



ZM1™ Low Amperage Line Sensor

Sentient Energy's ZM1 intelligent line sensor targets zero current and low current overhead grid locations such as low-load feeders and overhead lateral lines. The ZM1 reduces outage duration (SAIDI /CAIDI) by analyzing, locating and promptly reporting faults and interruptions.

Benefits:

- Visibility of low load feeders and laterals
- More precise fault location
- Enhanced fault analysis capabilities
- More granular load profiling
- Simplified deployment

Monitoring of the Entire Overhead Distribution Grid

The ZM1 is a battery-powered intelligent sensor that complements Sentient Energy's MM3™ Line Monitor by enabling line monitoring on overhead laterals and portions of the main overhead feeder backbone with near zero currents. The ZM1 supports multiple embedded apps that enable fault detection, analysis, and load monitoring, adding visibility of the entire overhead distribution grid.

SAIDI: Fault Detection and Location

Sentient Energy's ZM1 uses advanced fault detection algorithms and is capable of wirelessly communicating fault information immediately to the utility control center. With ZM1, operators can dispatch crews to the correct faulted location, supported by a super bright visible LED which further confirms the faulted phase. Non-priority fault information is detected, collected, and reported daily to Ample® Analytics.

SAIFI: High Resolution Sampling

Equipped with high-resolution sampling rate of 130 samples per cycle, the ZM1 line sensor captures and records details with each fault and interruption. This detailed information is used by Sentient Energy Grid Analytics System™ applications to identify probable fault causes or identify failures before they cause future outages. The ZM1 receives GPS for location, and efficiently enables uploads and downloads over constrained networks allowing data transfers, software upgrades, and configuration changes remotely over the air from the utility's control center.



High Accuracy Load Monitoring

Sentient Energy's ZM1 Log-I app captures snapshots of current per a configurable schedule. The data is downloaded daily to Ample Analytics, making it available to users to view for asset management and planning. The resulting data can also be integrated into other utility applications. At low current, ZM1 is able to maintain a high-accuracy detection within 1A.

Easy to Mount and Maintenance Free for 10 Years

Sentient Energy ZM1 line sensors are easily installed with a hotstick. With a 10-year battery life, the ZM1 will provide years of maintenance-free operation. The remaining battery life is indicated on the Ample screen for advanced replacement planning.

Proven Cellular Communications

Supporting DNP31 direct to SCADA or via Ample without requiring an RTU or any translation middleware, Sentient Energy's ZM1 devices are available with full 4G/LTE support today, and can support mesh radios upon request. The ZM1 reduces the burden on the communications network by transmitting only key fault event characteristics in real time, while forwarding non-priority fault and interval loading data once a day during a daily health check.

Sentient Energy's Ample Analytics Platform

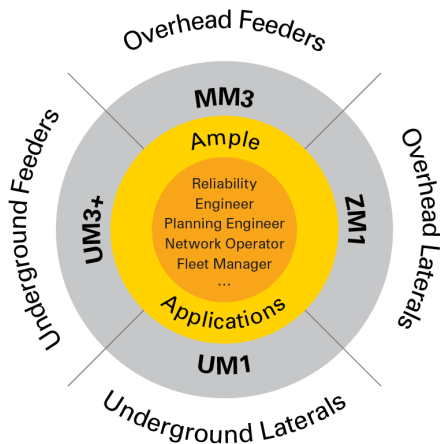
The ZM1, along with Ample Analytics, empowers utility operators to review device health and make desired remote modifications to data collection parameters. The ZM1 integrates seamlessly into Ample and provides critical information on lateral and low load feeder lines.



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A Complete Grid Analytics System

Sentient Energy's Grid Analytics System consists of the MM3™, ZM1™, UM3+™, and UM1™ line sensors, and the Ample Analytics Platform. Each sensor features fault detection and load monitoring capabilities, an LED indicator, GPS, and integrated cellular or mesh communications. The MM3 is used for overhead feeders and the ZM1 monitors overhead laterals as well as low load feeder segments. The UM3+ addresses underground feeders while the UM1 monitors underground residential distribution. All four sensors are designed to maximize the amount of system data gathered while transmitting only the necessary information.



Ample® Analytics Platform

Sentient Energy's Ample Analytics Platform is a comprehensive set of software tools that turn sensor data into actionable insights for network operators, reliability engineers, and planning engineers. In addition to providing data visualization and analytics, Ample streamlines sensor fleet management and integration of sensor system data into existing OT systems.

Key Characteristics

Wireless Communications (WAN)	Cellular (4G LTE, 3G, GPRS) – AT&T, Verizon, International MVNO Communications Protocol: DNP3 ¹
Battery Life/Technology	10-year expected life / Lithium Thionyl Chloride
Current, Fault Measurement	Up to 10kA peak current; 25kA RMS fault current tolerant
Additional Characteristics	Current direction detection, e-field sensing
Waveform Capture (I & V)	130 samples/cycle (60 Hz) and 156 samples/cycle (50 Hz), 1st – 22nd harmonics
Operating Environment	Up to 44kV (L-L), -40°F to + 185°F (-40C to 85°C)
Conductor Diameter	0.160" to 1.030" / 4.06 mm to 26.16 mm
Conductor Surface Area	12.9 to 537 mm ²
Physical Size and Construction	7" x 6.5" x 4"; Weight: 3.5lbs; Weather-proof; 10+ year lifespan
Qualifications	ANSI®/IEEE495-2007; FCC part 15; ICES-003; salt fog environmental, AT&T and Verizon certified
Event Notifications	Immediate network messaging, daily health reports, and local superbright high visibility LED FCI-type indicator
Installation	Standard hot stick; minimal installation time with no pole attachments required
Security	Transport Layer Security (TLS)
GPS	Lat/Long location information

¹DNP/IEC 60870-5-104 through concentrator

Visibility, Analytics, and Control for a Better Distribution Grid

Sentient Energy®, a Koch Engineered Solutions company, is the premier provider of intelligent sensing, data analytics, optimization, and control technologies for the distribution grid. Sentient Energy's hardware and software solutions help electric utilities make data-driven decisions to enhance the delivery of safe, reliable, and efficient power. With the industry's only Grid Analytics System™ that covers the entire distribution network, Sentient Energy leads the global market with the largest network of line sensor deployments in North America, gathering rich data in real time for predictive insights and strategic grid management. Sentient Energy's Grid Edge Control solutions enable utilities to reduce energy costs at the grid edge through Volt-VAR optimization, conservation voltage reduction, and peak demand reduction. Sentient Energy partners with leading communications network providers. For more information visit www.sentientenergy.com.

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