Metal Clad
Air Insulated Switchgear

SecoGear
SecoGear Metal Clad Switchgear

Features

- Fully metal-clad
- Equipped with Embedded pole VCB
- Full Front access (can be installed against wall)
- Perfect interlocking system to ensure the safety of the operator and equipments
- Passed high altitude testing
- Arc Proof tested
### Electrical Data

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>24kV</td>
</tr>
<tr>
<td>Frequency</td>
<td>50/60Hz</td>
</tr>
<tr>
<td>Power Frequency Withstand Voltage</td>
<td>65kV</td>
</tr>
<tr>
<td>Rated Lighting Impulse Withstand Voltage</td>
<td>125kV</td>
</tr>
<tr>
<td>Rated current horizontal busbars</td>
<td>630/1250/1600/2000/2500A</td>
</tr>
<tr>
<td>Rated short time withstand current (3s)</td>
<td>20kA, 25kA and 31.5kA</td>
</tr>
<tr>
<td>Rated peak withstand current</td>
<td>50kA &amp; 63kA, 80kA</td>
</tr>
<tr>
<td>Standard</td>
<td>IEC 62 271-200</td>
</tr>
</tbody>
</table>
# Type Tested 24kV Switchgear  
**Type SecoGear (TTA)**

## Mechanical Data

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measurement</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heigh</td>
<td>2250 mm</td>
<td></td>
</tr>
<tr>
<td>Width</td>
<td>800 mm</td>
<td>(up to 1250A Main bus)</td>
</tr>
<tr>
<td></td>
<td>1000 mm</td>
<td>(1600A – 2500A Main bus)</td>
</tr>
<tr>
<td>Depth</td>
<td>1680 mm</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>800 ~ 1200kg</td>
<td></td>
</tr>
<tr>
<td>Frame Material</td>
<td>Alu-Zinc Steel (2mm thickness)</td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IP4X</td>
<td></td>
</tr>
<tr>
<td>Finish color (Coating)</td>
<td>RAL 7032 (Light Grey)</td>
<td></td>
</tr>
<tr>
<td>Access</td>
<td>Full Front Access</td>
<td></td>
</tr>
</tbody>
</table>
The Fact about Alu-Zinc Steel

- 90% of Metallic Parts of SecoGear are utilizing Alu-Zinc Steel
- Alu-Zinc Steel is 3-7 times longer lifetime than Hot Dip Galvanized steel
- Good environment choice
- Alu-Zinc surface is twice harder
SecoGear Metal Clad Switchgear
Functional Compartments

A. Main Busbar
B. Breaker
C. Cable
D. Low Voltage Compartments
SecoGear Metal Clad Switchgear
Busbar Compartment

- Individual metal clad compartment
- Mainbus Inter-unit Bushing with Stainless steel support plate
- Rounded Edge Copper busbar
- Fully Insulated Busbar
- Pressure relief flap
SecoGear Metal Clad Switchgear
Breaker Compartment

- Individually metal clad compartment
- Grounded metal shutters (Padlockable)
- Mechanical interlock between VCB and Earthing switch
- Pressure relief channel
- Spring loaded ground bus for VCB
- Door closed operation
SecoGear Metal Clad Switchgear
Breaker Compartment

- Mechanical interlock for plug in socket
- VCB Truck Position Switch (Standard)
- Space Heater 50W (Standard)
SecoGear Metal Clad Switchgear

Drawout VT Compartment

- Grounded metal shutters (Padlockable)
- Door closed operation
- Mechanical interlock for plug in socket
- VT Truck Position Switch (Standard)
- Blown Fuse Switch (Option)
- Surge Arrester (Option)
SecoGear Metal Clad Switchgear
Cable Compartment

- Individually metal clad compartment
- Reliable interlock between cable compartment door and Earthing switch
- Ample space for cable connection
- Make-Proof Earthing switch
- Pressure relief channel
- Cable clamp
- Ground CT mounting (optional)
- Lightning Arrester (optional)
SecoGear Metal Clad Switchgear
Cable Compartment

- Space heater (100W)
- Post Insulator with voltage divider sensing
- Earthing switch auxiliary contacts
- Control Cable glands
SecoGear Metal Clad Switchgear
Low Voltage Compartment

- Individual metal clad compartment
- Modular compartment
- Ample space for secondary component installation
- Gasketed door to prevent dust (standard)
SecoGear Metal Clad Switchgear
Low Voltage Compartment

- 3-stacked Swing mounted Terminal
  Block plate
- Control cable glands 2x4 (Left and Right)
- Inter-unit cable through
- Heater current monitor (standard)
- Mimic Diagram with indicator
- Mimic Diagram with position indicating lights (Standard)
- High Voltage potential indicator (Standard)
SecoGear Metal Clad Switchgear
Cross Sectional View

- Main Busbar
- Inter-unit Bushing
- Current Transformer
- Earthing Switch
- Circuit Breaker
SecoGear Metal Clad Switchgear
Typical Incomer/Feeder 2500A

Incoming/feeder unit
(24kV/2500A/25kA)
SecoGear Metal Clad Switchgear
Drawout VT Module

Incoming Panel

Metering Panel
SecoGear Metal Clad Switchgear
Typical Bus Tie VCB

Bus tie (24kV/2500A/25kA)
SecoGear Metal Clad Switchgear
Typical Bus Riser with Drawout VT
SecoGear Metal Clad Switchgear
Special Design VT and Earthing Switch

Busbar Earthing Switch

VT at Main Busbar
SecoGear Metal Clad Switchgear
Typical Protection (Feeder)

Functionality

Price

UR – “Flexibility in Protection, Control, and Communications”
SR – “Designed and Built for the Industrial Environment”
“M-Family – “Cost Effective Digital Protection”

SecoGear Metal Clad Switchgear
Typical Protection (Feeder)
SecoGear Metal Clad Switchgear

Typical Protection (Transformer)

Functionality

Price

SR745

T35

T60

UR – “Flexibility in Protection, Control, and Communications”

SR – “Designed and Built for the Industrial Environment”
SecoGear Metal Clad Switchgear
World Class Factory
SecoVac
Vacuum Circuit Breaker
Embedded Pole Type
SecoVac Embedded Pole VCB

Fully type tested and complies to IEC Standards:

- IEC 60694
- IEC62271-100
SecoVac Embedded Pole VCB
Product Overview

1. Tulip Contact  2. Contact Arm Spring
3. Lower Contact  4. Upper Contact Terminal
5. Embedded Pole  6. Low Resistance VI
7. R Shape Contact  8. Bellow
9. Contact Spring  10. Shutter Driving Plate
11. Insulated Coupling Rod
12. Opening Spring
13. Earthing Contact Terminal
14. Movable Unit  15. Driving Screw
16. Locking Piece  17. Operating Shaft
18. Operation Cover  19. Closing Spring
20. Secondary Plug
SecoVac Embedded Pole VCB

New Generation VCB

- Latest Embedded Pole Design
- High Quality Vacuum Interrupter
- Modular Operating Mechanism
- Cycloid (Tulip) Contact Arm
SecoVac Embedded Pole VCB Interrupter Design

- Lower contact resistance type Vacuum Interrupter
- Insulated Coupling Rod (with dish shape contact springs inside)
- Upper and Lower Contact Terminals
SecoVac Embedded Pole VCB
Technology Challenge

Main technical challenge of embedded pole technology

- The cracking of embedded pole caused by the different heat coefficient multiplier between ceramic tube and the epoxy resin (Ceramic : Epoxy Resin = 1:10)
SecoVac Embedded Pole VCB
Innovative Technology

Solution:

- A special cushion layer made of high insulation, gas tight and strong elastic material was employed around the surface of the ceramic tube of vacuum interrupter before it was embedded, so the cracking is thoroughly avoided.
SecoVac Embedded Pole VCB
APG Process

- Patented Double APG (Auto Pressure Gelatin) Process
- LSR (Liquid Silicon Rubber) cushion layer made of high insulation, gas tight and strong elasticity material
- Employed around the surface of the ceramic tube of vacuum interrupter before embedded
- Cracking is thoroughly avoided
SecoVac Embedded Pole VCB
Embedded Process - APG Process

- Hedrich equipment with latest APG technology ensure the high insulation performance and strong mechanical strength of the embedded pole.
SecoVac Embedded Pole VCB
Embedded Process - Clamping Process

- Clamping machine from Vogel & Huebers
- The most advance clamping machine in the world
- Ensure high insulation performance and strong mechanical strength
SecoVac Embedded Pole VCB
Embedded Process - Epoxy Resin

- High quality epoxy resin from Vantico of Switzerland
- Ensure the high insulation performance
- Strong mechanical strength
- Perfect appearance of the embedded pole
SecoVac Embedded Pole VCB
Advanced Quality Control

- X-Ray check for its APG process quality.
- High insulation performance of the embedded pole is tested by partial discharge test
- Actual measured value of partial discharge shall be less than 5pC
SecoVac Embedded Pole VCB
Advanced Quality Control

Extreme Test....

The SecoVac VCB had successfully passed the repeated lower and higher temperature testing at -40°C and +50°C.
SecoVac Embedded Pole VCB
Advanced Operating Mechanism

- Modularized
- Standardized
- Optimized
- Opening Damper
SecoVac Embedded Pole VCB
Closing/Opening Module

Closing Module

Opening Module
SecoVac Embedded Pole VCB
Benefit of Modular Mechanism

- Less time and no special tool needed for overhaul
- Reduce shutdown time
- Lower maintenance cost
- No mechanical readjustment after the replacement
- Decreased number of items and quantity of spare parts (not more than 6 spare parts items)
- Lower operation and maintenance cost
- Faster lead time (15 days)
SecoVac Embedded Pole VCB
Standardized Module

- Universal closing and opening module for all SecoVac VCB
- Universal secondary control circuit board for all SecoVac VCB
- Standardized production and optimized sourcing management
- Standardized design of parts to shorten the lead time
SecoVac Embedded Pole VCB
Optimized Operating Mechanism

- Few numbers of part (only 145 parts for mechanism)
- Decreased number of the total parts
- Less possible fault points
- Increased reliability of the mechanism
SecoVac Embedded Pole VCB Opening Damper

- Reduce over travel and re-bouncing of the moving contact during opening
- To prevent the over fatigue of the bellow and maintain its mechanical endurance
- To prevent re-ignition or re-strike between contacts
# SecoVac Embedded Pole VCB
## Specific Technical Data

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>Technical Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rated Operating Sequence</td>
<td>-</td>
<td>O-0.3s-CO-180s-CO O-180s-CO-180s-CO</td>
</tr>
<tr>
<td>2</td>
<td>Closing Time (Rated Control Voltage)</td>
<td>ms</td>
<td>35~70</td>
</tr>
<tr>
<td>3</td>
<td>Opening Time (Rated Control Voltage)</td>
<td>ms</td>
<td>25~45</td>
</tr>
<tr>
<td>4</td>
<td>Breaking Time</td>
<td></td>
<td>40~60</td>
</tr>
<tr>
<td>5</td>
<td>Switching Operations of Rated Short-circuit breaking current</td>
<td>Times</td>
<td>50</td>
</tr>
<tr>
<td>6</td>
<td>Mechanical Endurance</td>
<td>Cycles</td>
<td>20,000</td>
</tr>
<tr>
<td>7</td>
<td>Electrical Endurance</td>
<td>Cycles</td>
<td>274 (E2)</td>
</tr>
<tr>
<td>8</td>
<td>Contact Erosion Limit</td>
<td>mm</td>
<td>3</td>
</tr>
</tbody>
</table>
SecoVac Embedded Pole VCB

Advantages of Embedded Pole Type

- High dielectric strength without any further external precautions
- Optimum protection of the vacuum interrupter from moisture, dust and external damage
- Suitability for different climatic conditions
- Elimination of damage or leakage caused by mechanical impact during transportation and installation
- Simplification of the assembly and adjustment to the pole of the VCB
- Compact and robust design
- Full Maintenance-free for its life span
Thank You!