PMC-352-D

DIN-Rail DC Energy Meter

User Manual

Version: V0.9

March 6, 2024

Standards Compliance

CE

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 Electric Technology (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

Chapter 1 Introduction

This manual explains how to use the PMC-352-D DIN-Rail DC Energy Meter.

This chapter provides an overview of the PMC-352-D meter and summarizes many of its key features.

1.1 Overview

The PMC-352-D DIN-Rail DC Energy Meter is CET's latest offer for the low-cost DC metering market. Designed in a compact DIN form factor measuring 36x65x90mm, it is perfect for DC metering application in a space-limited environment. The PMC-352-D comes standard with 3xCurrent Inputs, 4xNTC Inputs for temperature monitoring and 3xDI for status monitoring. It also optionally provides 1xIresidual Input for Residual Current measurement. The standard SOE Log records meter events such as power-off, setup changes and DI operations in 1ms resolution. With a standard RS-485 port supporting the Modbus RTU protocol, the PMC-352-D becomes a vital component of an intelligent, wireless, multifunction monitoring solution for any DC Power and Energy Management systems.

Following is a list of typical applications for the PMC-352-D:

- DC Inverter, DC Panel Metering and DC Charging Station
- Industrial and commercial DC metering
- DC Distribution Monitoring and Data Center
- Wireless Energy & Condition Monitoring of DC Charging Stations

Contact CET Technical Support at support@cet-global.com should you require further assistance with your application.

1.2 Features

Ease of Use

- Easy installation with DIN Rail mounting, no tools required
- Simple commissioning and low-deployment cost with Hall Effect Solid-Core CT and optional wireless IoT communication

Basic Measurement

- 1xDC Voltage Input and 3xDC Current Inputs
- 3xDC Sub-Meters (SM), each with Current, kW, kWh, Current and kW Demand

Setpoint

- 10 user programmable Setpoints with extensive list of monitoring parameters including Current, kW and kW Total, Temperature, Residual Current and Demand measurements
- Configurable thresholds and time delays

SOE Log

- 16 events time-stamped to ±1ms resolution
- Setup changes, Setpoint Alarms, DI Status changes, Clear Actions, etc.

I/O

- 3xDI for Status Monitoring
- 4xNTC Inputs for Temperature Monitoring (sensor not included)
- Optional 1xIresidual Input for Residual Current Measuring

Communications

- Optically isolated RS-485 port at 1,200 to 38,400 bps

System Integration

- Supported by our PecStar® iEMS and PMC Setup
- Easy integration into other Automation or SCADA systems via Modbus RTU protocol or IoT based Energy Management System via LoRa

1.3 PMC-352-D's application in Power and Energy Management System

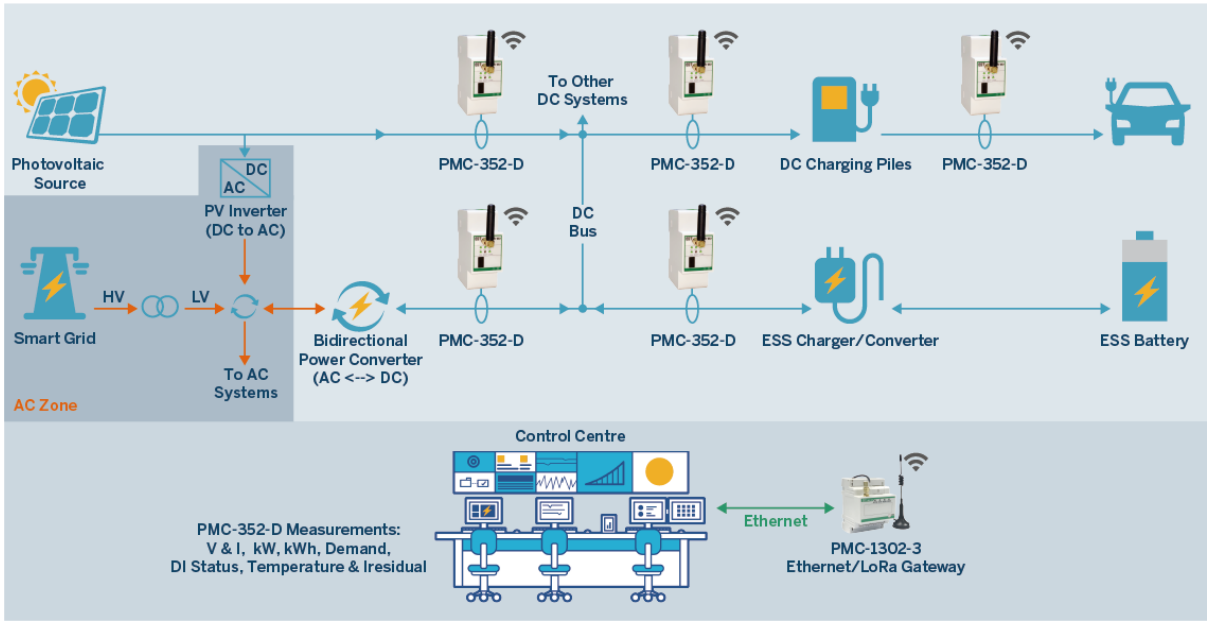


Figure 1-1 PMC-352-D's application in Power and Energy Management System

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-352-D 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

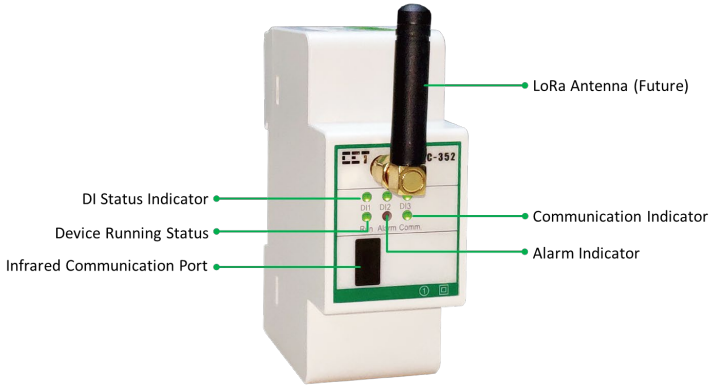


Figure 2-1 Front Panel

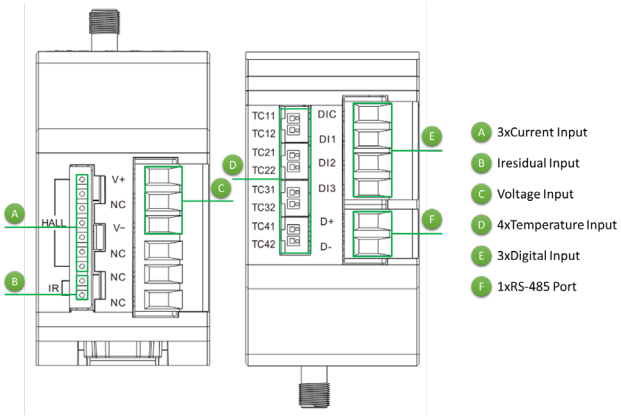


Figure 2-2 Terminals Diagram

2.2 LED Indicators

There are six LED indicators on the PMC-352-D's Front Panel as described below:

Indicator	Color	Status	Description
DI1/DI2/DI3	Green	On	Corresponding DI channel is closed
		Off	Corresponding DI channel is open
Run	Green	Blink for one second	Device is running normally
		Off	Power Off or Device is running abnormally
Alarm	Red	On	Setpoint Alarm Active
		Off	Setpoint Alarm Inactive
Comm.	Green	Flashing	Receiving or transmitting data via RS-485
		Off	No Communication

Table 2-1 LED Indicator Descriptions

2.3 Hall Effect Solid Core CT Appearances & Specifications

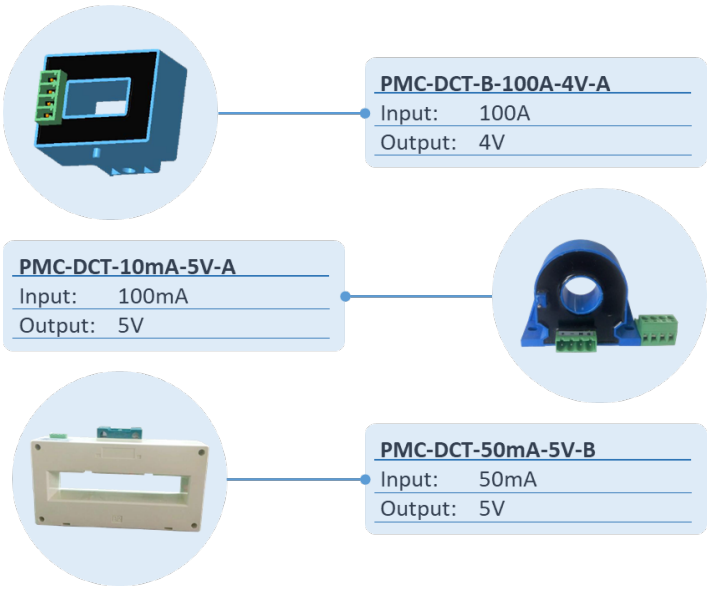


Figure 2-3 Hall Effect Solid Core CT Appearances & Specifications

2.4 CT Adaptor Appearances & Specifications

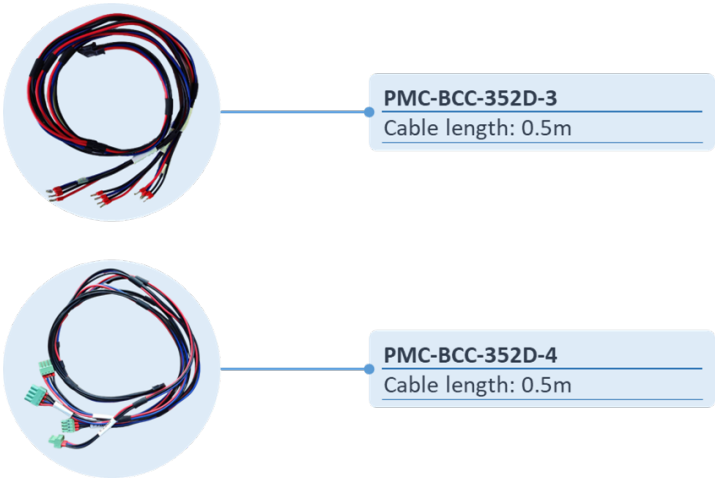
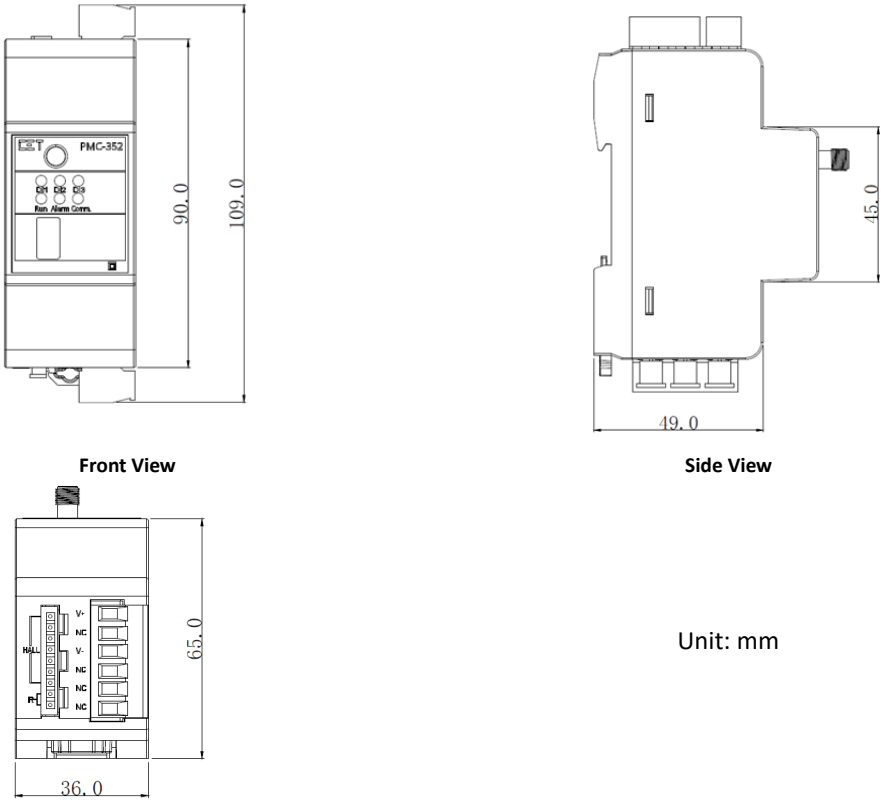


Figure 2-4 CT Adaptor Appearances & Specifications

2.5 Dimensions

2.5.1 Device Dimensions



Front View

Side View

Bottom View

Unit: mm

Figure 2-5 Device Dimensions

2.5.2 Terminal Dimensions

Terminal	Terminal Dimensions	Wire Size	Max. Torque
Voltage Input, Digital Input, RS-485 Port	☐2.6mmx3.2mm	1.5mm^2	5.0kgf.cm/M3.0 (4.3lb-in)

Table 2-2 Terminal Dimensions

2.5.3 NTC Dimensions

2.5.3.1 NTC-104/NTC-1043/NTC-1044

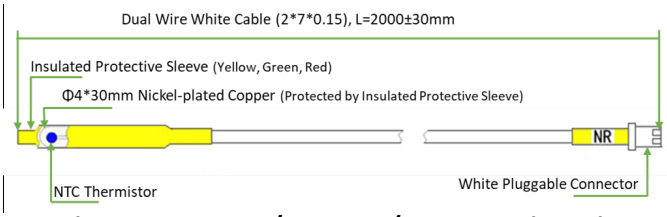


Figure 2-6 NTC-104/NTC-1043/NTC-1044 Dimensions

2.5.3.2 NTC-104M4/NTC-104M10

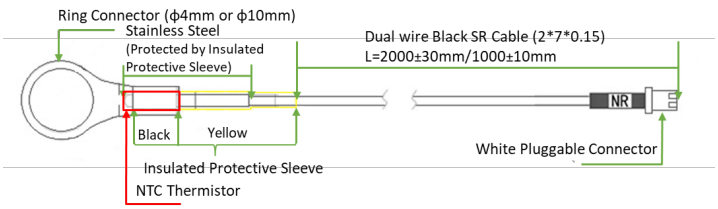


Figure 2-7 NTC-103M4/NTC-104M10 Dimensions

2.6 DIN-Rail Installation

The PMC-352-D should be installed in a dry environment with no dust and kept away from heat, radiation and electrical noise source.

1. Before installation, make sure the DIN Rail is already in place.
2. Move the installation clips at the back of the PMC-352-D downward to the “unlock” position.
3. Align the top of the mounting channel at the back of the PMC-352-D at an angle against the top of the DIN Rail as shown in Figure 2-8 below.
4. Rotate the bottom of the PMC-352-D towards the back while applying a slight pressure to make sure that the device is completely and securely fixed on to the DIN Rail.
5. Push the installation clips upward to the “lock” position to secure the PMC-352-D on to the DIN Rail.

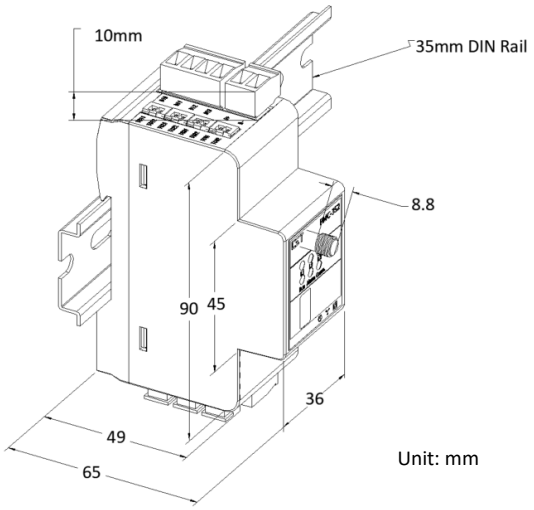


Figure 2-8 DIN-Rail Installation

2.7 Wiring Connection

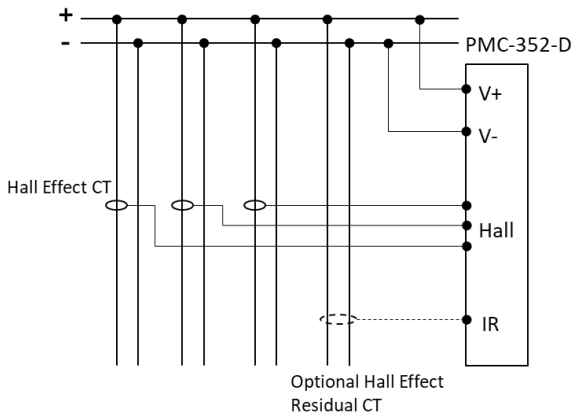


Figure 2-9 Wiring Connection

Notes:

1) The meter is self-powered from the voltage input.
2) Confirm that the Sensor’s primary and secondary ratings are correct before installation.
3) Please remember that:
    a. The Hall Effect Sensor has a Voltage Output.
    b. Caution should be exercised during installation of Hall Effect Sensor. Using the incorrect Sensor may cause permanent damage to the meter.

2.8 RS-485 Wiring

The PMC-352-D provides one standard RS-485 port that supports the Modbus RTU protocol. Up to 32 devices can be connected on an RS-485 bus. The overall length of the RS-485 cable connecting all devices should not exceed 1200m.

If the master station does not have a RS-485 communications port, an Ethernet-to-RS-485 gateway or USB/RS-485 converter with optically isolated outputs and surge protection should be used. The following figure illustrates the RS-485 connections on the PMC-352-D.

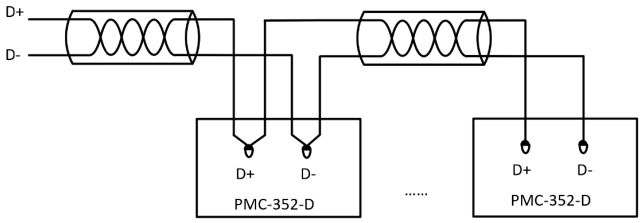


Figure 2-10 RS-485 Wiring

2.9 Digital Input Wiring

The following figure illustrates the Digital Input connections:

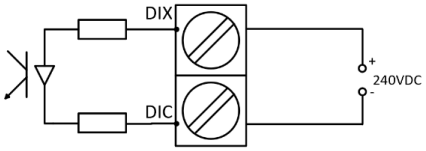


Figure 2-11 DI Connections

2.10 NTC Input Wiring

The following figure illustrates the NTC Input connections on the PMC-352-D.

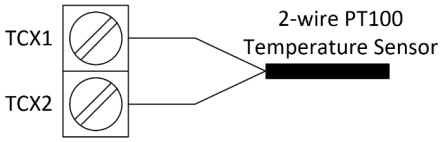


Figure 2-12 NTC Input Connections

Chapter 3 Application

3.1 Inputs

3.1.1 Digital Inputs

The PMC-352-D comes standard with three Digital Inputs externally excited by 240VDC. Digital Inputs on the PMC-352-D can be used for status monitoring which can help prevent equipment damage, improve maintenance, and track security breaches. The real-time status of the Digital Inputs are available through communications. Changes in Digital Input status are stored as events in the SOE Log in 1ms resolution.

The following table describes the DI setup parameters that can be programmed over communications:

Setup Parameter	Definition	Options/Default*
DIx Function	Each **DI** can be configured as a Status Input.	0=Status Input*
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.	100 to 9999 (ms) 100*

Table 3-1 Digital Input Setup Parameters

3.1.2 NTC Temperature Input

The PMC-352-D provides four NTC Inputs for temperature measurements. The thermistor sensors are not included and should be ordered separately if required. The 2-wire outputs of the thermistor sensor are connected to the NTC Input of the PMC-352-D. The PMC-352-D can provide accurate temperature monitoring with the standard NTC inputs for measuring the temperature of the conductor or other equipment.

3.1.3 Optional Residual Current Input

The PMC-352-D optionally provides one Ir input for Residual Current measurement via external Hall Effect sensor. The Ir measurement can be set as the Setpoint Source to trigger an alarm when a threshold value is exceeded.

3.2 Power and Energy

3.2.1 Basic Measurements

The PMC-352-D provides the measurements for DC voltage, Residual Current, TC1 to TC4, and 3 x Sub-Meter (SM) DC Current, kW as well as kW Total. All the measurements are available through communications.

3.2.2 Energy Measurements

The PMC-352-D's Energy measurements include SM1-3 kWh at a resolution of 0.01 and a maximum value of 10,000,000.00 kWh. When the maximum value is reached, it will automatically roll over to zero.

The Energy can be reset manually through the communications.

3.2.3 Demand Measurements

Demand is defined as the highest average power consumption over a fixed interval (usually 15 minutes) within the billing period. PMC-352-D provides Present Demand for SM1-3 Current and kW as well as kW Total.

The PMC-352-D provides the following Demand setup parameters:

Setup Parameter	Definition	Options
Demand Period	See the **Options**. 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 (min) Default=15
# of Sliding Windows	Number of Sliding Windows.	1 to 15 Default=1

Table 3-2 Demand Setup

3.3 Setpoint

The PMC-352-D comes standard with 10 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.

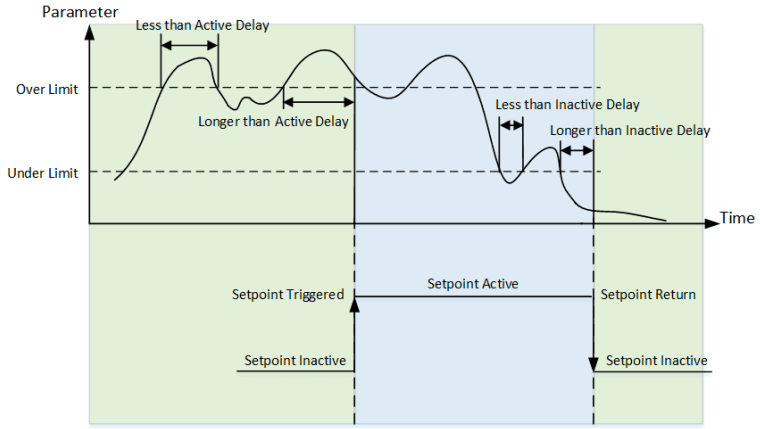


Figure 3-1 Over Setpoint

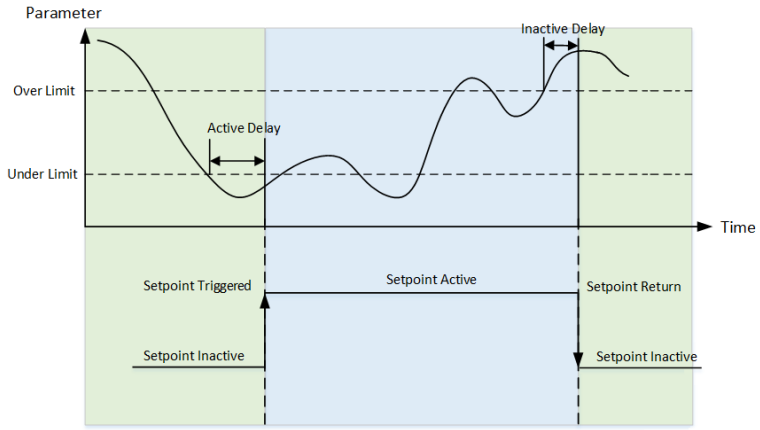


Figure 3-2 Under Setpoint

Setpoints can be programmed via communication and have the following setup parameters:

Parameter	Definition	Options/Default*
Setpoint Type	Over or Under Setpoint.	0=Disabled* 1=Over Setpoint 2=Under Setpoint
Setpoint Parameter	Specify the parameter to be monitored.	See Table 3-4
Over Limit	Specify the value that the setpoint parameter must exceed for Over Setpoint to become active or for Under Setpoint to become inactive.	999,999*
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
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
Trigger (Reserved)	Specify what action a setpoint would take when it becomes active.	0 = None*

Table 3-3 Description for Setpoint Parameters

The table below illustrates the Setpoint Parameters.

Key	Setpoint Parameter	Scale	Unit
0	None	-	-
1-21	Reserved	-	-
22	SM1 Current Demand	x1	A
23	SM2 Current Demand	x1	A
24	SM3 Current Demand	x1	A
25	SM1 kW Demand	x1	kW
26	SM2 kW Demand	x1	kW
27	SM3 kW Demand	x1	kW
28	TC1	x1	˚C
29	TC2	x1	˚C
30	TC3	x1	˚C
31	TC4	x1	˚C
32	SM1 Current	x1	A
33	SM2 Current	x1	A
34	SM3 Current	x1	A
35	Voltage	x1	V
36	SM1 kW	x1	kW
37	SM2 kW	x1	kW
38	SM3 kW	x1	kW
39	kW Total	x1	kW
40	Iresidual	x1	mA

Table 3-4 Setpoint Parameters

Notes:

1. The **Trigger** registers are reserved and the **Alarm** indicator on the Front Panel would be lit when any Setpoint becomes active. The Setpoint status is stored in the register 0033.

3.4 SOE Log

The PMC-352-D's SOE Log can store up to 16 events such as Power-on, Power-off, Digital Input status changes, Setup changes and Setpoint events in its non-volatile memory. Each event record includes the event classification, its relevant parameter values and a timestamp in ±1 ms resolution. The SOE Log can be retrieved or reset via communications. If there are more than 16 events, the newest event will replace the oldest event on a First-In-First-Out basis.

Chapter 4 Modbus Map

This chapter provides a complete description of the Modbus register map (**Protocol Version 1.0**) for the PMC-352-D to facilitate the development of 3rd party communications driver for accessing information on the PMC-352-D. For a complete Modbus Protocol Specification, please visit http://www.modbus.org. The PMC-352-D 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-352-D 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

4.1 Basic Measurements

Register	Property	Description	Format	Unit
0000	RO	DC Voltage	Float	V
0002	RO	SM1 Current	Float	A
0004	RO	SM2 Current	Float	A
0006	RO	SM3 Current	Float	A
0008	RO	Iresidual	Float	mA
0010	RO	SM1 kW	Float	kW
0012	RO	SM2 kW	Float	kW
0014	RO	SM3 kW	Float	kW
0016	RO	kW Total	Float	kW
0018	RO	TC1	Float	°C
0020	RO	TC2	Float	°C
0022	RO	TC3	Float	°C
0024	RO	TC4	Float	°C
0026	RO	Wiring Diagnostic[1]	UINT16	--
0027-0028	--	Reserved	--	--
0029	RO	DI Status[2]	UINT16	--
0030	--	Reserved	--	--
0031	RO	TC Sensor Status[3]	UINT16	--
0032	--	Reserved	--	--
0033	RO	Setpoint Status[4]	UINT16	--
0034	--	Reserved	--	--
0035	RO	SOE Log Pointer[5]	UINT32	--
0037	RO	Device Running Time	UINT32	x0.1hour
0039	--	Reserved	--	--

Table 4-1 Basic Measurements

Notes:

1. For the **Wiring Diagnostic** register, the bit values of B0 to B3 represent the wiring states of Voltage and SM1 to SM3 Current, respectively, with “1” meaning “Reverse” and “0” meaning “Normal”.
2. For the **DI Status** register, the bit values of B0 to B2 represent the states of DI1 to DI3, respectively, with “1” meaning Active (Closed) and “0” meaning Inactive (Open).
3. For the **TC Sensor Status** register, the bit values of B0 to B3 represents the sensor states of TC1 to TC4, respectively, with “1” meaning “Disconnected” and “0” meaning "Normal”.
4. For the **Setpoint Status** register, the bit values of B0 to B9 represents the states of Setpoint #1 to Setpoint #10, respectively, with “1” meaning “Active” and “0” meaning "Return”.
5. The range of the SOE Log Pointers is between 0 and 0xFFFFFFFFH. The Log Pointer is incremented by one for every new log generated and will roll over to 0 if its current value is 0xFFFFFFFFH. If a Clear SOE Log is performed via communications, the corresponding Log Pointer will be reset to zero. Therefore, any 3rd party software should assume that a Clear Log action has been performed if it sees the SOE Log Pointer rolling over to zero or to a value that is smaller than its own pointer.

4.2 Energy Measurements

The Energy registers have a maximum value of 1,000,000,000 and will roll over to zero automatically when it is reached. The actual energy value is 0.01 times of the register value.

Register	Property	Description	Format	Scale	Unit
0500	RW	kWh Total	INT32	x0.01	kWh
0502	RW	SM1 kWh	INT32	x0.01	kWh
0504	RW	SM2 kWh	INT32	x0.01	kWh
0506	RW	SM3 kWh	INT32	x0.01	kWh

Table 4-2 Energy Measurements

4.3 Present Demand

Register	Property	Description	Format	Scale	Unit
3000	RO	SM1 Current	Float	x1	A
3002	RO	SM2 Current	Float	x1	A
3004	RO	SM3 Current	Float	x1	A
3006	RO	SM1 kW	Float	x1	kW
3008	RO	SM2 kW	Float	x1	kW
3010	RO	SM3 kW	Float	x1	kW
3012	RO	kW Total	Float	x1	kW

Table 4-3 Present Demand

4.4 SOE Log

The SOE Log Pointer points to the register address within the SOE Log where the next event will be stored. The following formula is used to determine the register address of the most recent SOE event referenced by the SOE Log Pointer value:

Register Address = 10000 + Modulo (SOE Log Pointer-1/16)*8

Register	Property	Description	Format
10000-10007	RO	Event 1	See **Note 1)**
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 4-4 SOE Log

Notes:

1. SOE Log Data Structure

Offset	Property	Description	Unit
+0	RO	Hi: Event Classification	See Table 4-6
	RO	Lo: Sub-Classification	
+1	RO	Hi: Year	0-37 (Year-2000)
	RO	Lo: Month	1 to 12
+2	RO	Hi: Day	1 to 31
	RO	Lo: Hour	0 to 23
+3	RO	Hi: Minute	0 to 59
	RO	Lo: Second	0 to 59
+4	RO	Millisecond	0 to 999
+5	RO	Hi: Reserved	-
	RO	Lo: Status[2]	-
+6 to +7	RO	Event Value[3]	-

Table 4-5 SOE Log Data Structure

2. The return value “01” means DI Inactive /Active (including Setpoint & Diagnosis)/Connection Fault; and the return value “00” means DI Active /Setpoint Return/Connection Restore.
3. The returned Event Value (for SOE Event Classification=Setpoint only) is in Float format, and please refer to Table 4-12 to check the Unit for each parameter.
4. SOE Classification

Event Classification	Sub-Classification	Status	Event Value	Description
1=DI Changes	1	1/0	0	DI1 Active / DI1 Inactive
	2	1/0	0	DI2 Active / DI2 Inactive
	3	1/0	0	DI3 Active / DI3 Inactive
2	Reserved			
	22	1/0	Setpoint Value (Float)	SM1 Current Present Demand Over Setpoint Active/Return
	23	1/0		SM2 Current Present Demand Over Setpoint Active/Return
	24	1/0		SM3 Current Present Demand Over Setpoint Active/Return
	25	1/0		SM1 kW Present Demand Over Setpoint Active/Return
	26	1/0		SM2 kW Present Demand Over Setpoint Active/Return
	27	1/0		SM3 kW Present Demand Over Setpoint Active/Return
	28	1/0		TC1 Over Setpoint Active/Return
	29	1/0		TC2 Over Setpoint Active/Return
	30	1/0		TC3 Over Setpoint Active/Return
	31	1/0		TC4 Over Setpoint Active/Return
	32	1/0		SM1 Current Over Setpoint Active/Return
	33	1/0		SM2 Current Over Setpoint Active/Return
	34	1/0		SM3 Current Over Setpoint Active/Return
	35	1/0		Voltage Over Setpoint Active/Return
	36	1/0		SM1 kW Over Setpoint Active/Return
	37	1/0		SM2 kW Over Setpoint Active/Return
	38	1/0		SM3 kW Over Setpoint Active/Return
	39	1/0		kW Total Over Setpoint Active/Return
	40	1/0		Iresidual Over Setpoint Active/Return
	41-61	--	--	Reserved
	62	1/0	Setpoint Value (Float)	SM1 Current Present Demand Under Setpoint Active/Return
	63	1/0		SM2 Current Present Demand Under Setpoint Active/Return
	64	1/0		SM3 Current Present Demand Under Setpoint Active/Return
	65	1/0		SM1 kW Present Demand Under Setpoint Active/Return
	66	1/0		SM2 kW Present Demand Under Setpoint Active/Return
	67	1/0		SM3 kW Present Demand Under Setpoint Active/Return
	68	1/0		TC1 Under Setpoint Active/Return
	69	1/0		TC2 Under Setpoint Active/Return
	70	1/0		TC3 Under Setpoint Active/Return
	71	1/0		TC4 Under Setpoint Active/Return
	72	1/0		SM1 Current Under Setpoint Active/Return
	73	1/0		SM2 Current Under Setpoint Active/Return
	74	1/0		SM3 Current Under Setpoint Active/Return
	75	1/0		Voltage Under Setpoint Active/Return
	76	1/0		SM1 kW Under Setpoint Active/Return
	77	1/0		SM2 kW Under Setpoint Active/Return
	78	1/0		SM3 kW Under Setpoint Active/Return
	79	1/0		kW Total Under Setpoint Active/Return
	80	1/0		Iresidual Under Setpoint Active/Return
4=Self-diagnosis	1	1	0	System Parameter Fault
	2	1	0	Internal Parameter Fault
	3	1	0	Reserved
	4	1	0	Memory Fault
5=Operations	1	0	0	Reserved
	2	0	0	Power Off
	3-29	0		Reserved
	30	0	0	Clear All Energy Registers via Comm.[5]
	31-36	0	0	Reserved
	37	0	0	Clear All Data via Comm. [6]
	38	0	0	Clear SOE Log via Comm.
	39-40	0	0	Reserved
	41	0	0	Clear Device Operating Time via Comm.
	42	0	0	Reserved

	43	0	0	Setup Changes via Comm.
	44	0	0	Preset Energy Value via Comm.

Table 4-6 SOE Classification

4.5 Device Setup

4.5.1 Basic Setup

Register	Property	Description	Format	Range, Default*
6000	RW	SM1 Hall Effect Sensor Primary	UINT16	1 to 10,000A, 100*
6001	RW	SM1 Hall Effect Sensor Secondary	UINT16	1 to 1,000V (x0.01V), 400*
6002	RW	SM2 Hall Effect Sensor Primary	UINT16	1 to 10,000A, 100*
6003	RW	SM2 Hall Effect Sensor Secondary	UINT16	1 to 1,000V (x0.01V), 400*
6004	RW	SM3 Hall Effect Sensor Primary	UINT16	1 to 10,000A, 100*
6005	RW	SM3 Hall Effect Sensor Secondary	UINT16	1 to 1,000V (x0.01V), 400*
6006	RW	Nominal Voltage	UINT16	1 to 400 (V), 240*
6007	RW	Enable Demo Mode	UINT16	0=No*, 1=Yes
6008	RW	Residual Hall Effect Sensor Primary	UNIT16	1 to 3000 (mA), 10*
6009	RW	Residual Hall Effect Sensor Secondary	UINT16	1 to 1,000 (x0.01V), 500*
6010-6029	--	Reserved	--	--
6030	RW	Demand Period	UINT16	1 to 60 (min), 15*
6031	RW	No. of Sliding Windows	UINT16	1 to 15, 1*

Table 4-7 Basic Setup

4.5.2 DI Setup

Register	Property	Description	Format	Range, Default*
6200	RW	DI1 Function	UINT16	0=Digital Input*
6201	RW	DI2 Function	UINT16	0=Digital Input*
6202	RW	DI3 Function	UINT16	0=Digital Input*
6203-6207	--	Reserved	--	--
6208	RW	DI1 Debounce Time	UINT16	100 to 9,999 (ms), 100*
6209	RW	DI2 Debounce Time	UINT16	100 to 9,999 (ms), 100*
6210	RW	DI3 Debounce Time	UINT16	100 to 9,999 (ms), 100*

Table 4-8 DI Setup

4.5.3 Communication Setup

Register	Property	Description	Format	Range, Default*
6400	RW	RS-485 Port Protocol	UINT16	0=Modbus RTU*
6401	RW	Unit ID	UINT16	1 to 247, 100*
6402	RW	Baud Rate[1]	UINT16	0=1200, 1=2400, 2=4800, 3=9600*, 4=19200, 5=38400
6403	RW	Data Format	UINT16	0=8N2, 1=8O1, 2=8E1* 3=8N1, 4=8O2, 5=8E2

Table 4-9 Communication Setup

4.5.4 Setpoint 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	UINT16	0* to 40
6502	RW		Over Limit	Float	999,999*
6504	RW		Under Limit	Float	0*
6506	RW		Active Delay	UINT16	0* to 9999 (s)
6507	RW		Inactive Delay	UINT16	0* to 9999 (s)
6508	RW		Trigger 1 (Reserved)	UINT16	0=None
6509	RW		Trigger 2 (Reserved)	UINT16	
…		…			…
6590	RW	Setpoint #10	Setpoint Type	UINT32	0=Disabled* 1=Over Setpoint 2=Under Setpoint
6591	RW		Parameter	UINT16	0* to 40
6592	RW		Over Limit	Float	999,999*
6594	RW		Under Limit	Float	0*
6596	RW		Active Delay	UINT16	0* to 9999 (s)

6597	RW		Inactive Delay	UINT16	0* to 9999 (s)
6598	RW		Trigger 1 (Reserved)	UINT16	0=None
6599	RW		Trigger 2 (Reserved)	UINT16	

Table 4-10 Setpoint Setup

Notes:

1. The table below illustrates the Setpoint Parameters.

Key	Setpoint Parameter	Scale	Unit
0	None	-	-
1-21	Reserved	-	-
22	SM1 Current Demand	x1	A
23	SM2 Current Demand	x1	A
24	SM3 Current Demand	x1	A
25	SM1 kW Demand	x1	kW
26	SM2 kW Demand	x1	kW
27	SM3 kW Demand	x1	kW
28	TC1	x1	°C
29	TC2	x1	°C
30	TC3	x1	°C
31	TC4	x1	°C
32	SM1 Current	x1	A
33	SM2 Current	x1	A
34	SM3 Current	x1	A
35	Voltage	x1	V
36	SM1 kW	x1	kW
37	SM2 kW	x1	kW
38	SM3 kW	x1	kW
39	kW Total	x1	kW
40	Iresidual	x1	mA

Table 4-11 Setpoint Parameters

2. For the PMC-352-D, the **Trigger** registers are reserved and the **Alarm** indicator on the Front Panel would be lit when any Setpoint becomes active. The Setpoint status is stored in the register 0033.

4.5.5 Time Registers

There are two sets of Time registers supported by the PMC-352-D – Year/Month/Day/Hour/Minute/ Second (Register # 60000 to 60002) and UNIX Time (Register # 60004). When sending time to the PMC-352-D 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	This time shows the number of seconds since 00:00:00 January 1, 1970

Table 4-12 Time Registers

4.5.6 Clear/Reset Control

Register	Property	Description	Format	Note
9600	WO	Reserved	UINT16	Writing "0xFF00" to the register to execute the
9601	WO	Clear All Energy		
9602-9606	WO	Reserved		
9607	WO	Clear Device Operating Time		

9608	WO	Clear All Data		described action.

Table 4-13 Clear/Reset Control Registers

4.6 Meter Information

Register		Property	Description	Format	Note
60200-60219	9800-9819	RO	Meter model[1]	UINT16	See **Note 1**
60220	9820	RO	Firmware Version	UINT16	e.g. 10000 shows the version is V1.00.00
60221	9821	RO	Protocol Version	UINT16	e.g. 10 shows the version is V1.0
60222	9822	RO	Firmware Update Date: Year-2000	UINT16	e.g. 140110 means January 10, 2014
60223	9823	RO	Firmware Update Date: Month	UINT16	
60224	9824	RO	Firmware Date: Day	UINT16	
60225	9825	RO	Serial Number	UINT32	e.g. 1901030100 means the 100th PMC-352-D that was manufactured on January 3rd, 2019
60227	9827	RO	Reserved	UINT16	
60228	9828	RO	Reserved	UINT16	
60229	9829	RO	Feature Code	UINT16	See Note 2

Table 4-14 Meter Information

Notes:

1. The Meter Model appears in registers 60200 to 60219 and contains the ASCII encoding of the string "PMC-352-D" as shown in the following table.

Register	Value(Hex)	ASCII
60200	0x0050	P
60201	0x004D	M
60202	0x0043	C
60203	0x002D	-
60204	0x0033	3
60205	0x0035	5
60206	0x0032	2
60207	0x002D	-
60208	0x0044	D
60209-60219	0x0020	Null

Table 4-15 ASCII Encoding of "PMC-352-D"

2. The following table illustrates the details for the Feature Code register.

BIT	Descriptions	Value (BIN)	Meaning	Product Code
BIT1|BIT0	Reserved	00	Reserved	0
BIT5|BIT4|BIT3	Wireless Comm.	000	None	0
		010	LoRa (Future)	L
BIT6	Residual Current	000	None	0
		001	Residual Current	R

Table 4-16 Feature Code for PMC-352-D

Appendix A - Technical Specifications

Voltage Inputs (V+, V-)	
Voltage (Un)	240VDC
Range	100 to 400 VDC
Starting Voltage	88V
Overload	400V continuous
Current Inputs (HALL)	
Current (In)	±4VDC (for use with 100A Hall Effect Solid Core CT)
Range	0.8% to 100% In
Overload	1.2xIn continuous, 10xIn for 1s
Starting Current	0.8% In
Burden	< 2VA
Nominal Output	± 4V
Power Supply (Self-Powered via Voltage Input)	
Nominal Voltage	240VDC
Range	88 to 400VDC
Burden	< 3VA
Digital Inputs (DI1, DI2, DI3, DIC)	
Type	240VDC Externally Excited
Sampling	1000Hz
Hysteresis	1ms minimum
Residual Current (IR)	
In	±5VDC (for use with 50mA/10mA Residual Hall Effect CT)
Range	0 to 120% In
NTC Temperature Inputs (TC11, TC12, TC21, TC22, TC31, TC32, TC41, TC42)	
NTC Type	2-Wire Thermistors (sensor not included)
Range	-20°C to +140°C
Communications	
RS-485 (Standard)	
Protocol	Modbus RTU
Baud Rate	1200/2400/4800/9600/19200/38400 bps
LoRa (Future)	
RF Range	860-935 MHz (Configurable)
ISM Bands	EU863-870, RU864-870, IN865-867, US902-928, AU915-928, AS920-923, AS923-925
RF Output Power	19 dBm (Maximum)
Receiver Sensitivity	-137 dBm (Maximum)
Output Watts	0.03 (Typical)
FCC Part 15C	Certified by TCB
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
Pollution Degree	2
Mechanical Characteristics	
Mounting	DIN Rail
Unit Dimensions	36(W)x65(D)x90(H)mm
IP Rating	IP30

Parameters	Accuracy	Resolution
Voltage	±0.5%	0.001V
Current	±0.5% + Hall Effect SCCT	0.001A
kW	±1.0%	0.001kW
kWh	IEC 62053-41: 2021 Class 1	0.01kWh
Residual Current	±0.5% + Hall Effect SCCT	0.1mA
Temperature	±1°C	0.1°C

Appendix B - Standards of 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: 2018
Insulation AC Voltage: 1.8kV @ 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: 2014+A1: 2017
Conducted Disturbances	EN 61000-4-6: 2014
Magnetic Fields	EN 61000-4-8: 2010
Ring Wave	EN 61000-4-12: 2017
Mechanical Tests	
Spring Hammer Test	IEC 62052-11: 2003
Vibration Test	IEC 62052-11: 2003
Shock Test	IEC 62052-11: 2003

Appendix C - Ordering Guide

CET Electric Technology

Version 20220216

Product Code	Description
PMC-352-D DIN-Rail DC Energy Meter	
Basic Function	
A	1xDC Voltage & 3xDC Current Inputs from external Hall Effect CT @ +/-4VDC Secondary, 4xNTC Inputs, 3xDI, 1xRS-485 and Modbus RTU
Input Voltage	
2	240VDC (88V to 400VDC)
Power Supply	
N	Self-powered from Internal Voltage Inputs
I/O	
A	3xDI @ 240VDC
Residual Current	
N	None
R~	1xIresidual Input, External Hall-Effect CT @ ±5V Secondary
Communication	
N	None
Language	
E	English

PMC-352-D	-	A	2	N	A	N	N	E	PMC-352-D-A2NANNE (Standard Model)

*Additional charges apply

~Please refer to the Accessories sheet to order the NTC Connector and Hall Effect Current Transducer for Sub Meter and optional Iresidual.

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