Circuit Breakers

40.5 kV to 500 kV

The outdoor high-voltage circuit breakers are designed to interrupt fault currents, switch normal loads, and manage reactive and charging duties across 40.5–500 kV systems. The portfolio includes live-tank porcelain-column SF_6 breakers, a vacuum breaker, and dead-tank SF_6 breakers for applications requiring compact layout and integrated CTs.

What's in the Range

Live Tank Circuit Breakers (LTCB)

Porcelain-column breakers where the interrupter is at line potential. Models include:

- **LW36-40.5 / 72.5 / 126 / 145 (SF_6):** self-energy arc systems, spring mechanisms, C2-class switching for capacitors/charging.
- **LW58-252 (SF_6):** 252 kV class with three-phase mechanical linkage option and high breaking (50/63 kA).
- **ZW39-40.5 (Vacuum):** outdoor vacuum CB addressing condensation issues in legacy designs; direct replacement for oil breakers.

Dead Tank Circuit Breakers (DTCB)

Interrupter enclosed in a grounded tank; CTs can be integrated in the tank for footprint and wiring efficiency.

- **LW58A-40.5/72.5/145/252 (Dead Tank):** compact, high-seismic resilience, integrated CTs, IP66 body, high-altitude/low-temperature suitability.

Live Tank vs Dead Tank

Aspect	Live Tank (LTCB)	Dead Tank (DTCB)
Representative models	LW36-40.5/72.5/126/145; LW58-252; ZW39-40.5 (vacuum)	LW58A-40.5/72.5/145/252 (Dead Tank)
Construction	Interrupter at line potential on porcelain columns (higher center of gravity).	Interrupter in grounded tank with integrated bushings/ CTs (lower center of gravity).
Primary CTs	Internal/external CTs around column; up to 4 per phase (model-dependent).	Integrated tank CTs with straight-through cores; compact and service-friendly.
Seismic behavior	Typical natural frequency of porcelain column designs (~4.5 Hz typ., per DT comparison).	Higher self-frequency (~13.5 Hz typ.) and low CG improve seismic performance.
Environmental sealing	Column insulators with SF_6 compartments; leakage target <0.5%/yr.	IP66 tank sealing, optional heaters, simplified gas monitoring.
When to choose	Open layouts, lighter structures; retrofit with internal/ external CTs; vacuum option at 40.5 kV.	Compact yard, high seismic/altitude/cold regions; prefer integrated CTs and reduced footprint.

Advanced Interruption

Self-energy (SF_6) or vacuum interruption delivers stable, low-energy arc extinction and high breaking capacities up to 63 kA, with proven C2-class capacitor/ charging performance on applicable models.

Reliability & Endurance

Spring operating mechanisms with high-strength alloy components support up to 10,000 mechanical operations (M2 class) and 20–22 full-fault interruptions.

Insulation & Sealing

Optimized external creepage (≥31 mm/kV), strict dehumidification, and SF_6 leakage <0.5%/year safeguard long-term dielectric performance; dead tank enclosure protection to IP66 improves ingress resilience.

Built for Real Environments

Configurations for cold regions (down to –42/–50 °C), high altitude (up to 3000–5000 m), heavy pollution (Class IV), and high seismic levels (e.g., IEEE 693 1.0 g).

Functionality & Options

- Fault interruption up to 31.5/40/50/63 kA depending on series.
- Load switching plus back-to-back capacitor (C2), and line/cable charging switching without restrike on specified models.
- Frequent operation capability via robust spring mechanisms and low operating forces.
- Three-phase mechanical linkage option (e.g., LW58-252) to prevent phase-loss operation.
- **Operating mechanisms:** spring-charged; single-pole or three-phase linkage; manual/ motorized with density relays and auxiliaries.
- **Current transformers (CTs):** internal (up to 4 per phase in some LTCBs), or integrated tank CTs on DTCB; accuracies to 0.2 / 0.2S.
- **Environmental adaptations:** cold-region, high-altitude insulation correction, heavy-pollution creepage.
- **Accessories:** surge arresters (where applicable), auxiliary contacts, heaters, wiring terminals, and control cabinet interfaces.

Key Components

- **Interrupter chamber:** Self-energy/double-action SF_6 interrupter or sealed vacuum bottle, providing stable arc extinction and low erosion.
- **Operating mechanism:** Spring mechanism with forged alloy parts, low noise, low operating energy, and simplified maintenance.
- **Insulation columns/tank:** Porcelain/composite columns for LTCB; grounded metal tank for DTCB with IP66 sealing and low center of gravity (seismic advantage).
- **Current transformers:** Internal CTs (LTCB) or straight-through/integrated CTs (DTCB) for compact footprint, stable accuracy, and simplified on-site works.

Technical Specifications

- **Rated voltages:** 40.5 / 72.5 / 126 / 145 / 252 kV.
- **Rated currents:** 2500–5000 A depending on model.
- **Short-circuit breaking current:** 31.5 / 40 / 50 / 63 kA (3–4 s short-time withstand per model).
- **Mechanical life:** up to 10,000 operations (M2). Electrical life: typically 20–22 full-fault breaks.
- **Insulation withstand (typical):** power-frequency 95–552 kV; lightning impulse 185–1260 kV (by class).
- **SF_6 gas pressure (20 °C):** 0.4–0.7 MPa (model-dependent); leakage <0.5%/yr. (Vacuum CB ZW39 uses SF_6 only as a small internal buffer around vacuum bottles per design note.)
- **Environmental capability:** –40/–50 to +55 °C, altitude ≤3000–5000 m (per series), pollution Class IV, IEEE 693 1.0 g seismic (where specified).

Model Highlights

- **LW36-40.5:** High-reliability C2 capacitor & charging switching; 2500/4000 A, 31.5/40/50 kA; internal CTs up to 0.2/0.2S.
- **LW36-72.5:** Cold-region variant (to –42 °C) and reactive compensation duty; up to 50 kA breaking; mechanical life 10,000.
- **LW36-126/145:** Advanced self-energy interrupter, C2 duties, high seismic compliance, altitude up to 3000–4000 m (with correction).
- **LW58-252:** 252 kV LTCB; 50/63 kA; optional 3-phase linkage to prevent phase-loss operation.
- **ZW39-40.5 (Vacuum):** Solves condensation/moisture issues of legacy outdoor designs; 31.5 kA up to 30+ breaks; direct oil-breaker replacement.
- **LW58A Dead Tank (40.5/72.5/145/252):** IP66, integrated CTs, low CG, high seismic; 31.5–50 kA; suited to ≤5000 m altitudes and cold climates.

Selection Checklist

- **Voltage class & BIL / PF withstand** targets.
- **Breaking class (31.5/40/50/63 kA)** and **rated current (up to 5000 A)**.
- **Live-tank vs Dead-tank** (yard footprint, seismic, CT integration, maintenance philosophy).
- **Environmental profile:** temperature, altitude, pollution, seismic level.
- **CTs & controls:** ratio/accuracy, internal vs tank CTs, mechanism control voltages, auxiliaries, density monitoring.

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