

AMORPHOUS-CORE TRANSFORMERS

Lower no-load losses for continuously energized distribution systems



Available through Hismar Solutions with project-specific ratings, voltage classes, cooling methods, accessories, standards, and test requirements coordinated during quotation.

Why amorphous cores reduce standing losses

A transformer consumes energy whenever it is energized, even when it supplies little or no load. This standing consumption is the no-load or core loss. Conventional grain-oriented electrical steel (CRGO) has a crystalline structure. Amorphous metal uses a thin, non-crystalline ribbon with high electrical resistance and low coercivity, reducing both hysteresis and eddy-current loss.

Core characteristic	Amorphous metal	CRGO steel
Structure	Non-crystalline ribbon	Crystalline grain-oriented steel
Typical thickness	0.025 mm	0.27 mm
Saturation flux density	1.59 T	2.03 T
Relative specific resistance	130	45
Primary benefit	Very low no-load loss	Established conventional construction

UP TO 82%	8,760 HOURS	LOWER TOC
Reduction in listed no-load-loss comparisons, depending on rating and construction.	No-load losses accrue every hour the transformer remains energized.	Lower lifetime energy loss can offset a higher initial transformer price.

Total owning cost

A transformer evaluation should consider purchase price plus the present value of no-load and load losses. A common screening form is $TOC = \text{purchase price} + (\text{no-load capitalization factor} \times \text{no-load loss}) + (\text{load-loss capitalization factor} \times \text{load loss})$. The examples in this brief isolate no-load-loss energy savings; project evaluation should also include load losses, duty cycle, demand charges, maintenance, financing, and applicable efficiency requirements.

Best-fit applications

Data centers, BESS and solar collector systems, microgrids, industrial facilities, commercial campuses, utility distribution, rail and infrastructure, and other sites where transformers remain energized for long periods.

Amorphous cast-resin transformers

Dry-type construction supports indoor installations and applications where low maintenance, fire performance, and reduced standing losses are important. Available configurations are coordinated to the project specification.

Rating (kVA)	CRGO no-load loss (W)	Amorphous loss (W)	Reduction (W)	Annual energy reduction (kWh)	Annual savings @\$0.0855/kWh
100	670	120	550	4,818	\$412
300	1,080	250	830	7,271	\$622
500	1,370	345	1,025	8,979	\$768
750	1,650	450	1,200	10,512	\$899
1,000	1,980	585	1,395	12,220	\$1,045
1,500	3,150	900	2,250	19,710	\$1,685
2,000	4,110	1,200	2,910	25,492	\$2,180
2,500	5,050	1,600	3,450	30,222	\$2,584
3,000	6,740	2,300	4,440	38,894	\$3,325

Example: A continuously energized 1,500 kVA unit with the listed loss values avoids about 19,710 kWh/year, equivalent to approximately \$1,685/year at \$0.0855/kWh.

General capability

Parameter	Available range / configuration
Ratings	Single phase up to 500 kVA; three phase up to 5 MVA
Cooling	AN (AA) or AF (FA)
Frequency	50 or 60 Hz
Primary voltage	Up to 34.5 kV
Secondary voltage	Up to 25 kV
Windings	Copper or aluminum
Taps	Rated +/-5% (5 taps)
Standards	Project-specific IEC, IEEE, CSA, and other applicable requirements

Typical features: high efficiency, low no-load loss, low acoustic noise, and configurations suitable for rapidly changing loads. C2, E2, and F1 test classifications may be available where required; confirm the exact design and test documentation during quotation.

Amorphous oil-immersed transformers

Oil-immersed designs support indoor or outdoor service, renewable generation, utility distribution, industrial facilities, and larger ratings. Accessory, fluid, cooling, tap-changer, protection, and test requirements are selected for the application.

Rating (kVA)	CRGO no-load loss (W)	Amorphous loss (W)	Reduction (W)	Annual energy reduction (kWh)	Annual savings @\$0.0855/kWh
100	665	80	585	5,125	\$438
300	1,400	160	1,240	10,862	\$929
500	2,040	230	1,810	15,856	\$1,356
750	2,400	300	2,100	18,396	\$1,573
1,000	3,000	400	2,600	22,776	\$1,947
1,500	4,500	450	4,050	35,478	\$3,033
2,000	6,000	650	5,350	46,866	\$4,007

Example: A continuously energized 2,000 kVA unit with the listed loss values avoids about 46,866 kWh/year, equivalent to approximately \$4,007/year at \$0.0855/kWh.

General capability

Parameter	Available range / configuration
Ratings	Single phase up to 167 kVA; three phase up to 15 MVA
Cooling	ONAN or ONAF
Frequency	50 or 60 Hz
Primary voltage	Up to 38 kV
Secondary voltage	Up to 38 kV
Windings	Copper or aluminum
Taps	OCTC: rated +/-5% (5 taps); OLTC: rated +/-10% (17 taps)
Standards	Project-specific IEC, IEEE, CSA, and other applicable requirements

Typical options can include natural-ester or mineral-oil fluid, monitoring accessories, surge protection, pressure and temperature devices, and project-specific terminal arrangements. Final capability depends on the selected manufacturing partner and approved design.

Texas savings method and project qualification

The savings tables use a Texas commercial retail electricity-price assumption of \$0.0855/kWh. This is the U.S. Energy Information Administration's 2024 annual average commercial electricity price for Texas. It is used as a stable customer-side value for an ERCOT-region screening example; it is not an ERCOT wholesale settlement price or a guaranteed tariff.

Calculation	Method
Loss reduction (W)	CRGO listed no-load loss minus amorphous listed no-load loss
Annual energy reduction (kWh)	Loss reduction (W) x 8,760 hours / 1,000
Annual savings (USD)	Annual energy reduction (kWh) x \$0.0855/kWh
10-year simple energy value	Annual savings x 10; excludes escalation, discounting, downtime, and demand charges

Important engineering notes

Loss values are comparative source data and are not a guarantee for every design. Final guaranteed losses, efficiency, dimensions, impedance, sound level, temperature rise, insulation levels, accessories, and applicable standards must be confirmed in the approved supplier proposal and drawings. Savings vary with the customer's tariff and energized hours.

Request a project-specific comparison

Hismar Solutions can coordinate transformer sizing, specification review, supplier quotation, loss evaluation, submittal review, and interface requirements for BESS, microgrid, industrial, commercial, and utility projects.

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Sources: U.S. Energy Information Administration, Electric Power Annual 2024, Texas average commercial retail price (8.55 cents/kWh), <https://www.eia.gov/electricity/state/Texas/>; comparative amorphous and CRGO loss values and general capability ranges adapted from supplier technical literature provided for this project. Hismar Solutions is the customer-facing engineering and sourcing contact.