E-SAVER OPAL™ Series

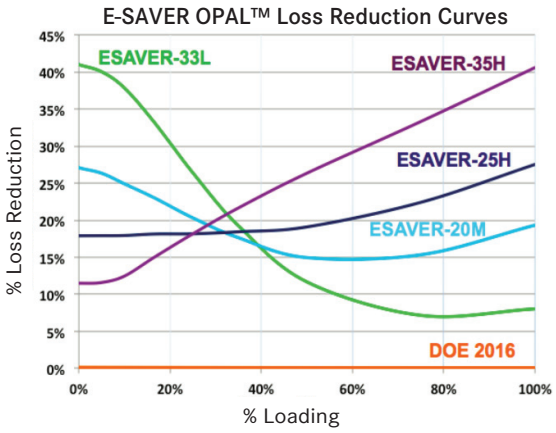
HIGH PERFORMANCE TRANSFORMERS OPTIMIZED TO DELIVER 25 - 50% LESS LOSSES THAN DOE 2016 MINIMUM EFFICIENCY REQUIREMENT

APPLICATION

The E-SAVER OPAL™ Series is a family of ultra-efficient dry-type isolation transformers that has been optimized for different application load profiles, to maximize energy savings and ensure electrical system compatibility. These energy optimized units are perfect for Net Zero, LEED® and High Performing Buildings.

OPAL™ OPTIMIZED PERFORMANCE FOR THE APPLICATION LOAD

To achieve 25-50% more savings than the DOE 2016 requirement, Powersmiths' developed and implemented a design best practice called OPAL™ - Optimized Performance for the Application Load. Recognizing that the transformer has much more impact in an electrical system than just efficiency, OPAL considers the system as a whole, including goals like managing impedance, arc flash, fault level, inrush, harmonics, and more. OPAL™ is possible thanks to the tight feedback loop between design, onsite manufacturing, and extensive ongoing real world operating performance verification. The result is more savings for the same dollar.



DOE 2016 IDENTIFIES BILLIONS IN SAVINGS BEYOND NEW LEGAL MINIMUM

Most manufacturers have designed their low-voltage transformers to just meet the new U.S. Dept. of Energy law (DOE 2016), setting minimum efficiency at a single required 35% load point, under an ideal sine wave factory test profile, sacrificing performance elsewhere. The DOE quantifies savings for going beyond DOE 2016 in billions of dollars. Furthermore, the DOE states that lifecycle savings can be maximized by optimizing for real-world loading. Powersmiths OPAL™ enables customers to access these savings – backed by real-world performance verification.

EXPANDED KVA SELECTION ENABLES RIGHT-SIZING

Powersmiths enables right-sizing of electrical infrastructure by offering a much broader selection of transformer kVA sizes. The capital cost, operating cost and footprint reductions can be dramatic - on the order of 30-50%, through smaller transformers, breakers, conductors, and distribution panels.

GUARANTEED PERFORMANCE FOR 32 YEARS

Powersmiths guarantees that every transformer we manufacture meets our published technical data, and furthermore, that this performance is met over the full term of the 32-year pro-rated warranty. Being able to trust that savings are both real and long-term is part of why organizations choose Powersmiths.

75kVA E-Saver OPAL™ Series shown with Cyberhawk TX™, hinged door and Rotatable IR Port™

K-RATING IS A MODERN REQUIREMENT

Many general purpose transformers are purchased and installed because they have the lowest first cost, however, they carry a UL label on the basis of feeding only linear loads. Since most connected loads today are electronic with nonlinear profiles, a low-voltage isolation transformer needs to be K-rated in order to have a valid UL listing for most applications today. E-Savers are appropriately K-rated.

ENVIRONMENTAL/GREEN BUILDING/LEED®/NET ZERO

By going meaningfully beyond the DOE 2016 baseline efficiency, the E-Saver™ contributes to green building, LEED®, Net Zero and carbon footprint reduction goals. Additional benefits of Powersmiths products include our ISO14001 certified manufacturing, integrated metering options and ability to integrate with the Powersmiths WOW™ Sustainability Management Platform.

CERTIFICATIONS & TESTING

Powersmiths certifications include ISO 9001 (Quality), ISO 14001 (Environment), ISO 17025 (Efficiency Test Lab), UL and CSA. Powersmiths has a production integrated nonlinear load test program that enables efficiency verification under real-world conditions, as well as IPMVP compliant field measurement of losses and efficiency, and Certified Test Lab Load Profile Test Reports.

METERING & ARC FLASH OPTIONS

Integrated metering can provide information about capacity utilization, load profiles, power quality and energy use. The lockable hinged door option, as well as our patented 360° Rotatable IR Port™ option enable quick and safe access to internal transformer connections, and reduces arc flash risk. Powersmiths also offers transformers with Integrated Power Distribution. For details see the Energy Station TX™ product information.

E-SAVER OPAL MODEL COMPARISON MATRIX[2]

Model	Optimized Load Range	Saving beyond DOE 2016*	Temp. Rise	Winding Material ***	Continuous Overload Capacity	K-Rating **/****	Applications
E-Saver-33L	0-25%	33%	<130°C	CU	5%	K7	Most Applications - office, education, healthcare, most other institutional, commerical (light load feeding electronic equipment).
E-Saver-20M	0-100%	20%	<115°C	CU	15%	K1, K9, K13	Where equipment or process loading varies widely, or where the load is expected to change significantly over time.
E-Saver-25H	75-100%	25%	<105°C	CU/AL CU opt.	20%	K13	Dedicated equipment (fans, pumps, elevators,etc), labs, broadcast, datacenter, industrial where loading is significant.
T1000-30H	50-100%	30%	<105°C	CU	20%	K20	Harmonic Mitigation Transformer - for heavy, harmonic-rich loads, high densities of electronic equipment, where voltage distortion could become excessive.
E-Saver-35H	75-100%	35%	<80°C	CU/AL CU opt.	33%	K20	Heavy loading for extended hours, and need for lower losses & operating costs, overload capacity, faster payback if high energy rate.
E-Saver-50H	75-100%	50%	<65°C	CU	50%	K30	For Special Applications close to full continuous load, where full load losses & heat output must be minimized, significant overload capacity.
E-Saver-S0L	0-100%	30%	<105°C	CU/AL CU opt.	20%	K20 (but not required for app)	Solar Applications - to avoid solar production waste - minimize transformer idling and full load losses, continuous overload capacity for longer life.

*Estimated average savings vs. DOE 2016 referance for the application load profile
** K-Rating per IEEE-C57.110
*** CU - Copper, AL Aluminum, CU/AL Copper primary with Aluminum Secondary
**** The high K-factor rating is not the goal of the design, but a consequence of the low current densities used to achieve the high loading efficiency goals

[1] U.S. Department of Energy, 10 CFR Part 431, [Docket No. EERE-2010-BT-STD-0048] Energy Conservation Program: Energy Conservation Standards for Distribution Transformers; Final Rule, April 18, 2013

TECHNICAL SPECIFICATIONS

The E-Saver™ is an ultra-efficient low-voltage dry-type isolation transformer that meaningfully exceeds the U.S. Dept. of Energy's new minimum efficiency law, commonly referred to as DOE 2016. Each model is optimized to maximize energy savings and electrical system compatibility in each target application, and has a K-factor listing per UL 1561 and an application appropriate K-rating per C57.110 (see Comparison Matrix). For models with an 'H' designation, K-rating is reduced by one level for 400kVA and larger, reflecting lower harmonic content reality at heavy loading for large kVA transformers (ex.K30->K20, K20->K13, K13->K9) to avoid overbuilding and associated unecessary cost. See table for individual model attributes.

E-Savers have a common-core (3-phase models), 10kV BIL, 200% rated neutral, are 60Hz rated (std), built to NEMA ST-20 and other applicable ANSI, IEEE standards and are UL listed and CSA approved. Both primary and secondary terminals and voltage taps (typically six 2.5%) are all front-accessible. E-Savers have a 220°C class insulation system that is NOMEX-based with an Epoxy Co-polymer impregnant with technical performance characteristics that embed lower environmental impact, long term reliability and long life expectancy. E-Savers carry OSHPD and IBC Seismic Certification. The seismic bracing option provides a higher 2.28g certification. All E-Saver models come standard in a Type 2 ventilated drip-proof indoor enclosure made of heavy gauge steel finished with epoxy powder coating for durability and low environmental impact, and are UL Listed for 2" rear clearance - a significant improvement over the typical industry 6" limit. A wide variety of enclosures and options are available.

Low Noise: Keeping audible noise at a minimum is key. While the NEMA ST-20 standard sets levels referenced by industry only a type test, not a production test, is required – so transformers on actual projects may be noisy. NEMA ST-20 also allows K13 transformers to be even noisier. Powersmiths builds 3dB quieter than NEMA standard values, and 6dB quieter than the K13+ allowance. Furthermore, every unit is tested to ensure quiet operation. For very sensitive environments, an additional 2dB lower noise option is available.

Management of Impedance, Inrush, Fault Level, Arc Flash: Powersmiths' OPAL™ design best practice includes addressing key transformer attributes like impedance, inrush, fault level, arc flash, to ensure smooth integration into an electrical system, avoiding the negative impacts often associated with high efficiency transformers. See individual technical data sheets for comprehensive values for all parameters.

Impedance: For 33L, 20M, 25H, 35H models, impedance is kept at or above 4.0% in order to manage downstream fault current and arc flash levels, and stay within interrupting capacity (kAIC) ratings. Higher impedance is available to meet specific project needs. 50H models are optimized to project specific requirements.

Inrush: Inrush currents are managed in order to avoid nuisance tripping of the primary breaker and to enable design engineers to use standard 125% rated primary protection, thereby avoiding expensive design changes that otherwise may be needed. Very low inrush designs are available as specific projects may require, for example some datacenter and medical applications.

ORDERING INFORMATION

OPAL PRODUCT FAMILY - MODEL - kVA - PV - SV - OPT

- OPAL PRODUCT FAMILY: E-SAVER
- MODEL: 33L, 20M, 25H, 35H, 50H
- kVA: kVA Rating Unit (9-1000 kVA)
- PV: Primary Voltage Input (Up to 600V)
- SV: Secondary Voltage Input (Up to 600/347V)
- OPT: Options if Applicable (See Available Options)

TECHNICAL DATA

kVA	Audible Noise	33L, 20M, 25H Model Weight Range (lbs)	Standard Case Size (in)	Alternate Smaller Case Size (in)*
15	42 dB	260-340	17.5W x 17D x 27.5H	17.5W x 14.5D x 25H
20	42 dB	300-380	25.5W x 18D x 30H	23W x 15.5D x 27.5H
25	42 dB	340-420	25.5W x 18D x 30H	23W x 15.5D x 27.5H
30	42 dB	380-470	25.5W x 18D x 30H	23W x 15.5D x 27.5H
45	42 dB	490-590	25.5W x 18D x 30H	No Alternate
50	42 dB	540-600	31.5W x 21.5D x 40H	No Alternate
63	47 dB	600-720	31.5W x 21.5D x 40H	26.5W x 20D x 33H
75	47 dB	650-800	31.5W x 21.5D x 40H	26.5W x 20D x 33H
100	47 dB	800-900	31.5W x 21.5D x 40H	No Alternate
112	47 dB	900-1000	31.5W x 21.5D x 40H	No Alternate
125	47 dB	1050-1150	37.5W x 26.5D x 48H	33W x 23D x 38H
150	47 dB	1170-1300	37.5W x 26.5D x 48H	33W x 23D x 38H
175	52 dB	1260-1450	37.5W x 26.5D x 48H	34.5W x 26.5D x 42H
200	52 dB	1375-1550	37.5W x 26.5D x 48H	34.5W x 26.5D x 42H
225	52 dB	1500-1700	37.5W x 31.5D x 52H	34.5W x 26.5D x 42H
250	52 dB	1650-1850	37.5W x 31.5D x 52H	37.5W x 26.5D x 48H
300	52 dB	1850-2000	37.5W x 31.5D x 52H	37.5W x 26.5D x 48H
400	57 dB	2150-2350	51.5W x 38D x 61H	43.5W x 33.5D x 55.5H
450	57 dB	2400-2650	51.5W x 38D x 61H	43.5W x 33.5D x 55.5H
500	59 dB	2800-3000	51.5W x 38D x 61H	43.5W x 33.5D x 55.5H
600	59 dB	3500-3800	64W x 47D x 67H	51.5W x 38D x 61H
750	61 dB	4000-4300	64W x 47D x 67H	Contact Factory
850	61 dB	4300-4850	64W x 47D x 67H	Contact Factory
1000	61 dB	4800-5500	64W x 53D x 67H	Contact Factory

* Typically the min cases are available for the standard models of 33L, 20M, 25H only.

AVAILABLE OPTIONS

Metering: Express Logger™, SMART™ or Cyberhawk TX™ (see product cut sheets for details)
CC: Core & Coils available for OEM Integration
3R: Type 3R, sprinkler proof/ outdoor ventilated enclosure
OSEC: Enclosure for outdoor public areas
SS: Painted stainless steel enclosure
NVI: Non-ventilated indoor enclosure
IRP: 360º Rotatable IR Port™
HD: Hinged Door
F50: 50 Hz design
1S: Single electrostatic shield
2S: Dual electrostatic shields
3S: Triple electrostatic shields
SPD: (120/208 V OR 277/480V)
- **PRO80:** 80kA, 7 mode, Filter
- **PRO120:** 120kA, 7 mode, Filter
- **PRO200:** 200kA, 7 mode, Filter
- **PRO240:** 240kA, 7 mode Filter
- **PROXX:** Where XX is custom ID

LKS: Lug kit, screw-type
LKC: Lug kit, compression type
VLI: Very Low Inrush
IMP: Custom Impedance
COL: Custom color
TS: Thermal sensors at 170°C and 200°C
RTR: Routine Test Report
NLT: Nonlinear Load Test with Certificate
2016TR: DOE 2016 Test Report
CTL: ISO 17025 Certified Test Lab, load profile test
SE: Sensitive environment, extra low noise
SB: Certified Seismic Bracing for 2.28g (for Certificate details contact Powersmiths)
WM: Wall-mount kit up to 75kVA is available (sold separately)

NOTE: The above data applies to the standard configuration of each kVA. Selection of some options may change enclosure size and/or transformer weight. Some options may be mutually exclusive. Consult factory for detailed product data sheet for these and other configurations. Efficiencies tested according to U.S. Dept. of Energy's 10 CFR Part 431, a linear load test at 35% of nameplate capacity. Refer to technical data sheet for comprehensive information for each specific model, kVA, and option selected.

As design optimization is continuous, technical data is updated over time. Please check with Powersmiths for latest revision.

POWERSMITHS

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