MEDIUM VOLTAGE AIS ANSI SWITCHGEAR

Advance and Advance 27
Non-arc-resistant MV ANSI switchgear
Agenda

Advance and Advance 27
- Ratings, dimensions and qualifications
- MV ANSI circuit breakers for Advance and Advance 27
- Design features
- Auxiliary compartments
- Enclosures
- Accessories
- Key options
- Key differentiators and values
## Advance and Advance 27
### Ratings, dimensions and qualifications

**Metal-clad non-arc-resistant switchgear**

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Voltage ratings:</strong></td>
<td>Advance = 5, 8.25 and 15 kV; Advance 27 = 27 kV</td>
</tr>
<tr>
<td><strong>Continuous current ratings:</strong></td>
<td>5-15 kV - 1200, 2000, 3000 A, (4000 AFAC*); 27 kV – 1200/2000 A</td>
</tr>
<tr>
<td>** Interruption ratings:**</td>
<td>5-15 kV - 25, 31.5, 40, 50 and 63 kA; 27 kV – 16, 25 kA</td>
</tr>
<tr>
<td><strong>Enclosure type:</strong></td>
<td>Category B</td>
</tr>
<tr>
<td><strong>Enclosure dimensions:</strong></td>
<td>36”w x 95”h x 85/92”d (27 kV is 92”d only)</td>
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<tr>
<td></td>
<td>Rear 10” or 20” extensions and front 10” extensions available</td>
</tr>
<tr>
<td><strong>Outdoor enclosure:</strong></td>
<td>Outdoor Non-Walk-in (ODNWl); Single Row Walk-in (ODSRWl) or eHouse/PDC</td>
</tr>
<tr>
<td></td>
<td>ODNWl is ABB design, tested and UL certified to C37.20.2</td>
</tr>
<tr>
<td></td>
<td>ODSRWl design is by Switchgear Power Systems (third-party)</td>
</tr>
<tr>
<td><strong>Certifications:</strong></td>
<td>Advance = C37.20.2-1993; UL; CSA**; Advance 27 = C37.20.2-1993; UL</td>
</tr>
<tr>
<td><strong>Seismic qualified to:</strong></td>
<td>UBC-1997, IBC-2012, CBC-2013, ASCE 7-10, IEEE 693-2005</td>
</tr>
<tr>
<td></td>
<td>SDS = 2.0 g, SS = 3.0 g, Ip = 1.5 for z/h = 1</td>
</tr>
</tbody>
</table>

* 4000 A is forced air cooled rating ** CSA available for 5/15 kV only
**Key features and values**

- All breakers have integrated racking trucks
- Roll-on-floor options are available to allow breakers in lower compartments to be rolled directly into the frame without the use of ramps or lift trucks
- ADVAC® breakers require the least amount of maintenance of all spring-charged mechanism breakers on the market today
- SmartCoil quick change technology included with ADVAC Model 4 breakers
- AMVAC™ breakers require the least amount of maintenance of all breakers on the market
- AMVAC comes standard with a 5-year warranty

<table>
<thead>
<tr>
<th>ADVAC® Model 4</th>
<th>AMVAC™ Model 4</th>
<th>ADVAC® Classic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breaker</td>
<td>Voltage</td>
<td>Continuous</td>
</tr>
<tr>
<td></td>
<td>class (kV)</td>
<td>current (A)</td>
</tr>
<tr>
<td>ADVAC M4</td>
<td>5, 8, 25, 15</td>
<td>1200, 2000, 3000</td>
</tr>
<tr>
<td>AMVAC M4</td>
<td>5, 15, 27*</td>
<td>1200, 2000, 3000</td>
</tr>
<tr>
<td>ADVAC Classic</td>
<td>5, 15</td>
<td>1200, 2000, 3000</td>
</tr>
</tbody>
</table>

*AMVAC 27 ratings = 1200 and 2000 A, 25 kA maximum, breaker is UL certified to 28.5 kV
ADVAC breaker not available for Advance 27
Advance
Generator circuit breakers

**ADVAC G generator circuit breakers**

Tested to new combined IEC 62271- C37.013 standards

- 50 kA GFF/50 kA SFF – Advance/SafeGear
  - Non-UL version released Q4-2017
  - UL version to be released when 50/63 GCB is completed
- 25 kA GFF/40 kA SFF – Advance/SafeGear
  - UL version released Q4-2017
  - 50 kA GFF/63 kA SFF – for use in SafeGear HD platform only. Currently in development

**Customer values**

Tested to the latest global standard IEC/IEEE 62271-37-013

Enables compact and full protection and connection of small power generators

Tested for out-of-phase switching and dc-components up to 130%

Withstand higher TRV values than breakers tested to previous C37.013a standard

Tested to the higher duty M2 mechanical endurance classification

Can be used with the ABB SmartRack® electric racking system
Design features

**Galvanized steel construction**

- High reflectivity increases visibility in compartments
- Corrosive resistant—suitable for use in unusual environment conditions
- Modular construction provides isolated LV compartments for increased personnel safety

**Hem bending**

- Superior strength and rigidity
- Reduced sharp edges for increased safety
- Reduces arc propagation between compartments
- Forms a self-supporting structure

**Delrin technology**

PT, CPT and CPT fuse primary connections use Delrin tipped primary contacts

- Increased personnel safety by eliminating arcing during racking
- Negates the need for shutters in auxiliary device compartments
Advance and Advance 27

Design features

Compartments

- Breaker – top or bottom, one-high or two-high (stacked)
- Instrument – LV compartment – isolated from HV
- Auxiliary compartments
- Main bus compartment
- Cable compartment
- Vent chamber (used for cooling in Advance)
- 10-inch front extension can be added – allows relays and instruments to be located on breaker doors
- Customized depths available when needed
- Modular design offers great flexibility in design configurations, increased personnel safety and robust structural integrity.
Design features

**Cable compartments**

- Insulated boots for cable connections
- Cable support structures
- Adjustable ground sensors mounting
- Cables routed through segregation barriers to meet metal-clad construction requirements
- Floor cover plates available for snubbing up cable conduits
- Galvanized steel construction makes it easier to see inside the cable compartments
- Ample room for cable pulling and bend radius
Advance and Advance 27

Design features

**Breaker compartments**

- Automatic primary and secondary disconnects
- Shutters to cover primary contacts
  - Advance standard: grounded metal, Lexan available. Advance 27 standard: Lexan
- Breaker position indicator
- Large viewing window on breaker door for quick, easy breaker position verification
- Dead front design when breaker is installed
- Breaker-to-door interlock available
- Closed-door racking for personnel safety
- Current transformers located on bushings
- SmartRack remote racking system available – Keeps operators away from switchgear

**Customer values**

- Closed-door racking provides a higher degree of operator safety than typical open-door racking
- SmartRack remote racking available – Improves operator safety
- Automatic primary and secondary contacts for increased reliability
- Large viewing windows and position indicators – safely determine the breaker position within the frame
- Automatic shutters for ensuring all primary parts are not exposed
Advance and Advance 27
Breaker compartment

- Primary contact shutters
- Shutter actuator arm
- Sliding secondary contact assembly
- Breaker position indicator
- Interference plate
- Breaker ground bus
- Current transformers
- Space heater w/guard
- TOC Switch
- T/B mounting access plate
- T/B mounting access plate
Auxiliary compartments

PT, CPT and CPT fuse compartments

- Closed-door racking
- Delrin snuffer contact technology
- PTs – Wye-Wye, Open Delta, Broken Delta
- CPT – 5, 10 or 15 kVA, single-phase w/integral fuse
- Standard secondary breaker mechanically interlocked with CPT truck
  - CPT Fuse – Single- or three-phase applications
  - For remote or rear mounted CPT
  - 5/15 kVA up to 112.5 kVA 3-ph, 50 kVA 1-ph
  - 27 kV up to 45 kVA 3-ph, 50 kVA 1-ph

Customer values

- Closed-door racking provides a higher degree of operator safety than typical open door racking
- Delrin snuffer contact technology increases product reliability and operator safety
- CPT rollout compartments provide increased flexibility and compactness of design
Advance and Advance 27
Tools and accessories

**Tools and accessories**

- Breaker operation accessories:
  - Racking crank and lifting yoke
  - Test jumper – connects between compartment and externally located breaker
  - Test cabinet – allows testing in adjacent room
- SmartRack remote racking system
  - Electrically racks the breakers in and out of the compartment – keeps personnel away from frame
- Hydraulic foot operated lift truck
- Manual and electrically operated Ground & Test devices (up to 50 kA)
  - Safely ground primaries when performing maintenance

**Customer values**

- G&T devices provide means to safely test and ground the primary circuits for maintenance personnel
- SmartRack provides personnel safety by allowing operators to rack breakers in and out while being safely away from the switchgear
- Lift trucks provide safety to operators while moving, installing and removing breakers from the cell
- Tools and accessories provide the means to easily operate and maintain the circuit breakers used in switchgear
# Key options

<table>
<thead>
<tr>
<th>Ultra Fast Earthing Switch (UFES)</th>
<th>Asset health monitoring</th>
<th>REA arc detection system</th>
</tr>
</thead>
</table>
| Incident energy level reduction device | Options available:  
- IR sensing (wired)  
  - Temp & humidity only  
- SAW sensing (wireless)  
  - Temp, humidity, PD  
- HMI for front of switchgear available  
- Improves personnel safety as IR ports not needed/less time required by operators to be around equipment  
- Increases reliability by detecting potential issues before they create a fault | High speed arc detection <2.5 ms  
- Light detection via fiber optic  
- Light or light and current can trip  
- Multi-shot use  
- Can be coordinated with other protective devices  
- Clears arc fault in 53-85 ms  
- Can be used with the Ultra Fast Earthing Switch - UFES |
| Clears arc faults by grounding system  
<\= 4 ms to extinguish arc fault  
Can work as stand alone or in conjunction with REA arc detection system  
Increases personnel safety by reducing the incident energy level  
Prevents switchgear damage – increases reliability  
Fastest in market from sense to trip | | |
Digital switchgear solutions

IEC61850 w/GOOSE messaging and process bus
Voltage and current sensors
Low energy analog input relays

Safety
– No open secondary CT issue
– Low output voltages
  • ~180 mv for current; ~10 V for voltage

Simple - 80% less wiring

Reliable – No CT saturation; No ferro resonance

P&C flexibility – Last minute load changes are no problem

Fault current protection

FC protector and IsLimiter
• Solves problems of short circuit values exceeding equipment ratings
• IsLimiter easily coordinated with P&C systems
• Construction savings
  • Cables, raceway, replacing switchgear
  • Can reduce fault current requirements for entire system in greenfield applications
Indoor construction as defined by ANSI C37.20.2

Outdoor enclosures available:
- Outdoor non-walk-in (ODNWI)
  - Designed and tested per ANSI C37.20.2, similar to NEMA 3R
  - Designed and manufactured by ABB
- Outdoor single-row walk-in (ODSRWI) (sheltered aisle)
  - Designed and manufactured by Switchgear Power Systems (SPS)
  - NEMA 3R construction
- Power Distribution Center (PDC) (e-house)
  - PDC’s by third-party suppliers

Customer value
- Enclosures designed and tested to ANSI standards ensure highest quality and reliability
- ODNWI enclosures are a low cost option for unmanned sites
- ODSRWI enclosures provide aisle space for operating and maintaining equipment out of the weather elements
Advance and Advance 27
Key options - utility metering cabinets

**Advance/Advance 27 – UMC features and ratings**

- Voltage ratings of 5, 8.25 and 15 kV
- Fault current ratings of 25, 31.5, 40 and 50 kA
- Continuous current ratings of 1200/2000/3000 A
- Certified to ANSI 37.20.2
- Typical dimensions: 95”h x 85/92”d x 36-60”widths
- Padlockable and sealable PT, metering and CT compartments
- Available in hot or cold sequence configurations
- Top or bottom entry with bus duct or cables
- Custom designs can be made for just about any utility

**UMC customer value**

- Flexibility in design to meet most all utility requirements
- Can be integrated into the switchgear line-up, or set as stand alone
- Flexible cable entry options that can accommodate large or multiple cables or bus duct
- ABB can obtain UMC design approval directly with the utility
## Key differentiators and values

<table>
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<tr>
<th>Differentiator</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>Separate low voltage compartment for instrumentation mounting</td>
<td>Instrumentation and controls are mounted away from MV presence – personnel safety</td>
</tr>
<tr>
<td>Use of hem bending and galvanized steel</td>
<td>Robust construction with natural corrosion resistance - reliability</td>
</tr>
<tr>
<td>Modular building block design</td>
<td>Field changes or repair times greatly reduced – reliability and flexibility</td>
</tr>
<tr>
<td>85-inch depth for all 5 and 15 kV applications, 35-inch width and 92-inch depth at 27 kV (competitors average 95 inches deep)</td>
<td>Space savings means dollars saved in PDC or e-house applications – reduced cost of ownership</td>
</tr>
<tr>
<td>Optional active arc-mitigating devices such as UFES and REA</td>
<td>Active arc-mitigation can result in reduced incident energy level – offers increased personnel safety</td>
</tr>
<tr>
<td>SmartRack remote racking system for all breakers and auxiliary compartments</td>
<td>Remote racking means increased operator safety</td>
</tr>
<tr>
<td>ADVAC and AMVAC breakers offer the lowest maintenance in the industry</td>
<td>Less maintenance = less cost and increased personnel safety</td>
</tr>
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</table>

**Advance with AMVAC or ADVAC offers the safest, most reliable MV ANSI non-arc-resistant switchgear available**