

5 kVA — 500 kVA

ULTRA-K

Series 600K - *he*



High Efficiency

K-Rated

Power Conditioning Transformers

Designed to be used with linear or non-linear loads.

Applications:

- Audio / Video Recording Equipment
- IT Systems / Computers
- VFD Controls
- Automated Scanning Electronics
- Isolation for Uninterruptible Power Systems
- Laboratory Instrumentation
- Electronic Measurement

Key Facilities / Industries:

- Schools
- Recording Studios
- Performing Arts / Theaters
- Waste Water Treatment
- Pharmaceutical
- Automated Manufacturing

**Meets and Exceeds
DOE 2016
Minimum Efficiency Standard**



UL 1561

C-UL Listed to CSA Standard C22.2, No. 47-13

Single and Three Phase Models Available
(300 kVA and 500 kVA models not shown)



TRYSTAR®

POWER PROBLEMS & SOLUTIONS

Trystar engineers and manufactures the industry's highest quality power conditioning transformers, capitalizing on many years of expertise. This enviable reputation for quality is reflected in the design, workmanship, and performance of our products.

Subjecting commercial and industrial electrical systems to a harsh, "polluted" electrical environment increases downtime, maintenance costs, and lost productivity. Maintaining spike-free voltage and keeping electrical noise away from the sensitive electronics, increases the reliability of electronic equipment, contributes to the overall integrity of data, and enhances workflow and productivity.

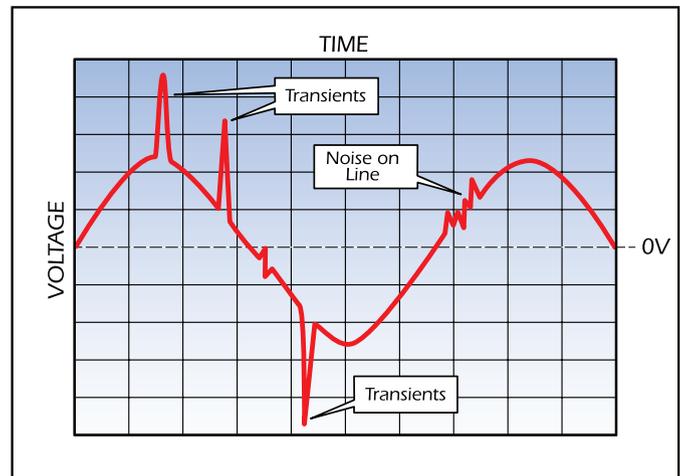
Trystar's **ULTRA-K Series 600K-he** High Efficiency, K-Rated, Power Conditioning Transformers are specifically designed to provide a high degree of electrical noise attenuation and optional transient voltage suppression to sensitive electronic loads. In addition, the **ULTRA-K** is offered with four different K-factor ratings (K4, K7, K13, K20) for full compatibility with harmonic-rich, non-linear loads.

The **ULTRA-K Series 600K-he** meets and exceeds the high efficiency levels defined by the **U.S. Department of Energy (DOE) 2016 Standard**, thus providing true energy savings under both linear and non-linear loads.

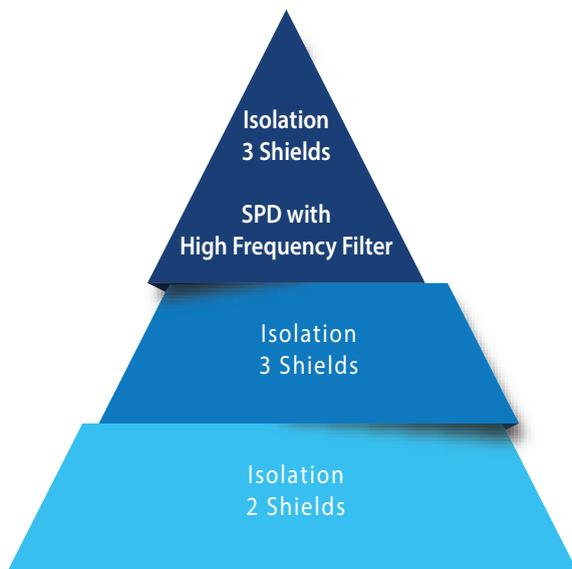
Electrical Noise & Voltage Transients

Electrical noise is a high frequency, low energy signal that travels on the power and ground lines of an electrical distribution system. While conditions external to a facility can cause electrical noise and impulses, the majority of these disturbances are generated by electronic and electrical equipment within the facility. Examples of this equipment include photocopiers, lighting controls, variable speed drives, and motor loads.

The electrical noise produced by this equipment can harm digital circuitry, because the high frequencies can easily be coupled into the signal path and cause data corruption. This corruption often results in system upset, unexpected restarts, and nuisance equipment behavior. In addition to electrical noise and impulses, high energy transients may also exist which lead to component failure within critical electronics and controls.



Electrical noise and voltage transients illustrated.



Building the ULTRA-K solution to power problems.

ULTRA-K Series 600K-he Solution

The **ULTRA-K** is provided standard with 2 full-length electrostatic shields which provide 126dB common mode noise attenuation. An optional 3rd shield is available which increases the attenuation to 146dB. That is 20dB greater in decibels, but the noise attenuation is actually 10 times greater! The **ULTRA-K** not only attenuates noise from input to output ... but also prohibits system back feed from noise generating loads. In addition, an optional pre-wired, high frequency filter and category B3 surge protection device (SPD) provide your critical loads with optimum protection from noise and impulses, as well as high energy voltage transients.

The **ULTRA-K's** noise attenuation is critical for any application in which digital circuitry is used to scan, measure or monitor critical data, control a critical process, or reproduce high quality audio / video signals!

ULTRA-K DESIGN BENEFITS

As an owner or specifying engineer ... why choose the **ULTRA-K Series 600K-he** over competing brands? It's a fair question. **We believe that the answer is found in (3) key objectives which needed to be met when we designed this product.**

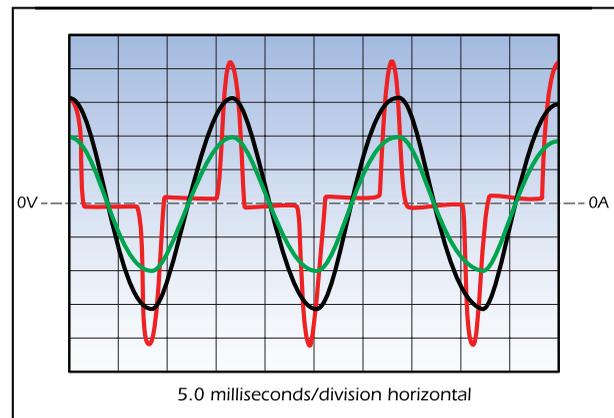
- ✓ Design the very best power conditioning isolation transformer to protect critical loads against electrical noise, impulses, and voltage transients. As described on Page 2 of this brochure ... mission accomplished!
- ✓ Design the **ULTRA-K** with the ability to handle the high harmonic currents associated with non-linear loads. To accomplish this, each **ULTRA-K** is made available with a K-factor rating of K4, K7, K13, or K20. The higher the K-rating, the more harmonic current the transformer can handle. In addition, the **ULTRA-K** removes load-generated triplen harmonics from the incoming power source!
- ✓ Design the **ULTRA-K** not only to meet, but exceed high efficiency levels defined by the U.S. Department of Energy (DOE) 2016 Standard. As illustrated below ... slam dunk!

When selecting the **ULTRA-K Series 600K-he** ... you're simply choosing the very best **High Efficiency, K-rated Power Conditioning Transformer** available.

Harmonics & K-Factor Ratings

Commercial and industrial facilities contain a myriad of electronic and electrical equipment that represent "non-linear" loads. Examples include non-PFC power supplies found in computers and lighting, as well as high-powered electronic controls. Linear loads draw current throughout the entire 60Hz waveform, tracking the applied voltage. Non-linear loads draw current in short intervals with extraordinarily high magnitudes (see illustration to the right), generating harmonics (multiples of the fundamental 60Hz). These harmonics create additional heat within the transformer windings, and may increase the output neutral current up to 200% on 3 phase models with line-to-neutral loading.

To overcome this safety problem, an **ULTRA-K** transformer is designed specifically to handle the harmonics, heating effects, and increased output neutral current created by non-linear loads. Its K4 through K20 selections allow it to be properly applied for both linear and non-linear loads!



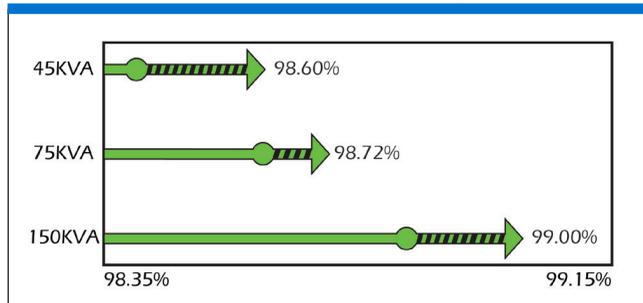
Voltage and Current Waveforms:

Output Voltage —

Linear Load Current —

Non-linear Load Current —

Ultra-K Series 600K-he Efficiency Examples



NOTE: The chart above illustrates the efficiency measured on (3) sample transformers. The "green dots" are positioned to reflect the DOE minimum efficiencies in comparison to the **ULTRA-K** efficiencies measured.

- DOE 2016 minimum efficiency levels at 35% of nameplate-rated load with a transformer operating temperature of 75°C: 45kVA (98.40%); 75kVA (98.60%); 150kVA (98.83%).

ULTRA-K High Efficiency Advantage

The **ULTRA-K** is uniquely designed to provide efficiencies that meet and exceed the DOE 2016 Standard.

Energy savings are easily seen when comparing the power losses of the **ULTRA-K** to a transformer only meeting the DOE minimum efficiency. For example, our 150 kVA **ULTRA-K** tested 99% efficient at 35% load; that's only 530 W of losses, compared to the minimum required efficiency of 98.83% which represents 621 W of losses. The **ULTRA-K** power losses were 17% lower, which reflect a decrease in operating costs over the life of the transformer.

Efficiency for a given KVA size will vary from transformer to transformer, but the **ULTRA-K's** design allows its efficiency to still exceed the minimum DOE-mandated level.

SPECIFICATIONS

Power Output

Single Phase	5, 8, 10, 15, 20, 25 kVA
Three Phase	15, 30, 45, 75, 112.5, 150, 225, 300, 500 kVA

Operating Frequency

Frequency	60Hz +/- 5% Note: 50Hz models available, consult factory
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Electrical Input

Single Phase (5-25kVA)	208, 240, 480, or 600 VAC
Voltage Taps	(2) 2.5% Full Capacity Above Nominal (4) 2.5% Full Capacity Below Nominal

Three Phase (15-150kVA)	208, 240, 480, or 600 VAC (Delta)
(225-500kVA)	480, 600 VAC (Delta)

Voltage Taps (15-300kVA*)	(2) 2.5% Full Capacity Above Nominal (4) 2.5% Full Capacity Below Nominal
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* Exception (1) 12.5kVA - 150kVA at 208 VAC or 240 VAC	(1) 5% Full Capacity Above Nominal (2) 5% Full Capacity Below Nominal
(500kVA)	(1) 3.5% Full Capacity Above Nominal (2) 3.5% Full Capacity Below Nominal

Note: Special voltages available for both single and three phase models. (see Page 6 Model Number Guide, Note¹)

Electrical Output

Single Phase	120, 120/240, or 208 VAC
Three Phase	208/120 or 480/277 VAC (Wye) Note: Special voltages available (see Page 6 Model Number Guide, Note ¹)

Output Impedance	2% to 3.5% typical
Output Distortion	Less than 1.0% THD added under linear load
Load Regulation	2% typical, no load to full load
Overload	Up to 500% for 10 seconds, 1000% for 1 cycle
Isolated Neutral	Establishes a new neutral to ground bond on the transformer's output (see Page 5 Isolated Output Neutral section)

Noise Attenuation

Common Mode	126dB - Standard double (2) shield 146dB - Optional triple (3) shield
Transverse Mode	3dB down at 10kHz, decaying 20 dB per decade; decaying 40 dB with "SPD With High Frequency" option

Environmental

Operating Ambient Temperature	-25° C to +40° C
Relative Humidity	0 to 95% non-condensing
Altitude	Up to 5000 feet above sea level without de-rating
Audible Noise	45 to 55dBA @ 1 meter, depending on kVA size

Efficiency

U.S.	Meets and exceeds U.S. Department of Energy (DOE) 2016 high efficiency standards identified under DOE 10 CFR Part 431
Canada	Meets and exceeds CSA Standard C802.2-12

K-factor Ratings

Ratings	K4, K7, K13, K20
Neutral Size	Twice the ampacity of the secondary phase conductor on three phase models

Harmonic Handling Capability

Designed to handle the following percentages of fundamental and harmonic currents, without exceeding temperature rise limits.

	K4	K7	K13	K20
Fundamental 60 Hertz	100%	100%	100%	100%
3rd Harmonic	25%	35%	40%	45%
5th Harmonic	20%	30%	42%	48%
7th Harmonic	12%	18%	25%	38%
9th Harmonic	3%	5%	7%	9%
11th Harmonic	5%	6%	10%	12%
13th Harmonic	4%	4%	8%	10%
15th Harmonic	2%	2%	3%	3%
17th Harmonic	1%	1%	2%	2%

$$K = \sum I_h(\text{pu})^2 h^2, \quad h = \text{harmonic}, \quad I = \text{RMS current of harmonic}$$

NOTE: The chart above represents only one scenario (per K-factor rating) of an infinite combination of harmonic content that could add up to a specific K-factor. Consult factory with your harmonic load profile for assistance in K-factor selection.

Harmonic Elimination

The load generated triplen harmonics of the fundamental (3rd, 9th, 15th, 21st, etc.) are eliminated from the input lines, thus reducing the overall THD content.

General

Transformer Construction	All copper winding and conductor construction, dry type transformer with M3, grain-oriented silicon steel
Electrical Connection	Copper bus provided for hardwired input and output Note: Optional lug kits available (see Page 5)
Basic Impulse Level	10KV
Temperature Rise	135° C rise above ambient, under non-linear loading per UL 1561 standard
Cooling	Convection cooled
Enclosure	Standard, floor mounted: NEMA 2 up to 225kVA; NEMA 1 at 300kVA and 500kVA Note: Optional NEMA 3R outdoor enclosure available up to 225kVA (see Page 5)

Certifications

Safety	UL 1561 Listed, labeled for operation with or below a specific K-factor rating; C-UL listed to CSA Standard C22.2, No. 47-13
RoHS	Compliant

Please visit our [website](#) and read our General and Guide Specifications for additional technical details about the **ULTRA-K Series 600K-he**.

SPECIFICATIONS & OPTIONS

Isolated Output Neutral

The **ULTRA-K** establishes a new neutral to ground bond on the transformer's output, meeting the definition of a separately derived power source as defined in NFPA 70, Article 250.20 (D). Its isolated wye secondary provides a new single point ground reference to which critical load neutral and ground conductors are wired, thus preventing potential N-G circulating currents.

Application Note:

The **ULTRA-K** may be paired with a transformer-less uninterruptible power system (UPS). This is critical if the input neutral to the UPS is shared with other electrical noise-producing loads, creating noise voltage with respect to ground. The transformer provides an isolated, clean neutral bond for IT/data center equipment. Locating the transformer at the input or output of the UPS is dictated by the UPS configuration and grounding requirements. In either case, the **ULTRA-K** ensures that the critical load is provided with the highest power quality, even when the UPS is in bypass mode.

Options

Output SPD With High Frequency Filter

Surge Protection Device (SPD) network comprised of high energy MOVs with <5 nanosecond response time and a maximum peak surge current capacity of 40 kA (8/20 μ s) per mode. High frequency filter increases transverse mode noise attenuation to 3 dB down at 10kHz, decaying 40 dB per decade. A single **status indicator light** (pictured on NEMA 2 enclosure shown) is provided to show that the SPD and filter are fully operational and functioning properly.

NOTE: SPD with peak surge current capacity ratings from 50 kA to 200 kA per phase are available, UL 1449 Listed, Type 2. Includes EMI/RFI filtering, Form C relay contacts, and LED protection status indicators. Contact factory for specifications. (See NOTE below)

Input / Output Circuit Breaker

Circuit breaker (15A – 800A ratings) provided in a separate NEMA 1 enclosure for external mounting and installation.

High / Over Temperature Alarm Contacts

Thermal warning alarm contacts for customer's hardwired connection. Thermal sensors at 180° C and 200° C. (See NOTE below)

NEMA 3R Enclosure

UL Listed NEMA 3R enclosure for outdoor installations. Enclosure is constructed using 14 gauge galvanized steel and provided with a durable powder coat paint finish. (See NOTE below)

IR Scanning Window

Infrared, transparent polymer IR window(s) for safe routine thermal scanning of transformer connections under load, without exposing personnel to arc flash hazards. Durable IR windows are industrial-grade with a patented reinforced grill, fully impact-resistant, and UL and C-UL Listed. This option adds 2" to the depth of the 112.5 kVA – 225 kVA enclosure. (See NOTE below)

Lug Kit

Mechanical (screw-type) lugs shipped for installer convenience. Consult factory for number of conductors per lug and wire range.

Special Designs

Special voltage configurations are available, including "high leg delta" designs.

NOTE: Option not available for 300kVA and 500kVA models.



Model shown with standard NEMA 2 enclosure, and optional SPD status indicator light. (30 kVA model shown)



Model shown with optional NEMA 3R enclosure, and optional IR scanning window. (75 kVA model shown)

MODEL NUMBER & SELECTION GUIDE

MODEL NUMBER GUIDE - ULTRA-K SERIES 600K_{he}

PHASE	INPUT VOLTAGE ¹	OUTPUT VOLTAGE ¹	FREQ ²	kVA	K-RATING	# OF SHIELDS	OUTPUT VOLTAGE SPD ³	ENCLOSURE TYPE ⁴
5 = Single 8 = Three	B = 208 C = 240 D = 480 E = 600	A = 120 B = 208 G = 120/240 L = 208/120 N = 480/277	X = 60Hz	5K6HE 45K6HE 8K6HE 75K6HE 10K6HE 112.5K6HE 15K6HE 150K6HE 20K6HE 225K6HE 25K6HE 300K6HE 30K6HE 500K6HE	4 7 13 20	A = 2 B = 3	A = SPD with High Frequency Filter B = SPD with Filtering; UL 1449 Listed, Type 2 N = None	1 = NEMA 1 2 = NEMA 2 3R = NEMA 3R

Model Number Example:
8DLX-75K6HE-13-BA2

¹ Special voltages available, consult factory for model number. Output voltage selections A, B, and G only available on 1 phase systems; L and N only available on 3 phase systems.

² 50Hz models available, consult factory.

³ SPD = Surge Protection Device. Select A, B, or N. (See SPD option descriptions on Page 5)

⁴ 300KVA and 500KVA models available in NEMA 1 enclosure only. NEMA 2 and 3R enclosures are not available for these KVA-rated models.

MODEL SELECTION GUIDE					
SINGLE PHASE					
MODEL NUMBER ⁵	OUTPUT KVA	INPUT VOLTAGE ⁶	OUTPUT VOLTAGE ⁶	CABINET DIMENSIONS (IN.) ⁷	WEIGHT ⁸
5**X-5K6HE-* ⁵	5	208, 240, or 480	120, 120/240, or 208	23W x 20D x 28H	170
5**X-8K6HE-* ⁵	8	208, 240, or 480	120, 120/240, or 208	23W x 20D x 28H	225
5**X-10K6HE-* ⁵	10	208, 240, or 480	120, 120/240, or 208	23W x 20D x 28H	300
5**X-15K6HE-* ⁵	15	208, 240, or 480	120, 120/240, or 208	23W x 20D x 28H	370
5**X-20K6HE-* ⁵	20	208, 240, or 480	120, 120/240, or 208	23W x 20D x 28H	390
5**X-25K6HE-* ⁵	25	208, 240, or 480	120, 120/240, or 208	23W x 20D x 28H	420
THREE PHASE					
MODEL NUMBER ⁵	OUTPUT KVA	INPUT VOLTAGE ⁶	OUTPUT VOLTAGE ⁶	CABINET DIMENSIONS (IN.) ⁷	WEIGHT ⁸
8**X-15K6HE-* ⁵	15	208, 240, 480, or 600	208/120 or 480/277	23W x 20D x 28H	370
8**X-30K6HE-* ⁵	30	208, 240, 480, or 600	208/120 or 480/277	23W x 20D x 28H	495
8**X-45K6HE-* ⁵	45	208, 240, 480, or 600	208/120 or 480/277	28W x 25D x 39H	700
8**X-75K6HE-* ⁵	75	208, 240, 480, or 600	208/120 or 480/277	28W x 25D x 39H	830
8**X-112.5K6HE-* ⁵	112.5	208, 240, 480, or 600	208/120 or 480/277	38W x 32D x 57H	1210
8**X-150K6HE-* ⁵	150	208, 240, 480, or 600	208/120 or 480/277	38W x 32D x 57H	1470
8**X-225K6HE-* ⁵	225	480 or 600	208/120 or 480/277	38W x 32D x 57H	1880
8**X-300K6HE-* ⁵	300	480 or 600	208/120 or 480/277	56W x 41.5D x 48H	2656
8**X-500K6HE-* ⁵	500	480 or 600	208/120 or 480/277	45W x 48D x 62.75H	4820

⁵ See Model Number Guide and Example above to complete model number.

⁶ Special voltages available on both single and three phase models, consult factory. **Optional three phase voltages include 400/230, 460/266, or 600/347 VAC.**

⁷ Reflects standard enclosure dimensions: NEMA 2 up to 225kVA; NEMA 1 at 300kVA and 500kVA. Consult factory for NEMA 3R enclosure dimensions.

⁸ Weight is based on K20 rated models and reflects unit weight only. Consult factory for shipping weight.

WARRANTY: Trystar warrants the **ULTRA-K Series 600K_{he}** transformer (core and coil) to be free from defects in material and workmanship for a period of 1 year full, and an additional 24 years prorated. All other unit components are covered by a 2 year full replacement warranty. The warranty periods begin following the original factory ship date.

QUALITY CERTIFICATION: Trystar is an ISO 9001:2015 certified company.



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