

## PRODUCT SHEET



### Type PE **e-Rated**® Power Transformer Medium Voltage, Dry-Type & Cast Coil Transformers for Low K-Factor Three-Phase Nonlinear Loads with an integrated Type TPM Transformer Performance Meter™



*Dry-Type Coils*



*Type PE Power Transformer*

#### Ultra-High Efficiency

- Exceeds NEMA TP 1-2002 and CSA C802.2-12 efficiency requirements
- Exceeds NEMA Premium® Efficiency Transformer Program qualification requirements
- Exceeds pre-2016 [10 CFR §431.196 (c)(1)] and post- Jan 1, 2016 [10 CFR §431.196 (c)(2)] U.S. DOE efficiency legislation
- Meets or exceeds previously proposed U.S. DOE efficiency legislation including Candidate Standard Level / Trial Standard Level (CSL/TSL) 3 and 4 efficiencies
- Ultra-low Excitation (no-load) Losses provide high efficiency during periods of light-loading (<15% FL)
- Significantly lower Impedance (load) Losses, under nonlinear loading, provide high efficiency, and reduce temperature rise and A/C loading during periods of heavier loading (>15% FL)
- Peak efficiency can be matched to anticipated or measured average loading above 50% full load

#### Additional Benefits

- Reduces apparatus heating and A/C loading
- Provides the most attractive payback & ROI in the industry
- Reduces energy & lifecycle costs
- Financial benefits increase with rising energy costs
- Transformer kVA ratings can be matched to anticipated or measured peak loading
- Designs can be optimized to limit inrush, short-circuit and arc flash levels
- Reduces environmental impact consistent with Green Building™ initiatives
- Enclosure size can be altered to match available space
- Standard sound level is 3dB (50%) below NEMA ST 20 requirements
- Optional Quiet Transformers™ are available at 6dB (75%) below NEMA ST 20 requirements
- Dry-Type & Cast Coil transformers are UL Certified & CSA Approved

#### Product Description

Type PE Power Transformers exceed all existing and pending energy efficiency requirements under low K-Factor nonlinear loading. Type PE transformers' ultra-low Excitation (no-load) Losses provide high efficiency during periods of light-loading (<15% FL). This benefit is achieved by using higher quality, grain oriented silicon core steel and full and step-lap miter-cut cores with reduced laminations per group.

Unlike Excitation Losses, which are constant from no-load to full-load, Impedance (load) Losses become significant at approximately 15% FL. Excitation and Impedance Losses are approximately equal at 50% FL under linear loading. Type PE transformers exceed the efficiency requirements of DOE 2016 under linear loading. Optional e-Rated® units exceed these efficiency requirements under low K-Factor nonlinear loading ( $\leq K-4$ ). Type PE transformers' published efficiencies can be matched to anticipated or measured average loading above 50% FL, when required.

Type PE Power Transformers are three-phase, single or multi-output power transformers that have been specifically designed to supply three-phase, low K-Factor nonlinear loads.

Type PE units may also be used to supply higher K-Factor single-phase nonlinear loads when series I<sub>0</sub>Filters™ zero-sequence harmonic filters are used to shunt zero-sequence harmonic currents and cancel positive- and negative-sequence harmonic currents. The application of I<sub>0</sub>Filters™ will improve any limitations on circuit length and/or loading. These limitations are graphically detailed in two PQI Publications entitled: 'Neutral-to-Ground Voltage vs. Branch Circuit Length & Loading for Typical Nonlinear Electronic Workstation Loads' and: 'Neutral-to-Ground Voltage vs. Branch Circuit Length & Loading for Typical Nonlinear Electronic Gaming Machine Loads'.

Type PE units are cost-effective alternatives to K-Rated power transformers, which are only intended to survive in a harmonic environment, and de-rated power transformers. These conventional transformers cannot reduce harmonic related 'penalty losses' or voltage distortion. Type PE Power Transformers provide the most attractive 'payback' and 'return-on-investment' in the industry.

# Type PE Ultra-Efficient, Medium Voltage, Dry-Type & Cast Coil Power Transformer

15kV Class, 60kV B.I.L Example		
kVA	Enclosure Size (Inches)	Weight (lbs.) *
750	80.00W x 48.00D x 91.50H	6050
1000	80.00W x 48.00D x 91.50H	7250
1500	90.00W x 60.00D x 91.50H	9250
2000	90.00W x 60.00D x 91.50H	10750
2500	100.00W x 60.00D x 110.00H	11950
3000	100.00W x 60.00D x 110.00H	13550
3750	110.00W x 72.00D x 110.00H	18600
5000	120.00W x 72.00D x 120.00H	21400
Other kV Classes Available		*Approx

## Notes:

The above weights and measures apply to Dry-Type, 15kV Class, 60kV B.I.L. single output configurations with a NEMA 1 enclosure and a standard temperature rise (150°). Other kV Classes (up to 25kV, 125kV B.I.L.), multiple output units and some options will change the enclosure size and weights. Consult PQI for detailed product information for these and other configurations. Enclosure provided will be determined by PQI unless otherwise specified.

## Technical Specifications

### Type:

PE – Delta:Wye

### Primary-Secondary Phase-Shift:

-30°

### Voltage Class:

5kV to 35kV

### Insulation Class:

R (220°C) Nomex

### BIL Rating:

Std. for Class

### Cooling:

ANN (Air, Internal/External Circ., Natural)

### Seismic Withstand:

Per IBC & CBC requirements with OSHPD Seismic Certification ( $S_{DS} = 2.1g$  &  $2.5g$ ,  $z/h = 1.0$ ,  $I_p = 1.5$ )

### Certifications:

Manufactured in an ISO 9001 facility, qualified by CSA International as a Testing Facility based on ISO/IEC 17025-2005

### Related Standards:

UL-506, ANSI C57.110, NEMA ST 20, NEMA TP 1-2002,

CSA C9-M1981, CSA 22.2 No.47-1977, CSA C802.2-00  
OSHPD Seismic Pre-Certification

### Listings & Approvals:

UL Listed and CSA Approved

### Warranty:

10 Years Pro-rated

### Product Selection

#### Frequency:

60Hz, 50Hz, 400Hz, Other

#### Rating:

750 – 5000kVA

#### Primary Voltage:

5kV Class through 35kV Class

#### Secondary Voltage:

600/346, 480/277, 208/120, Other

#### Temperature Rise:

150°C <sup>[1]</sup>, 115°C, 105°C, 80°C, Other

#### K-Factor:

K-4<sup>[1]</sup>, K-9, K-13

#### Taps:

4 Taps, ±2.5%, ±5% <sup>[1]</sup>

6 Taps, ±2.5%, ±5%, +7.5%, +10% (6T)

## Transformer Application

Type PE Power Transformers are ideally suited for new construction or when replacing older transformers with historically low efficiencies as part of a power system optimization and energy reduction plan.

## Efficiency Confirmation

The efficiencies of Type PE Power Transformers are confirmed using NEMA TP 2-2005 (*Standard Test Method for Measuring the Energy Consumption of Distribution Transformers*).

## The PQI Solution™

Power Quality International's Application Engineers use IEEE Std. C57.110 compliant engineering software (*The PQI Calculator™*) to quickly and accurately determine and compare the losses and efficiencies of any two transformers under any anticipated or measured load profile. The software can also be used to compare an existing and proposed transformer in a replacement scenario.

Given the cost of each transformer or a single transformer in a replacement scenario and the utility rates, the software calculates the annual energy savings, including A/C costs, payback on incremental or replacement costs, return-on-investment and EPA environmental benefits. PQI offers these analytical services, with recommendations, on a 'no charge' basis.

## Low Sound:

3dB below NEMA ST 20 <sup>[1]</sup>  
6dB below NEMA ST 20 (LS6)

## Enclosure:

NEMA 1<sup>[1]</sup>  
NEMA 3R w/ Weather Shield (N3R),

## Enclosure Color:

PQI White <sup>[1]</sup>  
ANSI 61 Gray (61), Other

## Winding Material:

Copper <sup>[1]</sup>, Aluminum (AL)

## Efficiency:

Exceeds DOE CSL 3 – Z3<sup>[1]</sup>, Z3+, Z4

## Transformer Power Meter

(TM)

## Options

### 1. Electrostatic Shield:

Single (ES), Dual (2ES), Triple (3ES)

### 2. Low Inrush:

Four times Full Load Current (4xIR)

### 3. Thermal Sensors (TS)

### 4. TVSS:

50kA Mode (TVSS50),  
100kA Mode (TVSS100), Other

## 5. Cast Coil (CC)



## Model Number Sequencing

Type-Hz-kVA-PV:SV-Temp. Rise-[Taps-Low Sound-Enclosure-Enclosure Color-Winding Material <sup>[1]</sup>]-Options (1 – 3)-Efficiency-Option (4 & 5)

## Sample Model Number

PE-60-1500-12470:480/277-150-ES-6T-AL-Z3

## Product Selection Note <sup>[1]</sup>

Selections that are identified as 'standard' are not required when creating a Model Number.



All Specifications are subject to change without notice.

All contents © 2016, Power Quality International, LLC, All Rights Reserved