 24 VDC. Digital Inputs are typically used for monitoring external status which can help prevent equipment damage, improve maintenance, and track security breaches. The real-time statuses of the Digital Inputs are available on the front panel as well as through communications. Changes in Digital Input status are stored as events in the SOE Log in 1 ms resolution.

4.1.2 Digital Output

The PMC-D726M comes optionally with two Mechanical Relay Output since Firmware V1.00.03 (LED)/V1.01.03 (LCD). Digital Outputs are normally used for Setpoint alarming, load control, or remote control applications.

The Digital Output on the PMC-D726M can be used in the following applications:

- 1) **Front Panel Control** Manually operated from the front panel. Please refer to the **DO SET** setup parameter in Section 3.5.3 for a detailed description.
- 2) **Remote Control** Remotely operated over communications via our free PMC Setup software or PecStar® iEMS Integrated Energy Management System.
- 3) **Control Setpoint** Control Setpoints can be programmed to trigger DO action upon becoming active. Please refer to Section 4.4 for a detailed description.

Since there are multiple ways to trigger the Digital Outputs on the PMC-D726M, a prioritized scheme has been developed to avoid conflicts between different applications. In general, Front Panel Control has the highest priority and can override other control schemes. Remote Control and Control Setpoint share the same priority, meaning that they can all be programmed to control the same Digital Output. This scheme is equivalent to having an implicit Logical OR operation for the control of a Digital Output and may be useful in providing a generic alarm output signal. However, the sharing of a Digital Output is not recommended if the user intends to generate a control signal in response to a specific Setpoint condition.

4.1.3 Energy Pulse Outputs

The PMC-D726M comes standard with two front panel LED Pulse Outputs and optionally with two Solid Relay Output for kWh or kvarh pulsing. Energy Pulse Outputs are typically used for accuracy testing. Energy pulsing can be enabled from the front panel through the **ENGY PULS** setup parameter. The **Pulse Constant** per kWh, where kWh may be kWh or kvarh, can be configured through the **ENGY CNST** setup parameter:

- 1A Current Input: 1000/3200/5000/6400/12800
- 5A Current Input: 1000/3200/5000
- 2.5mA Current Input*: 1000/3200/5000
- 40mA Current Input*: 40/100/400

*Available since Firmware V1.00.07 (LED) / V1.01.07 (LCD)

4.1.4 AO Output

The PMC-D726M comes optionally with an Analog Output which can be programmed as 0mA to 20mA or 4mA to 20mA output. There are 4 setup parameters:

Parameter	Description
Type	Select between 0-20mA or 4-20mA output.
Key	Defines the parameter to which the Analog Output is proportional. The Analog Output Parameters are listed in Table 3-7.
AO 1	Defines the full scale value of the parameter when the Analog Output is 20 mA. The value ranges between -999,999 and +999,999.
AO 0	Defines the zero scale value of the parameter when the Analog Output is 0 mA or 4 mA. The value ranges between -999,999 to +999,999.

Table 4-1 AO Setup Parameters

For example, an AO of 4-20mA is required to be proportional to Phase A current. The maximum value of phase A current is 2000A, and the minimum value is 500A. As such, the **AO TYPE** parameter should be programmed as **4-20mA**. The **KEY** should be programmed as Ia (Phase A current, Key Value = 1). The **AO 1** parameter should be programmed with the value 2000. The **AO 0** parameter should be programmed with the value 500. Therefore, when Phase A Current is 500A or below, the AO output is 4mA. When Phase A Current is 2000A, the AO output is 20mA. When Phase A Current is 1250A, the AO output is $(1250A-500A) \times (20mA-4mA) / (2000A-500A) + 4mA = 12.00mA$.

4.2 Power and Energy

4.2.1 Basic Measurements

The PMC-D726M provides the following basic measurements which can be retrieved via the Front Panel or communications:

Parameter	Phase A	Phase B	Phase C	Total	Average
UIn	●	●	●	-	●
UII	●	●	●	-	●
Current	●	●	●	-	●
Neutral Current	-	-	-	In (Calculated)	-
kW	●	●	●	●	-
kvar	●	●	●	●	-
kVA	●	●	●	●	-
Power Factor	●	●	●	-	●
Fundamental PF	●	●	●	-	-
Frequency	●	-	-	-	-

Table 4-2 Basic Measurements

4.2.2 Energy Measurements

Then PMC-D726M provides Energy measurements for active energy (kWh), reactive energy (kvarh) and apparent energy (kVAh) with a resolution of 0.1k and a maximum value of 100,000,000.0. When the maximum value is reached, the energy registers will automatically roll over to zero.

The energy parameters can be reset manually or preset to user-defined values through the Front Panel or via communications. The PMC-D726M provides the following energy measurements:

Active Energy	kWh Import/Export kWh Import/Export of TOU T1-4*
Reactive Energy	kvarh Import/Export kvarh Import/Export of TOU T1-4*
Apparent Energy	kVAh

*Available in Firmware V1.00.04 (LED) / V1.01.04 (LCD) or later

Table 4-3 Energy Measurement

4.2.3 Demand Measurements

Demand is defined as the average power consumption over a fixed interval (usually 15 minutes) based on the sliding window method. The PMC-D726M provides the following Demand and Peak Demand measurements since Firmware V1.00.04 (LED)/V1.01.04 (LCD):

Present Demands	la, lb, lc
	kW Total, kvar Total, kVA Total
Peak Demands	la, lb, lc
	kW Total, kvar Total, kVA Total

Table 4-4 Demand Measurement

All Demand parameters can be retrieved through communications for both versions. Only Present Demands can be accessed via the Front Panel of the LCD version but not the LED version.

The PMC- D726M 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 1x15=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 three options: <ul style="list-style-type: none"> • 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. • A 0xFFFF value will disable the Self-Read operation and replace it with manual operation. A manual reset will cause the Max. Demand of This Month to be transferred to the Max. Demand of Last Month and then reset. The terms This Month and Last Month will become Since Last Reset and Before Last Reset. 	Default=0xFFFF

Table 4-5 Demand Setup

4.3 Power Quality

The PMC-D726M provides the following Power Quality parameters since Firmware V1.00.04 (LED)/V1.01.04 (LCD).

- Phase Angles
- Harmonics (THD, TOHD, TEHD, HD02~HD31)
- TDD
- K-Factor
- Crest Factor
- Unbalance

All of above Power Quality parameters can be accessed through communications. Only Voltage/Current Unbalance and 3-Phase Voltage/Current THD can be retrieved via the Front Panel of the LCD version.

4.3.1 Phase Angles

Phase analysis is used to identify the angle relationship between 3-phase 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 PF 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°.

4.3.2 Power Quality Parameters

The PMC-D726M provides the following PQ parameters:

4.3.2.1 Harmonics

The PMC-D726M provides harmonic analysis for THD, TOHD, TEHD and individual harmonics up to the 31st order. All harmonic parameters are available through communications. In addition, the PMC-D726M also provides TDD, K-factor and Crest-factor measurements for Current.

4.3.2.2 TDD

Total Demand Distortion (TDD) is defined as the ratio of the root mean square (rms) of the harmonic current to the root mean square value of the rated or maximum demand fundamental current.

TDD of the current I is calculated by the formula below:

$$TDD = \frac{\sqrt{\sum_{h=1}^{h=\infty} (I_h)^2}}{I_L}$$

where

I_L = maximum demand of fundamental current

h = harmonic order (1, 2, 3, 4, etc.)

I_h = rms load current at the harmonic order h

4.3.2.3 K-Factor

K-Factor is defined as the weighted sum of the harmonic load current according to their effects on transformer heating, as derived from ANSI/IEEE C57.110. A **K-Factor** of 1.0 indicates a linear load (no harmonics). The higher the **K-Factor**, the greater the harmonic heating effect.

$$K-Factor = \frac{\sum_{h=1}^{h=h_{max}} (I_h h)^2}{\sum_{h=1}^{h=h_{max}} (I_h)^2}$$

where

I_h = I_{th} Harmonic Current in RMS

h_{max} = Highest harmonic order

4.3.2.4 Crest Factor

Crest Factor is defined as the **Peak to Average Ratio (PAR)**, and its calculation is illustrated below:

$$C = \frac{|X|_{peak}}{X_{rms}}$$

where

$|X|_{peak}$ = Peak amplitude of the waveform

X_{rms} = RMS value

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

D726M.

	Phase A/AB	Phase B/BC	Phase C/CA	
Harmonic-Voltage	THD	THD	THD	
	TEHD	TEHD	TEHD	
	TOHD	TOHD	TOHD	
	2 nd Harmonics	2 nd Harmonics	2 nd Harmonics	
	
	31 st Harmonics	31 st Harmonics	31 st Harmonics	
Harmonic-Current	THD	THD	THD	
	TEHD	TEHD	TEHD	
	TOHD	TOHD	TOHD	
	TDD	TDD	TDD	
	TEDD	TEDD	TEDD	
	TODD	TODD	TODD	
	K-factor	K-factor	K-factor	
	Crest-factor	Crest-factor	Crest-factor	
	2 nd Harmonics	2 nd Harmonics	2 nd Harmonics	
	
		31 st Harmonics	31 st Harmonics	31 st Harmonics

Table 4-6 Harmonic Measurements

4.3.3 Unbalance

The PMC-D726M provides Voltage and Current Unbalance measurements. The calculation method of Voltage and Current Unbalances are listed below:

$$\text{Voltage Unbalance} = \frac{V2}{V1} \times 100\%$$

$$\text{Current Unbalance} = \frac{I2}{I1} \times 100\%$$

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 Setpoints

The PMC-D726M comes standard with 6 user programmable Setpoints which provide extensive control by allowing a user to initiate an action in response to a specific condition. Typical Setpoint applications include alarming, fault detection and power quality monitoring. This feature is available in Firmware V1.00.04 (LED)/V1.01.04 (LCD) or later.

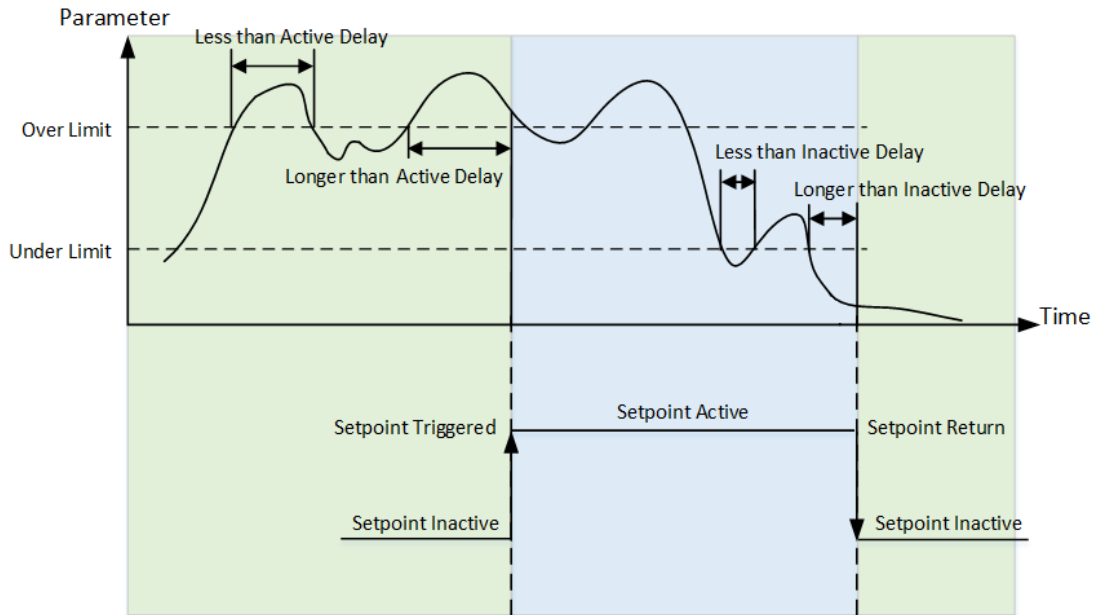


Figure 4-1 Over Setpoint

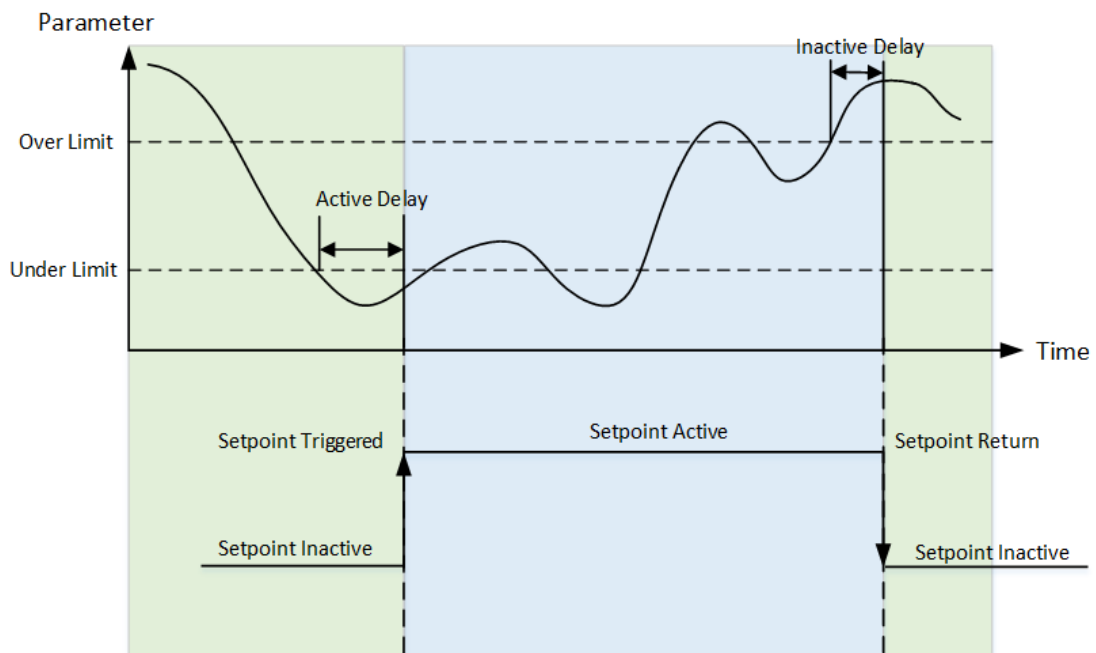


Figure 4-2 Under Setpoint

Setpoints can be programmed over communications and have the following setup parameters:

Setup Parameter	Definition	Options/Default*
Setpoint Type	Over or Under Setpoint.	0=Over Setpoint* 1=Under Setpoint
Setpoint Parameter	Specify the parameter to be monitored.	See Table 4-8
Over Limit	Specify the value that the Setpoint parameter must exceed for Over Setpoint to become active or for Under Setpoint to become inactive.	0*
Under Limit	Specify the value that the Setpoint parameter must go below for Over Setpoint to become inactive or for Under Setpoint to become active.	0*

Active Delay	Specify the minimum duration that the Setpoint condition must be met before the Setpoint becomes active. An event will be generated and stored in the SOE Log. The range of the Active Delay is between 0 and 9999 seconds.	0 to 9999s Default=10
Inactive Delay	Specify the minimum duration that the Setpoint return condition must be met before the Setpoint becomes inactive. An event will be generated and stored in the SOE Log. The range of the Inactive Delay is between 0 and 9999 seconds.	0 to 9999s Default=10
Setpoint Trigger	Specify what action a Setpoint would take when it becomes active. Please refer to Table 4-9 below for a list of Setpoint Triggers.	See Table 4-9

Table 4-7 Description for Setpoint Parameters

Key	Parameter	Scale/Unit
0	None	-
1	ULN	x100, V
2	ULL	x100, V
3	I	x1000, A
4	In	x1000, A
5	Frequency	x100, Hz
6	kW Total	x1000, kW
7	kvar Total	x1000, kvar
8	kVA Total	x1000, kVA
9	P.F. Total	x1000
10	kW Total Demand	x1000, kW
11	kvar Total Demand	x1000, kvar
12	kVA Total Demand	x1000, kVA

Table 4-8 Setpoint Parameters

Key	Action
0	None
1	DO1 Closed
2	DO2 Closed

Table 4-9 Setpoint Triggers

4.5 Logging

4.5.1 Peak Demand Log

The PMC-D726M records the **Peak Demand of This Month (Since Last Reset)** and **Last Month (Before Last Reset)** with timestamp for Ia, Ib, Ic, kW Total, kvar Total and kVA Total since Firmware V1.00.04 (LED)/V1.01.04 (LCD). All Peak Demand information can be accessed through the Front Panel as well as communications. Please refer to Section 4.2.3 for a complete description of the **Self-Read Time** and its operation.

Peak Demand Logs of This Month (Since Last Reset) and Last Month (Before Last Reset)
Ia
Ib
Ic
kW Total
kvar Total
kVA Total

Table 4-10 Peak Demand Log

4.5.2 SOE

The PMC-D726M can store up to 16 events such as Power-On, Power-Off, Digital Input status changes, Setpoint and setup changes in its non-volatile memory. Each event record includes the event classification, its relevant parameter values and a timestamp in 1ms resolution.

All event records can be retrieved via communications. If there are more than 16 events, the newest

event will replace the oldest event on a First-In-First-Out basis. The SOE Log can be reset from the front panel or via communications.

4.6 Time of Use (TOU)

TOU is used for electricity pricing that varies depending on the time of day, day of week and season. The TOU system allows the user to configure an electricity price schedule inside the PMC-D726M and accumulate energy consumption into different TOU tariffs based on the time of consumption. TOU programming is only supported through communications. This feature is available in Firmware V1.00.04 (LED)/V1.01.04 (LCD) or later.

The TOU feature on PMC-D726M supports one TOU schedule, which can be switched at a pre-defined time. The TOU schedule supports:

- 6 seasons
- 10 Daily Profiles, each with 6 Periods in 15-minute interval
- 10 Holidays or Alternate Days
- 4 Tariffs

The TOU schedule has the following setup parameters and can only be programmed via communications:

Setup Parameters	Definition	Options
Daily Profile #	Specify a daily rate schedule which can be divided into a maximum of 6 periods in 15-min intervals. Up to 10 Daily Profiles can be programmed for each TOU schedule.	1 to 10, the first period starts at 00:00 and the last period ends at 24:00.
Season #	A year can be divided into a maximum of 6 seasons. Each season is specified with a Start Date and ends with the next season's Start Date.	1 to 6, starts from January 1 st
Alternate Days #	A day can be defined as an Alternate Day, such as May 1 st . Each Alternate Day is assigned a Daily Profile.	1 to 10.
Day Types	Specify the day type of the week. Each day of a week can be assigned a day type such as Weekday1, Weekday2, Weekday3 and Alternate Days. The Alternate Day has the highest priority.	Weekday1, Weekday2, Weekday3 and Alternate Days

Table 4-11 TOU Setup Parameters

For each of the 4 Tariff Rates, the PMC-D726M provides the following information:

Energy: kWh Import/Export, kvarh Import/Export and kVAh

TOU data is available through the Front Panel and communications

Chapter 5 Modbus Register Map

This chapter provides a complete description of the Modbus register map (**Protocol Versions 1.4** and above) for the PMC-D726M Digital Multifunction Meter to facilitate the development of 3rd party communications driver for accessing information on the PMC-D726M. For a complete Modbus Protocol Specification, please visit www.modbus.org.

The PMC-D726M 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)

The following table provides a description of the different data formats used for the Modbus registers. The PMC-D726M 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 Basic Measurements

Register	Property	Description	Format	Scale	Unit
0000	RO	Uan ¹	UINT32	×100 ²	V
0002	RO	Ubn ¹	UINT32		
0004	RO	Ucn ¹	UINT32		
0006	RO	ULN average	UINT32		
0008	RO	Uab	UINT32		
0010	RO	Ubc	UINT32		
0012	RO	Uca	UINT32		
0014	RO	ULL average	UINT32	×1000	A
0016	RO	Ia	UINT32		
0018	RO	Ib	UINT32		
0020	RO	Ic	UINT32		
0022	RO	I average	UINT32	×1000	kW
0024	RO	kWa ¹	INT32		
0026	RO	kWb ¹	INT32		
0028	RO	kWc ¹	INT32		
0030	RO	kW Total	INT32		
0032	RO	kvara ¹	INT32	×1000	kvar
0034	RO	kvarb ¹	INT32		
0036	RO	kvarc ¹	INT32		
0038	RO	kvar Total	INT32		
0040	RO	kVAa ¹	INT32	×1000	kVA
0042	RO	kVAb ¹	INT32		
0044	RO	kVAc ¹	INT32		
0046	RO	kVA Total	INT32		
0048	RO	PFa ¹	INT16		
0049	RO	PFb ¹	INT16		
0050	RO	PFc ¹	INT16		
0051	RO	PF average	INT16		
0052	RO	FREQ	INT16	×100	Hz
0053	RO	Uan/Uab(3P3W) Angle	UINT16	×100	°
0054	RO	Ubn/Ubc(3P3W) Angle	UINT16		
0055	RO	Ucn/Uca(3P3W) Angle	UINT16		
0056	RO	Ia Angle	UINT16		
0057	RO	Ib Angle	UINT16		
0058	RO	Ic Angle	UINT16		
0059	RO	In (Calculated)	UINT32		
0061	RO	Phase A Fundamental PF	INT16	×1000	

0062	RO	Phase B Fundamental PF	INT16		
0063	RO	Phase C Fundamental PF	INT16		
0064~0094	RO	Reserved			
0095	RO	Setpoint Status ^{3*}	INT16		
0096	RO	DO Status ⁴	INT16		
0097	RO	DI Status ⁵	INT16		
0098	RO	SOE Pointer ⁶	UINT32		

* Available in Firmware Version V1.00.04 (LED)/V1.01.04 (LCD) or later

Table 5-1 Basic Measurements

Notes:

- 1) When the **Wiring Mode** is Delta, the per phase line-to-neutral voltages, kW, kvars, kVAs and PFs have no meaning, and their registers are reserved.
- 2) “x100” indicates the value returned in the register is 100 times the actual engineering value with the unit V (voltage). For example, if the register contains a value 22003, the actual voltage is 22003/100=220.03V.
- 3) For the **Setpoint Status** register, the bit values indicate the various Setpoint states with “1” meaning Active and “0” meaning Inactive. The following table illustrates the details of the **Alarm Status** register.

Bit15 - Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Reserved	Setpoint6	Setpoint5	Setpoint4	Setpoint3	Setpoint2	Setpoint1

Table 5-2 Alarm Status Register

- 4) For the **DO Status** register, the bit values of B0 and B1 represent the states of DO1 and DO2, respectively, with “1” meaning Active (Closed) and “0” meaning Inactive (Open).
- 5) For the **DI Status** register, the bit values of B0 and B1 represent the states of DI1 and DI2, respectively, with “1” meaning Active (Closed) and “0” meaning Inactive (Open).
- 6) The range of the **SOE Pointer** is between 0 and 0xFFFFFFFF. The **SOE Pointer** is incremented by one for every event generated. If a **CLR SOE** is performed from the front panel or via communications, the **SOE Pointer** will be reset to zero and then immediately incremented by one with a new “Setup Changes via Front Panel” or “Setup Changes via Communications” event. Therefore, any 3rd party software should assume that a **CLR SOE** action has been performed if it sees the **SOE Pointer** rolling over to one or to a value that is smaller than its own pointer. In this case, the new **SOE Pointer** also indicates the number of events in the SOE Log if it is less than 16. Otherwise, there will always be 16 events in the SOE Log.

5.2 Energy Measurements

Register	Property	Description	Format	Scale	unit
1000	100	RW	kWh Import	x0.1	kWh
1002	102	RW	kWh Export		kWh
1004	104		Reserved		
1006	106	RW	kvarh Import	x0.1	kvarh
1008	108	RW	kvarh Export		kvarh
1010	110		Reserved		
1012	112	RW	kVAh	x0.1	kVAh
1014	114	RW	kWh Import of T1	x0.1	kWh
1016	116	RW	kWh Export of T1		kWh
1018	118	RW	kvarh Import of T1		kvarh
1020	120	RW	kvarh Export of T1		kvarh
1022	122	RW	kVAh of T1		kVAh
1024	124	RW	kWh Import of T2		x0.1
1026	126	RW	kWh Export of T2	kWh	
1028	128	RW	kvarh Import of T2	kvarh	
1030	130	RW	kvarh Export of T2	kvarh	
1032	132	RW	kVAh of T2	kVAh	
1034	134	RW	kWh Import of T3	x0.1	
1036	136	RW	kWh Export of T3		kWh
1038	138	RW	kvarh Import of T3		kvarh
1040	140	RW	kvarh Export of T3		kvarh
1042	142	RW	kVAh of T3		kVAh
1044	144	RW	kWh Import of T4		x0.1
1046	146	RW	kWh Export of T4	kWh	
1048	148	RW	kvarh Import of T4	kvarh	
1050	150	RW	kvarh Export of T4	kvarh	
1052	152	RW	kVAh of T4	kVAh	

Table 5-3 Energy Measurements

Notes:

- 1) The Energy registers have a maximum value of 1,000,000,000 in units of 0.1 kWh and will roll over to zero automatically when it is reached.
- 2) The Energy registers for TOU T1 to T4 are available in Firmware V1.00.04 (LED)/V1.01.04 (LCD) or later.

5.3 Harmonic Measurements

The Harmonic Measurements are available in Firmware V1.00.04 (LED)/V1.01.04 (LCD) or later.

5.3.1 Power Quality Measurements

Register	Property	Description	Format	Scale	Unit
1300	RO	Ia TDD	Float	x1	-
1302	RO	Ib TDD	Float		
1304	RO	Ic TDD	Float		
1306	RO	Ia TDD Odd	Float		
1308	RO	Ib TDD Odd	Float		
1310	RO	Ic TDD Odd	Float		
1312	RO	Ia TDD Even	Float		
1314	RO	Ib TDD Even	Float		
1316	RO	Ic TDD Even	Float		
1318	RO	Ia K-factor	Float		
1320	RO	Ib K-factor	Float		
1322	RO	Ic K-factor	Float		
1324	RO	Ia Crest-factor	Float		
1326	RO	Ib Crest-factor	Float		
1328	RO	Ic Crest-factor	Float		
1330	RO	Voltage Unbalance	Float		
1332	RO	Current Unbalance	Float		

Table 5-4 Power Quality Measurements

5.3.2 Current Harmonic Measurements

Register	Property	Description	Format	Scale	Unit
1400	RO	Ia THD	Float	x1	-
1402	RO	Ib THD	Float		
1404	RO	Ic THD	Float		
1406	RO	Ia TOHD	Float		
1408	RO	Ib TOHD	Float		
1410	RO	Ic TOHD	Float		
1412	RO	Ia TEHD	Float		
1414	RO	Ib TEHD	Float		
1416	RO	Ic TEHD	Float		
1418	RO	Ia HD02	Float		
1420	RO	Ib HD02	Float		
1422	RO	Ic HD02	Float		
1424~1590	RO	...	Float		
1592	RO	Ia HD31	Float		
1594	RO	Ib HD31	Float		
1596	RO	Ic HD31	Float		

Table 5-5 Current Harmonic Measurements

5.3.3 Voltage Harmonic Measurements

Register	Property	Description	Format	Scale	Unit
1600	RO	Uan (Wye)/Uab (Delta) THD	Float	x1	-
1602	RO	Ubn (Wye)/Ubc (Delta) THD	Float		
1604	RO	Ucn (Wye)/Uca (Delta) THD	Float		
1606	RO	Uan (Wye)/Uab (Delta) TOHD	Float		
1608	RO	Ubn (Wye)/Ubc (Delta) TOHD	Float		
1610	RO	Ucn (Wye)/Uca (Delta) TOHD	Float		
1612	RO	Uan (Wye)/Uab (Delta) TEHD	Float		
1614	RO	Ubn (Wye)/Ubc (Delta) TEHD	Float		
1616	RO	Ucn (Wye)/Uca (Delta) TEHD	Float		
1618	RO	Uan (Wye)/Uab (Delta) HD02	Float		

1620	RO	Ubn (Wye)/Ubc (Delta) HD02	Float		
1622	RO	Ucn (Wye)/Uca (Delta) HD02	Float		
1624~1790	RO	...	Float		
1792	RO	Uan (Wye)/Uab (Delta) HD31	Float		
1794	RO	Ubn (Wye)/Ubc (Delta) HD31	Float		
1796	RO	Ucn (Wye)/Uca (Delta) HD31	Float		

Table 5-6 Voltage Harmonic Measurements

Notes:

- 1) When the **Wiring Mode** is **Wye**, the phase A/B/C Voltage THD/TOHD/TEHD/HDxx mean phase AB/BC/CA Voltage THD/TOHD/TEHD/HDxx.

5.4 Demands

The Demand registers are available in Firmware Version V1.00.04 (LED)/V1.01.04 (LCD) or later.

5.4.1 Present Demands

Register	Property	Description	Format	Scale	Unit
3000	RO	la	INT32	x1000	A
3002	RO	lb	INT32		
3004	RO	lc	INT32		
3006	RO	kW Total	INT32	x1000	kW
3008	RO	kvar Total	INT32	x1000	kvar
3010	RO	kVA Total	INT32	x1000	kVA

Table 5-7 Present Demand Measurements

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

Register	Property	Description	Format	Scale	Unit	
3400~3405	RO	la	See Section 5.4.4 Demand Data Structure	x1000	A	
3406~3411	RO	lb				
3412~3417	RO	lc				
3418~3423	RO	kW Total			kW	
3424~3429	RO	kvar Total				kvar
3430~3435	RO	kVA Total				kVA

Table 5-8 Peak Demand Log of This Month (Since Last Reset)

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

Register	Property	Description	Format	Scale	Unit	
3600~3605	RO	la	See Section 5.4.5 Demand Data Structure	x1000	A	
3606~3611	RO	lb				
3612~3617	RO	lc				
3618~3623	RO	kW Total			kW	
3624~3629	RO	kvar Total				kvar
3630~3635	RO	kVA Total				kVA

Table 5-9 Peak Demand Log of Last Month (Before Last Reset)

5.4.4 Demand Data Structure

Offset	Description	
+0	High	Year - 2000
	Low	Month
+1	High	Day
	Low	Hour
+2	High	Minute
	Low	Second
+3	-	Millisecond
+4~+5	-	Peak Demand Value

Table 5-10 Demand Data Structure

5.5 SOE Log

Each SOE event occupies 8 registers as shown in the following table. The SOE LOG Data Structure is

described in Table 5-12.

Register	Property	Description	Format
10000-10007	RO	Event 1	See Table 5-12 SOE LOG Data Structure
10008-10015	RO	Event 2	
10016-10023	RO	Event 3	
10024-10031	RO	Event 4	
10032-10039	RO	Event 5	
10040-10047	RO	Event 6	
10048-10055	RO	Event 7	
10056-10063	RO	Event 8	
10064-10071	RO	Event 9	
10072-10079	RO	Event 10	
10080-10087	RO	Event 11	
10088-10095	RO	Event 12	
10096-10103	RO	Event 13	
10104-10111	RO	Event 14	
10112-10119	RO	Event 15	
10120-10127	RO	Event 16	

Table 5-11 SOE Log

Notes:

- 1) SOE LOG Data Structure

Offset	Property	Description
+0	RO	Storage location (0-15) in SOE buffer
+1 (Hi)	RO	Class (0-3)
+1 (Lo)		Event Classification (See Table 5-13)
+2 (Hi)	RO	High-order Byte: Year-2000
+2 (Lo)		Low-order Byte: Month
+3 (Hi)	RO	High-order Byte: Day
+3 (Lo)		Low-order Byte: Hour
+4 (Hi)	RO	High-order Byte: Minute
+4 (Lo)		Low-order Byte: Second
+5	RO	Millisecond
+6	RO	Event Value High-order Word
+7	RO	Event Value Low-order Word

Table 5-12 SOE LOG Data Structure

- 2) SOE Event Classification

Event Classification	Sub-Classification	Status	Event Value	Description
0= Operations	1	1 / 0	1/0	DI1 Inactive / DI1 Active
	2	1 / 0	1/0	DI2 Inactive / DI2 Active
	3	1 / 0	1/0	DO1 Inactive / DO1 Active
	4	1 / 0	1/0	DO2 Inactive / DO2 Active
	11	None	0	Clear all Energy Registers via the Front Panel
	12	None	0	Clear all Energy Registers via the Communications
	13	None	0	Clear Present Demand, Peak Demand Log of This Month (Since Last Reset) and Last Month (Before Last Reset) via the Front Panel
	14	None	0	Clear Peak Demand Log of This Month (Since Last Reset) and Last Month (Before Last Reset) via the Front Panel
	15	None	0	Clear Present Demand, Peak Demand Log of This Month (Since Last Reset) and Last Month (Before Last Reset) through Communications
	21	None	0	Clear SOE via Front Panel or through the Communications
	22	None	0	Power Off
	31	None	0	Setup Parameter Changes via Front Panel
	32	None	0	Setup Parameter Changes via Communication
3=Setpoint	1	None	Trigger Value	Over Uln Setpoint Active
	2	None		Over Ull Setpoint Active
	3	None		Over Current Setpoint Active

	4	None		Over In Setpoint Active
	5	None		Over Frequency Setpoint Active
	6	None		Over kW Total Setpoint Active
	7	None		Over kvar Total Setpoint Active
	8	None		Over kVA Total Setpoint Active
	9	None		Over PF Total Setpoint Active
	10	None		Over kW Total Present Demand Setpoint Active
	11	None		Over kvar Total Present Demand Setpoint Active
	12	None		Over kVA Total Present Demand Setpoint Active
	13~60	None		Reserved
	61	None		Under UIn Setpoint Active
	62	None		Under UII Setpoint Active
	63	None		Under Current Setpoint Active
	64	None		Under In Setpoint Active
	65	None		Under Frequency Setpoint Active
	66	None		Under kW Total Setpoint Active
	67	None		Under kvar Total Setpoint Active
	68	None		Under kVA Total Setpoint Active
	69	None		Under PF Total Setpoint Active
	70	None		Under kW Total Present Demand Setpoint Active
	71	None		Under kvar Total Present Demand Setpoint Active
	72	None		Under kVA Total Present Demand Setpoint Active
	129	None	Return Value	Over UIn Setpoint Return
	130	None		Over UII Setpoint Return
	131	None		Over Current Setpoint Return
	132	None		Over In Setpoint Return
	133	None		Over Frequency Setpoint Return
	134	None		Over kW Total Setpoint Return
	135	None		Over kvar Total Setpoint Return
	136	None		Over kVA Total Setpoint Return
	137	None		Over PF Total Setpoint Return
	138	None		Over kW Total Present Demand Setpoint Return
	139	None		Over kvar Total Present Demand Setpoint Return
	140	None		Over kVA Total Present Demand Setpoint Return
	141~188	None		Reserved
	189	None		Under UIn Setpoint Return
	190	None		Under UII Setpoint Return
	191	None		Under Current Setpoint Return
	192	None		Under In Setpoint Return
	193	None		Under Frequency Setpoint Return
	194	None		Under kW Total Setpoint Return
	195	None		Under kvar Total Setpoint Return
	196	None	Under kVA Total Setpoint Return	
	197	None	Under PF Total Setpoint Return	
	198	None	Under kW Total Present Demand Setpoint Return	
	199	None	Under kvar Total Present Demand Setpoint Return	
	200	None	Under kVA Total Present Demand Setpoint Return	

Table 5-13 SOE Event Classification

5.6 Device Setup

5.6.1 Basic Setup Parameters

Register	Property	Description	Format	Range/Unit
6000 [#]	RW	PT Primary Voltage ^{#1}	INT32	1V to 1,000,000V

				(Default = 100V)
6002 [#]	RW	PT Secondary Voltage ^{#1}	INT32	1V to 690V (Default = 100V)
6004 [#]	RW	CT Primary Current ^{#2}	INT32	1A to 30,000A (Default = 5A)
6006 [#]	RW	CT Secondary Current ^{#2}	INT32	1A to 5A*
6008-6010	RW	Reserved		
6011	RW	Wiring Mode	INT16	0=WYE*, 1=DELTA, 2=DEMO
6012	RW	Reserved		
6013	RW	Unit ID	INT16	1 to 247 (Default = 100)
6014	RW	Baud rate	INT16	0=1200, 1=2400, 2=4800 3=9600*, 4=19200, 5=38400
6015	RW	Comm. Config.	INT16	0=8N2, 1=8O1, 2=8E1* 3=8N1, 4=8O2, 5=8E2
6016	RW	AO Key ³	INT16	0* (Ia)
6017	RW	AO Zero Scale	INT32	-999,999 to 999,999
6019	RW	AO Full Scale	INT32	-999,999 to 999,999
6021	RW	AO Type	INT16	0=4-20mA*, 1=0-20mA
6022	RW	Phase A CT	INT16	0=Normal*, 1=Reversed
6023	RW	Phase B CT	INT16	0=Normal*, 1=Reversed
6024	RW	Phase C CT	INT16	0=Normal*, 1=Reversed
6025	RW	PF Convention	INT16	0=IEC*, 1=IEEE, 2=-IEEE
6026	RW	kVA Calculation	INT16	0=Vector*, 1=Scalar
6027	RW	Energy Pulse	INT16	0=Disable, 1=Enable*
6028	RW	Energy Pulse Constant ⁴	INT16	0=1000, 1=3200* 2=5000, 3=6400 4=12800, 5=100 6=400, 7=40 [^]
6029	RW	ARM before EXECUTE for DO remote control	INT16	0=Disabled, 1=Enabled*
6030	RW	Clear SOE ⁵	INT16	Writing "0xFF00" to the register clears SOE
6031	RW	Clear All Energy Registers	INT16	Writing "0xFF00" to the register to execute the described action..
6032	RW	Clear Peak Demand of This Month (Since Last Reset)~ and Last Month (Before Last Reset)	UINT16	Writing "0xFF00" to the register to execute the described action.
6033	RW	Clear All Demand ^{6~}	UINT16	
6034	RW	Demand Period~	UINT16	1 to 60 (minutes), 15*
6035	RW	Number of Sliding Windows~	UINT16	1 to 15, 1*
6036	RW	Self-Read Time ⁷	UINT16	Default=0xFFFF (Manual Reset)

*Default.

[#]Available in Firmware V1.00.03 (LED)/V1.01.03 (LCD) or later.

[~]Available in Firmware V1.00.04 (LED)/V1.01.04 (LCD) or later.

[^] Available in Firmware V1.00.07 (LED)/V1.01.07 (LCD) or later.

Table5-14 Setup Parameters

Notes:

- 1) PT Primary Voltage/PT Secondary Voltage must be no more than 10000. PT Ratio × CT Ratio x Rated Line Voltage x Rated Current must be less than 790,000,000.
- 2) When the Current Input is 2.5mA (SCCTA Option for 5A SCCT), the CT Primary Current and CT Secondary Current should be programmed to match the external CT's Primary and Secondary ratings, respectively. When the Current Input is 40mA (SCCT Option for 100A-800A SCCT), the CT Primary Current should be programmed as the selected SCCT's Nominal Current while the CT Secondary Current must be configured as 1.
- 3) AO Key

Value	Parameters	Value	Parameters	Value	Parameters
0	Ia	5	Ubc	10	kWc
1	Ib	6	Uca	11	kW Total
2	Ic	7	ULL avg	12	PF Total

3	I avg	8	kWa	13	FREQ
4	Uab	9	kWb		

Table 5-15 AO Key

In the table above, FREQ with a scale "×100, Hz", PF Total with a scale "×1000", the values of the other parameters in the registers are in accordance with the actual values.

4) Voltage, Current Specification and corresponding Pulse Constant

Voltage Inputs	Current Inputs	Pulse Constant options (imp/kWh)
57.7VLN/100VLL	1A	1000/3200/5000/6400/12800
	5A	1000/3200/5000/6400/12800
	2.5mA	1000/3200/5000/6400/12800
	40mA	40/100/400/1000
240VLN/415VLL	1A	1000/3200/5000/6400/12800
	5A	1000/3200/5000
	2.5mA	1000/3200/5000
	40mA	40/100/400

Table 5-16 Pulse Constant options

- 5) If a **SOE CLR** is performed from the front panel or via communications, the **SOE Pointer** will be reset to zero and then immediately incremented by one with a new "Setup Changes via Front Panel" or "Setup Changes via Communications" event.
- 6) Writing 0xFF00 to the **Clear All Demand** register to clear all Demand registers and logs, including Present Demand, Peak Demand Log of This Month (Since Last Reset) and Last Month (Before Last Reset).
- 7) The **Self-Read Time** applies to the Peak Demand Log and supports the following three 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.
 - A 0xFFFF value means the automatic self-read operation is disabled and the log will be transferred manually.

5.6.2 I/O Setup Parameters

The I/O setup parameters are available in Firmware V1.00.03 (LED)/V1.01.03 (LCD) or later for PMC-D726M with the I/O option.

Register	Property	Description	Format	Range, Default*
6100	RW	D11 Debounce	UINT16	1ms to 9999ms, 20*
6101	RW	D12 Debounce	UINT16	1ms to 9999ms, 20*
6102~6105	RW	Reserved		
6106	RW	DO1 Pulse Width	UINT16	0 to 6000 (x0.1s), 0 = Latch Mode 10*
6107	RW	DO2 Pulse Width	UINT16	

Table 5-17 I/O Setup

5.6.3 Setpoints Setup

Register	Property	Description	Format	Range, Default*	
6500	RW	Setpoint #1	Setpoint Type	UINT16	0=Disabled* 1=Over Setpoint 2=Under Setpoint
6501	RW		Parameters ¹	UINT16	0 to 12
6502	RW		Over Limit ²	INT32	0*
6504	RW		Under Limit ²	INT32	0*
6506	RW		Active Delay	UINT16	0 to 9999 s, 10*
6507	RW		Inactive Delay	UINT16	0 to 9999 s, 10*
6508	RW		Trigger Action 1 ³	UINT16	0 to 2
6509	RW		Trigger Action 2 ³	UINT16	
...	
6550	RW	Setpoint #6	Setpoint Type	UINT16	0=Disabled* 1=Over Setpoint 2=Under Setpoint
6551	RW		Parameter ¹	UINT16	0 to 12
6552	RW		Over Limit ²	INT32	0*
6554	RW		Under Limit ²	INT32	0*

6556	RW		Active Delay	UINT16	0 to 9999 s, 10*
6557	RW		Inactive Delay	UINT16	0 to 9999 s, 10*
6558	RW		Trigger Action 1 ³	UINT16	0 to 4
6559	RW		Trigger Action 2 ³	UINT16	

Table 5-18 Setpoint Setup Parameters

Notes:

1) The PMC-D726M provides the following Setpoint parameters:

Key	Parameter	Scale/Unit
0	None	-
1	ULN	x100, V
2	ULL	x100, V
3	I	x1000, A
4	In	x1000, A
5	FREQ	x100, Hz
6	kW Total	x1000, kW
7	kvar Total	x1000, kvar
8	kVA Total	x1000, kVA
9	P.F. Total	x1000
10	kW Total Demand	x1000, kW
11	kvar Total Demand	x1000, kvar
12	kVA Total Demand	x1000, kVA

Table 5-19 Setpoint Parameters

2) For Over Setpoint, the Setpoint parameter must exceed the **Over Limit** to become active and go below the **Under Limit** to become inactive.

For Under Setpoint, the Setpoint parameter must go below the **Under Limit** to become active and exceed the **Over Limit** to become inactive.

3) The PMC-D726M provides the following Setpoint Triggers:

Key	Action
0	None
1	DO1 Closed
2	DO2 Closed

Table 5-20 Setpoint Triggers

5.7 TOU Setup

5.7.1 Basic

Register	Property	Description	Format	Range, Default*
7000	RO	Current Tariff ¹	UINT16	0=T1, 1=T2, 2=T3, 3=T4
7001	RO	Current Season	UINT16	0 to 5 (Season #1 to #6)
7002	RO	Current Period	UINT16	0 to 5 (Period #1 to #6)
7003	RO	Current Daily Profile No.	UINT16	0 to 9 (Daily Profile #1 to #10)
7004	RO	Current Day Type	UINT16	0=Weekday1 1=Weekday2 2=Weekday3 3= Alternate Day
7005~7008	RW	Reserved	UINT16	
7009	RW	Sunday Setup	UINT16	0=Weekday1* 1=Weekday2 2=Weekday3
7010	RO	Monday Setup	UINT16	
7011	RO	Tuesday Setup	UINT16	
7012	RO	Wednesday Setup	UINT16	
7013	RO	Thursday Setup	UINT16	
7014	RO	Friday Setup	UINT16	
7015	RO	Saturday Setup	UINT16	

Table 5-21 TOU Basic Setup

5.7.2 Season

Register	Property	Description	Format	Range/Note
7100	RW	Season #1: Start Date	UINT16	0x0101
7101	RW	Season #1: Weekday#1 Daily Profile	UINT16	0 (Daily Profile #1) to 9 (Daily Profile #10)
7102	RW	Season #1: Weekday#2 Daily Profile	UINT16	
7103	RW	Season #1: Weekday#3 Daily Profile	UINT16	
7104	RW	Season #2: Start Date	UINT16	High-order Byte: Month Low-order Byte: Day
7105	RW	Season #2: Weekday#1 Daily Profile	UINT16	0 to 9
7106	RW	Season #2: Weekday#2 Daily Profile	UINT16	
7107	RW	Season #2: Weekday#3 Daily Profile	UINT16	
7108	RW	Season #3: Start Date	UINT16	See Season #2: Start Date
7109	RW	Season #3: Weekday#1 Daily Profile	UINT16	0 to 9
7110	RW	Season #3: Weekday#2 Daily Profile	UINT16	
7111	RW	Season #3: Weekday#3 Daily Profile	UINT16	
7112	RW	Season #4: Start Date	UINT16	See Season #2: Start Date
7113	RW	Season #4: Weekday#1 Daily Profile	UINT16	0 to 9
7114	RW	Season #4: Weekday#2 Daily Profile	UINT16	
7115	RW	Season #4: Weekday#3 Daily Profile	UINT16	
7116	RW	Season #5: Start Date	UINT16	See Season #2: Start Date
7117	RW	Season #5: Weekday#1 Daily Profile	UINT16	0 to 9
7118	RW	Season #5: Weekday#2 Daily Profile	UINT16	
7119	RW	Season #5: Weekday#3 Daily Profile	UINT16	
7120	RW	Season #6: Start Date	UINT16	See Season #2: Start Date
7121	RW	Season #6: Weekday#1 Daily Profile	UINT16	0 to 9
7122	RW	Season #6: Weekday#2 Daily Profile	UINT16	
7123	RW	Season #6: Weekday#3 Daily Profile	UINT16	

Table 5-22 Season Setup

Notes:

- 1) **Start Date** for Season #1 is Jan. 1st and cannot be modified.
- 2) Setting a Season's **Start Date** as 0xFFFF terminates the TOU's Season settings. All subsequent Seasons' setup parameters will be ignored since the previous Season's duration is from its **Start Date** to the end of the year.
- 3) The **Start Date** of a particular Season must be later than the previous Season's.

5.7.3 Daily Profile

Register	Property	Description	Format
7200~7211	RW	Daily Profile #1	See Table 5-24 Daily Profile Data Structure
7212~7223	RW	Daily Profile #2	
7224~7235	RW	Daily Profile #3	
7236~7247	RW	Daily Profile #4	
7248~7259	RW	Daily Profile #5	
7260~7271	RW	Daily Profile #6	
7272~7283	RW	Daily Profile #7	
7284~7295	RW	Daily Profile #8	
7296~7307	RW	Daily Profile #9	
7308~7319	RW	Daily Profile #10	

Table 5-23 TOU Daily Profile Setup

Offset	Property	Description	Format	Note
+0	RW	Period #1 Start Time	UINT16	0x0000
+1	RW	Period #1 Tariff	UINT16	0=T1, ..., 3=T4
+2	RW	Period #2 Start Time	High-order Byte: Hour	0 ≤ Hour < 24
			Low-order Byte: Min	
+3	RW	Period #2 Tariff	UINT16	0=T1, ..., 3=T4
+4	RW	Period #3 Start Time	UINT16	See Period #2 Start Time
+5	RW	Period #3 Tariff	UINT16	0=T1, ..., 3=T4
+6	RW	Period #4 Start Time	UINT16	See Period #2 Start Time
+7	RW	Period #4 Tariff	UINT16	0=T1, ..., 3=T4
+8	RW	Period #5 Start Time	UINT16	See Period #2 Start Time
+9	RW	Period #5 Tariff	UINT16	0=T1, ..., 3=T4
+10	RW	Period #6 Start Time	UINT16	See Period #2 Start Time

+11	RW	Period #6 Tariff	UINT16	0=T1, ..., 3=T4
-----	----	------------------	--------	-----------------

Table 5-24 Daily Profile Data Structure

Notes:

- 1) **Daily Profile #1's Period #1 Start Time** is always 00:00 and cannot be modified.
- 2) Setting a Period's **Start Time** as 0xFFFF terminates the Daily Profile's settings. All subsequent Daily Profiles' setup parameters will be ignored, and the previous Period's duration is from its **Start Time** to the end of the day.
- 3) The minimum interval of a period is 15 minutes.
- 4) The **Start Time** of a particular Period must be later than the previous Period's .

5.7.4 Alternate Days

Each Alternate Day is assigned a Daily Profile and has a higher priority than Season. If a particular date is set as an Alternate Day, its assigned Daily Profile will override the “normal” Daily Profile for this day according to the TOU settings.

Register	Property	Description	Format	Note
7700	RW	Alternate Day #1 Date ¹	UINT32	Table 5-26
7702	RW	Alternate Day #1 Daily Profile	UINT16	0 to 9
7703	RW	Alternate Day #2 Date ¹	UINT32	Table 5-26
7705	RW	Alternate Day #2 Daily Profile	UINT16	0 to 9
7706	RW	Alternate Day #3 Date ¹	UINT32	Table 5-26
7708	RW	Alternate Day #3 Daily Profile	UINT16	0 to 9
7709	RW	Alternate Day #4 Date ¹	UINT32	Table 5-26
7711	RW	Alternate Day #4 Daily Profile	UINT16	0 to 9
7712	RW	Alternate Day #5 Date ¹	UINT32	Table 5-26
7714	RW	Alternate Day #5 Daily Profile	UINT16	0 to 9
7715	RW	Alternate Day #6 Date ¹	UINT32	Table 5-26
7717	RW	Alternate Day #6 Daily Profile	UINT16	0 to 9
7718	RW	Alternate Day #7 Date ¹	UINT32	Table 5-26
7719	RW	Alternate Day #7 Daily Profile	UINT16	0 to 9
7721	RW	Alternate Day #8 Date ¹	UINT32	Table 5-26
7722	RW	Alternate Day #8 Daily Profile	UINT16	0 to 9
7724	RW	Alternate Day #9 Date ¹	UINT32	Table 5-26
7725	RW	Alternate Day #9 Daily Profile	UINT16	0 to 9
7727	RW	Alternate Day #10 Date ¹	UINT32	Table 5-26
7729	RW	Alternate Day #10 Daily Profile	UINT16	0 to 9

Table 5-25 Alternate Days Setup

Notes:

- 1) The following table illustrates the data structure of the Date register:

Byte 3	Byte 2	Byte 1	Byte 0
Reserved	Year-2000 (0-37)	Month (1-12)	Day (1-31)

Table 5-26 Date Format

When the Year and/or Month are set as 0xFF, it means the Alternate Day is repetitive by year and/or month, i.e. the same day of every year or every month is an Alternate Day.

5.8 Time

There are two sets of Time registers supported by the PMC-D726M – Year / Month / Day / Hour / Minute / Second (Registers # 60000 to 60002) and UNIX Time (Register # 60004). When sending time to the PMC-D726M 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 0x7FE8177F The corresponding time is 2000.01.01 00:00:00 to 2037.12.31 23:59:59 (GMT 0:00 Time Zone)

Table 5-27 Time Registers

5.9 DO 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-D726M does not support the Read Coils command (Function Code 0x01) because DO Control registers are “Write-Only”. The DO Status register 0096 should be read instead to determine the current DO status.

The PMC-D726M 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 (6029), which is **Enabled** 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 DO1 Close	UINT16	Writing “0xFF00” to the register to perform the described action.
9101	WO	Execute DO1 Close	UINT16	
9102	WO	Arm DO1 Open	UINT16	
9103	WO	Execute DO1 Open	UINT16	
9104	WO	Arm DO2 Close	UINT16	
9105	WO	Execute DO2 Close	UINT16	
9106	WO	Arm DO2 Open	UINT16	
9107	WO	Execute DO2 Open	UINT16	

Table 5-28 DO Control Registers

5.10 Meter Information

Register	Property	Description	Format	Note
9800~9819	RO	Meter model ¹	UINT16	See Note 1
9820	RO	Firmware Version	UINT16	e.g. 10111 means V1.01.11
9821	RO	Protocol Version	UINT16	e.g. 10 means V1.0
9822	RO	Firmware Update Date: Year-2000	UINT16	e.g. 160709 means July 9, 2016
9823	RO	Firmware Update Date: Month	UINT16	
9824	RO	Firmware Update Date:	UINT16	

		Day		
9825	RO	Serial Number	UINT32	e.g. 1601030100 means the 100 th PMC-D726M that was manufactured on January 3 rd , 2016
9827	RO	Reserved	UINT16	
9828	RO	D726X Model	UINT16	3=D726M, Others=Reserved
9829	RO	Feature Number	Bitmap	B4B3B2B1B0: 0xx00=No DI/DO/AO 0xx01=2 DIs 0xx10=1 DO 0xx11=1 AO 1xx00=2 DIs+2 DOs 1xx01=2 DIs+2 Pulse Outputs Bits 5 to 15: Reserved
9830	RO	Current Input	UINT16	1A / 5A ² / 40 mA~
9831	RO	Voltage Input	UINT16	120 / 415 (V)

*Default

~ Available in Firmware V1.00.07 (LED)/V1.01.07 (LCD) or later

Table 5-29 Meter Information

Notes:

- 1) The Meter Model appears from registers 9800-9819 and contains the ASCII encoding of the string "PMC-D726M" as shown in the following table.

Register	Value(Hex)	ASCII
9800	0x50	P
9801	0x4D	M
9802	0x43	C
9803	0x2D	-
9804	0x44	D
9805	0x37	7
9806	0x32	2
9807	0x36	6
9808	0x4D	M
9809~9819	0x20	Null

Table 5-30 ASCII Encoding of "PMC-D726M"

- 2) For 2.5mA (SCCTA Option for 5A SCCT) Current Input, the **Current Input** would be read as 5A too.

Appendix A Technical Specifications

Voltage Inputs (V1, V2, V3, VN)	
Standard Range	240VLN/415VLL
Starting Voltage	10V to 120% Un
PT Ratio	10V
Overload	1-1,000,000 (Primary), 1-690 (Secondary)
Burden	1.2xUn continuous, 2xUn for 1s
Frequency	<0.02VA per phase
Current Inputs (I11, I12, I21, I22, I31, I32)	
Standard Input	45-65Hz
Optional Input	5A
CT Ratio	1A
Optional SCCT Input	1-30,000 (Primary), 1-5 (Secondary)
Range	2.5mA (SCCTA Option for 5A SCCT)
Starting Current	40mA (SCCT Option for 100-800A SCCT)
Overload	0.1% to 120% In
Burden	0.1% In
	1.2xIn continuous, 10xIn for 10s, 20xIn for 1s
	<0.25VA per phase
Power Supply (L/+, N/-, GND)	
Standard	95-250VAC/DC, ±10%, 47-440Hz
Burden	<2W
Digital Inputs (DI1, DI2, DIC)	
Type	Dry contact, 24VDC internally wetted
Sampling	1000Hz
Hysteresis	1ms minimum
Digital Outputs (DO11, DO12, DO21, DO22)	
Type	Form A Mechanical Relay
Loading	5A @ 250VAC or 30VDC
Analog Output (AO+, AO-)	
Type	0-20 / 4-20 mA
Parameter	Selectable
Loading	500 Ω maximum
Overload	24 mA maximum
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
Mechanical Characteristics	
Panel Cutout	68x68 mm
Unit Dimensions	72x72x71.8 mm (LCD), 72x72x76.8 mm (LED)
IP Rating	52
Shipping Weight	0.802 kg
Shipping Dimensions	125x110x80 mm

Accuracy

▪ **5A/1A Current Input**

Parameters	Accuracy	Resolution
Voltage	±0.2% reading	0.1V
Current	±0.2% reading	0.001A
kW, kvar, kVA	±0.5% reading	0.001kX
kWh	IEC 62053-21 Class 1	0.01kWh
kvarh	IEC 62053-23 Class 2	0.01kvarh
P.F.	±1.0% reading	0.001
Frequency	±0.02 Hz	0.01Hz
AO	±1% F.S.	-
Harmonics	IEC 61000-4-7 Class B	0.1%
K-Factor	IEC 61000-4-7 Class B	0.1

▪ **40mA SCCT Input**

Parameters	Accuracy	Resolution
Voltage	±0.5% reading	0.1V
Current	±1% reading	0.001A
kW, kvar, kVA	±1% reading	0.001kX
kWh	IEC 62053021 Class 1	0.01kWh
kvarh	IEC 62053-23 Class 2	0.01kvarh
P.F.	±1.0% reading	0.001
Frequency	±0.02 Hz	0.01Hz
AO	±1% F.S.	-
Harmonics	IEC 61000-4-7 Class B	0.1%
K-Factor	IEC 61000-4-7 Class B	0.1

▪ **2.5mA SCCT Input**

Parameters	Accuracy	Resolution
Voltage	±0.5% reading	0.1V
Current	±1% reading	0.001A
kW, kvar, kVA	±1.5% reading	0.001kX
kWh	IEC 62053-21 Class 2	0.01kWh
kvarh	IEC 62053-23 Class 2	0.01kvarh
P.F.	±1.5% reading	0.001
Frequency	±0.02 Hz	0.01Hz
AO	±1% F.S.	-
Harmonics	IEC 61000-4-7 Class B	0.1%
K-Factor	IEC 61000-4-7 Class B	0.1

Appendix B Standards Compliance

Safety Requirements		
CE LVD 2006 / 95 / EC		EN 61010-1-1: 2001 EN 61010-2-030: 2010
Insulation Dielectric test: Insulation resistance: Impulse voltage:		IEC 60255-5: 2000 2kV @ 1 minute >100MΩ 6kV, 1.2/50μs
Electromagnetic Compatibility CE EMC Directive 2004 / 108 / EC (EN 61326: 2006)		
Immunity Tests		
Electrostatic discharge		EN 61000-4-2: 2009
Radiated fields		EN 1000-4-3: 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 61000-4-11: 2004
Oscillatory waves		EN 61000-4-2: 2009
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 (CISPR 22)
Limits for harmonic current emissions for equipment with rated current ≤16 A		EN 61000-3-2: 2006+A1: 2009 +A2: 2009
Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤16 A		EN 61000-3-3: 2008
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		IEC 60255-25: 2000
Mechanical Tests		
Vibration Test	Response	IEC 255-2-1: 1989 Level I
	Endurance	IEC 255-2-1: 1989 Level I
Shock Test	Response	IEC 255-2-2: 1989 Level I
	Endurance	IEC 255-2-2: 1989 Level I
Bump Test		IEC 255-2-2: 1989 Level I

Appendix C Ordering Guide

Product Code		Description								
PMC-D726M		DIN72 3-Phase Multifunction Meter								
Display Screen										
" "			LED							
L			LCD							
Input Current										
5			5A							
1			1A							
SCCT*			For use with 100A, 200A, 400A and 800A SCCTs with 40mA Output							
SCCTA*			For use with 5A SCCT with 2.5mA Output							
Input Voltage										
3			240V/415V							
Power Supply										
2			95-250V AC/DC, 47-440Hz							
System Frequency										
5			45-65Hz							
I/O										
X			None							
A*			2xDI							
C*			1xAO							
D*			2xDI+2xDO							
E*			2xDI+2xSSR Pulse Output							
Communications										
X			None							
A			1xRS-485 Port, Modbus							
Display Language										
E			English							
PMC-D726M	-	5	3	2	5	X	A	E	PMC-D726M-5325XAE (LED Example)	
PMC-D726M	-	L	5	3	2	5	X	A	E	PMC-D726M-L5325XAE (LCD Example)

* Additional charges apply

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