450 microsecond switching
Technical Details

EDISON breaker compared to typical values for mechanical breakers, solid-state breakers, and other hybrid breakers that we could either find described in the literature or actual products on the market.

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Mechanical</th>
<th>Solid State</th>
<th>Hybrid (a)</th>
<th>Hybrid (b)</th>
<th>EDISON</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON-state power loss</td>
<td>&lt; 0.01%</td>
<td>&gt; 0.3%</td>
<td>&lt; 0.1%</td>
<td>&lt; 0.01%</td>
<td>&lt; 0.01%</td>
</tr>
<tr>
<td>Switching speed</td>
<td>10 – 100 ms</td>
<td>&lt; 100 µs</td>
<td>&lt; 2 ms</td>
<td>&lt; 1 ms</td>
<td>&lt; 500 µs</td>
</tr>
<tr>
<td>DC voltage limit</td>
<td>3 kV</td>
<td>Scalable</td>
<td>Scalable</td>
<td>Scalable</td>
<td>Scalable</td>
</tr>
<tr>
<td>Rel. power density</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>Medium</td>
<td>High</td>
</tr>
</tbody>
</table>

Product Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Units</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Voltage (DC)</td>
<td>kV</td>
<td>12</td>
</tr>
<tr>
<td>Peak Interruption Voltage</td>
<td>kV</td>
<td>24</td>
</tr>
<tr>
<td>Rated Continuous Current</td>
<td>kA</td>
<td>2</td>
</tr>
<tr>
<td>Peak Fault Current</td>
<td>kA</td>
<td>8</td>
</tr>
<tr>
<td>Minimum Source Inductance</td>
<td>µH</td>
<td>300</td>
</tr>
<tr>
<td>Maximum Energy Absorbed</td>
<td>kJ</td>
<td>30</td>
</tr>
<tr>
<td>Fault Clearing Time</td>
<td>µs</td>
<td>450</td>
</tr>
<tr>
<td>Trip Slew Rate</td>
<td>A/µs</td>
<td>40</td>
</tr>
<tr>
<td>FMS Volume</td>
<td>L</td>
<td>270</td>
</tr>
<tr>
<td>Power Density</td>
<td>MW/m³</td>
<td>60</td>
</tr>
<tr>
<td>Efficiency</td>
<td></td>
<td>99.97%</td>
</tr>
<tr>
<td>Arc Energy in an incident</td>
<td>cal/cm²</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>J/cm²</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Key Innovations

1. Sequential Insertion
2. Supercritical Fluid Dielectric
3. Fast Mechanical Switching Technology

Specifications

- Rated Voltage (DC): 12 kV
- Peak Interruption Voltage: 24 kV
- Rated Continuous Current: 2 kA
- Peak Fault Current: 8 kA
- Minimum Source Inductance: 300 µH
- Maximum Energy Absorbed: 30 kJ
- Fault Clearing Time: 450 µs
- Trip Slew Rate: 40 A/µs, 3 kA
- FMS Volume: 270 L
- Power Density: 60 MW/m³
- Efficiency: 99.97%
- Arc Energy in an incident: 0.01 cal/cm², 0.04 J/cm²

*Calculation is based on an 8-kA fault current in 500 µs

LEARN MORE

2. Wei, Jia. “Supercritical dielectric fluids for high power density applications.” PhD diss., Georgia Institute of Technology, 2021.
3. Schematic closed-loop control system of the fast mechanical switch (C. Xu et al. IEEE Transactions on Power Delivery, 2022)
Designed to Fit

EDISON is customizable and scalable to fit any novel application scenario.

Blade

- OPEN Failure Mode
- Scalable & Modular
- Volume 0.4 m³
- Potential Application: Data Centers, All-Electric Ships, etc.

Octopus

- Pres-pack IGBTs
- SHORT Failure Mode
- Light Weight FMS
- Volume 0.35 m³
- Potential Application: Utilities, Industrial Arc Protection, etc.
Applications

EDISON boasts innovative features that will enable novel applications. Industries we are currently exploring include the following:

- Wildfires
- Offshore Wind Farms
- Utility
- Arc Flash Mitigation
- Data Center Security
- All-Electric Ships
- High Efficiency
- Energy Dense
- Arc Mitigation
- Battery Protection
Arc Flash

mitigation is crucial as these electrical explosions cause severe injuries and equipment damage.

Wildfire
Prevention

Arc Flash
Mitigation

Data Center
Safety

All-Electric
Ships

Off-shore
Wind Farms

Utility

The Workplace Safety Awareness Council (WSAC) determined three key factors that characterize the severity of arc flash incidents:

+ The proximity of the worker to the hazard
+ Temperature, which is a function of available energy
+ Time for the circuit to break

Electrical exposure is one of OSHA’s fatal four – leading causes of workplace fatalities. In 20 years, the recordable case rate of injuries and illness per 100 full-time workers has declined from 6.7 in 1999 to 2.8 in 2019. Fatalities have increased from 4,836 in 2015 to 5,333 in 2019.”

-Industrial Safety and Hygiene, 2021

The Workplace Safety Awareness Council (WSAC) determined three key factors that characterize the severity of arc flash incidents:

- The proximity of the worker to the hazard
- Temperature, which is a function of available energy
- Time for the circuit to break

Fault Clearing Time
450 µs

Incident Arc Energy
0.01 cal/cm²

EDISON

Level 1
1.2 - 4.0

Level 2
4.0 - 8.0

Level 3
8.0 - 25

Level 4
25 - 40

EDISON
Efficient DC Interrupter with Surge Protection
Efficient DC Interrupter with Surge Protection