

Packet Power™ Wireless Multi-Channel Current Monitor

User Manual

Version 1.0



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CAUTION!

- Read all instructions carefully prior to installation.
- The AC to 5V DC power supply shall utilize appropriate overcurrent protection.
- The Wireless Current Monitor must only be connected to a low voltage 5 VDC power source. Do not connect directly to any line sources.
- Certain current transformers (CTs) connected to this device may have dangerously high voltage present on their terminals or leads when monitoring live loads.
- Always shut AC power off when connecting the power supply.
- Always shut AC power off when connecting or disconnecting the CTs to the current monitor or placing CTs around a conductor.
- Only qualified electrical personnel with the correct protective equipment shall place the current transducers on to AC conductors.
- No field-serviceable parts. Do not attempt to disassemble the product. Installation and maintenance must be performed by qualified personnel.
- Follow basic safety precautions to reduce the risk of electrical shock and damage to equipment.
- Intended for indoor use only, do not install in a wet location.
- Adhere to all local and national electrical codes and guidelines when installing this product.
- Failure to use the product in the specified manner may lead to injury or death and damage to equipment.

REGULATORY INFORMATION



This product has been certified to meet the following requirements:

- UL / ANSI standards 61010-1, Second Edition, Dated July 12, 2004 with revisions through and including October 28, 2008
- CAN/CSA-C22.2 No. 61010-1, second edition, including Amendment 1, or a later version of the same standard incorporating the same level of testing requirements.
- Council Directive 2006/95/EC (December 12, 2006) on Low Voltage Equipment Safety; IEC 61010-1:2001 (Second Edition) and EN 61010-1:2001 (Second Edition)
- Council Directive 1999/05/EC - European Union (EU) Radio & Telecommunications Terminal Equipment Directive (R&TTE) ETSI EN 300 220-2, Issued:2006/04/01 and ETSI EN 301 489-3, Issued:2002/08/01 V1.4.1
- Council Directive [2004/108/EC](#) (December 15, 2004) on Electromagnetic Compatibility CENELEC EN 61326-1 Issued:2006/05/01; IEC 61326-1:2005;:1997 –
- AS/NZS 4268: 2008

Class B Device Statement / FCC Regulations:

Section 15.105(a) of the FCC Rules: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Section 15.19 of the FCC Rules: This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Pursuant to Part 15.21 of the FCC Rules, any changes or modifications to this product not expressly approved by Packet Power LLC might cause harmful interference and void the FCC authorization to operate this product.

Pursuant to part 2.1091c of the FCC rules device is categorically excluded from routine RF Exposure regulations.

Industry Canada (IC) Compliance Statement

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) This device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Per section RSS-102, 2.5 of Industry Canada regulations, this device is categorically excluded from Routine Evaluation Limits.

Industrie Canada (IC) Déclaration de conformité

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement. Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Safety summary and specifications

This general safety information is to be used by both the Power Wireless Current Monitoring Module (CMM) operator and servicing personnel. Packet Power LLC assumes no liability for user's failure to comply with these safety guidelines. Please read this manual carefully before proceeding.



This symbol is used throughout this manual to indicate critical safety information. Failure to observe the information following this symbol may result in injury or death.

CAUTION: This CMM and the area it is installed in may contain life threatening voltages. Qualified personnel must disconnect all high voltage wiring before using or servicing the CMM.

- ⚠** CMM must only be connected to the type of power source indicated on the label.
- ⚠** Do not overload the CMM by using the incorrect type of current transducer or power source as this can result in a risk of fire or electrical shock.
- ⚠** Disconnecting CTs from the CMM while there is current flowing through the conductors on which the CTs are installed may result in exposure to very high voltages capable of resulting in serious injury or death and damage to the CTs.
- The current transformer(s) used with the CMM must be appropriate to the amperage of the circuit(s) on which they will be used as well as the correct output.
- Only current transformers approved by Packet Power should be connected to the PMM. Using unapproved current transformers could result in inaccurate readings and damage to the CMM device.
- Adhere to all local and national electrical codes and guidelines.
- Prior to installation, check to make sure the CMM has not been damaged.
- Store in a clean, dry location.
- Use indoors only and do not install in a wet location.
- Following installation in the final product, the connectors on the CMM and other internal components such as the CT connection board and the 5V DC power supply must be fully enclosed in a manner compliant with all relevant local electrical codes and regulations.
- ⚠** Failure to use the product in the specified manner may lead to injury or death and damage to equipment.



The CMM is a Class 2 electrical device and does not require a safety connection to electrical earth.

5VDC The CMM shall only be powered by a 5 VDC source through the designated AC to DC power supply.



Do not apply or remove the current transducers from live conductors.

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Introduction

Current Monitoring Module Overview

Monitoring Capabilities

The CMM provides current monitoring for up to six separate conductors using externally connected current transducers. It also provides a reading of the ambient temperature within the CMM enclosure. The device is powered by a 5 VDC source which can be from the available “universal voltage micro power supply” or another compatible 5 VDC source.



Communication

All data communication for the CMM is wireless. This includes firmware updates. The CMM incorporates Packet Power's advanced zero-configuration wireless mesh networking technology to wirelessly transmit current measurement data to the wireless Gateway module and forwarded to remote data monitoring and analysis systems.

Enclosure

The CMM is designed to mount directly onto existing electrical enclosures using a 1.0" NPT hole. In order to provide a reliable radio connection, the CMM is equipped with an internal radio antennae fully encased within the enclosure. To allow proper radio operation, the CMM must be housed such that the top portion of the unit is not fully enclosed in a metal housing. Current transducers and the power supply are connected to a remote interface board that is linked to the CMM via a ribbon cable connector terminating on the back side of the CMM. The CMM must be housed in an enclosure that prevents access to the terminal strip and wires. The CMM is certified as a UL modular device.

Packet Power Solution Overview

Communications

The CMM communicates using Packet Power's wireless network. As soon as a CMM is installed and powered up, it automatically tries to join the wireless network. If you already have an operating Packet Power network within your facility all information from the CMM will shortly become accessible.

If you do not yet have a Packet Power network operating within your facility, a separate radio gateway device called an Ethernet Gateway is required to create the wireless network needed in order to gather information from the CMM. A software application operates in conjunction with the radio gateway device(s) to control how information is gathered and formatted for transmission over an IP network for consumption by various other applications. Please refer to the online software support section of www.packetpower.com for additional information regarding wireless gateway and software setup.

The P5J6 model may use a radio operating at 2.4GHz, a radio operating in a subset of the range between 860 and 930MHz (the exact frequencies vary with region – please contact Packet Power for details), or both depending on how the firmware in the module is configured.

The network operates in a mesh topology. **Each device in the network must be within range of at least one other device in the network.** The effective range of the radio in the CMM varies depending on several factors, including the environment in which the product is used. Typically, the device has an effective range of 25 to over 100 feet. The CMM will not transmit effectively if it is installed in an enclosure that blocks radio signals.

Every site where the CMM is deployed must have installed at least one compatible Packet Power Ethernet Gateway device and associated software to collect data and prepare it for transmission to approved monitoring and analysis applications.

The rate at which monitoring information is gathered from a CMM depends primarily on the ratio of the number of CMMs to the number of gateways. It can range from every few seconds to 100 seconds or more.

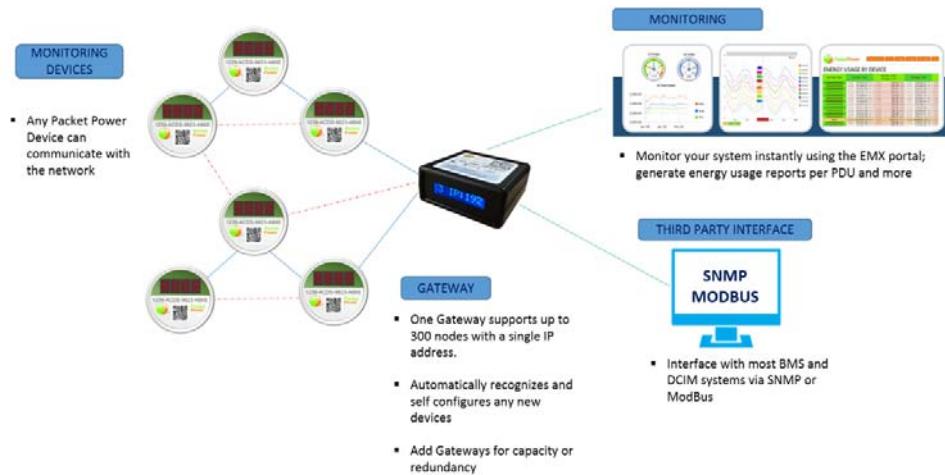


Figure 1: Packet Power Wireless Network Architecture

Installation

Safety prerequisites

⚠ The CMM should be installed only by qualified technicians with a solid understanding of electrical wiring and devices. Familiarity with and understanding of all terms used in this section is assumed. The user is responsible for ensuring that all electrical connections are safely performed in accordance with all applicable codes and regulations using appropriate tools and materials. The user is responsible for ensuring that all applicable codes and regulations are satisfied.

⚠ When installing the universal power supply a proper external power disconnect such as circuit breaker or fusible disconnect shall be installed upstream (on the supply side) from the power supply unit. Power must be disconnected before the unit is installed.

⚠ The CMM is a low voltage class device but hazardous voltages may still be present through the current transducers and power supply module.

CMM Components

1. Meter Body (P5J6)
2. Ribbon Cable Jumper
3. Interface Board
4. Power Supply (not shown)

5. Power Supply Connector Kit (not shown)

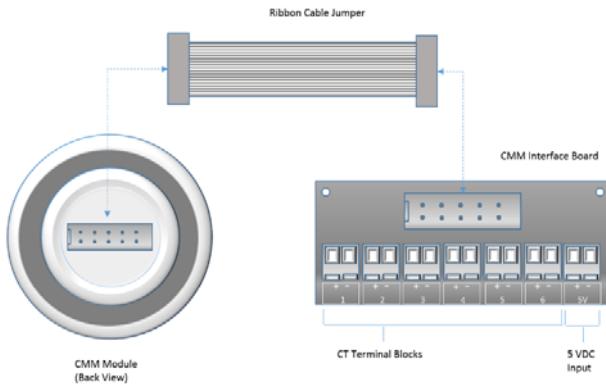


Figure 2: CMM system components

Mounting the CMM

The CMM mounts in any standard electrical enclosure by placing a 1" NPT hole in the enclosure. The threaded tube of the module is placed in the hole, and the bezel nut is used to secure the CMM against the enclosure surface.

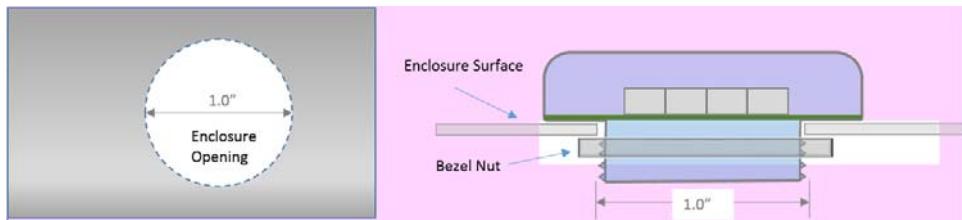


Figure 3: Mounting Dimensions

Note: If the current transformer(s) are located in the same enclosure as the CMM, you must ensure that any electrical code fill rate requirements are being met.

Installing the universal power supply.

The universal power supply will provide a 5 VDC source to the remote interface board when an alternate 5 VDC source is not available. The power supply shall be wired to an AC source and shall have a means of overcurrent protection and disconnect from the upstream source.

The input range for the power supply is 90-264 VAC at 50 or 60 Hz.

The power supply can be secured inside most electrical cabinets using adhesive tabs or fasteners with mounting holes on the power supply.

Always provide overcurrent protection on the line side (brown cable) of the AC input to the power supply.

Comment [SV2]: Should we indicate which line should be fused?

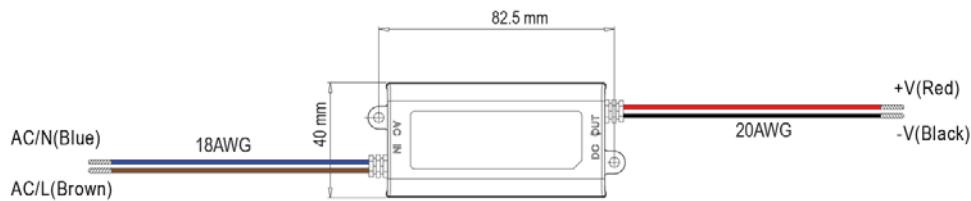


Figure 4: Universal Power Supply

Note: You must ensure that all connections ("taps") being made to the load-carrying lines satisfy relevant safety codes and local regulations. You are responsible for understanding how to perform this connection. Failure to correctly perform this connection could result in product failure and hazardous operating conditions.

Choosing the correct current transformers

The CMM can operate with a variety of standard current transformers (CTs). Only CTs approved by Packet Power can be used with the CMM.

1. The CT must be approved by Packet Power for use with the CMM
2. The CT must be compatible with the version of the Interface Board that will be used.
3. The CT must be sized correctly for the maximum current of the circuit being measured.

4. The CT must meet all local and national safety requirements relevant to the installation, including but not limited to maximum voltage and any other relevant mechanical requirements.
5. The output of the CT must be compatible with the CMM and the CMM Interface Board.
6. ***The CMM has to be configured for the correct CT type and model (it is not auto ranging).***
7. Using the wrong C/T can result in damage to the CMM and the CMM Interface Board and inaccurate measurement readings.
8. Solid core and split core CTs are available but cannot be interchanged.
9. Always select a CT that is close as possible to your desired maximum range to obtain the highest possible accuracy.

10. Note that C/T's may provide less accurate readings at loads under 5-10% of their maximum rated current.

Examples of C/T's and their associated current range are shown below.

CT	Type	Max. (Amps)	Interface Board Model
CT-PacPow 35A	Solid Core	35	MIB-5V6C-R
CT-AT60	Solid Core	70	MIB-5V6C-R
xxx-xxx	Solid Core	240	MIB-5V6C-R
xxx-xxx	Split Core	36	MIB-5V6C-K
xxx-xxx	Split Core	82	MIB-5V6C-K
xxx-xxx	Split Core	240	MIB-5V6C-K
xxx-xxx	Split Core	480	MIB-5V6C-K
xxx-xxx	Split Core	2400	MIB-5V6C-K

Note: You must ensure the current transformer(s) you have selected is approved by Packet Power and matched correctly to maximum rated load of the conductor on which it will be used. You are responsible for understanding how to correctly select and use the appropriate current transformers for the type of power you wish to monitor. Failure to correctly size and install the current transformers could result in product failure and hazardous operating conditions.

Wiring the CMM

FOLLOW ALL OF THE FOLLOWING SAFETY PRECAUTIONS BEFORE WIRING THE CMM.

1. Place the CT interface board and power supply in the optimal locations using adhesive tabs or using the holes provided (use PCBA stand offs when mounting the CMM interface board). The CMM, power supply and all connections must be fully enclosed.
2. Connect the ribbon cable from the interface board to the CMM module. Note that Packet Power offers ribbon cables in different lengths.
3. Connect the 5 VDC power source to the interface board. If using the 5 VDC universal micro power supply make sure to provide a disconnect and over current protection (1.0 A fused recommended) at the supply source. Refer to the wiring diagram for details.
4. Connect the CTs to the Interface Board observing the polarity of the CT wires as well as the proper orientation of the CT on the conductor. The indicator marker on the CT shall always face the source of the current. Refer to figure 3 below as well as the Packet Power current transformer data sheet for detailed information. Failure to observe the correct polarity will result in negative or incorrect current readings.

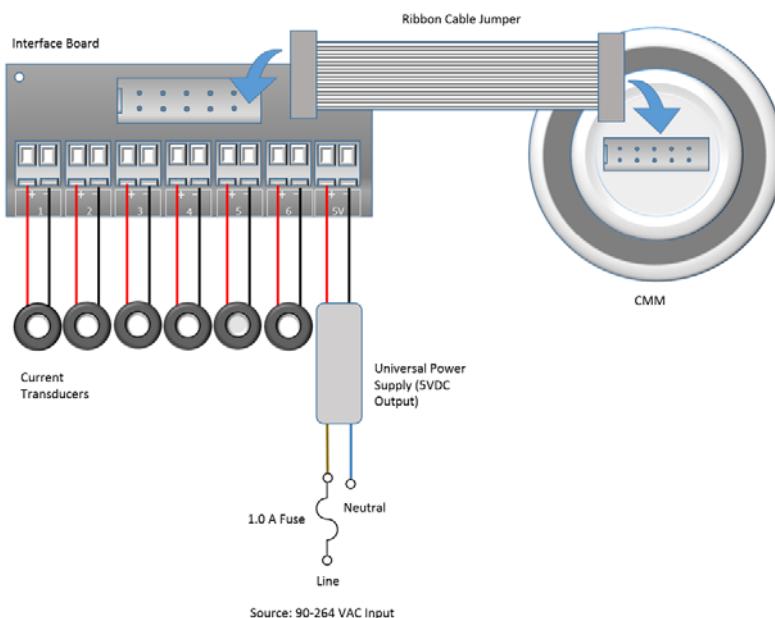


Figure 5. CMM wiring diagram

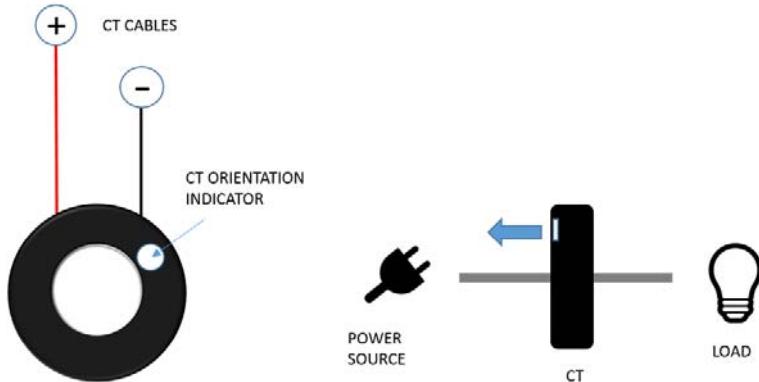


Figure 6: CT polarity and orientation

LED readings and indicator lights

The CMM has 4 large alpha-numeric LEDs that provide for local display of monitoring data and x small lights adjacent to the LEDs that provide operating status information.

The CMM can be configured to display all or some of the following data via the numeric LEDs. The order of display can also be customized. The data type indicator is shown followed by the corresponding value, e.g. to show a reading of 10.1 amps on channel A, the PMM displays "A1" followed by "10.1".

- P5= XXX firmware version
- Id = ABC last 3 digits of the Packet Power node ID
- C1....C6 = current on channel 1-6 in Amps
- A1...A6 = Current utilization hours on channel 1-6 in Amps Hours
- T = Internal temperature in °C/F

The 3 status lights are interpreted as follows (top, middle and bottom positions assume that the PMM is viewed such that the status lights are to the right of the large LEDs):

Top small light (green)

- 900MHz radio activity
 - off: disabled
 - solid on: active, not connected
 - slow flashing: active, connected to the mesh network
 - very rapid flashing: test/configuration mode

Middle small light (red)

- 2.4 GHz radio activity
 - off: disabled
 - solid on: active, not connected
 - slow flashing: active, connected to the mesh network
 - rapid flashing: connected in near communication mode
 - very rapid flashing: test/configuration mode

Lower small light (green)

- Power monitoring activity
 - off: power monitor disabled or not functional
 - slow flashing: active, monitoring power
 - very rapid flashing: test/configuration mode

Maintenance and Repair

Maintenance

The CMM has no user-serviceable parts and requires no maintenance. If necessary, clean the outside of the PMM using a clean, dry cloth.

Repair

The PMM contains no field-serviceable components. Failed products should be returned to Packet Power for replacement. For any service or repair information please contact Packet Power at support@packetpower.com. Please be sure to enclose the 16-character serial number.

Technical Specifications

Electrical

Communications	
Operating Frequency	860 to 920MHz (frequencies specific to region) and 2.4 GHz
Wireless Network Protocol	Frequency hopping self-configuring load-balancing mesh
Data output (Gateway)	SNMP and Modbus TCP/IP protocols (one IP address needed per Gateway); optional EMX cloud or local energy management system
Firmware updates	Wireless
Typical transmission range	10 to 30 meters indoors (extended by relaying through any other Packet Power wireless device)
Antenna	Fully enclosed, fixed configuration

System Status	Local LED display (includes measurement readings)
Voltage inputs	
Voltage rating	60-270V
Current rating	10mA (max. current drawn, VA-N only)
Frequency range	45-65Hz
Category	CAT II/CAT III
Current inputs	
Current rating	Approved CTs producing 333mV output at full range. 250mA fuse protected.
Category	CAT II/CAT III
Current inputs	
Current rating	Approved CTs producing 25mA at full range. 250mA fuse protected.
Category	CAT II/CAT III
Measurements	
All versions	
Current [A]	6 channels, ±1%
Temperature [°C]	Internal ±2%,

Mechanical

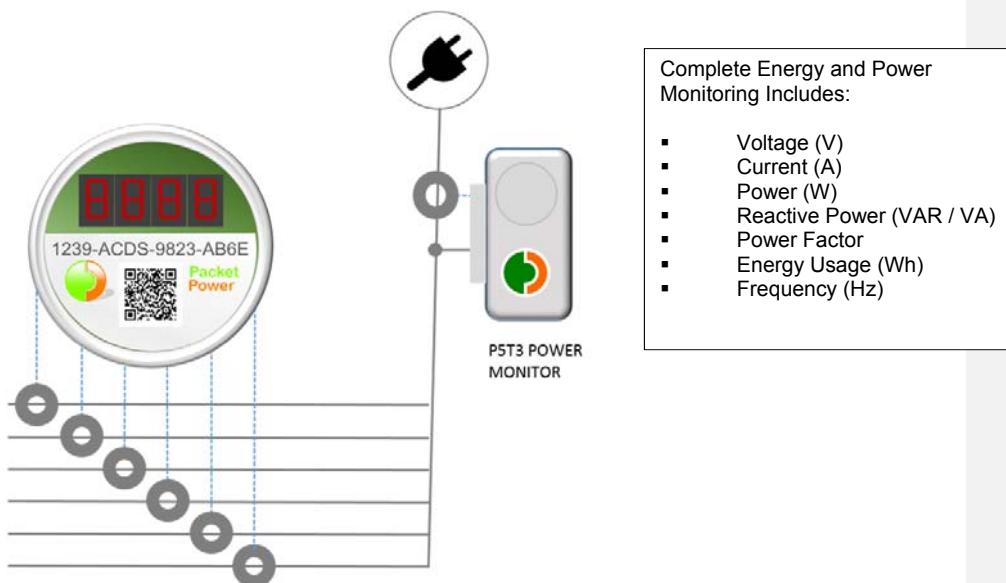
Enclosure	All versions
Enclosure material	High-impact resistant Lexan, V0 flammability rating
Weight (w/out CTs)	3.6 oz / 105 g
Dimensions (core)	2.8 in x 1.6 in x 1.4 in 71 mm x 40 mm x 36 mm
Dimensions (including mounting tabs and connectors)	4.2 in x 1.6 in x 1.8 in 106 mm x 40 mm x 45 mm

Environmental

Operating conditions	All versions
Operating temperature	-7°C to +70°C (+20°F to +176°F)
Humidity	5% to 95% non-condensing
Max. operating altitude	2000m (6561ft)
Pollution degree	2

Complete Power and Energy Monitoring

Each channel of the CMM can provide full power and energy monitoring information when used in conjunction with a Packet Power P5T3 Power Monitoring Module at the current source. The Power Monitoring Module provides voltage and power factor information needed for power and energy calculations for each current channel as for the total source power. ***This combined information may only be available using the EMX portal (web based or local application) and not locally from the Gateway in all instances.***



Product Safety Label

The product safety label can be found on the side of the CMM.

