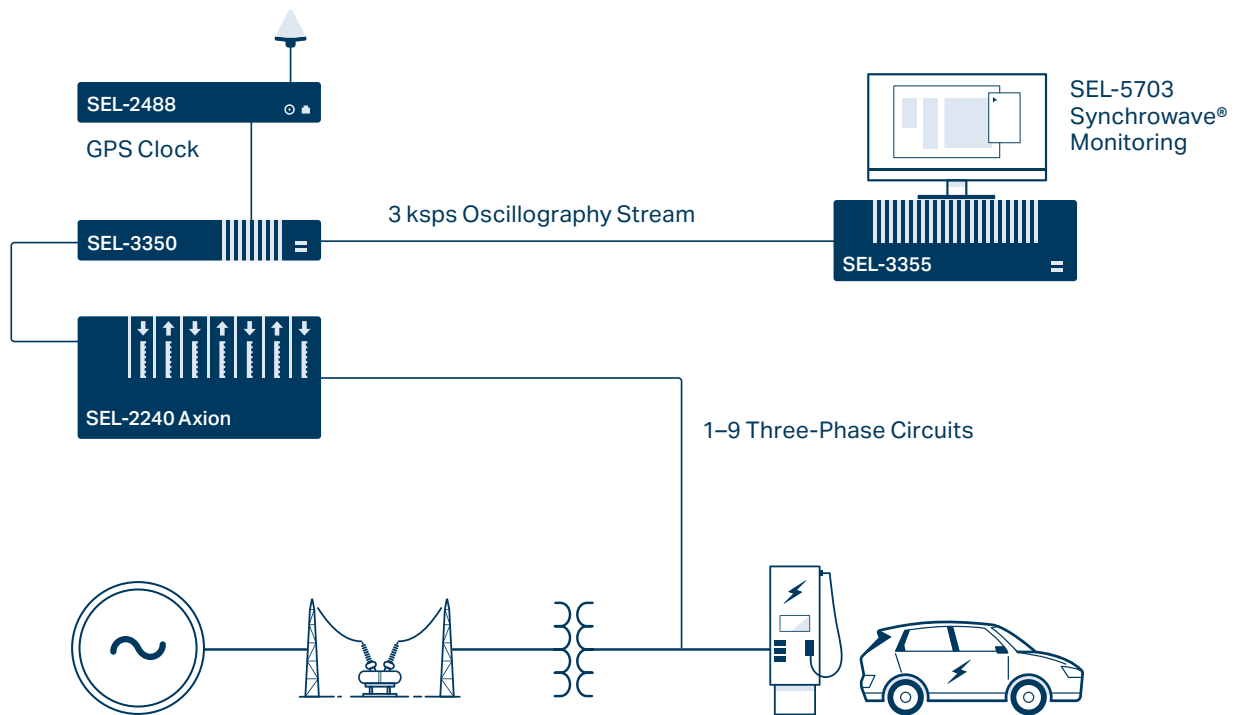


Capture Every Disturbance With Continuous Waveform Recording



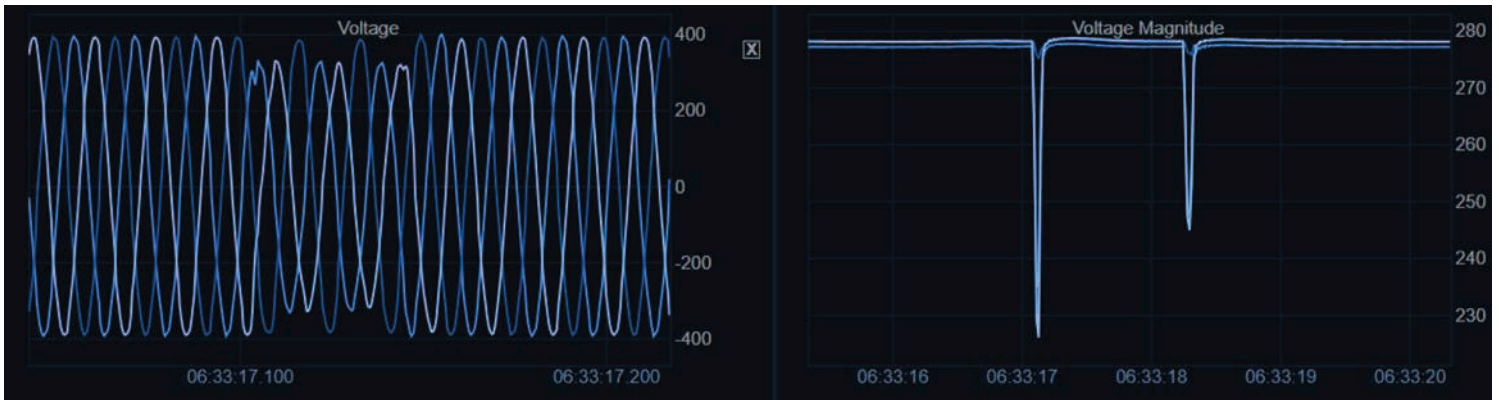
Continuously measure, stream, and record time-synchronized waveform oscillography

- Precisely measure energy exchange regardless of frequency, phase angle, or signal distortion.
- Analyze disturbances at 3,000 samples per second of ac current and voltage waveform data.
- Instantly view detailed waveforms, in intervals from microseconds to days.
- Visualize positive, negative, and net energy packets in 10 ms intervals.
- Calculate and trend power, voltage, and current magnitudes.

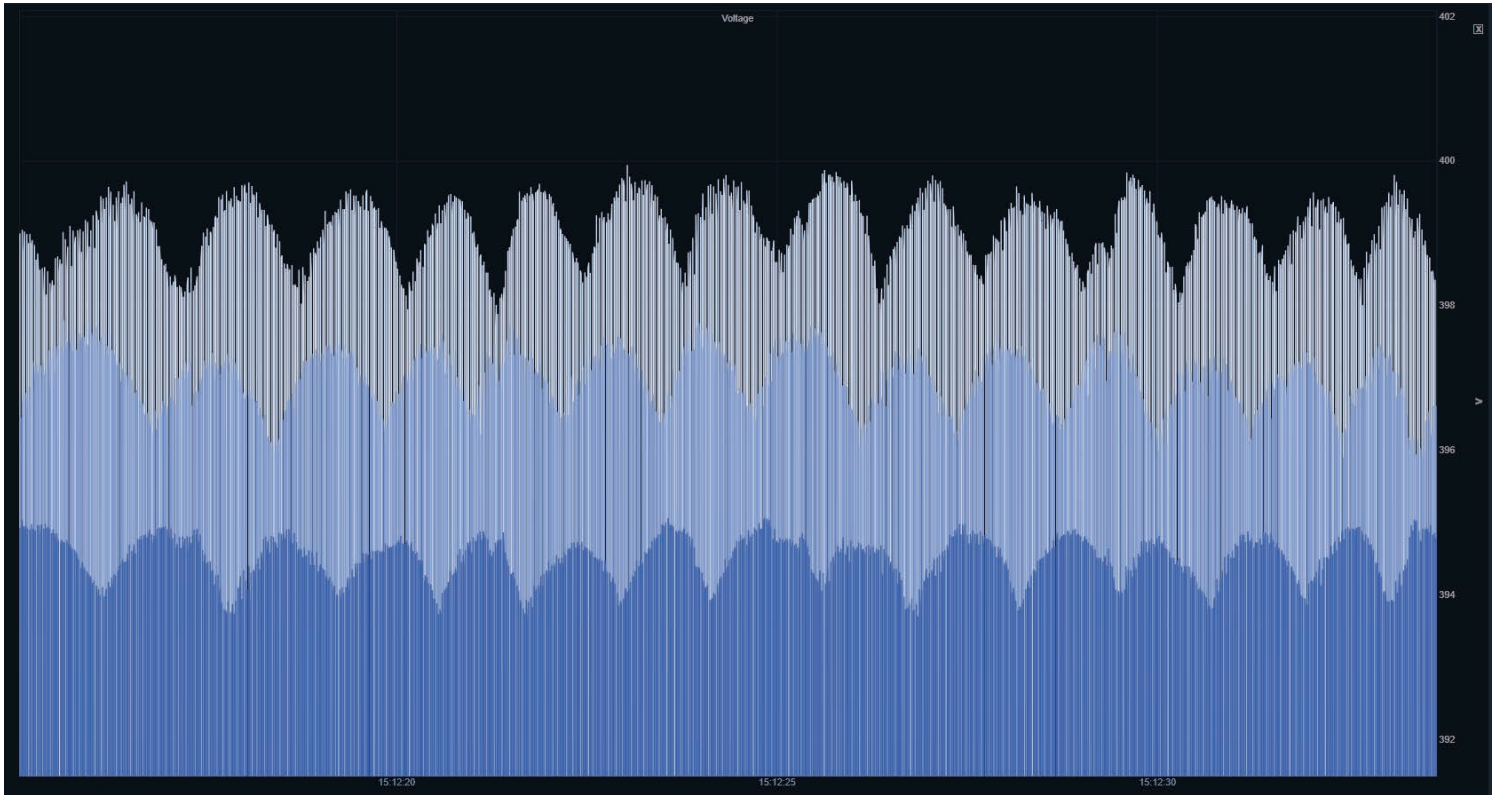
Never Miss an Event

Conventional power monitors depend on phasor-based calculations to detect faults and disturbances, but energy flow changes faster than once per cycle—the typical measurement rate of these devices. Kilo-sample per second (ksps) time-domain measurements expose power system disturbances that traditional power monitors do not typically capture, allowing you to take immediate action.

Monitoring devices—including protective relays and power quality meters—capture several cycles of waveform disturbance data based on predefined event conditions. Power system disturbances become less predictable as more distributed energy resources and nonlinear loads connect to the power system. Monitoring devices may fail to identify an event such as voltage oscillations. Additionally, disturbances like voltage sags on distribution circuits can last longer than the waveform recording window, and traditional recording devices may fail to capture the event. The SEL continuous oscillography streaming and recording system provides gapless 3 ksps recording of voltage, current, and energy transfer, so you never miss an event.



Capture all voltage disturbances regardless of magnitude.



Voltage ripple caused by varying load.



Visualize the energy required to start a motor.

Energy Measurement Redefined

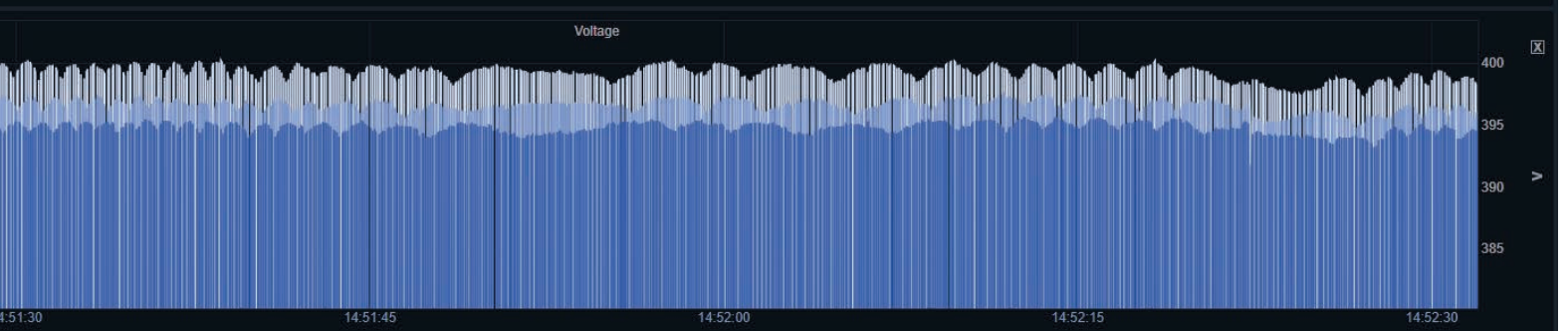
Industry-exclusive energy packet technology from SEL precisely reports energy flow under all system conditions regardless of frequency, angle, or distortion. Positive energy packets represent energy delivered to the load. Negative energy packets represent energy received (returned) from the load. Negative energy packets can indicate suboptimal system utilization.

See application guide AG2023-19, “View Streamed Axion® Wave Server Time-Series Data in Synchronwave® Monitoring and Calculate Energy Packets in RTAC Logic Engine,” for applying energy packet technology. The guide provides instructions on how to calculate and visualize energy exchanges in precise 10 ms windows. Use this information to gain insight into bidirectional energy transfer, reverse power flow, subcycle oscillations, and contributors to lost capacity. Operators can clearly identify load changes such as motor starts, inverters cycling, and inrush events.

Configure an SEL Real-Time Automation Controller (RTAC) to share energy packet information with control and monitoring systems via traditional protocols, including GOOSE, DNP3, and Modbus.

Energy packets provide a clear visualization of cyclical loads.





Simple Technology With Advanced Capabilities

The time-synchronized waveform streaming system contains SEL-2240 Axion devices with SEL-2245-42 AC Protection Modules. These modules provide three current and three voltage measurements at 3 kps to SEL Synchronwave software via the Axion Wave Server protocol in the SEL-3350 or SEL-3555 RTAC. This protocol is based on IEEE C37.118, but the packet consists of time-domain sampled data rather than calculated phasor data. The waveform streaming system supports up to 96 channels per SEL RTAC and works with both SEL-5702 Synchronwave Operations and SEL-5703 Synchronwave Monitoring.

Users access the data with server-based Synchronwave software to view either real-time or historical data streams and magnitude trends. Synchronwave software records the data to a server with a user-configurable retention period. The server can record over a year of streaming data, depending on the memory allocated and the number of recorded channels.

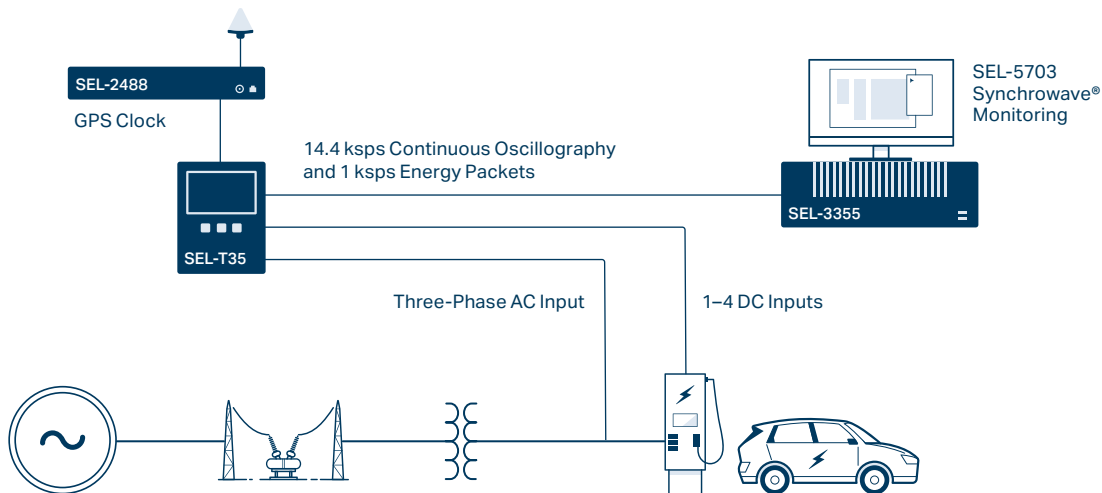
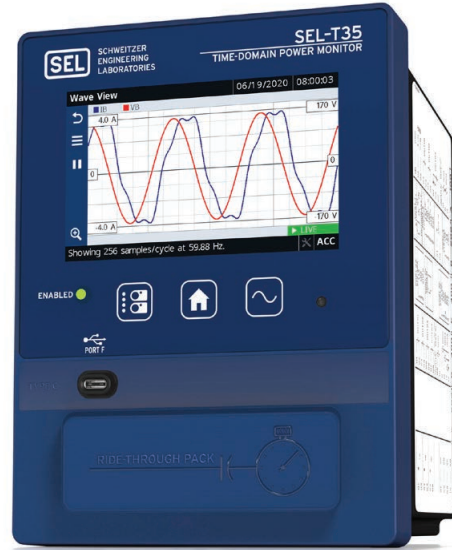


COMING SOON

SEL-T35 Time-Domain Power Monitor

The SEL-T35 precisely samples ac and dc signals and streams voltage and current data at 14.4 ksps and energy calculations at 1 ksps to SEL Sychrowave software. This data stream includes energy packets calculated every millisecond, providing energy measurements independent of frequency and phase angles.

With the SEL-T35, you can view ac and dc voltage and current measurements plus time-domain energy transfer in real time on the color touchscreen HMI, as though it were an oscilloscope. You can also measure the output from third-party transducers, including temperature, solar irradiance, and high-energy dc voltage or current, using low-level milliampere (mA) dc analog inputs. An integrated ride-through pack ensures that you never miss a disturbance during short-duration outages.



24-Channel System Components

Contact SEL for system bundling options.

Quantity	Product	Part No.
1	SEL-3350 RTAC Processor: Quad-core 1.6 GHz RAM: 8 GB Storage: 480 GB	3350#X6TM
1	SEL-2240 Axion Pre-assembled Axion with 19" rack-mount backplane, Power Coupler with Ethernet, and four AC Protection Modules	2240#X9AP
4	Synchrowave Monitoring Data collection, visualization, and archiving software	5703TAQ0025
Optional	SEL-3355 Computing platform with Microsoft Windows 10 Enterprise Processor: Quad-core 2.8 GHz RAM: 32 GB Storage: 256 GB primary, 4 TB secondary	3355#YEFJ

Server Requirements

Operating Systems: Microsoft Windows 10 or Windows Server 2016
(administrative privileges required for installation)

RAM: 16 GB RAM

Web Browsers: Google Chrome version 73 or newer; Microsoft Edge

Display Screen Resolution: VGA 1024 × 768 or higher resolution monitor



Making Electric Power Safer, More Reliable, and More Economical
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