SEL-351RS Kestrel®
Single-Phase Recloser Control

Lightweight and flexible recloser control for single-phase applications

- Plug-and-work operation with popular single-phase reclosers simplifies new and retrofit installations.
- EZ settings present a simple and familiar operator interface.
- Single-phase tripping minimizes outage times and improves reliability indices.
- Comprehensive communications protocols and interfaces ease integration into distribution automation systems.
Functional Overview

ANSI NUMBERS/ACRONYMS AND FUNCTIONS

- 16 SEC: Access Security (Serial, Ethernet)
- 27: Undervoltage
- 32: Directional Power
- 50: Overcurrent
- 51: Time Overcurrent
- 59: Overvoltage
- 79: Autoreclosing
- 81 (O,U): Over-/Underfrequency
- 85 RIO: SEL Mirrored Bits® Communications
- DFR: Event Reports
- HMI: Operator Interface
- LGC: SELLogic® Control Equations
- MET: High-Accuracy Metering
- PMU: Synchrophasors
- PQM: Voltage Sag, Swell, and Interruption
- SER: Sequential Events Recorder

ANALOG FUNCTIONS

- BRM: Breaker Wear Monitor
- HBL2: Harmonic Blocking
- LDP: Load Data Profiling
- LOC: Fault Locator

Additional Functions

1. Copper or fiber-optic
2. Optional feature
**Key Features**

**Advanced Protection**
The Kestrel can protect single-phase distribution circuits with comprehensive protection capabilities, including time-overcurrent, autoreclosing, over- and undervoltage, and frequency elements. The Kestrel's accurate fault locating feature increases service restoration efficiency.

**EZ Settings**
You can commission the Kestrel quickly using EZ settings, which are similar to traditional recloser control settings.

**Inrush Detection**
The Kestrel detects transformer energization or motor startup and blocks tripping until these inrush conditions subside using a second-harmonic blocking element.

**Advanced Communications Interfaces and Protocols**
With the Kestrel, you can coordinate relay-to-relay operation with high-speed **Mirrored Bits** communications. You can also integrate the Kestrel into serial and Ethernet communications networks with standard DNP3 or Modbus protocols or optional IEC 61850 protocols.

**Metering and Power Quality Information**
Accurate metering reports in the Kestrel eliminate the need for external meters. Voltage sag, swell, and interruption data are also available to provide power quality monitoring.

**System Monitoring**
You can view system and recloser conditions using an integrated web server. From the web server homepage, you can check settings and view meter and Sequential Events Recorder (SER) reports.

**Compatibility With Popular Reclosers**
The Kestrel works with the G&W Viper-SP single-phase recloser and the ABB Elastimold Molded Vacuum Recloser (MVR), and it can be configured for complete plug-and-work capability. The interface is designed and tested to exceed the IEC 62271-111/IEEE C37.60 standard. Certificates for popular single-phase reclosers are available at [selinc.com/products/351RS_Kestrel](http://selinc.com/products/351RS_Kestrel).
Product Overview

Navigation controls make information readily accessible.

Programmable pushbuttons and configurable labels simplify operation.

EIA-232 front serial port provides local access.

A standard three-point latch improves physical security.
Standard dual-copper Ethernet ports and optional single- or dual-fiber ports improve communications.

Standard multisession Modbus TCP and DNP3 (and optional IEC 61850) protocols enable easy integration with existing systems.

Two standard EIA-232 ports, an EIA-485 port, and a USB port provide communications flexibility.

Built-in synchrophasor measurements provide real-time electrical quantities.

16 SELogic variables replace traditional panel switches with 16 latching, 16 local, and 16 remote control points.
Selective Load Shedding for Improved System Response

The Kestrel can preserve critical loads while balancing system loading. The underfrequency elements in the Kestrel provide the power to segment the feeder to maximize load preservation while still responding to system conditions. For example, on a feeder serving both a critical load and residential loads, you can set the reclosers serving the residential loads with as many as six levels of frequency and time conditions to coordinate with other controls during a loss of generation.

**Mirrored Bits Relay-to-Relay Communications**

SEL *Mirrored Bits* communications provides bidirectional relay-to-relay digital communication. *Mirrored Bits* communications can operate independently on two of the Kestrel’s EIA-232 serial ports. This provides communication upstream and downstream. This bidirectional digital communication creates eight virtual outputs (transmitted *Mirrored Bits*) and eight virtual inputs (received *Mirrored Bits*) for each serial port operating in the *Mirrored Bits* mode.

You can use these *Mirrored Bits* to transmit and receive information between upstream and downstream recloser controls to enhance coordination and trip faster for downstream faults. *Mirrored Bits* technology also helps reduce the total scheme operating time by eliminating the need to assert output contacts to transmit information.

**Coordinated Three-Phase Lockout for Single-Phase Faults**

For a single-phase permanent fault, it may be preferable to trip and lock out all three phases. The Kestrel can coordinate with other single-phase recloser controls at a single location or with upstream three-phase devices to achieve this. Using *Mirrored Bits* for fast communication between recloser controls, the Kestrel can signal coordinating devices to trip and lock out until repairs are made or network reconfiguration is complete.
Customizations

SEL offers a variety of recloser control accessories that let you create a customized solution to meet your application needs. Popular accessories include a cabinet heater, accessory mounting kits, and prewired connectors. Many accessories are available for factory installation or as field upgrade kits. Listed below are some of the accessories available to create a robust recloser solution.

SEL-2401 Satellite-Synchronized Clock
Provide precise time for synchrophasor measurements and accurate Sequence of Events (SOE) reporting with the SEL-2401, which has ±100 nanosecond accuracy for automatically updated time.

SEL-2925 BLUETOOTH® Serial Adapter
Protect personnel from hazardous conditions by allowing them to control and monitor equipment from their trucks or other safe locations. The SEL-2925 transmits data at 115,200 bits per second over distances of 100 meters (328 feet) in typical applications.

SEL-3031 Serial Radio Transceiver
The SEL-3031 combines three serial ports into one radio, allowing three different connections and protocols to operate simultaneously. The spread-spectrum, frequency-hopping radio transmits data in the license-free 900 MHz ISM band, providing an economical communications path or backup communications system.

SEL-3060 Ethernet Radio
The SEL-3060 is a multipurpose Ethernet radio for wireless distribution automation applications, including SCADA and engineering access. The SEL-3060A has a 15-mile range and operates in the license-free 900 MHz ISM frequency band. The SEL-3060B has a 10-mile range and operates in the 2.4 GHz ISM band.

SEL Fault Indicators and Sensors
SEL faulted circuit indicators allow you to pinpoint exact fault locations, even on lateral feeds. This reduces outage times by guiding repair crews directly to the faulted line section.

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# Kestrel Specifications

<table>
<thead>
<tr>
<th>General</th>
<th></th>
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<tbody>
<tr>
<td><strong>Compatible Single-Phase Reclosers</strong></td>
<td>G&amp;W Viper-SP</td>
</tr>
<tr>
<td></td>
<td>ABB Elastimold Molded Vacuum Recloser (MVR)</td>
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<tr>
<td><strong>Current Input</strong></td>
<td>1 A nominal</td>
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<tr>
<td><strong>AC Voltage Input</strong></td>
<td>300 V maximum</td>
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<tr>
<td><strong>System Frequency</strong></td>
<td>50 or 60 Hz</td>
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<tr>
<td><strong>Communications Ports</strong></td>
<td>Three EIA-232</td>
</tr>
<tr>
<td></td>
<td>One EIA-485</td>
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<tr>
<td></td>
<td>One USB Type B</td>
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<tr>
<td></td>
<td>One Ethernet:</td>
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<tr>
<td></td>
<td>Dual 10/100BASE-T (RJ45 connectors)</td>
</tr>
<tr>
<td></td>
<td>Single 100BASE-FX (LC connector; optional)</td>
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<tr>
<td></td>
<td>Dual 100BASE-FX (LC connectors; optional)</td>
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<tr>
<td><strong>Communications Protocols</strong></td>
<td>SEL protocols, IEC 61850 (optional), MIRRORED BITS communications, Modbus, DNP3, ASCII, SNTP, IEEE C37.118 (synchrophasors), HTTP web server</td>
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<tr>
<td><strong>Power Supply</strong></td>
<td>85–264 Vac; 100–350 Vdc</td>
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<tr>
<td><strong>Weight</strong></td>
<td>&lt;34 kg (75 lb) including batteries</td>
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<tr>
<td><strong>Battery Reserve</strong></td>
<td>≥5 hours at −40°C (−40°F), and ≥15 hours at +25°C (+77°F)</td>
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<tr>
<td><strong>Operating Temperature</strong></td>
<td>Relay module: −40° to +85°C (−40° to +185°F)</td>
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<td></td>
<td>Batteries: −40° to +80°C (−40° to +176°F)</td>
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<td></td>
<td>Entire SEL-351RS unit: −40° to +60°C (−40° to +140°F)</td>
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