***GENERIC SPECIFICATION FOR SOCKET AND SWITCHBOARD FORM REVENUE METER, SHARK® 270 METER***

1. PRODUCT

2.1. POWER METER

1. Meter shall be CE marked. Meter shall be REACH and RoHS 3 Directive compliant. Meter shall have third party certification or testing for the following standards:
   * + 1. ANSI C12.20 0.1 Accuracy Class certified.
       2. IEC 62053-22 0.2S certified.
       3. IEC 62053-23 Accuracy Class 2 certified.
       4. FCC, Part 15, Subpart B, Class A.
       5. EN 61326-1 and CE subordinate standards.
2. Meter shall be a traceable revenue meter, containing a utility-grade test pulse for accuracy verification. Meter shall:
   * + 1. Have accuracy of +/- 0.1% or better for voltage and current, and 0.1% for power and energy. Meter shall have a frequency accuracy of +/- 0.007 Hz to support frequency control.
       2. Perform CT/PT compensation.
       3. Perform transformer and line loss compensation.
       4. Have a test mode for testing meter accuracy. Test Mode shall provide access to Wh (delivered and received) and VARh (delivered and received) values. When operating in test mode, the stored readings from normal mode shall not be impacted or compromised
       5. Meter shall have energy presets.
       6. Meter shall have KYZ pulse outputs and inputs.
       7. Meter shall have perpetual time of use with configurable rates/seasons and cumulative/continuous cumulative demand.
3. Meter shall be designed for multifunction electrical measurement on 3 phase power systems.
   * + 1. Meter shall measure watts (total and per phase), VARs (total and per phase), VA (total and per phase), power factor (total and per phase), voltage max/min in the interval, and frequency; accumulated watt-hour, VA-hour, and VAR-hour; watt-hour received; watt-hour delivered; VAR-hour and VA-hour readings shall be accumulated and stored for each of the 4 quadrants of power.
       2. Demand calculation shall be available for average and peak demand for block and rolling demand calculation. Cumulative and continuous cumulative demand for total bi quadrant watts shall be available.
       3. Meter shall provide time-stamped maximum and minimum readings for demand, power and energy values, THD, TDD, K Factor, + and - Qh total, symmetrical components, voltage unbalance, and current unbalance.
       4. Meter shall provide secondary or primary readings for all energy values. This shall be programmable.
          1. Scaled secondary energy shall be supported.
       5. Meter shall provide updates of all readings at 1 second intervals.
       6. Meter shall provide a customizable separate interval for interval energy and interval energy pulses.
          1. The meter can compute interval energy for aggregators and the meter’s digital inputs.
          2. The interval energy can be used to generate an end of interval pulse to trigger demand averaging.
       7. The meter shall provide V2T and I2T readings, which shall be accumulated in their own registers.
          1. These readings can be logged.
          2. These readings can be assigned to Test pulse 2.
4. Meter shall include a graphical, back-illuminated LCD programmable display with pre-programmed screens and a WYSIWYG Screen Designer for creating custom screens. The user shall be able to:
   * + 1. Display any measured parameters with custom scale factors and formulas.
       2. Display other commodities, such as gas and water.
       3. Use the display as an aggregator, by totalizing measurements.
       4. Display operational data on the display screen.
       5. Set up any combination of up to 250 pre-programmed and customized display screens, in any order, assigned to any of three View modes.
       6. The user shall be able to set up independent scaling for the display.
5. Meter shall have two standard and 2 optional communication ports, which shall operate simultaneously.
   * + 1. Standard ports shall consist of an ANSI Type 2 optical port and an RS485/KYZ pulse serial port.
       2. Up to two optional ports shall be available. Optional communication shall consist of:
          1. 10/100BaseT Ethernet card with Modbus TCP/IP or DNP3 over IPv4 and IPv6 Ethernet communication. Ethernet option card shall support NTP time server for high accuracy time sync, 12 simultaneous Modbus TCP/IP connections and 5 simultaneous DNP3 over TCP/IP connections, an embedded HTML5-based web server, email on alarm and periodic meter status notification emails, port control, firewalls consisting of Allow/Block lists for IPv4/ IPv6/MAC addresses, and encrypted email with SMTP. Up to two Ethernet cards shall be available.
          2. IEC 61850 Protocol communication card. IEC 61850 option card shall support simultaneous IEC 61850 and Modbus TCP/IP communication, 5 simultaneous MMS clients, 5 simultaneous Modbus connections, a web server for status and configuration, multiple logical nodes, a configurable CID file, and whitelisted IP/MAC address to protect from unauthorized programming.
          3. RS232/RS485 communication card.
          4. Under-glass wireless cellular modem card (socket form meter). The cellular modem card option shall be a Verizon-certified 4G LTE™[[1]](#footnote-1) card. The cellular modem supports data collection from EIG software or MV90, secure communication using virtual private network infrastructure, collection of metering data and power quality waveforms through the same connection and shall use a high-speed protocol to program meters and download data. The card supports Modbus TCP/IP protocol.

The cellular modem card shall be accessible for changing SIM cards.

The cellular modem card shall support custom APN.

The cellular modem card shall have four optional external antenna kits for mounting an external antenna. Kits shall include an omni-directional antenna for bracket or cabinet mounting, an omni-directional antenna for mounting to any surface, an omni-directional vandal-resistant antenna, and a directional antenna for pole mounting. Adapters shall be included in the kit and cables from 5 feet to 100 feet shall be available for ordering.

1. Meter shall have built-in I/O and up to two optional I/O modules. Optional I/O shall use Keystone connectors and shall consist of:
   * + 1. Analog output cards of four channel, +/- 0-1 mA or 4-20 mA outputs assignable to any parameter.
       2. Four pulse outputs/four status inputs card, assignable to any parameter, including End of Interval pulse. The cards shall provide KYZ outputs and pulse-counting inputs. The inputs shall be assignable to accumulators and usable with aggregators.
       3. Two relay outputs/two status inputs card, which shall have programmable set/reset delays, and shall be programmable for control, alarm, and status applications. One of the relays shall be programmable as an operational status output indicating meter’s status.\* The inputs shall be assignable to accumulators and usable with aggregators.
       4. An IRIG-B and pulse output card. The IRIG-B shall be available for time synchronization and the pulse outputs shall provide KYZ outputs assignable to any parameter, including End of Interval pulse.
2. Meter shall have up to 128 MB datalogging and PQ recording memory. Available logs shall consist of:
   * + 1. Six separately programmable historical trending logs of up to 64 parameters each.
       2. I/O change log of up to 2048 relay output and input status changes.
       3. Limits/Alarm log of up to 2048 events.
       4. System events, anti-tampering log.
3. Meter shall provide power quality measurement and analysis, including:
   * + 1. Simultaneous voltage and current waveform recording at up to 512 samples per cycle for sag, swell, or current fault event.
       2. Waveform scope for viewing real time voltage and current waveforms.
       3. CBEMA and SEMI F47 graphs.
       4. Harmonics, power factor, phase imbalance, and symmetrical components measurement.
4. Meter shall provide limits and control capability:
   * + 1. Up to 16 limits shall be available.
       2. Limits can consist of any measured parameter, including voltage and current unbalance.
       3. Through optional relay outputs, meter shall support trigger on user-set alarms.
5. Meter shall have cyber security for NERC CIP compliance, including:
   * + 1. Encryption of 30-character passwords and username.
       2. One Admin and up to ten configurable users.
       3. Role-based authorization.
       4. Digital firmware signature.
       5. IP Allow/Block lists, port control, and encrypted email for Ethernet option cards.
       6. Programmable sealing switch.
6. The meter shall have a Modbus map with a customizable section for user configuration.
7. Meter shall have upgrade packs (V1-V5) that enable additional features in the field, without removing the meter from installation.
8. Meter shall be available in socket or switchboard form.
   * + 1. Socket form meter shall support 9s, 45S, 36S, and installation in an A-Base.
       2. Switchboard form meter shall be an S1 Relay case retrofit, with:
          1. Draw out meter cradle.
          2. Easy remove hinged paddle.
          3. NEMA 4X-rated cover.
          4. One button cover release.
          5. Same wiring and dimensions as S1 case.
9. Meter shall be designed for long life in harsh electrical environments.
   * + 1. Meter shall have an internal protection module designed to prevent damage to the meter’s electronic circuits
       2. The internal protection module must attenuate power surges and prevent them from damaging the meter’s electronics.
       3. The internal protection module shall be dedicated to this purpose and housed separately from the rest of the meter’s circuits.
10. Meter shall be programmable by software supplied by meter manufacturer. Meter data shall integrate with cloud-based energy management system for enterprise-wide power quality and usage analysis, predicted usage and demand, reporting, and email alarms.
11. Meter shall have a standard 4-year warranty.
12. The following options shall be available for ordering:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Model** | **Form** | **Frequency** | **Current**  **Class** | **V-Switch**TM  **Pack** | **Power**  **Supply** | **Option Card 1 Type\*** | **Option Card 2 Type\*** |
| **Shark270** | **- 9S** | **-60** | **-2** | **-V2** | **-S** | **-INP100S** | **-X** |
| Shark® 270 Revenue Meter | 9S | 50 50 Hz System | 2 2 A  Nominal CT Secondary | V1 Multifunction Meter | S Blade Powered (Not for SWB3) | X None | X None |
| 45S | 60 60 HZ System | 20 20 A  Nominal CT Secondary | V2 V1 + 2 MB  Memory | SE Externally Powered | PO1S 4 Pulses/4 Status Inputs | PO1S4 Pulses/4 Status Inputs |
| 36S | V3 V2 + 4 MB  Memory and Power Quality Harmonics | RO1S 2 Relay Outputs/2 Digital Inputs | RO1S 2 Relay Outputs/2 Digital Inputs |
| 9A | V4 V3 + 10 MB Memory and 128 Samples/Cycle Waveform Recording | 1mAOS 4 Channel Analog Output 0-1mA bi-directional | 1mAOS 4 Channel Analog Output 0-1mA bi-directional |
| SWB3 |
| V5 V4 + 128 MB Memory and 512 Samples/Cycle Waveform Recording | 20mAOS 4 Channel Analog Output 4-20mA | 20mAOS4 Channel Analog Output 4-20mA |
| RS1S RS232/RS485 Com Card | RS1S RS232/RS485 Com Card |
| INP100S 100BaseT Ethernet | INP100S 100BaseT Ethernet |
| INP300S\* IEC 61850 Protocol Ethernet | INP300S\* IEC 61850 Protocol Ethernet |
| IRG1 IRIG-B and Pulse Output | IRG1 IRIG-B and Pulse Output |
|  |  |  |  |  |  |  | 4GLTE\* 4G LTE Cellular Modem For Verizon (Not for SWB3) |

\*A Shark® 270 meter cannot have more than one INP100S card, cannot have more than one 4GLTE card, and cannot have both an INP300S card and a 4GLTE card. The switchboard meter does not support the 4GLTE card.   
  
Acceptable product is Electro Industries/GaugeTech, Model   
SHARK270-9S-60-20-V5-S-INP100S-INP300S.

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1. LTE is a trademark of ETSI. [↑](#footnote-ref-1)