SEL-RS Rotary Switch Instruction Manual

Features, Benefits, and Applications

The SEL family of rotary switches is designed and manufactured to meet or exceed UL, IEEE, and IEC standards. SEL expertise in protection, automation, and electronics, combined with the latest manufacturing technology, enables us to offer the first rotary switch in the world with a ten-year warranty.

SEL has applied innovative technology across the family of lockout relay, breaker control, and selector switches to increase reliability, security, ease of use, and flexibility while reducing cost and lead times.

SEL rotary switches are the most robust in the industry, with as many as 60 double-break, single-throw contacts on 15 decks, a nominal current of 30 A, and an interrupting current of 8 A at 125 Vdc. Trip speeds will remain constant no matter how many contacts you have. From configurable labels and captive screws, to ergonomic handles and flexible contact configuration, SEL is revolutionizing the rotary switch industry by applying innovation and state-of-the art technology.

The SEL rotary switch family provides open or close contacts that operate in accordance with handle and/or shaft angular position. Shaft position is controlled by torque, applied manually through one handle and/or through electrical operation with linear solenoid.

The SEL-RS switches provide the following features:

- Panel mounting
- Fast-speed trips and lockout coil monitor SCADA contact
- As many as three switches on a 19", 4 UR (7 inch) rack
- Special tools are not needed to mount, wire, and test
- As many as 60 contacts in 15 decks
- Maximum flexibility in contact arrangement
- Rugged double-break, single-throw contacts
- Captive screws to reduce wiring time
- Rotary cam control switch designed for four independent contacts per deck
- Contacts and indicators compatible with ac or dc systems and loads
- Four handle types with rugged and ergonomic design, with color-code options

- Fixed and customer-configurable labels
- Easy-to-change front-panel text (available only with configurable labels)
- Large, highly visible indicators to provide at-a-glance rotary switch status indication
- Lockout, maintained, or spring-return actions
- Modular design that allows repeatability and increased overall product quality

Introduction

There are three main types of rotary switches.

- SEL-RS43 selector switch with sustained contacts
- SEL-RS52 control switch with momentary contacts
- SEL-RS86 lockout relay with electrical operation, electrical reset, and manual reset

Selector Switch With Sustained Contacts (SEL-RS43)

This type of switch is often used to select permanent positions as ON or OFF, measuring instrument circuits for Phase A, B, C, and others. The operator sets the control position, and the switch remains in that state until the operator changes it.

Figure 1 shows common SEL-RS43 front panels with configurable labels. This device can have as many as eight positions and can be assembled with as many as ten modules of four double-break, single-throw contacts, with combinations of normally open (NO) or normally closed (NC) contacts.

Figure 1 SEL-RS43 Common Front Panel With Configurable Labels, Showing the Eight-Position Option and the Two-Position Option

Control Switch With Momentary Contacts (SEL-RS52)

These switches are primarily used to open/close breakers and disconnect switches, sectionalizers, and other electrical equipment. The handle and shaft are moved to the control position manually, and are returned to the normal position by spring action. The switch can have two or three positions, typically Trip/Close and Normal with as many as ten modules of four double-break, single-throw contacts with combinations of NO and NC slip contacts. *Figure 2* shows typical SEL-RS52 front panels with and without electromechanical targets.

Figure 2 SEL-RS52 Front Panel With and Without Electromechanical Target

Lockout Relay With Electrical Operation and Manual Reset (SEL-RS86)

Also called a lockout auxiliary relay, these devices are normally used to trip and lock out one or more circuit breakers when a fault or other predetermined condition exists. The shaft moves at high speed to trip position by electromechanical action when another device, usually a protective relay, sends a trip signal to its solenoid and releases the mechanical spring energy to move the shaft and change the contact position. An operator manually resets the device. It can be assembled with as many as 15 modules of four double-break, single-throw contacts, with combinations of NO or NC contacts. *Figure 3* shows typical SEL-RS86 front panels with and without electromechanical targets.

Figure 3 SEL-RS86 Front Panel With and Without Optional Electromechanical Target

All of these versions use a straightforward wiring system for ring terminals, although fork terminals can be used. This system is based on captive screws, which reduces wiring time. *Figure 4* shows this design.

Figure 4 Easy Wiring System Based on Captive Screws

AC or dc voltage can be used to illuminate the front-panel LED indicators. Five different LED colors are available: green, amber, blue, red, and white.

There are four different options of ergonomic handles available, according to the number of decks selected, with five color choices: red, gray, yellow, green, and blue. *Figure 5* shows the four different handle selections.

NOTE: Handle Type D is only available in black.

Figure 5 Handle Types From Left to Right: A, B, C, and D, Showing Two of the Five Color Options

Installation

Product Configuration

Terminal Identification and Connections

Customers might require LEDs for specific applications, so they can select as many as three LEDs and choose from five different colors (red, amber, blue, green, and white) for any LED.

Figure 6 shows the numbering for each LED (when LEDs are required).

Figure 6 LED Identification for SEL-RS Rotary Switch Family

Modules

The rotary switches are formed by various types of modules, as shown in *Table 1*.

Table 1 Different Modules and Their Positions

Module Type	Module Position	Quantity
LEDs	A	0 or 1[a]
Trip mechanism	B	1[b]
Mechanism	No Label	1
Individual contacts	C–Q	1–15
Electric reset	No label	0 or 1[b]

a. SEL-RS43 might not require LEDs.
b. SEL-RS86 only.

For the SEL-RS86, customers can select as many as 15 individual contact modules. For the SEL-RS52, customers can select as many as five individual contact modules. For the SEL-RS43, customers can select as many as four individual contact modules.

Figure 7 shows each of these modules in one assembly.

Figure 7 General Assembly for the Rotary Switch Family

LED Module

Some applications may not require an LED module. *Figure 8* shows the labeling for the LED module.

Figure 8 Labeling for the LED Module

Figure 9 shows the connection for each LED inside the LED module. Note the polarity of the LED connections in case you ever need to change the LEDs.

Figure 9 Connections for LEDs Inside the LED Module

Trip Module

The trip module is used only on SEL-RS86 devices. *Figure 10* shows the labeling for the trip module.

Figure 10 Trip Module Labeling

The main part of the trip module is the trip coil, located at the bottom of the module. *Figure 11* shows the trip coil location.

Figure 11 Trip Coil Location

To perform a manual operation of the trip coil, follow these steps.

Step 1. Remove the plastic trip coil cover.

Step 2. Using a screwdriver or other tool, gently push the movable core of the coil until the device trips.

Step 3. Return the cover to the original position.

Figure 12 illustrates this action.

Figure 12 SEL-RS86 Manual Trip

This module provides contacts to disconnect the trip coil once it has operated, avoiding potential damage to the coil. These contacts also offer the possibility of using LEDs to signal for reset status, coil status, and permanent fault indication. There are two options available for this module:

- Option One: As many as two LEDs
- Option Two: As many as two LEDs plus SCADA contact

Figure 13 shows the internal connections for the trip module, with and without LEDs. The left image shows connections for the trip coil without using LEDs. The right image is an example of LEDs used for signaling. In this example, LED1 is **RESET AND COIL OK** and LED3 is **PERMANENT TRIP**.

If you select LED Option One, during normal operating conditions, LED1 turns ON to indicate a healthy trip coil. When an external trip occurs, the trip coil is energized and the SEL-RS86 trips. The contacts between B2+, B1+, and B6+ open, LED1 turns OFF, and LED3 turns ON for the period of time that the external trip contact remains closed. If the external trip contact reopens, LED3 turns OFF, but if the external trip contact remains closed, LED3 remains illuminated, indicating a permanent fault condition. If the trip coil fails, both LED1 and LED3 turn ON, indicating that the coil is unhealthy. In this case, the trip coil must be replaced.

Figure 13 Common Connections for Tripping Module

Option Two provides a dry contact for monitoring the status of the operation coil, normally used with SCADA applications. *Figure 14* shows the internal connections for the trip module when the SCADA contact option is selected.

Figure 14 Connection for SEL-RS86 With Signaling Contact to SCADA

During normal operating conditions, the LED1 turns ON to indicate a healthy trip coil and the contact between A2+ and A2– remains open.

When an external trip occurs, the trip coil is energized and the SEL-RS86 trips. The contact between B1+ and B8 opens, the contact between B1+ and B2+ closes, and LED3 turns ON for the period of time that the external trip contact remains closed. If the external trip contact opens again, LED3 turns OFF, but if the external trip contact remains closed, LED3 remains illuminated, indicating a permanent fault condition. Note that in this case, LED1 remains ON and the SCADA contact provided for SEL-RS86 remains open, indicating that the trip coil is healthy.

The SCADA contact provided with SEL-RS86 only closes when the trip coil is damaged and loses continuity between A1+ and B4– or when the circuit dc supply fails.

In much the same way as we used this contact for SCADA, we can use it to energize an SEL relay input to convert this operation in one variable and to use any communications protocol the relay has available to send trip coil status to another level or to other devices.

Figure 13 and *Figure 14* show only schematic representations of the LEDs. A high-impedance electronic circuit powers the LEDs and prevents trip coil operation even if the LEDs are short-circuited.

The trip coil is a linear solenoid that can be operated by either Vdc or Vac. It is actuated for a very short period of time and is self-interrupting using an NC contact that opens when the device trips.

Operating Voltage and Time Response

There are four operation voltages for the trip coil, and these are designed to cover most protection systems. This trip coil operates reliably over the voltage ranges indicated in *Table 2*.

Table 2 Operating Voltage

Nominal Voltage	Minimum Operating Voltage (Vdc)	Minimum Operating Voltage for < 1 Cycle (Vdc)	Maximum Voltage (Vdc)	Minimum Operating Voltage for < 1 Cycle (Vac)	Maximum Voltage (Tested) [Vac]	Dielectric Strength (Core to Coil) [Vac]
250/125	51	53	374	68	300	4500 Vac RMS 1 min
125/48	28	30	277	38	300	4500 Vac RMS 1 min
48/24	9.5	10	150	20	300	3300 Vac RMS 1 min

The voltage shown in the second column of *Table 2* is the minimum voltage to operate the coil, but this voltage level must not be used as a threshold operation level. The values expressed in the third column of *Table 2* are the minimum voltages to ensure an operation time less than 1 cycle. Typical operation times are 8–10 ms.

The voltage applied to the operating coil directly affects its response time.

Figure 15 shows the relationship between voltage and operation time for an SEL-RS86 with different trip coils.

Figure 15 Time vs. Voltage

Data Coil Resistance

Table 3 expresses the resistance and current consumption for the trip coil when nominal voltage is applied.

Table 3 Coil Resistance and Current Consumption

Coil	Resistance [Ω] at 20°C	Nominal Current [A]
250/125 V	42	5.9/2.9
125/48 V	12	10.4/4.0
48/24 V	4	12.0/6.0

The device can interrupt the operating coil current consumption and can be used with voltages exceeding nominal values. Using the device with voltages exceeding the nominal reduces operation time but increases current consumption.

Figure 16 Current Consumption

Mechanism Module

Each device uses a mechanism module. The mechanism module is used to set positions and, based on the type of operations, gives the necessary support for sustained, momentary, or lockout action. *Figure 17* shows the mechanism module and its position in the general arrangement.

Figure 17 Mechanism Module

Contact Modules

Each of the individual contact modules provides four double-break, single-throw contacts. As indicated in *Table 1*, the user can select as many as 15 individual contact modules, providing as many as 60 independent contacts (SEL-RS86). *Figure 18* shows the individual contact module labeling.

n = C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q

Figure 18 Individual Contact Module Labeling

The contacts for the first individual contact module are labeled as C1–C1C, C2–C2C, C3–C3C, and C4–C4C. The second individual contact module contacts are D1–D1C, D2–D2C, D3–D3C, and D4–D4C. Next are E1–E1C, E2–E2C, E3–E3C, and E4–E4C, and so on until all contacts are labeled. *Figure 19* shows this idea.

Figure 19 Individual Contact Module Labeling Example

There are various standard configurations for individual contact modules; the type of rotary switch determines the types of contacts that can be selected.

Individual Contact Modules for SEL-RS86

There are three types of individual contact modules for the SEL-RS86, as listed in *Table 4–Table 6*.

NOTE: When the SEL-RS86 is ordered with the electric reset module, only the option shown in Table 4 is available.

Table 4 Two Contacts Closed in TRIP Position and Two Contacts Closed in RESET Position

Position	Contacts			
	n1–n1C[a]	n2–n2C	n3–n3C	n4–n4C
TRIP		X		X
RESET	X		X	

a. n = C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q.

Table 5 Four Contacts Closed in TRIP Position

Position	Contacts			
	n1–n1C[a]	n2–n2C	n3–n3C	n4–n4C
TRIP	X	X	X	X
RESET				

a. n = C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q.

Table 6 Four Contacts Closed in RESET Position

Position	Contacts			
	n1–n1C[a]	n2–n2C	n3–n3C	n4–n4C
TRIP				
RESET	X	X	X	X

a. n = C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q.

Individual Contact Modules for SEL-RS52

The SEL-RS52 can have closed contacts at TRIP, NORMAL, or CLOSE positions. Additionally, some applications require slip contacts called Normal-After-Trip (NAT) and/or Normal-After-Close (NAC). These kinds of contacts are used to indicate if the rotary switch comes to NORMAL from either the CLOSE or TRIP position. *Figure 20* shows an SEL-RS52 in NORMAL position.

Figure 20 SEL-RS52 in NORMAL Position

Customers can select as many as five individual contact modules, each module providing four double-break, single-throw contacts.

There are eight options for individual contact modules for the SEL-RS52, listed in *Table 7–Table 14*.

NOTE: For Table 7 through Table 14, the positions called **NAT** and **NAC** mean "Normal-After-Trip" and "Normal-After-Close", respectively. Both positions, **NAT** and **NAC**, are summed to create the NORMAL position.

Table 7 Two Contacts Closed in TRIP Position and Two Contacts Closed in CLOSE Position

Position		Contacts			
		n1–n1C[a]	n2–n2C	n3–n3C	n4–n4C
TRIP		X		X	
NORMAL	NAT				
	NAC				
CLOSE			X		X

a. n = C, D, E, F, G.

Table 8 Four Contacts Closed in TRIP Position

Position		Contacts			
		n1–n1C[a]	n2–n2C	n3–n3C	n4–n4C
TRIP		X	X	X	X
NORMAL	NAT				
	NAC				
CLOSE					

a. n = C, D, E, F, G.

Table 9 Four Contacts Closed in CLOSE Position

Position		Contacts			
		n1–n1C[a]	n2–n2C	n3–n3C	n4–n4C
TRIP					
NORMAL	NAT				
	NAC				
CLOSE		X	X	X	X

a. n = C, D, E, F, G.

Table 10 Two Contacts Closed in CLOSE Position and Two Contacts Closed in NORMAL Position

Position		Contacts			
		n1–n1C[a]	n2–n2C	n3–n3C	n4–n4C
TRIP					
NORMAL	NAT		X		X
	NAC		X		X
CLOSE		X		X	

a. n = C, D, E, F, G.

Table 11 Two Contacts Closed in TRIP Position and Two Contacts Closed in NORMAL Position

Position		Contacts			
		n1–n1C[a]	n2–n2C	n3–n3C	n4–n4C
TRIP		X		X	
NORMAL	NAT		X		X
	NAC		X		X
CLOSE					

a. n = C, D, E, F, G.

NOTE: The vertical line indicates that the contact remains closed even if the handle is moved to the next position.

Table 12 One Contact Closed in CLOSE and NAC Positions, Two Contacts Closed in NORMAL Position and One Contact Closed in TRIP and NAT Positions

Position		Contacts			
		n1–n1C[a]	n2–n2C	n3–n3C	n4–n4C
TRIP				X	
NORMAL	NAT		X	X	X
	NAC	X	X		X
CLOSE		X			

a. n = C, D, E, F, G.

Table 13 Two Contacts Closed in TRIP and NAT Positions and Two Contacts Closed in TRIP Position

Position		Contacts			
		n1–n1C[a]	n2–n2C	n3–n3C	n4–n4C
TRIP		X	X	X	X
NORMAL	NAT	X		X	
	NAC				
CLOSE					

a. n = C, D, E, F, G.

Table 14 Two Contacts Closed in CLOSE Position and Two Contacts Closed in CLOSE and NAC Positions

Position		Contacts			
		n1–n1C[a]	n2–n2C	n3–n3C	n4–n4C
TRIP					
NORMAL	NAT				
	NAC		X		X
CLOSE		X	X	X	X

a. n = C, D, E, F, G.

Individual Contact Modules for SEL-RS43

The SEL-RS43 can have eight positions. *Figure 21* shows the eight possible positions for the SEL-RS43.

Figure 21 Eight Positions on the SEL-RS43

Customers can select as many as four individual contact modules for either standard or custom configuration. Each module provides four independent double-break, single-throw contacts.

There are seven different standard configurations for the SEL-RS43. *Table 15–Table 21* show these standard configurations.

Table 15 Two Closed Contacts in Position 3 and Two Closed Contacts in Position 4

Position	Contacts				Total
	Module C				
	1–1C	2–2C	3–3C	4–4C	
3		X		X	2
4	X		X		2

Table 16 Four Closed Contacts in Position 3 and Four Closed Contacts in Position 4

Position	Contacts								Total
	Module C				Module D				
	1–1C	2–2C	3–3C	4–4C	1–1C	2–2C	3–3C	4–4C	
3		X		X		X		X	4
4	X		X		X		X		4

Table 17 One Closed Contact in Position 2, Two Closed Contacts in Position 3, and One Closed Contact in Position 4

Position	Contacts				Total
	Module C				
	1–1C	2–2C	3–3C	4–4C	
2				X	1
3	X		X		2
4		X			1

Table 18 Two Closed Contacts in Position 2, Four Closed Contacts in Position 3, and Two Closed Contacts in Position 4

Position	Contacts								Total
	Module C				Module D				
	1–1C	2–2C	3–3C	4–4C	1–1C	2–2C	3–3C	4–4C	
2				X				X	2
3	X		X		X		X		4
4		X				X			2

Table 19 Four Closed Contacts in Position 2, Four Closed Contacts in Position 3, and Four Closed Contacts in Position 4

Position	Contacts												Total
	Module C				Module D				Module E				
	1–1C	2–2C	3–3C	4–4C	1–1C	2–2C	3–3C	4–4C	1–1C	2–2C	3–3C	4–4C	
2	X		X						X		X		4
3						X		X		X		X	4
4		X		X	X		X						4

Table 20 Two Closed Contacts in Position 2, Two Closed Contacts in Position 3, Two Closed Contacts in Position 4, and Two Closed Contacts in Position 5

Position	Contacts								Total
	Module C				Module D				
	1–1C	2–2C	3–3C	4–4C	1–1C	2–2C	3–3C	4–4C	
2	X		X						2
3		X		X					2
4					X		X		2
5						X		X	2

Table 21 Three Closed Contacts in Position 2, Three Closed Contacts in Position 3, Three Closed Contacts in Position 4, and Three Closed Contacts in Position 5

Position	Contacts												Total
	Module C				Module D				Module E				
	1–1C	2–2C	3–3C	4–4C	1–1C	2–2C	3–3C	4–4C	1–1C	2–2C	3–3C	4–4C	
2	X		X									X	3
3		X		X						X			3
4					X		X		X				3
5						X		X			X		3

If you require a different configuration from the standard, you can use *Table 22* to select a custom option.

Use the following steps to fill out the table.

Step 1. Select the starting position (1–8).

This is the left-most position for the SEL-RS43, but if an SEL-RS43 free turn is selected, there will not be a start or end position.

Step 2. Select the number of positions for your SEL-RS43.

How many positions does your application need?

Step 3. Based on the number of positions, select the angle, (45° or 90°).

This is the separation among positions for the SEL-RS43. The SEL-RS43 has eight positions, so each position is 45° apart. If you use more than four positions, you will not be able to select 90°.

Step 4. Based on the number of contacts, select the number of modules.

There are four double-break, single-throw contacts per module. The maximum number of modules is four.

Step 5. Select the required configuration.

For mechanical design requirements, one of the contacts needs to be repeated, so Contact 3 needs to follow Contact 1 or Contact 4 needs to follow Contact 2.

Table 22 Non-Standard Configuration for SEL-RS43 With Four Individual Contact Modules

Position	Contacts[a]															
	Module C				Module D				Module E				Module F			
	1–1C	2–2C	3–3C	4–4C	1–1C	2–2C	3–3C	4–4C	1–1C	2–2C	3–3C	4–4C	1–1C	2–2C	3–3C	4–4C
0°																
45°																
90°																
135°																
180°																
225°																
270°																
315°																

a. If your application requires more than four decks (more than 16 contacts), please contact the factory.

Example

If you need a selector with three positions (Manual, OFF, Auto), with three contacts in Manual position, three in OFF, and two in Auto, you would perform the following steps.

Step 1. Select the start position: 2.

Step 2. Select the number of positions: 3.

Step 3. Select the angle: 45 degrees.

Step 4. Select the number of contact modules: 2.

Step 5. Select the required program. *Table 23* shows the program.

Table 23 Contacts Program Example

Position	Legend	Contacts								Total
		Module C				Module D				
		1–1C	2–2C	3–3C	4–4C	1–1C	2–2C	3–3C	4–4C	
2	Manual	X		X		X				3
3	OFF				X		X		X	3
4	Auto		X					X		2

Figure 22 shows the complete assembly for the SEL-RS43 in the previous example.

Figure 22 Final Assembly for SEL-RS43

LED Module Voltage

The front-panel LED indicator system (when selected) works with either ac or dc power supplies, ranging from 20 to 300 Vac (or Vdc).

Figure 23 shows an example LED module connection. This is a common example for an SEL-RS52. LED1 indicates breaker open and trip coil status for a breaker open condition, LED2 indicates breaker closed and trip coil status on a breaker closed condition. In the same way, LED3 can be used as status for Trip Coil 2 for a breaker closed condition. Contact C1–C1C uses Trip Coil 1 to trip the breaker, and contact C2–C2C uses Trip Coil 2 to trip the breaker.

Figure 23 Front-Panel LED Example Wiring Diagram for SEL-RS52

Figure 24 shows an example of an SEL-RS86 using LED1 to monitor a constant trip and LED3 for coil status.

Figure 24 SEL-RS86 Using Front-Panel LED1 and LED3

Figure 24 shows only a schematic representation of the LEDs. A high-impedance electronic circuit powers the LEDs and prevents trip coil operation even if the LEDs are short-circuited.

Electric Reset Module

Use the electric reset module to move the SEL-RS86 from trip position to reset position remotely, without any manual intervention. This module also has the option to manually reset the equipment. *Figure 25* shows the electric reset module included on an SEL-RS86.

Figure 25 SEL-RS86 Lockout With Electric Reset Option

You have three voltage ordering options for the SEL-RS86 with the electric reset module: 48 Vdc, 125 Vdc, and 250 Vdc. With the 48 Vdc option, you can order the SEL-RS86 with a maximum of five contact modules. With the

125 Vdc and 250 Vdc options, you can order the SEL-RS86 with a maximum of 10 contact modules.

Figure 26 shows the internal components for the electric reset module. The image shows the SEL-RS86 in trip position, with the electric reset module ready to actuate.

When the SEL-RS86 linear actuator receives an external signal (a SCADA order for reset, for example), it develops a high force during its downstroke and applies this force through a pull mechanism to a rotary arm. The rotary arm converts this force into sufficient angular momentum to rotate the shaft to which it is attached and move the SEL-RS86 from TRIP to RESET position.

Figure 26 Main Parts in Lockout Electrical Reset (Shown in Trip Position)

The electric reset for SEL-RS86 trips by the same method as that for the manual reset SEL-RS86. With the switch in trip position, you can send a signal through the contact (**RESET**). This operates the auxiliary relay (**R1**), which closes its internal contact (**CR1**). Current flows through the coil of the solenoid, causing the SEL-RS86 to move from trip to reset position. Contact A10-A11 opens and interrupts the current through the auxiliary relay, while contact A6/A7-A9 opens to interrupt the current through the reset coil (**RC**) to prevent possible damage (see *Figure 27*).

As shown in *Figure 27*, the voltages for the reset and trip coils can be independent. You can therefore choose to use a separated power supply.

Figure 27 Electric Diagram Shown in Trip Position

The RESET contact should remain closed for a minimum time indicated in *Table 24*.

Table 24 Minimum Energized Time

Nominal Voltage (Vdc)	Minimum Time (ms)
250	35
125	40
48	60

The operating voltages in the second column of *Table 25* are the minimums necessary to operate the reset coil. These voltages must not be used as a threshold operation level. The voltages applied to the solenoid directly affects its response time.

Table 25 Operating Voltage

Nominal Voltage (Vdc)	Minimum Operating Voltage (Vdc)	Maximum Operating Voltage (Vdc)
250	200	275
125	100	137.5
48	38.4	52.8

Table 26 shows the resistance and current consumption for each reset solenoid option when nominal operating voltages are applied. The reset coils can be used with higher voltages (shown in *Table 2*) to reduce operating time. Doing so increases current consumption.

Table 26 Solenoid Resistance and Current Consumption

Solenoid Nominal Voltage (Vdc)	Resistance [Ω] at 20°C	Nominal Current [A]
250	30.8	7
125	8.1	11
48	1.88	15

Mounting

⚠CAUTION
Before you start mounting procedures, observe all local safety recommendations and use the appropriate tools to prevent an accident.

Use the dimensions in *Figure 28* to install the SEL-RS Rotary Switch in any 19" rack. For more details, see *Mechanical Drawings*.

All dimensions are in millimeters (inches).

Figure 28 SEL-RS Dimension Drawing for Mounting Purpose

Instructions

Perform the following steps to install the device.

Step 1. Remove the contents from the box.

Step 2. Use *Figure 28* as a template to drill the mounting holes (2 in *Figure 29*) on the panel plate.

Step 3. Remove the four mounting screws (5) from the front plate (4) and the spacers (not shown).

If you ordered the plastic cover with the configurable labels (6, 7, and 8) option, you must remove this plastic cover first to see the mounting screws (5).

Step 4. Put the SEL-RS (1) in place inside the panel. Contact C1–C1C must always be on top.

Step 5. Put the front plate (4) in the correct position.

Step 6. Verify that the holes in the front plate match the holes in the mounting plate.

Step 7. Tighten the four mounting screws (5) to 20 lb-in.

Step 8. If you ordered the plastic cover with configurable labels (6, 7, and 8), position it in place.

Step 9. Gently push the four corners until you hear a click.

Step 10. Place the handle (10) in the correct position.

Step 11. Insert and tighten the handle lock screw (9) to secure the handle (10) to the shaft (3).

NUMBER	NAME
1	Module assembly
2	Mounting holes
3	Shaft
4	Mounting plate
5	Mounting screws
6	Configurable label
7	Overlay
8	Cover
9	Handle screw lock
10	Handle

Figure 29 SEL-RS Rotary Switch Mounting Diagram for Type A, B, and C Handles

NUMBER	NAME
1	Module assembly
2	Mounting holes
3	Shaft
4	Mounting plate
5	Mounting screws
6	Configurable label
7	Overlay
8	Cover
9	Handle screw lock
10	Handle

Figure 30 SEL-RS Rotary Switch Mounting Diagram for Type D Handles

Wiring

For wiring, SEL-RS rotary switches use a system with an 8/32" captive screw capable of fastening a ring (or fork) terminal with a 4.37 to 6.35 mm (11/64" to 1/4") inner diameter and a 6.35 to 10.32 mm (1/4" to 13/32") outer diameter. The switch can receive as many as two wires 18 to 10 AWG in each terminal or connection point. *Figure 31* shows the dimensions of the captive screw used on the SEL-RS. Torque the captive screw to 1.69 Nm (15 in-lb) for a single-wire terminal and to 2.26 Nm (20 in-lb) for a two-wire terminal.

Figure 31 Captive Screw Dimensions

Accessories

Standard Labels

The SEL-RS rotary switches have predefined labels in both English and Spanish to meet the most common customer needs.

Figure 32 and *Figure 34* show the standard English labels for the SEL-RS86 and SEL-RS52 with and without electromechanical target, respectively.

Figure 32 Standard English Labels for SEL-RS86 With and Without Electromechanical Target

Figure 33 Standard English Labels for SEL-RS86 With and Without Electromechanical Target, No LEDs Option

Figure 34 Standard English Labels for SEL-RS52 With and Without Electromechanical Target

Figure 35 Standard English Labels for SEL-RS52 With and Without Electromechanical Target, No LEDs Option

Figure 36 and *Figure 37* show the standard Spanish labels for the SEL-RS86 and SEL-RS52 with and without electromechanical target, respectively.

Figure 36 Standard Spanish Labels for SEL-RS86 With and Without Electromechanical Target

Figure 37 Standard Spanish Labels for SEL-RS52 With and Without Electromechanical Target

Configurable Labels

SEL-RS rotary switches have predefined labels and one versatile front panel that you can customize for your needs. *Figure 38* shows the assembly for this configurable label.

Figure 38 Assembly for Configurable Label Option

Figure 39 shows the printable spaces for creating your own customized labels. The configurable label kit includes blank labels, the word processor template, and instructions, and accompanies an SEL-RS43 ordered with the configurable label option.

Figure 39 Printable Space for Configurable Label

Handles

The handles are ergonomically designed to be easy for operators to use, providing better grip and torque.

There are four different types of handles. Based on the type of device, a customer can select a preferred style and color. Color options for handle types A, B, and C are blue, gray, green, red, and yellow. Handle Type D is only available in black.

Handle Type A

Handle Type A is designed mainly for the SEL-RS52 and SEL-RS86 when the number of contact modules is six or fewer. It can also be used on certain

models of the SEL-RS43 when combinations of the starting position and the number of positions allow it. *Figure 40* shows the dimensions for this handle.

All dimensions are in millimeters.

Figure 40 Dimensions for Handle Type A

Handle Type B

This handle is designed to provide the maximum torque and can be used with any SEL-RS52, SEL-RS86, as well as with certain models of the SEL-RS43 when combinations of the starting position and the number of positions allow it. This handle is the largest of the three types. *Figure 41* shows the dimensions for this handle.

All dimensions are in millimeters.

Figure 41 Dimensions for Handle Type B

Handle Type C

This handle is designed for use only with the SEL-RS43. The circular design allows complete rotation for use on any of the eight positions for this device. *Figure 42* shows the dimensions for this handle.

All dimensions are in millimeters.

Figure 42 Dimensions for Handle Type C

Handle Type D

Handle Type D is designed for the SEL-RS52, SEL-RS43 and SEL-RS86 when the number of contact modules is five or fewer. *Figure 43* shows the dimensions for this handle.

NOTE: Handle type D cannot be retrofitted on switches originally ordered with type A, B, or C handles.

All dimensions are in millimeters.

Figure 43 Dimensions for Handle Type D

Mounting Plates

Mounting plates for one, two, or three SEL-RS rotary switches are available. These plates can be ordered in either gray ANSI-61 or gray ANSI-70 and are made of 12-gauge cold-rolled steel. *Figure 44–Figure 46* show the dimensions for each plate.

All dimensions are in millimeters.

Figure 44 Mounting Plate for One SEL-RS Rotary Switch

All dimensions are in millimeters.

Figure 45 Mounting Plate for Two SEL-RS Rotary Switches

All dimensions are in millimeters.

Figure 46 Mounting Plate for Three SEL-RS Rotary Switches

Table 27 summarizes part numbers for the different mounting plates.

Table 27 Part Numbers for Ordering

Part Number	Number of SEL-RS	Color	Material	Mounting Plate Height
RSAC=0027	1	Gray ANSI-61	12-gauge cold-rolled steel	4 UR
RSAC=0028	2	Gray ANSI-61	12-gauge cold-rolled steel	4 UR
RSAC=0029	3	Gray ANSI-61	12-gauge cold-rolled steel	4 UR
RSAC=0030	1	Gray ANSI-70	12-gauge cold-rolled steel	4 UR
RSAC=0031	2	Gray ANSI-70	12-gauge cold-rolled steel	4 UR
RSAC=0032	3	Gray ANSI-70	12-gauge cold-rolled steel	4 UR

Mechanical Drawings

Figure 47 shows general dimensions for an SEL-RS86.

Module		Length	Minimum/Maximum	Fixed
A	Handle A	72.00	72.00/72.00	No
A	Handle B	88.00	88.00/88.00	No
A	Handle C	32.00	32.00/32.00	No
A	Handle D	52.60	52.60/52.60	No
B	Front Panel	9.75	6.75 (Without transparent cover)/9.75	Yes
C	Panel Plate	3.04	2.66 (12-gauge cold-rolled steel)/3.42 (10-gauge cold-rolled steel)	Yes
H	Individual Contact Module	17.80	17.80 (1 module)/267.00 (15 modules)	Yes

All dimensions are in millimeters.

Figure 47 General Dimensions for SEL-RS86 Lockout Relay With Electrical Operation and Manual Reset

Figure 48 shows the dimensions for an SEL-RS86 with the electrical reset module.

Module		Length	Minimum/Maximum	Fixed
A	Handle A	72.00	72.00/72.00	No
A	Handle B	88.00	88.00/88.00	No
A	Handle C	32.00	32.00/32.00	No
A	Handle D	52.60	52.60/52.60	No
B	Front Panel	9.75	6.75 (Without transparent cover)/9.75	Yes
C	Panel Plate	3.04	2.66 (12-gauge cold-rolled steel)/3.42 (10-gauge cold-rolled steel)	Yes
H	Individual Contact Module	17.80	17.80 (1 module)/267.00 (15 modules)	Yes

All dimensions are in millimeters.

Figure 48 Dimensions for SEL-RS86 Lockout Relay With Electrical Reset Module

Figure 49 shows general dimensions for an SEL-RS52.

Module		Length	Minimum/Maximum	Fixed
A	Handle A	72.00	72.00/72.00	No
A	Handle B	88.00	88.00/88.00	No
A	Handle D	52.60	52.60/52.60	No
B	Front Panel	9.75	6.75 (Without transparent cover)/9.75	Yes
C	Panel Plate	3.04	2.66 (12-gauge cold-rolled steel)/3.42 (10-gauge cold-rolled steel)	Yes
H	Individual Contact Module	17.80	17.80 (1 module)/267.00 (15 modules)	Yes

All dimensions are in millimeters.

Figure 49 General Dimensions for SEL-RS52 Control Switch With Momentary Contacts

Figure 49 shows general dimensions for an SEL-RS43.

Module		Length	Minimum/Maximum	Fixed
A	Handle C	32.00	32.00/32.00	No
A	Handle D	52.60	52.60/52.60	No
B	Front Panel	9.75	6.75 (Without transparent cover)/9.75	Yes
C	Panel Plate	3.04	2.66 (12-gauge cold-rolled steel)/3.42 (10-gauge cold-rolled steel)	Yes
H	Individual Contact Module	17.80	17.80 (1 module)/267.00 (15 modules)	Yes

All dimensions are in millimeters.

Figure 50 General Dimensions for SEL-RS43 Control Switch With Momentary Contacts

You can accommodate as many as three rotary switches on a normal 19", 4 UR (7") plate. *Figure 51–Figure 53* give the SEL-RS Rotary Switch dimensions for panel mounting.

All dimensions are in millimeters.

Figure 51 Cutout for Mounting One SEL-RS Device on a 19" Plate

All dimensions are in millimeters.

Figure 52 Cutout for Mounting Two SEL-RS Devices on a 19" Plate

All dimensions are in millimeters.

Figure 53 Cutout for Mounting Three SEL-RS Devices on a 19″ Plate

Figure 54 shows the detail for cuts in the previous three figures.

All dimensions are in millimeters.

Figure 54 Details for Cuts in Previous Figures

Specifications

Compliance

ISO 9001:2008
UL, cUL: 20131030-E356404
UL 60947-1
UL 60947-4-1A
CSA C22.2 No. 60947-1-07
CSA C22.2 No. 60947-4-1-07

Individual Contact Module

Nominal Current:	30 A
Interrupting Rating:	8 A at 125 Vdc load L/R = 40 ms 2 A at 250 Vdc load L/R = 40 ms Per IEEE C37.90
Make:	30 A at 250 Vdc per IEEE C37.90 At least 360 A Tested in high-impedance bus protection applications At least 25 HP at 220 Vca Tested as full voltage motor starting
Short-Time Current Ratings:	1 s: 500 A 1 min: 100 A
Contact Resistance:	Less than 10 mΩ

LED Module

Range:	85–150 Vac, 20–300 Vdc
Consumption:	0.24 mA at 127 Vac per LED
SCADA Output Breaking Capacity (10,000 operations) per IEC 60255-0-20:1974:	24 Vdc 0.75A L/R = 40 ms 48 Vdc 0.50A L/R = 40 ms 125 Vdc 0.30A L/R = 40 ms 250 Vdc 0.20A L/R = 40 ms

Tripping Mechanism Module

Coil Consumption:	5.9/2.9/4.0/6.0 A These ranges are with nominal voltages
Voltage Range:	250/125/48/24 Vdc ±10%
250/125 Vdc:	53–374 Vdc, 68–300 Vac
125/48 Vdc:	30–277 Vdc, 38–300 Vac
48/24 Vdc:	10–150 Vdc, 20–300 Vac
Coil Resistance:	42 Ω/42 Ω/12 Ω /4 Ω ±10% to 20°C

Electric Reset Module

Coil Consumption:	7/11/15 A These ranges are with nominal voltages
Voltage Range:	250/125/48 Vdc ±10%
250 Vdc:	200–275 Vdc
125Vdc:	100–137.5 Vdc
48 Vdc:	38.4–52.8 Vdc
Coil Resistance:	30.8 Ω/8.1 Ω/1.88 Ω ±10% to 20°C

Type Tests

Environmental

Type:	UL 1 for use in protected environments
Object Penetration:	IEC 60529 IP40 IP40 (wire or small tool < 1 mm) front IP20 (finger < 12.5 mm) rear
Vibration, Shock, Bump, and Seismic:	IEC 60255-21-1:1988 Severity Level: Class 1 Endurance, Class 2 Response IEC 60255-21-2:1988 Severity Level: Class 1 Shock Withstand, Bump, and Class 2 Shock Response IEC 60255-21-3:1993 Severity Level: Class 2 (Quake Response)
Cold:	IEC 60068-2-1:2007 Severity Level: 16 hours at –40°C
Dry Heat:	IEC 60068-2-2:2007 Severity Level: 16 hours at +85°C
Damp Heat, Cyclic:	IEC 60068-2-30:2005 Severity Level: 25°C to 55°C, 6 cycles, Relative Humidity: 95%
Fog Chamber:	ASTM-B117

Safety

Dielectric Strength:	IEC 60255-5:2000 IEEE C37.90-2005 Severity Level: 2500 Vac on contacts. 3100 Vdc on power supply. Type Tested for 1 minute
Impulse:	IEC 60255-5:2000 Severity Level: 0.5 Joule, 5 kV

Electromagnetic Compatibility Immunity

Electrostatic Discharge Immunity:	IEC 60255-2-2:2008 IEC 61000-4-2:2008 Severity Level: 2, 4, 6, 8 kV contact; 2, 4, 8, 15 kV air IEEE C37.90.3-2001 Severity Level: 2, 4, and 8 kV contact; 4, 8 and 15 kV air
Surge Withstand Capability Immunity:	IEC 60255-22-1:2007 Severity Level: 2.5 kV peak common mode, 1.0 kV peak differential mode IEEE C37.90.1: 2002 Severity Level: 2.5 kV oscillatory, 4 kV fast transient waveform
Radiated Radio Frequency Immunity:	IEC 60255-22-3:2007 IEC 61000-4-3:2010 Severity Level: 10 V/m IEEE C37.90.2-2004 Severity Level: 35 V/m

Factory Assistance

We appreciate your interest in SEL products and services. If you have questions or comments, please contact us at:

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⚠DANGER

Contact with instrument terminals can cause electrical shock that can result in injury or death.

⚠WARNING

Use of this equipment in a manner other than specified in this manual can impair operator safety safeguards provided by this equipment.

⚠CAUTION

Equipment components are sensitive to electrostatic discharge (ESD). Undetectable permanent damage can result if you do not use proper ESD procedures. Ground yourself, your work surface, and this equipment before removing any cover from this equipment. If your facility is not equipped to work with these components, contact SEL about returning this device and related SEL equipment for service.

⚠DANGER

Tout contact avec les bornes de l'appareil peut causer un choc électrique pouvant entraîner des blessures ou la mort.

⚠AVERTISSEMENT

L'utilisation de cet appareil suivant des procédures différentes de celles indiquées dans ce manuel peut désarmer les dispositifs de protection d'opérateur normalement actifs sur cet équipement.

⚠ATTENTION

Les composants de cet équipement sont sensibles aux décharges électrostatiques (DES). Des dommages permanents non-décelables peuvent résulter de l'absence de précautions contre les DES. Raccordez-vous correctement à la terre, ainsi que la surface de travail et l'appareil avant d'en retirer un panneau. Si vous n'êtes pas équipés pour travailler avec ce type de composants, contacter SEL afin de retourner l'appareil pour un service en usine.

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