

DESCRIPTIVE BULLETIN

SafeGear® HD

5/15 kV, 63 kA arc-resistant
high duty switchgear



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SafeGear® HD

Higher interrupting solutions and safety considerations for medium voltage switchgear

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01 Conventional
switchgear 50 kA
interruption at
KEMA Test Lab

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02 Arc-resistant
switchgear 63 kA
interruption at
KEMA Test Lab

SafeGear® HD is ABB's newest ANSI platform for arc-resistant switchgear. It features a 0.5 second 63 kA arc withstand time for increased safety considerations in medium voltage switchgear, Type 2B accessibility per IEEE C37.20.7, a small footprint, two high configuration, and a 3-way vent flap system to ensure safety of personnel working on or around the gear. SafeGear HD is also seismic-certified to IBC Seismic Region D.

Product highlights

Safe and reliable

- Fully compliant to ANSI C37.20.2-1999 for switchgear construction and IEEE C37.20.7-2007 for arc-resistant testing at 0.5s arcing time withstand
- Type 2B accessibility rating
- All bus primary insulation is high strength epoxy
- ADVAC 63 kA breaker fault clearing duty time is max 50ms (3-cycle)
- New bus and breaker compartment design with increased volume and strength
- Closed door PT and CPT fuse drawout racking
- Available SmartRack remote racking system, capable of racking not only the breaker but also the PT and CPT fuse drawout units
- UL and CSA certified

Easy to use and maintain

- Multi-point front door latch with single easy to use padlockable handle
- Rear hinged upper and lower doors for ease of maintenance
- Dual secondary disconnect plugs operate without opening the front door
- Two viewing windows for verification of breaker truck and contact position
- Externally flanged plenum design for ease of installation
- Foot operated hydraulic lift truck

Optimal flexibility

- Modular design and construction
- Designed to be used with the ABB drawout I_s-limiter for ratings exceeding 63 kA
- Available for top and/or bottom cable entry

Compact and space savings solution

- Standard 36 inch frame width for 5 and 15 kV switchgear
- Minimal depth of 112 inches
- Normal height over the plenum of 118 inches with a height of 129.5 inches for vent release for 2000 A/3000 A
- Minimum exposed hardware heads on front of frame provides a neat and smooth surface appearance

Voltage class	FLC (Amps)	Isc (kA)	BIL (kV)	Hi-pot (kV, rms)
5/15 kV	1200 A	50/63	95	36
	2000 A	50/63	95	36
	3000 A	50/63	95	36
	4000 A*	50/63	95	36



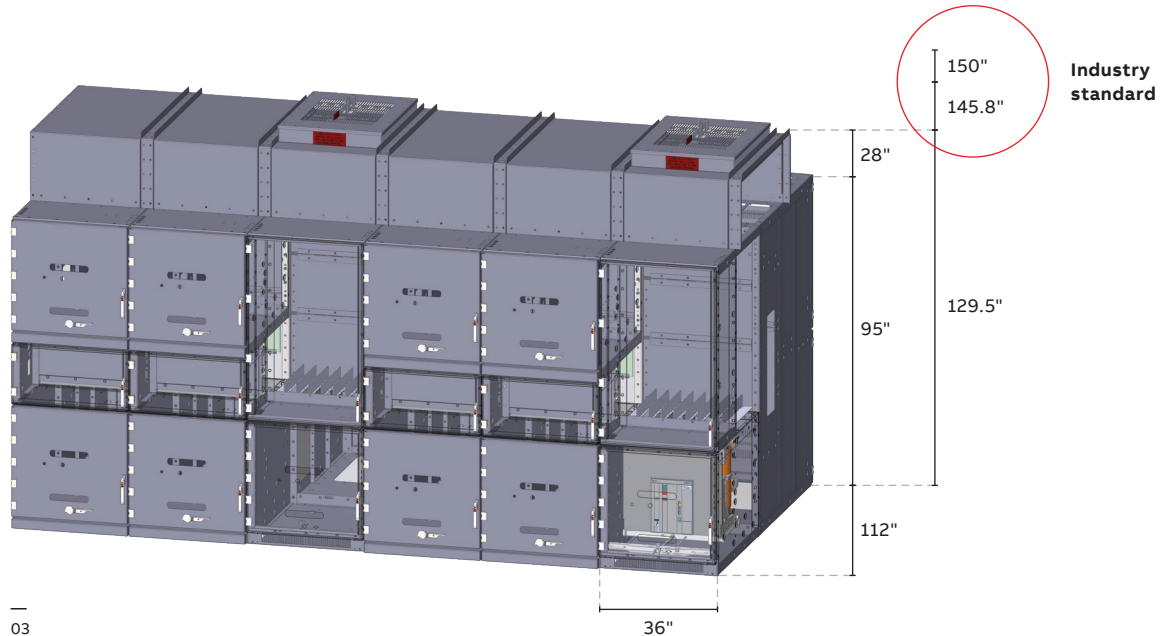
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01



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02

Features

03 Dimensions depict 3000 A main bus scenario. For more information, see SafeGear HD technical guide 1VAL108001-TG.



Safety

When an arc fault occurs in conventional switchgear, the heat of the arc (10-20,000° K), can melt and even vaporize compartment materials and components. Flames and hot gases escape and ignite nearby materials. As air temperature increases in the enclosed space, so does the pressure. The rapid pressure build-up is explosive, hurling objects such as doors, panels, and components.

Disastrous arc faults cost managers of large-power installations hundreds of thousands of dollars in lost equipment and downtime as well as needless deaths and injuries. The video excerpts below illustrate the consequences of an arc fault in conventional switchgear and the advantages of using SafeGear arc-resistant switchgear.

Arc-flash venting

ABB has developed a new 3-way spring-loaded vent flap system for SafeGear HD that vents through the center of the switchgear and does not require additional space for side mounted venting chimneys. ABB vents through 57" chimneys, straight to the plenum, and out of the building to a safe distance.

Available configurations

ABB has one-high and two-high breaker configurations available. Customers can also arrange to have PTs on top of breakers to allow for extra space and cost savings. CPTs can be withdrawable or fixed mounted in the rear cable compartment with withdrawable fuse trucks. Top entry cable is also available as an option even with a plenum.

Small footprint

Similar to its SafeGear platform, the SafeGear HD platform is among the smallest footprints in the industry. SafeGear HD with plenum requires only a distance of 129.5" minimum, floor to ceiling, for clearance of the vent box handle. This allows for lower Power Distribution Center (PDC) heights, which is a direct cost saving.

Testing details

SafeGear HD was design tested per IEEE C37.20.7-2007 for arc-resistant rating up to Type 2B with 0.5s withstand time, and complies with IEEE Standard C37.20.2. SafeGear HD has also certified for IBC Seismic Region D. SafeGear HD is also UL and CSA compliant.

63 kA ADVAC breaker

Advanced design vacuum circuit breaker

The ADVAC series is a complete line of ANSI-rated vacuum circuit breakers offering power distribution system customers the advantages of the latest technology that reduces ownership costs through improved reliability and maintainability. Maintenance costs are further reduced due to ABB vacuum interrupter and contact design, with contacts that wear less than 1 mm during the lifetime of the breaker.



Voltage class	FLC (Amps)	Isc (kA)	Max wave voltage (kV, rms)	Max. sym. interrupt & STC (kA, rms)	Close and latch (kA, rms)	BIL (kV)	Hi-pot (kV, rms)	Cap switch rating (15kA peak, 2.0 kHz)	Interrupt time (cycles)	Closing time (msec)
5/15 kV	1200 A	63	5/15	63	164	95	36	C1 (1600 A)	3	50-80
	2000 A	63	5/15	63	164	95	36	C1 (1600 A)	3	50-80
	3000 A	63	5/15	63	164	95	36	C1 (1600 A)	3	50-80

Close coils			Open/trip coils		
Nominal control voltage	Voltage range	Resistance ranges (Ω)	Nominal control voltage	Voltage range	Resistance ranges (Ω)
			24 VDC	14-28 VDC	$3.5 \pm 4.2\%$
48 VDC	38-56 VDC	$9.5 \pm 4.3\%$	48 VDC	28-56 VDC	$9.5 \pm 4.2\%$
120 VDC	100-140VDC		125 VDC	70-140 VDC	
120 VAC	104-127VAC	$48 \pm 4.0\%$	120 VAC	104-127 VAC	$48 \pm 4.0\%$
250 VDC	200-280 VDC		250 VDC	140-280 VDC	
240 VAC	208-254 VAC	$174 \pm 5.2\%$	240 VAC	208-254 VAC	$174 \pm 5.2\%$

Instrument transformers

Current transformers

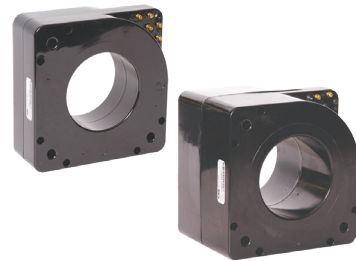
SafeGear HD is designed and tested for use with the ABB SAB-1/1D current transformers for 1200 and 2000 A applications, and the SAB-2/2D current transformers for 3000 A and 4000 A applications. These CT's are used for voltage ratings of 5, 7.5 and 15 kV and are located on the breaker primary bushings.

Each breaker primary bushing can accommodate up to two (2) standard accuracy CTs (SAB-1 or SAB-2), for a total possible four (4) current transformers per phase. For high accuracy requirements the bushings can accommodate one (1) CT, for a total of two (2) CTs per phase.

The ABB SAB CTs are available in single and multi-ratio styles with primary ampere ratings from 50 to 5,000 amps. These current transformers are used as a source of current for both relaying and metering. The deeper case SAB-D is used when high burden relaying and metering is required.

The ring-type core is insulated and toroidally wound with a fully distributed secondary winding. The protective case, made of an impact-resistant polycarbonate, is assembled using self-tapping screws. Secondary terminals are 10-32 brass terminal screws with hardware.

Saturation, overcurrent ratio correction factor and phase-angle curves are available upon request. IEEE test reports are stored electronically and can be e-mailed in various formats at the time of shipment.



These units meet all applicable IEEE and NEMA standards and are UL Recognized components.

Product features

- 600 Volt Indoor
- 10 kV BIL
- 25 through 400 Hertz
- 50-5000 Primary Amperes
- Mechanical Rating:
 - 180 x rated current
- Thermal Rating:
 - 80 x rated current, one second
- Continuous Current Rating Factor:
 - 50-4000 Primary Amperes:
 - 1.33 @ 30°C ambient
 - 1.00 @ 55°C ambient
 - 5000 Primary Amperes:
 - 1.00 @ 30°C ambient
 - 0.50 @ 55°C ambient
- UL Recognized Component; File No. E96461

Instrument transformers

15 kV voltage transformers

For 8.25 – 15kV applications, SafeGear HD is designed and tested for use with the ABB VIZ Indoor Voltage Transformers.

The VIZ-75 and VIZ-11 indoor voltage transformers are fused and are used for metering or relaying applications. Both units are available in single, double and tapped secondary designs with two accuracy and thermal rating options.

SafeGear HD utilizes drawout trays for the PTs that offer closed door racking for increased safety. These trays are available in both single phase and 3-phase, and include both Wye-Wye and Open Delta configurations.

The primary and secondary coils are wound using special winding and shielding techniques for improved voltage stress distribution. The coils are designed to withstand continuous operation at either 1.1 or 1.25 times the line-to-line voltage level for Z burden units and 1.9 times the line-to-ground voltage level for Y burden units. Each coil is insulated with mylar film to provide a high dielectric strength between layers. The coils and core are combined to create a complete winding structure that is assembled to a support frame.



The entire assembly is vacuum cast in polyurethane for added insulation and protection.

IEEE test reports are stored electronically and can be e-mailed in various formats at the time of shipment.

These units meet all applicable IEEE and NEMA standards and are UL Recognized components.

Product features

- 8.25 and 15 kV indoor
- 75 and 110 kV BIL, 60 Hertz
- Primary volts: 2400 - 14400
- UL Recognized Component, File No. E148620

Instrument transformers

5 kV voltage transformers

For 5kV applications, SafeGear HD is designed and tested for use with the ABB VIY-60 Indoor Voltage Transformers.

The VIY-60 indoor voltage transformers are fused and are used for metering or relaying applications.

SafeGear HD utilizes drawout trays for the PTs that offer closed door racking for increased safety. These trays are available in both single phase and 3-phase PT applications, and include both Wye-Wye and Open Delta configurations.

The primary and secondary coils are wound using special winding and shielding techniques for improved voltage stress distribution. The coils are designed to withstand continuous operation at 1.1 times the line-to-line voltage level and the line-to-ground voltage level for Y burden units.

Each coil is insulated with mylar film to provide a high dielectric strength between layers. The coils and core are combined to create a complete winding structure that is assembled to a support frame.



The entire assembly is vacuum cast in polyurethane for added insulation and protection. IEEE test reports are stored electronically and can be e-mailed in various formats at the time of shipment. These units meet all applicable IEEE and NEMA standards and are UL Recognized components.

Product features

- 5 kV indoor
- 60 kV BIL, 60 Hertz
- Primary volts: 2400 - 4800
- UL Recognized Component, File No. E148620

Distribution protection and control

Relion® relays

— 04 Relion 615 series

— 05 Relion 620 series

— 06 COM600 Grid Automation Controller

ABB's Relion® family of protection and control relays for distribution applications provides the performance, safety, and ease-of-use that switchgear specifiers and users demand. The Relion 615 and 620 series offer complete protection and control for feeders, motors, and transformers in switchgear applications and are characterized by their flexibility and performance in today's and future distribution schemes.

The IEC61850 implementation in Relion includes fast peer-to-peer communication over the substation bus. GOOSE communication is used between Relion devices in switchgear to form a stable, reliable, and high-speed bus bar protection system, provide fast and dependable auto transfer schemes and zone interlocking. Separate hard-wiring is not needed for the horizontal communication between the switchgear cubicles.

Relion relays for feeder protection offer an optional cable fault detection function that can detect extremely short duration underground faults. These faults are typically undetectable by conventional protection where there is no operation of the breaker. This feature helps users to learn of these events faster, resulting in reduced down time.

ABB's COM600 Grid Automation Controller can be used as a local HMI to display switchgear single line diagrams and the status of devices such as breakers and protection relays. COM600 also provides gateway functionality to enable switchgear integration into SCADA systems. It can be easily installed as part of the switchgear control devices.

Relion 615R, 615 and 620 series relays include:

- Comprehensive set of protection and metering functions for feeders, transformers, and motors
- Draw-out design

- Integrated Open/Close push buttons and Local/Remote selector with indicating lights
- Protection and control for one and two breakers as well as breaker-and-a-half schemes
- Enhanced safety with optional arc fault protection in all 615 and 620 series relays
- Web browser based user interface accessible through an RJ45 front port
- Trip coil monitoring
- Monitoring of breaker health parameters such as travel time, number of operations, wear and tear, and spring charging time
- DNP3 and Modbus protocols included standard in all relays
- Relion relays are fully IEC61850 compliant for communication and interoperability of substation automation devices
- Fully ANSI and RoHS compliant as well as UL listed



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