TAVRIDA ELECTRIC
Excellence in Engineering

www.tavrida.com/tena

Rec35_Smart4_HDG Recloser

38 kV Triple-Single Design with Crossarm Mounting Kit with Recloser Control featuring Point-on-Wave technology

5 YEAR WARRANTY

Mitigate inrush currents, voltage dips and mechanical stress

Integrate renewable power generation quickly and efficiently

Add value to the existing assets

Streamline integration projects

Improve reliability of power distribution networks

The most compact 38kV recloser in the world!

- 1250A continuous rated current
- Ability to implement point-on-wave inrush-free switching functionality
- x6 voltage and x3 current sensors built in
- IEEE 1547 compliant solution for DER interconnection
- Voltage sensors with 0.5% accuracy
- Magnetically actuated vacuum interrupters
- Tested to 30,000 CO operations at full load
- Maintenance free and light weight
- 5-year warranty

What is Point-on-Wave (POW)?

Point-on-Wave (POW) switching is an advanced method of controlled switching that precisely synchronizes circuit breaker operation with the optimal point in the AC voltage cycle. By closing the breaker at the right phase angle, POW technology significantly reduces transient inrush currents when energizing transformers, motors, reactors, and other inductive loads.

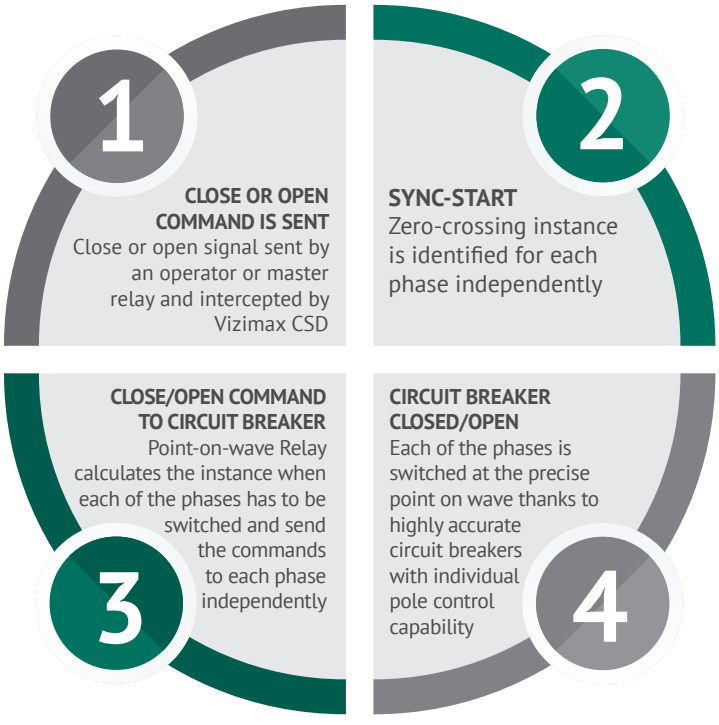
Why Use POW Switching?

POW switching offers multiple benefits across various electrical applications:

- **Improved Power Quality –** Reduces voltage dips, harmonics, and transient disturbances, enhancing grid stability.
- **Extended Equipment Lifespan –** Minimizes electrical and mechanical stress on transformers, circuit breakers, and other equipment.
- **Enhanced System Protection –** Prevents unnecessary relay tripping, misoperations, and disruptions in protection schemes and increases relay protection sensitivity and efficiency due to reducing of settings values and times.
- **Energy Efficiency –** Reduces electrical losses associated with transient events and improves overall system efficiency.
- **Seamless Integration** - Can be implemented in new installations and retrofitted into existing systems without major modifications.

How it Works?

- **Tavrida Electric**
  Outdoor Vacuum Circuit Breakers with single phase operation
- **Vizimax SynchroTeq®**
  Control Switching Device (CSD)
- **SEL-451**
  Protection Relay

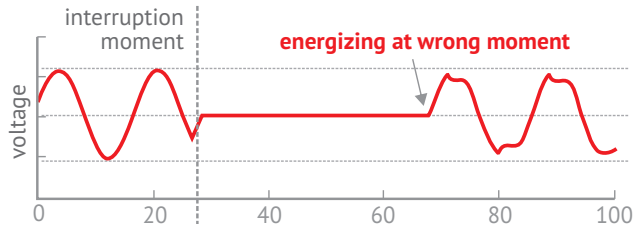


Transformer Inrush Current Simulation Example

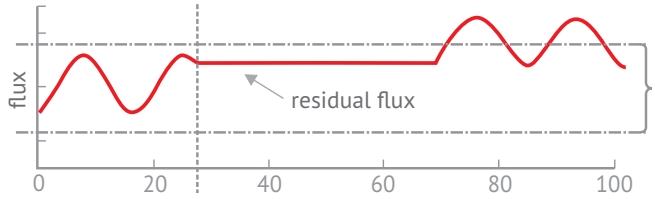
HAVING PROBLEMS WITH ENERGISING YOUR TRANSFORMER — CONTACT OUR REPRESENTATIVE TO SEE HOW CONTROLLED SWITCHING SOLUTION CAN HELP!

WORST CASE SCENARIO

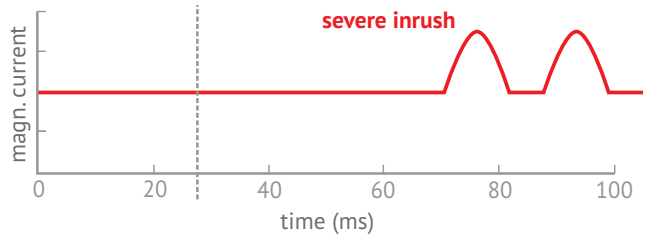
Energizing the transformer at the wrong moment



Results in the transformer core oversaturation

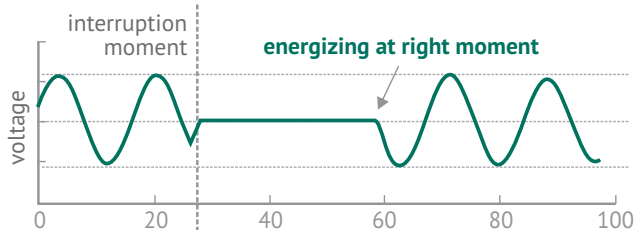


And the severe inrush current occurs

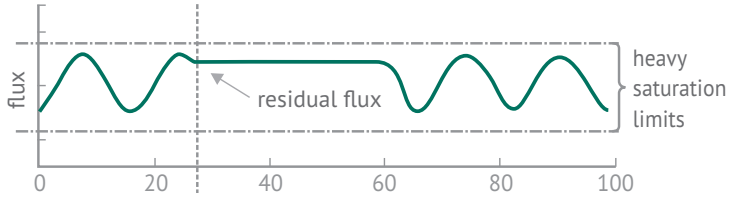


BEST CASE SCENARIO

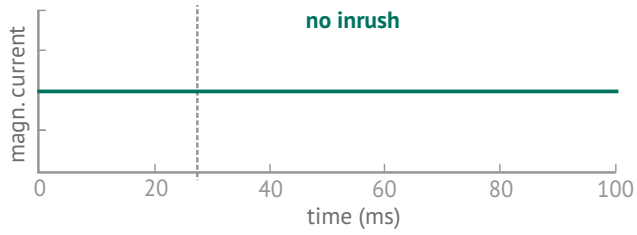
Energizing at the right moment



Keeps the flux in normal value's range



So there is no inrush current



How Does POW Reduce Inrush Currents?

POW switching reduces inrush currents by synchronizing circuit breaker operation with the optimal point in the AC voltage cycle. When a transformer or reactor is energized, residual magnetic flux in the core can cause a sudden surge in current, potentially reaching 10–20 times the nominal load. POW technology precisely calculates the residual flux and determines the best phase angle for breaker closure, ensuring a smooth transition with minimal current spikes.

Unlike conventional switching, which relies on random breaker operation and can lead to high transient currents, POW technology actively controls the switching process. By integrating real-time monitoring, adaptive algorithms, and predictive switching control, POW prevents voltage dips, protects equipment from mechanical and thermal stress, and enhances overall power quality. This makes it especially valuable in applications such as transformer energization, capacitor bank switching, and offshore wind power integration, where system stability is critical.

Comparison: Conventional vs. POW Switching

Feature	Conventional Switching	POW Switching
Inrush Current Levels	High (10–20× nominal)	Low (<1× nominal)
Voltage Stability	Voltage dips & harmonics	Stable operation
Equipment Stress	Increased wear & overheating	Reduced stress
Protection Coordination	Risk of false tripping	Accurate relay operation
System Efficiency	Energy losses due to transients	Optimized energy use

Key Applications of POW Switching

- **Transformer Energization –** Minimizes inrush currents, preventing equipment overloading and false relay activation.
- **Shunt Reactor Switching –** Suppresses voltage transients, increasing the longevity of reactors in substations.
- **Capacitor Bank Switching –** Reduces switching surges and mitigates overvoltage issues in power factor correction systems.
- **Industrial Power Systems –** Supports stable operation in microgrids, manufacturing plants, and renewable energy facilities.
- **Offshore & Wind Power –** Ensures reliable transformer switching and electrical infrastructure protection in offshore substations and wind farms.
- **Data Centers & Critical Loads –** Prevents power disturbances in facilities with sensitive electronic equipment.
- **Utilities & Substations –** Optimizes switching performance for transformers and reactors in high-voltage transmission networks.
- **Renewable Energy Integration –** Enhances grid stability by enabling smooth transformer operation in solar and wind power installations.

Industry Standards and Compliance

- **Standards IEEE C37.06 and IEEE C37.012 :** Define circuit breaker switching performance and controlled switching applications.
- **Standard IEEE C37.60 :** Defines the requirements for automatic circuit reclosers used in medium-voltage distribution networks, improving power restoration while reducing inrush currents and switching transients.
- **Standard IEEE 1547 :** Defines the technical requirements for the interconnection and interoperability of Distributed Energy Resources (DERs).

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Applications of Our Circuit Breakers with POW Technology

Application	Project / Location	Equipment Used
Transformer Switching and DER Interconnection	Rockwool – Flums, Switzerland	SG25_MILE SWG series + Draw-out Unit / IPO
	Rockwool China	IPO SWG configuration
	Evishagaran Wind Farm, UK	Transformer switching
	Roanoke Rapids, NC	OSM35 Smart_4, IPO + CSD
	Duke Energy – Mount Holly Microgrid, USA	12.47kV, 500kVA grounding transformer
	Rookwool China, Furnace Transformer	VCB15_MD3
	Project in the Netherlands	ISM15_LD3 (2 units)
	Tenaris Romania	OSM50, filter application
Capacitor Bank Switching	Fallago Rig Wind Farm, UK (Enspec Power)	OSM50 (6 capacitor banks)
	Arcelor Mittal, Belgium (Condensator Dominit)	OSM50, 32kV capacitor banks
Harmonic Filter Applications	Alvance Smelter, UK (Enspec Power)	OSM50
Shunt Reactor Switching	Kincardine Offshore Wind Farm, UK (Enspec Power)	OSM35 / IPO + CSD (onshore installation)
	Various wind farm turbine arrays	Similar POW-based design recycled for transformer and shunt reactor switching
Industrial Power Systems	Mount Holly Microgrid (Prime Engineering)	Prime Switchgear with Tavrida poles
	Oneok, Pembina Birch Storage, Kelt Exploration, Marine Harvest	Prime Switchgear for MV transformer energization

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Main Technical Parameters

Rated Data	OSM35_Smart_4(600.200_150_ALL)	
Rated voltage (Ur), up to	38kV	
Rated continuous current (Ir)	1250A[1]	
Rated power frequency withstand voltage (Ud), 1 min dry	70kV	
Rated power frequency withstand voltage (Ud), 10s wet	70kV	
Rated lightning impulse withstand voltage (peak) — BIL (Up)	170kV	
Rated short-circuit breaking current (Isc)	16kA	
Rated short-circuit making current, peak	41.2kA	
Rated short-time withstand current, 4s (Ik)	20kA	
Rated peak withstand current (Ip)	52kA	
Rated frequency	50/60Hz	
Switching Performance		
Mechanical life (CO cycles)	30,000	
Operating cycles, rated current (CO cycles)	30,000	
Electrical endurance, breaking current (CO cycles)	100	
Closing time[2]	<60ms	
Opening time[2]	<15ms	
Break time[2]	<25ms	
Rated operating sequence	O-0.3sCO-10sCO-10sCO-10sCO	
Other Data		
Current Sensing	3 built-in current transformers	
	600:1, C100	200:1, C20
Voltage Sensing	6 built-in voltage sensors	
Voltage measurement accuracy	+/-0.5%	

1 - When used with 600:1 CT ratio. 600A – when used with 200A CT ratio

2 - Switching module closing, opening and break times excluding control module recognition time.

If you would like to obtain more detailed information about our solutions or become one of our local partners, please feel free to contact us

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