POWEROHM®

Harmonic Mitigating Transformers

Product Overview

HUBBELL

About

Powerohm harmonic mitigating transformers combine several technologies utilized in our non-linear load (K-Factor) transformers while also providing harmonics cancellation. 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 results in cleaner power and provides the most energy efficient means to deal with harmonic problems.

Many of today’s electronic devices are non-linear loads that draw current in non-sinusoidal pulses. This results in a distorted current wave-form that generates harmonics in the power system. These harmonics are feed back on the distribution system resulting in potential nuisance tripping of circuit breakers, overheating of conductors and transformers and damage to electronics in the system. PQS Harmonic Mitigating Transformers use special winding techniques to minimize eddy current losses by pitting the waveforms against themselves, the result is “cleaner power” and greater energy efficiency.

Harmonic Mitigating Transformers, or HMTs, are specifically designed using phase shifting zig-zag windings to minimize the voltage distortion and power losses that result from non-linear loads and are a cost-effective, energy efficient way to mitigate harmonics.

Typical applications with significant harmonic loads include data centers and other applications with heavy digital loads.

Benefits provided by ACME’s line of HMT’s

- Transformers meet DOE 2016 efficiency requirements reducing the cost to operate
- HMT’s are a cost-effective means of treating harmful harmonics in electrical distribution systems reducing equipment wear and maintenance costs
- Harmonic mitigation is provided entirely by electromagnetic flux; no power electronics reducing the cost of maintenance and increasing the system resilience
- Electrostatic shield for attenuation of common mode and transverse mode noise to reduce interference with other electronic loads on the system
- No need to rerate transformer due to harmonics reducing overall project cost
- Decreases maintenance and replacement costs due to the impact of harmonics on your electrical system
- The transformer will operate at a lower temperature which extends the life
- Reduce supply voltage flat topping and nuisance tripping
- Improve overall power factor of the electrical system

General Description and Features

Applications

- Banks and high rise buildings
- Educational facilities
- Hospitals/ Healthcare
- Office buildings
- Data centers

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

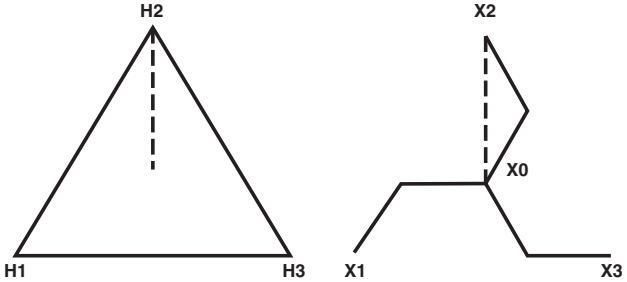
(1) Wall mounting brackets are available for these sizes, refer to page 7

Harmonic Mitigating Transformers – How do they work?

They consist of a Delta primary and a Zig-Zag secondary. The Zig-Zag secondary creates a phase shift in the secondary wave form, which results in a harmonic 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 Primary and Zig-Zag Secondary

(Zero degree angular displacement)



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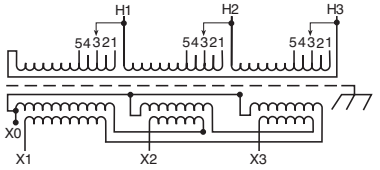
PRIMARY: 480 Volts Delta
SECONDARY: 208Y/120 Volts
TAPS: 2, 2 1/2% ANFC, 2, 2 1/2% BNFC



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

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
- 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
- Data centers

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 (I2R). 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.

Benefit from our history of dedication

Powerohm started in Houston, Texas in 1996 to change how people think about power resistor products. Customers discovered our commitment to quality, selection, and service at a lower total cost. We added our Crestview Hill, Kentucky engineering facility in 2004. We joined the Hubbell family of brands in 2014.

Our footprint grew as our vision expanded to encompass more power conditioning products. Primary production relocated to Monterrey, Mexico in 2020.

You can count the quality and value we bring to your business.

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

The Acme Electric Legacy

Acme Electric provides transformers, filters and specialty magnetics to OEM, industrial and commercial markets. Founded in 1917 in Cleveland, Ohio as the Acme Electric and Machine Company, Acme 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 transformers and inductors and fittings.

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

Notes

POWEROHM®

Powerohm is a world-class, customer-driven manufacturer of power resistor products. Our team is committed to providing the highest value, highest quality product at attractive prices

GET IN TOUCH:

sales@powerohm.com

(800) 838-4694

www.hubbell.com/powerohm

Powerohm
N56 W13385 Silver Spring Dr
Menomonee Falls, WI 53051

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