

KSTAR-D OPAL™ Series

DUAL OUTPUT HARMONIC MITIGATING TRANSFORMER
OPTIMIZED FOR 30% LESS LOSSES THAN DOE 2016
AND IMPROVED POWER QUALITY

APPLICATION

The KSTAR-D-30H™ model is an ultra-efficient dual-output low voltage dry-type harmonic mitigating transformer optimized to reduce voltage distortion in harmonic-rich environments. Under a heavy harmonic-rich load, the KSTAR-D delivers an average of 30% less losses than a comparable U.S. Department of Energy Law (DOE 2016)¹ transformer.

KEY PERFORMANCE CHARACTERISTICS

KSTAR-D™ harmonic mitigating transformers treat the 3rd harmonic through secondary flux cancellation in both secondary windings, and reduce upstream current imbalance. In addition, the dual 3-phase, 4-wire outputs are phase-shifted by 30 degrees from each other, such that the 5th and 7th harmonics are subtracted between the two outputs on the secondary side, reducing the harmonic flow upstream of the transformer. This product provides enhanced local harmonic treatment compared to single-output harmonic mitigation transformer applications, where separate transformers with alternating phase-shifted models provide treatment at the common point upstream of the transformers. The key requirement for the KSTAR-D to be effective, is that the downstream loads need to be separated into two groups, with each having similar loading and load profiles.

DOE 2016 IDENTIFIES BILLIONS IN SAVINGS BEYOND NEW LEGAL MINIMUM & POWERSMITHS' OPAL™ DELIVERS

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 U.S. Dept. of Energy quantifies savings for going beyond DOE 2016 in billions of dollars. Furthermore, the U.S. Dept. of Energy states that lifecycle savings can be maximized by optimizing for real-world loading. Powersmiths' OPAL™ – Optimized Performance of the Application Load enables customers to access these savings – backed by real-world performance verification.

OPAL™ – OPTIMIZED PERFORMANCE FOR THE APPLICATION LOAD

To achieve these savings, 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.



75kVA KSTAR-D™ shown with Cyberhawk TX™, hinged door and Rotatable IR Port™

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 physical footprint reductions can be dramatic – on the order of 30–50%, through smaller transformers, breakers, conductors, and distribution panels.

GUARANTEED PERFORMANCE FOR 32 YEARS

In a world filled with small print disclaimers and limited DOE compliance testing, you can count on Powersmiths' performance because we guarantee that every transformer we manufacture meets our published technical data, and furthermore that this performance is met over the full term of our 32-year pro-rated warranty. Being able to trust that savings are both real and long-term is part of why organizations choose Powersmiths.

ENVIRONMENTAL/GREEN BUILDING/LEED®/NET ZERO

By going beyond the DOE 2016 baseline efficiency, KSTAR-D contributes to green building, LEED®, Net Zero and carbon footprint reduction goals. Additional benefits include ISO 14001 certified certified manufacturing, integrated metering, and integration with Powersmiths WOW™ Sustainability Management Platform.

CERTIFICATIONS & TESTING

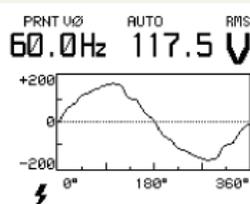
Powersmiths' certifications include ISO 9001 (Quality), ISO 14001 (Environment), ISO 17025 (Efficiency Test Lab), UL and CSA. In addition to standard industry tests, Powersmiths has a production-integrated nonlinear load test program that enables efficiency verification comparable to real-world conditions, as well as IPMVP compliant field measurement of losses and efficiency.

METERING & ARC FLASH OPTIONS

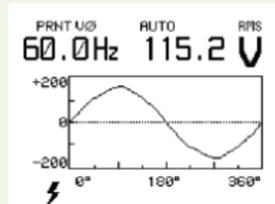
Integrated metering can provide information about capacity utilization, load profiles, power quality and energy use. The lockable hinged door option as well as our patented Rotatable IR Port™ option enable quick, safe access to internal transformer connections, which reduces arc flash risk. Powersmiths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

KEY FEATURES

- OPAL optimized harmonic mitigation for power quality and efficiency in harmonic-rich, heavy load environments
- Treats 3rd, 5th, 7th, 9th and other harmonic currents in the secondary windings
- Significant energy savings beyond DOE 2016¹
- Available with wide range of safety & performance features like integrated hinged door, 360° Rotatable IR Port™, Cyberhawk™ metering & logging
- Manufactured in a certified ISO 9001, ISO 14001 and ISO 17025 facility for quality, low environmental impact, and transformer efficiency testing



Voltage Waveform Before



Voltage Waveform with KSTAR-D

¹ U.S. Department of Energy, 10 CFR Part 431, Subpart K - Distribution Transformers

TECHNICAL SPECIFICATIONS

The KSTAR-D-30H™ is an ultra-efficient dual-output low voltage dry-type harmonic mitigating transformer that meaningfully exceeds the U.S. Dept. of Energy's new minimum efficiency law, commonly referred to as DOE 2016. The KSTAR-D is optimized to maximize energy savings and electrical system compatibility in heavily loaded harmonic-rich applications, where it delivers an average of 30% savings compared to a standard DOE 2016 transformer.

KSTAR-D-30H is copper-wound; K-20 rated per C57.110 (K-13 for 400kVA and larger); 200% rated neutral; and 60Hz rated (standard). It has a 105°C operating temperature rise; 120% continuous duty overload capacity; common-core design; and 10kV BIL rating. It is built to NEMA ST-20 and other applicable ANSI and IEEE standards, and is UL listed and CSA approved. Both primary and secondary terminals and voltage taps (typically six 2.5%) are all front-accessible. The KSTAR-D-30H has a 220°C class insulation system that is Nomex® based with an epoxy copolymer impregnant with technical performance characteristics that embed lower environmental impact, long term reliability and long life expectancy. The KSTAR-D-30H carries OSHPD and IBC Seismic Certification. The seismic bracing option provides a higher 2.28g certification. The KSTAR-D-30H comes standard in a Type 2 indoor ventilated drip-proof enclosure made of heavy gauge steel finished with epoxy powder coating for durability and low environmental impact, which is 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 is required – so transformers on actual projects may be noisy. NEMA ST-20 also allows K-13 transformers to be even noisier. Powersmiths builds 3dB quieter than NEMA standard values, and 6dB quieter than the K-13 allowance. Furthermore, every unit is tested to ensure quiet operation. For highly noise-sensitive environments, an additional 2dB lower noise option is available.

Electrostatic Shield Comes Standard: The KSTAR-D-30H comes standard with a single full-length copper electrostatic shield for high frequency noise attenuation. Dual and triple shields are available options. See technical data sheets and application notes for comprehensive information.

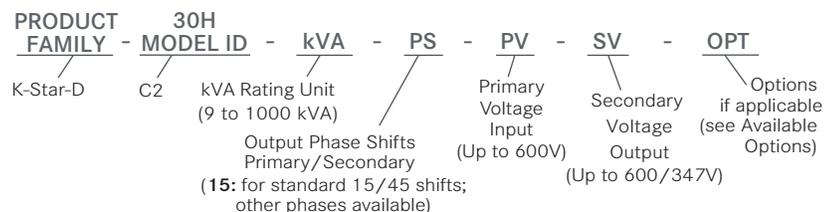
Management of Impedance, Inrush, Fault Level, Arc Flash: Powersmiths' OPAL™ design best practice includes addressing key transformer attributes like impedance, inrush, fault level, arc flash, to ensure smooth integration into an electrical system, avoiding the negative impacts often associated with higher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

Impedance: Impedance for the KSTAR-D-30H is kept at or above 3.8% in order to manage downstream fault current and arc flash levels. Higher impedance is available to meet specific project needs.

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 for project-specific requirements; for example some datacenter and medical applications.

Output Capacity: Each 3-phase output is rated for 60% of the nameplate kVA of the transformer and therefore requires protection with the appropriate Amp rating.

ORDERING INFORMATION



Sample Order: K-Star-D-C2-300-15-480-208-HD

(For 300kVA unit with standard 15/45 output phase shift, 480V primary, 208/120V for both secondaries, with the hinged door option)

TECHNICAL DATA

kVA	Audible Noise	Model Weight Range (lbs)	Standard Case Size (in)
15	42 dB	315-365	25.5W x 18D x 30H
20	42 dB	370-410	25.5W x 18D x 30H
25	42 dB	400-450	25.5W x 18D x 30H
30	42 dB	425-475	25.5W x 18D x 30H
45	42 dB	550-600	31.5W x 21.5D x 40H
50	42 dB	600-650	31.5W x 21.5D x 40H
63	47 dB	700-750	31.5W x 21.5D x 40H
75	47 dB	800-900	31.5W x 21.5D x 40H
100	47 dB	1000-1100	31.5W x 21.5D x 40H
112	47 dB	1150-1250	37.5W x 26.5D x 48H
125	47 dB	1300-1400	37.5W x 26.5D x 48H
150	47 dB	1500-1600	37.5W x 26.5D x 48H
175	52 dB	1600-1750	37.5W x 26.5D x 48H
200	52 dB	1750-1850	37.5W x 26.5D x 48H
225	52 dB	1850-2000	37.5W x 31.5D x 52H
250	52 dB	2000-2150	37.5W x 31.5D x 52H
300	52 dB	2200-2500	37.5W x 31.5D x 52H
400	57 dB	2600-2900	51.5W x 38D x 61H
450	57 dB	3000-3300	51.5W x 38D x 61H
500	57 dB	3500-3850	51.5W x 38D x 61H
600	59 dB	4000-4400	64W x 47D x 67H
750	61 dB	4600-5100	64W x 47D x 67H

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.

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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: 360° Rotatable IR Port™

HD: Hinged door

F50: 50 Hz design

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

LI: Custom 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)