

DESCRIPTIVE BULLETIN

# ReliaGear® LV SG

## Low voltage switchgear





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# ReliaGear® LV SG

## Overview

With technology rapidly evolving, it is nearly impossible to predict future needs. ABB believes in creating reliable and safe solutions that meet today's needs with flexibility to scale for tomorrow.

—  
01 Ekip trip unit with easy protection setting and information access that saves time, labor, and cost while helping to ensure greater energy efficiency and reliability

ReliaGear LV SG is now available to meet the ever-expanding needs of the marketplace. With the flexibility to scale for tomorrow, while providing improved safety, more reliability and saving time and money.

The ReliaGear LV SG low voltage switchgear platform incorporates the best of both worlds: cutting edge SACE® Emax® 2 ACB technology integrated into the proven AKD low voltage switchgear platform.

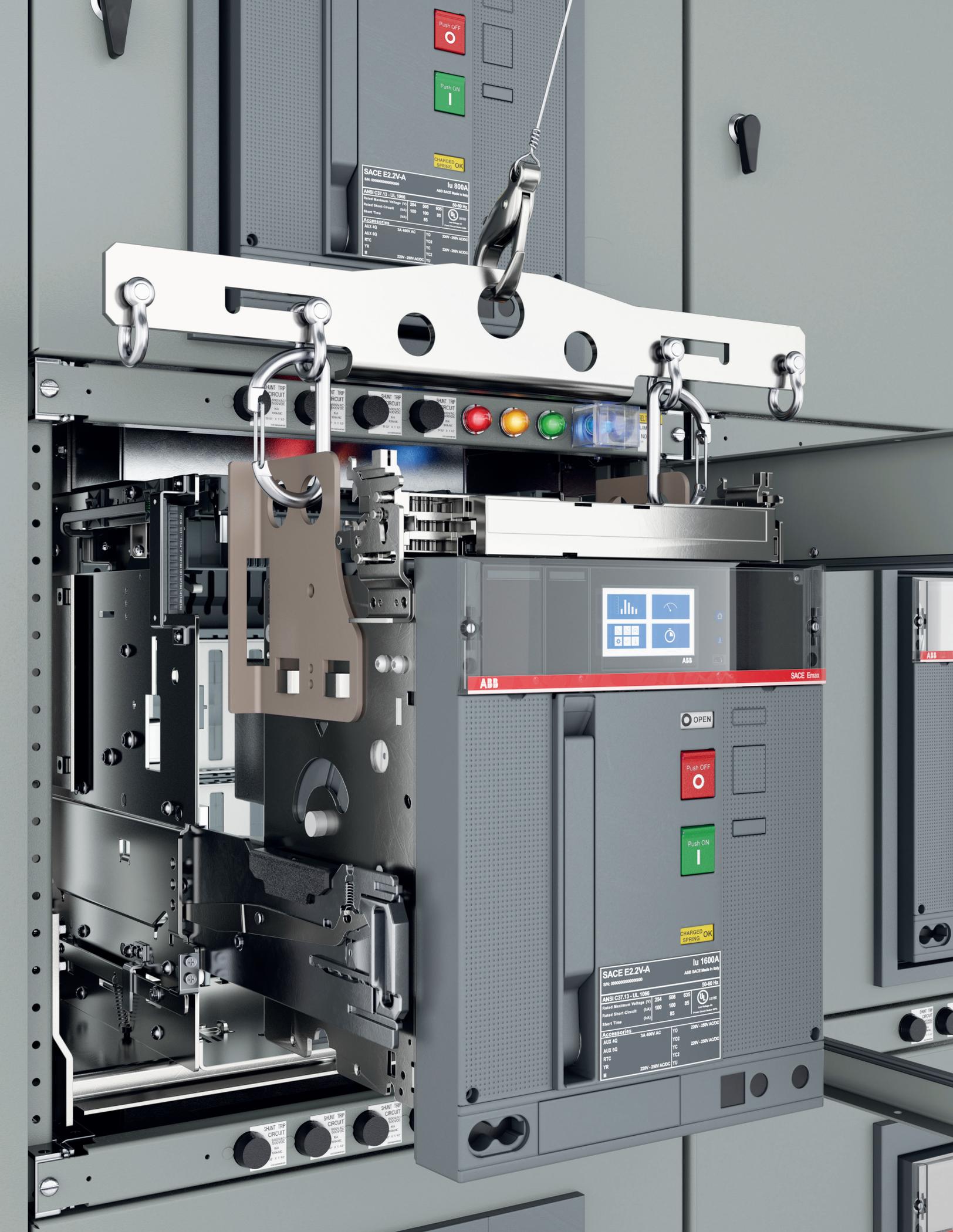
This new generation LV switchgear platform provides the latest technological innovations and reliability that customers expect from ABB.

### Target markets

- Data centers
- Key industrial segments (food and beverage, water/wastewater)
- Oil and gas
- Hospitals
- Education/institutional facilities
- Infrastructure (stadiums, etc.)



—  
01



**SACE E2.2V-A**  
lu 800A  
ANSI C37.13-LL-1006  
ABB SACE Made in Italy

Rated Maximum Voltage (V)	254	508	635
Rated Short-Circuit (kA)	100	100	85
Short Time (kA)			85

Accessories

AUX 4Q	3A 60V AC	Y0	220V ~38V ACDC
AUX 6Q		Y02	220V ~38V ACDC
RTC		Y0	220V ~38V ACDC
YR		Y02	220V ~38V ACDC
M		Y0	220V ~38V ACDC



**ABB**

SACE Emax

**SACE E2.2V-A**  
lu 1600A  
ANSI C37.13-LL-1006  
ABB SACE Made in Italy

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# Safe, smart and sustainable

—  
02 Enhanced protection reduces the risk of arc flash and minimizes personnel exposure



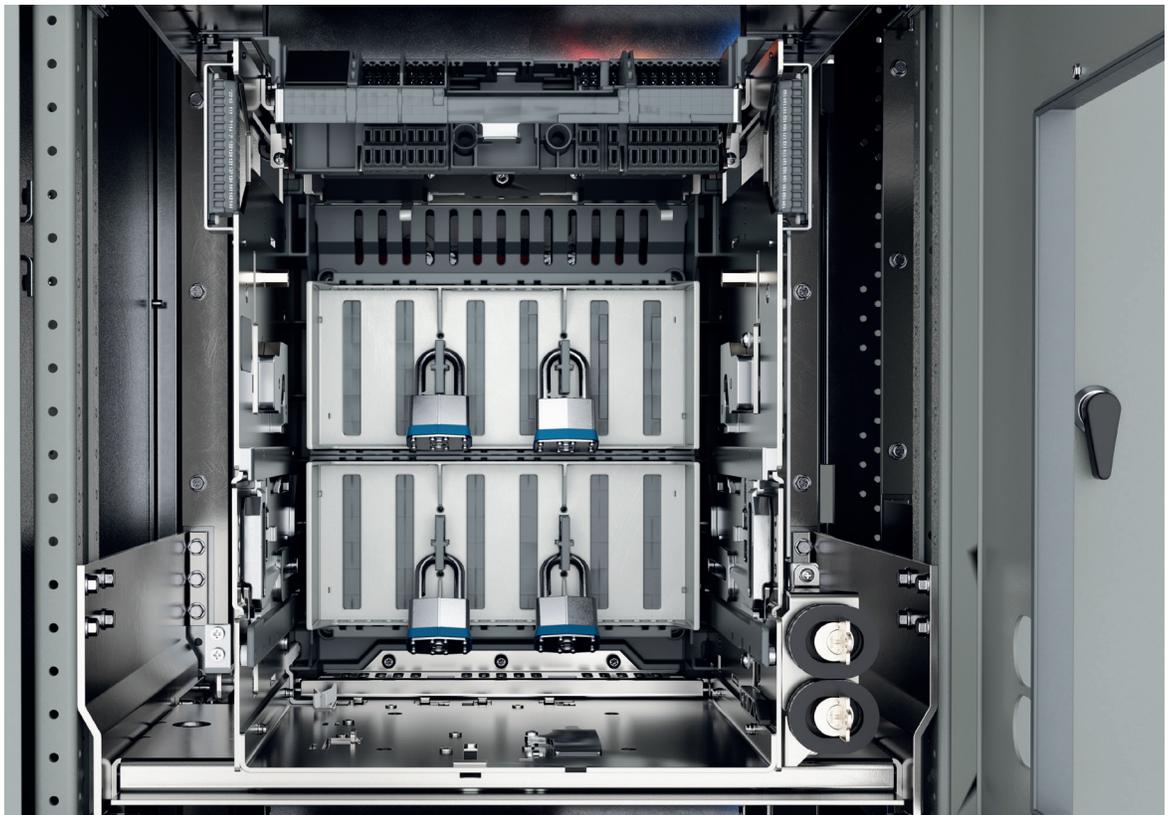
### SAFE

#### Enhanced protection

- Closed door racking
- ZSI on instantaneous
- RELT ready
- Full remote operation
- Padlocking

Because safety is a priority, all breakers can be racked in and out of the cubicle with the door closed and all breaker cradles have a safety shutter mechanism as a standard offering.

As an enhanced safety measure, a remote racking device can be used to rack breakers in and out from up to 20 feet away. When the breaker is fully removed, shutters can be padlocked for tag out operations. An optional Kirk key interlock system is available to further enhance safe tag out operations.



—  
02



The trip unit can be upgraded to the Ekip Hi-Touch, ABB's premium trip unit that includes more robust features like class one percent metering accuracy in a smaller footprint, eliminating the need for additional equipment.

Touch and Hi-Touch trip units can be coupled with modules that allow for internal transfer schemes between breakers. In addition, all SACE® Emax® 2 breakers have the ability to choose between eight different native communication protocols.

Data centers, hospitals, manufacturing plants, and many other facilities rely on backup generators to maintain continuity of electrical service when there is an unexpected power outage. With the Ekip Hi-Touch, continuity of service and selectivity can be maintained using the integrated dual setting feature. The dual setting feature can add an extra level of protection against arc flash within a system.

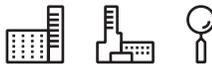
**SMART**  
**Easy to install**

- Integrated auto transfer
- 1% metering option
- 8 different communication protocols
- Bluetooth connectivity



Accuracy: Current 0.5%,  
Voltage 0.5%, Power 1%, Energy 1%

Low current detection,  
starting from 0.4% of In



Perfectly suitable for  
SCADA integration

Analysis of  
energy demand





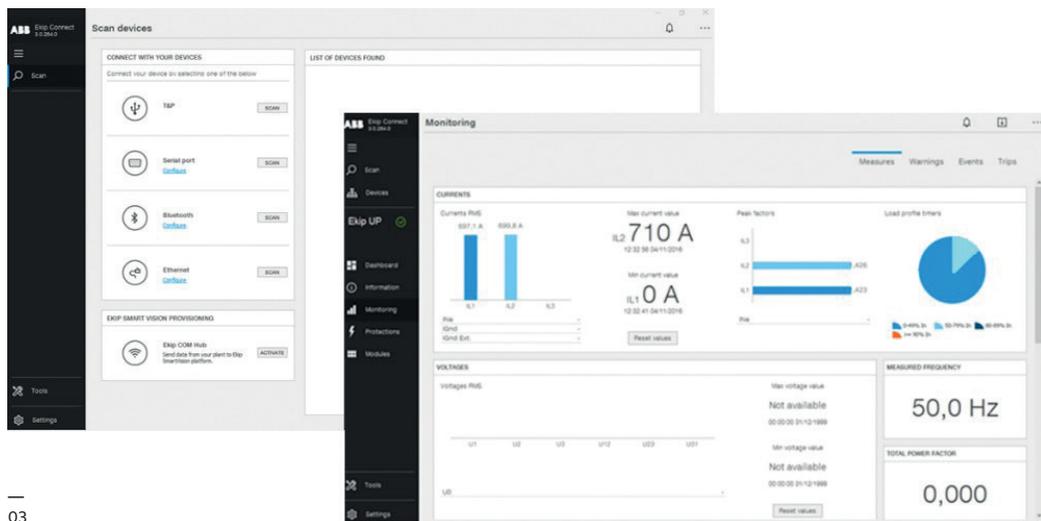
03 SACE® Emax® 2 breaker with Ekip trip unit technology provides predictive maintenance functionality and connectivity to understand, analyze, and predict the health and status of breakers



## SUSTAINABLE

### Outstanding reliability

- ABB Ability™ (PM data)
- Ekip connect for settings uploads
- Ekip connect commissioning reports
- User replaceable accessories (fast and simple)



—

ReliaGear LV SG brings reliability and innovation to the switchgear platform with ratings that range from 2000 A – 8000 A as main bus and utilizing SACE® Emax® 2 ACB covering 800 A–6000 A frames served by four envelopes (E1.2, E2.2, E4.2 and E6.2) and up to 600 V nominal equipment class compliance.



# More advantages

1

**Functionality:** From a reliability and up-time standpoint, ABB has incorporated new functionalities with advanced electronics in the Ekip Touch trip units. Customers are now able to add additional protections, measures, and functionalities to the breaker via ABB MarketPlace, while the breaker is in the closed position, using Ekip Connect Software.



**Easy and fast interaction**



2

**Watchdog:** Ekip trip units ensure high reliability thanks to an electronic circuit that periodically checks the continuity of internal connections, such as trip coil, rating plug and each current sensor (ANSI 74). In case of an alarm, a message is shown on the display (Ekip Touch) or through LED signalization (Ekip Dip).



**Watchdog**



If a protection function intervenes, the unit always checks that the circuit breaker has been opened through auxiliary contacts that indicate the position of the main contacts. Otherwise, the unit creates an alarm (ANSI BF code - Breaker Failure) that can be used to command the opening of the upstream circuit breaker. Ekip trip units are also provided with self-protection against abnormal temperature (OT) to ensure correct operations.



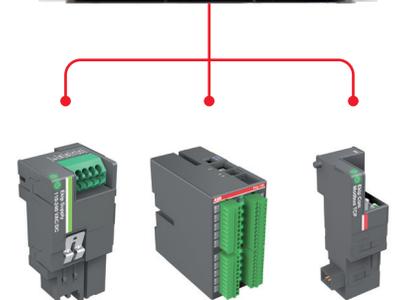
**Safer interaction**



3

**Safety:** An energy reducing maintenance switch makes it possible to keep operators outside the arc flash boundary, reducing the risk of arc flash incidents. The Ekip Com Actuator module can be installed in the front of the device to remotely control the circuit breaker.

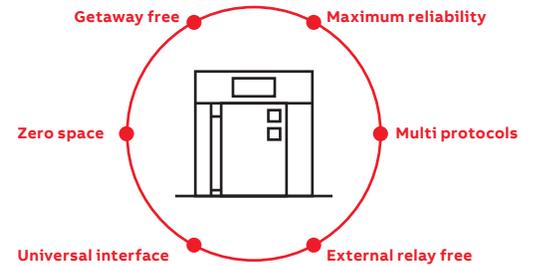
Reduced Energy Let Through (RELT) is now available in SACE® Emax® 2 Ekip with a dedicated modul 2i protection that can clear in as little as 1.5 cycles at 60 Hz. Lower incident energy with dynamic zone selective interlocking and RELT 2i significantly reduce the risk of arc flash incidents.



## 4

**Communication:** There are a vast variety of communication protocols which the customer can use to remotely supervise and control the breakers via BMS. Communication and Connectivity Ekip Touch and Hi-Touch trip units can be easily integrated into the most modern supervision systems through several communication protocols:

- IEC 61850
- Modbus TCP
- Modbus RS-485
- Profibus
- Profinet
- DeviceNet™
- EtherNet/IP™



## 5

**Redundancy:** Repetition of communication allows for greater system reliability. The circuit breaker can be equipped with two communication modules at the same time, allowing the information on two buses to be exchanged simultaneously. Measurements, status and alarms can be easily programmed and viewed by remote function, with no need of external interface devices. Several communication modules with different protocols can be used simultaneously.



# Switchgear details

Ratings range from 2000 A – 8000 A as main bus and utilizing SACE® Emax® 2 Ekip technology covering 800 A – 6000 A frames served by four envelopes (E1.2, E2.2, E4.2 and E6.2) and up to 600 VAC nominal equipment class compliance, while still maintaining UL1558 and IEEE/ANSI standards.



- 3P3W & 3P4W - 600/347Vac, 480/277Vac
- Fully rated 100KAIC at 480/277Vac, 100KAIC at 635Vac
- Main circuit breakers: up to 6000 A
- Main lugs: up to 8000 A
- Feeder air circuit breakers: 200-4000 A
- Non-arc resistant
- UL1558
- Enclosures: NEMA Type 1 and 3R
- Seismic ratings: CBC-2019 / IBC-2018 and OSHPD levels 2.5g SDS (z/h:0) and 2.0g (z/h:1)
- Depths: 57-74"
- Widths: 15-49"

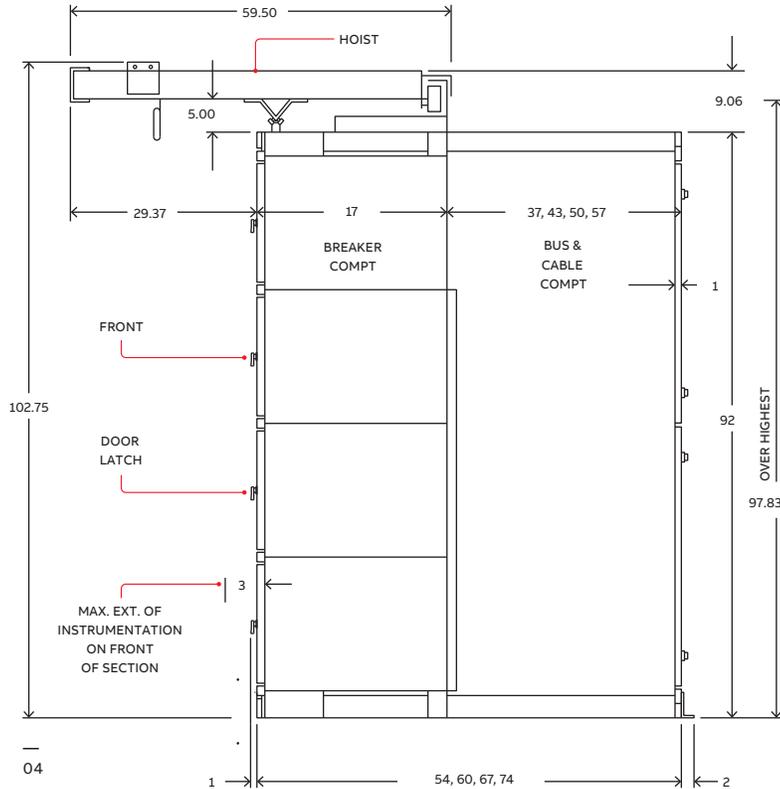
## Key differentiators and value proposition

- **Footprint:** E1.2 envelope integration provides a 15-inch minimum four-high stack width.
- **Enhancement:** E2.2 provides a higher withstand without changing “envelope” size; (i.e. up to 85 kA). The E4.2 can go all the way to 100 kA withstand and still fit in a 22-inch section.
- **New Ekip trip unit:** with high accuracy measurement, optional integral 1% metering; no external CTs, PTs or meters required.
- **Functionality:** M-T-M or Utility-Gen auto transfer built in to the Ekip Trip Unit. No external relays, PLCs or devices required. With optional sync check module on breaker for closed transitions.
  - Accuracy: current 0.5%, voltage 0.5%, power 1%, energy 1%
  - Low current detection, starting from 0.4% of In
  - Perfectly suitable for SCADA integration
  - Analysis of energy demand

# Configurations

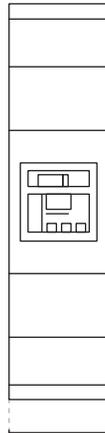
— 04 ReliaGear LV SG side view showing a NEMA 1 standard and optional depths of fully tested UL 1558, CSA C22.2 and Seismic certified gear

— 05 ReliaGear LV SG can accommodate four vertical section stacks - 49, 38, 30, 22, and 15-inch widths – meeting a variety of power density and footprint requirements that can result in cost and space savings



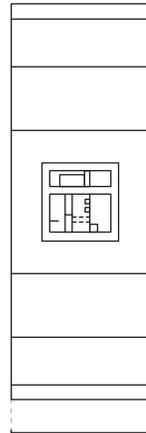
- Bolted construction - No welding
- Seismic qualified - meets CBC/IBC 2018,  $I_p=1.5$ ,  $z/h = 0-1$  and IEEE 693-2018 Moderate and High Seismic Loading
- Standard depth is 54" (24" deep front compartment plus 30" deep rear compartment)
- Rear compartment depth can be extended 6, 13 or 20 inches (applies to all sections in line-up)
- Intermix sections allow 22 inch wide breakers to be mounted in 30 inch wide section
- Both frame options provide additional conduit space

**Emax E1.2**  
1200A



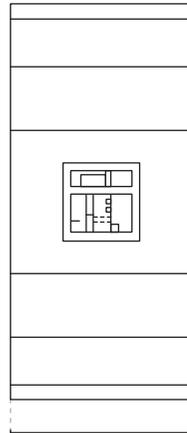
381...762 mm  
15...30in

**Emax E2.2**  
2000A



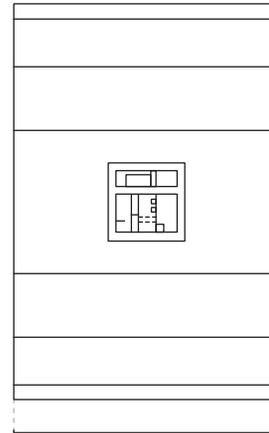
559...965 mm  
22...38in

**Emax E4.2**  
3200A



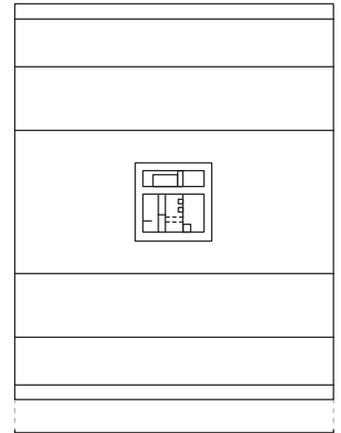
559...965 mm  
22...38in

**Emax E6.2**  
5000A



965 mm  
38in

**Emax E6.2**  
6000A



1245 mm  
49in

# Air case circuit breakers

## SACE® Emax® 2 UL 1066

- 1. Performance** — Satisfying all major requirements at the right size
- 2. Control** — Optimization of power flow even in emerging microgrid
- 3. Connectivity** — Integration into any digital systems
- 4. Ease of use** — Simplified user experience; at all customer interactions during the product's lifecycle



Table 1: High performance for Main or Feeders



kAIC Ratings (508V)	Version	250A	800A	1200A	1600A	2000A	3200A	4000A	5000A	6000A
100	V-A									
85	H-A						E4.2		E6.2	
65	S-A									
50	N-A				E2.2					
42	B-A		E1.2							

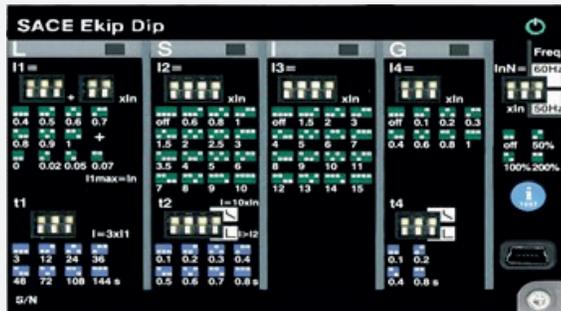
Rating overlap

# SACE® Emax® 2

## Trip unit

The SACE® Emax® 2 trip units are designed to be used in a wide range of applications. This complete, flexible protection trip unit can be adapted to the actual level of protection required, independently of the complexity of the system.

The range is available for three levels of performances, to meet any requirement, from simple to advanced applications.



### Ekip Dip: the standard trip unit

Current protection for basic distribution

- Thermal memory, separate settings for neutral
- LED with trip cause signalisation



### Ekip Touch: the smart trip unit

Ready to be upgraded and customized

- ABB Ability Marketplace™ Ready
- Advanced protection sets included:
  - Modified Differential Ground Fault
  - 2I...Reduced Energy Let Through Ready
- Embedded Bluetooth antenna
- Internal voltage sensing pre-installed<sup>1</sup>



### Ekip Hi-Touch: the ultimate trip unit

Ekip Touch Plus a lot more preloaded:

- Class 1% accuracy
- Directional protection for complex grids
- Dual setting for smart grids and arc-flash
- Enabled Internal voltage sensing and self-power

Table 2: Protection functions

ABB code	ANSI code	Function	Threshold	Threshold step	Tripping time	Time step
Synchro-check SC	25	Synchrocheck (Live busbars)	$U_{live} = 0.5...1.1 U_n$	0.001 $U_n$	Stability voltage time for live state = 100...30000ms Minimum matching time = 100...3000ms	0.001s 0.01s
			$\Delta U = 0.02...0.12 U_n$	0.001 $U_n$		
			$\Delta f = 0.1...1 \text{ Hz}$ $\Delta \phi = 5...50^\circ \text{ elt}$	0.1 Hz 5° elt		
		Tolerance	$\pm 10\%$			
		Synchrocheck (Live, dead busbars)	$U_{live} = 0.5...1.1 U_n$	0.001 $U_n$ 0.001 $U_n$	$t_{ref} = 0.1...30s$	0.1s
		Frequency check off	$U_{dead} = 0.02...0.2 U_n$			
		Phase check off				
		Dead bar configuration	Reverse/standard			
		Primary voltage	100...1150	100, 115, 120, 190, 208 220, 230, 240, 277, 347, 380, 400, 415, 440, 480, 500, 550, 600, 660, 690, 910, 950, 1000, 1150		
		Secondary voltage	100...120	100, 110, 115, 120		
		Tolerance	$\pm 10\%$			

<sup>1</sup> With vaux all threshold are available. Without Vaux minimum threshold is limited to: 0.3in (with In = 100A), 0.25in (eith In = 400A) or 0.2In (for all other ratings). The tolerances above apply to trip units already powered by the main circuit with current slowing in at least two-phases or an auxiliary power supply. In all other cases the following tolerance values apply.

Table 3: Measurement functions

Instantaneous measurements		Parameters
Currents (RMS)	[A]	L1, L2, L3, Ne
Earth fault current (RMS)	[A]	Ig
Phase-phase voltage (RMS)	[V]	U12, U23, U31
Phase-neutral voltage (RMS)	[V]	U1, U2, U3
Phase sequence		
Frequency	[Hz]	f
Active power	[kW]	P1, P2, P3, Ptot
Reactive power	[kVAR]	Q1, Q2, Q3, Qtot
Apparent power	[kVA]	S1, S2, S3, Stot
Power factor		total
Peak factor		L1, L2, L3, Ne
Countries recorded from installation or from the last reset		Parameters
Active energy	[kWh]	Ep total, Ep positive, Ep negative
Reactive energy	[kVARh]	Eq total, Eq positive, Eq negative
Apparent energy	[kVAh]	Es total
Network analyzer		Parameters
Hourly average voltage value	[V]	$U_{min} = 0.75...0.95 \times U_n$ $U_{max} = 1.05...1.25 \times U_n$
	[no]	Events counter (nr. of events day by day in the last year plus the total events in the breaker's life)
Short voltage interruptions	[no]	$U_{min} = 0.75...0.95 \times U_n$ $U_{max} = 1.05...1.25 \times U_n$
	[no]	Events counter (nr. of events day by day in the last year plus the total events in the breaker's life)
Short voltage spikes	[no]	$U_{min1} = 0.75...0.95 \times U_n$ ; $U_{min2} = 0.75...0.95 \times U_n$ ; $U_{min3} = 0.75...0.95 \times U_n$ $U_{max1} = 1.05...1.25 \times U_n$ ; $U_{max2} = 1.05...1.25 \times U_n$
	[no]	Events counter (nr. of events day by day in the last year plus the total events in the breaker's life)
Slow voltage sags and swells	[no]	Events counter (nr. of events day by day in the last year plus the total events in the breaker's life)
	[V]	$U_{neg.seq.} = 0.02...0.10 \times U_n$
Voltage unbalance	[no]	Events counter (nr. of events day by day in the last year plus the total events in the breaker's life)
		Current and voltage: Up to 50°; Alarm THD: 5...20%
Harmonic analysis		Single harmonic alarm: 3-10% plus a count of minutes the harmonic has been exceeded

Table 3: Measurement functions (continued)



Precision (Class 1)	Ekip Touch *	Ekip Hi-Touch	Ekip G Touch*	Ekip G Hi-Touch
0.5%	•	•	•	•
2%	•	•	•	•
0.5%	◦	•	•	•
0.5%	◦	•	•	•
	◦	•	•	•
0.1%	◦	•	•	•
1%	◦	•	•	•
2%	◦	•	•	•
1%	◦	•	•	•
2%	◦	•	•	•
	◦	•	•	•
<b>Precision (Class 1)</b>				
1%	◦	•	◦	•
2%	◦	•	◦	•
1%	◦	•	◦	•
<b>Intervals</b>				
t = 5...120min	◦	•	◦	•
t ≤ 40ms	◦	•	◦	•
t ≤ 40ms	◦	•	◦	•
t = 0.02s...60s	◦	•	◦	•
t = 5...120min	◦	•	◦	•
	◦	•	◦	•

\* Precision (Class 1) available with dedicated extracode. With no Class 1, please refer to the following precision values.

Current (RMS)	1%	Frequency	0.2%	Power factor	2%
Eart fault current (RMS)	2%	Active power	2%	Active energy	2%
Phase-phase voltage (RMS)	0.5%	Reactive power	2%	Reactive energy	2%
Phase-neutral voltage (RMS)	0.5%	Apparent power	2%	Apparent energy	2%

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# ABB Ability™ Condition Monitoring for electrical systems (CMES)

The ability to identify and manage problems in the electrical system before they occur

Monitor the condition of ABB's low voltage switchgear and motor control and its connected loads, analyze past and current events to prevent, predict conditions and monitor and manage energy consumption - anytime from anywhere, with ABB Ability™ Condition Monitoring for electrical systems (CMES).

The ABB Ability™ CMES is the innovative on premise-based monitoring platform that enables switchgear operators and plant maintenance managers to monitor and manage electrical distribution systems and motor control center via smartphone, tablet or computer in real time to optimize maintenance and operational costs and energy consumption.

Installed as integral part of the switchgear assembly at the time of manufacturing the solution monitors the complete lifetime of a switchgear from FAT in the manufacturers' assembly location, through commissioning including start-up phase and operational life.

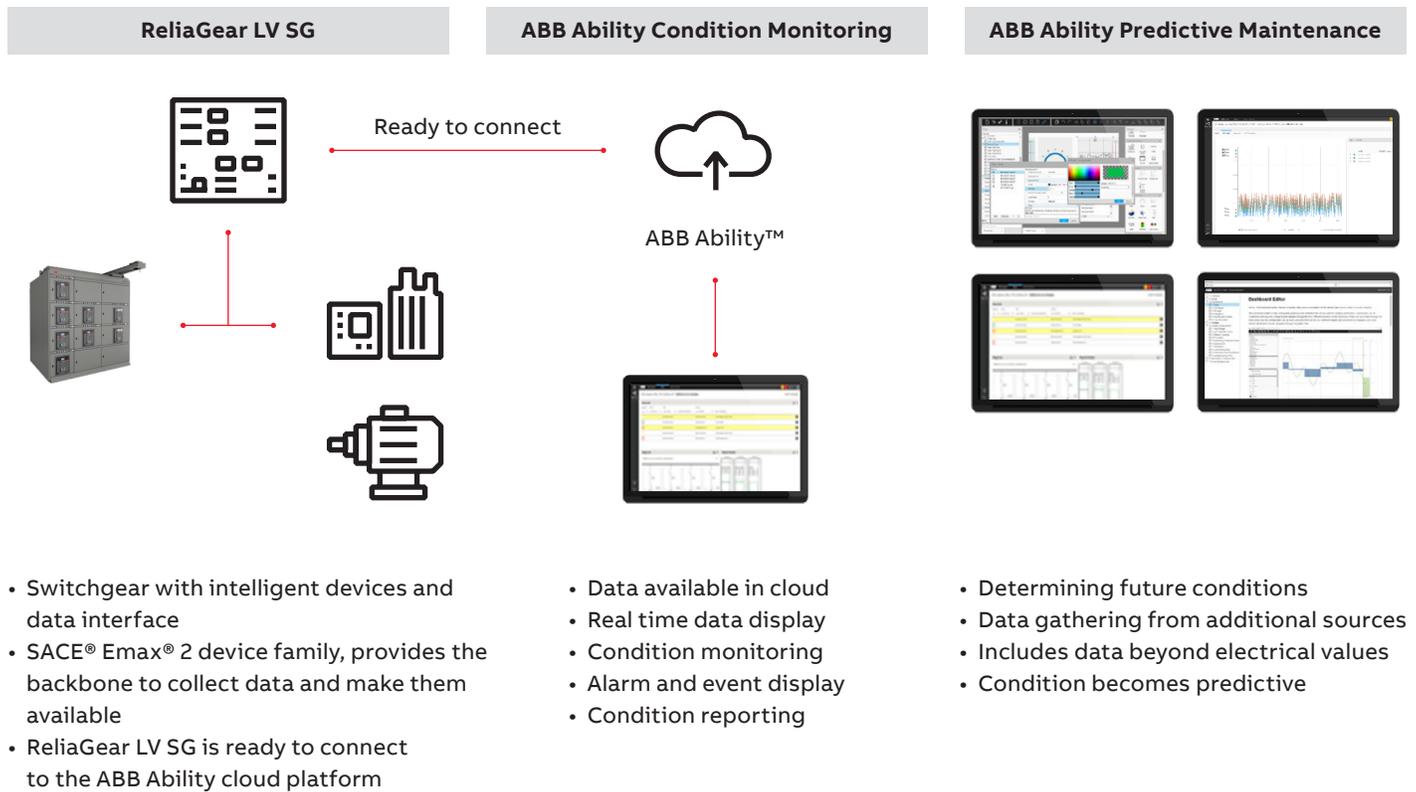
Cloud connectivity options complete the solution offering. Thus, the condition monitoring solution enables predictive capabilities that reduces downtime needed for maintenance and enables users to reduce operational costs.

Availability. Reliability. Maintainability.  
ABB Ability™ CMES.



# ABB Ability™ LV Switchgear – ReliaGear LV SG

Providing a complete real-time solution, with integrated data connectivity and optimized reporting





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