

SHARK[®] 250

Power and Energy Meter for Utility and Critical Industrial Substations



Revenue Metering

- Certified ANSI C12.20 0.1 Accuracy Class Energy Measurements
- High Resolution Frequency Measurements - 0.001 Hz
- Cyber Secured Encrypted Configuration
- Perpetual Time of Use, Transformer/Line Loss, CT/PT Compensation, Test Mode, and Energy Presets
- Rugged Design for Harsh Environments

Power Quality Metering

- PQ Analyzer with Limits, THD Monitoring, and Harmonics Recording
- 512 Samples/Cycle Waveform Recording of up to 319 Events
- Millisecond Timestamp for Accurate CBEMA and SEMI F47 Data Analysis

- Extensive Data Logging, Including Six Historical Logs of 64+ Parameters Each
- Email Power Quality Events on Alarm

Communication and I/O

- Real Time SCADA Communication Capability: Modbus RTU, Modbus TCP/IP, Level 2 DNP3, and IEC 61850
- Ethernet Card Firewalls, Encrypted Email with SMTPS, Port Control, and Digital Firmware Signature Prevent Unauthorized Access and Hacking of Power System Data
- Standard RS485 and Front USB Ports
- MV90 Support
- V-Switch™ Keys Add Functionality in the Field
- Field-upgradable I/O



Applications

- Utility Substation Metering.
- Distribution Automation.
- Alternative Energy.
- Industrial Control Panels.
- Power Quality Studies.
- Distributed Energy.
- Microgrid.



Primary Revenue Metering

Energy Metrology - 0.1% Class Certified

The Shark[®] 250 is an ANSI C12.20 0.1 Accuracy Class meter that provides highly stable, precise, and reliable measurements that maintain accuracy over time. It has comprehensive revenue energy measurement capability, including:

- Energy test pulse.
- Test mode and energy presets.
- Pulse accumulators and totalizers.
- Up to eight pulse outputs and eight pulse inputs.

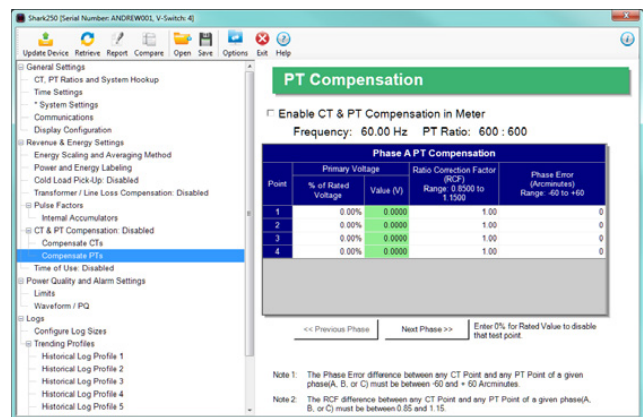
Time of Use

Set up multiple tariffs that meet any contractual obligation with the Shark[®] 250 meter's time of use (TOU). Features include:

- Perpetual TOU calendar – set up once and use indefinitely.
- Up to four customizable seasons.
- Up to 12 months per year - set independently from seasons.
- Flexible billing periods, rates, holidays, and schedules.
- Up to 16 configurable datasets with 38 channels of data, including all energy channels, pulse data, readings per quadrant and phase, and pulse aggregators.
- Cumulative and continuous cumulative demand.

CT/PT Compensation

Utility and other critical metering applications have stringent accuracy requirements. Because of this, users need to compensate for inaccuracies of instrument transformers in their system. The Shark[®] 250 meter has built-in features that provide CT/PT compensation through amplitude and phase angle adjustment. CT reversal setting is also supported.



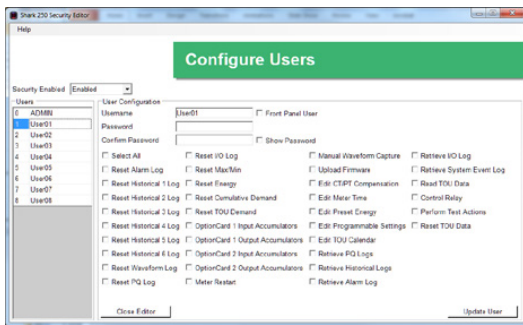
Transformer/Line Loss Compensation

The Shark[®] 250 meter's transformer and line loss compensation (TLC) supports correct energy measurements when the meter is placed on the secondary side of the transformer. Compensate energy readings for TLC to perform accurate customer usage billing.

Cyber Security for NERC CIP Compliance

Data security is necessary for all critical metering applications today. The Shark® 250 meter provides a multi-level cyber secure encrypted configuration to protect metering data. Meet your security initiatives with the following features:

- Nine user IDs - an administrator and eight users.
- Highly secure encrypted passwords of up to 30 characters, to ensure password strength.
- Password fail timeouts to eliminate brute force attacks.
- Role-based authorization.

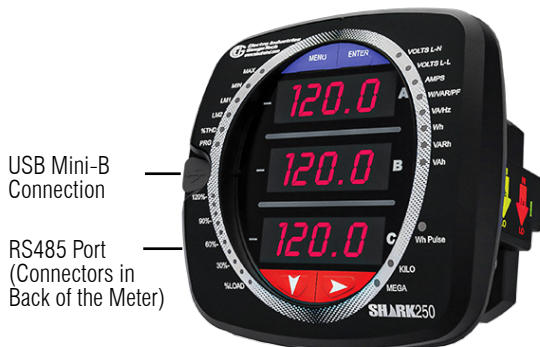


The meter's cyber secured configuration is easily set up using EIG's CommunicatorPQA® software.

Robust Communication for Critical Applications

The Shark® 250 meter is equipped with an advanced communication architecture suited to the specific needs of utilities and other critical metering applications. The meter provides up to four serial and Ethernet communication ports. Protocols include Modbus ASCII/RTU/TCP, Level 2 DNP3, and IEC 61850. Standard ports are:

- USB front port for data downloads and configuration.
- RS485 port.



Field Expandable I/O & Optional Communication Capabilities

The Shark® 250 meter's flexible communication architecture integrates directly into most existing software systems. In addition to its standard communication, the meter offers extensive communication and I/O expandability through its two universal option card slots. The meter accepts and auto-detects new I/O cards even after installation. Up to two cards of any type can be used per meter.

INP100S: 100BaseT Ethernet

- Supports IPv4 and IPv6.
- Embedded HTML5-based web server, smartphone compatible.
- Network Time Protocol support for clock sync.
- Twelve simultaneous Modbus TCP/IP connections.
- Five simultaneous Level 2 DNP3 over TCP/IP connections.
- Encrypted alarm emails with SMTPS and periodic email notification of meter status/reading data.
- Firewalls to prevent unauthorized access.
- Digital firmware signature.



INP300S: IEC 61850 Protocol Ethernet

- Simultaneous communication of IEC 61850 and Modbus TCP/IP.
- Five simultaneous MMS clients.
- Multiple logical nodes, including LLNO, LPHD, MMXU, MHAI, MMTR, and others.
- Polled operation mode (queried reports).
- Buffered and unbuffered reports.
- Configurable .CID file.
- Offers enhanced security to protect from unauthorized programming of meter settings.



RS1S: Serial Communication Card

- Programmable RS485 or RS232 port.
- Up to two ports per meter in addition to the standard RS485 port.
- Supports Modbus ASCII/RTU and Level 2 DNP3.*



* One session at a time of Level 2 DNP3 serial communication is available per meter.

1mAOS: Four Channel Bi-directional 0-1 mA Outputs

- Assignable to any parameter.
- 0.1% of full scale.
- Max. load impedance: 10 k Ω .
- Range \pm (0-1) mA.
- Designed for RTUs and generating stations.



20mAOS: Four Channel 4-20 mA Outputs

- Assignable to any parameter.
- 0.1% of full scale.
- 850 Ω at 24 V DC.
- Loop powered using up to 24 V DC.
- Ideal for any process control application.



PO1S: Four Pulse Outputs / Four Status Inputs

- Programmable to any energy parameter and pulse value.
- Form A: Normally open contacts.
- Can be used for end of interval pulse.
- 120 mA continuous load current.
- Status inputs - dry contact status detection only.
- Provides KYZ outputs and pulse input counting.



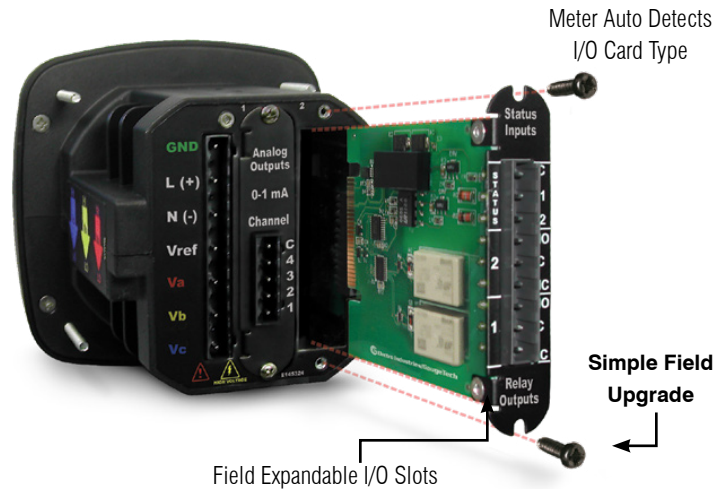
RO1S: Two Relay Outputs / Two Status Inputs*

- 250 V AC / 30 V DC - 0.25 A relays, form C.
- Trigger on user set alarms.
- Set delays and reset delays.



FOVPS or FOSTS: Fiber Optic Card

- EIG's exclusive fiber optic daisy chain switchable built-in logic mimics RS485 half-duplex bus. This lets you daisy chain meters for lower installation costs; full duplex is also assignable. This feature requires the software to ignore echoes.
- ST terminated option (-FOSTS).
- Versatile link terminated option (-FOVPS).
- Modbus and Level 2 DNP3 protocols.



Note: I/O cards can be ordered separately - see last page.

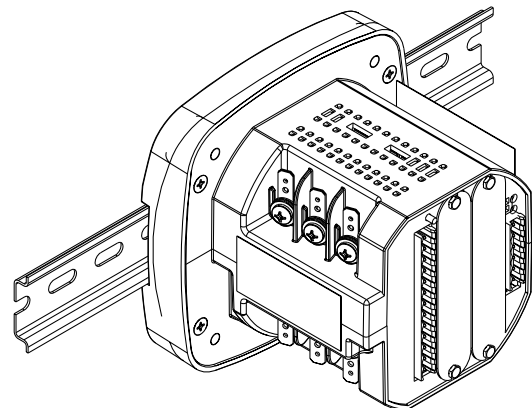
Rugged Design

The Shark[®] 250 meter is designed for harsh environments. It features:

- Compliance with IEC 610186-1/2/3 (high reliability).
- Improved surge withstand capability.
- Intrinsically safe current connections.

Shark[®] 250T Transducer Mounting

This transducer version of the Shark[®] 250 meter does not have a display. The unit mounts directly to a DIN rail and provides an RS485 Modbus or Level 2 DNP3 output and expandable I/O.



Easy DIN Rail Mounting

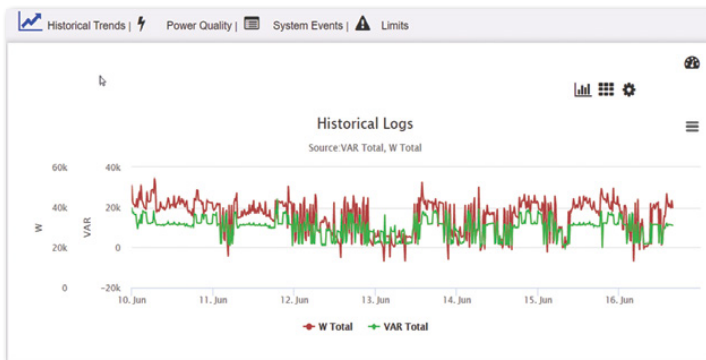
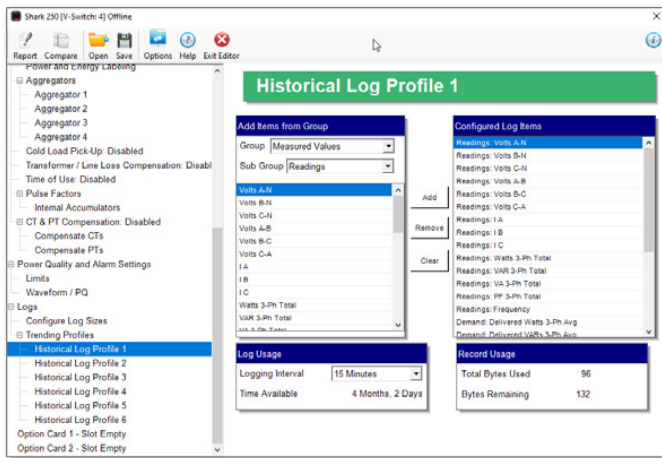
*The meter must be at V-Switch™ key 2 or higher to use the relay features.

Data Trending & Analysis

The Shark[®] 250 meter has up to 128 MB memory for data logging, used for historical trends, limit alarms, I/O changes, and sequence of events. The meter's advanced storage means the unit can be programmed to store historical and waveform data for many years. Its real time clock allows for timestamping of all the data in the meter when log events are created. The clock is accurate to 3.5 ppm and is very stable over temperature.

Historical Logs

- Up to six assignable historical logs.
- 64+ parameters per log.
- Independently programmed trending profiles.



I/O Change Log

- Provides a timestamped log of any relay output.
- Provides a timestamped log of input status changes.
- 2048 events available.

System Events Log

For this anti-tampering log, the meter records and logs the following actions with a timestamp:

- System startup.
- Demand resets.
- Energy resets.
- Log resets.
- Critical data repairs.
- Programmable settings changes.
- Password requests.

Limit/Alarm Log

- Provides magnitude and duration of an event.
- Includes timestamps and alarm value.
- 2048 events available.

Alarm Limits and Control Capability

- Set limits on any measured parameter.
- Up to 16 limits.
- Voltage unbalance.
- Current unbalance.
- Based on % of full scale settings.
- Trigger relay outputs or emails for control.

Limit ID	Item	Value	Status	Limit 1	Limit 2	Setting	Point	Hysteresis	Setting	Point	Hysteresis
1	Volts A-N	15.143	OK	Above	15.840k	15.840k	Below	12.960k	12.960k		
2	Volts B-N	15.324	OK	Above	15.840k	15.840k	Below	12.960k	12.960k		
3	Volts C-N	15.143	OK	Above	15.840k	15.840k	Below	12.960k	12.960k		
4	Watts Total	42923.733	OK	Above	172.800M	129.600M	Below	0.000	0.000		
5	Frequency	60.000	OK	Above	51.000	51.000	Below	49.000	49.000		

Alarm/Limits Polling Screen

Power Quality Measurement and Analysis

Optional Waveform Recorder

The Shark® 250 meter records up to 512 samples per cycle for a voltage sag or swell or a current fault event. The unit provides the pre- and post-event recording capability shown in the table below. Waveform records are programmable to the desired sampling rate. V4 provides up to 128 MB of storage.

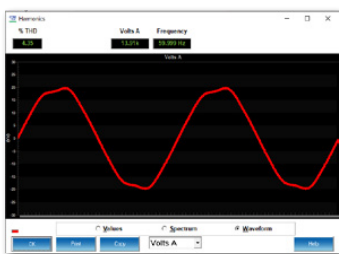
The meter's advanced DSP design allows power quality triggers to be based on a one cycle updated RMS. Hundreds of events can be stored until the memory is full. The meter stores waveform data in a first-in/first-out circular buffer, to ensure data is always recording.

	Samples per Cycle	Pre-Event Cycles	Post-Event Cycles	Max Waveforms per Event
V3	32	16	48	128
	64	8	24	64
	128	4	12	32
V4	256	2	6	16
	512	1	3	8

Note: Sampling rate based on 60 Hz systems.
For 50 Hz systems, multiply by 1.2.

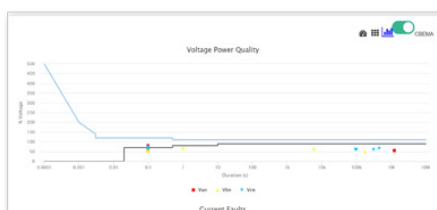
Waveform Scope

The unit uniquely offers a waveform scope that lets you view the real time waveform for voltage and current. The waveform scope lets you use the meter as a basic oscilloscope throughout a power system.



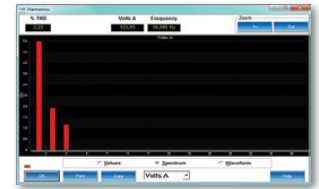
Independent CBEMA or SEMI F47 Log Plotting

The meter stores an independent CBEMA or SEMI F47 log for magnitude and duration of voltage events. This lets you quickly view total surges, total sags, and duration, without retrieving waveform data. Timestamps are stored with millisecond accuracy.



Harmonic Recording to the 40th Order

The Shark® 250 meter provides advanced harmonic analysis to the 40th order for each voltage and current channel, in real time. Using the stored waveforms, harmonic analysis is available to the 255th order.



V-Switch™ Key Technology Upgrades

The Shark® 250 meter has EIG's V-Switch™ key technology, which allows a user to upgrade features without removing the meter from service.

Features	V1	V2	V3	V4
Multifunction Measurement	✓	✓	✓	✓
Programmable Display	✓	✓	✓	✓
Time of Use	✓	✓	✓	✓
System Events		✓	✓	✓
Input Status Change	✓	✓	✓	✓
Limits	✓	✓	✓	✓
Harmonics	✓	✓	✓	✓
2 MB Memory * (3 Historical logs)		✓		
10 MB Memory * (6 Historical logs)			✓	
128 MB Memory * (6 Historical logs)				✓
Waveform 128 samples/cycle			✓	
Waveform 512 samples/cycle				✓
CT/PT Compensation	✓	✓	✓	✓
TLC Compensation	✓	✓	✓	✓
IEC 61850 Protocol **		✓	✓	✓
Level 2 DNP3	✓	✓	✓	✓
Modbus Protocol	✓	✓	✓	✓

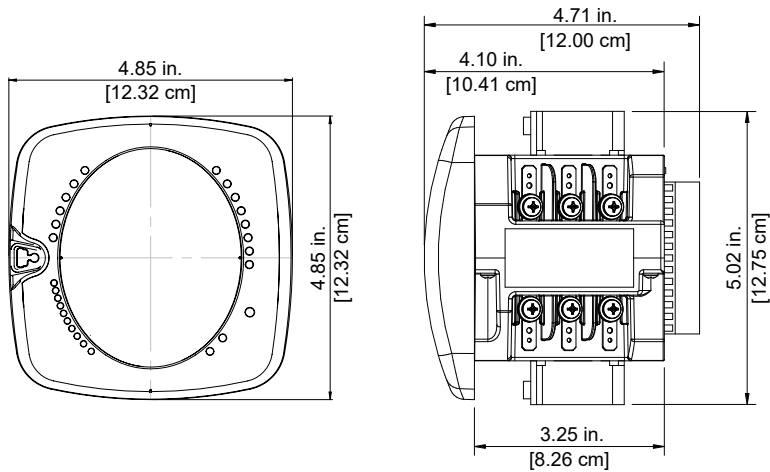
* Note that some memory is reserved for internal operations.
** INP300S option card required.

EnergyPQA.com® Cloud-based Energy Management System

The EnergyPQA.com® system provides energy analytics and predictions enterprise wide and deep insights into power quality.

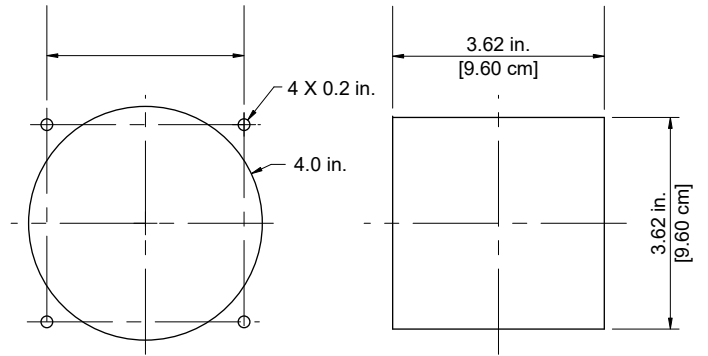
- Increase energy usage efficiency by analyzing load disaggregation and usage comparisons.
- Perform cost allocation and submetering by properly billing for actual energy usage versus square footage estimations.
- Analyze enterprise carbon footprint to determine and improve impact on the environment.

Dimensional Drawings



**Shark® 250 Meter
Front Dimensions**

**Shark® 250 Meter
Side Dimensions**

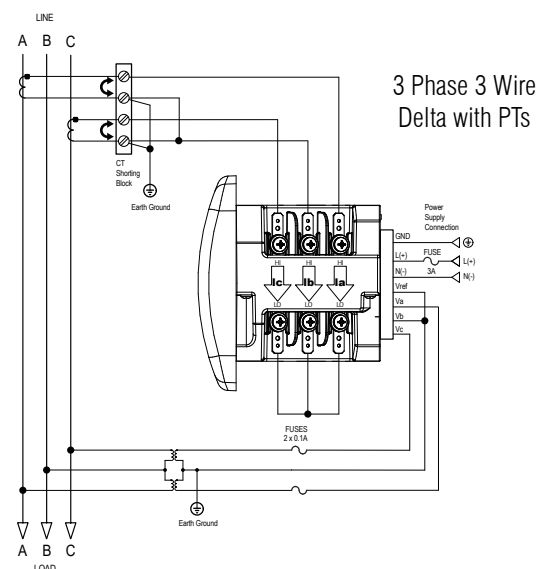
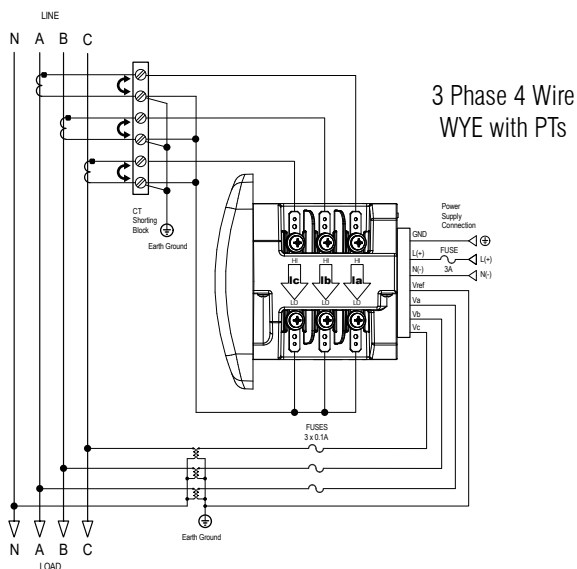
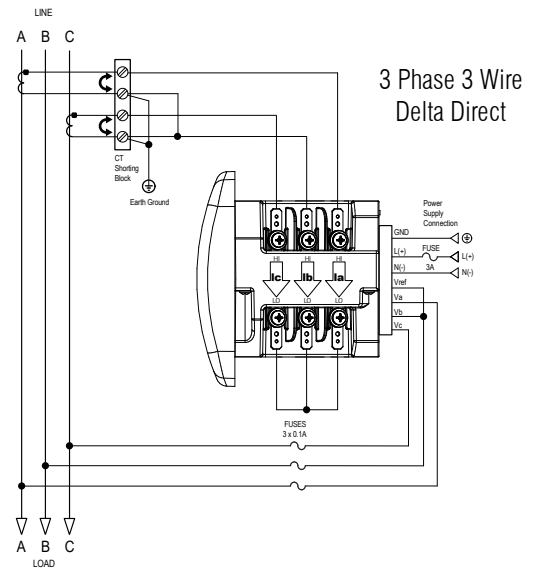
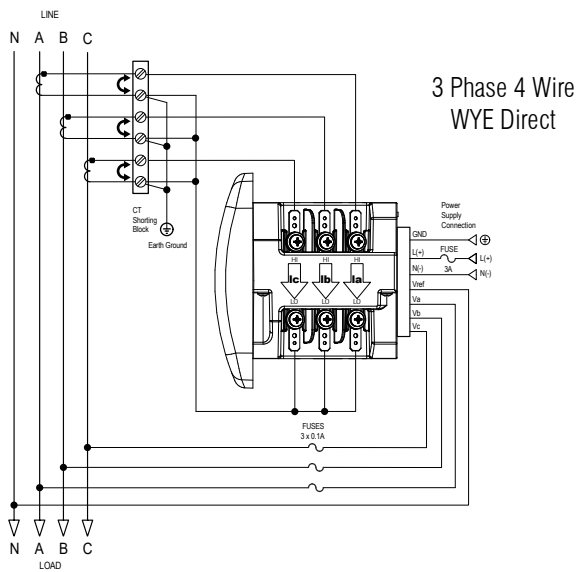


The unit mounts directly into an ANSI C39.1 or an IEC 96 mm DIN square form, making it perfect for new and existing installations.

**ANSI Mounting
Dimensions**

**DIN Mounting
Dimensions**

Wiring Diagrams



Specifications

Voltage Inputs:

- Absolute Range: (20-576) Volts Line to Neutral, (0-721) Volts Line to Line
- Universal Voltage Input
- Input Withstand Capability – Meets IEEE C37.90.1 (Surge Withstand Capability)
- Programmable Voltage Range to Any PT Ratio
- Supports: 3 Element WYE, 2.5 Element WYE, 2 Element Delta, 4 Wire Delta Systems
- Burden: Input Impedance 8 MΩ; Burden 0.0018 W at 120 Volts
- Input Wire Gauge: AWG#12-26/ (0.129 - 3.31) mm²

Current Inputs:

- Class 10: (0.005 to 10) A, 5 A Nominal CT Secondary
- Class 2: (0.001 to 2) A, 1 A Nominal CT Secondary
- Fault Current Withstand (at 23 °C): 100 A for 10 Seconds, 300 A for 3 Seconds, 500 A for 1 Second
- Continuous Current Withstand: 20 A for Screw Terminated or Pass Through Connections
- Programmable Current to Any CT Ratio

- Burden 0.005 VA per Phase Max at 11 A
- Pickup Current: 0.1% of Nominal- Class 10: 5 mA, Class 2: 1 mA
- Pass Through Wire Diameter: 0.177"/4.5 mm

Isolation:

- All Inputs and Outputs are Galvanically Isolated to 2500 Volts

Environmental Rating:

- Storage: (-20 to +70) °C
- Operating: (-20 to +70) °C
- Humidity: to 95% RH Non-condensing
- Faceplate Rating: NEMA 12
- Mounting Gasket Included
- Protection: IP30 - Meter Front/Back, Optional DIN Rail Mounting, Optional Plug-in I/O Modules

Sensing Method:

- True RMS
- Sampling at over 400 Samples/Cycle on all Channels of Measured Readings Simultaneously
- Harmonics Resolution to 40th Order
- Waveform up to 512 Samples/Cycle

Update Rate:

- Watts, VAR, and VA - Every 6 Cycles
- All Other Parameters - One Second

Power Supply:

- Option D2: Universal, (90 to 265) V AC @ 50/60 Hz or (100 to 370) V DC; 10 VA Max
- Option D: (18-60) V DC (24 to 48 V DC Systems); 7 W Max

Standard Communication:

- 2 Com Ports (Back and Faceplate)
 - RS485 Port through Backplate
 - USB through Faceplate (Uses USB Mini-B Connector)
- Com Port Baud Rate: (1200 - 57600) bps
- Com Port Address: 1-247(RS485); 1-65519 (DNP)
- 8-Bit, Parity Setting: Odd, Even, None
- Modbus RTU, ASCII, or Level 2 DNP3 Protocols

KYZ Pulse:

- Type Form C Contact
- On Resistance: 35 Ω Max

- Peak Voltage: 350 V DC
- Continuous Load Current: 120 mA
- Peak Load Current: 350 mA (10 ms)
- Off State Leakage Current @ 350 V DC: 1uA

Dimensions and Shipping:

- Weight: 2 lbs./91 kg
- Basic Unit: H4.85" x W4.85" x L4.25"
- Shark® 250 Meter Mounts in 96 mm DIN or ANSI C39.1 4" Round Cutouts

- Shipping Container Dimensions: 6" Cube

Meter Accuracy:

- 0.1% Energy Accuracy
- Note: For 2.5 element programmed units, degrade accuracy by an additional 0.5% of reading.
- Note: For 1A (Class 2) Nominal, degrade accuracy to 0.5% of reading for watts and energy; all other values 2 times rated accuracy.

Compliance:

- ANSI C12.20 2015 and C12.1 2014, 0.1 Accuracy Class (Eurofins/MET Labs Certified)*
- FCC Part 15, Class B (Radiated and Conducted Emissions)*

- IEEE C37.90.1 (Surge Withstand)*
- IEEE C62.41 (Surge Immunity)*
- IEC 62053-22 Accuracy, Class 0.2S*
- IEC 62053-23*
- CE (IEC 61326-1*, IEC 61000-6-2, IEC 61000-6-4)
 - IEC 61000-4-2 (Electrostatic Discharge)*
 - IEC 61000-4-4 (EFT)*
 - IEC 61000-4-5 (Surge Immunity)*
 - IEC 61000-4-11 (Voltage Variations Immunity)*
 - IEC/CISPR 11, Class B (Radiated Emissions)*
 - CISPR 16-2-1 (AC Mains Conducted Emissions)*
- EU Directive 2011/65/EU (RoHS 3 Directive)
- REACH Compliant
- Certified to UL/IEC 61010-1 and CSA C22.2 No. 61010-1, UL File: E250818*

*Third party lab tested

Ordering Information - All fields must be filled in to create a valid part number.

	Model	Frequency Range	Current Input	V-Switch™ Pack	Power Supply	I/O Slot 1*	I/O Slot 2*	Mounting
Option Numbers:	-	-	-	-	-	-	-	-
Example:	Shark250	60	10	V1	D2	INP100S	X	X
	Shark250 (Meter)	60 60 Hz System	10 5 A Nominal CT Secondary	V1 Multifunction Measurement	D2 (90-265) V AC @ 50/60 Hz or (100-370) V DC	X None	X None	X ANSI Mounting
		50 50 Hz System	2 1 A Nominal CT Secondary	V2 V1 + 2 MB Memory	D (18-60) V DC	RO1S** 2 Relays/2 Status	RO1S** 2 Relays/2 Status	DIN DIN Mounting Brackets (Not for transducer models)
	Shark250T (Transducer)			V3 V2 + 10 MB Memory and 128 Samples per Cycle Waveform Recording		PO1S 4 Pulses/4 Status	PO1S 4 Pulses/4 Status	
				V4 V3 + 128 MB Memory and 512 Samples per Cycle Waveform Recording		1mAOS 4 Channel Analog Output 0-1 mA (bidirectional)	1mAOS 4 Channel Analog Output 0-1 mA (bidirectional)	
						20mAOS 4 Channel Analog Output 4-20 mA	20mAOS 4 Channel Analog Output 4-20 mA	
						FOSTS Fiber Optic Output ST terminated	FOSTS Fiber Optic Output ST terminated	
						FOVPS Fiber Optic Output V-pin terminated	FOVPS Fiber Optic Output V-pin terminated	
						INP100S 100BaseT Ethernet	INP100S 100BaseT Ethernet	
						INP300S IEC 61850 Protocol Ethernet	INP300S IEC 61850 Protocol Ethernet	
						RS1S RS232/RS485 Comm Card	RS1S RS232/RS485 Comm Card	

Accessories

- E205301** RS485 to USB Adapter
- CAB26522** USB-A to USB Mini-B Cable
- Unicom 2500** RS485 to RS232 Converter
- Unicom 2500-F** RS485 to RS232 to Fiber Optic Converter
- Certificate of Calibration, Part #: CCal** This provides Certificate of Calibration with NIST traceable test data.

Software

- COMPQA5P1Y** CommunicatorPQA® 5.0 Software for Windows Single-Computer License (One Year)
- ENERGYPQA-1Year** Cloud-based Energy Management Solution

*I/O cards can be ordered separately using the part numbers shown in the ordering information.

**The meter must be at V2 or higher to use the relay features.



1800 Shames Drive, Westbury, NY 11590 **1-877-EIMETER**
 (1-877-346-3837) **Tel:** 516-334-0870 **Fax:** 516-338-4741
Email: sales@electroind.com **www.electroind.com**



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