

# Medium Voltage VHC-Series<sup>+</sup> Conversion



## Vertical Lift Switchgear History

The first draw-out switchgear circuit breakers were vertical-lift designs because they were oil filled. The primary conductor bushings protruded from the top so the oil would not leak. Westinghouse announced its De-ion circuit breaker interruption technology in 1925. This was followed by a patent for the De-ion and horizontal draw-out concept (DH). Most manufacturers licenced the technology and re-configured their switchgear for horizontal draw-out. General Electric Company (GE) used the De-ion concept, but retained the vertical lift (Magne-Blast<sup>®</sup>) switchgear design until 1980.

## Maintenance - Expected Life

GE Magne-Blast<sup>®</sup> switchgear is heavy-duty switchgear that can last for many years beyond its original design life of 30-50 years as long as it is properly applied, operated and maintained. Failure to comply with these criteria eventually creates issues for any switchgear design.

## Why Convert Magne-Blast to Horizontal Draw-out?

Lack of maintenance and expertise in specific areas can result in issues:

- Lift/elevator mechanisms
- Lift/elevator motors
- Cost and availability of renewal parts
- Time/cost of maintenance
- Primary disconnects

Due to changes in NFPA-70E, users are asking manufacturers to extend the time between recommended maintenance intervals to as long as ten years.

## Conversion Methods

Most owners of Magne-Blast<sup>®</sup> switchgear like their vertical structures but want reductions in maintenance costs and extensions in the required service intervals of the cell components and power circuit breakers. IEEE C37.59 provides guidance on retrofill conversions but there are some issues associated with the process.

- Outages for bus measurements
- Long outage for installation
- IEEE test certification costs
- Possible loss of metal-clad integrity
- Vertical structure changes may prevent reverting to the original design

## VHC-Series<sup>+</sup> Conversion

GE Magne-Blast<sup>®</sup> vertical structures can now be converted to horizontal draw-out with Eaton's new VHC-Series<sup>+</sup>. The reversible conversion requires no cutting or drilling of the original vertical cell structure and does not violate the original metal-clad integrity. The system is also fully tested to C37.59 and C37.09 for  $k=1$  and  $k>1$  rating structures. After conversion, the new system has an extended scheduled maintenance interval and requires no lubrication or adjustments for 10 years or 10,000 operations, whichever comes first. The vertical cell lift mechanism is no longer used, so there is no maintenance required.

## Vertical Structure Primary Contacts

Some older vertical cell primary contacts can leak a pitch-like material over time or can harden and crack. Eaton has a process to repair these cracks and prevent future leakage of the pitch material. This process, depending on service conditions and maintenance, can extend the useful life of GE Magne-Blast<sup>®</sup> cell structure primary conductors for up to thirty years.



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## VHC-Series+ Availability

| Existing AM4.16 Circuit Breaker Type | VHC-Series+ Circuit Breaker Type ① | Maximum Application Voltage<br>kV | Nominal 3-Phase MVA Class<br>MVA | Existing Circuit Breaker Rated Continuous Current at 60 Hz<br>Amps | Rated Voltage Factor<br>K | Rated Withstand ANSI Test Voltage |                 | Rated Short-Circuit<br>I<br>kA RMS | Maximum Sym. Interrupting Capability<br>KI<br>kA RMS | Closing and Latching / Momentary Capabilities<br>kA RMS / Peak |
|--------------------------------------|------------------------------------|-----------------------------------|----------------------------------|--|---------------------------|-----------------------------------|-----------------|------------------------------------|--|--|
|                                      |                                    |                                   |                                  |  |                           | Low Freq. kV RMS                  | Impulse kV Peak |                                    |  |  |
| AM4.16-150                           | 50VHC-36+ ②③                       | 4.76                              | 150                              | 1200 / 2000  | 1.00                      | 19                                | 60              | 36                                 | 36   | 58 / 97  |
| AM4.16-250                           | 50VHC-36+ ②                        | 4.76                              | 250                              | 1200 / 2000  | 1.00                      | 19                                | 60              | 36                                 | 36   | 58 / 97  |
| AM4.16-250                           | 50VHC-41+ ②③                       | 4.76                              | 250                              | 1200 / 2000  | 1.00                      | 19                                | 60              | 41                                 | 41   | 78 / 132   |

① All circuit breakers have a 3 second short-time and 3-cycle interrupting ratings.

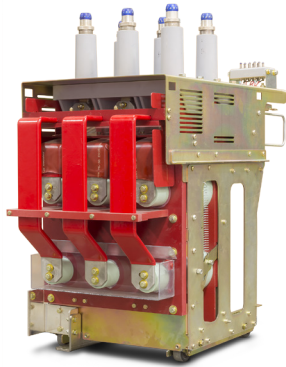
② Non-standard rating.

③ Requires bus bracing study and additional switchgear bracing.

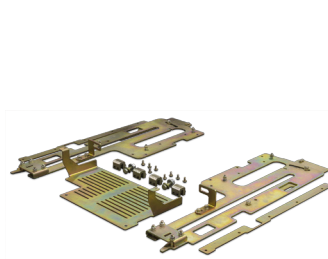
## VHC-Series+ Components (VHC-36+ 1200A shown)



Vertical Cell Structure Adapter  
(Front View)



Vertical Cell Structure Adapter  
(Rear View)



Vertical Cell Structure  
Conversion Components



VHC-36+ Horizontal Draw-out  
Circuit Breaker

## VHC-Series+ Installation (AM4.16 shown in a laboratory environment in a de-energized cell Structure)



Lower and remove the existing  
vertical lift circuit breaker



Insert the vertical structure  
adapter, lift into position and  
secure with provided hardware



Insert horizontal draw-out VHC+  
circuit breaker into adapter



Rack VHC+ to connected position  
manually or with an RPR-2

### Conversion Process

VHC-Series+ conversions should be performed by Eaton's EESS personnel. The conversions can be performed in a de-energized vertical structure in less than 45 minutes and is reversible. Contact your local Eaton representative for details.

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