NOVAs Outdoor Pole Mounted Vacuum Circuit Breaker
Powering business worldwide

Eaton delivers the power inside hundreds of products that are answering the demands of today’s fast changing world.

We help our customers worldwide manage the power they need for buildings, aircraft, trucks, cars, machinery and entire businesses. And we do it in a way that consumes fewer resources.

**Next generation transportation**

Eaton is driving the development of new technologies – from hybrid drivetrains and emission control systems to advanced engine components – that reduce fuel consumption and emissions in trucks and cars.

**Higher expectations**

We continue to expand our aerospace solutions and services to meet the needs of new aviation platforms, including the high-flying light jet and very light jet markets.

**Building on our strengths**

Our hydraulics business combines localised service and support with an innovative portfolio of fluid power solutions to answer the needs of global infrastructure projects, including locks, canals and dams.

**Powering Greener Buildings and Businesses**

Eaton’s Electrical Group is a leading provider of power quality, distribution and control solutions that increase energy efficiency and improve power quality, safety and reliability. Our solutions offer a growing portfolio of “green” products and services, such as energy audits and real-time energy consumption monitoring. Eaton’s Uninterruptible Power Supplies (UPS), variable-speed drives and lighting controls help conserve energy and increase efficiency.
Eaton Corporation is a worldwide leader in the design, manufacture, and sale of safe, reliable and high-performance medium voltage power distribution equipment in accordance with IEC, ANSI and GB / DL standards.

Complete Global Medium Voltage Switchgear Solutions
Eaton, a premier leader in designing and manufacturing power distribution and protection equipment in the electrical industry, offers a comprehensive range of medium voltage (MV) solutions to meet the needs of virtually every application. From products that feature cutting-edge design that allow for easy access, maintenance and space savings, to arc-resistant products that enhance safety, Eaton’s medium voltage solutions provide a variety of products for every need. Additionally, Eaton’s global service network provides maximum customer support in all regions of the world.

As one of the few completely vertically integrated and diversified industrial manufacturers in the world, Eaton designs not only MV assemblies, but also the key components that comprise the MV solutions – from steel housing and circuit breaker compartments to vacuum interrupters, circuit breakers, bus systems and fuses.

Eaton’s MV heritage, strengthened by acquisitions such as Westinghouse DCBU, Cutler Hammer, MEM and Holec, has resulted in breakthrough MV technologies and numerous international patents over the years.

Part of Eaton’s complete electrical PowerChain Solutions – which help businesses minimize risks while realizing greater reliability, cost efficiencies, capital utilization and safety – Eaton’s medium voltage equipment meets all applicable standards and certifications such as IEC, NEMA / ANSI, GB / DL, UL, IEEE, KEMA and CSA.

When it comes to medium voltage solutions, you can trust the one name with a long history of proven performance: Eaton.
# NOVAs Outdoor Pole Mounted Vacuum Circuit Breaker

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1. General

**General**

NOVAs outdoor circuit breaker is a three-phase vacuum circuit breaker suitable for pole or substation mounting. It can meet various metering and protection requirements equipped with automation control. NOVAs provides flexible choice to customer with optional supply of current transformer and disconnect.

![NOVAs Outdoor Pole Mounted Vacuum Circuit Breaker](image)

**Standard**

- GB/T 11022 Common specifications for high-voltage switchgear and controlgear standards
- IEC 62271-1 High-voltage switchgear and controlgear- Part1: Common specifications
- GB/T 1984 High-voltage alternating-current circuit-breakers
- IEC 62271-100 High-voltage switchgear and controlgear- Part100: Alternating-current circuit-breakers.

2. Feature

- Solid-encapsulated pole with high-hydrophobicity outdoor epoxy, no oil, no SF6
- Embedded vacuum interrupt
- Internal voltage sensor (optional)
- Spring mechanism with high reliability, up to 10000 times maintenance-free operation
- Manual open & close operation
- Manual or Motor charging (<12s)
- External protective current transformer (Optional)
- Multiple CT ratio of 600/400/200:5
- Integrated disconnector (Optional)
- Switch status indicator: Open/Close status, Charging status.
- Stainless steel or carbon steel tank (IP54)
- Surge protector option when only manual type
- Distribution automation with intelligent FXD control configured
# NOVAs Outdoor Pole Mounted Vacuum Circuit Breaker

## Technical

### 3. Technical parameters

#### Environment

Temperature: Max 50°C, Min -40°C  
Altitude: 2000m  
Humidity: 95%  
Ingress Protection: IP54

#### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage</td>
<td>kV</td>
<td>24</td>
</tr>
<tr>
<td>Rated Current</td>
<td>A</td>
<td>630</td>
</tr>
<tr>
<td>Frequency</td>
<td>Hz</td>
<td>50/60</td>
</tr>
<tr>
<td>Rated Current</td>
<td>A</td>
<td>630</td>
</tr>
<tr>
<td>Power frequency withstand voltage</td>
<td>Phrase to Phrase</td>
<td>kV/1min</td>
</tr>
<tr>
<td>BIL</td>
<td>Phrase to Phrase</td>
<td>kV</td>
</tr>
<tr>
<td>Operation Sequence</td>
<td></td>
<td>0-(0.3s)-CO-(15s)-CO</td>
</tr>
<tr>
<td>Short time withstand current</td>
<td>kA/s</td>
<td>20/4</td>
</tr>
<tr>
<td>Rated short circuit making current</td>
<td>kA</td>
<td>50</td>
</tr>
<tr>
<td>Rated short circuit breaking current</td>
<td>kA</td>
<td>20</td>
</tr>
<tr>
<td>Line Charging Breaking Current</td>
<td>A</td>
<td>10</td>
</tr>
<tr>
<td>Cable Charging Breaking Current</td>
<td>A</td>
<td>31.5</td>
</tr>
<tr>
<td>Circuit Breaker Level</td>
<td></td>
<td>C2-E2-M2</td>
</tr>
<tr>
<td>Mechanism Type</td>
<td></td>
<td>Spring Mechanism</td>
</tr>
<tr>
<td>Energizing Motor Voltage</td>
<td>V</td>
<td>DC24, AC220/DC220 (Optional)</td>
</tr>
<tr>
<td>Energizing Motor Power</td>
<td>W</td>
<td>80</td>
</tr>
<tr>
<td>Charging time</td>
<td>s</td>
<td>&lt;12</td>
</tr>
<tr>
<td>Opening Release Voltage</td>
<td>Rated</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>V</td>
</tr>
<tr>
<td>Closing Release Voltage</td>
<td>Rated</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>V</td>
</tr>
<tr>
<td>Closing time</td>
<td>ms</td>
<td>40~70</td>
</tr>
<tr>
<td>Opening time</td>
<td>ms</td>
<td>20~70</td>
</tr>
<tr>
<td>Mechanical Lifetime</td>
<td>Times</td>
<td>10000</td>
</tr>
</tbody>
</table>
4. Structure and functions

- Open & Close Indicator
- Manual Open/Close Handle
- Charging Status Indicator
- Energizing Handle
- Open & Close Indicator
- Terminal
- CT
- Surge Protector
- Grounding Terminal

**E-CAP**
- Solid-encapsulated pole
- Vacuum Interrupt embedded (up to 20kA Breaker)
- Over design for creepage distance
- HCEP Insulation Material
  - Low leakage current
  - Low discharge activity
  - Low flash over probability
  - Environment Friendly (no SF6, no Oil)
- 2000m altitude application
NOVAs Outdoor Pole Mounted Vacuum Circuit Breaker

Structure and functions

CT
- HCEP insulation material
- Ratio: 600/400/200/5
- Class: 10P10

Mechanism
- Spring charged, stored energy mechanism
- Up to 10000 times long mechanical life
- Optimized mechanical design
- Easy installation
- Motor / Manual operation
- Low energy
- Light weight

NOVAs-24 can configure a disconnector with integrated design
- Three phase design, moving simultaneously
- Manual Open/Close
- Interlock design to keep the disconnector manipulation safety
- Operation sequence:
  - Open: SWG -> Disconnect
  - Close: Disconnect -> SWG
## Disconnect Parameter

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage</td>
<td>kV</td>
<td>24</td>
</tr>
<tr>
<td>BIL</td>
<td>kV</td>
<td>145</td>
</tr>
<tr>
<td>PF withstand / 1min</td>
<td>kV</td>
<td>50/60</td>
</tr>
<tr>
<td>Rated current</td>
<td>A</td>
<td>630</td>
</tr>
<tr>
<td>Rated making current</td>
<td>kA</td>
<td>40</td>
</tr>
<tr>
<td>Short time withstand current</td>
<td>kA/3s</td>
<td>16</td>
</tr>
<tr>
<td>Mechanical life</td>
<td>Times</td>
<td>2000</td>
</tr>
<tr>
<td>Main Resistance (Incl SWG)</td>
<td>µΩ</td>
<td>150</td>
</tr>
<tr>
<td>Clearance distance</td>
<td>mm</td>
<td>300</td>
</tr>
</tbody>
</table>
General

The FXD circuit breaker control belongs to FXD family. It shared the same platform as FXD recloser control. It is developed by Eaton-Cooper Power System for the distributor automation system, and can meet customer various requirements including relay, metering, monitor, remote control & smart solution.

Standard

- IEC 60255: Measuring relays and protection equipment
- IEEE C37.90: Relays and Relay Systems Associated
- IEC 255-21-3: Vibration, Shock, Bump, and Seismic Tests in Measuring Relays and Protective Equipment; Seismic tests, Class 1 minimum, class 2 preferred.
- EN 61000-4: Electromagnetic Compatibility
- EN 61000-4-12: Oscillatory waves immunity test

HMI

- LCD display
- Operation Buttons
- LED Indicator

LCD Display

- 4 line 16-character wide display
- Enter: Saving modification/entering submenu
- Edit: Modify setting, configurations and values
- Esc: Leave current page to previous page
- Up/Down/Left/Right: Direction

Operation Buttons

- Trip/Close
- Hot Line: Prevent all closing operation and shift to one-trip-lockout
- Block Ground trip fault detection
- Block sensitive fault detection
NOVAs Outdoor Pole Mounted Vacuum Circuit Breaker

Control unit

LED Indicator
- Trip signal was issued, one of them was lighted up
- Indicates that a Ground or Sensitive Fault emerged
- Tripped current is higher than the pre-programmed min trip
- Indicates the control is in a locked out state
- Indicates FXD is in the open position
- Indicates FXD is in the closed position

FXD - Protection
- Phase/Ground/Negative Time Overcurrent
- Phase/Ground/Negative Instantaneous Overcurrent Protection
- Phase/Ground/Negative Sequence High Current Lockout Protection
- Sensitive Earth Definite Time Overcurrent Protection
- Cold Load Pickup Blocking
- Phase Directional Control
- Ground/Sensitive Earth Directional Control
- Negative Directional Control
- Under/Over voltage Protection
- Under/Over Frequency
- Protection TCC:
  ANSI: Moderate/Very/Extremely
  IEC: Inverse/Very/Extremely

FXD - Metering
- Current: IA, IB, IC, I0
- Voltage: UA, UB, UC, U0, Uab, Ubc, Uca
- Real Power
- Reactive Power
- Apparent Power
- THD%

Communication
- Communication Board:
  - 1*RS232 + 1*RJ45
  - 2*RS232
  - 2*RJ45
- Communication Protocol:
  - DNP3.0
  - Modbus
  - IEC 101
  - IEC 104
  - IEC 61850

Communication Module:
- GPRS
- SMS
- Optical Fiber Box

The red light will be lighted when these six situations occurred: CLPU Failure, No AC Present, Battery Alarm, Trip Malfunction, Close Malfunction and Interrupter Malfunction

Indicates the control is operating normally
Indicates the presence of AC Power
Indicates the presence of BATTERY Power

FXD - Protection

FXD - Metering
NOVAs Outdoor Pole Mounted Vacuum Circuit Breaker

Outline drawing

6. Outline drawing

- Without Current Transformer

- With Current Transformer

Weight: 85kg

Weight: 105kg
NOVAs Outdoor Pole Mounted Vacuum Circuit Breaker

Outline drawing

- With Disconnector

- With Current Transformer and Disconnector

Weight: 115kg

Weight: 135kg
# NOVAs Outdoor Pole Mounted Vacuum Circuit Breaker

## Ordering guideline

### 7. Ordering guideline

<table>
<thead>
<tr>
<th>NS</th>
<th>Product Name</th>
<th>NS = NOVAs Pole Mounted Spring Vacuum Circuit Breaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>Rated Voltage</td>
<td>2 = 24kV</td>
</tr>
<tr>
<td>X</td>
<td>Connector</td>
<td>0 = w/ Connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N = w/o Connector</td>
</tr>
<tr>
<td>X</td>
<td>Tank Material</td>
<td>S = SS</td>
</tr>
<tr>
<td>X</td>
<td>Controller Type</td>
<td>F = FXDController</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N = w/o Controller</td>
</tr>
<tr>
<td>X</td>
<td>Motor Input Voltage</td>
<td>4 = DC24V</td>
</tr>
<tr>
<td>X</td>
<td>CT Ratio</td>
<td>2 = 200/5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 = 400/5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 = 600/5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N = w/o CT</td>
</tr>
<tr>
<td>X</td>
<td>CT</td>
<td>3 = CT*3</td>
</tr>
<tr>
<td>X</td>
<td>Controller Type</td>
<td>F = FXDController</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N = w/o Controller</td>
</tr>
<tr>
<td>X</td>
<td>IVS</td>
<td>E = IVS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F = IVS+EVT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N = w/o IVS</td>
</tr>
<tr>
<td>X</td>
<td>PT</td>
<td>P = PT*1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N = w/o PT</td>
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<tr>
<td>X</td>
<td>Bracket</td>
<td>B = NOVA Bracket</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C = NOVA+PT Bracket</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N = w/o bracket</td>
</tr>
<tr>
<td>X</td>
<td>Control Cable</td>
<td>3 = 12 Pin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N = N/A</td>
</tr>
<tr>
<td>X</td>
<td>NOVA Type</td>
<td>n = Normal</td>
</tr>
</tbody>
</table>
Eaton is a power management company with 2016 sales of $19.7 billion. We provide energy-efficient solutions that help our customers effectively manage electrical, hydraulic and mechanical power more efficiently, safely and sustainably. Eaton is dedicated to improving the quality of life and the environment through the use of power management technologies and services. Eaton has approximately 95,000 employees and sells products to customers in more than 175 countries. For more information, visit www.eaton.com.