Technical guide

Advance 27
27 kV medium voltage, metal-clad 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 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.

Advance 27 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, metal-clad switchgear for the ANSI market utilizing modern manufacturing techniques.

Design details like 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.

Advance 27 metal-clad switchgear is available in one-high and two-high configurations.

The current ABB medium voltage switchgear product portfolio consists of:

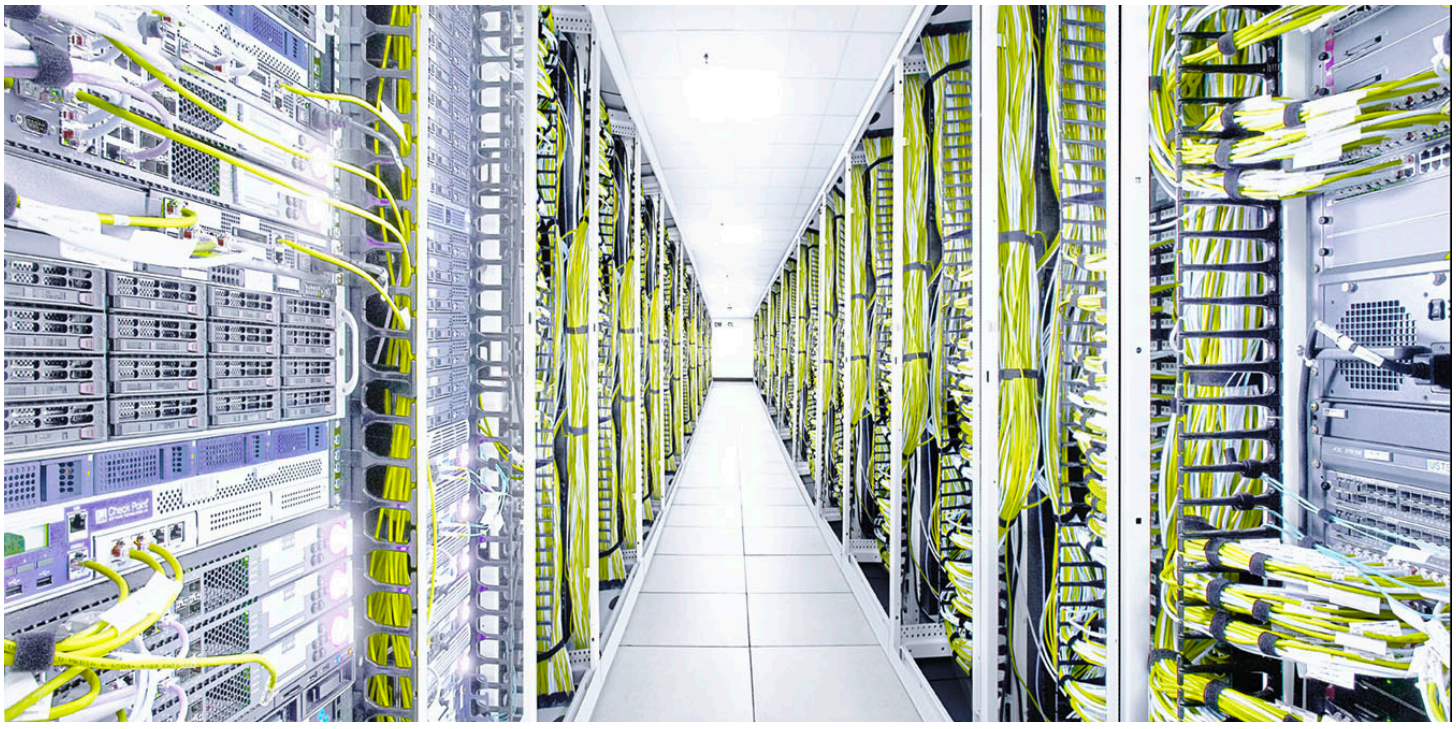
Advance metal-clad switchgear, 5 and 15 kV, up to 50 kA, utilizing the ADVAC or AMVAC circuit breaker

Advance 27 metal-clad switchgear, 27 kV, up to 25 kA, utilizing the AMVAC circuit breaker

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 Advance 27 switchgear.



Advance 27 background and design
Features

The standardized cubicle sizes and modular design allow for simplified engineering. The Advance 27 basic frames are 36” wide, 95” high and 92” 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 listing. Advance 27 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

Advance and Advance 27 metal-clad switchgear are the first with completely innovative modular, bolted designs 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 Advance and Advance 27 for the ANSI metal-clad switchgear market with the user in mind.

Modular construction

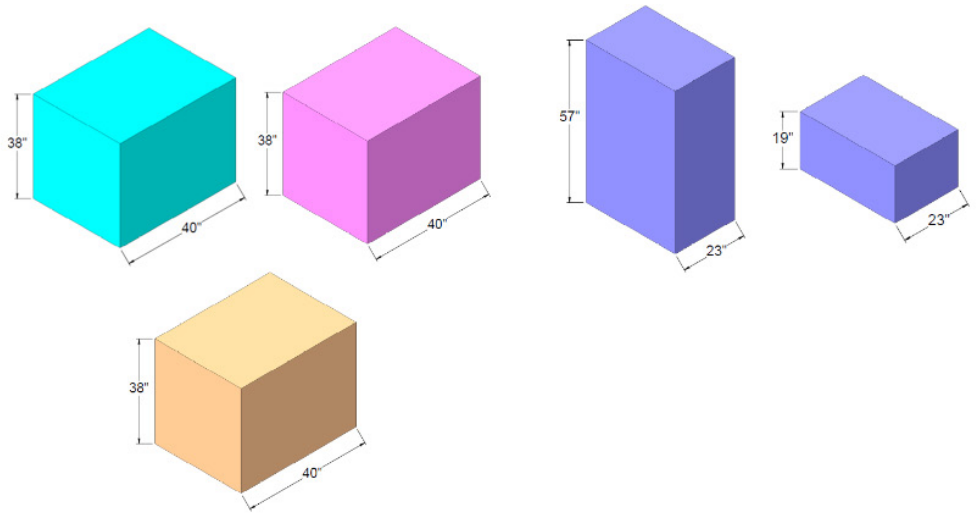
Complete sets of rugged, stackable circuit breaker and auxiliary equipment modules are assembled to form an Advance 27 switchgear lineup. All modules are constructed from Galvanized steel for superior corrosion resistance.

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 metal-clad switchgear (breaker compartment construction shown).

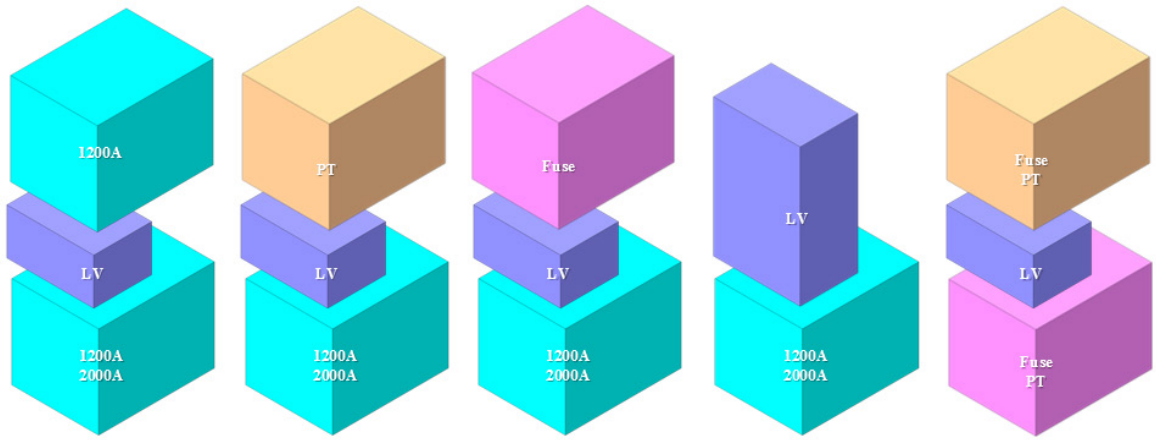
Typical module types

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

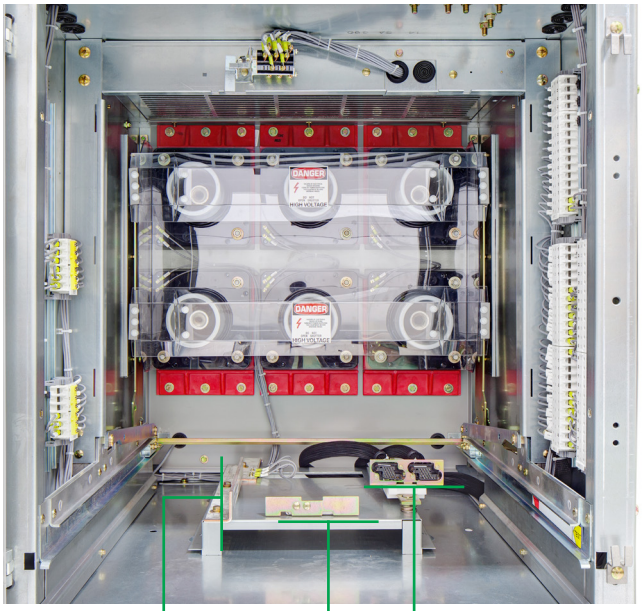
Advance 27 AMVAC™ circuit breaker modules are designed for maximum operator safety by providing a viewing window and three-position closed door racking. The circuit breakers have self-aligning, fully automatic primary and secondary contacts. They incorporate distinctive features for ease of installation, 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.

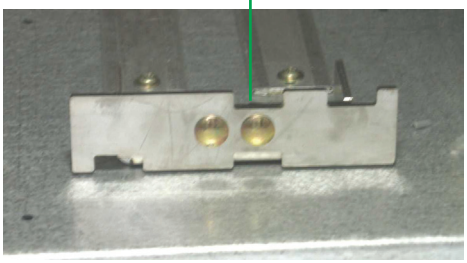
Interlocks

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.



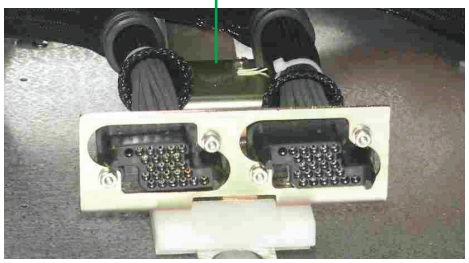
Circuit breaker grounding

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

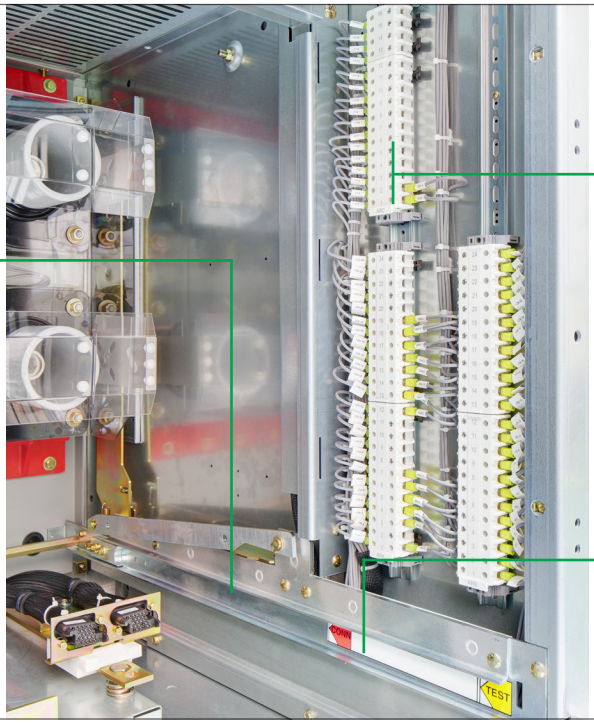
Interference blocking prevents insertion of improperly rated circuit breakers into the module. This decreases the risk of human error.



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
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



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 are made from insulating polycarbonate material. Primary contact stabs can be visually inspected without opening the shutter.

Primary shutter opening and closing is mechanically forced by the movement of the circuit breaker, 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

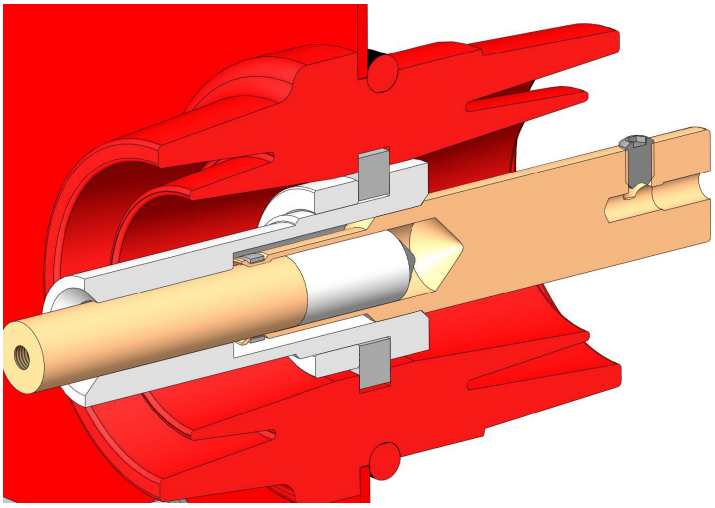
Primary contacts and current transformers (CTs) are supported by standard porcelain bushings.

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 probe and receptacle to contain the arc and extinguish it safely.



Delrin primary probe and recessed contact assembly

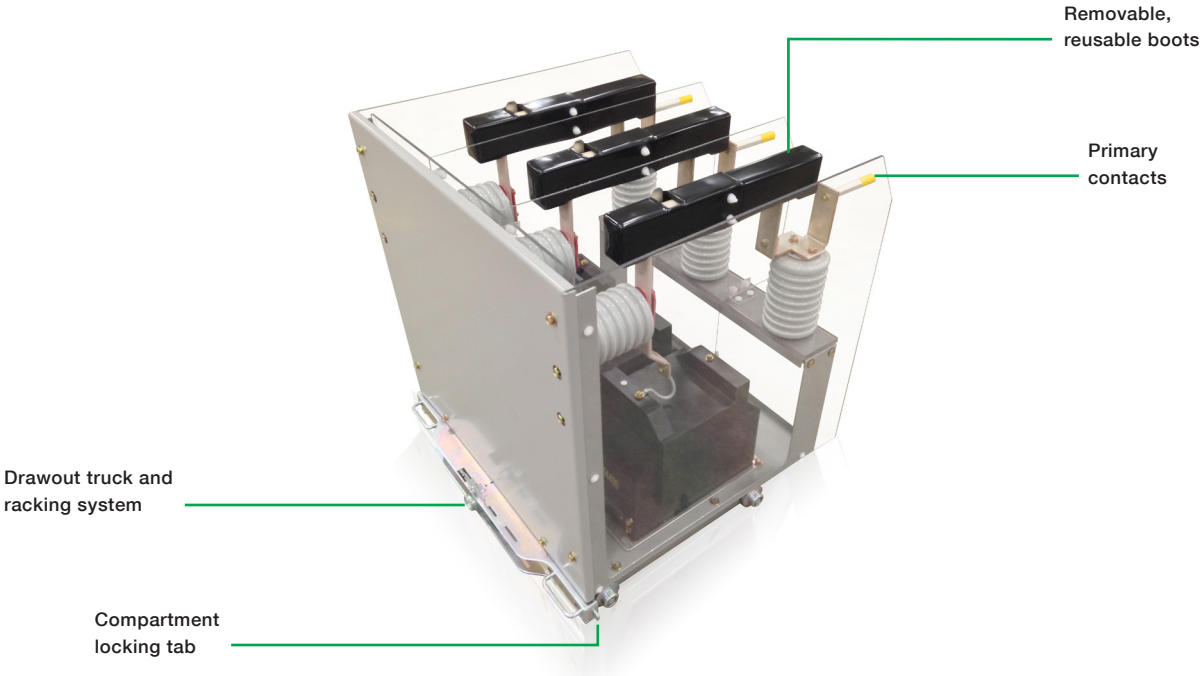
Closed door racking

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.

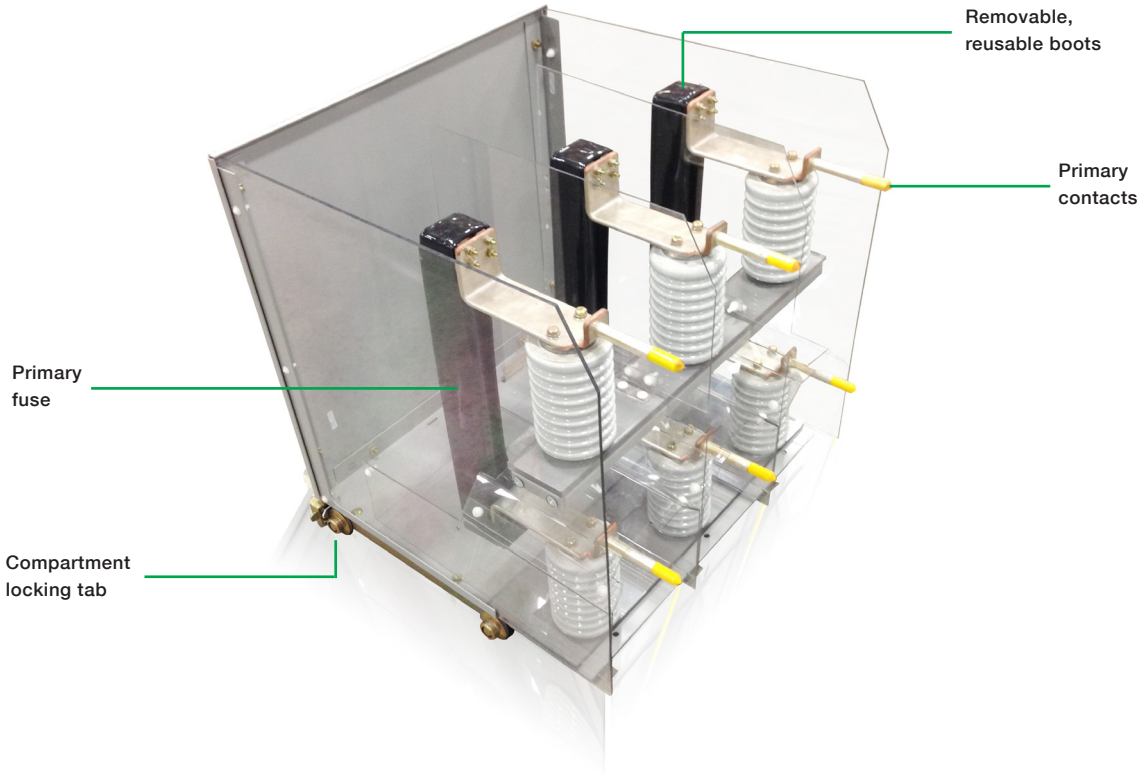
Voltage

PT modules accommodate industry-leading type 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



Control power transformer (CPT) drawout fuses

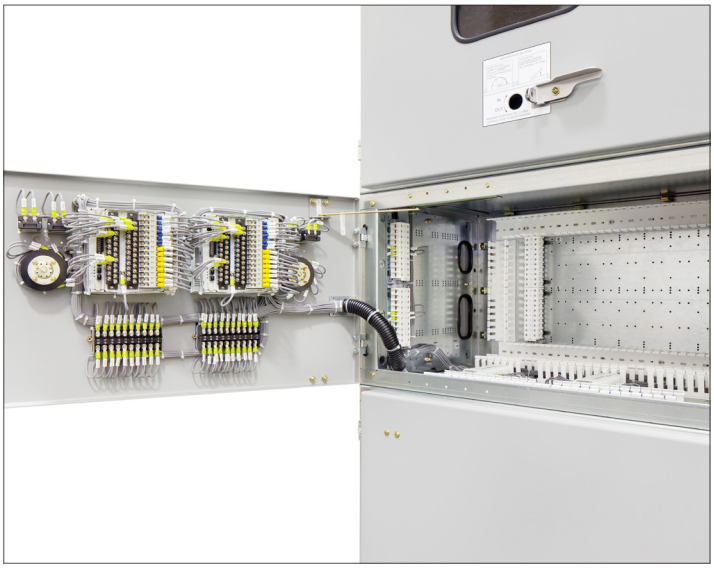


Drawout fuses for Control Power Transformer (CPT)

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 50 kVA single phase mounted in the rear cable compartment. Larger CPTs can be remote mounted and connected via cable to the fuse drawout.

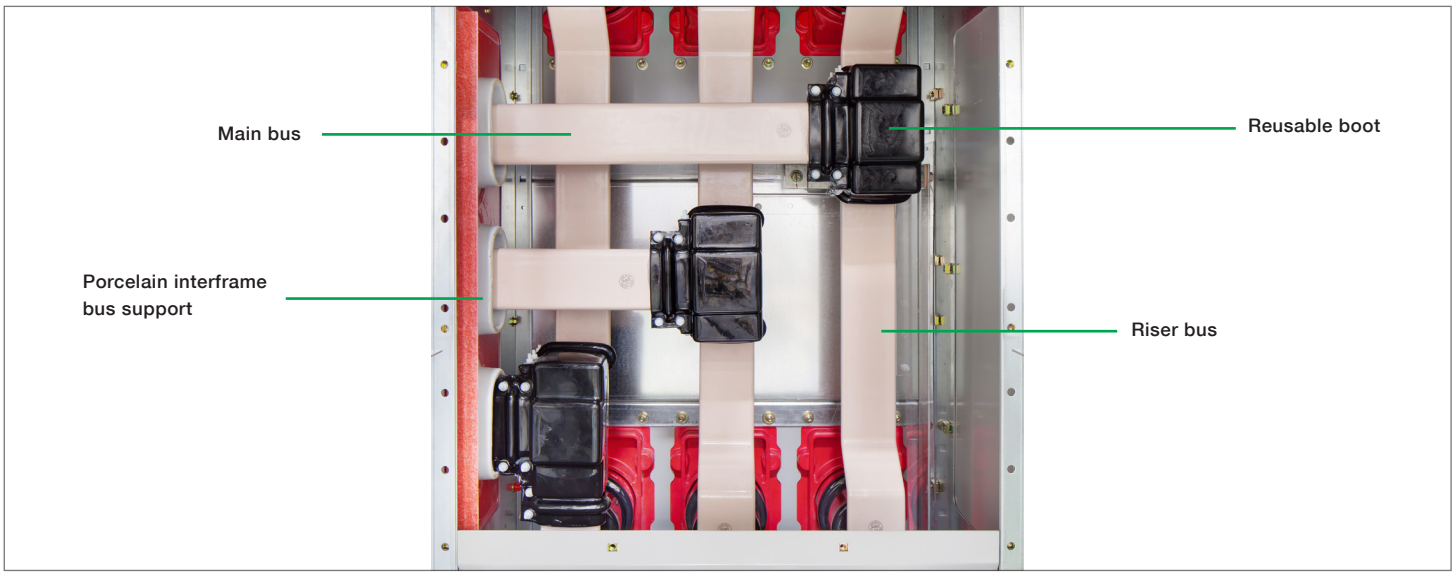
Low voltage instrument module

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 and 2000 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 risers, the connections from stationary primary contacts to the main bus and runbacks, and connections from stationary primary contacts to line or load terminations. Internal stand- offs and inter-frame supports are porcelain for all ratings.

Cable compartments

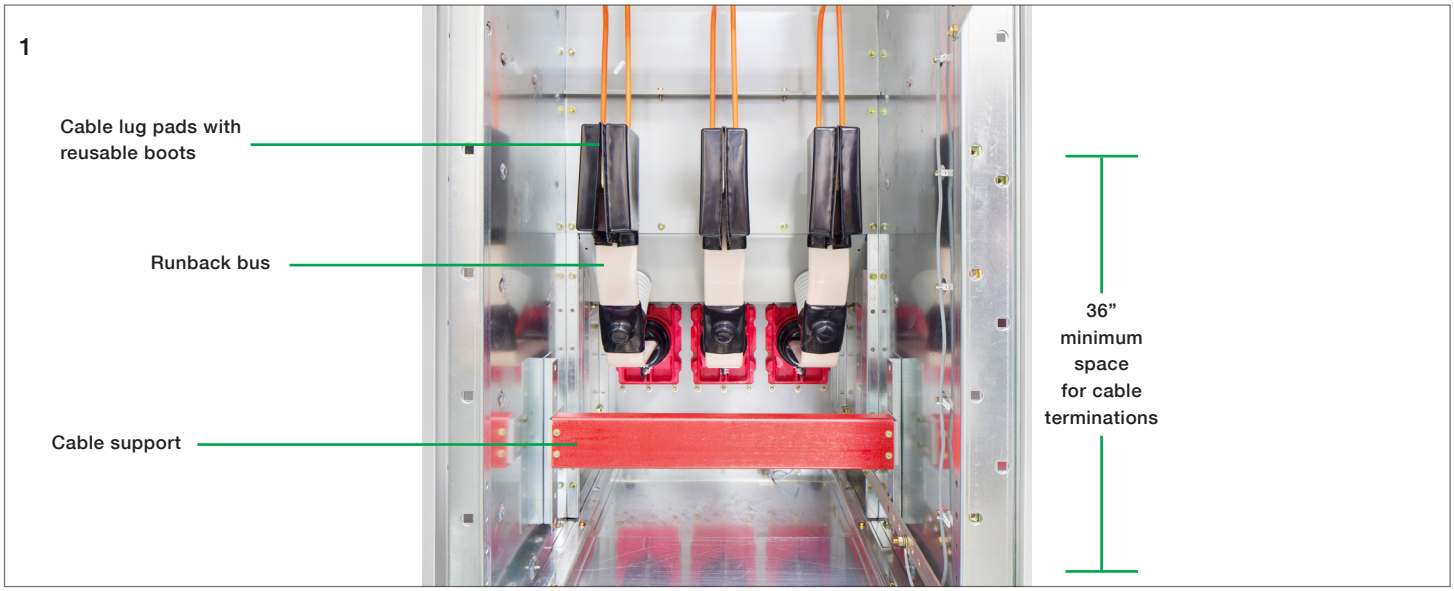
Well-designed cable compartments for Advance 27 provide an efficient layout with ample room for stress cones and a choice of cable terminations and lug types. Customers also have the flexibility of top or bottom cable entry. Top connections can also be made to bus duct or roof bushings.

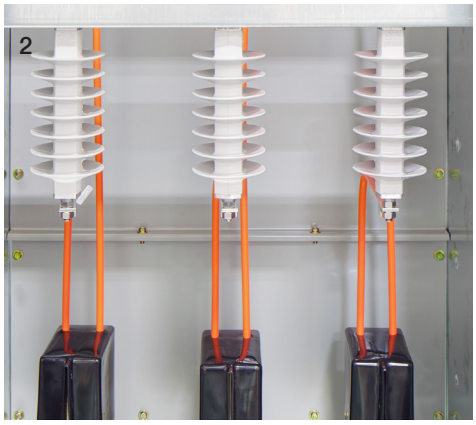
In two-high arrangements with stacked circuit breakers, steel barriers separate the compartments and isolate the primary circuits. All configurations come standard with lug boots and have an option for cable supports to make field connections more efficient and secure.

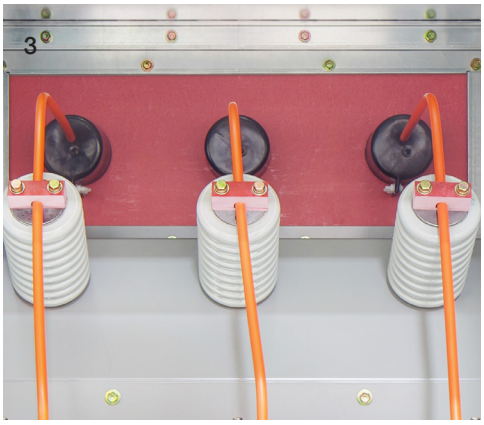
Cable compartments are available with optional readily accessible zero sequence current transformers, surge arresters and capacitors, and ground studs on the runback bus bars. When a drawout fuse compartment is installed in the front of the switchgear, the rear cable compartment offers room for a large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

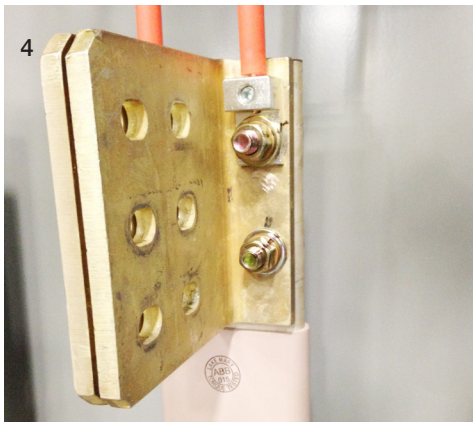
The 92 inch depth of Advance 27 switchgear provides ample space for various cable terminations and protective, monitoring, and control devices as needed.

1 Cable compartment (main bus - cover installed) | 2 Surge arrestors | 3 PT line connection via Natvar | 4 Standard 2000A lug pad (boot removed)









Bus design details

Advance 27metal-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.

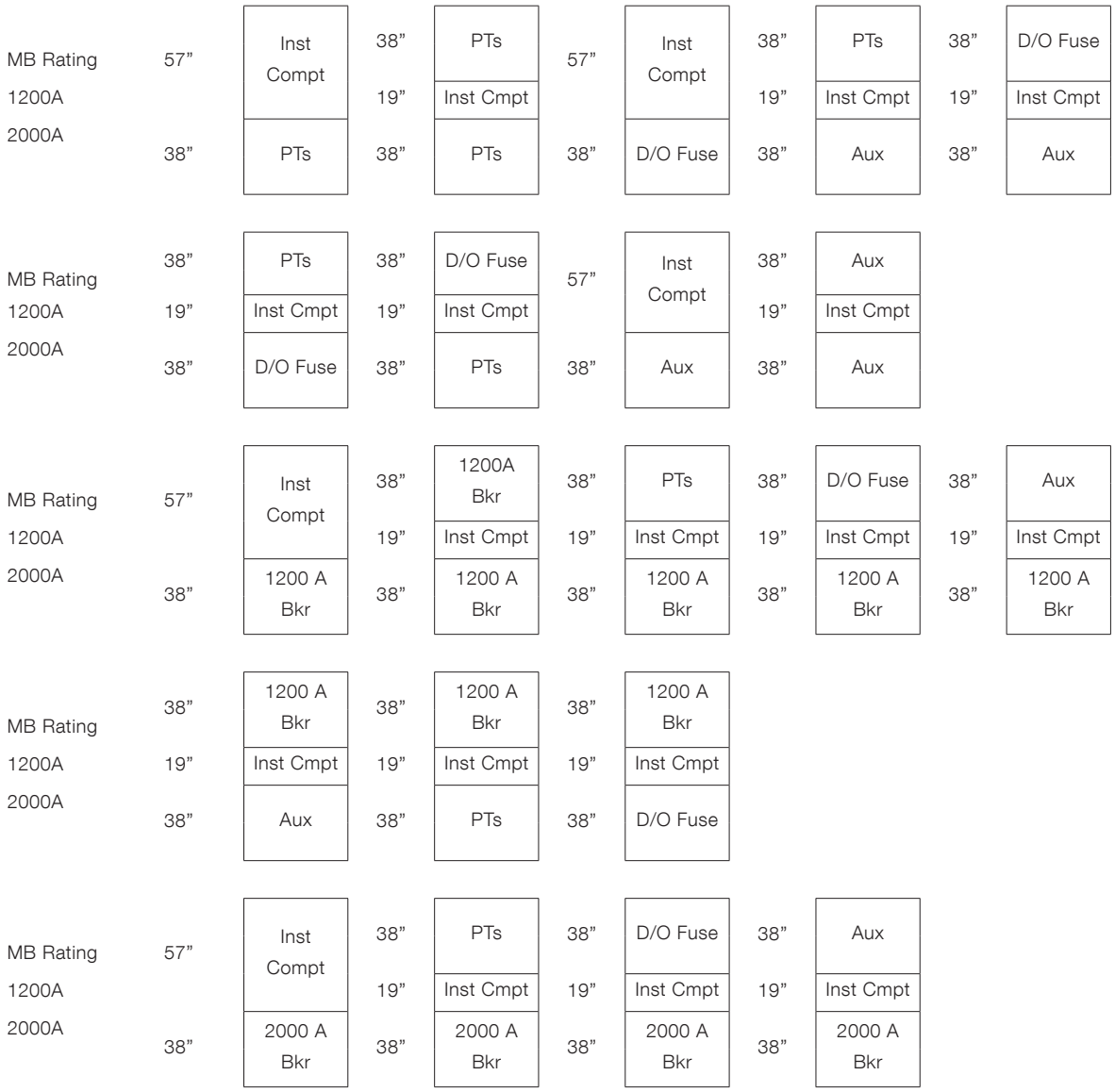
Continuous current	Rating	Quantity	Size
1200 A	25 kA	1	.375” x 4”
2000 A	25 kA	1	.75” x 4”

Advance 27 utilizes a special bus boot design consisting of black Plastisol joint covers encapsulating all bus joints and a special bus skirt applied to each of the bus bars. A silicone sealant is used to assure complete sealing of the skirts and the boot. All boots installations are completed by nylon hardware to seal the flanges.

Advance 27 metal-clad switchgear design certifications are based on porcelain primary bus supports. Porcelain is standard for standoff bus insulator supports, primary breaker bushings and inter-frame main bus supports. Separate drawings are available to indicate the position and dimensions of the porcelain compartment-mounted primary contact supports, porcelain inter-frame horizontal bus supports, and standoff insulators. Physical characteristics of the porcelain material is provided in the following table.

Characteristic	Porcelain specification
Flexural Strength, ksi	25 kA
Tensile Strength, ksi	6
Izod Impact Strength, ft-lb/inch of notch	1.5
Thermal Shock – cycles	1
Dielectric Strength (Short Time), V/m	300

Modules and frames
Advance 27



Indoor circuit breakers

Advance 27 metal-clad switchgear is available with the following circuit breaker:
16-25 kA Model 4 AMVAC

Ratings structure

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 magnetically actuated ANSI medium voltage circuit breaker to successfully complete standard and definite purpose capacitor switching tests as described in the revised standards.
The AMVAC breaker consists of unique technologies that decrease maintenance requirements, increases reliability and personnel safety. The actuator in the AMVAC breaker requires no maintenance as it is only one moving part that requires no lubrication or adjustment. Magnetic actuation technology eliminates the cause of failure of traditional close and trip coils as it delivers a current limited pulse, as opposed to holding the current on the coils. Because of this unique design, the AMVAC also draws less than 100W during charging and less than 10W at rest.

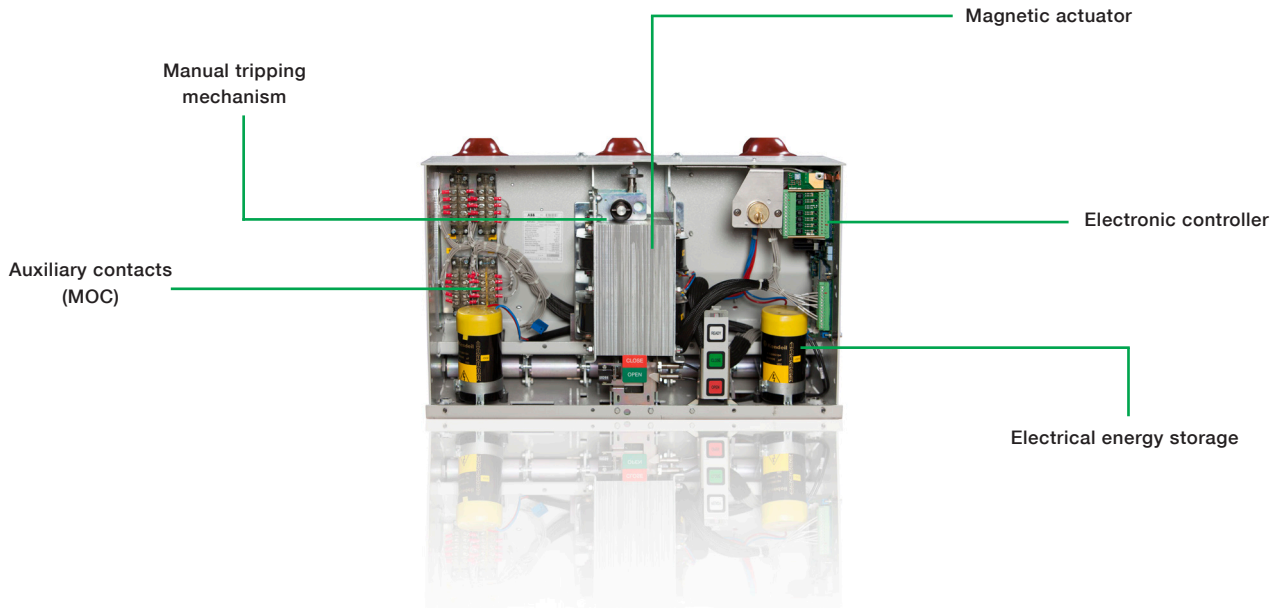
Summary of benefits:

- Standard 5-year warranty
- Simple mechanical operation
- Fewer than 6 moving parts
- Manual opening capability
- High reliability
- Proven design since 2003 using a magnetic actuator operating mechanism with one moving part, built in open/close coils and no maintenance on the operating mechanism.
- Switching operations are achieved by exciting one of the two coils which shifts the flux density and causes a force that exceeds the retaining force of the permanent magnets
- Current to the actuator open and close coils is time limited to approximately 45ms, thus eliminating the possibility to burn up coils common in spring actuated mechanisms.
- Capacitor charging, switching, anti-pumping, interlocking, under voltage release, and armature position details incorporated by an electronic controller
- The racking mechanism (truck) is integrated into the breaker and designed to 180 ft·lb torque rating to provide increased reliability and reduced maintenance costs

The following table identifies the standard 27kV AMVAC circuit breaker ratings and related capabilities.

Nominal Voltage Class kV	FLC (Amps)	Isc (kA)	Style Code	Type/Rating	Max. Wave voltage (kV, rms)	Max. Sym. Interrupt & STC (kA, rms)	Close & Latch (kA, rms)	Lightning Impulse Withstand (BiL) (kV, Crest)	Low Frequency Withstand (Hi-Pot) (kV, rms)	Cap Switch	Interrupt Time (cycles)
27	1200	16	MA4P1	AMVAC 27.12.16	27	16	42	125	60	160A C1	3
	2000	16	MA4P2	AMVAC 27.20.16	27	16	42	125	60	160A C1	3
	1200	25	MA4Q1	AMVAC 27.12.25	27	25	65	125	60	160A C1	3
	2000	25	MA4Q2	AMVAC 27.12.25	27	25	65	125	60	160A C1	3

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.

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

- Completely concealed moving parts
- UL labeling and CSA compliant
- Low power consumption
- ANSI/IEE compliance at 5, 8, 15 and 27 kV

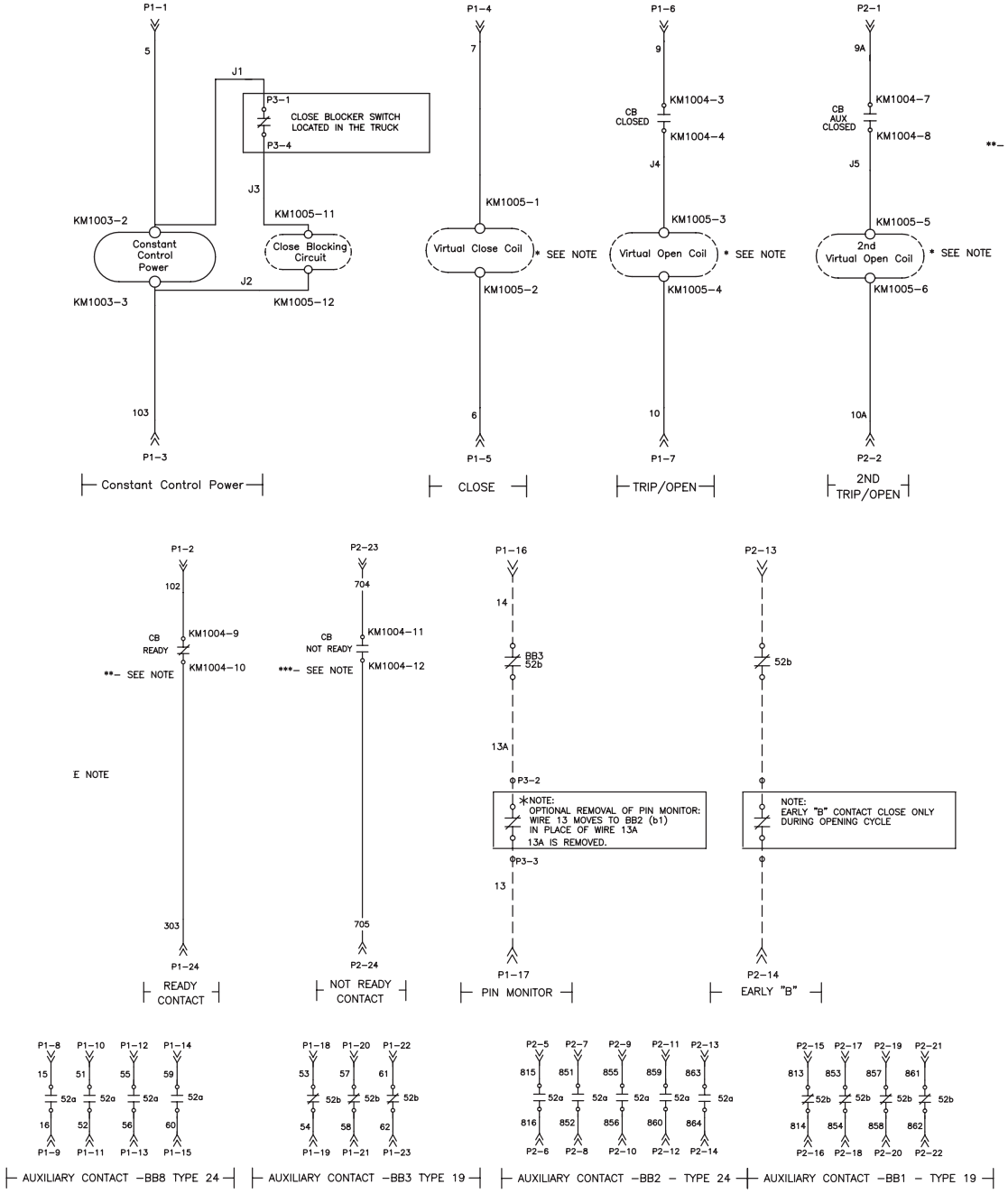
Control power data

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.

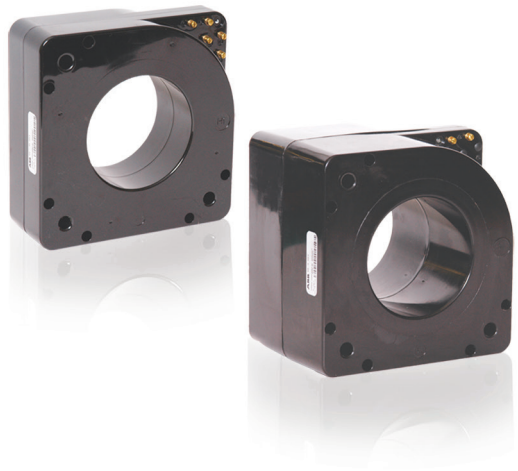


Auxiliary device ratings

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. Refer to the following tables for the accuracy ratings and dimensions for each available CT ratio.



Primary ampere rating	IEEE metering accuracy					IEEE	
	B-0.1	B-0.2	B-0.5	B-0.9	B-1.8	Relaying accuracy	Style number
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	
	B-0.1	B-0.2	B-0.5	B-0.9	B-1.8	Relaying accuracy	Style number
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

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.

VIZ-12

Primary voltages	BIL	Ratios	Metering accuracy
12,000	125	100:1	0.3 Z
13,200	125	110:1	0.3 Z
14,400	125	120:1	0.3 Z
16,500	125	137.5:1	0.3 Z
18,000	125	150:1	0.3 Z
21,000	125	175:1	0.3 Z
24,000	125	200:1	0.3 Z

2000 VA thermal at 30°C ambient.
1500 VA thermal at 55°C ambient.

VIZ-12G

Primary voltages	BIL	Ratios	Metering accuracy
12,000	125	100:1	0.3 Z
14,400	125	120:1	0.3 Y
16,000	125	133.3:1	0.3 Z
18,000	125	150:1	0.3 Z

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

Control power transformer (CPT) ratings

CPTs are designed to provide control power in medium voltage switchgear. Units are only available in single 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 conductors.

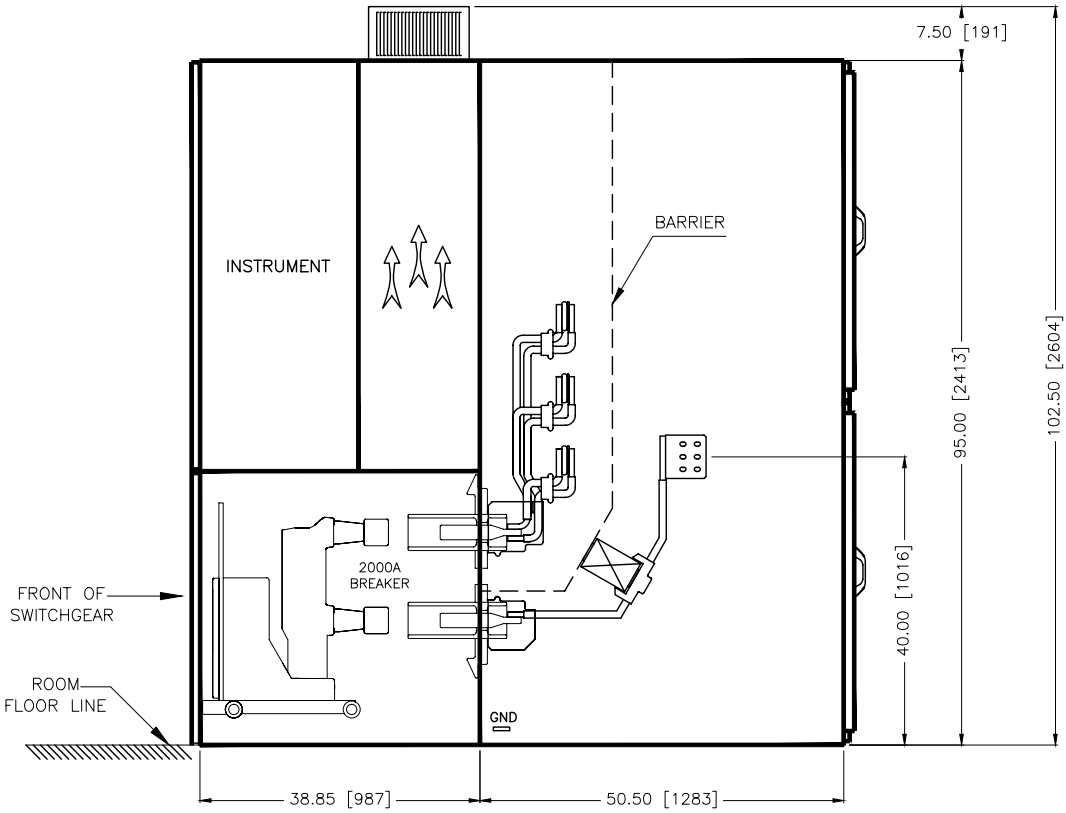
Single phase, 60Hz, 240/120 V Secondary, epoxy cast

Primary voltages	BIL	Available kVA
12,000, 12,400, 13,800, 14,400	125	25, 37.5, 50

Typical side views and floor plans

Advance 27 switchgear one-high

Circuit breaker: 2000A



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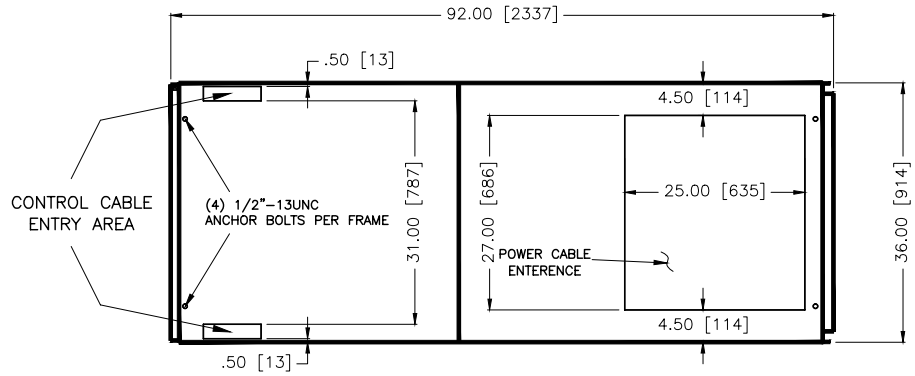
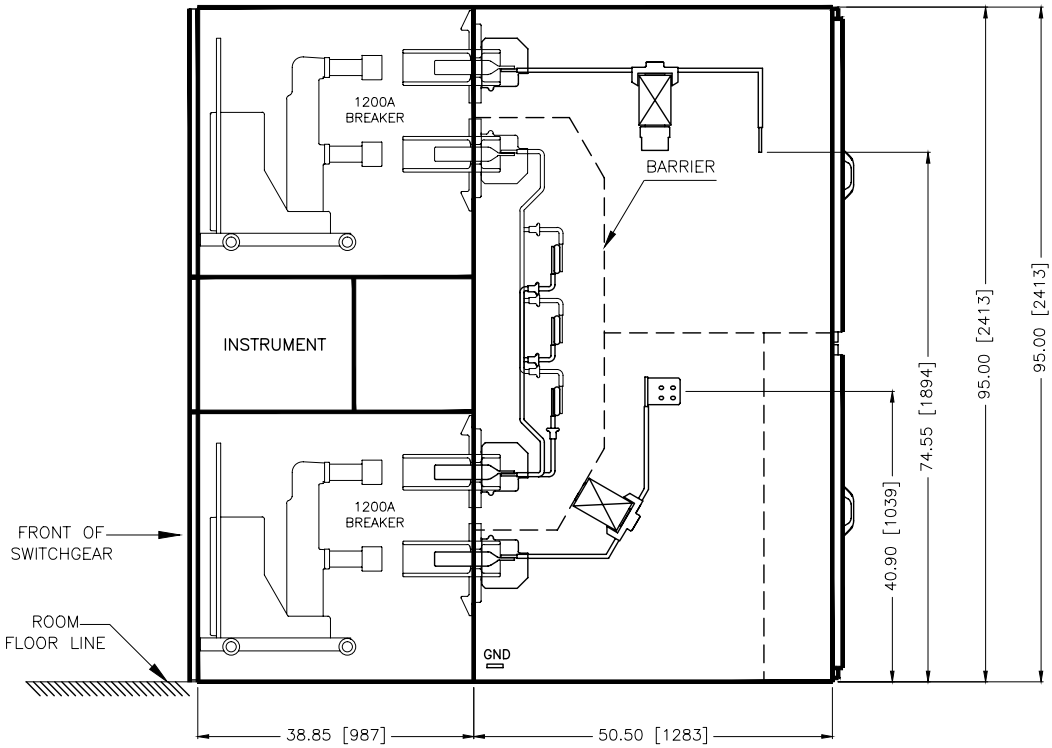


FLOOR PLAN

See configuration sheet on page 15 for available arrangements.

Advance 27 switchgear two-high

Circuit breaker: 1200A/1200A



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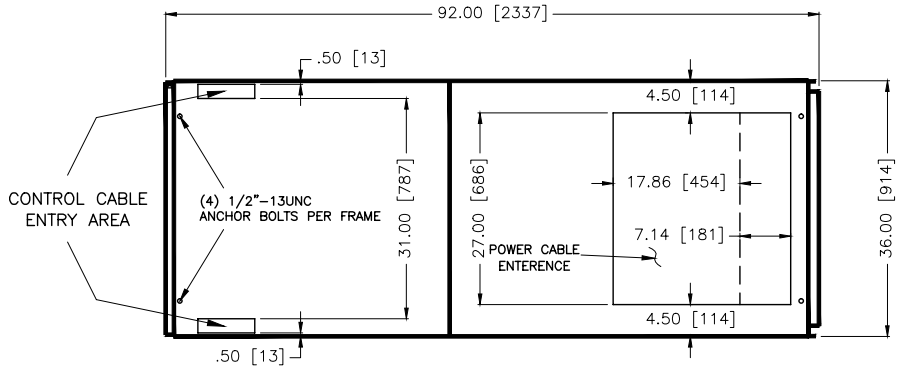
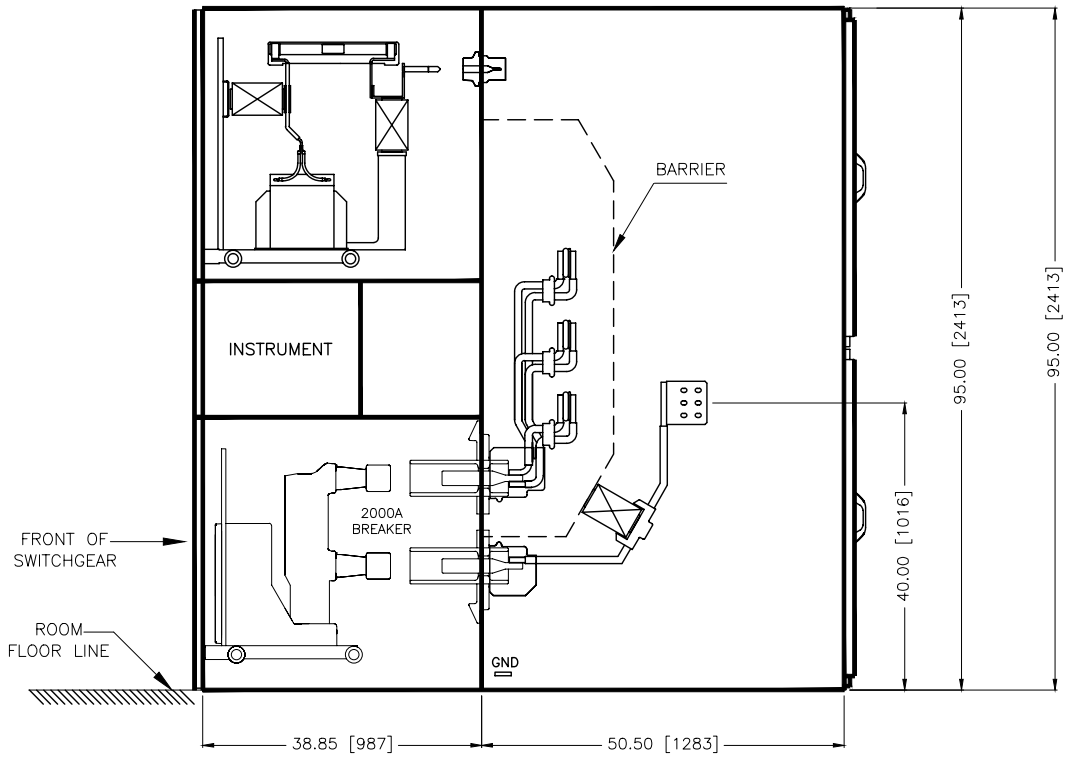


FLOOR PLAN

See configuration sheet on page 15 for available arrangements.

Advance 27 switchgear one-high with PT drawout

Circuit breaker: 2000



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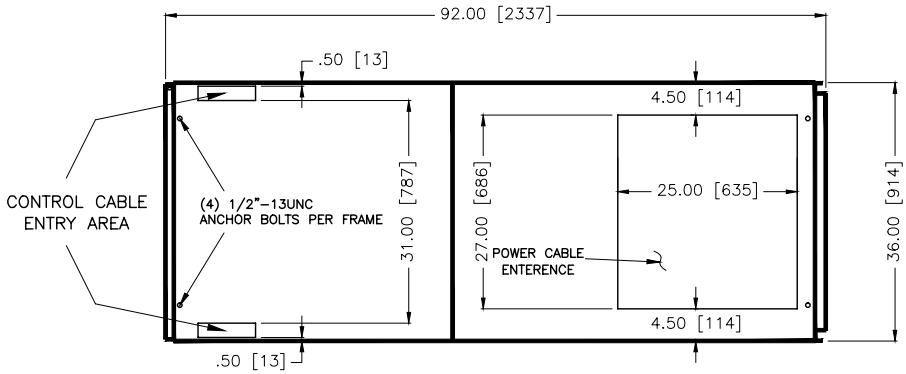


FLOOR PLAN

See configuration sheet on page 15 for available arrangements.

Module combinations
Dimensions and weights

Based on its modular design, project engineers may combine and stack modules in many ways. Advance 27 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 92 inches. The Advance 27 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	
Advance27	36 (914)	95 (2413)	92 (2845)	In ODNWI, ODWI and PDC

*For outdoor applications, indoor Advance 27 is offered as Outdoor Non-Walk In, Outdoor Walk In, or installed in a PDC (Power Distribution Center) enclosure.

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 components.

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

Low voltage modules may contain significant amounts 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 low voltage module.

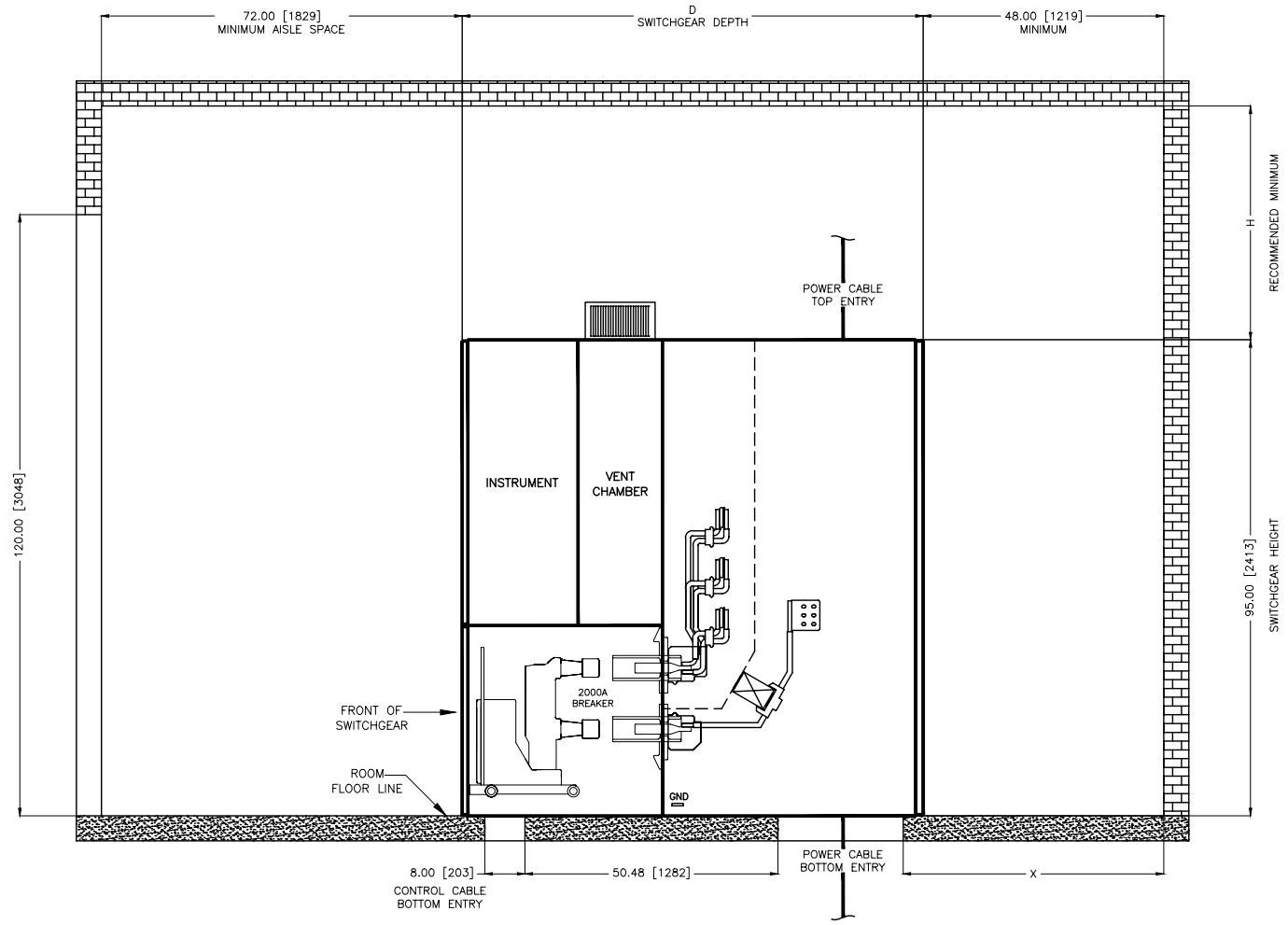
The weight of the end panels has to be considered per lineup of switchgear. Weights given are for two end panels, one on each end of the switchgear lineup.

Typical frame weights are listed below. Detailed drawings for the arrangements are located on pages 22-24. Weights include all modules and components as listed above.

Basic frame configuration	Circuit breaker (rating)	Weight	
		lbs	kg
One circuit breaker	1200	1,990	903
	2000	2,245	1,018
Two circuit breakers	1200	2,800	1,270
One circuit breaker, one VT	1200	2,620	1,188
	2000	2,960	1343
One circuit breaker, one CPT	1200	2,305	1046
	2000	2,640	1197

Component	Rating/size	Weight	
		lbs	kg
AMVAC circuit breaker (25kA)	1200	400	182
	2000	425	193
Circuit breaker module (including bus risers, runbacks and supports)	1200	516	234
	2000	730	331
Low voltage module (not including instruments and wiring)	19”	140	64
	57”	278	126
Bus and cable module (rating is for main bus)	1200	658	298
	2000	757	357
PT module (including 3 VT’s)	-	837	380
Fuse module (including 3 Fuses)	-	520	236
Front extension	10”	60	27
Rear extension	10”	36	16
End panels (per lineup)		360	163

Typical civil engineering information



Typical civil engineering dimensions - inches (mm)			
Advance 27	Depth (D)	Opening (W)	Distance (X)
	92 (2337)	25 (635)	52 (1321)

Dimension H:
6 inches for 1200A lineups
14 inches for 2000A lineups
Notes:

1. Additional height clearance may be needed during installation of the switchgear. Please allow for 6” shipping base for movement during installation.
2. For outdoor installations without a rear aisle, the switchgear can be provided for direct access via a weatherproof rear door.

Indoor and outdoor applications

Advance 27 is available in indoor and outdoor construction. For outdoor applications, Advance 27 can be provided in Outdoor Non-Walk-In (ODNWI), Outdoor Walk-In/Sheltered Aisle (ODWI), or installed in a PDC building. All applications offer the flexibility of one-high or two-high construction.

Standard indoor and outdoor construction meet the requirements of ANSI and IEEE standards.

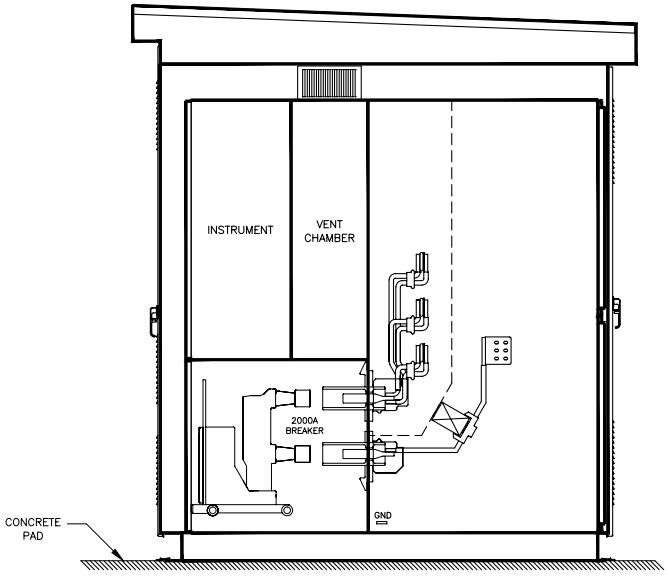
OutDoor Non-Walk-In (ODNWI)

Outdoor non-walk-in enclosures provide a weatherproof skin around the switchgear to allow for outdoor installations.

ODNWI enclosures do not provide any indoor space for personnel or additional equipment and access to the front and rear of the switchgear frames is provided through external, weatherproof access doors. The front of the switchgear still accommodates internal equipment doors for access to circuit breaker or auxiliary modules as well as for mounting of low voltage control equipment and protective devices.

The structures are skid mounted and shipped in standard shipping splits for ease of handling and reconnection at the installation site. The design allows for ease of future extension through removal of the end wall and direct integration of additional frames.

The ODNWI enclosure provides a cost effective solution for outdoor applications with limited space requirements. The design is built, tested and certified to IEEE C27.20.2.



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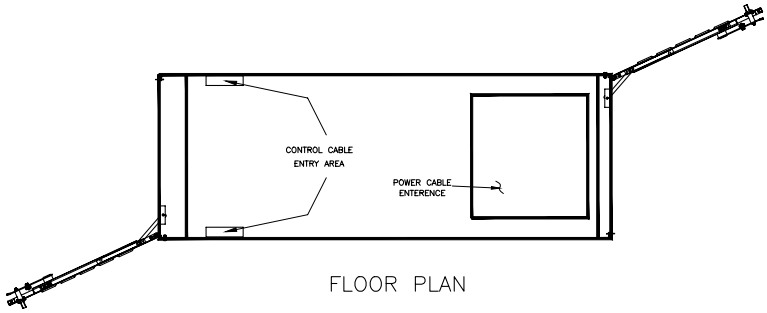


FLOOR PLAN

OutDoor Walk-In (ODWI)

Outdoor Walk-In enclosures provide a weatherproof skin around the switchgear for outdoor installations with included front aisle.

ODWI enclosures are designed to provide a front aisle for the switchgear installations for personnel access and maintenance activities. Access to the rear of the switchgear frames is provided through external, weatherproof access doors.

The structures are prefabricated to be placed over a concrete slab and the switchgear frames at site. This design provides a simple skid mounted two or three piece enclosure for ease of handling and installation.

The ODWI enclosure provides a cost effective solution for outdoor applications with front aisle requirements. Available in 72” or 84” aisle depths for single row and double row configurations. The design is built, tested and certified to IEEE C27.20.2 and can be certified to area seismic, wind and snow load requirements.

Power Distribution Center (PDC)

Power Distribution Centers are prefabricated, modular, skid-mounted enclosures for electrical distribution systems including low and medium voltage switchgear and motor control as well as auxiliary equipment such as batteries, SCADA systems and unit substation transformers.

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 Advance 27 metal-clad switchgear and the AMVAC circuit breaker 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 and Fuses, use the same accessories. Required accessories include a handle for manually opening the circuit breaker operating mechanism and contacts 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.

Test jumper

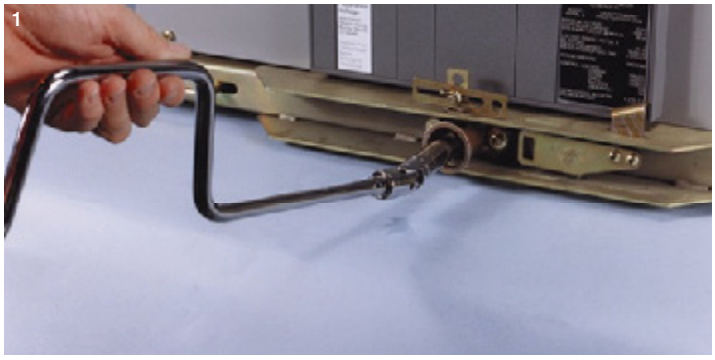
A test jumper is an extension cord. It allows the connection of secondary contacts on a circuit breaker to the switchgear, while outside a breaker compartment. This enables the breaker to be electrically operated using controls in the switchgear.

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 circuit breaker secondary contacts, and serves as an aid to breaker inspection and maintenance in switchgear aisles or work areas.

1 Racking crank | 2 AMVAC manual opening handle | 3 Lift truck | 4 Test jumper | 5 Test cabinet

1



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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.

27 kV Ground and Test device for Advance 27

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 27 kV simple, manual G&T device is marketed for use with the ABB Advance 27 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

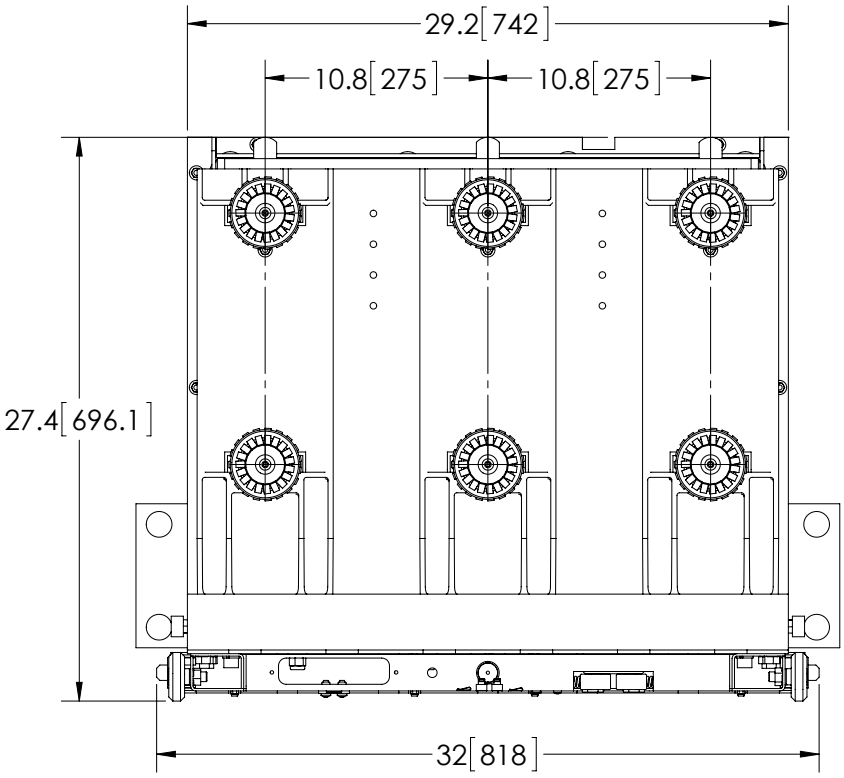
The device features a grounding connection system that operates with the use of grounding cables. The grounding cables and related hardware provided with the device satisfy the requirements of the design tests for the short time and momentary tests as required per IEEE C37.20.6.

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.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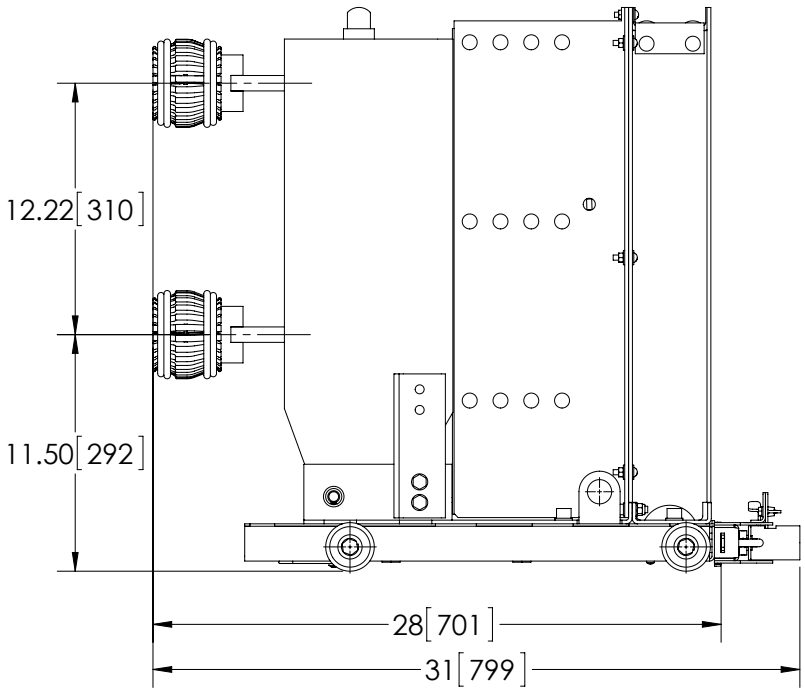
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SmartRack™ electrical racking device

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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