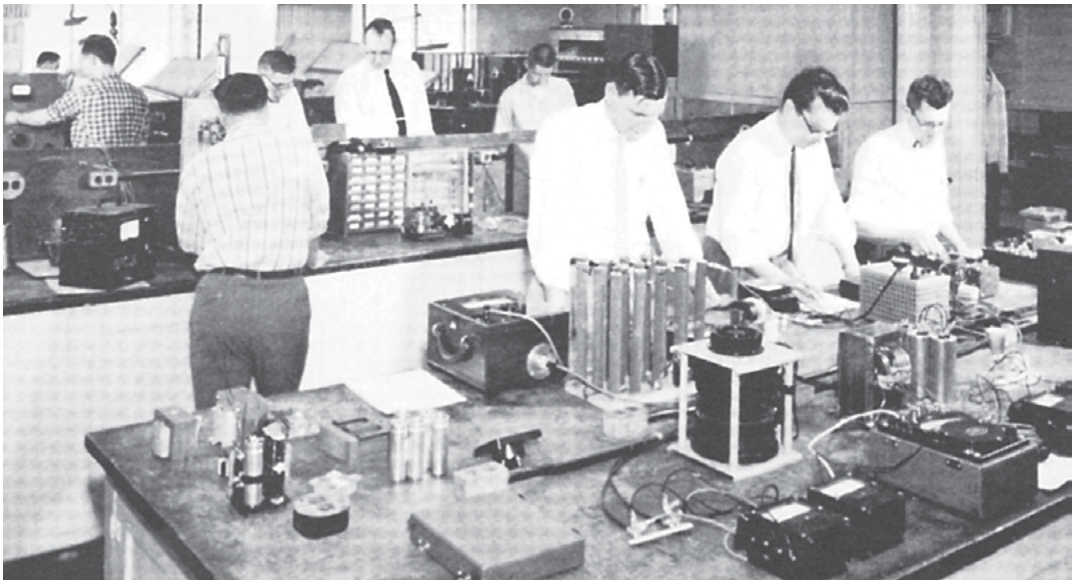
Harmonic Mitigating & Load Isolation Transformers

Special winding techniques minimize eddy current losses. A double sized neutral handles excessive neutral currents. UL Listed for "K" Factor Loads 4, 13 & 20.



Today's electronic devices are non-linear loads generating high levels of harmonic currents which then feed back onto your distribution system. The resulting waveform distortion overheats motors and transformers, increases neutral currents and causes malfunctions and equipment damage. Acme Non-Linear Load (K-Factor) Isolation Transformers use special winding techniques to minimize eddy current losses generated by harmonic currents. A double-sized neutral conductor handles the excessive neutral current. Acme Electric Harmonic Mitigating Transformers combine the several technologies utilized in our non-linear load transformers to eliminate harmonics. By pitting the waveforms against themselves, the result is "cleaner power" greater energy efficiency.

Applications

- Financial facilities
- Educational facilities
- TV Broadcast facilities
- Office buildings
- Hospitals
- Healthcare facilities

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Section 3 | General Description, Features, Selection Charts and Wiring Diagrams

Many of today's electronic devices are non-linear loads generating high levels of harmonic currents that are then fed back onto your distribution system. This waveform distortion results in overheating of motors and transformers, increased neutral currents and malfunction/damage to other equipment on the line.

Acme Electric introduces a line of harmonic mitigating transformers that combine the technologies shown in our non-linear load (K-Factor) transformers. Where conventional K-Factor transformers "deal" with harmonics, containing them within the transformer and preventing them from going further upstream; harmonic mitigating transformers eliminate harmonics by pitting them against themselves. This technology not only results in "cleaner power" but also provides the most energy efficient means to deal with harmonic problems.

Available in sizes ranging from 30 thru 225 kVA, with copper or aluminum windings and a variety of other design options and accessories, Acme harmonic mitigating transformers offer you reduced transformer heat, reduced voltage distortion due to 3rd order harmonics, and higher efficiency.

Features

- Unlike K-rated transformers, Harmonic Mitigating transformers actually treat the triplen harmonics in the secondary winding
- Reduce supply voltage flat topping caused by non-linear loads
- Improve overall power factor of supply system
- Suitable for K-Factor loads
- Improved energy efficiency

Applications

- Financial facilities
- Educational facilities
- TV Broadcast facilities
- Office buildings
- Hospitals
- Health care facilities

480 DELTA PRIMARY VOLTS — 208Y/120 SECONDARY VOLTS — DOE/NRCan 2019 Compliant **COPPER WINDINGS**

kVA	Catalog Number	Height (Inches)(Cm.)	Width (Inches)(Cm.)	Depth (Inches)(Cm.)	Weight (Lbs.)(Kg.)	Mounting Type (Wall)(Floor)	Weather Shield	Wiring Diagrams	Design Figures
30.0	H3030K0014BCS	25.50 (64.8)	24.39 (61.9)	19.37 (49.2)	360 (163.2)	F ①	WSA1	81	E
45.0	H3045K0014BCS	25.50 (64.8)	24.39 (61.9)	19.37 (49.2)	500 (226.8)	F ①	WSA1	81	E
75.0	H3075K0014BCS	29.41 (74.7)	28.15 (71.5)	22.37 (56.8)	600 (272.2)	F ①	WSA2	81	E
112.5	H3112K0014BCS	35.47 (90.1)	31.90 (81.0)	26.88 (68.2)	938 (425.5)	F	WSA3	81	E
150.0	H3150K0014BCS	41.52 (105.5)	32.90 (83.5)	29.87 (75.9)	1213 (550.2)	F	WSA4	81	E
225.0	H3225K0014BCS	41.52 (105.5)	32.90 (83.5)	29.87 (75.9)	1872 (849.1)	F	WSA4	81	E

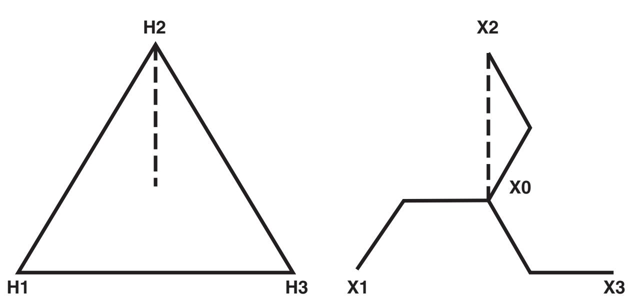
① Wall mounting brackets are available for these sizes, refer to page 7

Harmonic Mitigating Transformers – How do they work?

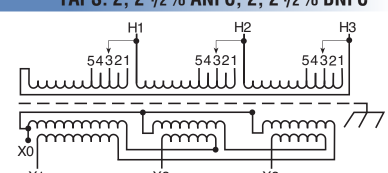
They consist of a Delta primary and a Zig-Zag secondary. The Zig-Zag secondary causes a phase shift in the triplen harmonics, which results in a canceling effect. This prevents the triplen harmonic losses from being coupled back into the primary and results in cooler operation and increased energy efficiency.

Diagram Showing Delta Primaryand Zig-Zag Secondary

(Zero degree angular displacement)



81 **PRIMARY: 480 Volts Delta**
SECONDARY: 208Y/120 Volts
TAPS: 2, 2 1/2% ANFC, 2, 2 1/2% BNFC



Primary Volts	Connect Primary Lines To	Inter-Connect	Connect Secondary Lines To
504	H1, H2, H3	1	
492	H1, H2, H3	2	
480	H1, H2, H3	3	
468	H1, H2, H3	4	
456	H1, H2, H3	5	
Secondary Volts			
208			X1, X2, X3
120 1 phase			X1 to X0 X2 to X0 X3 to X0

Non-linear loads generate high levels of harmonic currents. When supplying power to these loads, a special transformer design is necessary.

Typical non-linear loads include desktop computers, AC variable speed drives, HID lighting, electronic ballasts, inverters and welders. Of these non-linear loads, the major source of harmonic currents is the switch mode power supply found in desktop computers, data processors and other office equipment.

Acme non-linear load isolation transformers use special winding techniques to minimize eddy current losses generated by harmonic currents. A double-sized neutral conductor handles the excessive neutral current found in non-linear load applications.

The amount of harmonics produced by a given load is represented by the term “K” factor. The larger the “K” factor, the more harmonics are present. Linear loads have a “K” factor of 1; switch mode power supplies typically have a “K” factor as high as 20.

Acme non-linear load isolation transformers are shielded for cleaner power and carry the Acme exclusive 10-year limited warranty.

Features

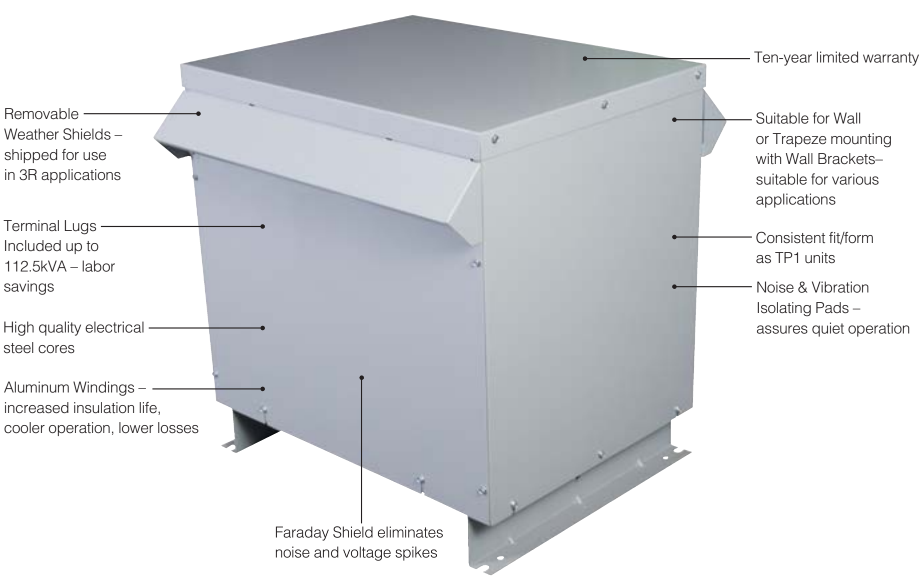
- Available in K-factors of 4, 13 and 20. Consult factory for other K-factors
- 3R Compliant
- All new units ship with weather shields already installed
- Flexibility when a weather shield is not needed, it can easily be removed
- Primary and secondary terminals come standard with lugs (up to 112.5kVA) for quicker, easier connections
- 150°C and 115°C temperature rise units. 80°C temperature rise consult factory
- 10-year limited warranty
- UL Listed and CSA Certified
- Available in 480V and 208V primary, 15 through 225 kVA
- Primary taps: (2) 2 ½% ANFC, (4) 2 ½% BNFC
- Aluminum windings

The following guide will help you select the proper transformer when the K-factor is unknown.*

K-Factor/Type of Load	
K1	Resistance heating, Incandescent lighting, Motors, Transformers, control/distribution
K4	Welders, Induction heaters, HID lighting, Fluorescent lighting, Solid state controls
K-13	Telecommunications equipment, Branch Circuits in classrooms and health care facilities
K-20	Main frame computers, Variable speed drives, Branch circuits with exclusive loads of Data Processing equipment, Desktop computers

* These ratings are to be used as a guide only. They may vary from one load equipment manufacturer to another. A Spectrum Analysis is the best source.

Note: Non-sinusoidal and non-linear are synonymous terms relating to the same transformer type.



Double-sized neutral conductor handles excessive neutral currents

Section 3 | Definition of Terms

1. Linear loads

Loads where the current waveform conforms to the waveform of the applied voltage. Or loads where a change in current is directly proportional to a change in applied voltage. For example:

- Resistance heating
- Incandescent lighting
- Water heater

2. Non-linear loads

Loads where the current waveform does not conform to the waveform of the applied voltage. Or loads where a change in current is not proportional to a change in applied voltage. Examples are:

- Computer power supplies
- Motor drives
- Fluorescent lighting

Non-linear loads produce non-sinusoidal current or voltage waveforms.

3. Sinusoidal current or voltage

This term refers to a periodic waveform that can be expressed as the sine of a linear function of time.

4. Non-linear currents or voltages

A waveform of current or voltage which cannot be expressed as the sine of a linear function of time. A non-linear load would result in a non-sinusoidal current or voltage.

5. Harmonic

A sinusoidal waveform with a frequency that is an integral multiple of the fundamental 60 Hz frequency.

- 60 Hz Fundamental
- 120 Hz 2nd Harmonic
- 180 Hz 3rd Harmonic
- 240 Hz 4th Harmonic
- etc.

Current waveforms from non-linear loads appear distorted because the non-linear waveform is the result of adding harmonic components to the fundamental current.

6. Triplen harmonics

Odd multiples of the 3rd harmonic (3rd, 9th, 15th, 21st, etc.).

7.Harmonic distortion

Non-linear distortion of a system characterized by the appearance in the output of harmonic currents (voltages) when the input is sinusoidal.

8. Voltage harmonic distortion (VHD)

Voltage harmonic distortion is distortion caused by harmonic currents flowing through the system impedance. The utility power system has relatively low system impedance, and the VHD is very low. But, VHD on the distribution power system can be significant due to its relatively high system impedance.

9. Total harmonic distortion (THD)

The square root of the sum of the squares of all harmonic currents present in the load excluding the 60 Hz fundamental. It is usually expressed as a percent of the fundamental.

10. Root mean squared current (or voltage) RMS

1: The vector sum of the fundamental current and the total harmonic distortion.
2: Square root of the sum of the squared value of the fundamental current and the squared value of the total harmonic distortion.

11. Eddy currents

Currents flowing in a conducting material in the presence of a time varying magnetic field. These currents are in addition to the current drawn by the load.

12. Eddy current losses

Power dissipated due to eddy currents. Includes eddy current losses in the core, windings, case and associated hardware of a transformer.

13. Stray losses

A term used to express the difference between the measured alternating current losses on a transformer and the direct current (DC) losses (I^2R). Stray losses include eddy losses. Stray losses are usually expressed as a percent of the direct current (DC) losses.

14. Per unit value

1: Percent value divided by 100.
2: The ratio of two components of a system.

15. Harmonic spectrum "K" factor

The sum of the product of each harmonic current squared and that harmonic number squared for all harmonics from the fundamental (60 Hz) to the highest harmonic of any measurable consequence. When the "K" factor is multiplied by the stray losses of the transformer, the answer represents the losses in the transformer caused by harmonic currents. When these losses are added to the I^2R losses of the transformer, the total load losses are known. The "K" factor for a linear load without harmonics is one (1).

K FACTOR 13, 150°C RISE
208 DELTA PRIMARY VOLTS — 208Y/120 SECONDARY VOLTS — 3Ø, 60 Hz — DOE/NRCan 2019 Compliant

kVA	Catalog Number	Height (Inches)(Cm.)	Width (Inches)(Cm.)	Depth (Inches)(Cm.)	Weight (Lbs.)(Kg.)	Mounting Type (Wall)(Floor)	Wiring Diagrams	Design Figures
15	T3015K0064BK13S	25.50 (64.8)	24.40 (62.0)	19.37 (49.2)	366 (166.0)	F①	61	E
30	T3030K0064BK13S	25.50 (64.8)	24.90 (62.0)	19.37 (49.2)	522 (236.8)	F①	61	E
45	T3045K0064BK13S	29.40 (74.7)	28.15 (71.5)	22.37 (56.8)	667 (302.6)	F①	61	E
75	T3075K0064BK13S	35.40 (89.9)	31.90 (81.0)	26.87 (68.3)	938 (425.5)	F	61	E
112	T3112K0064BK13S	41.52 (105.5)	32.90 (83.6)	29.88 (75.9)	1213 (550.2)	F	61	E
150	T3150K0064BK13S	41.52 (105.5)	32.90 (83.6)	29.88 (75.9)	1700 (771.0)	F	61	E
225	T3225K0064BK13S	45.60 (115.8)	39.50 (100.3)	35.50 (90.2)	2165 (982.0)	F	61	E

K FACTOR 20, 150°C RISE
480 DELTA PRIMARY VOLTS — 208Y/120 SECONDARY VOLTS — 3Ø, 60 Hz

kVA	Catalog Number	Height (Inches)(Cm.)	Width (Inches)(Cm.)	Depth (Inches)(Cm.)	Weight (Lbs.)(Kg.)	Mounting Type (Wall)(Floor)	Wiring Diagrams	Design Figures
15.0	T3015K0013BK20S	25.50 (64.8)	24.40 (62.0)	19.40 (49.3)	366 (166.0)	F ①	22	E
30.0	T3030K0013BK20S	25.50 (64.8)	24.40 (62.0)	19.40 (49.3)	500 (226.8)	F ①	22	E
45.0	T3045K0013BK20S	29.40 (74.7)	28.15 (71.5)	22.37 (56.8)	600 (272.0)	F	22	E
75.0	T3075K0013BK20S	35.90 (91.2)	31.90 (81.0)	26.88 (68.3)	938 (425.5)	F	22	E
112.5	T3112K0013BK20S	41.52 (105.5)	32.90 (83.6)	29.88 (75.9)	1213 (550.2)	F	22	E
150.0	T3150K0013BK20S	41.52 (105.5)	32.90 (83.6)	29.88 (75.9)	1600 (725.8)	F	22	E
225.0	T3225K0013BK20S	45.60 (115.8)	39.50 (100.3)	35.50 (90.2)	1938 (879.0)	F	22	E

K FACTOR 13, 150°C RISE
480 DELTA PRIMARY VOLTS — 208Y/120 SECONDARY VOLTS — 3Ø, 60 Hz — DOE/NRCan 2019 Compliant

kVA	Catalog Number	Height (Inches)(Cm.)	Width (Inches)(Cm.)	Depth (Inches)(Cm.)	Weight (Lbs.)(Kg.)	Mounting Type (Wall)(Floor)	Wiring Diagrams	Design Figures
15.0	T3015K0013BK13S	25.50 (64.8)	24.40 (62.0)	19.40 (49.3)	366 (166.0)	F①	22	E
30.0	T3030K0013BK13S	25.50 (64.8)	24.40 (62.0)	19.40 (49.3)	500 (226.8)	F①	22	E
45.0	T3045K0013BK13S	29.90 (75.9)	28.15 (71.5)	22.37 (56.8)	600 (272.0)	F①	22	E
75.0	T3075K0013BK13S	35.90 (91.2)	31.90 (81.0)	26.88 (68.3)	938 (425.5)	F	22	E
112.5	T3112K0013BK13S	41.52 (105.5)	32.90 (83.6)	29.88 (75.9)	1213 (550.2)	F	22	E
150.0	T3150K0013BK13S	41.52 (105.5)	32.90 (83.6)	29.88 (75.9)	1600 (725.8)	F	22	E
225.0	T3225K0013BK13S	45.60 (115.8)	39.50 (100.3)	35.50 (90.2)	1938 (879.0)	F	22	E

K FACTOR 4, 150°C RISE
480 DELTA PRIMARY VOLTS — 208Y/120 SECONDARY VOLTS — 3Ø, 60 Hz — DOE/NRCan 2019 Compliant

kVA	Catalog Number	Height (Inches)(Cm.)	Width (Inches)(Cm.)	Depth (Inches)(Cm.)	Weight (Lbs.)(Kg.)	Mounting Type (Wall)(Floor)	Wiring Diagrams	Design Figures
15.0	T3015K0013BK4S	25.50 (64.8)	24.40 (62.0)	19.40 (49.3)	325 (147.0)	F①	22	E
30.0	T3030K0013BK4S	25.50 (64.8)	24.40 (62.0)	19.40 (49.3)	366 (166.0)	F①	22	E
45.0	T3045K0013BK4S	25.50 (64.8)	24.40 (62.0)	19.40 (49.3)	500 (226.8)	F①	22	E
75.0	T3075K0013BK4S	29.40 (74.7)	28.15 (71.5)	22.37 (56.8)	600 (272.0)	F	22	E
112.5	T3112K0013BK4S	35.40 (89.9)	31.90 (81.0)	26.87 (68.3)	938 (425.5)	F	22	E
150.0	T3150K0013BK4S	41.52 (105.5)	32.90 (83.6)	29.88 (75.9)	1213 (550.2)	F	22	E
225.0	T3225K0013BK4S	41.52 (105.5)	32.90 (83.6)	29.88 (75.9)	1600 (725.8)	F	22	E

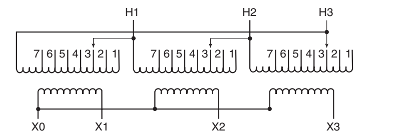
K FACTOR 13, 115°C RISE
480 DELTA PRIMARY VOLTS — 208Y/120 SECONDARY VOLTS — 3Ø, 60 Hz — DOE/NRCan 2019 Compliant

kVA	Catalog Number	Height (Inches)(Cm.)	Width (Inches)(Cm.)	Depth (Inches)(Cm.)	Weight (Lbs.)(Kg.)	Mounting Type (Wall)(Floor)	Wiring Diagrams	Design Figures
15	T3015K0013BK13SF	25.50 (64.8)	24.40 (62.0)	19.40 (49.3)	366 (166.0)	F①	22	E
30	T3030K0013BK13SF	25.50 (64.8)	24.40 (62.0)	19.40 (49.3)	500 (226.8)	F	22	E
45	T3045K0013BK13SF	29.40 (74.7)	28.15 (71.5)	22.37 (56.8)	600 (272.0)	F	22	E
75	T3075K0013BK13SF	35.40 (89.9)	31.90 (81.0)	26.87 (68.3)	938 (425.5)	F	22	E
112	T3112K0013BK13SF	41.52 (105.4)	32.90 (83.6)	29.88 (75.9)	1213 (550.2)	F	22	E
150	T3150K0013BK13SF	41.52 (105.5)	32.90 (83.6)	29.88 (75.9)	1600 (725.8)	F	22	E
225	T3225K0013BK13SF	45.60 (115.8)	39.50 (100.3)	35.50 (90.2)	1938 (879.0)	F	22	E

① Wall mounting brackets are available for these sizes, refer to page 7.

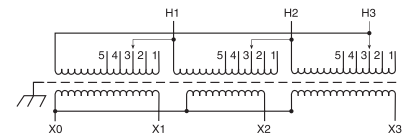
For Additional Low Temperature Rise 115° and 80° Degree Units and Copper Wound Units, Consult Factory
Non-Linear Load Isolation® Wiring Diagrams and Design Figures refer to page 7

22 PRIMARY: 480 Volts Delta
SECONDARY: 208Y/120 Volts
TAPS: 2, 2½% ANFC, 4, 2½% BNFC



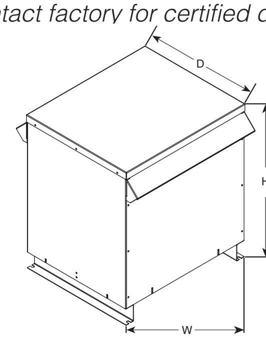
Primary Volts	Connect Primary Lines To	Inter-Connect	Connect Secondary Lines To
504	H1, H2, H3	1	
492	H1, H2, H3	2	
480	H1, H2, H3	3	
468	H1, H2, H3	4	
456	H1, H2, H3	5	
444	H1, H2, H3	6	
432	H1, H2, H3	7	
Secondary Volts			
208			X1, X2, X3
120 1 phase			X1 to X0 X2 to X0 X3 to X0

61 PRIMARY: 208 Volts Delta
SECONDARY:208Y/120 Volts
TAPS: 2, 2½% ANFC, 2, 2½% BNFC

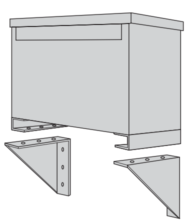


Primary Volts	%	Connect Leads to Tap No.
218	105	1
213	102.5	2
208	100	3
203	97.5	4
198	95	5
Secondary Volts		
208		X1, X2, X3
120 1 phase		X1 & X0 X2 & X0 X3 & X0

Drawing is for reference only.
Contact factory for certified drawings.



Design E



WALL MOUNTING BRACKET

Required on:
Ventilated Units:
1Ø, 37.5 and 50 kVA
3Ø, 30, 45 and 75 kVA
Catalog Number: PL-79912

Encapsulated Units:
3Ø dit., 11 kVA — 20 kVA
3Ø std. distribution 15 kVA
Catalog Number: PL-79911

Wall mounting brackets are not required on:
1Ø units — 25 kVA and below
3Ø units — 9 kVA and below

Warranty Certificate

Acme Electric 10-Year Limited* Warranty

Acme Electric (Acme) warrants to the original purchaser to correct by repair, replacement or refund of original purchase price, at Acme's option, products manufactured and sold by its Power Distribution Products Division, that may fail in service within the applicable period as set forth below, from the date of manufacture provided however, that conditions of operation have been normal at all times, and that the equipment has not been subjected to abnormal stress from such causes as incorrect primary voltage or frequency, improper ventilation or improper use. This warranty is made on the condition that prompt notice of defect is given to Acme in writing within the warranty period, and that Acme's inspection reveals to its satisfaction that the original purchaser's claim is valid under the terms of this warranty. Acme's obligation under this warranty, which is in lieu of all other warranties, express or implied, including the implied warranty of fitness for a particular purpose and merchantability, is limited to replacing or repairing defective products or parts, free of charge, provided they are returned to the factory, or refund of original purchase price, at Acme's option. However, purchased components (except for timers and photocells used in low voltage lighting power supplies) including but not limited to capacitors, circuit breakers, terminal blocks, batteries, fuses and tubes shall not be covered under this warranty. Repairs or replacement deliveries shall not interrupt or prolong the term of this warranty. Acme will not be liable for any special, indirect, consequential or incidental damages, including, without limitation, from loss of use, data, function or profits deriving out of or in connection with the use or performance of the product and shall have no liability for payment of any other damages whether in an action of contract, strict liability or tort. The remedy provided herein states Acme Electric's entire liability and buyer's sole and exclusive remedy here under. Rights may vary in certain states.

***Warranty Period:**

Standard Catalog Transformers — 10-year limited; Medium Voltage Transformer — 3-year limited, Custom products — 1 year.

10 YEARS WARRANTY

HUBBELL® Acme Electric®

Our history is strong, engaging and dedicated... just like our people.

The Acme Electric Legacy

Acme Electric provides power quality and conversion equipment to OEM, industrial and commercial markets. Founded in 1917 in Cleveland, Ohio as the Acme Electric and Machine Company, the company has a legacy of providing innovative electrical products. Acme is now part of Hubbell Incorporated, one of the largest electrical manufacturers in North America. Hubbell's history of innovation extends back to 1888 and the invention of the pull chain light switch and the electric plug.

Acme's original product line of motor-driven battery chargers, electrical appliances and electrical generators has transformed to a diversified mix of high-quality low voltage, medium voltage and 3 phase transformers and power supplies.

Learn more about us at www.hubbell.com/acmeelectric/en

HUBBELL® COMMERCIAL CONSTRUCTION
A Division of Hubbell Incorporated (Delaware)

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