

DESCRIPTIVE BULLETIN

Advance® 27

ANSI 27 kV metal-clad switchgear



Table of contents

04 – 05	Advance® 27
06	AMVAC™ breaker
07 – 08	Instrument transformers
09	Distribution protection and control
10	Switchgear asset health monitoring
11 – 12	Advance® 27 Digital

Advance® 27

Introduction

Advance® 27 is ABB's ANSI platform for 27 kV rated, non-arc-resistant, metal-clad switchgear featuring a narrow footprint, and designed and tested per IEEE C37.20.2.

Featuring galvanized steel construction, hem bending techniques, and Delrin arc-quenching contacts, Advance 27 is designed with safety, reliability, and durability in mind. Advance 27 is seismically tested and certified to IBC Region D, with importance factor 1.5.

Product highlights

- Fully compliant to IEEE C37.20.2 for metal-clad switchgear construction
- Closed door draw-out PT and draw-out fuse racking
- Standard 36-inch wide, 92-inch deep, 95-inch tall frame
- Available SmartRack™ remote racking system for breakers, PT and draw-out fuses
- UL certified
- Automatic secondary disconnects
- Large Lexan viewing window for viewing breaker status and position
- Modular design and construction
- Available two-high construction
- Available top and bottom cable or bus duct entry
- Galvanized construction for superior rust protection and illumination properties
- Hem bending of double wall 14 gauge steel for strength and rigidity
- Delrin arc-quenching contacts
- ISO 9001 certified manufacturing facilities

Available configuration/competitive footprint

Advance 27 features the most competitive footprint in the market with available two-high configurations. Each switchgear frame measures 36 inches wide, 92 inches deep and 95 inches tall in both one-high and two-high stacked breaker configurations.

Each frame includes a separate isolated low voltage compartment that separates relays, meters and other instruments using grounded, metal barriers, protecting maintenance personnel from exposure to high voltage.

Delrin arc-quenching contacts

For draw-out PT and fuse contacts, ABB uses Delrin arc-quenching contacts. A sleeve with a round conductor probe is inserted into a receptacle with recessed contacts. Due to the unique properties of Delrin, which include self-lubrication, arcs created during load break conditions are extinguished by a gas emitted by the Delrin material as it heats. The recessed contact design also eliminates the need for safety shutters as access to live bus is very difficult.

Galvanized steel construction

Advance 27 uses galvanized steel construction for increased protection from rust, scratches and corrosion. Galvanized steel is used inside low voltage compartments for its increased illumination properties to enhance instrument viewing.

Hem bending

Hem bends, the process of folding a single sheet of steel over upon itself, are used throughout the construction of Advance 27 for increased rigidity. This construction technique also protects maintenance personnel and any LV wiring inside the switchgear as it eliminates sharp edges and burs in the metal work.

Advance 27 accessories

- Racking crank
- Test cabinet
- Test jumper
- SmartRack™ electric racking device
- Lift truck double wall
- Manually operated ground & test device
- Breaker release handle operator
- AMVAC™ manual open handle

Advance 27 options

- IR viewing ports
- SwitchGearMD™ 24x7 monitoring
- Ground CTs
- Lightning arresters
- Cable supports
- Ground studs

- Tin-plated phase bus
- 10-inch front extensions (allows relays to be placed in front of breakers)
- 10-inch, 20-inch rear extensions (deeper possible)
- REA arc detection system
- UFES active arc mitigation system
- Digital switchgear with current and voltage sensors and IEC-61850-based communications (non-UL applications). Reference Descriptive Bulletin 1VAL108401-DB

Enclosures

- Indoor enclosures (Category B)
- Outdoor Non-Walk-in (ODNWI) enclosures
- Outdoor Sheltered aisle, single or double row walk-in enclosures
- eHouse (PDC) enclosures

Table 1: Advance 27 ratings*

Characteristic	Unit	Rated maximum voltage level**
		27 kV
Rated nominal voltages***	kV	16.9, 24.5, 26.2
Main bus continuous current	A	1200, 2000
Rated Short-time current (rms)(2sec)	kA	25
Rated momentary withstand current (peak withstand current)****	kA	65
Rated frequency	Hz	60
Low frequency withstand (rms)	kV	60
Lightning impulse withstand level (BiL, crest)	kV	125

*Ratings given are for usual service conditions within temperature and altitude limitations as defined by IEEE C37.20.2 metal-clad switchgear standards.
** Breakers have been UL certified to 28.5 kV rated maximum voltage level
*** Other nominal voltages available
**** Rated momentary withstand current is equal to the close and latch ratings of the breaker



AMVAC breaker

Advanced design vacuum circuit breaker

AMVAC breakers offer unique technologies that decrease maintenance requirements, and increase reliability and personnel safety.

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AMVAC breaker

The actuator in the AMVAC breaker requires no maintenance as it has 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.



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- Summary of benefits**
- Proven design 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 limited to approximately 45ms, eliminating the possibility of coil failure that is seen in spring actuated mechanisms
 - Capacitor charging, switching, anti-pumping, interlocking, under voltage release, and armature position details incorporated by an electronic controller
 - Standard 5-year warranty
 - The racking mechanism (truck) is integrated into the breaker and designed to provide increased reliability and reduced maintenance costs

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Table 2: AMVAC breaker ratings

Voltage (kV)	Withstand (kV)	BIL (kV)	Frequency (Hz)	Rated current (A)		Interrupting (kA)	Operation sequence	Interrupting time
								(cycles)
27	60	125	60	1200		25	O - 0.3 s - CO - 3 min -CO	3
				2000				

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AMVAC breaker dimensions

Rated current		Height		Length		Depth		Poles		Weight	
A		in	mm	in	mm	in	mm	in	mm	lbs	kg
1200										410	186
2000	27.9	708	31.1	790	24.2	614	10.8	275		420	191

Instrument transformers

Current transformers

Advance 27 is designed and tested for use with the SAB-1/1D current transformers for 1200 and 2000 A applications.

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Current transformers

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

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

The ring-type core is insulated and toroidally wound with a fully distributed secondary winding. The protective case, made of an impact-resistant polycarbonate, is assembled using self-tapping screws.

Secondary terminals are 10-32 brass terminal screws with hardware.

Saturation, overcurrent ratio correction factor and phase-angle curves are available upon request.

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

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



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Product features

- 600 V indoor
- 10 kV BIL
- 25 through 400 Hertz
- 50-5000 Primary Amps
- Mechanical rating
 - 180 x rated current
- Thermal rating
 - 80 x rated current, one second
- Continuous current rating factor
 - 50-4000 Primary Amps
 - 1.33 @ 30°C ambient
 - 1.00 @ 55°C ambient
 - 5000 Primary Amps
 - 1.00 @ 30°C ambient
 - 0.50 @ 55°C ambient
- UL Recognized component; File No. E96461

Instrument transformers

27 kV voltage transformers

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Voltage transformers

Product features

- 25 kV, indoor
- 125 kV BIL, 60 Hertz
- Primary volts: 7200 - 27600

Application

The VIZ-12 and VIZ-12G indoor voltage transformers are designed for service in metal-clad switchgear and are used for metering, relaying, or control power. Both units are available in single, double, and tapped secondary designs with two accuracy and thermal rating options.

Construction features

The primary and secondary coils are wound using special winding and shielding techniques for improved voltage stress distribution. The coils are designed to withstand continuous operation at either 1.1 or 1.25 times the line-to-line voltage level for Z burden units and the line-to-ground voltage level for Y burden units. For some line-to-ground voltage units, a short-time withstand voltage of 1.9 is available upon request.

Each coil is insulated with mylar film to provide a high dielectric strength between layers. The coils and core are combined to create a complete winding structure that is assembled to a support frame. The entire assembly is vacuum cast in polyurethane for added insulation and protection.

Fuse classifications

These units are available in three fuse classifications: mounted fuse with hardware, unfused with hardware, or unfused without hardware. Optional fuse kits are offered to convert unfused styles to fused styles.

Consult your ABB sales representative concerning overvoltage conditions for designs above the standard rated voltage factor of 1.25.



Baseplate

The baseplate is constructed of corrosion-resistant aluminum and is secured to the encapsulated base support.

Mounting

The VIZ-12 and VIZ-12G can be mounted in upright or cantilever positions.

Test reports

Test reports are stored electronically and can be emailed in various formats at the time of shipment.

Standards

This unit can be tested to all applicable IEEE, CSA, or IEC standards as requested.

Distribution protection and control

Relion relays

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04
Relion 615 series

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05
Relion 620 series

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06
COM600 grid
automation controller

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07
Relion REX640

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

The IEC 61850 implementation in Relion includes fast peer-to-peer communication over the substation bus. GOOSE communication is used between Relion devices in switchgear to form a stable, reliable, and high-speed bus bar protection system, provide fast and dependable auto transfer schemes and zone interlocking. Separate hard-wiring is not needed for the horizontal communication between the switchgear cubicles.

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



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04



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05

The COM600 grid automation controller can be used as a local HMI to display switchgear single line diagrams and the status of devices such as breakers and protection relays. COM600 also provides gateway functionality to enable switchgear integration into SCADA systems. It can be easily installed as part of the switchgear control devices.

Relion 615, 620 and 640 series relays include:

- Comprehensive set of protection and metering functions for feeders, transformers, and motors
- Draw-out design
- Integrated Open/Close push buttons and Local/Remote selector with indicating lights
- Protection and control for one and two breakers as well as breaker-and-a-half schemes
- Enhanced safety with optional arc fault protection in all 615 and 620 series relays
- Web browser based user interface accessible through an RJ45 front port
- Trip coil monitoring
- Monitoring of breaker health parameters such as travel time, number of operations, wear and tear, and spring charging time
- DNP3 and Modbus protocols included standard in all relays
- Relion relays are fully IEC 61850 compliant for communication and interoperability of substation automation devices
- Fully ANSI and RoHS compliant, as well as UL listed



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Switchgear asset health monitoring

Advance 27 can be provided with integrated IR windows, from multiple manufacturers, on the rear door to facilitate thermal monitoring of the cable connections.

For users wanting a greater peace of mind, Advance 27 also comes with a 24x7 monitoring solution for temperature, humidity, and partial discharge activity.

The temperature monitoring is done using either IR sensor technology or SAW sensor technology. The PD activity is monitored with UHF antennas and specialized signal processing.

The monitored data is available locally, as well as remotely in the user's SCADA or historian systems.



Advance® 27 digital

An ABB Ability™ solution

Advance® 27 Digital is an advanced medium voltage switchgear solution — reliability and simplicity are its hallmarks. Digitalization of the protection and control system simplifies construction while increasing safety and versatility. ABB is taking the next dramatic leap forward in advancing the technology of switchgear solutions.

Product and process optimization



Reduced footprint

Sensors are more compact than traditional instrument transformers

Bus/line potential transformer compartments can be eliminated

Up to **25%** less space needed



Optimized weight

Conventional instrument transformers weigh 40-60 lbs

Sensors weigh 1.5-4.5 lbs

Up to **25%** weight reduction



Faster delivery to site

More efficient engineering versus conventional protection and control

Late customization possible

Up to **30%** faster delivery



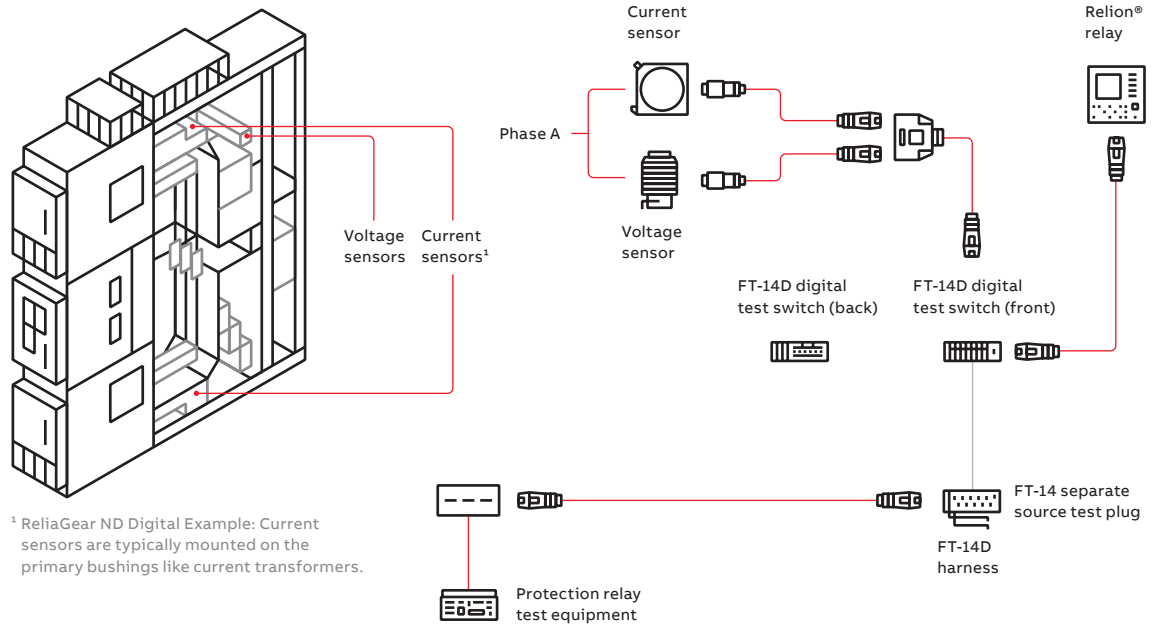
Faster installation/commissioning

Fewer frames to install and fewer inter-frame connections

Fewer components to test and reduction of inventory

25% reduction

- 08
Minimized analog wiring in the switchgear increases reliability
- 09
Rogowski coil
- 10
Resistive voltage divider



— 08

Next level safety

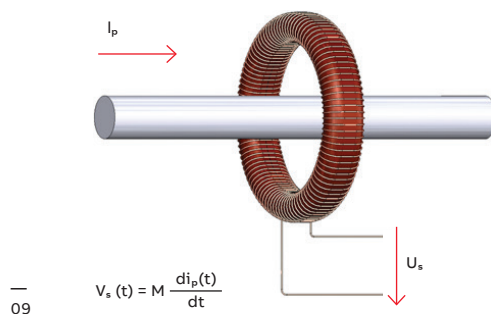
- Minimizes the amount of operator interaction while troubleshooting and servicing
- No potential exposure to open secondary CT circuits
- Minimizes potential for high voltage exposure with closed door racking

Next level sustainability

- Reduces resource consumption in manufacturing
- Significant savings of CO₂ over lifetime
- Energy loss is minimized

Current sensors

- Rogowski coil
- Output voltage is proportional to the derivative of primary current
- Output voltage is integrated by protective relay
- No saturation (air core)
- Open CT hazard eliminated
- Linear through the entire measuring range
- One sensor for all current ratings for up to 4000 A



Next level reliability

- Sensors are immune against grid disturbances such as Ferro resonance phenomena
- Less wiring required – Decreased risk of potential operator error
- IEC 61850 + Ethernet-based GOOSE messaging digital communication enables fast and precise actions in case of malfunction

Voltage sensors

- Resistive voltage divider (RVD) sensors
 - Passive elements
 - No fuses required
- No Ferro resonance (non-inductive)
- Inherently safe as they fail open
- One sensor for all voltage ranges
- Three-phase configurations (wye-wye, open delta) are configured in the IED

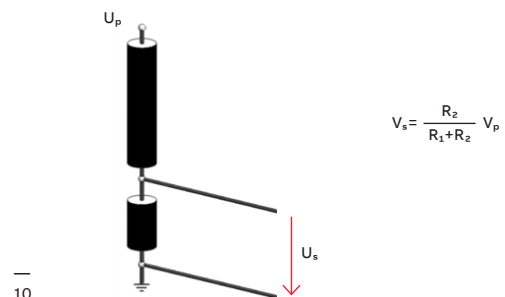






ABB Inc.

305 Gregson Drive
Cary, NC 27511 USA
abb.com/contacts

abb.com/mediumvoltage

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