Technical guide

SafeGear HD®
5/15 kV, 63 kA arc resistant high duty switchgear

Power and productivity
for a better world™

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General overview
ABB medium voltage switchgear

Introduction

Millions of ABB circuit breakers are installed and operating worldwide, giving the ABB SafeGear and SafeGear HD switchgear product lines a proven record of dependability that assures maximum uptime in any environment. Superior safety and low maintenance are achieved by customer-focused design innovations, such as a closed-door racking system with fully automatic secondary connections. To provide maximum protection for equipment and personnel, SafeGear and SafeGear HD add the advantages of arc resistant construction.

SafeGear HD arc resistant metal-clad switchgear is manufactured from an array of standard modules for fast, efficient delivery of custom switchgear. Quality is assured by extensive design and production tests, coupled with manufacturing in facilities that have been certified in compliance with ISO 9001.

General description

ABB offers medium voltage, arc resistant, metal-clad switchgear for the ANSI market utilizing modern manufacturing techniques.

Design details like arc resistant construction, closed door racking, fully automatic secondary disconnects and safety interlocks inside the cell give operators superior protection and minimize the risk of errors and injuries. Other details reduce maintenance efforts. The modular design allows for compact space-saving arrangements. Bolted construction enables faster replacement and modification in the field. All these features lead to lower cost of ownership and reduced risk.

SafeGear HD arc resistant metal-clad switchgear is available in one-high and two-high configurations.

The current ABB arc resistant medium voltage product portfolio consists of:

SafeGear arc resistant switchgear, 5 and 15 kV, up to 50 kA, utilizing the ADVAC or AMVAC circuit breaker

SafeGear HD arc resistant switchgear, 5 and 15 kV, 63 kA, utilizing the ADVAC circuit breaker for the 63 kA rating, or the ADVAC or AMVAC circuit breaker for the 50 kA rating, to coordinate with the ABB Is-Limiter, which can be applied in the switchgear to increase the rating beyond 63 kA.

This bulletin covers SafeGear HD switchgear.

SafeGear HD background and design
Features

The standardized cubicle sizes and modular design allow for simplified engineering. The SafeGear HD basic frames are 36” wide, 95” high and 112” deep. The front compartment is composed of combinations of modules standing 19”, 38” or 57” tall.

The product offerings conform to the appropriate IEEE and ANSI standards and come with optional UL or CSA listings. SafeGear HD arc resistant metal-clad switchgear meets all of the requirements according to IBC Region D with an importance factor of 1.0 for seismic rating.

Contemporary design

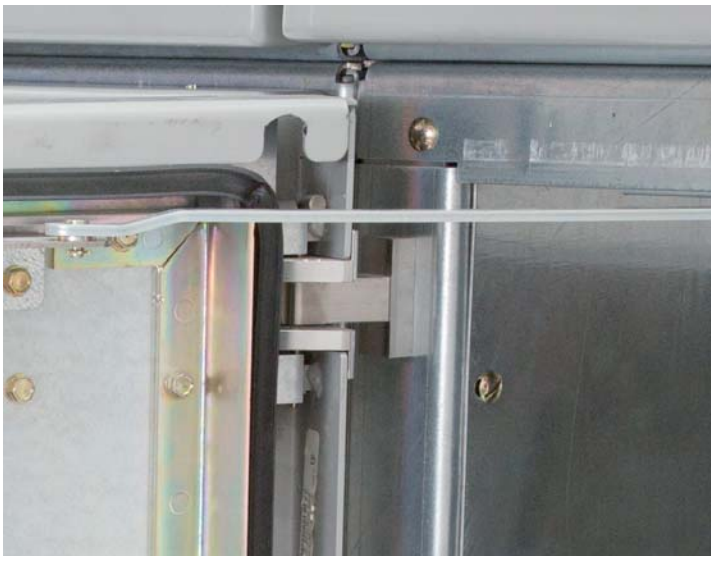
SafeGear and SafeGear HD arc resistant metal-clad switchgear are the first with completely innovative modular, bolted design introduced in the ANSI market in more than a decade.

With more than 50 years of experience in power distribution systems and equipment design, ABB developed SafeGear and SafeGear HD for the ANSI arc resistant switchgear market with the user in mind.

Modular construction

Complete sets of rugged, stackable circuit breaker and auxiliary equipment modules are assembled to form a SafeGear HD switchgear lineup. All modules are constructed from Galvanized steel for superior corrosion resistance.

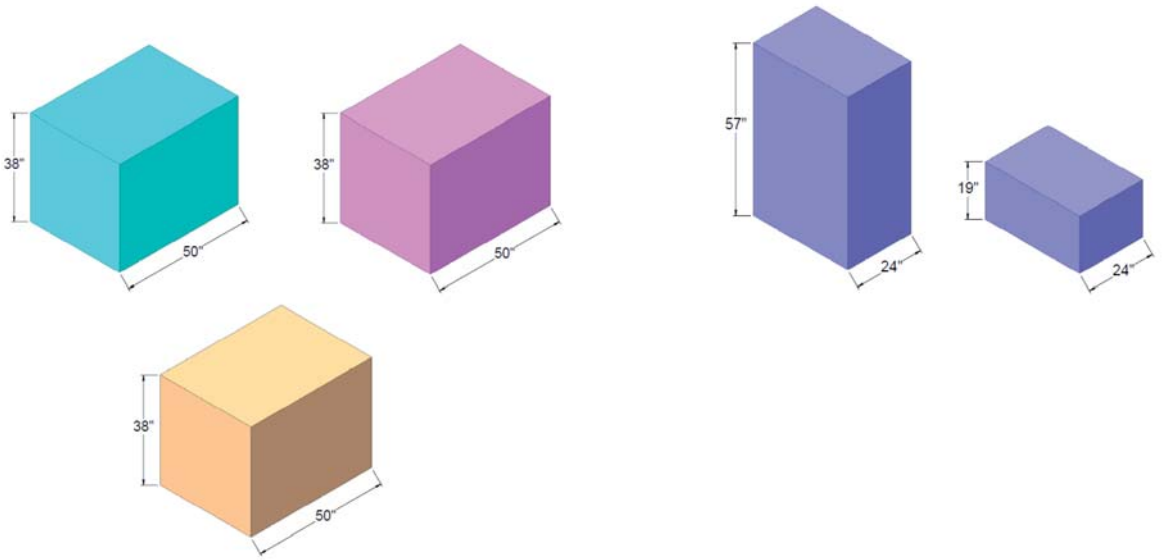
Hem bending is used to form a rigid, self-supporting structure. In addition to its outstanding structural benefits, hem bending results in rounded steel edges that greatly reduce the risk of injury during maintenance and field inspections.



Hem bending creates a rigid structure and sturdy construction in arc resistant metal- clad switchgear (reinforced, arc resistant door construction shown).

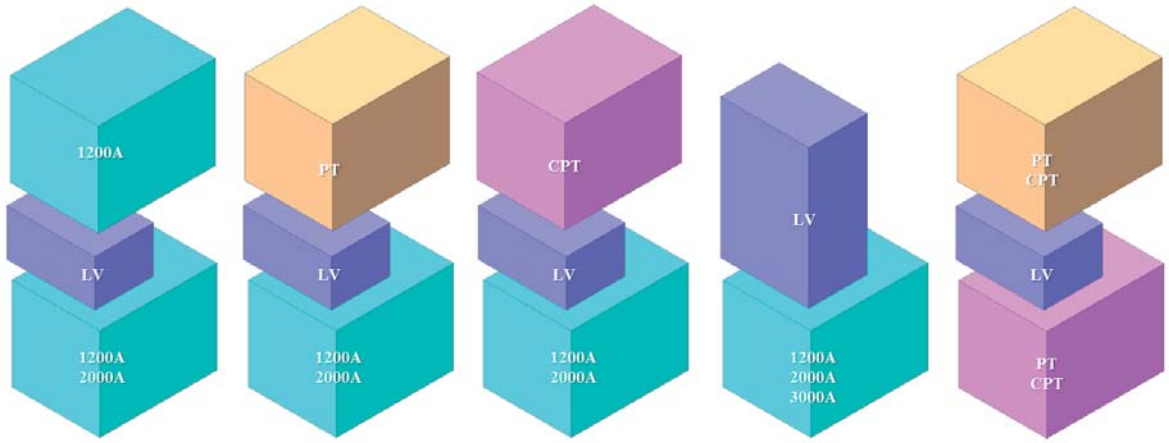
Typical module types

A complete set of primary and low-voltage modules are available. All modules are 36 inches wide.



Flexible arrangements

Modules are stackable in a variety of one-high and two-high configurations as shown below.



Circuit breaker modules

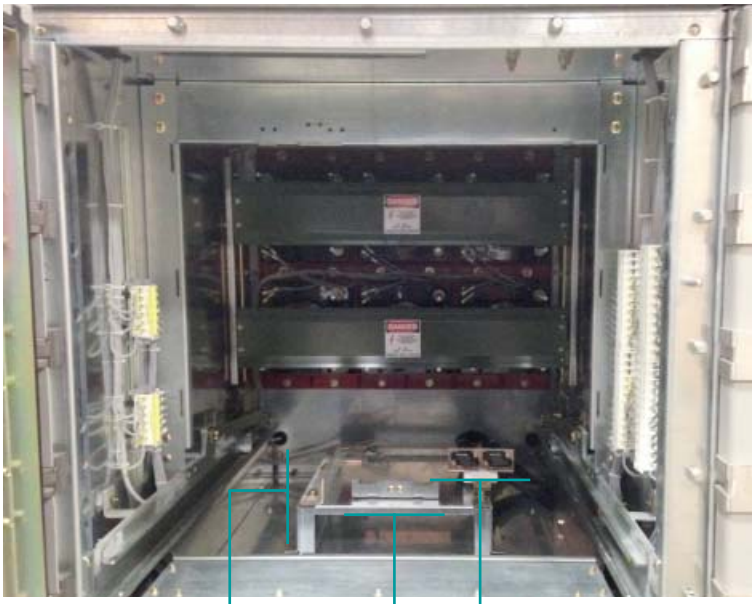
SafeGear HD ADVAC™ circuit breaker modules are designed for maximum operator safety by providing two viewing windows and three-position closed door racking. The circuit breakers have self-aligning, fully automatic primary and secondary contacts. They incorporate distinctive features for ease of installation, operational safety and maintenance simplicity.

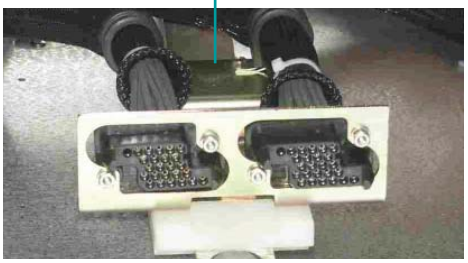
Unique racking system

The racking system is unique and features a three - position (Disconnected/Test/Connected) closed door system for all circuit breakers. The racking system is integral to the circuit breaker, so moving parts can be inspected and maintained outside the breaker compartment and away from energized primary and secondary circuits.

Interlocks

The racking system includes all necessary interlocks in compliance with ANSI / IEEE standards to assure proper sequencing and safe operation. For improved safety, the interlocking system prohibits operation of the breaker while in an intermediate position and prohibits insertion of an improperly rated breaker into a breaker compartment.





Circuit breaker grounding

A solid stationary ground contact engages the grounding contact of the circuit breaker. Ground connection is made prior to the coupling of the primary or secondary contacts and is continuous during the racking operation.

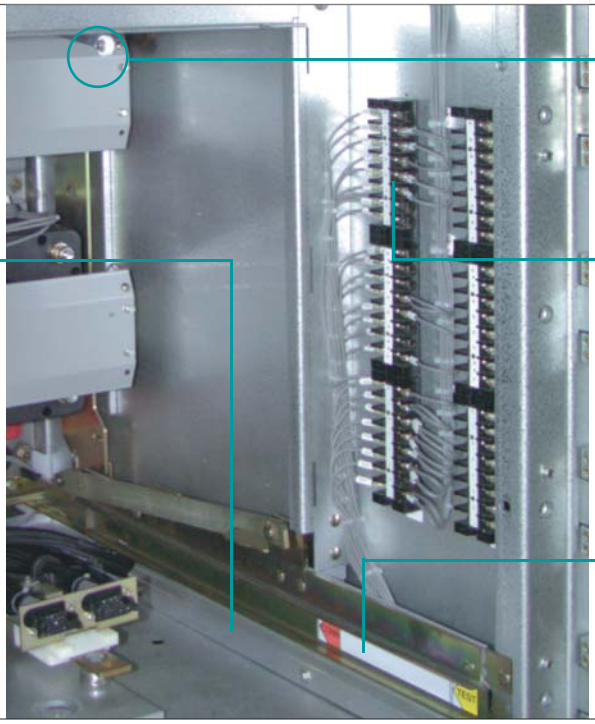
Interference blocking

Interference blocking prevents insertion of improperly rated circuit breakers into the module. This decreases the risk of human error.

Secondary disconnect system

A dual, (50-pin) self-aligning secondary disconnect for control circuitry is provided as a standard feature. The female portion resides in the circuit breaker module. Potentially energized contacts are recessed and remain “touch safe.”

Dual guide rails
ADVAC/AMVAC circuit breakers lock securely into circuit breaker modules on both sides. Dual guide rails and self-aligning primary and secondary contacts assure smooth, consistent racking, and support the breaker firmly during peak short circuit conditions.



TOC actuator
Switch contacts are actuated by the front panel as the breaker moves in and out of the connected position.

Terminal block mounting space
Ample room is provided for connections to secondary wiring from circuit breakers, current transformers and other devices.

Position indicator
A position decal indicates breaker position by alignment with the front panel of the breaker.

Primary shutters

Primary shutters automatically cover primary contacts when the breaker is not in the connected position. The shutters may be grounded metal or optional insulating polycarbonate material. Primary contact stabs can be visually inspected without opening the shutter.

Primary shutter opening and closing is mechanically forced by circuit breaker movement, rather than relying on springs or gravity. Personnel are assured that shutters are closed when removing the breaker from the cell. A locking mechanism prevents opening of the shutter when the circuit breaker is removed.

Primary supports and current transformers

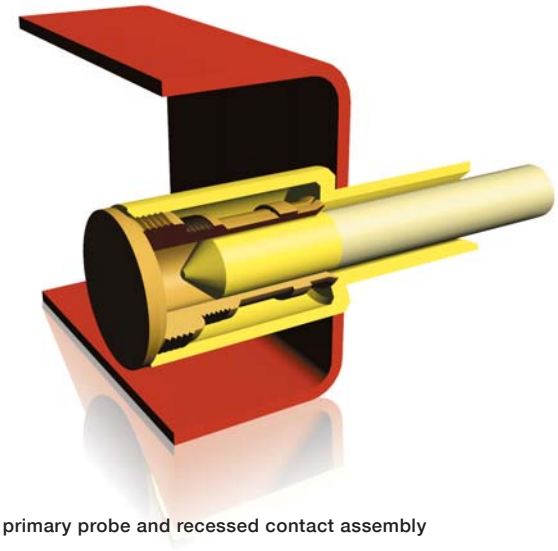
Primary contacts and current transformers (CTs) are supported by standard epoxy bushings.

CTs can be mounted on both line and load primary bushings behind the shutter. Bushings accommodate up to four standard accuracy CTs per phase.

Auxiliary primary modules

Auxiliary primary modules snuffer

All primary auxiliary equipment utilizes arc quenching Delrin® technology. A Delrin® tipped conductor probe is inserted into a Delrin® receptacle with recessed contacts. During load break, localized heating of the delrin material due to arcing causes the material to release a gas. This gas fills the small isolating gap between the sleeve and receptacle to contain the arc and extinguish it safely.



Delrin primary probe and recessed contact assembly

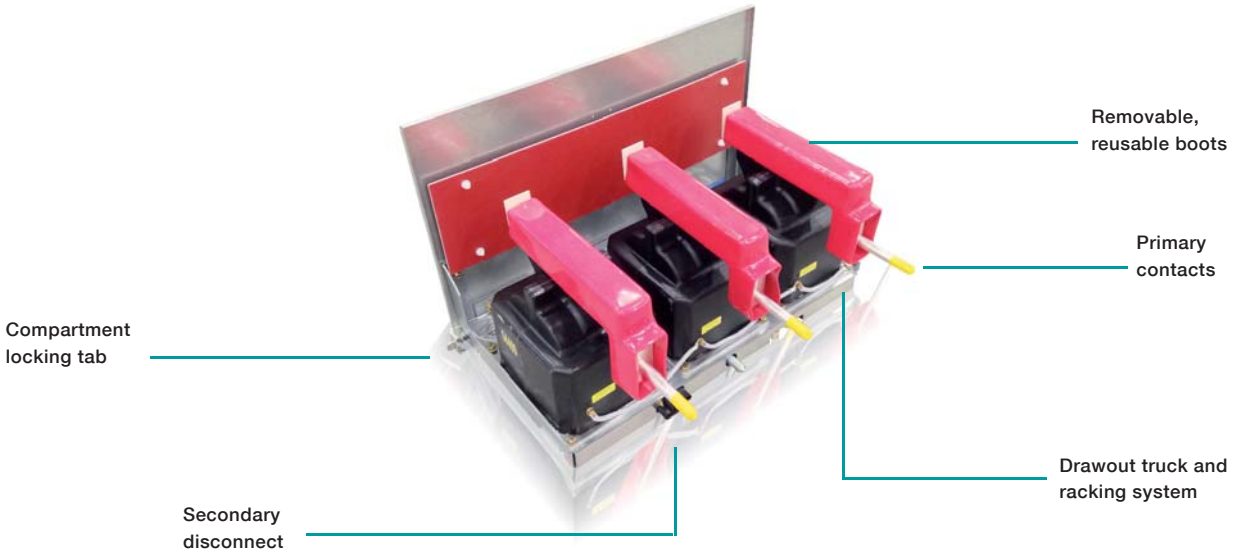
Closed door racking

Primary modules for auxiliary equipment are equipped with similar technology as the circuit breaker cells. Consistent designs, with closed door racking system and automatic secondary disconnect, allow for operator familiarity. The cell interface uses the same accessories as the circuit breaker module. Secondary contacts engage/disengage automatically and interlocks ensure proper operation where applicable.

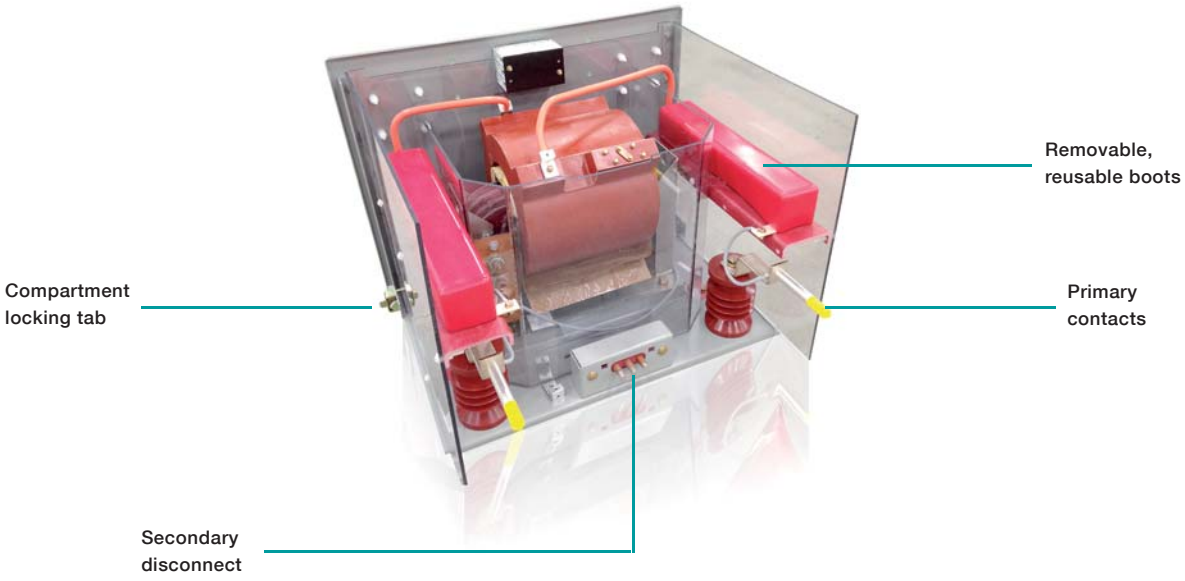
Voltage

PT modules accommodate industry-leading type VIY and VIZ switchgear style VTs from ABB. Each module accepts up to three transformers with line-to-line (L-L) or line-to-ground (L-G) connections. VTs are automatically grounded momentarily on withdrawal to discharge residual stored energy in the primary windings.

PT drawout assembly with three voltage transformers - the fuses can be removed without removing the PT truck from the rails.



Control power transformer (CPT) drawout fuses



Control power transformer (CPT) drawout fuses

CPT modules provide convenient mounting and operation of single-phase control power transformers in ratings up to 15 kVA, minimizing the possibility of inadvertent interruption of control power for AC operated switchgear.

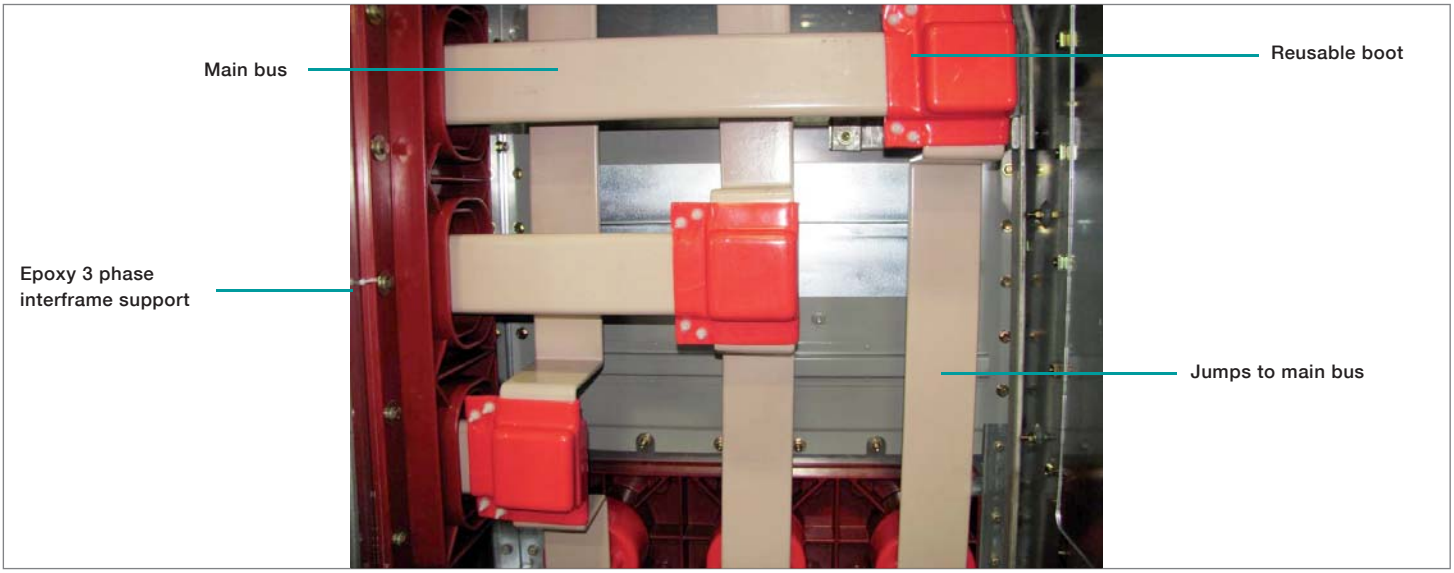
Fuse modules accommodate up to three primary fuses for use with fixed-mount control power transformers and other primary voltage level circuit protection. Fuse modules are provided with stationary control power transformers in ratings up to 45 kVA three-phase or 50 kVA single phase.

Low voltage instrument module

ABB mounts all protection and control devices in a dedicated low voltage module. Each low voltage instrument module is completely isolated and segregated from high voltage compartments. This ensures safety for operations and maintenance personnel while they work on control and auxiliary circuits. Devices and control switches are mounted on the door for easy readability and convenient access. Those devices that do not require immediate access are mounted inside the compartment.

Low voltage instrument module isolated for maximum safety when working with low voltage circuits

Primary bus system



All primary bus is 100% copper with full round edges, and is available in 1200 A, 2000 A, and 3000 A ratings. The bus is silver-plated at joints and bolted together with a minimum of two half-inch SAE grade 5 bolts. Proper torque is verified by calibrated tools for both safety and optimum performance. The main (horizontal) bus is not tapered and is easily extended at both ends to facilitate future expansions.

The bus is epoxy insulated with an advanced powder coat system that eliminates voids and other potential defects, resulting in maximum integrity of the insulation system. Removable, reusable boots are provided at each joint to simplify access and maintenance.

Insulating standoffs rigidly support the bus. This includes jumps, the connections from stationary primary contacts to the main bus and risers, and connections from stationary primary contacts to line or load terminations. Internal standoffs and interframe supports are epoxy for all ratings.

Cable compartments

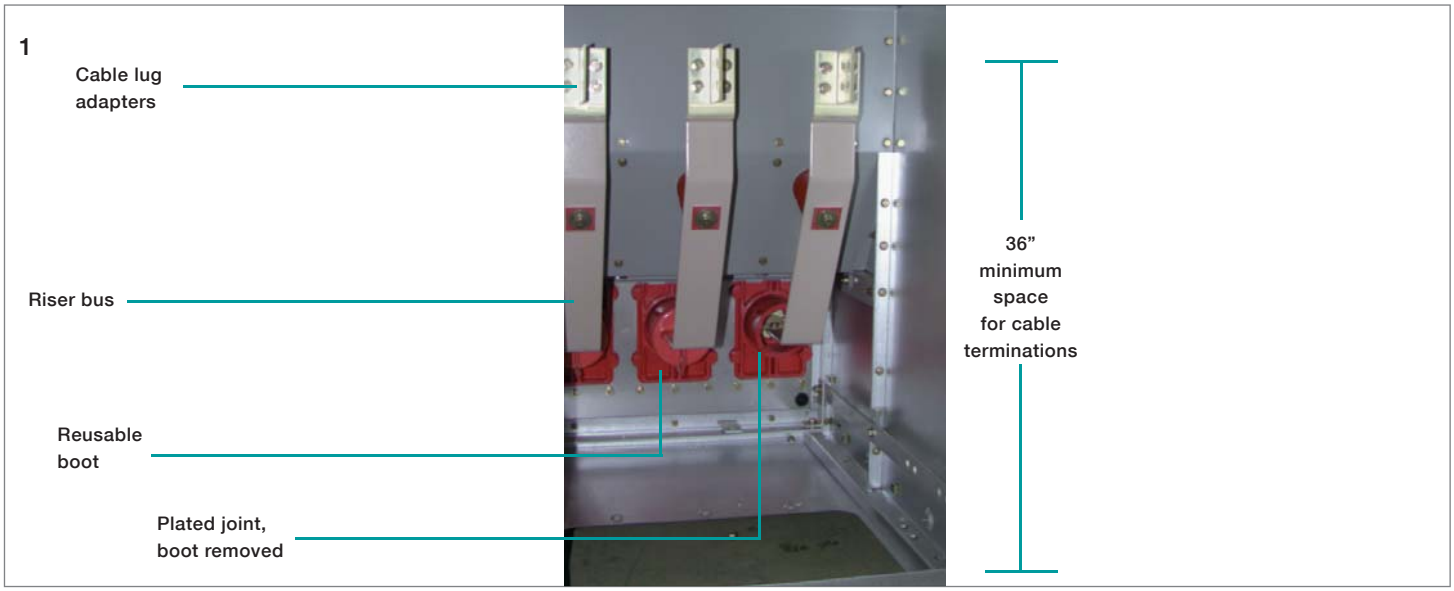
Well-designed cable compartments for SafeGear HD provide an efficient layout with ample room for stress cones and a choice of cable terminations and lug types. Customers also have the flexibility of top or bottom cable entry. Top connections can also be made to bus duct or roof bushings.

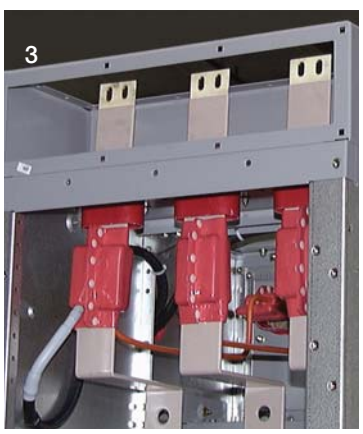
In two-high arrangements with stacked circuit breakers, steel barriers separate the compartments and isolate the primary circuits. All configurations come standard with lug boots and have option for cable supports to make field connections more efficient and secure.

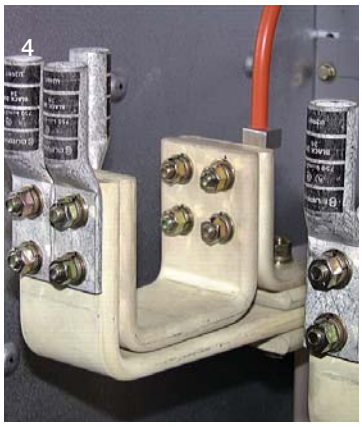
Cable compartments are available with optional readily accessible zero sequence current transformers, surge arresters and capacitor, and ground studs on the bus risers. When a drawout fuse compartment is installed in the front of the switchgear, the rear cable compartment offers room for a large three-phase floor-mounted control power transformer.

The 112 inch depth of SafeGear HD switchgear provides ample space for various cable terminations and protective, monitoring, and control devices as needed.

1 Cable compartment (main bus - cover installed) | Various application designs in cable compartments: 2 Surge arrestors | 3 Bus risers to bus duct or roof bushings | 4 Connection of up to eight cables per phase (three cable lugs shown) | 5 Large fixed-mount CPT up to 45 kVA 3-phase or 50 kVA single-phase







Modules and frames
SafeGear HD

MB Rating																	
1200A	57”	Inst Compt	38”	PTs	57”	Inst Compt	38”	CPT ≤15 kVA	38”	PTs	38”	CPT ≤15 kVA
2000A			19”	Inst Cmpt			19”	Inst Cmpt	19”	Inst Cmpt	19”	Inst Cmpt
3000A	38”	D/O Fuse	38”	D/O Fuse	38”	CPT ≤15kVA	38”	Auxiliary Compt	38”	CPT ≤15kVA	38”	PTs

MB Rating												
1200A	57”	Inst Compt	38”	PTs	38”	PTs	57”	Inst Compt	38”	1200 A Bkr	38”	1200 A Bkr
2000A			19”	Inst Cmpt	19”	Inst Cmpt			19”	Inst Cmpt	19”	Inst Cmpt
3000A	38”	PTs	38”	PTs	38”	Auxiliary Compt	38”	Auxiliary Compt	38”	Auxiliary Compt	38”	PTs

MB Rating												
1200A	38”	1200 A Bkr	38”	1200 A Bkr	38”	1200 A Bkr	38”	Inst Compt	38”	PTs	38”	CPT ≤15 kVA
2000A	19”	Inst Cmpt	19”	Inst Cmpt	19”	Inst Cmpt	19”		19”	Inst Cmpt	19”	Inst Cmpt
3000A	38”	CPT	38”	D/O Fuse w/ CPT	38”	1200 A Bkr	38”	1200 A Bkr	38”	1200 A Bkr	38”	1200 A Bkr

MB Rating								
2000A	38”	Inst Compt	38”	PTs	38”	CPT ≤15 kVA	38”	1200 A Bkr
3000A	19”		19”	Inst Cmpt	19”	Inst Cmpt	19”	Inst Cmpt
	38”	2000 A Bkr	38”	2000 A Bkr	38”	2000 A Bkr	38”	2000 A Bkr

MB Rating		
3000A	38”	Inst Compt
	19”	
	38”	3000 A Bkr

Every lineup must contain at least one (1) 57” Instrument Compartment for every 7 frames in order to provide a path to the plenum for arc ventilation.

2000A lineups require at least one (1) 57” Instrument Compartment for every two (2) 2000A breakers in order to provide a path to the plenum for heat ventilation.

CPTs greater than 15 kVA require a drawout fuse unit with stationary mounted CPT.

Arc resistance

SafeGear HD metal-clad switchgear is a newly designed arc resistant switchgear product. All the design features of SafeGear are included in SafeGear HD, making this the most advanced switchgear product, with the best protection available today.

Arc resistance protects the operator from harm and limits damage to equipment in the case of an internal arc fault. The arc resistant design of SafeGear metal-clad switchgear was developed utilizing decades of ABB experience with medium voltage power systems. SafeGear HD provides all of the benefits of SafeGear, with extended interrupting and arc resistance ratings to 63 kA.

Safegear HD arc resistant accessibility types

SafeGear is designed to comply with the arc resistant testing requirements of IEEE test guide C37.20.7 (2007). The IEEE test guide reflects the arc resistant switchgear types as shown below.

SafeGear HD is available in accessibility types 2 and 2B.

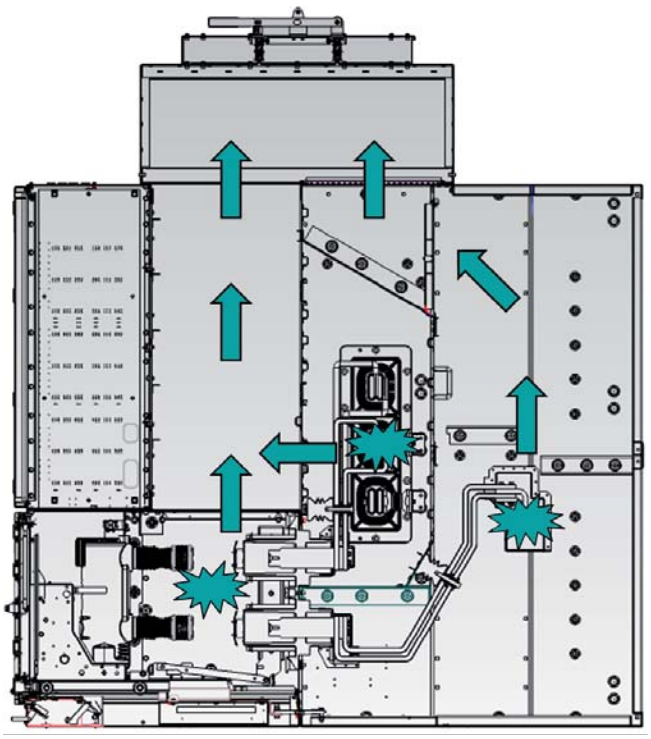
IEEE C37.20.7 - 2007	Accessibility Specification
Type 1	Front only
Type 2	Front, sides and rear
Type 2B	Front, sides, rear and LV compartment
Type 2C	Front, sides, rear and between adjacent compartments and sections within a lineup *
Type 2BC	Front, sides, rear, LV compartment and between adjacent compartments and sections within a lineup *

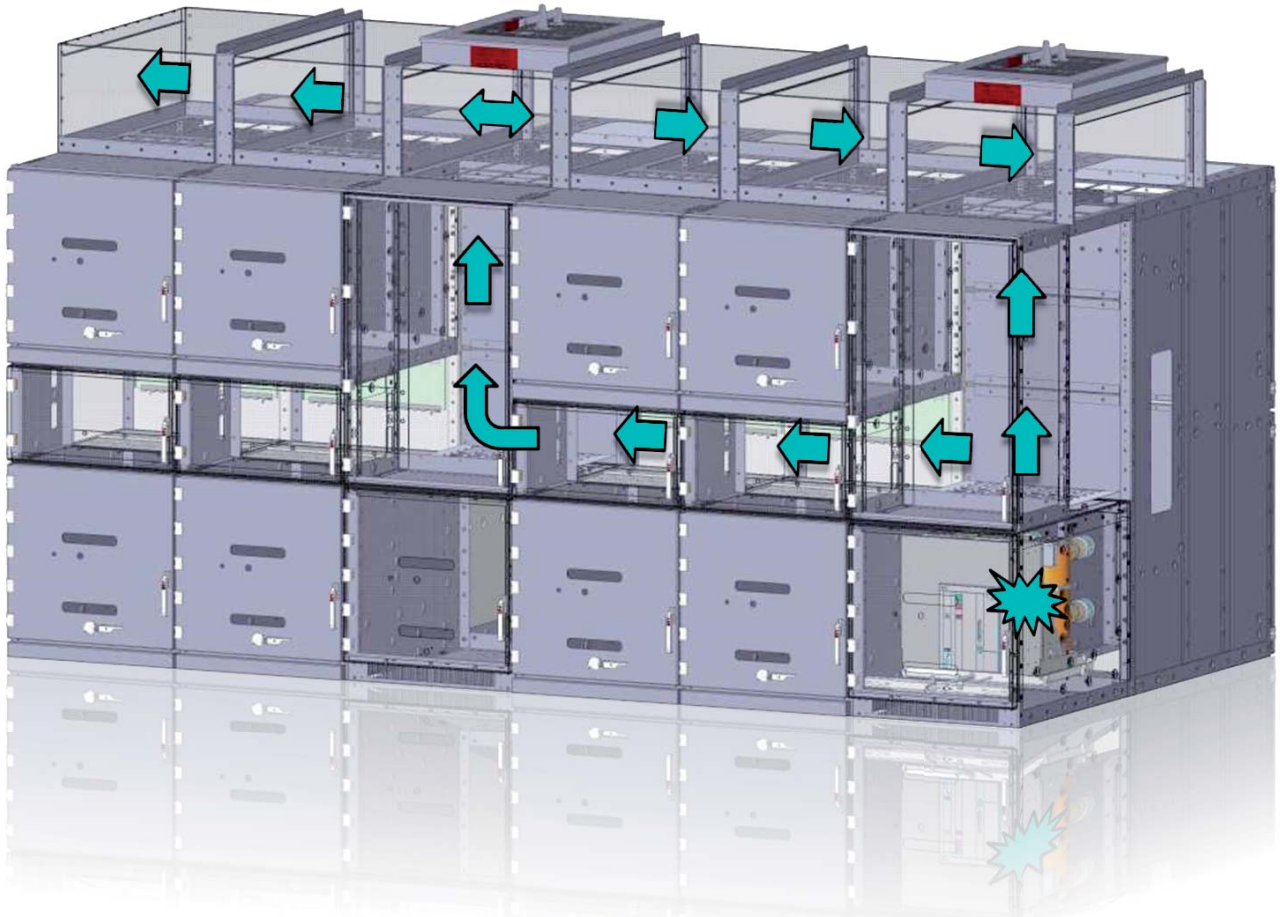
*In two-high circuit breaker configurations, the cable compartment can only be rated Type 2 because the lower cable module vents through the upper cable module.

Plenum details

A system of chambers inside the switchgear lineup serves as an exhaust system venting gases away from personnel and the affected cubicle in the case of an arc fault. Vents and flaps are located inside the chamber system which leads to a top-mounted plenum on the enclosure to direct and exhaust the pressure and gases in an area away from personnel. The plenum sections feature external flanges for ease of bolting sections together at assembly and installation. ABB developed this venting system combining the internal chamber with the plenum and holds patents on the construction details of this truly innovative concept.

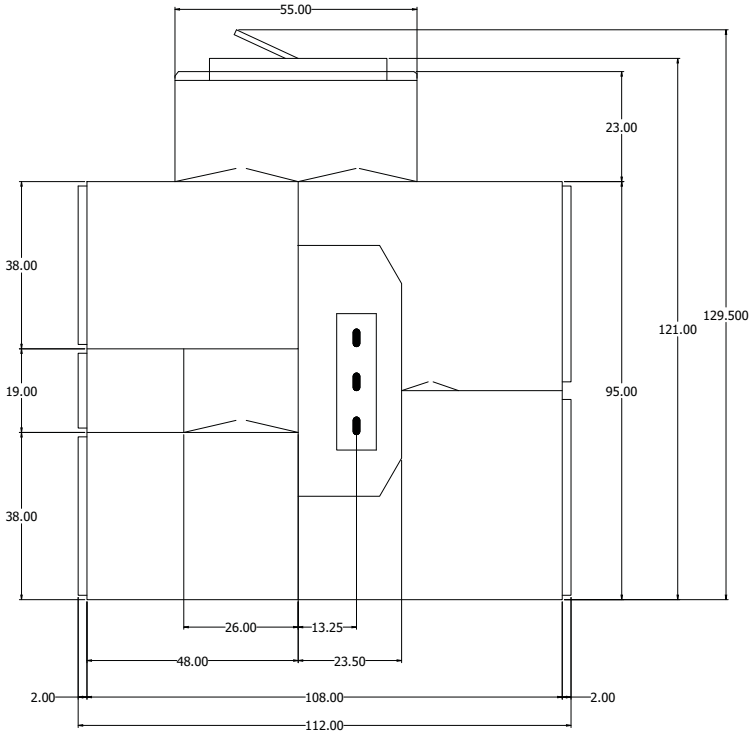
Arc resistance and closed-door racking significantly reduces operator risk during the handling and operation of the equipment. Installation, maintenance and operations personnel recognize the sturdiness and benefit of the design. Insurance companies recognize the reduced operational risk with lower contract rates. Owners realize the gain from reduced loss of revenue due to improved reliability of the power system.





SafeGear HD sideview

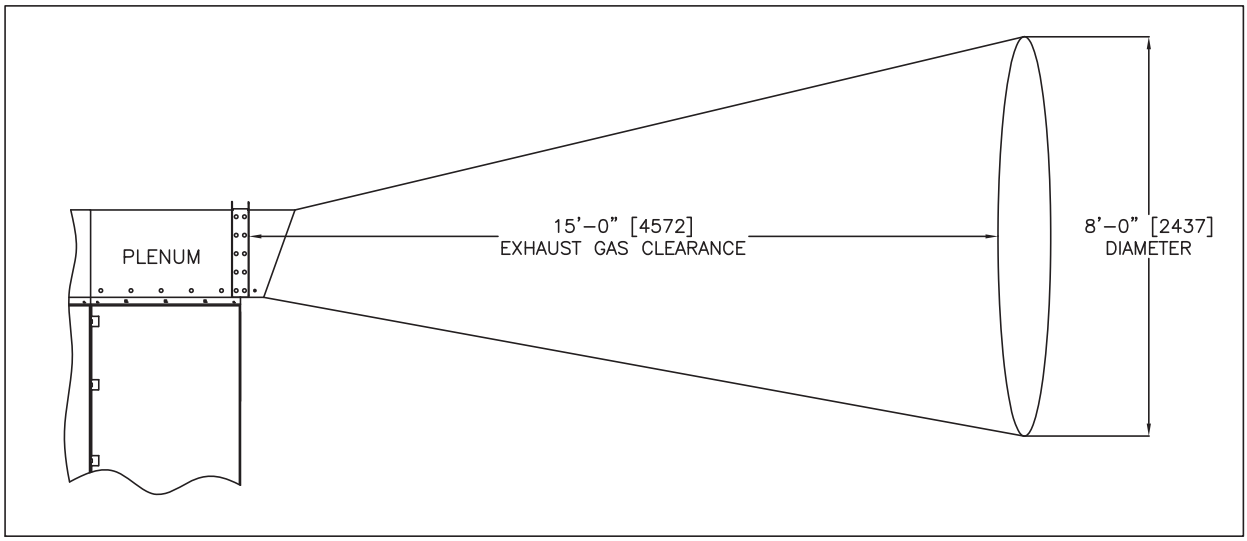
The drawing below is a SafeGear HD side view with pertinent external dimensions. A minimum clearance of 5 inches above the plenum ventillation reset handle is required in all installations.



Plenum exhaust clearance requirements

For proper and safe plenum exhausting, it is recommended that an eight foot cylinder, projecting out 15 feet, be maintained to be clear of all objects and especially personnel at the point where the plenum exits the building. Refer to the illustration below.

Installation expertise is required to properly install and commission arc resistant metal-clad switchgear. Consult with the factory for assistance.



Indoor circuit breakers

SafeGear HD arc resistant switchgear is available with the following circuit breakers:

– 63 kA with 63 kA Classic ADVAC circuit breakers installed.
– 50 kA with 50 kA Model 4 ADVAC or 50 kA Model 4 AMVAC circuit breakers installed. This configuration can be coordinated with the ABB Is-Limiter to increase the interrupting rating beyond 63 kA where needed.

Ratings structure

ADVAC and AMVAC circuit breakers have been fully tested to ANSI/IEEE C37.04-1999, C37.06-2009 and C37.09-1999. Using “k” factor equals 1 as the test criteria the AMVAC is the first ANSI medium voltage circuit breaker to successfully complete standard and definite purpose capacitor switching tests as described in the revised standards.

The following table identifies standard SafeGear HD arc resistant metal-clad switchgear / circuit breaker types and ratings, and provides the most commonly required ratings and related capabilities.

The 50 kA rating, using the Model 4, 50 kA ADVAC or Model 4, 50 kA AMVAC circuit breaker, enables coordination with the ABB Is-Limiter in applications where the available short circuit current exceeds 63 kA. Consult the ABB factory for details on the Is Limiter application in the HD switchgear.

SafeGear HD switchgear and related ADVAC* and AMVAC* circuit breaker ratings

Breaker type	Nominal voltage class kV	Rated maximum voltage kV	Low frequency withstand voltage kV rms	Impulse level (BIL) kV crest	Rated short circuit current kA rms	Short time current kA rms 2 sec.	Close and latch kA peak	Rated voltage range factor K
Model 4 ADVAC	13.8	15	36	95	50	50	130	1.0
Model 4 AMVAC	13.8	15	36	95	50	50	130	1.0
Classic ADVAC	13.8	15	36	95	63	63	164	1.0

*ADVAC circuit breakers are available in continuous current ratings of 1200, 2000 and 3000 A rms.

ADVAC circuit breaker

The ADVAC series of vacuum circuit breakers is a complete line of ANSI/IEEE-rated circuit breakers offering power distribution system customers the advantages of vacuum circuit breaker technology — technology that reduces ownership costs through improved reliability and maintainability. Vacuum interrupters are embedded in a proprietary epoxy material, achieving excellent dielectric and thermal capabilities. Eliminating mechanism operated cell switches, the ADVAC breaker packages all auxiliary control contacts on the circuit breaker.

Ratings

Model 4 ADVAC and AMVAC circuit breakers are available in the full range of ANSI and IEEE ratings through 15 kV, with interrupting ratings to 50 kA and continuous currents through 3000 A. Classic ADVAC has a 63 kA interrupting rating at 15 kV. A complete table of breaker types and ratings is provided in this section.

Operating mechanism

ADVAC uses a simple, front-accessible stored-energy operating mechanism designed specifically for use with vacuum technology. This provides the benefits of dependable vacuum interrupters, with advanced contact design and proven reliability- without the complexity of mechanisms and linkages found in previous generation circuit breakers.

This simple concept uses only a small fraction of the moving parts found in conventional breakers, resulting in maximum reliability over a longer life — with added savings from easy, infrequent maintenance.

Control system

Control features of the ADVAC breaker emphasize convenience, maintainability and flexibility. Charge, close and trip functions can be accomplished both electrically and manually. All manual functions can be performed with great ease at the front of the breaker.

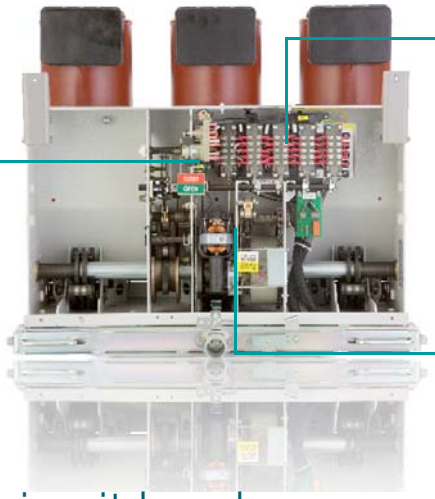
Control flexibility is the result of a wide range of standard and optional features, including independently selectable voltages for electric charge, close and trip functions.

Several options are available to offer a high degree of flexibility in control system design. Options include dual isolated shunt trip coils and a direct- acting under-voltage release. A total of 16 auxiliary contacts (nine “a”, seven “b”) are provided as a standard feature and are wired through the automatic dual secondary disconnects. Since all auxiliary contacts are on-board, they are automatic, operating with the breaker in either the “Test” or “Connected” position.

The ADVAC control system reduces ownership costs through greatly simplified inspection and maintenance procedures. The entire operating mechanism and its control components are front accessible. Modular construction and the use of common components result in fewer spare parts. The entire control package is removable for easy maintenance and functional changes.

Front view of ADVAC circuit breaker

ADVAC circuit breaker with front panel removed



Rear view of ADVAC circuit breaker

Capacitance switching ratings

ADVAC and AMVAC circuit breakers are suitable for "General Purpose" applications as defined by applicable ANSI/IEEE standards. Contact ABB for availability of non-standard ratings.

Capacitance switching ratings are as specified in the tables below and are subject to the following conditions:

1. The transient voltage from line-to-ground shall not exceed three times the maximum design line-to-ground crest voltage as measured at the circuit breaker terminals.

2. The number of re-strikes or re-ignitions shall not be limited as long as the transient voltage-to-ground does not exceed the value given in number 1 above.

3. The capacitance rating applies only to "Single Bank Switching". Interrupting time is in accordance with the rated interrupting time of the circuit breaker.

ADVAC

Rated maximum voltage kV rms	Rated short circuit current kA rms	Continuous current rating		
		1200 A C1	2000 A C1	3000 A C1
15	50	630 A	630 A	630 A
15	63	1770 A	1770 A	1770 A

AMVAC

Rated maximum voltage kV rms	Rated short circuit current kA rms	Continuous current rating		
		1200 A C1	2000 A C1	3000 A C1
15	50	630 A	630 A	630 A

Mechanical endurance

ADVAC circuit breakers are subjected to extensive testing for durability in accordance with ANSI/ IEEE standards. This information is provided as a guide for maintenance planning under normal operating conditions. Actual experience may vary based on operational conditions and maintenance practices. The AMVAC table is provided below for comparison purposes.

ADVAC

Continuous current	1200 & 2000 A	1200 & 2000 A	3000 A
Interrupting current	**50 kA**	**63 kA**	**ALL**
No-load mechanical operations	10,000	5,000	5,000
Between servicing operations	2,000	1,000	1,000
Full load current operations	1,000	500	500
Rated KSI	800%	800%	800%

AMVAC

Interrupting current	1200 & 2000 A	50 kA
Continuous current	**Less than 50 kA**	**3000 A**
No-load mechanical operations	10,000	10,000
Between servicing operations	2,000	2,000
Full load current operations	500	500
Rated KSI	800%	800%

Altitude rating correction factors

This table must be used in accordance with ANSI C37.04 to correct published circuit breaker ratings for operation at altitudes over 3,300 feet above sea level.

AMVAC

	Rating correction factor	
Altitude Feet (m)	**Continuous current**	**Voltage & dielectric withstand**
3,300 (1,000) and below	1.00	1.00
5,000 (1,500)	0.99	0.95
10,000 (3,000)	0.95	0.80

Auxiliary and Truck Operated Contact (TOC) switches

Circuit breaker auxiliary switches operate whenever the breaker opens or closes. Contacts are compression type, mounted on the breaker and wired to switchgear terminal blocks through the secondary disconnect system. Contacts are operated through simple mechanical links from an auxiliary drive shaft which rotates in conjunction with the main drive shaft. Switch contacts are silver-plated.

The standard contact configuration is four “a” contacts (normally open when the breaker is open), and four “b” contacts (normally closed when the breaker is open). An optional dual secondary disconnect enables the addition of five “a” contacts and four “b” contacts, for a total of nine “a” and eight “b” contacts. The contacts are not field reversible.

Auxiliary contact current ratings	Continuous (A)	Switching (A)
@ 250 VDC	10	2.0
@ 125 VDC	10	4.0
@ 48 VDC	10	6.0
@ 24 VDC	10	7.7
@ 240 VDC	10	10.0
@ 120 VDC	10	10.0

TOC switch current ratings	Continuous (A)	Switching (A)
@ 250 VDC	20	5.0
@ 125 VDC	20	10.0
@ 48 VDC	20	12.0
@ 24 VDC	20	15.0
@ 240 VDC	20	10.0
@ 120 VDC	20	15.0

Optional TOC switches are actuated by movement of the circuit breaker to indicate when the breaker is in the “Connected” position. TOC switch contacts are mounted in an isolated low voltage area at the top of the breaker compartment. TOC switches are available with four, eight or twelve contacts, with an even number of “a” contacts (normally open when breaker is not connected) and “b” contacts (normally closed with breaker is not connected). Contacts are not field-reversible.

Close and trip coils

ADVAC circuit breaker close and trip coils are reliable solenoids with a rotary movement that actuates appropriate operating mechanism linkages.

ADVAC Classic

Nominal coil voltage (V)	Trip coil		Close coil		Impedance +/- 5% (Ohms)
	Rated voltage range (V)	Nominal current (A)	Rated voltage range (V)	Nominal current (A)	
24 VDC	17-26	9	17-26	9	24
48 VDC	28-56	4.8	38-56	4.8	47
125 VDC	70-140	3.0	100-140	3.0	198
250 VDC	140-280	1.5	200-280	1.5	8
120 VDC	104-127	3.0	104-127	3.0	198
240 VDC	208-254	1.5	208-254	1.5	8

Note that the minimum value for the 24 VDC trip coil is higher (more restrictive) than the normal range defined by ANSI/IEEE standards.

Unless near the battery source, or unless a special effort is made to ensure adequacy of conductors, 24 and 48 VDC control functions are not recommended.

AC trip voltages are not recommended under any conditions, due to the reliability of AC power sources. If the only available control power source is AC, the recommended procedure is to use a capacitor trip device for each trip circuit.

Second trip coil

ADVAC circuit breakers are available with a second trip coil option. This option uses the standard coil, except that a different control voltage may be selected. A dual secondary disconnect must be used whenever a second shunt trip is specified. This provides complete redundancy of the trip circuit from the trip coil, through the secondary disconnect system, to the switchgear terminal blocks.

ADVAC and AMVAC circuit breakers are also available with an optional undervoltage trip feature. This is a direct acting trip coil that actuates the trip linkage when the control voltage drops below 35 to 70% of the nominal range. This prevents a condition from happening in which control voltage is no longer available to trip a breaker. This feature is not available for 24 VDC trip circuits.

ADVAC Classic

Charge motor	Nominal voltage range (V)	Nominal current (A)	Inrush current	Stalled current (A)	No load current (A)	Charging time (nominal)
48 VDC	38-56	8	6-8 x nominal current	25.0	3.5	15 seconds
125 VDC	100-140	4		12.5	1.5	
250 VDC	200-280	2		6.5	0.8	
120 VAC	104-127	4		12.5	1.5	
240 VAC	208-254	2		6.5	0.8	

ADVAC charging motor

ADVAC circuit breakers use a reliable and durable motor for electrically charging the toroidal spring in the stored energy operating mechanism. The two-pole universal motor is suitable for AC or DC voltages at each nominal rating. The motor is rated at 0.35 horsepower and uses a 100:1 internal gear reduction.

Electric charging requires eight to nine seconds at nominal control voltage. The 48 VDC motor voltage is not recommended unless located near a battery or a special effort is made to assure the adequacy of the conductors. Manual charging is also quick and convenient, requiring approximately 25 easy strokes of a manual charging handle inserted at the front panel of the circuit breaker. The manual procedure takes about 25 second to complete.

Timing characteristics

The ADVAC circuit breaker uses the same stored energy mechanism for all ratings, resulting in consistent operation and timing characteristics in all ratings and configurations.

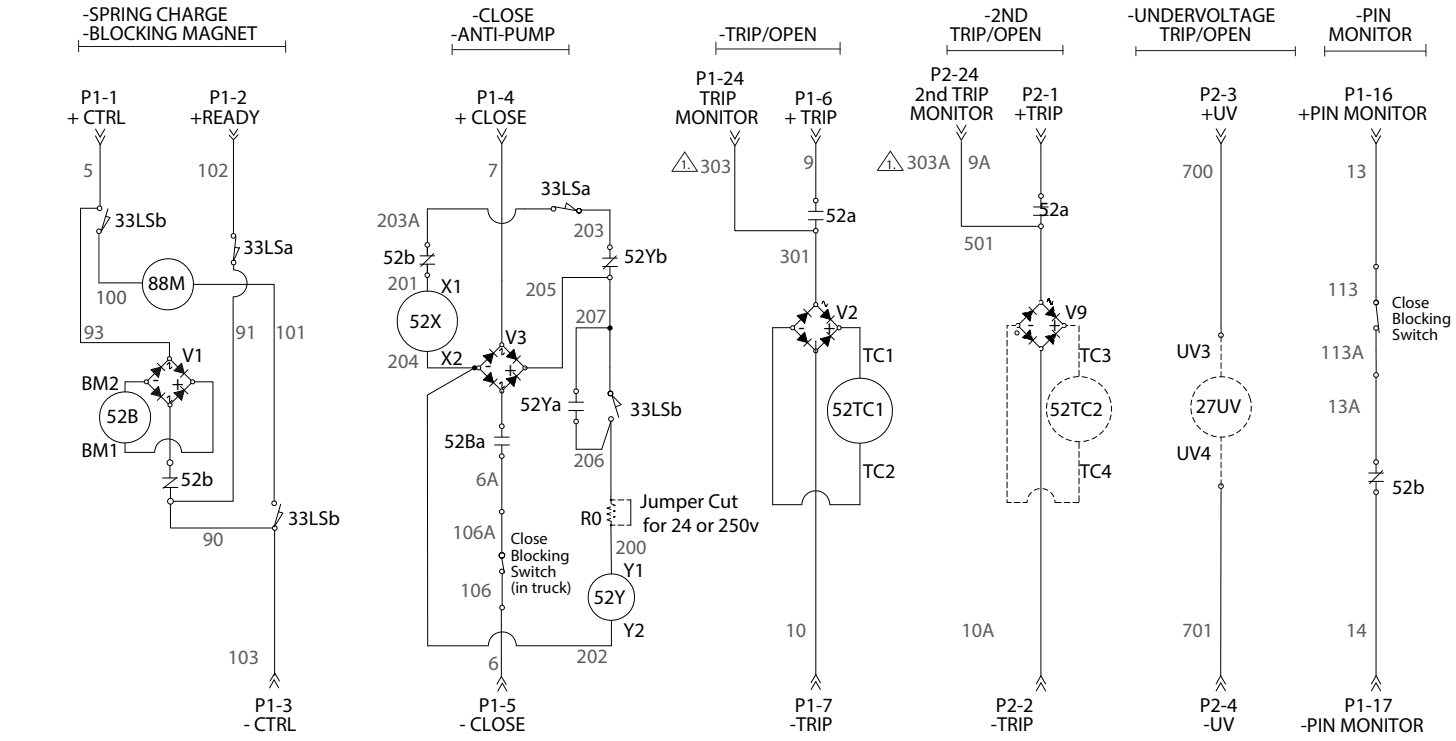
Vacuum interrupters

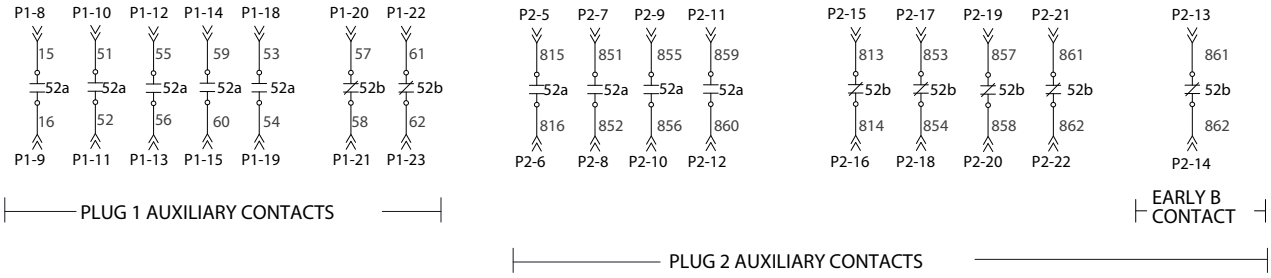
ADVAC and AMVAC circuit breakers use superior quality vacuum interrupters with proven reliability over a long life. All interrupters use advanced copper-chrome contact material for superior performance and minimum current chop. 4,000A forced air cooled is also available.

	ADVAC	AMVAC
Nominal closing time	60 ms	45-60 ms
Nominal opening time	35-40 ms	35-45 ms
Arcing time	< 15 ms	< 15 ms
Nominal interrupting time	< 55 ms	< 55 ms
Motor charging time	8-9 seconds*	N/A
Manual charging time	~25 seconds**	N/A

ADVAC Classic schematic diagram

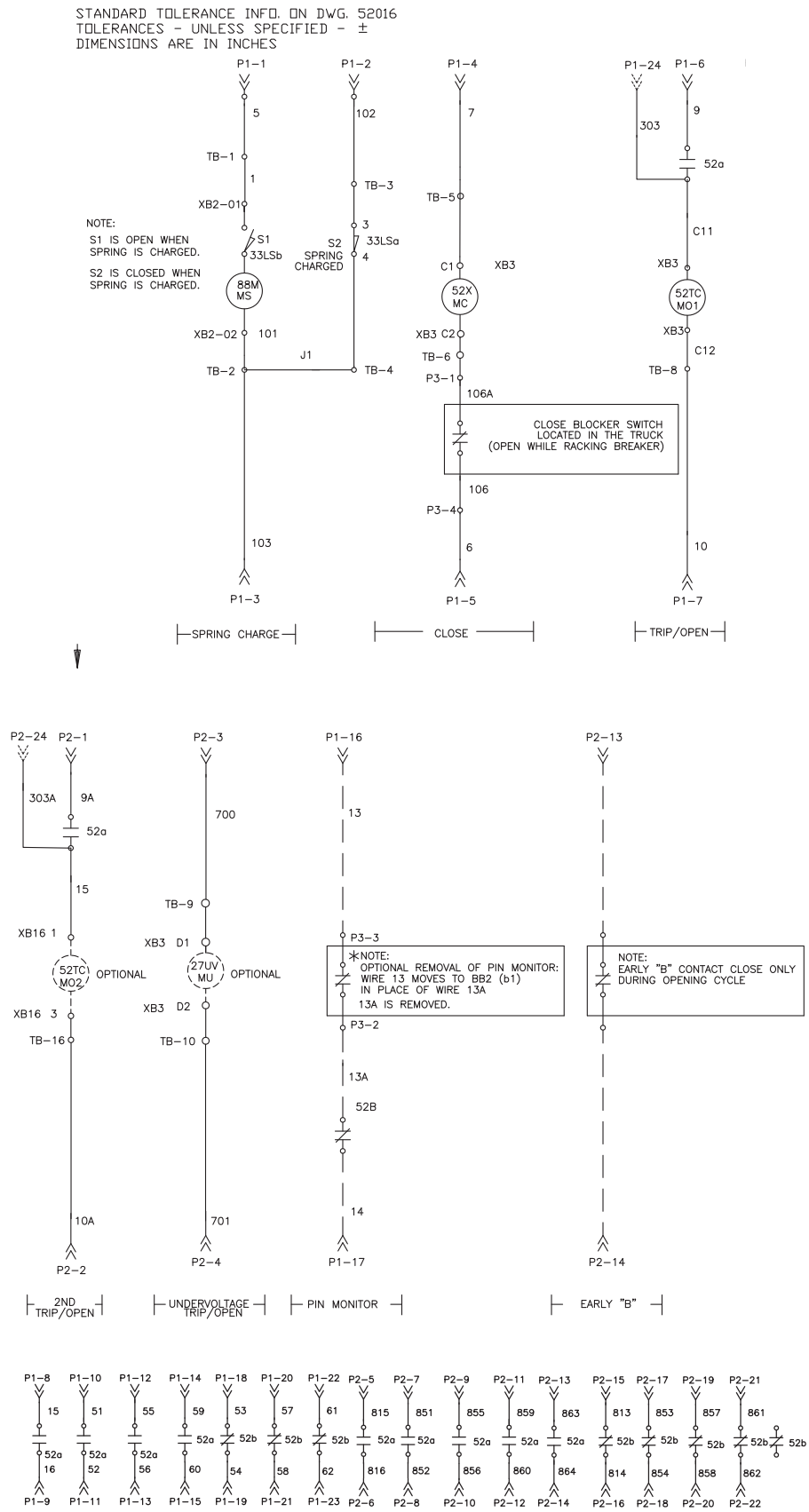
ADVAC circuit breakers with Classic mechanisms are available with a second shunt trip device and an under-voltage trip device. Dual secondary disconnects are provided as a standard feature.





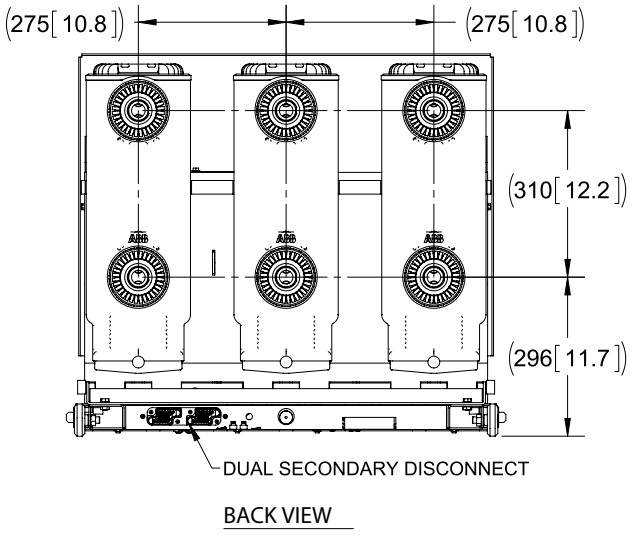
ADVAC model 4 schematic diagram

ADVAC model 4 circuit breakers with twin EL mechanisms are available with a second shunt trip device and an under-voltage trip device. Dual secondary disconnects are provided as a standard feature.

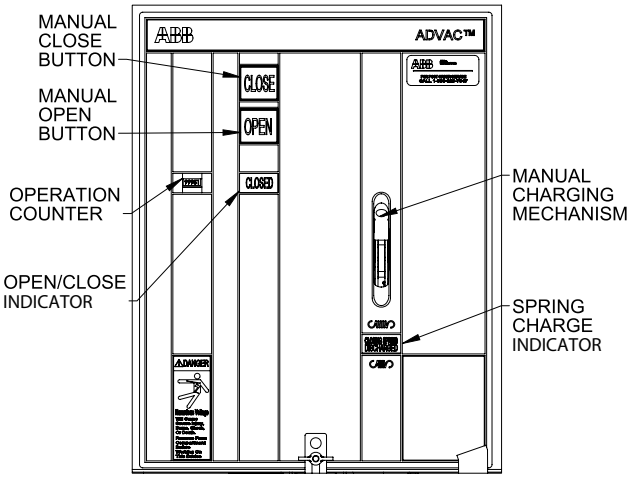


Outline and dimensions

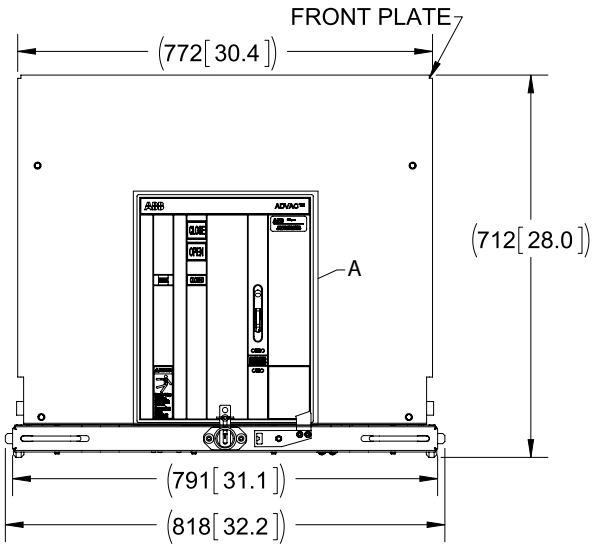
ADVAC circuit breaker dimensions are similar for all 36-inch wide compartments and ratings. The control components, racking system and accessories are the same for all ratings. The operating mechanisms have the same form, fit, and function. Breakers with higher interrupting and continuous current ratings use various primary lead assemblies and interrupter housings with different appearances, but cell interface dimensions are identical.



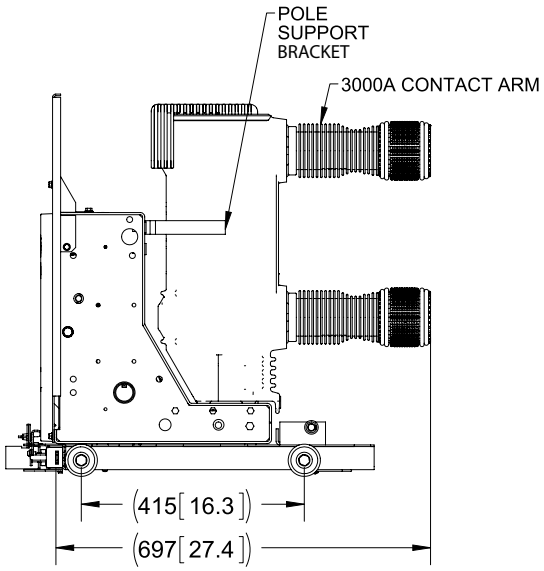
BACK VIEW



DETAIL A
SCALE 1 : 5

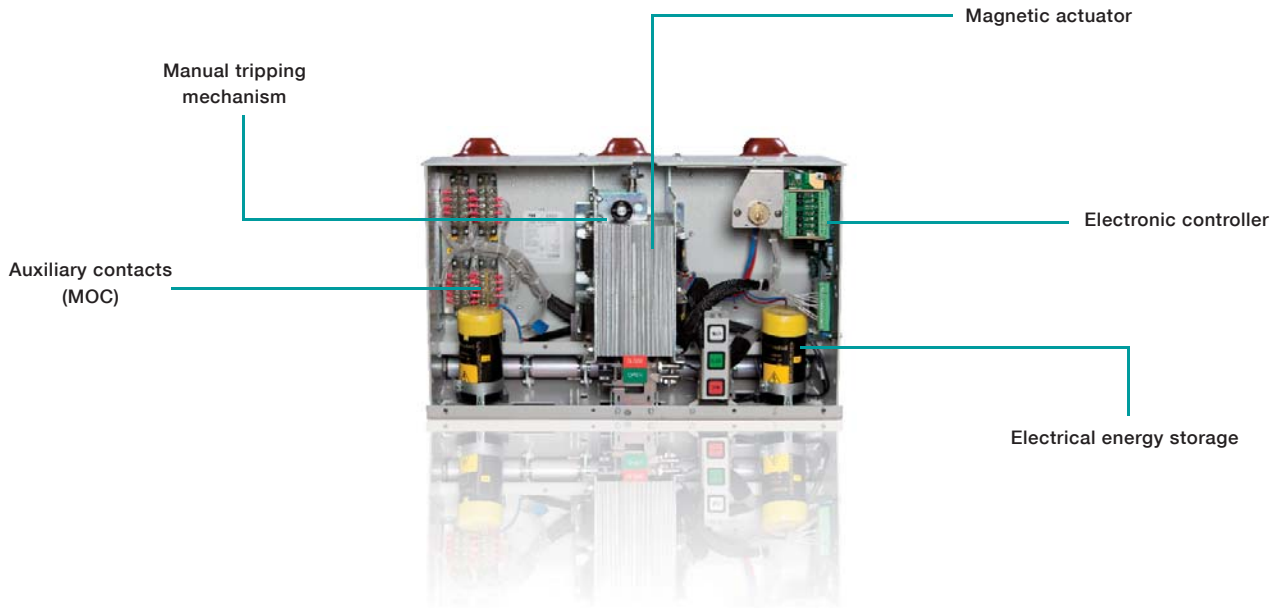


FRONT VIEW



SIDE VIEW

AMVAC circuit breaker



With the AMVAC, ABB is the first to combine the unique requirements of vacuum interrupter technology with a stored energy mechanism. Using a flux-shifting device with integral permanent magnets, the AMVAC mechanism has just one moving part. Having only open and close coils, an electronic controller, and capacitors for energy storage, the AMVAC circuit breaker mechanism is capable of 100,000 operations. Vacuum interrupters are pole-embedded in a proprietary epoxy material, achieving excellent dielectric and thermal capabilities. Eliminating mechanism operated cell switches, the AMVAC breaker packages all auxiliary control contacts on the circuit breaker.

Ratings

AMVAC is available in the full range of ANSI and IEEE ratings through 27 kV. It has interrupting ratings up to 50 kA and continuous currents through 3000 A. AMVAC circuit breakers have been fully tested to ANSI/IEEE C37.04-1999, C37.06-2009 and C37.09-1999, using “k” factor equals 1 as the test criteria.

Universal applications

- Medium voltage motor starting applications
- Capacitor switching
- Retrofit applications to replace existing circuit breakers in repetitive duty applications
- Mining applications where high reliability and resistance to dust and humidity are critical

AMVAC specifications

- Interchangeable mechanically with ADVAC
- Completely concealed moving parts
- UL labeling and CSA compliant
- Low power consumption
- ANSI/IEE compliance at 5, 8 and 15 kV

Summary of benefits

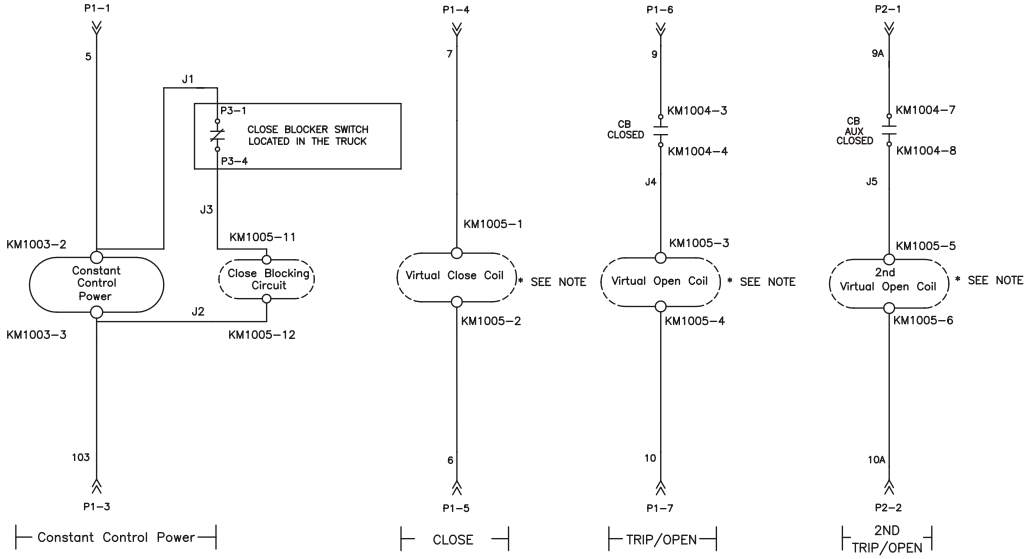
- Simple mechanical operation
- Fewer than 6 moving parts
- Manual opening capability
- High reliability

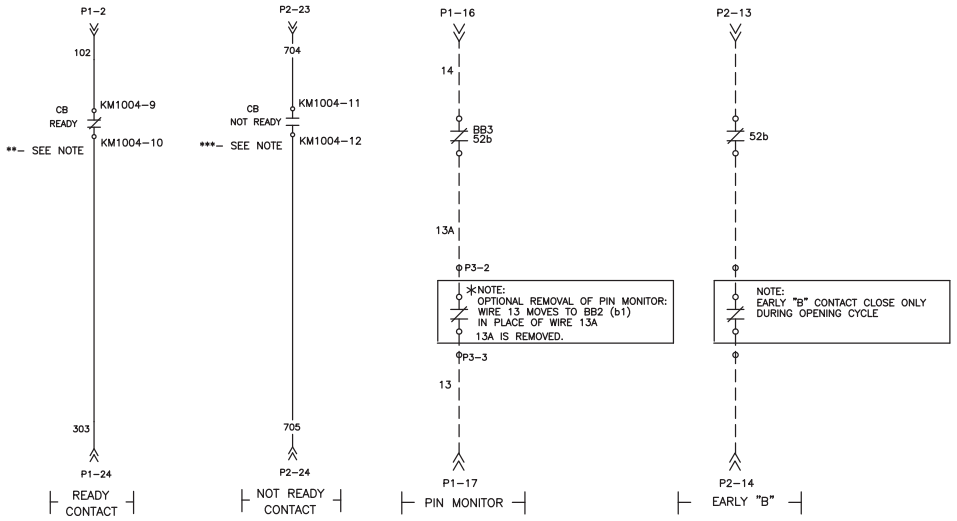
AMVAC

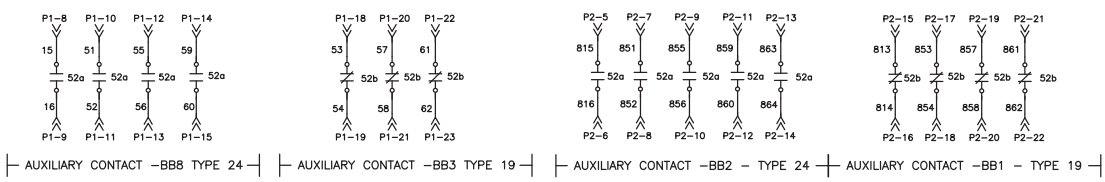
	Control power voltage rating	Tripping voltage range	Closing voltage range	Capacitor charging	Continuous power
Low voltage board	20 - 53 VAC	20 - 264 VAC	20 - 264 VAC	100 watts	10 watts
	17 - 75 VDC	20 - 264 VDC	20 - 264 VDC	100 watts	10 watts
High voltage board	85 - 264 VAC	20 - 264 VAC	20 - 264 VAC	100 watts	10 watts
	77 - 280 VDC	20 - 264 VDC	20 - 264 VDC	100 watts	10 watts

AMVAC schematic diagram

AMVAC circuit breakers are supplied with dual secondary disconnects, which includes 9 normally open “a” contacts and 8 normally closed “b” contacts.







Auxiliary device ratings

Current transformer ratings

Current transformers (CTs) are the low voltage ring core type, for front-accessible mounting on the primary contact support bushings. Standard accuracy CTs (SABs) are 3.5 inches deep, and up to four of these CTs can be installed for each phase (two on each bushing).

High accuracy CTs (SAB-Ds) are 7.0 inches deep, and up to two of these can be installed for each phase (one on each bushing). The CTs are mounted around the primary bushings on threaded rods that are securely fastened to the base of the bushings. Note that 3000 A bushings have a larger overall diameter than 1200 or 2000 A bushings, and therefore require CTs with a larger window diameter. Refer to the following tables for the accuracy ratings and dimensions for each available CT ratio.

Primary ampere rating	IEEE metering accuracy					IEEE Relaying accuracy	Style number
	B-0.1	B-0.2	B-0.5	B-0.9	B-1.8		
SAB-1 (5.25” window)							
50	2.4	4.8	-	-	-	C10	923A329G01
75	1.2	2.4	4.8	-	-	C10	923A329G02
100	1.2	2.4	4.8	-	-	C20	923A329G03
150	0.6	0.6	1.2	2.4	4.8	C20	923A329G04
200	0.3	0.3	0.6	1.2	2.4	C50	923A329G05
250	0.3	0.3	0.6	1.2	1.2	C50	923A329G06
300	0.3	0.3	0.3	1.2	1.2	C50	923A329G07
400	0.3	0.3	0.3	0.3	0.6	C100	923A329G08
500	0.3	0.3	0.3	0.3	0.6	C100	923A329G09
600	0.3	0.3	0.3	0.3	0.3	C100	923A329G10
800	0.3	0.3	0.3	0.3	0.3	C100	923A329G11
1000	0.3	0.3	0.3	0.3	0.3	C100	923A329G12
1200	0.3	0.3	0.3	0.3	0.3	C200	923A329G13
1500	0.3	0.3	0.3	0.3	0.3	C200	923A329G14
2000	0.3	0.3	0.3	0.3	0.3	C200	923A329G15
2500	0.3	0.3	0.3	0.3	0.3	C400	923A329G16
3000	0.3	0.3	0.3	0.3	0.3	C400	923A329G17
4000	0.3	0.3	0.3	0.3	0.3	C400	923A329G18
5000	0.3	0.3	0.3	0.3	0.3	C400	923A329G19
Multi-ratio, IEEE, 5 terminals							
600	0.3	0.3	0.3	0.3	0.6	C100	923A329G20
1200	0.3	0.3	0.3	0.3	0.3	C200	923A329G21
2000	0.3	0.3	0.3	0.3	0.3	C200	923A329G22
3000	0.3	0.3	0.3	0.3	0.3	C400	923A329G23
4000	0.3	0.3	0.3	0.3	0.3	C400	923A329G24
5000	0.3	0.3	0.3	0.3	0.3	C400	923A329G25

Primary ampere rating	IEEE metering accuracy					IEEE Relaying accuracy	Style number
	B-0.1	B-0.2	B-0.5	B-0.9	B-1.8		
SAB-1D (5.25” window)							
50	2.4	4.8	-	-	-	C20	923A331G01
75	1.2	2.4	4.8	-	-	C20	923A331G02
100	0.6	1.2	2.4	-	-	C50	923A331G03
150	0.3	0.6	1.2	4.8	4.8	C50	923A331G04
200	0.3	0.6	1.2	1.2	2.4	C100	923A331G05
250	0.3	0.3	0.6	1.2	2.4	C100	923A331G06
300	0.3	0.3	0.3	0.6	1.2	C100	923A331G07
400	0.3	0.3	0.3	0.6	1.2	C200	923A331G08
500	0.3	0.3	0.3	0.3	0.6	C200	923A331G09
600	0.3	0.3	0.3	0.3	0.3	C200	923A331G10
800	0.3	0.3	0.3	0.3	0.3	C200	923A331G11
1000	0.3	0.3	0.3	0.3	0.3	C200	923A331G12
1200	0.3	0.3	0.3	0.3	0.3	C400	923A331G13
1500	0.3	0.3	0.3	0.3	0.3	C400	923A331G14
2000	0.3	0.3	0.3	0.3	0.3	C400	923A331G15
2500	0.3	0.3	0.3	0.3	0.3	C800	923A331G16
3000	0.3	0.3	0.3	0.3	0.3	C800	923A331G17
4000	0.3	0.3	0.3	0.3	0.3	C800	923A331G18
5000	0.3	0.3	0.3	0.3	0.3	C800	923A331G25
Multi-Ratio, IEEE, 5 Terminals							
600	0.3	0.3	0.3	0.3	0.3	C200	923A331G19
1200	0.3	0.3	0.3	0.3	0.3	C400	923A331G20
2000	0.3	0.3	0.3	0.3	0.3	C800	923A331G21
3000	0.3	0.3	0.3	0.3	0.3	C800	923A331G22
4000	0.3	0.3	0.3	0.3	0.3	C800	923A331G23
5000	0.3	0.3	0.3	0.3	0.3	C800	923A331G24

Primary ampere rating	IEEE metering accuracy					IEEE Relaying accuracy	Style number
	B-0.1	B-0.2	B-0.5	B-0.9	B-1.8		
SAB-2 (6.5” window)							
1500	0.3	0.3	0.3	0.3	0.6	C200	923A330G01
2000	0.3	0.3	0.3	0.3	0.3	C200	923A330G02
2500	0.3	0.3	0.3	0.3	0.3	C200	923A330G03
3000	0.3	0.3	0.3	0.3	0.3	C200	923A330G04
4000	0.3	0.3	0.3	0.3	0.3	C200	923A330G05
5000	0.3	0.3	0.3	0.3	0.3	C200	923A330G06
Multi-ratio, IEEE, 5 terminals							
2000	0.3	0.3	0.3	0.3	0.3	C200	923A330G07
3000	0.3	0.3	0.3	0.3	0.3	C200	923A330G08
4000	0.3	0.3	0.3	0.3	0.3	C200	923A330G09
5000	0.3	0.3	0.3	0.3	0.3	C200	923A330G10

Primary ampere rating	IEEE metering accuracy					IEEE Relaying accuracy	Style number
	B-0.1	B-0.2	B-0.5	B-0.9	B-1.8		
SAB-2D (6.5” window)							
1500	0.3	0.3	0.3	0.3	0.6	C400	923A332G01
2000	0.3	0.3	0.3	0.3	0.3	C400	923A332G02
2500	0.3	0.3	0.3	0.3	0.3	C400	923A332G03
3000	0.3	0.3	0.3	0.3	0.3	C400	923A332G04
4000	0.3	0.3	0.3	0.3	0.3	C400	923A332G05
5000	0.3	0.3	0.3	0.3	0.3	C400	923A332G06
Multi-ratio, IEEE, 5 terminals							
2000	0.3	0.3	0.3	0.3	0.3	C400	923A332G07
3000	0.3	0.3	0.3	0.3	0.3	C400	923A332G08
4000	0.3	0.3	0.3	0.3	0.3	C400	923A332G09
5000	0.3	0.3	0.3	0.3	0.3	C400	923A332G10

Standard voltage transformer (PT) ratings

PTs are indoor type, designed for metering and relaying applications. The primary and secondary coils of the transformer are wound using special winding and shielding techniques for improved voltage stress distribution. The entire assembly is cast in polyurethane under vacuum for added insulation and protection.

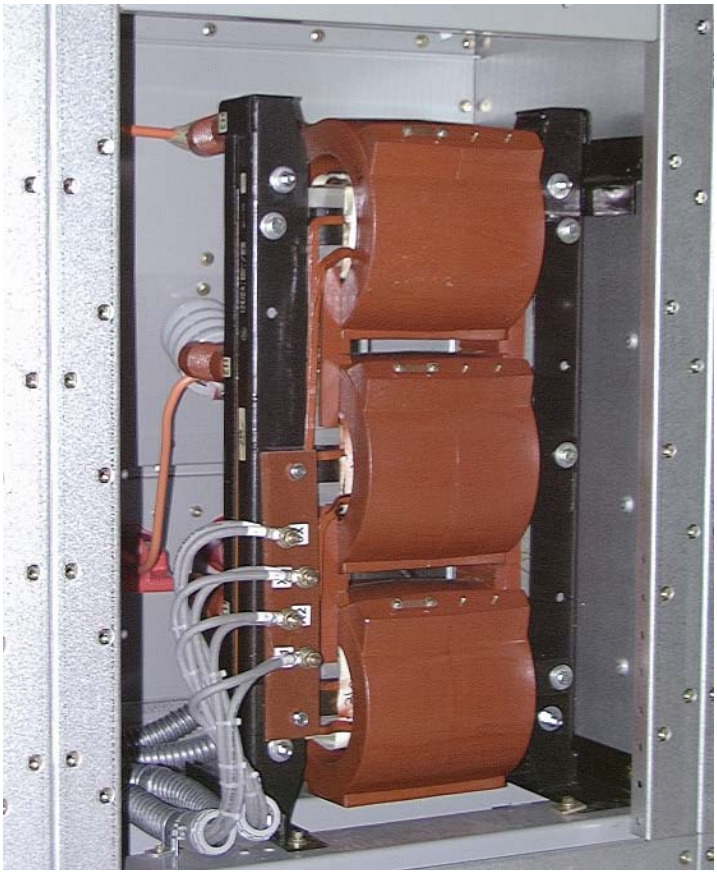
Voltage transformers are supplied with primary fusing to take the transformer off-line in the event of an internal failure and to protect the transformer from partial primary and secondary short-circuit.

Three phase, 60 Hz, 208/120 V secondary, epoxy - cast

Primary voltages	BIL	Ratios	Metering accuracy
2400, 4200, 4800	60	20:1, 35:1, 40:1	0.3 W, X, M, Y, Z and 0.6ZZ burdens at 120 V
7200, 8400, 12000, 14400	110	60:1, 70:1, 100:1, 120:1	0.3 W, X, M, Y and 1.2Z at 69.3 V
12000, 14400	125	100:1, 120:1, 200:1	

1500 VA thermal at 30°C ambient.
1000 VA thermal at 55°C ambient.

Standard control power transformer (CPT) ratings



CPTs are designed to provide control power in medium voltage switchgear. Units are available in both single and three phase configurations. All CPTs are manufactured to meet the requirements of IEEE C57.12.01. Primary windings are vacuum cast for high dielectric strength and ruggedness. Transformers are constructed with high quality grain-oriented core steel and copper conductor.

Single phase, 60 Hz, 240/120 V secondary, epoxy - cast

Primary voltages	BIL kV	Available kVA
2400, 4160, 4800	60	3, 5, 10, 15, 25, 37.5, 50
7200, 7620, 8320	95	3, 5, 10, 15, 25, 37.5, 50
12000, 12470, 13200, 13800	95	3, 5, 10, 15, 25, 37.5, 50
12000, 14400	125	3, 5, 10, 15, 25, 37.5, 50

Three phase, 60 Hz, 208/120 V secondary, epoxy - cast

Primary voltages	BIL kV	Available kVA
2400, 4160, 4800	60	9, 15, 30, 45
7200, 7620, 8320	95	9, 15, 30, 45
12000, 12470, 13200, 13800	95	9, 15, 30, 45

Bus design details

SafeGear HD arc resistant metal-clad switchgear design certifications are based on 100% copper bus, with full round edges and sizes as shown in the following table. The main horizontal bus is not tapered. Connection joints are silver-plated and at least two properly-torqued half-inch SAE grade 5 steel bolts and split lock washers are used at each joint. The bus is epoxy insulated and removable boots cover the joints.

Continuous current	Rating	Quantity	Size
1200 A	63 kA	1	.75” x 4”
2000 A	63 kA	1	.75” x 4”
3000 A	63 kA	2	.75” x 4”

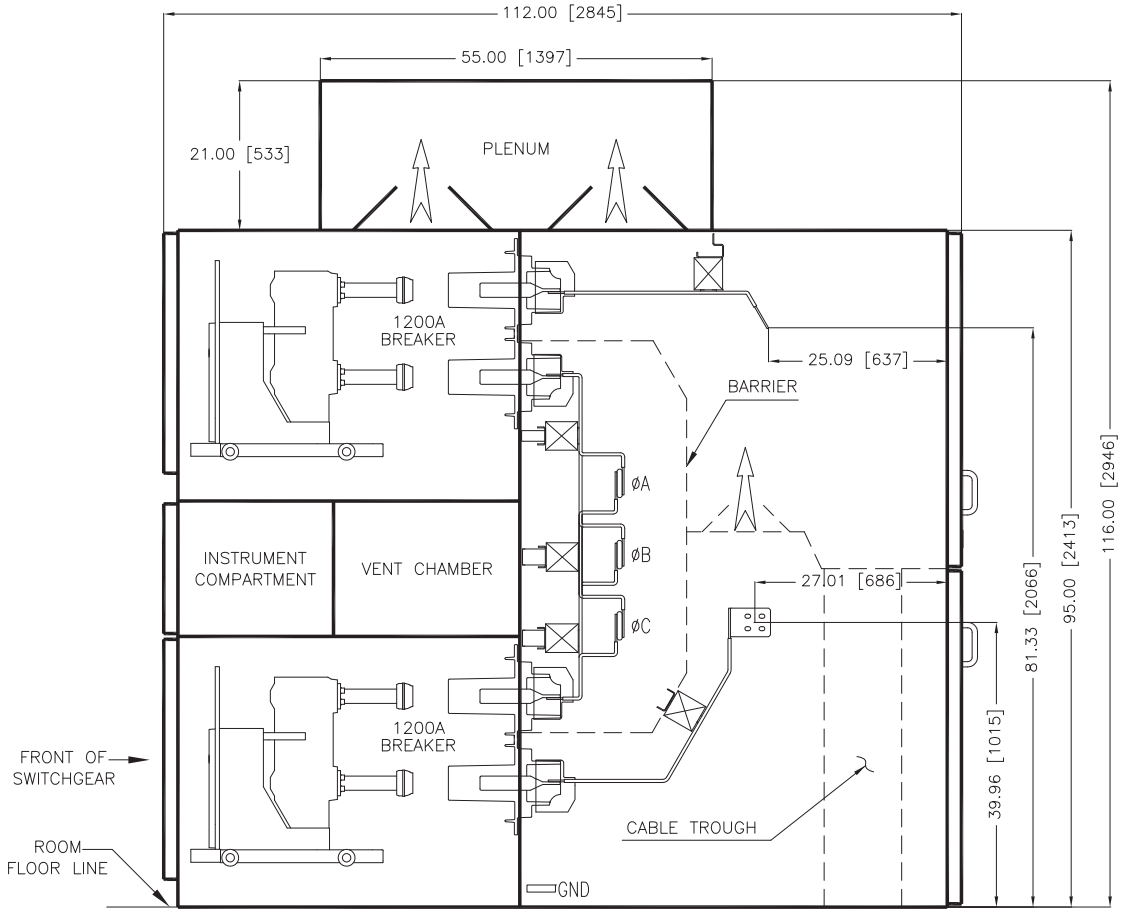
SafeGear HD arc resistant metal-clad switchgear design certifications are based on epoxy primary bus supports. Epoxy is standard for standoff bus insulator supports, primary breaker bushings and interframe main bus supports. Separate drawings are available to indicate the position and dimensions of the epoxy compartment-mounted primary contact supports, epoxy inter-frame horizontal bus supports, and standoff insulators. Physical characteristics of the epoxy material is provided in the following table.

Characteristic	Epoxy specification
Flexural Strength, MPA	120 - 150
Tensile Strength, MPA	70 – 90
Impact Strength, KJ/m2	10 – 15
Thermal Class	F
Dielectric Strength (Short Time), kV/mm	> 23

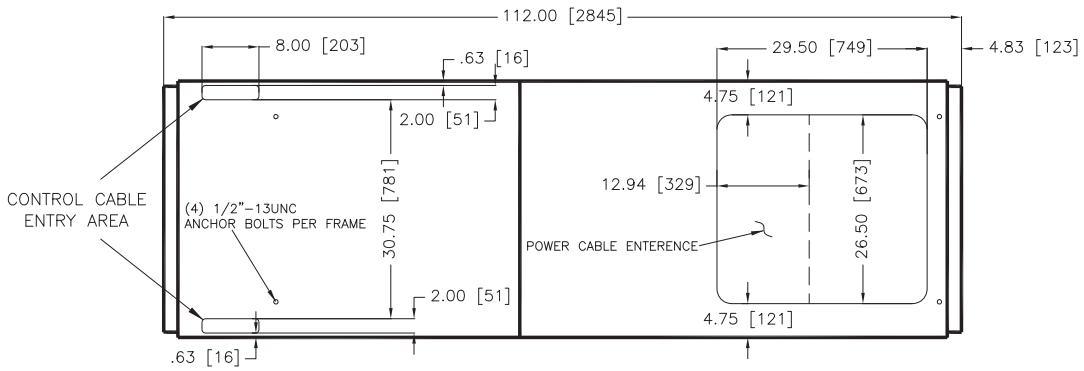
Typical side views and floor plans

SafeGear HD switchgear two-high

Circuit breaker: 1200A/1200A



SIDE SECTION

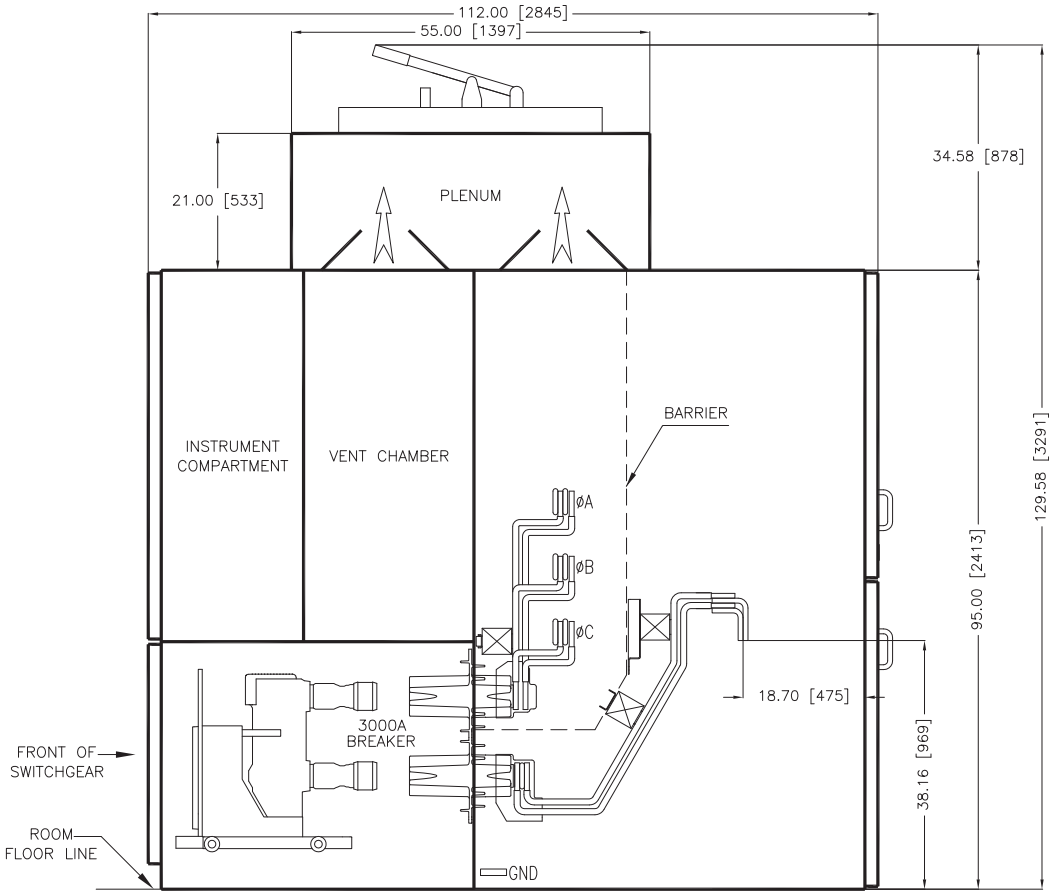


FLOOR PLAN

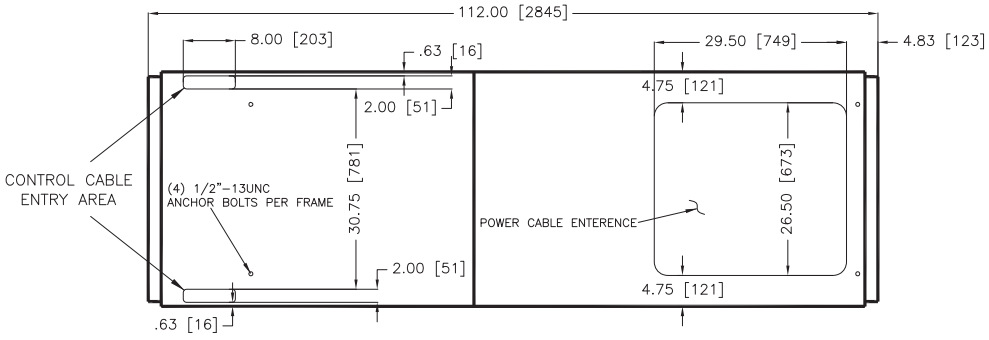
See configuration sheet on page 14 for available arrangements.

SafeGear HD Switchgear one-high

Circuit breaker: 3000A



SIDE SECTION

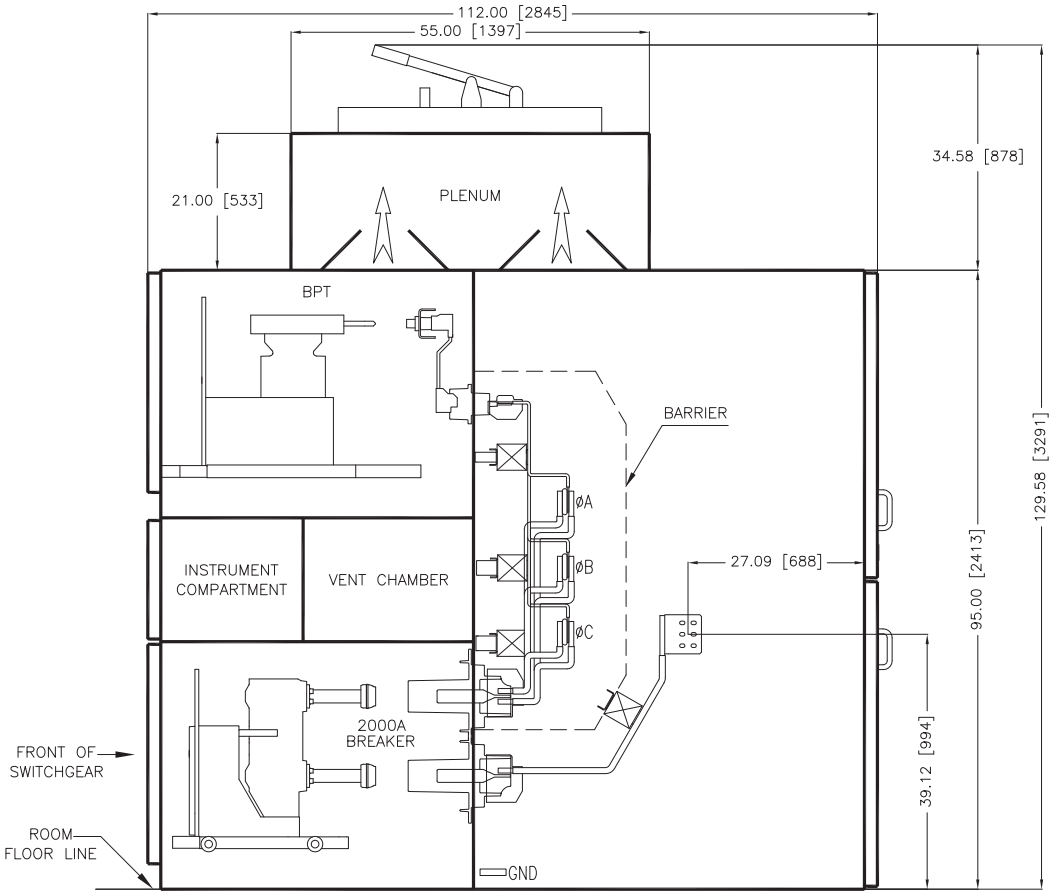


FLOOR PLAN

Typical for all one high breakers. See configuration sheet on page 14 for available arrangements.

SafeGear HD switchgear one-high with PT drawout

Circuit breaker: 2000A



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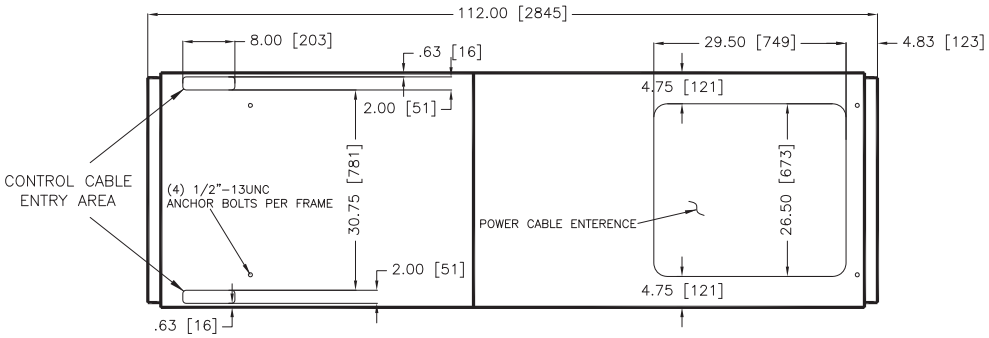


FLOOR PLAN

Typical for all one high breakers. See configuration sheet on page 14 for available arrangements.

Module combinations
Dimensions and weights

Based on its modular design, project engineers may combine and stack modules in many ways. SafeGear HD switchgear is constructed from a family of 36-inch wide modules that are stackable to a total height of 95 inches and a total depth of 112 inches. The SafeGear HD rear cable compartment is expansive and provides more than sufficient space for cable terminations and installation of other devices as required.

Module combinations and dimensions

Frame style	Frame dimensions, inches (mm)			
	Width per frame	Indoor*		Outdoor***
		Height**	Depth	
SafeGear HD	36 (914)	95 (2413)	112 (2845)	In PDC

*A one inch end panel is added to each end of a lineup.
** Add 35 inches of height for plenum and vent reset handle (an additional 5 inches for handle clearance is required)
***For outdoor applications, indoor SafeGear HD is installed in a PDC (Power Distribution Center) Building.

Typical frame weights calculation

To calculate the weight of a frame, identify the current rating for each module. Select the weights from the appropriate column in the adjoining table for SafeGear HD components.

A frame consists of one bus and cable module and the appropriate circuit breaker and auxiliary modules. The weight of the circuit breaker is given separately and must be added.

Low voltage modules may contain significant amount of secondary equipment and wiring. Depending on the extent of secondary protection and control equipment, ABB recommends adding 20% to 50% of the empty weight of the module.

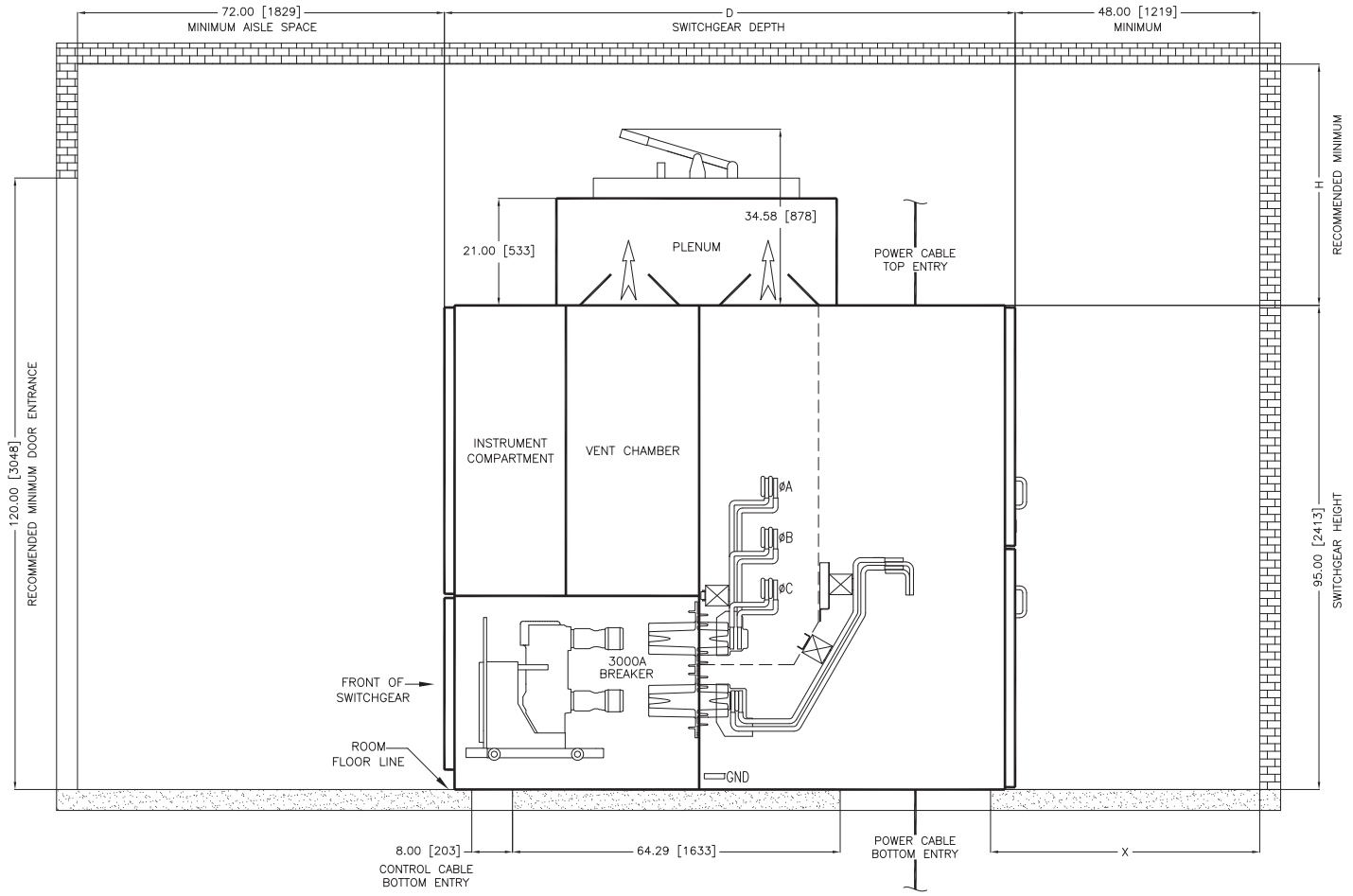
The weight of the end panels has to be considered per lineup of switchgear. Weights given are for two end panels, one on each end of the switchgear lineup.

Typical frame weights are listed below. Detailed drawings for the arrangements are located at the end of this section. Weights include all modules and components as listed above.

Basic frame configuration	Circuit breaker (rating)	Weight	
		lbs	kg
One circuit breaker	1200	4550	2068
	2000	4915	2234
	3000	5550	2523
Two circuit breakers	1200/1200	6380	2900
	1200	5305	2411
One circuit breaker, one VT	2000	5675	2580
One circuit breaker, one CPT	1200	5330	2423
	2000	5700	2591

Basic frame configuration	Circuit breaker (rating)	Weight	
		lbs	kg
63 KA ADVAC Circuit Breaker	1200 A	575	261
	2000 A	575	261
	3000 A	650	295
Circuit Breaker Compartment	1200 A	1215	552
	2000 A	1275	580
	3000 A	1410	641
Low Voltage Compartment w/o Relays, Wiring, etc.	19” High	290	132
	57” High	545	248
Draw-Out PT Compartment	Wye	1015	461
	Delta	890	405
Draw-Out CPT Compartment		1040	473
Draw-Out Fuse Compartment (3 PH)	w/o remote CPT	790	359
Jump Bus	1200A, 1H	64	29
	2000A, 1H	185	84
	3000A, 1H	240	109
	1200A, 2H	140	64
	2000A, 2H	275	125
Main Bus	1200A	175	80
	2000A	175	80
	3000A	280	127
Riser Bus	1200A, 1H	90	41
	2000A, 1H	185	84
	3000A, 1H	450	205
	1200A, 2H	165	75
	2000A, 2H	260	118
Cable Compartment	1 High	1300	591
	2 High w/ Trough	1450	659
Door -Rear w/Vent	Top and Bottom	400	182
Plenum -Single Frame	w/Vent	275	125
	w/o Vent	180	82
Plenum -Extension	24” Long	200	91
	36” Long	250	114
Plenum Exhaust Assembly		225	102
End Panel	Left and Right	1500	682

Typical civil engineering information



Typical civil engineering dimensions - inches (mm)			
SafeGear HD	Depth (D)	Opening (W)	Distance (X)
	112 (2845	25 (635)	52 (1321)

Dimension H:

24 inches for 1200A lineups
40 inches for 2000A/3000A lineups
Note: additional clearance may be needed during assembly of the plenum.

Indoor and outdoor applications

SafeGear HD is available in indoor construction. For outdoor applications, SafeGear HD is installed in a PDC building. Both applications offer the flexibility of one-high or two-high construction.

Standard indoor construction meets the requirements of ANSI and IEEE standards.

Power Distribution Center (PDC)

Power Distribution Centers are prefabricated, modular, skid-mounted enclosures for switchgear and auxiliary equipment such as batteries, SCADA systems and unit substation transformers. A plenum installed on SafeGear arc resistant switchgear provides a path for arc propagation outside the building, protecting personnel, equipment and the PDC itself in the event of an arc fault.

As a self-contained unit, the PDC and all enclosed equipment are completely coordinated, assembled and tested in a controlled factory environment. This offers many advantages over conventional types of outdoor switchgear construction:

- Single source responsibility and accountability
- Reduced installation and ownership costs
- Application flexibility for a variety of equipment types, operating environments and changing system requirements

Accessories

The accessory group for SafeGear HD arc resistant metal-clad switchgear and the ADVAC and AMVAC circuit breakers includes a complete array of required and optional special tools for proper handling, operation and maintenance. For maximum convenience, all withdrawable assemblies - circuit breakers, PTs, CPTs and fuses - use the same accessories. Required accessories include a handle for manually charging the circuit breaker operating mechanism and a racking crank for inserting and removing primary assemblies. A standard 16 mm socket wrench with a swivel adapter can be conveniently used for racking.

Lift truck

A lift truck is required for all primary devices. The lift truck docks with the switchgear, allowing a primary device to be raised or lowered to the appropriate height and safely rolled into the compartment. The lift truck has wheels for easy maneuvering in restricted aisle space that is common to switchgear installations. A motor lift is available as an option. For one high construction without VTs, ramps can be supplied, eliminating the need for a breaker lift truck. The lift truck is not needed for slide rail PT and CPT/fuse drawouts.

Test jumper

A test jumper is an extension cord. It allows the connection of secondary contacts on a circuit breaker to the switchgear, while outside a breaker compartment. This enables the breaker to be electrically operated using controls in the switchgear, or electrically charged after manual operation of the breaker in a switchgear aisle.

Test cabinet

A test cabinet is a wall-mounted control cabinet connected to a separate power source, containing switches to open and close a breaker. The test cabinet has a female connector and an umbilical cord (stored inside the cabinet) for connection to the breaker, and serves as an aid to breaker inspection and maintenance in switchgear aisles or work areas.

1 Racking crank | 2 Charging handle | 3 Lift truck | 4 Test jumper | 5 Test cabinet

3

4

5

Ground and Test device (G&T)

A Ground and Test (G&T) device is a drawout assembly compatible with circuit breaker compartments. The G&T provides a means to select and test primary circuits in a controlled manner, then connect de-energized primary circuits to the switchgear ground bus to support maintenance activity. The racking system of the grounded G&T device can then be padlocked or Kirk Key interlocked in the "Connected" position in accordance with lock-out and tag-out safety procedures.

63 kA Ground and Test device for SafeGear HD

Safety, interlocking, insertion and withdrawal, and coordination features

Terminal sets barriers

The simple manual G&T device is equipped with a barrier designed to prevent access to the ungrounded terminal set. A padlocking (hasp) provision is provided as a secure means to prevent the barrier from being inadvertently moved and exposing the ungrounded terminal set.

Insertion and withdrawal

The device is able to be inserted and withdrawn from the circuit breaker compartment in the same manner as the circuit breaker, including use of the same lift truck and racking tools. The device is provided with a position indicator.

Coordination

The device is equipped with mechanical interlock that coordinates with the circuit breaker compartment. The device is blocked from being inserted into a circuit breaker compartment where the required ratings exceed those of the G&T device.

Grounding feature

The 15 kV/ 63 kA simple, manual G&T device is marketed for use with the ABB SafeGear HD platform. These devices are supplied when specified by the customer.

Terminal sets

The device features two terminal sets. One set is intended for grounding of the line side, and the other set for the load side. Only one set can be grounded at any time.

Grounding connection system

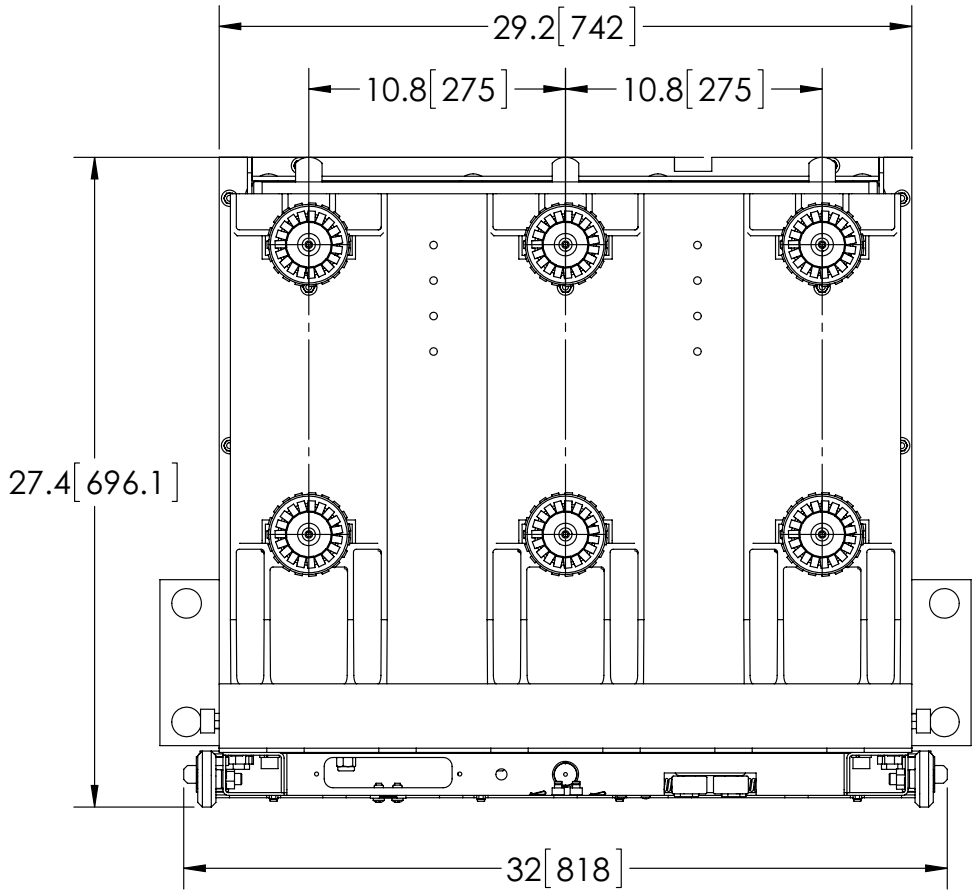
The device features a grounding connection system that operates with the use of grounding cables. The grounding cables and related hardware provided with the device satisfy the requirements of the design tests for the short time and momentary tests as required per IEEEI C37.20.6.

Notes:

1. The device is for use with cells designed for ADVAC or AMVAC breakers.
2. Two sets of cables are furnished. The short set attaches to the lower terminal set, and the long set attaches to the upper terminal set.
3. This device is designed for use with only one set of cables attached to a terminal set at any given time. Either the upper terminals are grounded through their cable set, or the lower terminals are grounded through their cable set.
4. Position stops are provided in the "Connected" and "Disconnected" positions. To assure that the device is in the fully "Connected" position, the "Connect" label must be in the correct position.
5 Device cannot be stored in breaker compartments.

Interrupting or Closing Capability

The ABB simple, manual G&T device does not feature closing or interrupting. The device does not have a mechanism by which to open or close a circuit. A single device can be used for both 1200 A and 2000 A compartments, and a separate G&T is required for 3000 A compartments.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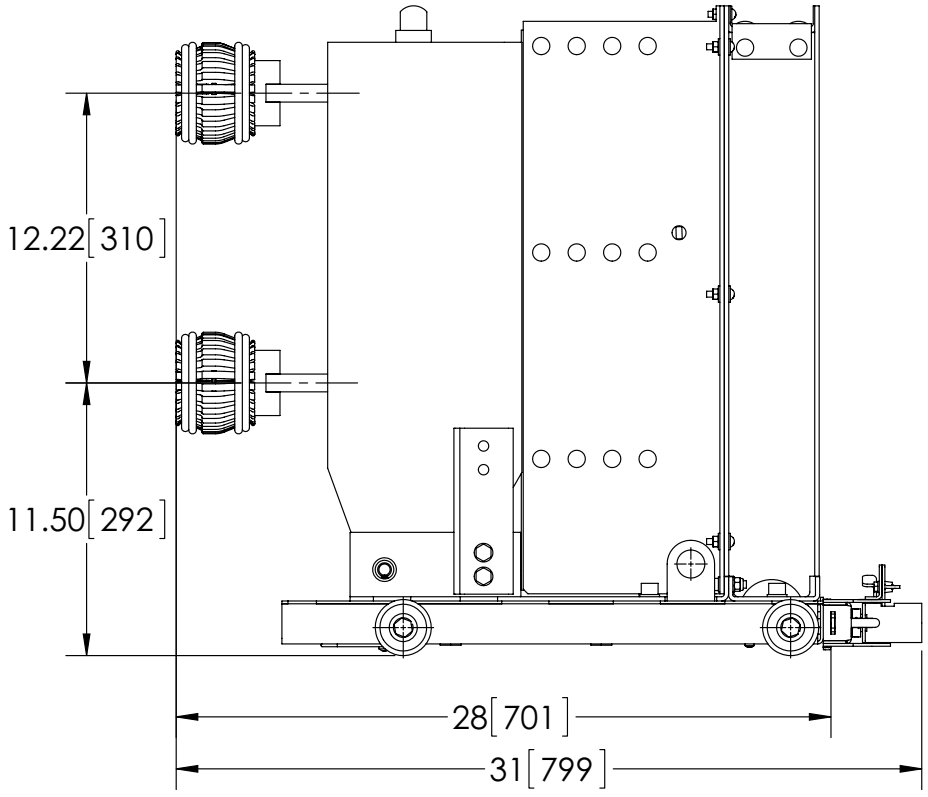
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SmartRack™ electrical racking device

The ABB SmartRack™ Electric Remote Racking Device is intended to assist technicians with the process of racking ABB medium voltage circuit breakers and associated equipment. The main function of the device is to perform the racking operation with minimal manual interaction. This allows the operator of the device to maintain a significant distance between themselves and the circuit breaker while racking is performed as compared to the traditional hand-crank method of racking.

The ABB SmartRack Electric Remote Racking Device is able to perform this complex task through the use of a programmable logic controller and servomotor. Throughout operation, the controller and motor are in constant communication allowing the device to accurately position a circuit breaker or other device in the switchgear cell. The racking device incorporates an actuator to operate the interlock lever which eliminates need for an additional unit to perform this task or for additional manual interaction.

Notes

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1VAL108001-TG Rev A April 2014

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