

# RL-Series Load Break Switch/Sectionalizer with ADVC Controller

## Medium Voltage Distribution Whitepaper

2019-12-16



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# About the Book

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## At a Glance

### Document Scope

This document promotes or highlights the features of the RL-Series Load Break Switch/Sectionalizer recloser ranges with ADVC Controller range. It also describes a brief overview of the technical specifications of the RL-Series Load Break Switch/Sectionalizer recloser range, the ADVC Controller and the Software WSOS5.

### Validity Note

This document is valid for the RL-Series Load Break Switch/Sectionalizer remotely controlled and monitored automatic circuit recloser (ACR) which consists of the RL-Series Load Break Switch/Sectionalizer recloser (ACR) combined with an ADVC Controller (ADVC).

### Related Documents

Title of Documentation	Reference Number
RL-Series Installation Manual	N00-811
Advanced Controller Operational Manual	N00-812

You can download these technical publications and other technical information from our website at <https://www.se.com/ww/en/download/> .



# Chapter 1

## Introduction

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### What Is in This Chapter?

This chapter contains the following topics:

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## Executive Summary

The development of these products was driven by customer demand for improved return on capital investment in the distribution network.

After carefully evaluating customer needs, the Schneider Electric RL-Series was developed to achieve optimum performance and reliability, making use of the latest available technology in SF<sub>6</sub> arc interruption and microelectronics.

## Introduction and Benefits

### Overview

The Schneider Electric RL-Series pole mounted, gas insulated, load break switch is available in manual and automatic models. The automatic model can be configured as a remotely controlled switch, or as a sectionaliser.

These automatic switches provide the features of traditional load break switches and sectionalisers, plus the benefits of an up-to-date design optimised for automation, remote control, and monitoring, making them ideal for any Smart Grid Solution, now or in the future.

### Benefits

#### Flexibility

- The RL-Series can be used as either a locally or remotely controlled manual switch, or as a fully automated sectionaliser.
- Advanced processing capabilities allow use in complex automation schemes such as Loop Automation and Automatic Changeover (ACO).

#### Reduced Installation Costs

- Simple Commissioning: Configuration of the product is via the user-friendly WSOS software tool or the operator interface (O.I.).
- The key components required for installation are included.
- Pole mounting brackets are provided in the standard package. An optional Voltage Transformer (VT) for auxiliary supply is available.

#### Reduced Operating costs

- The switchgear monitors line current and voltage without the need for additional measurement devices. This data can then be used for forward planning and optimisation of existing feeders.
- Long lifetime, low maintenance equipment reduces lifetime cost.

#### DSA/SCADA Compatibility

When used with a compatible Distribution System Automation (DSA) or SCADA system, Schneider Electric switchgear supports remote control and monitoring to provide the following advantages:

- Reduced Travel Time for Line Crews. Information on events current and LBS status values transmitted to system control allows fast location of the by affected line section.
- This same information allows informed remote switching, reducing the affected area and quickly restoring supply.
- Switchgear can be configured and settings managed from system control, without technicians having to visit each individual switch in the field, with a consequent reduction in traveling time and improved system integrity.

#### Increased customer satisfaction

- Reduced Customer Minutes Lost: Supply can be quickly restored to fault-free areas.

**Deferred capital works**

- Remotely controlled and monitored switchgear gives an improved knowledge of a system and provides better system control. Feeder and substation load can then be remotely managed, improving utilisation of existing plant. Purchase of new plant can then most likely be deferred for a considerable period.

## Applications

### Smart Grid Ready

With the increasing need for advanced monitoring, reduction of outages, improved network control, and automation of distribution networks, the RL-Series Load Break Switch / Sectionalizer is ready to be integrated into your Smart Grid solution.

### Loop Automation

Restoring supply to your customers in time is the focus of Recloser Solutions Loop Automation Scheme. The Loop Automation Scheme reconfigures protection settings, sectionalises by events, minimises affected areas, and restores network supply without the need for communications or operator intervention, using standard product features. Loop Automation is a Distribution System Automation Scheme designed to restore supply to customers in time.

### Automatic Changeover (ACO)

The Automatic Changeover (ACO) system is used in support of a load (such as a hospital) so the supply is available in the event of a power failure. Intelligence embedded in the master switchgear device monitors the supply status and controls a slave device via a dedicated communications link. In the event of an outage the normally open point is closed to provide a secure source of supply to the load. A high level of flexibility so that the system is compatible with most network configurations.

### Operation as a Sectionalizer

Reclosers and sectionalizers work together to further improve feeder reliability. The RL-Series LBS/Sectionalizer, as part of a feeder automation network, detects passage event and automatically isolates sections events of a network in conjunction with upstream recloser operation. To accomplish it senses three-phase current and voltage to count the number of recloser trip operations. When the preprogrammed number of recloser operations is reached, the controller opens the sectionalizer during the recloser dead time to isolate the downstream event. This allows the recloser to restore power up to the sectionalizer during the next reclose sequence.



# Chapter 2

## LBS Overview

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### What Is in This Chapter?

This chapter contains the following topics:

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## LBS / Sectionalizer Overview

### Overview

The SF<sub>6</sub> gas as the insulating and arc quenching media together with puffing principle ensure the positive breaking of small current, mainly active load current, cable charging current, and magnetising current. The short arcing times (within half a cycle) plus tulip type contacts with arc resistant material ensure the long switching life and extended short circuit making capability. The RL-Series can be operated either manually or by a DC motor in a motor compartment below the tank.

A manual operating arm allows hookstick operation from ground level. By pulling on the appropriate side of the arm the load break switch can be tripped or closed. The interrupters are ganged together and driven by an over-centring spring mechanism.

The mechanism is “operator independent” so that it does not matter how slowly the arm is moved by the operator. A motor mechanism is used in feeder automation schemes to facilitate remote control.

Schneider Electric’s RL-Series SF<sub>6</sub> gas switch is designed to meet the growing requirements for oil free, maintenance free, long life, maximum safety, and feeder automation, with a view to Smart Grid applications.



### Function

#### Switching Contacts

The RL-Series switch features a common rotary shaft driving three sets of contacts which operate on the puffer principle of arc quenching. The contacts are “tulip” style with copper-tungsten alloy to ensure a long switching life.

#### Tank

The switching contacts are housed in a tank made of 316 stainless steel. The finish is the natural, unpainted finish, and is grit-blasted. The tank envelope is 3.0 mm thick and reinforced with ribbing to give excellent impact resistance.

Each tank is equipped with the following:

- a mechanical operations counter which is independent of the controller.
- an explosion vent on the side, which will safely release any overpressures developed by excessive internal arcing.
- a mechanical low-gas interlock, which prevents operation of the switch if the gas falls below safe pressure and which provides visible indication of low gas through a window in the tank.
- a manual lock-out ring. When pulled by the hookstick, this mechanically prevents operation of the switch, for example, if maintenance work is being done on the line downstream of the switch.

### **Indication**

Two on/off indicators are provided: one on the side of the tank by the operating lever and one underneath the tank in order to be visible to the operator from below. The underside indicator is directly operated by the switching shaft.

### **Current Transformers**

A toroidal current transformer is mounted on the inside stem of each bushing on one side of the RL switch. The analog current signal is read by the on-board electronics and passed to the controller as a digital signal. The current transformers have a range 10–16,000 A for measurement and fault detection.

### **Voltage Sensors**

Capacitive voltage dividers are mounted in each bushing, providing an analog current signal which is proportional to the voltage between the bushing and earth potential. This analog signal is read by the on-board electronics and passed to the ADVC Controller.

### **On-Board Electronics**

Each RL-Series switch includes a built-in electronic board which reads the current and voltage signals. It also contains memory holding the switch serial number, number of operations and contact wear.

In addition, the on-board electronics contains a temperature-compensated pressure transducer which is used to display the gas pressure at the ADVC Controller.

## RL-Series LBS / Sectionalizer Specifications

	Specification			
RL-Series Range	15 kV	27 kV	38 kV	16 kV
	12.5/16 kA	12.5/16 kA	12.5/16 kA	12.5/16 kA
<b>RATINGS</b>				
Rated Maximum Voltage	15.5 kV	27 kV	38 kV	16 kV
Rated Continuous Current	630 A	630 A	630 A	630 A
Fault Make Capacity (RMS)	12.5/16 kA	12.5/16 kA	12.5/16 kA	12.5/16 kA
Fault Make Capacity (Peak)	31.5/40 kA	31.5/40 kA	31.5/40 kA	31.5/40 kA
Power Operating Time (Close/Open)	< 2 s	< 2 s	< 2 s	< 2 s
Mechanical Operations	10,000	10,000	10,000	10,000
Rated Full Load Operations	600	600	400	400
Short Time Current	12.5/16 kA	12.5/16 kA	12.5/16 kA	12.5/16 kA
<b>BREAKING CAPACITY</b>				
Mainly Active (0.7 pf)	630 A	630 A	630 A	630 A
Cable Charging	25 A	25 A	25 A	25 A
<b>LIGHTNING IMPULSE WITHSTAND LEVEL</b>				
Phase to Phase	125 kV	150 kV	170 kV	170 kV
Phase to Earth	125 kV	150 kV	170 kV	170 kV
Across Interrupter	145 kV	170 kV	200 kV	200 kV
On Loss of SF <sub>6</sub>	50 kV	70 kV	70 kV	70 kV
<b>POWER FREQUENCY WITHSTAND VOLTAGE</b>				
Phase to Earth	40 kV	60 kV	70 kV	70 kV
Across Interrupter	50 kV	60 kV	80 kV	80 kV
<b>SERVICE CONDITIONS</b>				
Ambient Temperature <sup>a</sup> (°C)	-30 to 50	-30 to 50	-30 to 50	-30 to 50
Ambient Temperature <sup>a</sup> (°F)	-22 to 122	-22 to 122	-22 to 122	-22 to 122
Solar Radiation (Max)	1.1 kW / m <sup>2</sup>			
Humidity	0–100%	0–100%	0–100%	0–100%
<ul style="list-style-type: none"> <li>● Option when cubicle battery heater is fitted (-10 °C to 50 °C {-14 °F to 122 °F} without heater)</li> <li>● For altitudes above 1000 m (3280 feet), derate in accordance with ANSI C37.60 for reclosers (ANSI C37.63 for LBS)</li> </ul>				

	Specification			
Altitude meters (max) <sup>b</sup>	3000	3000	3000	3000
Altitude feet (max) <sup>b</sup>	9840	9840	9840	9840
<b>NET WEIGHTS</b>				
Circuit breaker with pole mount bracket (kg/lbs)	128/282	128/282	128/282	128/282
Control cubicle with control cable (kg /lbs)	41/90	41/90	41/90	41/90
Gross Weight of crate (kg / lbs)	285/628	285/628	285/628	285/628
<b>CRATE DIMENSIONS</b>				
Width (mm / in.)	1200/47.2	1200/47.2	1200/47.2	1200/47.2
Depth (mm / in.)	1150/45.3	1150/45.3	1150/45.3	1150/45.3
Height (mm / in.)	755/29.7	755/29.7	755/29.7	755/29.7
<ul style="list-style-type: none"> <li>● Option when cubicle battery heater is fitted (-10 °C to 50 °C {-14 °F to 122 °F} without heater)</li> <li>● For altitudes above 1000 m (3280 feet), derate in accordance with ANSI C37.60 for reclosers (ANSI C37.63 for LBS)</li> </ul>				



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# Chapter 3

## ADVC Controller Series

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### What Is in This Chapter?

This chapter contains the following topics:

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ADVC Features	23
<i>flexVUE</i> Operator Interface	26

## ADVC Controller Series

### Overview

Advanced protection, data logging, and communications capabilities are made possible by the technology housed in the ADVC Controller.

It has been designed especially for outdoor pole mounted operation and is typically mounted low on the pole for ease of access by operation personnel.



*ADVC ULTRA (with flexVUE)*



*ADVC COMPACT (with setVUE)*

## Function

With a cubicle designed to minimise temperature rise from solar heating, the 304 (**COMPACT**) or 316 (**ULTRA**) grade stainless steel enclosure is used to mount the Control And Protection Enclosure (CAPE), Power Supply Unit (PSU), customer accessories and Operator Interface.

The ADVC Controller Series incorporates the functions of a multi-function protection relay, a circuit breaker controller, a metering unit, and a remote terminal unit.

Batteries are carefully located underneath these modules to help avoid overheating so that a battery life of up to 5 years <sup>(1)</sup> can be achieved. A vandal resistant lockable stainless steel door, sealed with a rubber gasket, provides access to the Operator Interface. Vents are screened against vermin entry and the electronic parts are enclosed in a sealed die-cast enclosure which help protect them from entry of moisture and condensation for a long lifetime.

The **COMPACT** cubicle is suitable for temperatures from -10 to 50 °C, while the option of a battery heater in the **ULTRA** cubicle extends its operating temperature range from -40 to 50 °C.

A built-in microprocessor controlled power supply provides uninterrupted operation of not only the circuit breaker and controller, but also the communications radio or modem. These accessories are connected to a built-in user programmable radio power supply. Therefore no other power supplies are required for connection into your SCADA or Distribution Automation System.

Due to careful design the efficiency of the parts is high, allowing a battery hold up time of up to 48 hours <sup>(2)</sup>. The architecture used has the advantage that the circuit breaker operation is independent of the high voltage supply, relying on a set of capacitors charged by the auxiliary supply.

Due to sophisticated power supply management techniques, a circuit breaker operation will operate when attempted and alarms are raised over the telemetry when auxiliary power is lost.

Communications equipment can be mounted within the ADVC Controller cubicle. RS-232 and Ethernet TCP/IP are provided as standard to support the of your communications needs.

The ADVC Controller series is available in two models:

- **ULTRA**
- **COMPACT**

The following table outlines some of the differences between the two models:

	<b>ULTRA</b>	<b>COMPACT</b>
Enclosure	316 stainless steel	304 stainless steel
Door locking	Three-point	Two-point
Customer accessory tray	Side tray Upper tray	Side tray only
Input/Output modules	8 inputs, 8 outputs Optional	N/A
Battery heater	Optional	N/A
Battery	7 Ah or 12 Ah	7 Ah

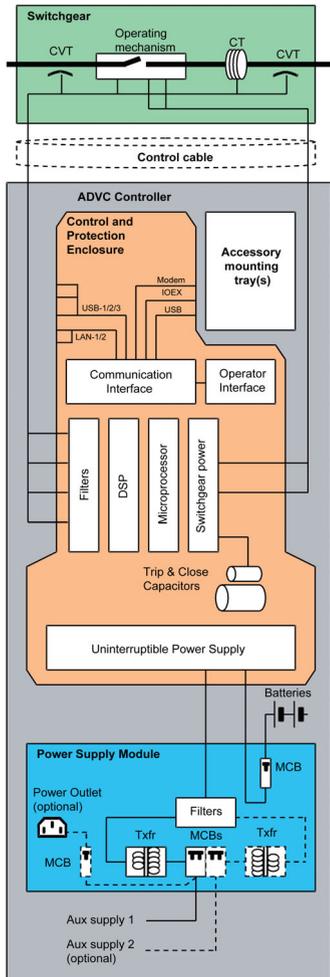
	<b>ULTRA</b>	<b>COMPACT</b>
Temperature range	-40–50 °C With battery heater option	-10–50 °C
Auxiliary power supply	115/230 Vac	115/230 Vac
Dual AC power supply	Optional	N/A
VT power via switchgear	Optional	Optional
DC power supply	Optional	N/A

- NOTE:** 1. Battery replacement interval is influenced by environmental temperature.  
2. With optional 12 Ah battery, panel off and without communications devices operating.

## ADVC Features

### ADVC Block Diagram

Schneider Electric automatic circuit reclosers provide many outstanding advantages to the user. New and innovative features have been made possible by the intimate way the pole-mounted circuit breaker and control cubicle work together. The ADVC block diagram shows how the two items are interfaced.



ADVC Controller block diagram

### ADVC Features

Special extended range current transformers provide a range from 1 A–12,500 A for measurement and protection. Embedded voltage screens accurately image the primary voltage value and phase relationship at the analog front end, allowing measurement of voltage, current, power factor and frequency in the electronic module.

Two different Operator Interfaces are available, these are:

- **seVUE** Operator Interface
  - Based on the field-proven operator panels in the previous controllers, this menu-driven interface with large LCD display offers a familiar look and feel.



seVUE Operator Interface

- **flexVUE** Operator Interface
  - 20 Status Lamps provide a quick snapshot of the protection and controller status.
  - 12 Quick Action Keys are available to execute frequently used actions such as “**Remote control**” ON/OFF, “**RECLOSE**” ON/OFF, and so on. Each key has its own status lamp to indicate the ON/OFF state.
  - The Status Lamps and Quick Action Keys are customizable.
  - It is possible to access Event and Measurement data and modify settings.



flexVUE Operator Interface

**Telemetry Interface**

The Schneider Electric ACR can be interfaced to your SCADA system through its RS-232 ports and a modem of your choice. Ethernet TCP/IP are also available. A variable voltage uninterrupted power supply is included for the radio or modem, which can be mounted inside the communications cubicle. Many telemetry protocols can be supported such as DNP3 and IEC 60870-5-101/104.

**Computer Interface**

WSOS is an advanced personal computer-based software package to allow off-line and on-line programming, monitoring, and control of a recloser via a USB port, RS232 port, or Ethernet.

**Remote Control**

The ADVC offers an impressive list of communication ports for use in remote control applications:

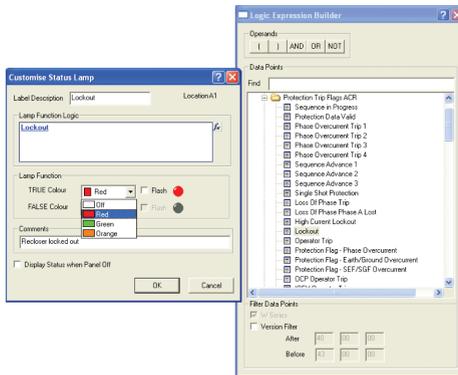
- 2 x RS-232
- 2 x 100Base-T Ethernet port
- 3 x USB (Type A)
- 1 x USB (Type B)

## flexVUE Operator Interface

### Overview

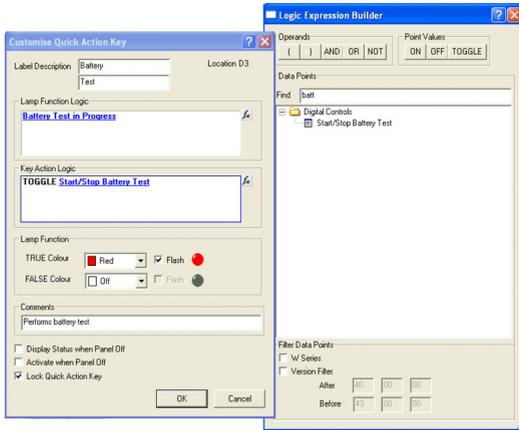
The **flexVUE** Operator Interface uses Light Emitting Diodes (Lamps) and an LCD display to communicate the system status to a local operator. Operator actions that are performed on a regular basis can be mapped to 12 dedicated buttons on the interface.

Each of these buttons also have a lamp to indicate the ON/OFF state of each action. Together with the 20 status lamps the panel provides no less than 32 three-color LEDs that display the state of the controller and overhead system. On the interface, the action buttons are grouped together and referred to as Quick Action Keys. The status LEDs are also grouped together and referred to as Status Lamps.



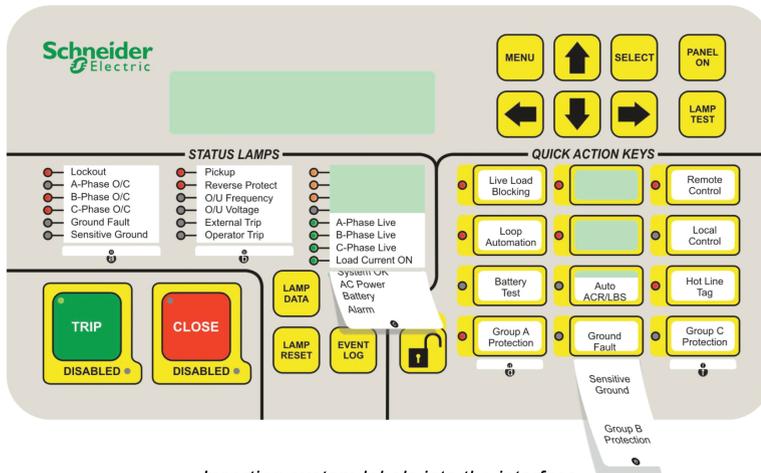
Example of building the logic function for a Status Lamp

Every controller is programmed with a standard configuration of Status Lamps and Quick Action Keys: text labels are used to mark the function of each. These labels are inserted into special pockets within the **flexVUE** Operator Interface and can be changed in the field if required.



Example of setting the action keys

A graphical panel configuration tool is provided as part of the WSOS 5 software package that allows full customization of the *flexVUE* Operator Interface, if required. With the tool, you can create your own logic functions driving the Status Lamps, as well as modify the actions linked to each Quick Action Key. New labels can be printed from the WSOS template using standard office stationery, cut to size and inserted into the controller.



Inserting custom labels into the interface



# Chapter 4

## Switchgear Operating System software

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### WSOS

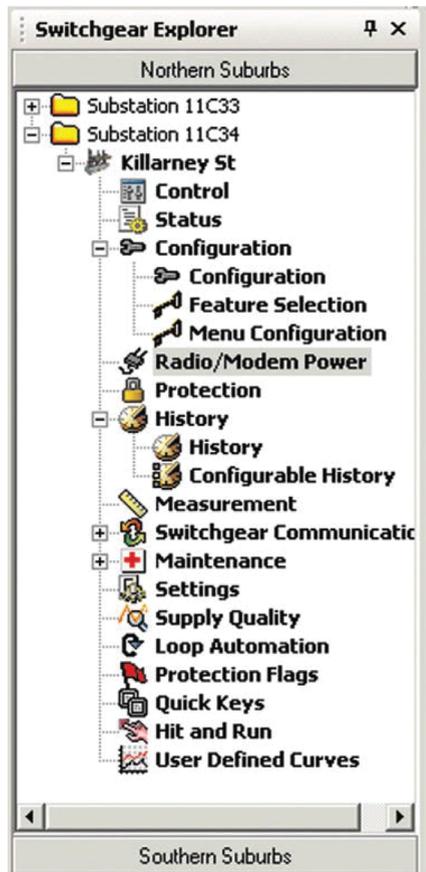
#### Overview

WSOS is the Schneider Electric Switchgear Operating System software. It provides easy access to the switchgear functions from opening/closing, through configuring protection and communication parameters to accessing measurement and analytical data.

By using a PC, engineers can manage many reclosers either remotely via a communications link or locally via a USB, serial port, or Ethernet connection.

#### Description

WSOS Version 5 integrates Schneider Electric's field proven Windows-based switchgear operating system and its powerful features and tools, developed over many years, into a modern desktop. The desktop includes the Switchgear Explorer to organise your switchgear the way you like it and the Launch Pad for handy links to online help, getting started, updates, and much more. Controlling, configuring, and accessing valuable switchgear data from a local or remote location is now even easier than before.



*Switchgear Explorer window*

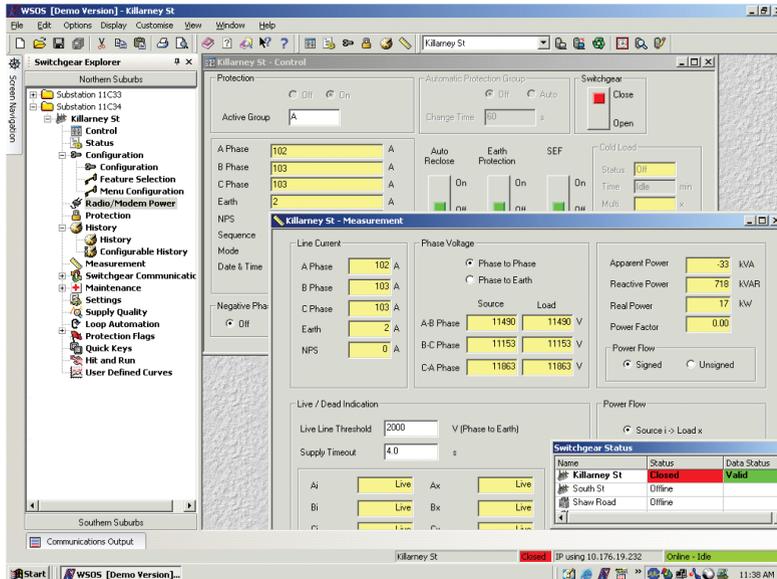
### Local and Remote Control

- Switchgear operation
- Protection group selection
- Protection group copy
- NPS on/off/alarm control
- Auto reclose, earth protection and SEF on/off control
- Work tag, low gas, and lockout on/off control
- Configurable Input/Output Expander (IOEX)
- Configurable quick keys
- Configurable delay for local Open and Close operations (Hit and Run)

- Configurable SCADA protocols:
  - DNP3.0 is included as standard

### Communication Options

- Local USB port
- Local RS-232 port connection
- GSM
- DNP3
- TCP/IP
- Communications output capture



Example of the WSOS5 desktop

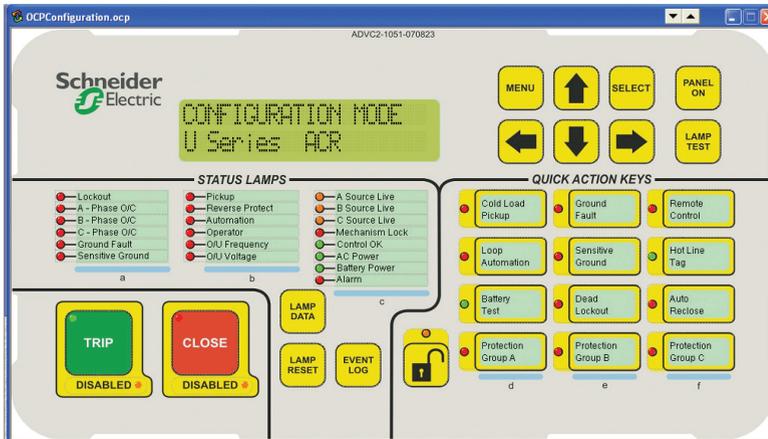
### Measurement Screens

- Three-phase, earth, and sequence current
- Phase voltages:
  - Phase to phase
  - Phase to earth, and
  - Sequence voltages
- Sequence voltages
- Apparent, reactive, and real power
  - Total, and
  - Per phase
- Power factor

- Signed or unsigned power
- Frequency
- Power quality toolkit:
  - Waveform capture
  - Harmonics

### Interface Configuration

- Status lamps:
  - Logic function to indicate; and
  - Separate true/false state color configuration
- Quick Action Keys:
  - Customize actions assigned to each key;
  - Custom logic functions for lamp indication; and
  - Separate true/false color configuration
- Print labels to insert into operator interface



Panel Configuration Tool

**NOTE:** U-series shown on the screen is for representation purposes only.

# Chapter 5

## Other Features

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### What Is in This Chapter?

This chapter contains the following topics:

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## Advanced Detection/Sectionalising Features

### Fault Detection

#### Phase Fault Detection

Phase fault detection monitors all three phases and makes event log entries on through-fault detection.

Phase Faults Setting Range	10–1260 A
Setting resolution	1 A
Detection Time range	0.01–100 s
Time resolution	0.01 s

#### Earth Fault Detection

Earth fault detection monitors earth faults and makes event log entries on through fault detection.

Earth Faults Setting Range	10–1260 A
Setting resolution	1 A
Detection Time range	0.05–100 s
Time resolution	0.01 s

#### Sensitive Earth Fault (SEF)

SEF causes a fault to flag when the earth current rises above a set level for longer than the set time.

SEF current range	1–80 A
SEF operating time range	0.1–999 s
SEF current setting resolution	1 A
SEF operating time resolution	0.1 s

#### Definite Time Protection

Definite Time works by flagging a fault at a fixed time after pick-up.

Setting current range	10–1260 A
Definite time resolution	0.01 s
Definite time range	0.01–100 s
Setting current resolution	1 A

### Inrush Restraint

Inrush restraint raises the phase and earth threshold currents for a short period of time to allow for short duration inrush currents when closing onto a load.

Multiplier range	1–30
Multiplier resolution	0.1
Time range	0.05–30 s
Time resolution	0.05 s

### Sequence Components

Negative, positive and zero phase sequence currents and voltages can be monitored and logged. In addition, the negative phase sequence current detection can be used for detection of low-level phase-to-phase event in the presence of high level three-phase loads.

Setting Current Range: 10 –1260 A

### Live Load Blocking

Live Load Blocking detection operates independently of the detection elements. It prevents the RL switch from closing when voltage is detected on the load side bushings.

Live Load Threshold Voltage range: 2–15 kV

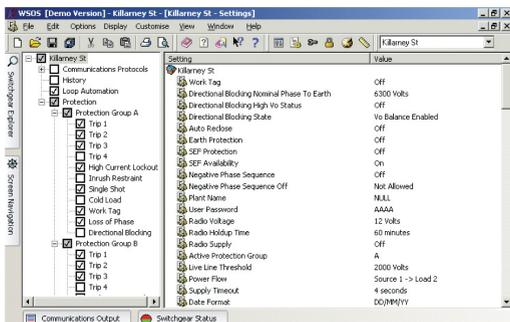
### Cold Load Pick-up

Cold load pick-up allows for a loss of diversity when a load has been without supply for a period of time.

Multiplier range	1– 5
Multiplier resolution	0.1
Time Constant range	1–480 min
Time constant resolution	1 min

### Multiple Detection Groups

The ADVC supports up to 10 detection groups (protection groups with an ACR). Each group can be configured with completely separate detection characteristics with different trip counts and setting currents. The number of detection groups available to the operator can be configured using WSOS, thereby restricting or enabling access to detection settings as required.



WSOS offers a quick, easy way to configure the protection groups.

### Automatic Detection Group Selection

Automatic Detection Group Selection is used to change the detection group depending on the direction of power flow. This allows the LBS / Sectionalisher to be correctly graded with devices downstream regardless of the power flow direction.

Range of Detection Group Pairs: A&B; C&D; E&F; G&H; I&J

### Sectionalising

### Supply Interruption

Supply Interruption Count Range: 1–4

### Sequence Reset Time

Sequence Reset Time	1–180 s
Timing resolution	1 s

## Measurement Features

### General

#### Voltage

The RL-Series uses the CTs, voltage sensors, and advanced control electronics to provide the following measurement features:

True RMS voltage is measured on the six terminals. A user-configured threshold indicates a live terminal (accuracy  $\pm 2.5\%$ ).

#### Current

RMS current is measured on three phases (accuracy  $\pm 2.5\%$ , reading 2.5–630 A).

#### Real Power (Signed or Unsigned)

Real power is determined by multiplying the line voltage and line current in real time and averaging over 2 seconds (accuracy  $\pm 5\%$  of reading, within limits of V and above).

#### Power Factor

The power factor of the line is determined from the line voltage and the line current phase relationship and the previously calculated real power (accuracy  $\pm 5\%$  of reading, within limits of V and I above).

#### Default Historical Measurements

Power flow is integrated over 5, 15, 30, or 60 minute intervals (kWh) and recorded for a period of two months from the date of the event. This can be viewed on the operator control panel, computer, or compatible SCADA system. Additionally, data can be uploaded into a portable computer or a compatible SCADA system.

#### Configurable Historical Measurements

Average demand profiles may be configured using WSOS. Customized configuration enables the user to specify only the parameters that are required, negating unnecessary information capture. Parameters such as line voltages and currents, power, kWh, battery voltage, and cubicle temperature can be recorded in intervals selectable 1–1,440 min.

#### Event History

- Maximum number of typical events stored in the event history: 30,000 events

#### Gas Pressure Measurements

- Gas Pressure Display Resolution: 5 kPa
- Gas Pressure Display Accuracy:  $\pm 10$  kPa
- Gas Low Alarm Setting: 65 kPa Gauge at 20 °C
- Gas Low Alarm/Interlock Accuracy:  $\pm 10$  kPa

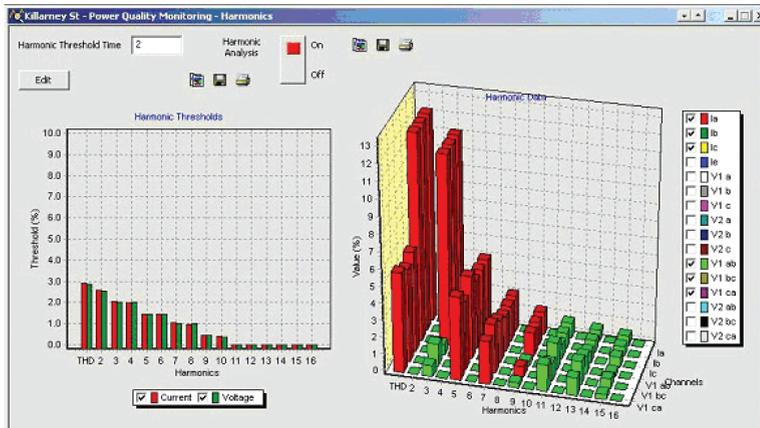
## Power Quality Toolkit

### Supply Outage Measurement

- The Supply Outage Measurement feature utilises built-in switch features to record the number and duration of outages. These statistics are recorded in the controller and are available to the Utility to help calculate system outage customer minutes.
- Controller Records
  - Cumulative total number of outages,
  - Cumulative total outage duration, and
  - The time and duration of each outage event in the Event Log.

### Harmonic Analysis

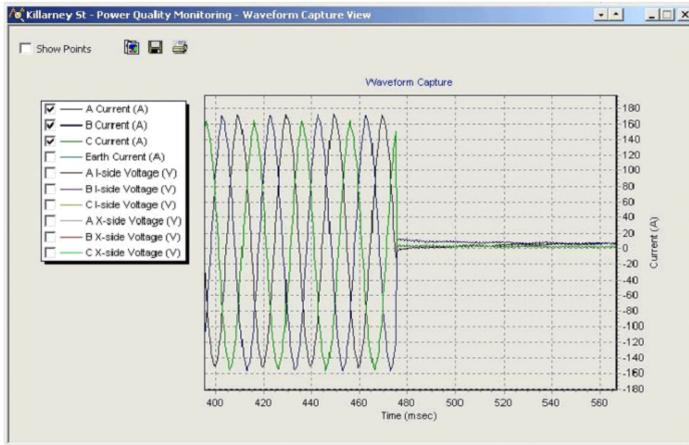
- Harmonics 2 to 16 and the Total Harmonic Distortion (THD) are calculated over an 80 ms period for four currents, six line-line voltages, and six line-earth voltages. These harmonics are available via WSOS.



Harmonic analysis

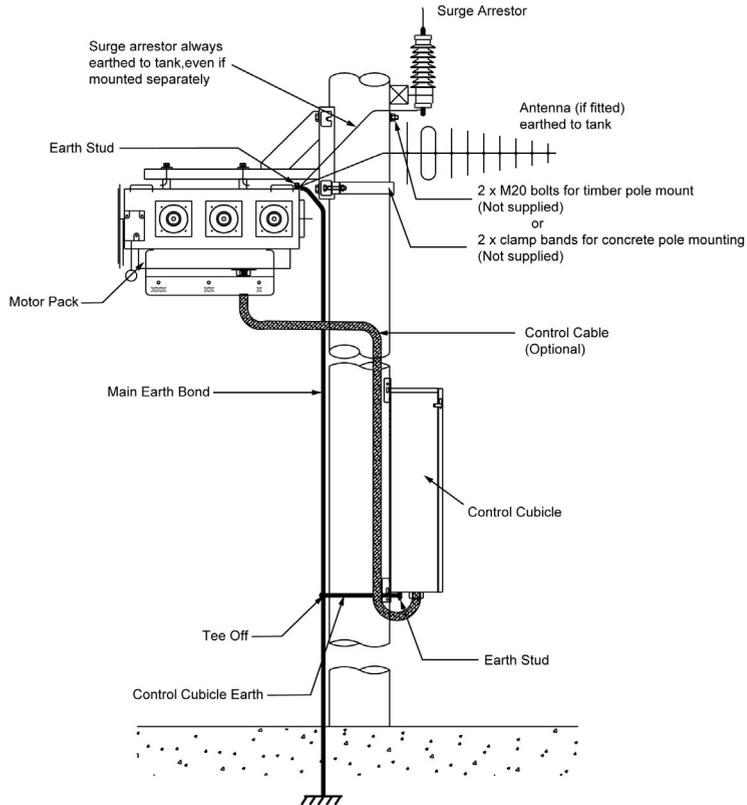
### Waveform Capture

- Based on a user-defined trigger, the ADVC captures and stores, in nonvolatile memory, scaled raw data (10 x 3200 samples per second) of the six line-earth voltages and four currents for a predefined time window either side of a user-defined trigger.
- The user can configure a pre and post trigger time ratio for data to be stored. This event to 50% pre-trigger and 50% post-trigger.
- The captured data can be uploaded at anytime in COMTRADE (IEEE Std C37.111-1999) format via WSOS.



Waveform capture

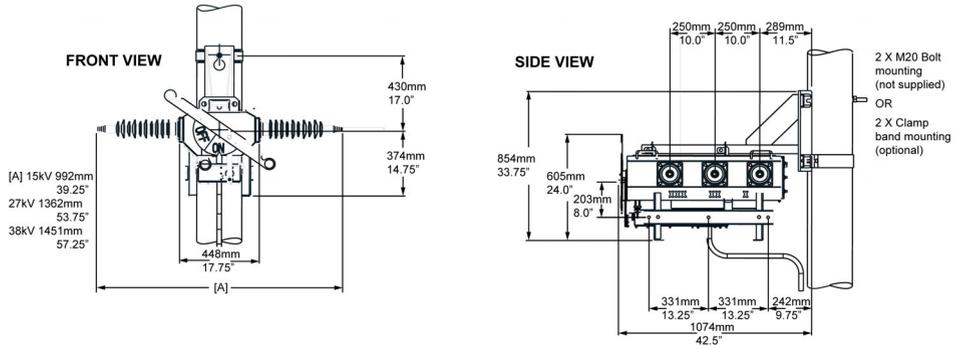
## RL-Series Recloser



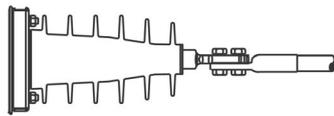
### NOTE:

- Details given in this illustration are subject to change without notice. For full details see the Installation Manual.
- Switch can be mounted closer to pole if lightning arresters are pole-mounted.

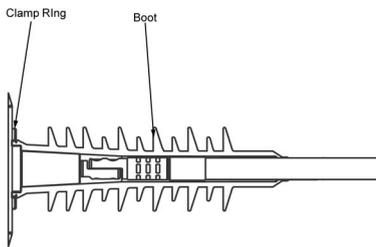
**RL-Series LBS / Sectionaliser Pole Mounting Details**



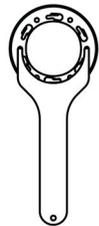
**Terminal / Bushing Options**



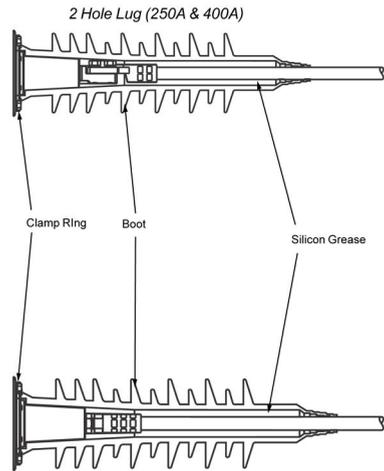
*Bare Terminal (15kV only)*



*2 Hole Lug (630 A)*



*Clamp Ring Spanner*

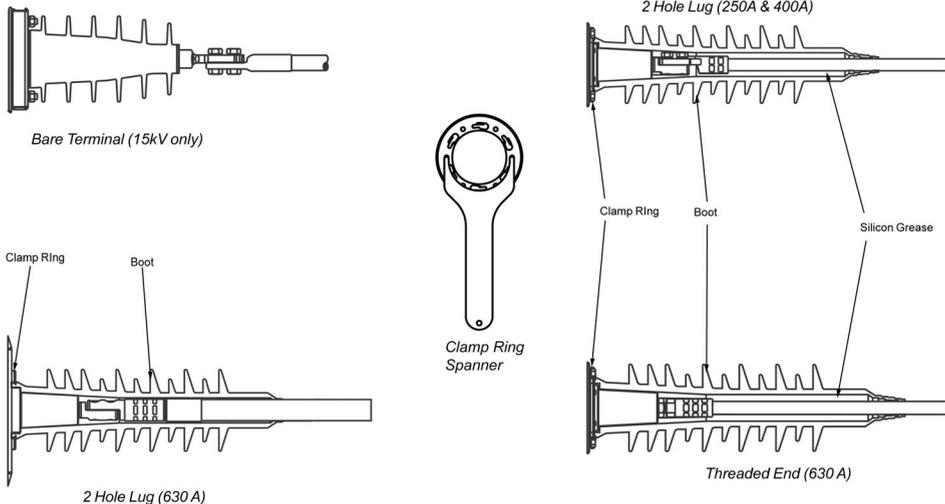


*Threaded End (630 A)*

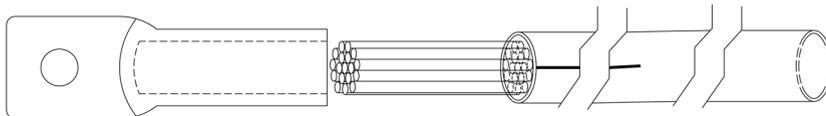
**Accessories**

Below are the various accessory available:

● **Boots:**

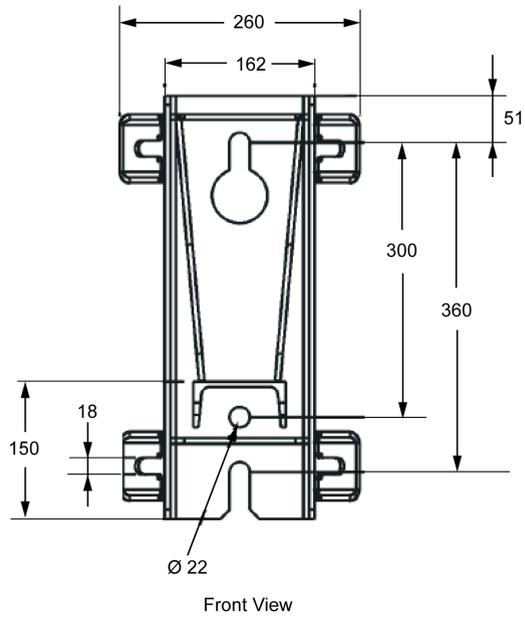


● **HV Cables:**

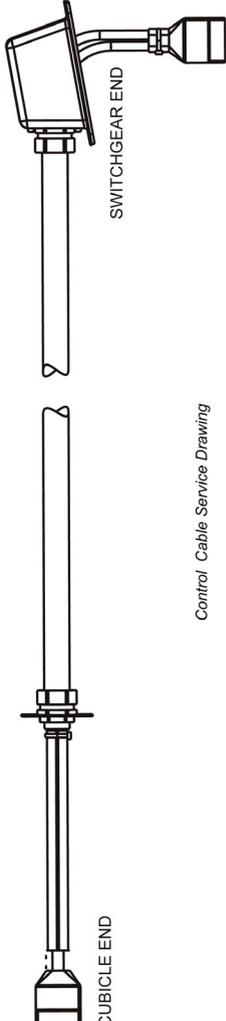
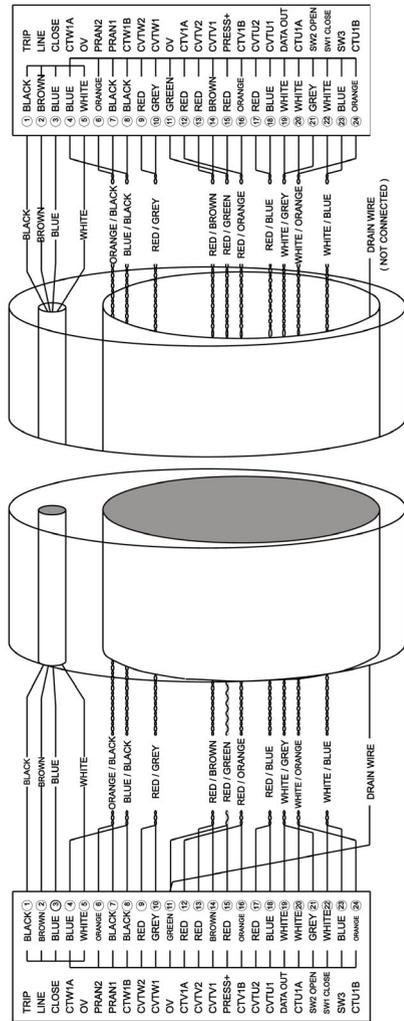


HV Cable	Current	Weight kg (lbs)
HV cables set of 6, standard length per cable is 3 m, other lengths available upon request:	250 A	9 (20)
	400 A	16 (35)
	630 A	29 (44)
	800 A	57 (126)

● **Mounting Brackets:**



- Control Cable:



Control Cable Service Drawing

# Appendices





# Appendix A

## Required details for order

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### What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
ADVC Controller	48
RL- Series LBS / Sectionalizer	49

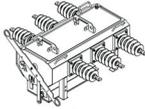
## ADVC Controller

Only one of the boxes (ticked  or filled  with the required value) have to be considered between each horizontal line.  
 Red Circle  lead-time should be requested from your distributor.

<b>ADVC Controller</b>		Quantity <input type="text"/>	
<b>Model</b> <small>(Features Highlighted are only available on ULTRA)</small>	COMPAC <input type="checkbox"/>	ULTRA <input checked="" type="checkbox"/>	
<b>Operator Interface (O.I.)</b>	setVUE  <input type="checkbox"/>	flexVUE  <input type="checkbox"/>	
<b>Ambient Temperature (°C)</b>	Standard	-10°C to 50°C <input type="checkbox"/>	
	Extended <small>With Battery Heater</small>	-40°C to 50°C <input type="checkbox"/>	
<b>Auxilliary Supply Type</b>	Single AC Supply:	115 Vac <input type="checkbox"/>	230 Vac <input type="checkbox"/>
		add 27.8 Vac Integrated Supply to above <input type="checkbox"/>	
		Dual AC <input type="checkbox"/>	DC Supply <input checked="" type="checkbox"/>
<b>Maximum Battery Hold Up Time</b>	28 Hours <input type="checkbox"/>	48 Hours <input type="checkbox"/>	
<b>Language</b>	English <input type="checkbox"/>	US English <input type="checkbox"/>	Spanish <input checked="" type="checkbox"/>
			Portugese <input checked="" type="checkbox"/>
<b>Standard Protocol</b>	MODBUS <input type="checkbox"/>	IEC <input type="checkbox"/>	DNP3 <input type="checkbox"/>
<b>Options</b>			
<b>FTIM</b> <small>(Ultra FTIM cable only)</small>	Not Applicable <input type="checkbox"/>	Yes <input checked="" type="checkbox"/>	
<b>IOEX</b>	Not Applicable <input type="checkbox"/>	Yes <input checked="" type="checkbox"/>	
<b>General Purpose IEC Socket</b>	Not Applicable <input type="checkbox"/>		Yes <input type="checkbox"/>
<b>GPO 10A max.</b> <small>Only with IEC Socket</small>	None <input type="checkbox"/>	AUS  <input type="checkbox"/>	EU-A  <input checked="" type="checkbox"/>
			EU-B  <input type="checkbox"/>
	Other <input type="checkbox"/>	UK  <input checked="" type="checkbox"/>	USA  <input type="checkbox"/>
			Sth Africa  <input type="checkbox"/>

**Special notes** (For other available Accessories, contact local suppliers)


## RL- Series LBS / Sectionaliser



Only one of the boxes (ticked  or filled  with the required value) have to be considered between each horizontal line. Red Circle  lead-time should be requested from your distributor.

\* For details about the manual RL-Series Switch contact your local distributor.

*Certain configurations may attract additional cost. To clarify these details, please consult your local distributor.*

<b>Switch Unit</b>		Quantity <input type="text"/>	
<b>Rating</b> (System Voltage / Interrupt / BIL)	15.5 kV / 12.5 kA / 125 kV <input type="checkbox"/>	27 kV / 12.5 kA / 150 kV <input type="checkbox"/>	38 kV / 12.5 kA / 170 kV <input type="checkbox"/>
	15.5 kV / 16 kA / 125 kV <input type="checkbox"/>	27 kV / 16 kA / 150 kV <input type="checkbox"/>	38 kV / 16 kA / 170 kV <input type="checkbox"/>
<b>Rated Current (A)</b>	630 A <input type="checkbox"/>		
<b>Frequency</b>	50 Hz <input type="checkbox"/>	60 Hz <input type="checkbox"/>	
<b>Rating Plate Language</b>	English <input type="checkbox"/>	Spanish <input checked="" type="radio"/>	Portugese <input checked="" type="radio"/>
<b>Switch State Indication</b>	ON / OFF <input type="checkbox"/>		I / O <input type="checkbox"/>
<b>Accessories</b>			
<b>Mounting Arrangement</b>	None <input type="checkbox"/>	<b>Pole Mount:</b>	Standard <input type="checkbox"/>
<b>Surge Arrester Brackets</b>	Not Applicable <input type="checkbox"/>		Standard Inclusion <input type="checkbox"/>
<b>Concrete Pole Clamps</b>	Not Applicable <input type="checkbox"/>	230 - 270 mm <input type="checkbox"/>	270 - 310 mm <input type="checkbox"/>
			310 - 360 mm <input type="checkbox"/>
<b>Control Cable Length</b>	4 Metres <input type="checkbox"/>	7 Metres (Default) <input type="checkbox"/>	(Max) 11 Metres <input type="checkbox"/>
			Other <input checked="" type="radio"/> <input type="text"/>
<b>Options</b>			
<b>Terminal Cable length</b> (Set of 6)	Not Applicable <input type="checkbox"/>	3 Metres <input type="checkbox"/>	4 Metres <input type="checkbox"/>
			5 Metres <input type="checkbox"/>
			6 Metres <input type="checkbox"/>
			Other <input checked="" type="radio"/> <input type="text"/>
<b>Terminal Cable Rating</b>	Not Applicable <input type="checkbox"/>	250A (Aluminium) <input type="checkbox"/>	400A (Aluminium) <input type="checkbox"/>
			630A (Aluminium) <input type="checkbox"/>
<b>Medium Voltage Terminals Options</b> (Set of 6)	Bare Terminal (15 kV Only) <input type="checkbox"/>	<b>Bushing Boots</b>	770 mm (15-27 kV) <input type="checkbox"/>
			1100 mm (38 kV) <input type="checkbox"/>
	HV Cable Current rating	250 A <input type="checkbox"/>	400 A <input type="checkbox"/>
			630 A <input type="checkbox"/>
<b>Surge Arresters</b>	Not Applicable <input type="checkbox"/>		Surge Arresters <input checked="" type="radio"/>
<b>VT Mounting</b>	Not Applicable <input type="checkbox"/>		Pole Mounted <input type="checkbox"/>
<b>Dressing</b> (Australia Only)	Not Applicable <input type="checkbox"/>		Dressed <input checked="" type="radio"/>

<b>Special notes</b>







**N00-806-00**

**Schneider Electric Industries SAS**

35, rue Joseph Monier  
CS30323  
F - 92506 Rueil Malmaison Cedex

[www.schneider-electric.com](http://www.schneider-electric.com)

*As standards, specifications and designs change from time to time, please ask for confirmation of the information given in this publication.*