



Where to Apply the SEL-9L: Comparison With SEL-311C and SEL-311L

SEL-9L Applications

Application Area	How the SEL-9L Supports It
Subcycle line protection	Distance elements with fast protection phasors for subcycle operation, CCVT transient detection, and optional 87L* differential
Multi-terminal lines	Overreaching zones, pilot schemes, and 87L* up to 4-terminals
Long lines	Sensitive directional elements, negative-sequence polarization, load-encroachment logic, power-swing blocking, and charging current compensation*
Cables	Charging current compensation*
Parallel lines	Negative-sequence directional supervision and charging current compensation* suitable for mutual coupling impacts
Single- and three-pole tripping and reclosing schemes	Single- and three-pole tripping and reclosing logic, pole-open detection, phase-segregated pilot schemes, and loop-specific distance logic
Breaker-and-a-half or ring-bus	Dual-breaker support, lead-follower reclosing, and two synchronism check elements
Main transfer bus	Six settings groups
Pilot protection schemes	POTT/PUTT ¹ /DCUB ¹ /DCB/DTT over direct or multiplexed channels
Weak source and terminal-open conditions	Weak-infeed and open breaker echo logic.
Digital substations/process bus*	IEC 61869-9 Sampled Values* and PTP*
Event analysis and fault location	10kHz and 1kHz event records, SOE logs, and single-ended or double-ended fault location with 87L*

*Future firmware release ¹Implemented with logic

SEL-9L vs SEL-311C vs 311L

High-Level Comparison

Capability/Feature	SEL-9L	SEL-311C	SEL-311L
Primary protection function	5 subcycle distance zones and line differential*	Distance with optional subcycle elements	Line differential and distance
Processing speed	1000 samples per second	4 samples per cycle	16 samples per cycle 87L 4 samples per cycle
Pilot schemes¹	Phase segregated POTT/DCB/DTT/87L*	POTT/DCB/DCUB/DTT	POTT/DCB/DCUB/DTT/87L
Directional elements	DirP, DirNeg, DirGnd for directional control of instantaneous, definite-time, and inverse-time overcurrent elements.	32Q, 32G, 32I	32Q, 32G, 32I
Load encroachment	Vertical-boundary design coordinated with quad characteristic	Circular load encroachment region	Circular load encroachment region
Power swing logic	Settingless PSD/OOST (per-loop)	Positive-sequence impedance-based PSB/OOST	Positive-sequence impedance-based PSB/OOST
CCVT transient detection	Settingless element	Y/N enable setting	Y/N enable setting
Reclosing/breaker failure	Integrated single- and dual-breaker logic	Single-breaker logic	Single-breaker reclosing and no breaker failure
Communications and protocols	1 Gbps SFPs; MB8 and MB16; IEC 61850 Ed 2.1; PRP; Sampled Values*	Serial; Ethernet; MB8; limited IEC 61850	Serial; Ethernet; MB8; C37.94; limited IEC 61850
Time sync	IRIG-B; SNTP [*] ; PTPv2 [*] (±100 ns)	IRIG-B; SNTP	IRIG-B
Best-fit applications	Modern distance and differential* line protection, digital substations*	Distance protection	Differential schemes, long lines, up to three-terminal lines
Software	Grid	Quickset, Grid support*	Quickset, Grid support*
SELogic	Free-form and functional organization	Fixed	Fixed

*Future firmware release ¹Implemented with logic

Hardware Comparison

Capability/Feature	SEL-9L	SEL-311C	SEL-311L
Front panel	7" color touchscreen, 10 pushbuttons, 16 programmable LEDs 5.4" graphic LCD, 8 pushbuttons, 24 programmable LEDs with SafeLock® Trip/Close pushbuttons*	2x16 LCD display, 10 pushbuttons, 15 programmable LEDs, <i>optional</i> SafeLock® Trip/Close pushbuttons	2x16 LCD display, 10 pushbuttons, 16 programmable LEDs
Inputs	Software selectable 24-250 V	<i>Optional</i> 24-250 V	<i>Optional</i> 24-250 V
Outputs	Standard, high-speed high-current, and high-speed high-current DC circuit monitor	Standard, high-current, and high-speed high-current	Standard, high-current, and high-speed high-current
Chassis	Horizontal 3U or 4U*	Horizontal or vertical, 2U or 3U	Horizontal or vertical, 3U or 4U
Power supply	Universal 48-250 V with integrated battery monitor	24/48 Vdc 48/125 Vdc or 120 Vac 125/250 Vdc or 120/230 Vac	24/48 Vdc 48/125 Vdc or 125 Vac 235/250 Vdc or Vac
Communications ports	Front – USB-C Rear – 2 RJ45 MB ports; 6 SFP Ethernet ports Networks – 3 with separate IP addresses	Front – DB9 EIA-232; USB Type B Optional Rear Port 1 – Isolated EIA-485 or SEL-2812 compatible multimode fiber-optic Rear Port 2 – DB9 EIA 232 with IRIG-B Rear Port 3 – DB9 EIA-232 Rear Port 5A and 5B – Single or dual redundant fiber-optic or copper Ethernet ports Networks – 1 with 1 IP address	Front – DB9 EIA-232 Rear – One or two electrical or optical fiber differential channels; single or dual redundant fiber-optic or copper Ethernet ports; 1 isolated EIA-485; 3 EIA-232 DB-9 Networks – 1 with 1 IP address

*Future firmware release