2018


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

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

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

# Advance and Advance 27

## MV ANSI circuit breakers

### 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

**ADVAC® Model 4**

**AMVAC™ Model 4**

**ADVAC® Classic**

| Breaker | Voltage class (kV) | Continuous current (A) | Interrupt (kA) | Close and latch (kA, peak) | BIL (kV, peak) | Low frequency withstand (kV) |
|---|---|---|---|---|---|---|
| ADVAC M4 | 5, 8.25,15 | 1200, 2000, 3000 | 25, 31.5, 40, 50 | 65, 82, 104, 130 | 60, 95 | 19, 36 |
| AMVAC M4 | 5, 15, 27* | 1200, 2000, 3000 | 25, 31.5, 40, 50 | 65, 82, 104, 130 | 60, 95, 125* | 19, 36, 60* |
| ADVAC Classic | 5, 15 | 1200, 2000, 3000 | 63 | 164 | 60, 95 | 19, 36 |

*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

**GFF – Generator Fed Fault  SFF – System Fed Fault**

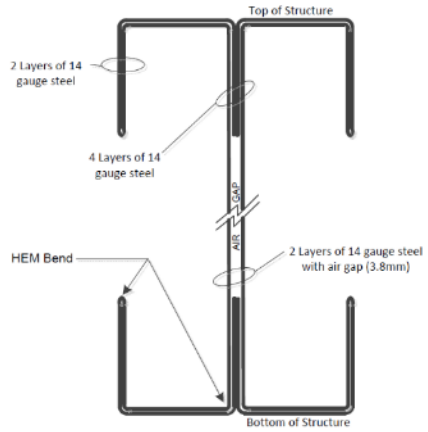
# Advance and Advance 27

## 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

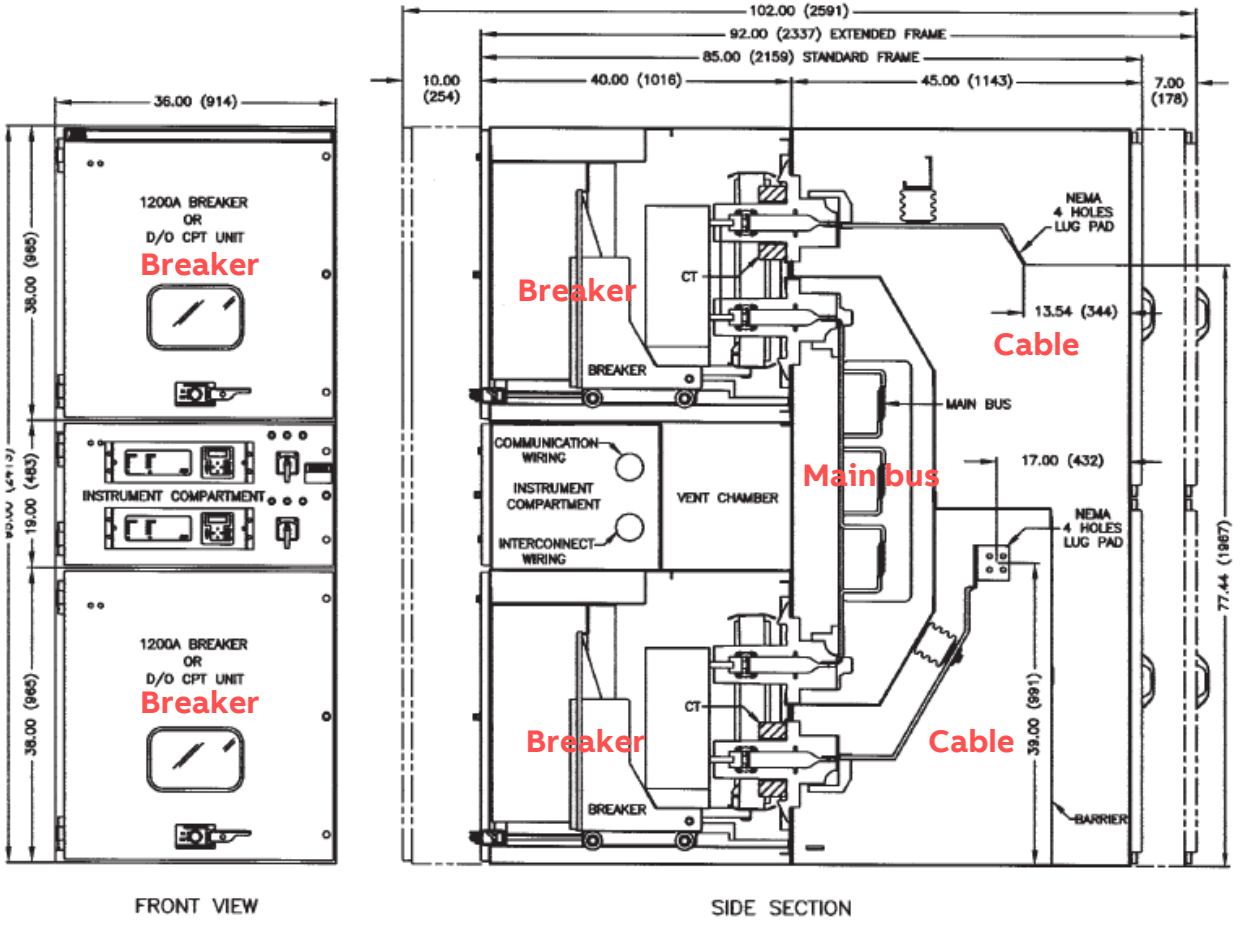
- Increased personnel safety by eliminating arcing during racking
- Negates the need for shutters in auxiliary device compartments

# 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.



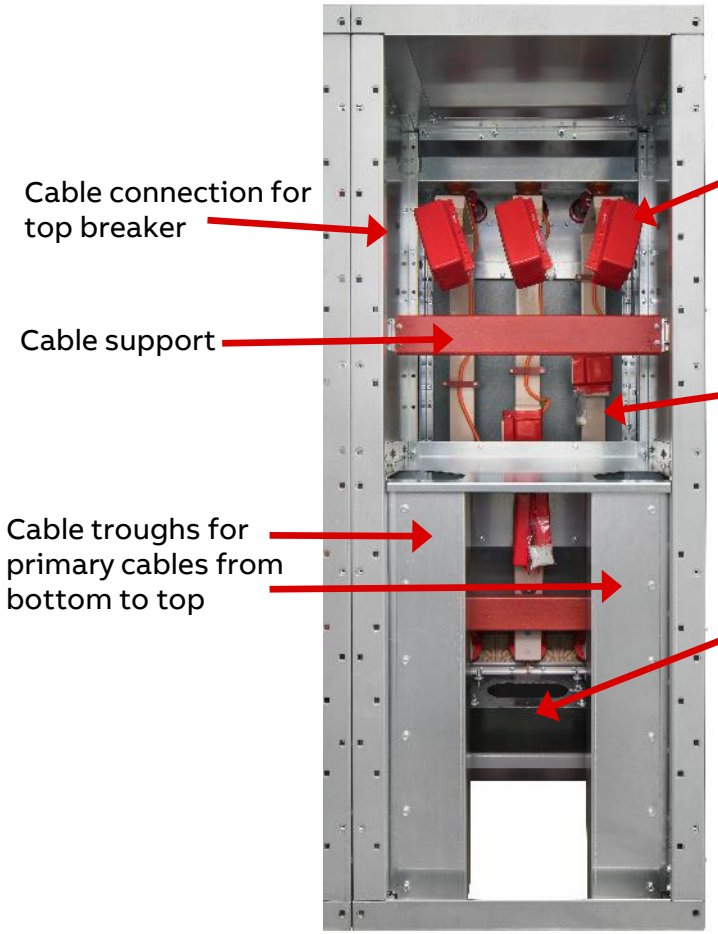
# Advance and Advance 27

## Design features

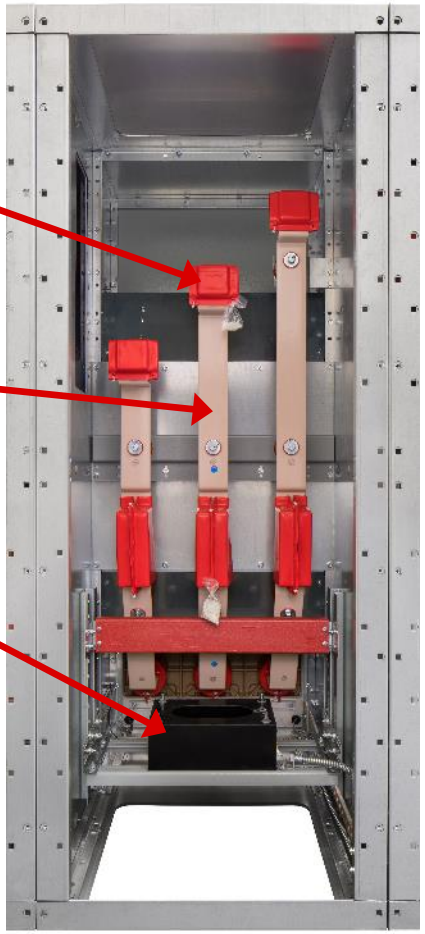
### Cable compartments

- 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




Two-high breaker cable compartment



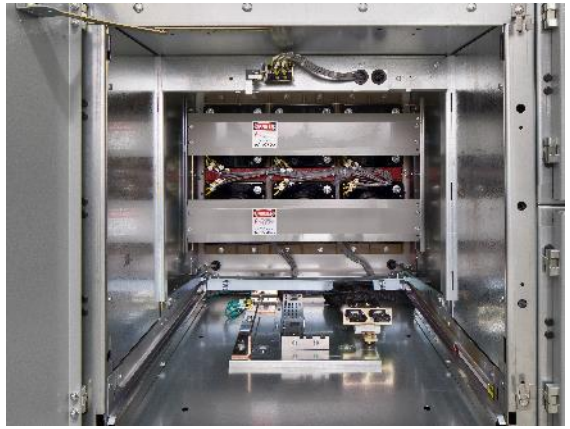

Tie transition with cable feeder

# 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



Advance Breaker Compartment

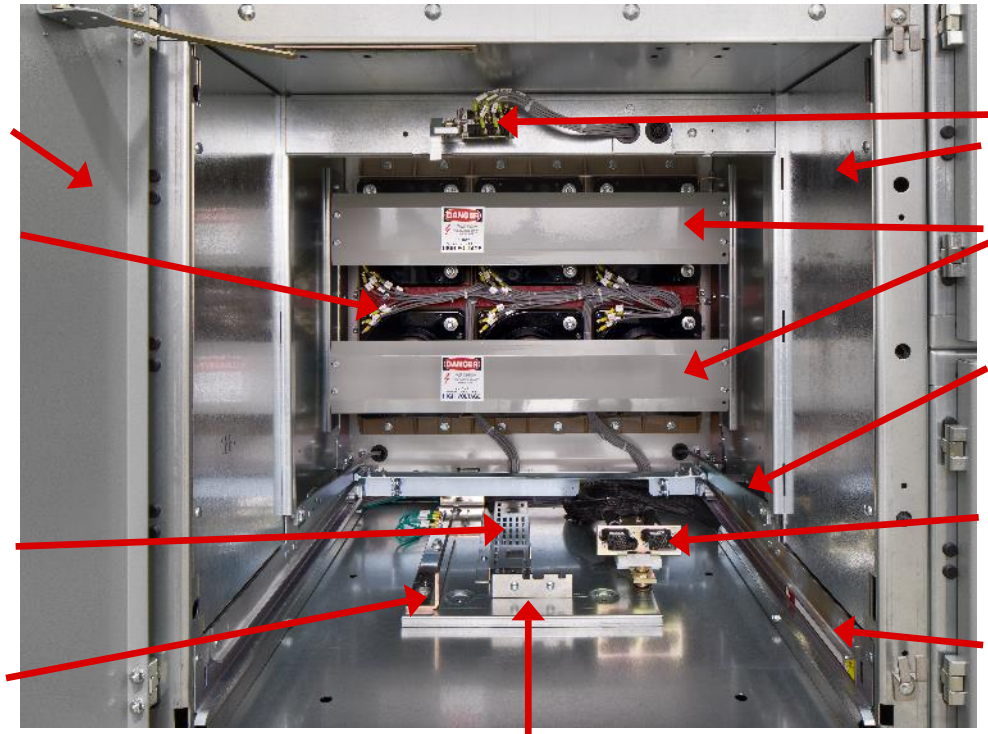

Advance 27 breaker compartment

### 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

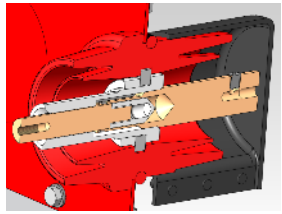


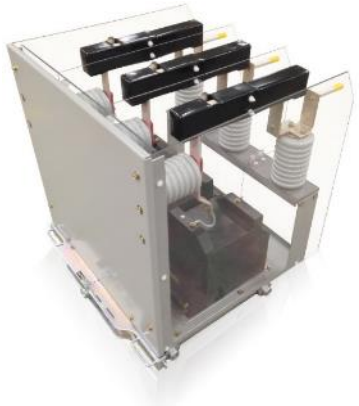
# Advance and Advance 27

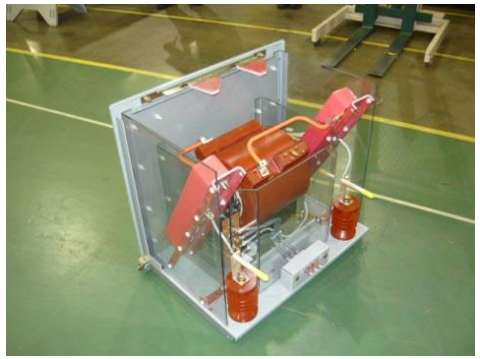
## Auxiliary compartments

### 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

# Advance & Advance 27

## Key options

### Ultra Fast Earthing Switch (UFES)

**Incident energy level reduction device**

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**

### Asset health monitoring

**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**

### REA arc detection system

**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

# Advance and Advance 27

## Key options

### Digital switchgear solutions

**IEC61850 w/GOOSE messaging and process bus**

Voltage and current sensors

Low energy analog input relays

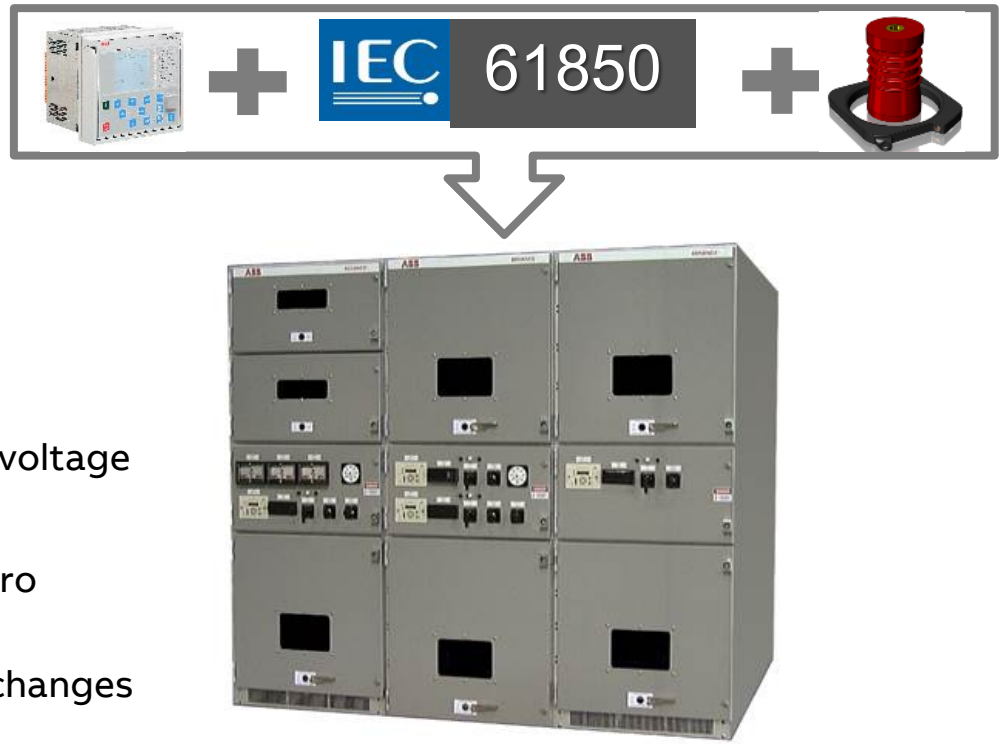
**Safety**

- 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

# Advance and Advance 27

## Key options - enclosures

### Enclosure types

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
- Pre-engineered and approved designs for:  EUSERC 400 std, Idaho Power, NV Energy, PG&E, Portland Gen.Elec,  Power Utility Districts,  Puget Sound Energy,  Sempra Energy
- ABB can obtain UMC design approval directly with the utility

# Advance and Advance 27

## Key differentiators and values

| Differentiator | Value |
| --- | --- |
| • Separate low voltage compartment for instrumentation mounting | • Instrumentation and controls are mounted away from MV presence – personnel safety |
| • Use of hem bending and galvanized steel | • Robust construction with natural corrosion resistance - reliability |
| • Modular building block design | • Field changes or repair times greatly reduced – reliability and flexibility |
| • 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) | • Space savings means dollars saved in PDC or e-house applications – reduced cost of ownership |
| • Optional active arc-mitigating devices such as UFES and REA | • Active arc-mitigation can result in reduced incident energy level – offers increased personnel safety |
| • SmartRack remote racking system for all breakers and auxiliary compartments | • Remote racking means increased operator safety |
| • ADVAC and AMVAC breakers offer the lowest maintenance in the industry | • Less maintenance = less cost and increased personnel safety |

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


ABB