



## INCLUDED WITH SHIPMENT



1x Bolt Recorder



1x 3 Channel Boxless Flex CT



1x USB Cable



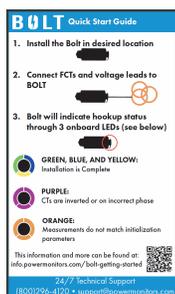
1x Voltage Cable



1x Mounting Bracket



1x Soft Case



1x Quick Start Guide Card



1x Lanyard

INPUTS	AC Voltage	0 to 600 V RMS continuous per phase
	AC Current	0 to 5000 A RMS
	Sample Rate	15,360 samples / second 265 samples / cycle

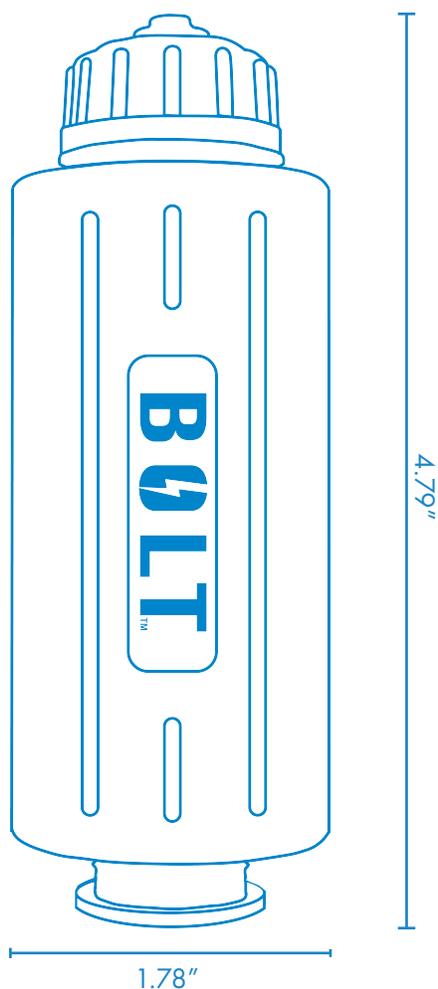
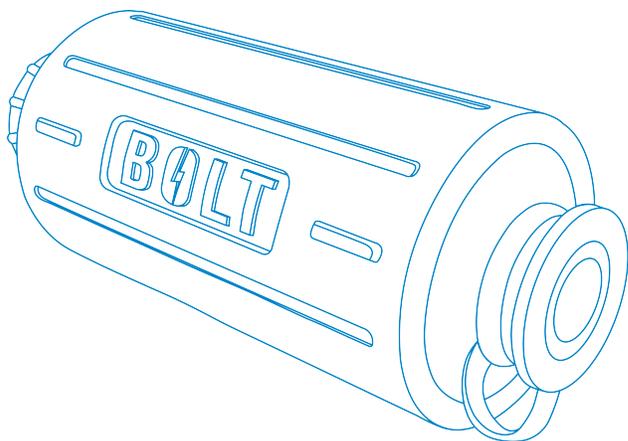
CHANNELS	Voltage	3 channels
	Current	3 channels

MEASURED QUANTITIES PER CYCLE	RMS Voltage	Volts
	RMS Current	Amps
	Real Power	Watts
	Apparent Power	VA
	Reactive Power	VARs
	Phase Angle	Degrees
	Power Factor	Watts / VA
	Displacement PF	cos (phase angle)
	Power Usage	kWh, kVARh, kVah

ACCURACY	Voltage	0.33% of full scale
	Current	1.0% of full scale w/o probe
	Power	1.0% of full scale w/o probe
	Phase Angle	1.0° w/o probe
	Power Factor	±0.02 w/o probe
	Displacement PF	±0.02 w/o probe

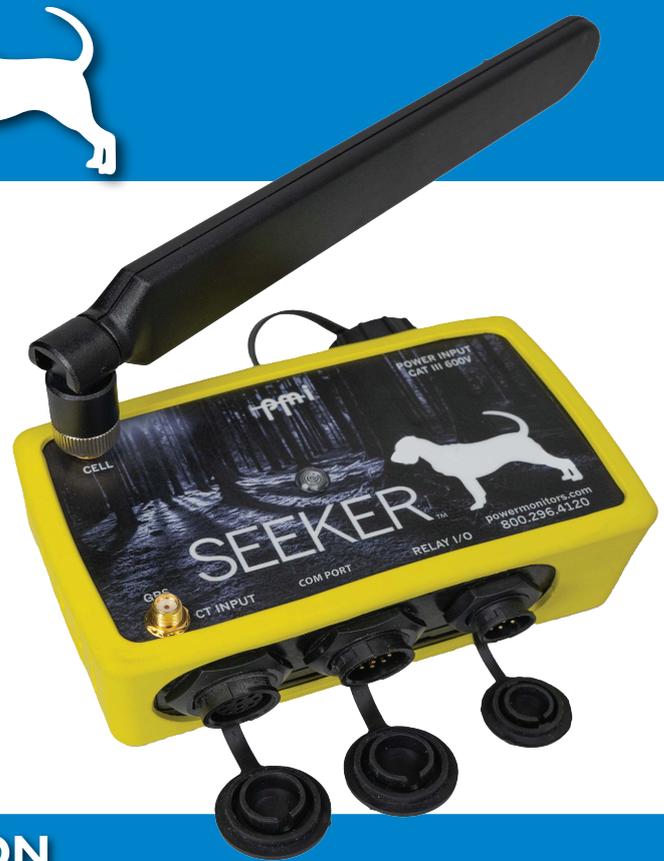
HARMONICS	Voltage	to the 51 <sup>st</sup>
	Current	to the 51 <sup>st</sup>
	Measures	Magnitude, phase, THD

POWER FAIL OPERATION	Super capacitor
	ride through for recording



<b>TIME SYNCHRONIZATION</b>	User-configurable SNTP time synchronization through Wi-Fi	
<b>COMMUNICATIONS</b>	Standard Options	Wi-Fi, Bluetooth Low Energy, USB
<b>INFORMATION STORAGE</b>	Data Storage	128 MB onboard storage, unlimited cloud storage
<b>RECORD SETTINGS</b>	Interval Graphs	1 cycle to 4 hour interval, user selected, stop-when-full or wrap-around memory modes
	Significant Change Flicker Settings	1 V to 8 V in 1 V steps User-defined, or conform to IEEE 1453/IEC 61000-4-15, and IEEE Std. 141
	Waveform Capture	Voltage and current threshold, periodic capture, waveshape, event cross triggers
<b>POWER SUPPLY REQUIREMENTS</b>	Voltage	60-600 VAC Channel 1 to Common (47-63-HZ)
	Power Consumption	3 Watts max 5 VA max at 600 V
<b>ENVIRONMENTAL</b>	Operating Temp	-20°F to +135°F
	Humidity	Less than or equal to 85%
	Shock	60 Hz to 2 kHz, acceleration 25 G
	Vibration	10 Hz to 60 Hz, amplitude 1.8 mm
	Max Altitude	2.0 km (6560 ft), derated about 2.0 km
<b>PHYSICAL DIMENSIONS</b>	Size	1.78" x 4.79"
	Weight	less than 1 lb
	Case	NEMA 4X
<b>SAFETY</b>	Designed to IEC 61010 -1, 600 V CAT III	

# SEEKER™



## ONE SIZE FITS ALL PQ SOLUTION

### FEATURES & BENEFITS:

#### Cloud-based Recording:

The Seeker continuously streams PQ data to cloud-based PQ Canvass. Use a web browser to analyze the latest data instantly, without downloading.

#### Control Options:

Use the internal dual Form C relays to control distributed generation or other equipment through SCADA or automatically based on measured values. Two isolated digital inputs provide status or other equipment monitoring.

#### Communication Options:

The Seeker includes Wi-Fi, Bluetooth, LTE cell modem, USB, and Ethernet communication options.

#### SCADA Compatibility:

A full DNP interface over Wi-Fi, cell or Ethernet exposes all PQ measurements and I/O control functions.

#### Easy To Install:

The Seeker's small weatherproof enclosure contains the AC power supply, wireless communications, relays, and PQ monitor. No external enclosure, power supply, or communications device is needed.

INPUTS	AC Voltage	0 to 600 V RMS continuous per phase
	AC Current	0 to 5000 A RMS
	Sample Rate	250 kHz voltage and current (4166 samples/ cycle)

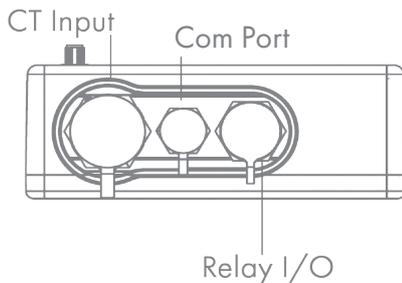
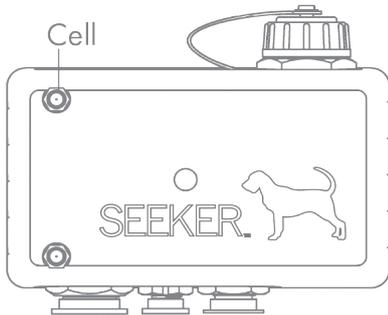
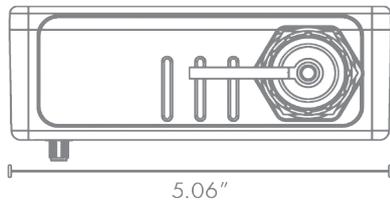
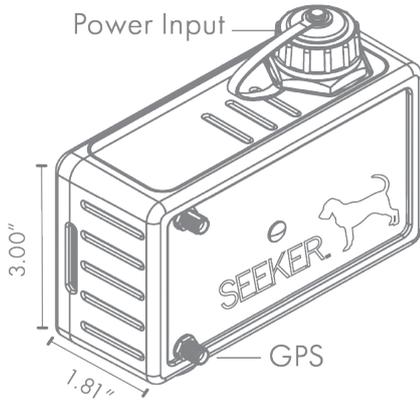
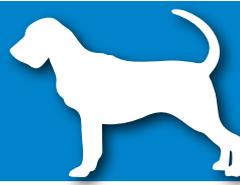
CHANNELS	Voltage	4 channels
	Current	4 channels

MEASURED QUANTITIES PER CYCLE	RMS Voltage	Volts
	RMS Current	Amps
	Real Power	Watts
	Apparent Power	VA
	Reactive Power	VARs
	Phase Angle	Degrees
	Power Factor	Watts/VA
	Displacement PF	cos (phase angle)
	Power Usage	kWh, kVARh, kVAh

ACCURACY	Voltage	0.33% of full scale
	Current	1.0% of full scale w/o probe
	Power	1.0% of full scale w/o probe
	Phase Angle	1.0° w/o probe
	Power Factor	±0.02 w/o probe
	Displacement PF	±0.02 w/o probe

POWER FAIL OPERATION	Super capacitor ride through power for notifications.
----------------------	--

# SEEKER™



<b>HARMONICS</b>	Voltage	to the 51st
	Current	to the 51st
	Measures	Magnitude, phase, THD

**SAFETY** Designed to IEC 61010-1, 600 V CAT III

**TIME SYNCHRONIZATION** User-configurable SNTP time synchronization through Ethernet or cell modem. High resolution timestamping with optional GPS.

<b>COMMUNICATIONS</b>	Standard Options	Wi-Fi, Bluetooth LTE Cell Modem, Ethernet USB
-----------------------	------------------	---

<b>INFORMATION STORAGE</b>	Data Storage	144 MB onboard storage, unlimited cloud storage
----------------------------	--------------	--

<b>RECORD SETTINGS</b>	Interval Graphs	1 cycle to 4 hour interval, user selected, stop-when- full or wrap-around memory modes
	Significant Change Flicker Settings	1 V to 8 V in 1 V steps User-defined, or conform to IEEE 1453/ IEC 61000-4-15, and IEEE Std. 141
	Waveform Capture	Voltage and current threshold, periodic capture, waveshape, event cross triggers

<b>RELAY OUTPUTS</b>	Output Type	Dry Contact Form C (1 normally open, 1 normally closed)
	Number of Outputs	2 Independent Relays
	Max Switching Voltage	120V
	Max Switching Current	4 amps

<b>DIGITAL INPUTS</b>	Input Type	High Impedance
	Number of Inputs	2
	Min Sense Voltage	60V
	Nominal Sense Voltage	120V
	Max Sense Voltage	150V

<b>POWER SUPPLY REQUIREMENTS</b>	Voltage	60-600 VAC Channel 1 to Common (47-63 Hz)
	Power Consumption	5 Watts max, 15 VA max at 600 V

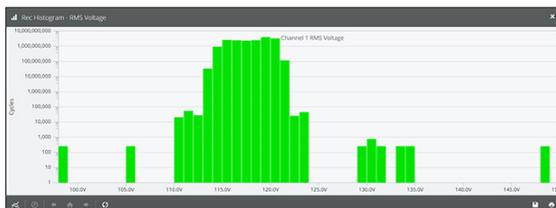
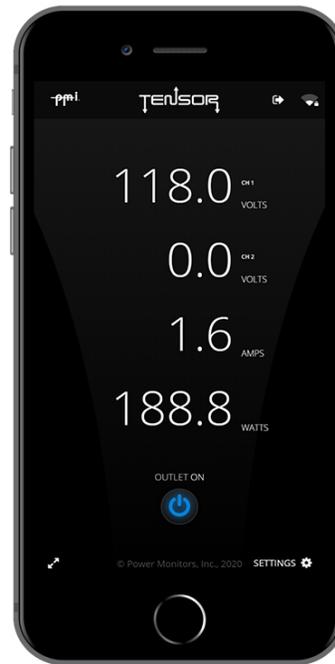
<b>ENVIRONMENTAL</b>	Operating Temp	-20° F to +135° F
	Humidity	Less than or equal to 85%
	Shock	60 Hz to 2 kHz, acceleration 25 G
	Vibration	10 Hz to 60 Hz, amplitude 1.8 mm
	Max Altitude	2.0 km (6560 ft), derated above 2.0 km

<b>PHYSICAL DIMENSIONS</b>	Size	5.06" L x 3.00" W x 1.81" H
	Weight	less than 1 lb
	Case	NEMA 4X

# TENSOR

The Tensor includes either WiFi or LTE connectivity, remote access to real-time and historical data, and receptacle power control. Identify voltage and equipment problems, track power usage, and control loads from your web browser.

- Adjustable voltage, current and power thresholds
- Instant e-mail & SMS alerts
- Cloud based data collection and analytics
- Wireless monitoring and smart plug control
- Advanced power quality: transient capture, harmonics, flicker, and ITIC triggering



# TENSOR Specifications

INPUTS	AC Voltage	0 to 140 V RMS 0-75 V RMS neutral-ground
	AC Current	0 to 70 A RMS (15 amps continuous)
	Sample Rate	256 samples/cycle

CHANNELS	Voltage	2 channels
	Current	1 channels

BASIC MEASUREMENTS	RMS Voltage	Volts
	RMS Current	Amps
	Real Power	Watts
	Apparent Power	VAs
	Reactive Power	VARs
	Power Usage	kWh, kVARh, kVAh

ADVANCED POWER	Phase Angle	Degrees
	Power Factor	Watts/VA
	Displacement PF	cos (phase angle)

ACCURACY	Voltage	0.33% of full scale
	Current	1.0% of full scale
	Power	1.0% of full scale
	Phase Angle	1.0°
	Power Factor	±0.02
	Displacement PF	±0.02

POWER FAIL OPERATION	The recorder can operate without any input voltage for up to 5 minutes.	
----------------------	---	--

HARMONICS	Voltage	to the 51st
	Current	to the 51st
	Measures	Magnitude, phase, THD

SAFETY	150 V CAT II, UL Listed, UL 60730-1/ CSA E60730-1, Indoor use only, Max load 1875VA	
--------	---	--

COMMUNICATIONS	Cell Modem or WiFi	
----------------	--------------------	--

INFORMATION STORAGE	Data Storage	64 MB in device, unlimited with PQ Canvass cloud storage
---------------------	--------------	--

RECORD SETTINGS	Interval Graphs	1 cycle to 4 hour interval, user selected, stop-when-full or wrap- around memory modes
	Significant Change	1 V to 8 V in 1 V steps
	Flicker Settings	User-defined, or conform to IEEE 1453/ IEC 61000-4-15, and IEEE Std. 141
	Waveform Capture	Voltage and current threshold, periodic capture, waveshape, event cross triggers
	CBEMA/ITIC	Triggered event capture

POWER SUPPLY REQUIREMENTS	Voltage	70-140 VAC Line to Neutral (47-63 Hz)
	Power Consumption	4 Watts max

ENVIRONMENTAL	Operating Temp	-20° F to +135° F
---------------	----------------	-------------------

PHYSICAL DIMENSIONS	Size	4.9" L x 2.7" W x 1.25" H
	Weight	8oz



Revolution®



Cell Revolution®

## REVOLUTION® WIRELESS POWER QUALITY RECORDERS 600V/5000A MAX

### FEATURES & BENEFITS:

Reduce fleet and labor costs with this small, rugged, lightweight recorder. Continuously view, analyze and retrieve data. The Cell Revolution allows you to retrieve data wirelessly from anywhere you have an internet connection. The included ProVision software lets you monitor real-time current, flicker, voltage, power and more from your desktop, or use a laptop, the PMI Field PC, or a PDA to monitor data from the field.

**600V CAT IV:** Allows use in a wide range of monitoring environments

**Pocket-size:** Can be installed inside meter bases, transformers, and panels

**Bluetooth® 2.0, Cell Phone Modem (optional) & Wi-Fi connection (optional):** Stay safe with wireless data behind closed panel covers

**USB 2.0, built in Ethernet Networking (Optional):** For permanent installations

### High sampling rate:

Captures high speed transients up to 5000V and 1 MHz.

**UL listed:** Increased user safety

**Large memory capacity:** Longer recording time and very high resolution wave capture.

**New Features:** E-mail & text alerts, network time sync.

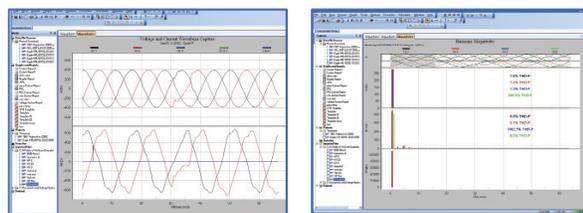
<b>INPUTS</b>	AC Voltage	0 to 600 RMS continuous per phase (±5 kV peak transients)
	AC Current	0 to 5000 amps
	Sample Rate	1 MHz Voltage (16666 samples/cycle) 250 kHz current (4166 samples/cycle)
<b>CHANNELS</b>	Voltage	4 channels
	Current	4 channels
<b>MEASURED QUANTITIES PER CYCLE</b>	RMS Voltage	Volts
	RMS Current	Amps
	Real Power	Watts
	Apparent Power	VA
	Reactive Power	VARs
	Phase Angle	Degrees
	Power Factor	Watts/VA
	Displacement PF	cos (phase angle)
	Power Usage	kWh, kVARh, kVAh
	<b>ACCURACY</b>	Voltage
Current		1.0% of full scale w/o probe
Power		1.0% of full scale w/o probe
Phase Angle		1.0° w/o probe
Power Factor		±0.02 w/o probe
Displacement PF		±0.02 w/o probe
<b>POWER FAIL OPERATION</b>	The recorder can operate without any input voltage for up to 30 minutes. This allows it to record down to 0 volts on all channels during power outages.	

<b>HARMONICS</b>	Voltage	to the 51st
	Current	to the 51st
	Measures	Magnitude, phase, THD
<b>COMMUNICATIONS</b>	Standard	Bluetooth® 2.0 Wireless, USB 2.0
	Options	Mobile Phone, Wi-Fi
<b>INFORMATION STORAGE</b>	Data Storage	16 MB (Standard); 128 MB, 512MB or 1 GB (Optional)
	Significant Change	1000 records
	Flicker	1000 records
<b>RECORD SETTINGS</b>	Interval Graphs	1 cycle to 4 hour interval, user selected, stop-when-full or wrap-around memory modes
	Significant Change	1V to 8V in 1V steps
	Flicker Settings	User-defined, or conform to IEEE 1453/ IEC 61000-4-15, and IEEE Std. 141
	Waveform Capture	Voltage and current threshold, periodic capture, waveshape, event cross triggers
	Transient Capture	Peak voltage threshold
<b>POWER SUPPLY REQUIREMENTS</b>	Voltage	60-600VAC Channel 1 to Common (47-63Hz)
	Power Consumption	5 Watts max, 15 VA max at 600V
<b>ENVIRONMENTAL</b>	Operating Temp	-20°F to +135° F
	Humidity	Less than or equal to 85%
	Shock	60 Hz to 2 kHz, acceleration 25G
	Vibration	10Hz to 60Hz, amplitude 1.8mm
	Max Altitude	2.0km (6560 ft), derated above 2.0km
<b>PHYSICAL DIMENSIONS</b>	Size	4.8" L x 3.35" W x 1.84" H
	Weight	less than 1 lb
	Case	NEMA 4X
<b>SAFETY</b>	IEC 61010-1, 600V CAT IV, UL listed	

## PROVISION SOFTWARE

ProVision® is the latest generation of PMI's popular, power quality analytical software for PCs. Virtually everything about ProVision's graphical user interface (GUI) has been redesigned—so it's not only easier to use, but also more flexible in the way it helps you to manage and report power quality data.

With ProVision's wireless communications features you can remotely initialize, schedule, download and manage multiple PQ recorders from within a single GUI. All recorder settings are viewable and configurable in real-time on your laptop or desktop PC. Once PQ data is downloaded to your computer, ProVision® gives you unprecedented control over the way it's viewed, managed and reported. You determine the way you want the software to search for and access your files. You choose your own scale, colors and font styles for viewing and printing. You can even insert your company logo to give reports and presentations a truly custom look.

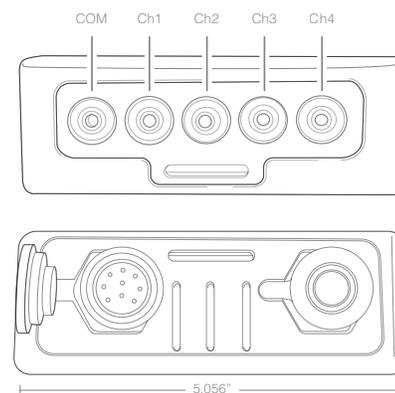
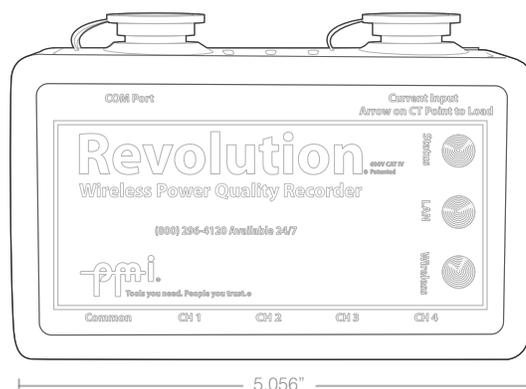
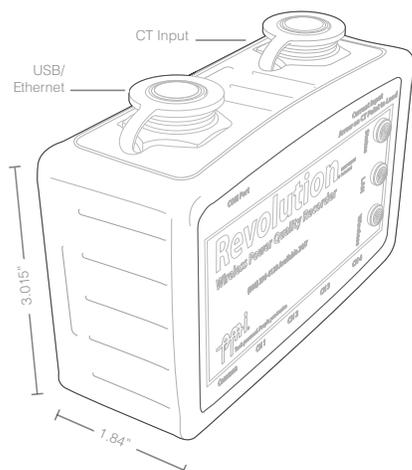


### WANT EVEN MORE FLEXIBILITY?

With ProVision® you can create and print your own standard and custom reports, or if you prefer, send PMI your data in digital form and our exclusive, Custom Report Service will prepare and print professional looking reports to meet your unique needs.

ProVision® transforms real-time and stored PQ data into an array of colorful charts and graphs that make it easy to track long-term trends and identify problems during triggered events:

- Event Change
  - Interval
  - Single Cycle Voltage Histogram
  - Significant Change
  - Power Outage
  - Flicker
  - Abnormal/Loose Neutral
- Voltage, Current & Power:
  - Interval Graph
  - Out of Limits
  - Histogram Graph
  - Daily Profile Graph



# ATOM



## FEATURES & BENEFITS

### Cloud-Based Recording:

Use the Atom for instant alerts from environmental problems and combine with cloud-based PQ Canvass to track trends and verify compliance.

### Communication Options:

The Atom uses Bluetooth communications. Connect the Atom to your iOS device to adjust Atom settings, view live readings, transfer stored data, and configure thresholds.

### Wireless Monitoring:

Pair an Atom with a Seeker, Tensor, or cell phone to upload stored environmental data to PQ Canvass, enabling long-term tracking and instant email/SMS alerts. Use a Tensor or Seeker as a hub for many Atoms to monitor multiple zones.

### TEMPERATURE

-20 C to 60 C

### PRESSURE

500 - 1100 hPa

### HUMIDITY

10 - 95% RH

### SOLAR FLUX

100 - 100,000 lux

### ENVIRONMENTAL RATING

IP68

### COMMUNICATION

Wireless BLE 5.0 Radio  
Sensor data read every minute

### POWER SUPPLY

10 year battery life

### PHYSICAL DIMENSIONS

Weight: 2 ounces

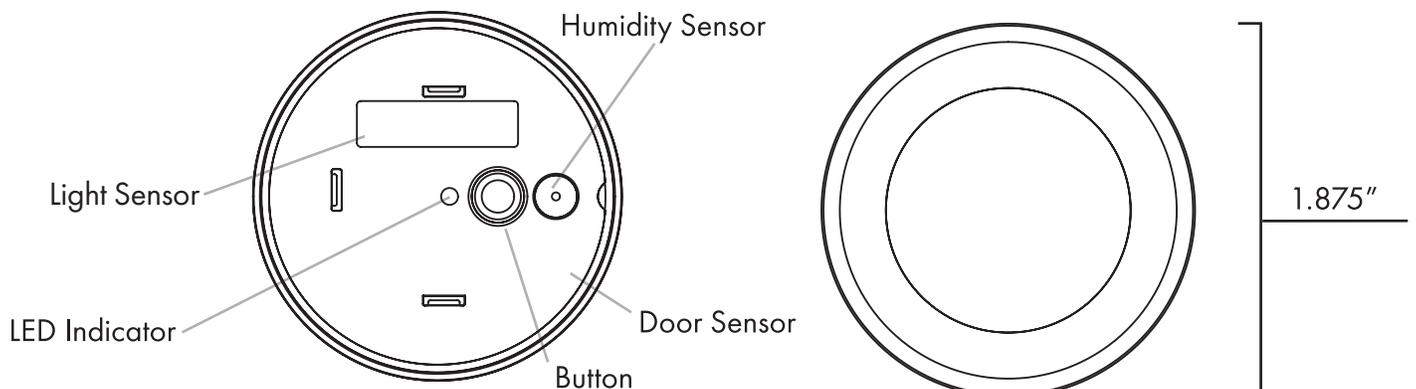
### MAGNETIC REED SWITCH

Door Closure Detection

### INFORMATION STORAGE

1 year of on-board memory

### ACCELERATION DROP VIBRATION DETECTION





## GUARDIAN



## iVS-2SX+

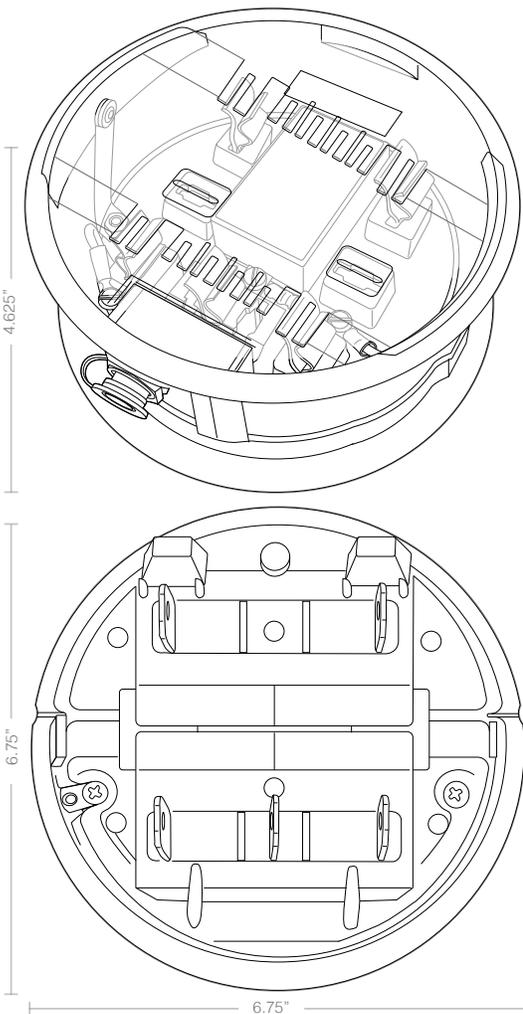


## iVS-3S

<b>INPUTS</b>	AC Voltage	0 to 150 volts continuous per channel	0 to 140 VAC RMS continuous	0 to 600 VAC continuous
	AC Current	200 amps RMS	200 amps RMS	200 amps RMS (Forms 12S, 14S, 15S, 16S, 17S) 25 amps (Forms 6S, 8S, 9S)
	Sample Rate	256 samples/cycle/channel	128 samples/cycle/channel	128 samples/cycle/channel
<b>CHANNELS</b>	Voltage	2 channels	2 channels	2 or 3 channels, depending on form
	Current	2 channels	2 channels	2 or 3 channels, depending on form
<b>MEASURED QUANTITIES PER CYCLE</b>	RMS Voltage	Volts	Volts	Volts
	RMS Current	Amps	Amps	Amps
	Real Power	Watts	Watts (Optional)	Watts
	Apparent Power	VAs	VAs	VAs
	Reactive Power	VARs	VARs (Optional)	VARs
	Phase Angle	Degrees	Degrees (Optional)	Degrees
	Power Factor	Watts/VA	Watts/VA (Optional)	Watts/VA
	Displacement PF	cos (phase angle)	cos (phase angle) (Optional)	cos (phase angle)
	Power Usage	kWh, kVARh, kVAh	kWh, kVARh, kVAh (Optional)	kWh, kVARh, kVAh
<b>ACCURACY</b>	Voltage	0.33% of full scale	0.33% of full scale	0.33% of full scale
	Current	1.0% of full scale	1.0% of full scale	1.0% of full scale
	Power	1.0% of full scale	1.0% of full scale	1.0% of full scale
	Phase Angle	1.0°	1.0°	1.0°
	Power Factor	±0.02	±0.02	±0.02
	Displacement PF	±0.02	±0.02	±0.02
<b>HARMONICS</b>	Voltage	to the 51st	to the 31st (Optional)	to the 31st
	Current	to the 51st	to the 31st (Optional)	to the 31st
	Measures	magnitude, phase, THD	magnitude, THD	magnitude, THD
<b>COMMUNICATIONS</b>	Type	Bluetooth® Wireless, USB	RS232 port	RS232 port
	Remote	Cell modem option	n/a	n/a
	Data Rate		4,800 to 28,800 baud	4,800 to 38,000 baud
<b>INFORMATION STORAGE</b>	Interval	6.9 MB	2.1 MB	2.1 MB
	Graphs			
	Significant Change	1000 records	1000 records	1000 records
	Flicker	1000 records	1000 records	1000 records
Waveform Capture	1.7 MB	384 KB (Optional)	384 KB	

	GUARDIAN	iVS-2SX+	iVS-3S
<b>RECORD SETTINGS</b>	Interval Graphs 1 second to 4 hour interval user selected, stop-when-full, or wrap around memory modes Significant Change 1V to 8V in 1V steps Flicker Settings User-defined, or conform to IEEE 1453/IEC 61000-4-15, and IEEE Std. 141. Waveform Capture Voltage and current threshold, periodic capture	1 second to 4 hour interval user selected, stop-when-full, or wrap around memory modes 1V to 8V in 1V steps User-defined, or conform to IEEE Std. 141. (Optional) voltage and current threshold	User selected, stop-when-full, or wrap around memory modes Significant Change 1V to 8V in 1V steps User-defined, or conform to IEEE Std. 141. Voltage and current threshold
<b>POWER SUPPLY</b>	Power Consumption Less than 2.5 watts Operating Temp -20°F to +135° F Shock 60 Hz to 2kHz, Acceleration 25G	Less than 2.5 watts -20°F to +135° F 60 Hz to 2kHz, Acceleration 25G	Less than 2.5 watts -20°F to +135° F 60 Hz to 2kHz, Acceleration 25G
<b>PHYSICAL DIMENSION</b>	Vibration 10 Hz to 60 Hz, Amplitude 1.8 mm Size 4.625" x 6.75" Weight 3.6 lbs	10 Hz to 60 Hz, Amplitude 1.8 mm 4.625" x 6.75" 3.6 lbs	10 Hz to 60 Hz, Amplitude 1.8 mm 4.625" x 6.75" 3.6 lbs

**POWER FAIL OPERATION** Can operate without any input voltage for up to 30 minutes. This allows it to record down to 0 volts on all channels during power outages.



### GUARDIAN

- 2 channels of AC voltage from 0-150 continuous per phase
- 2 channels 200 amps RMS current
- 256 samples/cycle/channel sampling rate
- Voltage and current harmonics to the 51st
- Measures all power functions
- Captures waveforms
- Bluetooth® wireless, USB, cell phone modem (optional) communications
- Up to 6.9 MB memory

### iVS-2SX+

- A budget oriented single-phase meter socket power quality recorder.
- 2 channels AC voltage from 0-140 continuous per phase
- 2 channels up to 200 amps RMS current
- 128 samples/cycle/channel sampling rate
- Harmonics and waveform capture (optional) to the 31st
- Measures real, reactive, and apparent power
- Up to 2.1 MB memory

### iVS-3S

- The only ten function three-phase meter socket power quality recorder available today.
- 2 or 3 channels AC voltage from 0-600 VAC
- 2 or 3 channels 200 amps RMS current (Forms 12S, 14S, 15S, 16S and 17S), or 25 amps (Forms 6S, 8S, and 9S)
- 128 samples/cycle/channel sampling rate
- Voltage and current harmonics to the 31st
- Captures waveforms
- Measures all power functions
- Up to 2.1 MB memory



## GUARDIAN<sup>®</sup> METER SOCKET RECORDER

### FEATURES & BENEFITS:

The Guardian power analyzer is designed for use in a 200A residential meter base with the existing revenue meter. In addition to RMS voltage and current in the 2SX+, the Guardian comes standard with the ability to measure and monitor power factor, demand, phase angle, and harmonics to the 51st, in an all-weather, self-contained unit.

#### Cell Modem or WiFi (Optional):

Stream your data immediately to the cloud for instant access with your web browser or connect to the Guardian directly with ProVision for live readings or to download recordings. Use WiFi to connect locally with a laptop or tablet.

#### Large Memory Capacity:

Record power and harmonics at high resolution to meet IEEE 519-2014 requirements with up to 1 GB of onboard memory. Capture more PQ problems with enhanced waveform triggering and extended memory.

#### New Features:

E-mail & text alerts, network time sync, WiFi, Cell Modem, CBEMA / ITIC recording, enhanced waveform capture, and PQ Canvass.



## GUARDIAN

INPUTS	AC Voltage	0 to 150 VAC per channel	INFORMATION STORAGE	Data Storage	16 MB (Standard), 128 MB, 512 MB, or 1 GB (optional)	
	AC Current	200 amps RMS		Significant Change	1000 records	
	Sample Rate	256 samples/cycle/channel		Flicker	1000 records	
CHANNELS	Voltage	2 channels	RECORD SETTINGS	Interval	1 cycle to 4 hour interval user selected, stop-when-full, or wrap around memory modes	
	Current	2 channels		Graphs	1 V to 8 V in 1V steps	
MEASURED QUANTITIES PER CYCLE	RMS Voltage	Volts	POWER SUPPLY	Power Consumption	Less than 5 Watts	
	RMS Current	Amps		ENVIRONMENTAL	Operating Temp	-20°F to +135°F
	Real Power	Watts				Shock
	Apparent Power	VA		PHYSICAL DIMENSION	Vibration	
	Reactive Power	VARs				Weight
	Phase Angle	Degrees		Size		
	Power Factor	Watts/VA			POWER FAIL OPERATION	Super capacitor ride through power for notifications.
	Displacement PF	cos (phase angle)				
	Power Usage	kWh, kVARh, kVAh				
	ACCURACY	Voltage		0.33% of full scale		
Current		1.0% of full scale				
Power		1.0% of full scale				
Phase Angle		1.0°				
Displacement PF		±0.02				
HARMONICS	Voltage	to the 51st				
	Current	to the 51st				
	Measures	Magnitude, phase, THD				
COMMUNICATIONS	Standard	USB 2.0				
	Options	WiFi or Internal Cell Modem				



## BOOMERANG

The Boomerang is a single-phase voltage monitor with an integrated cell phone modem. Available in a Form 2S meter socket adapter, or standalone box configuration, the Boomerang works with the Canvass web-based data analysis software to provide a complete voltage picture.

The Boomerang collects RMS voltage data on a one second basis. Every 30 minutes, most recent 1800 one-second RMS values are sent to the PMI data center, for storage in the Canvass database. With this system, all data collection is performed continuously by the Canvass database – no data is stored in the Boomerang, and no recording download operation is required by the user. The data is always available via Canvass, automatically. As soon as the Boomerang is installed, it links with Canvass – no user setup is required at all. The latest realtime readings are always available via the Canvass interface.

### SPECIFICATIONS:

Measured Quantities	1 second RMS voltage frequency
Input range	80-300V RMS
Accuracy	0.50%
Resolution	0.1V
Communication	GSM cell modem (AT&T)
Temperature range	-22F to 130F

### COMPLETELY PROGRAMMABLE

The Boomerang can also be programmed to send e-mail or SMS text message alerts, based on programmable voltage thresholds, or power outages. These alerts are also stored in the Canvass database, for analysis later.

In addition to the Canvass data link, the Boomerang also includes a DNP3 TCP link. This can be set up to work with a SCADA system. The DNP3 interface includes analog points for RMS voltage, frequency, and modem signal strength, and fully configurable event thresholds for voltage triggers. Events can be polled, or reported via unsolicited report by exception.

## CANVASS WEB SOFTWARE

The Canvass system includes a database in the PMI data center, and web-based data analysis software. All Boomerang data is available any time, all from a web browser. To get started, load <http://canvass.powermonitors.com> in a browser.

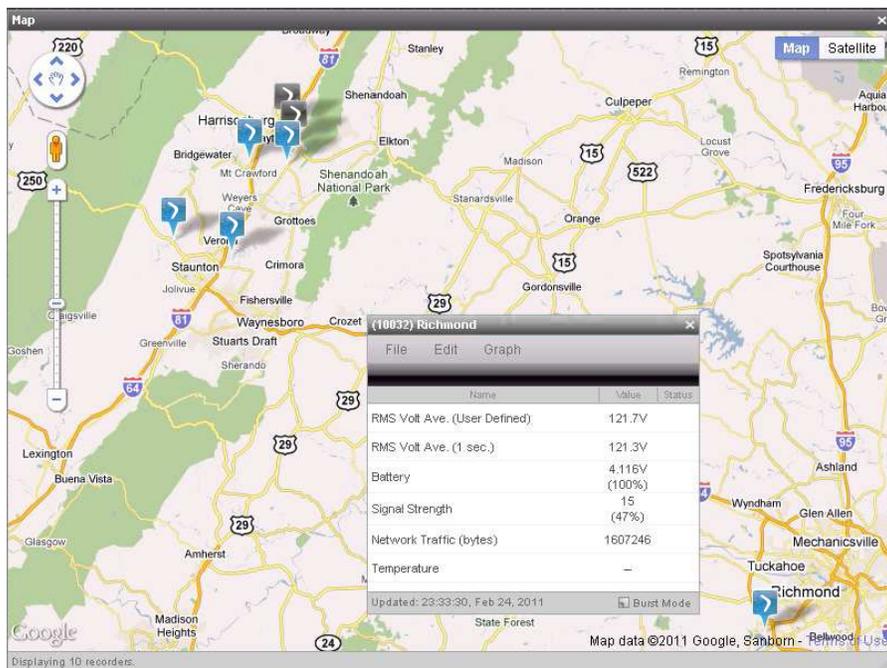


Figure 1. After logging into <http://canvass.powermonitors.com>, click on a boomerang to display its status window.

After logging in, a map of Boomerangs will be displayed. Active Boomerangs are displayed in blue, inactive ones in grey. A Boomerang in an alert condition (due to voltage threshold exceedance) are shown in orange. Click on a Boomerang to display its status window.

The Boomerang status window shows the latest real-time readings. Two RMS types are shown: the one-second RMS value, and a user-defined average voltage (e.g. a 5 minute average voltage). In addition, status information such as internal battery voltage, modem signal strength, and total cell network traffic are displayed.

The menus in the status window are used for graphing and device setup.

### GRAPH OPTIONS

Under Graph, there are three graph types displayed: Stripchart, Histogram, and Daily Profile.

These graphs are all generated from the data in the Canvass database, using the one-second RMS voltage information.

Choosing "Stripchart" will generate a new window, as shown in Figure 3. The default stripchart graphs the last four hours of data, using 1 second RMS values.

### STRIPCHART

The stripchart start and stop times can be changed to several built-in values (e.g. the last week, last month, etc.) or adjusted to any custom date range. The graph can include all data ever recorded by the Boomerang – there's no limit to the size of the graph, and since Boomerang is continuously sending data to the database, there's no gaps in the data, or start or stop time in a recording.



Figure 2. Graph options for displaying RMS voltage data.



Figure 3. Stripchart display

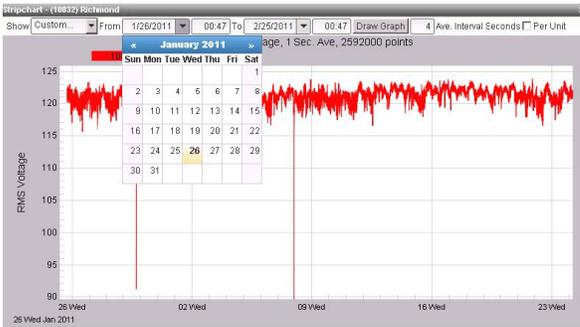


Figure 4. Stripchart start and stop times can be adjusted.

All the graph types also feature an adjustable averaging interval. By default, the graphs use the raw one second RMS voltage values. This interval is adjustable for each graph. For example, a 5 minute interval may be used, to smooth out sags, if long-term average voltage is desired. Just enter the averaging interval in the input field at the top of the graph, and click “Draw Graph” to redraw the plot.

### FULL ZOOM CONTROL

Full zoom controls are also available. Just click in the graph, hold down the left mouse button, and draw a zoom window on the graph (just like ProVision and Winscan). The graph will zoom to the desired extent. Some of the hotkeys utilized in ProVision also work with Canvass:

- U** Undo a zoom level.
  - Z** Undo all zoom.
- And here is a new one:
- O** Double the current time span.

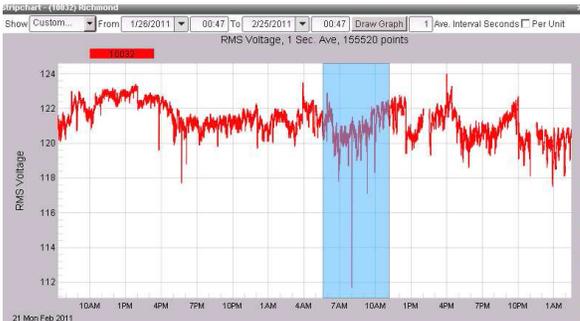


Figure 5. Full zoom control

The “T” hotkey toggles the Boomerang list on the right side. This pulls up a list of all Boomerangs in the group. Click Off or On displays or hides other Boomerang traces on the graph. This makes it very easy to compare voltages at different locations, and find correlations across a distribution system.



Figure 6. The ‘T’ hot key toggles the Boomerang list.

### HISTOGRAM

The Histogram graph displays the number of seconds the voltage was at each voltage level (shown in Figure 7).

Adjustable parameters include a log plot, interval average size, and how many days to include in the histogram. As with the stripchart, the T hotkey toggles the Boomerang list, allowing the selection of multiple Boomerangs, but it also can display statistics from the histogram. The “Stats” checkbox determines whether the Boomerang list or stats list is displayed. The “Weekdays” checkbox enables just weekdays only (no weekends), or all days of the week.

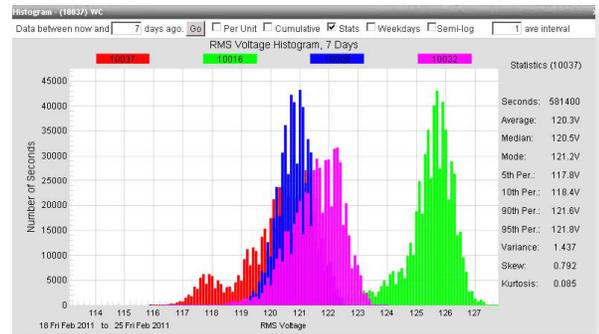


Figure 7. Histogram display

### DAILY PROFILE GRAPH

The Daily Profile graph show the “average” 24 hour period, for the selected timestamp. Below, a 30 day profile is shown. Each 15 minute block in the 24 hour period is average across all days, and these 15 minute blocks are graphed, to show the typical daily trend. As with the Histogram graph, the timestamp, averaging interval, and weekdays-only parameters are adjustable.

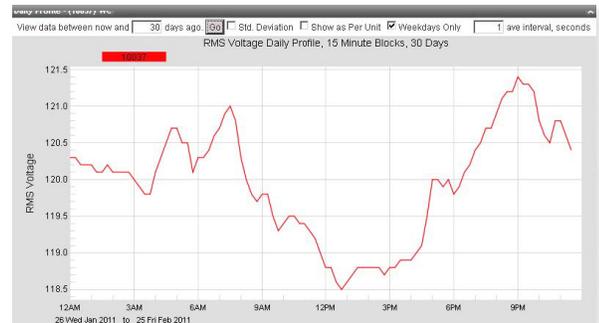


Figure 8. Daily profile graph

### STANDARD DEVIATION

The “Std. Deviation” checkbox enables the graphical display of the standard deviation for each 15 minute block. This is shown as shaded bars, and indicates how much the voltage varied within that block. In the graph on the right, the voltage varied the most between 9am and 5pm, which is also the period with the lowest average voltage.

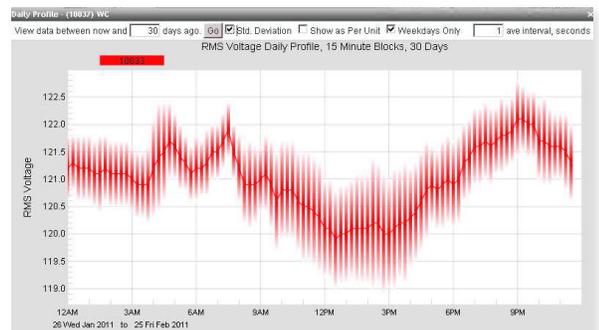


Figure 9. Standard Deviation

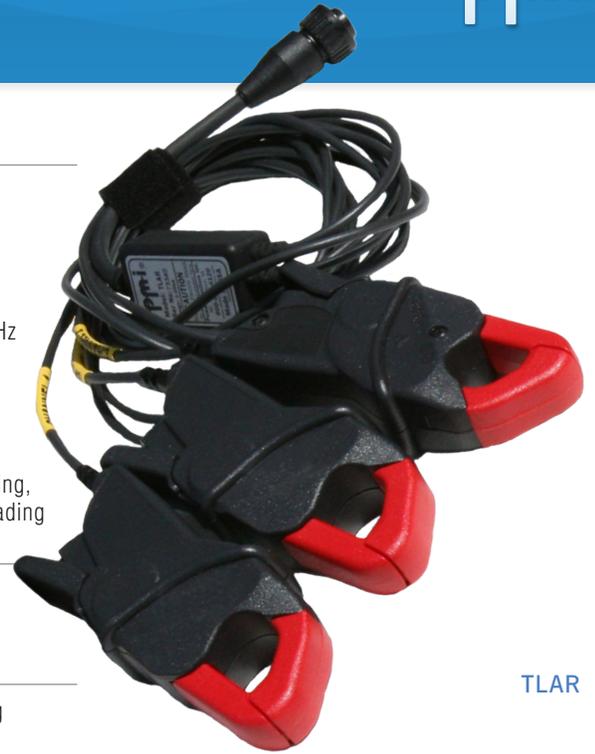
### ULTRA SLIM FLEX CTs

<b>ELECTRICAL SPECIFICATIONS</b>	Switchable Ranges	1 to 100A, 1 to 1000A, 1 to 5000A
	Operating Limit	1 to 5000A
	Controls	Range is chosen from the recorder, PC, or PDA software.
	Power Source	Power is supplied by connection to PMI recorder. No external battery or other power source is required.
	Linearity	±0.05%
	Phase Shift	≤ ±0.5% at 50 to 60 Hz
	Frequency Range	8Hz to 10kHz
	Crest Factor (mid range)	100A and 1000A scale: 3.0 5000A scale: 1.6
<b>PMI RECORDER CAPABILITY</b>	Position Sensitivity	±1.5% 1 in from connector
<b>MECHANICAL MATERIALS</b>	iVS-3/600E may require firmware upgrade.	
<b>ENVIRONMENTAL</b>	Sensor Jacket	Polyurethane UL94V0
	Connector	FR Polypropylene UL94V0
	Cable Jacket	Polyurethane UL94V0
<b>PHYSICAL DIMENSIONS</b>	Operating Temperature	-20 to 135° F (-29 to 57° C)
	Altitude Operating	0 to 2000m, derated above 2000m
	Case Protection	Sensor and Module IP65 per IEC 529
<b>ACCURACY</b>	Min. Bending Radius	1 in (25.4 mm)
	Sensor Diameter	.310 in (7.9 mm)
	Connector Diameter	1.07 in max (27.2 mm)
	Sensor Output Cable Length	48 in (1.2 m)
<b>WORKING VOLTAGE</b>	± 1% of full scale	
<b>SAFETY</b>	Sensor	600V AC to earth
	Module	600V AC to earth
<b>SAFETY</b>	Double Insulated	
	Sensor	600V CAT IV
	Module	600V CAT III
	Pollution Degree 2	



Ultra Slim Flex CTs

		<b>TLAR</b>	<b>TLARS</b>
<b>ELECTRICAL SPECIFICATIONS</b>	Current Ranges	20A, 200A AC	20A, 200A AC
	Operating Limit	200A Continuous	200A Continuous
	Frequency Range	40 to 10kHz	40 to 10kHz
	Working Voltage	600 VAC max	600 VAC max
	Influence of conductor position in jaw	0.5% of reading at 50/60Hz	0.5% of reading at 50/60Hz
	Influence of adjacent conductor	1.50%	1.50%
	Influence of frequency	40Hz to 1kHz: 3% of reading, 1kHz to 10kHz: 12% of reading	40Hz to 1kHz: 3% of reading, 1kHz to 10kHz: 12% of reading
<b>PHASE SHIFT</b>	1-20A	≤ 3 degrees	≤ 3 degrees
	20-80A	≤ 2 degrees	≤ 2 degrees
	80-200A	≤2.5 degrees	≤2.5 degrees
<b>ACCURACY</b>	20A scale	1 to 20 A: 1.5% of reading ±0.1A	1 to 20 A: 1.5% of reading ±0.1A
	200A scale	1.5% of reading ±0.5A	1.5% of reading ±0.5A
<b>SAFETY</b>	Rating	UL 61010B-1 IEC 61010-1 600V CAT III	IEC 61010-1 600V CAT III
	<b>PMI RECORDER CAPABILITY</b>	10A range only with iVS-3/600E and ViPs with SNs lower than 61000, otherwise adjustable 20A/200A range	
	<b>ENVIRONMENTAL</b>	Operating Temp	14 to 131° F -10 to 55° C
Operating Relative Humidity		10-35° C 85% RH	10-35° C 85% RH
Case Protection		Probes - IP40, Enclosure - IP65	Probes - IP40, Enclosure - IP65
<b>PHYSICAL DIMENSIONS</b>	Maximum Conductor Size	0.78 in (20 mm), bus bar 20 x 5 mm	0.59 in (15 mm)
	Probes	5.47 x 2.00 x 1.18 in (139 x 51 x 30 mm)	5 x 1.67 x 0.93 in bus bar 15 x 17 mm
	Enclosure	2.36 x 1.38 x 0.67 in	2.36 x 1.38 x 0.67 in
	Weight	TLAR+200/3 -0.75 lb TLAR+200/4 -1.00 lb	TLAR+200/3 -0.75 lb TLAR+200/4 -1.00 lb
	Probe Leads	4 ft, 600V rating	4 ft, 600V rating
	Output Cable	9 in, 600V rating	9 in, 600V rating



TLAR



TLARS

