

## PRODUCT SHEET



### Type DV e-Rated® Distribution TransFilter™ Ultra-Efficient, Low Voltage, Dry-Type Isolation Transformer for High K-Factor, Phase-to-Neutral Connected Nonlinear Loads with an integrated Type TPM Transformer Performance Meter™



#### 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 (a)(1)] and post- Jan 1, 2016 [10 CFR §431.196 (a)(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 or 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 35% full load

#### Additional Benefits

- 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%) or 9dB (87.5%) below NEMA ST 20 requirements

#### Product Description

Type DV harmonic mitigating Distribution TransFilters™ exceed all existing and pending energy efficiency requirements under nonlinear loading.

Type DV 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 in the Unicore™ cores of lower kVA ratings and in the full and step-lap miter-cut cores, with reduced laminations per group, in higher kVA ratings.

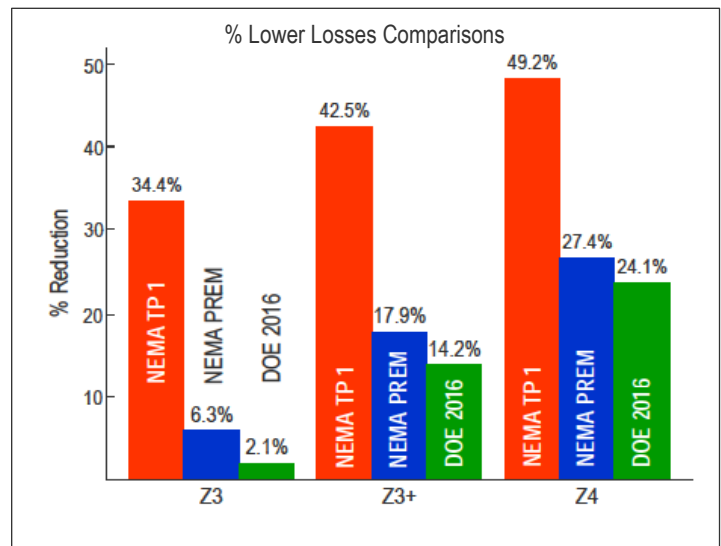
Unlike Excitation Losses, which are constant from no-load to full-load, Impedance (load) Losses increase rapidly above 15% FL; particularly when the transformer's loads are nonlinear. To maintain energy efficiency, Type DV Distribution TransFilters' ultra-low zero-sequence impedance flux cancellation windings maintain published efficiencies at 35% FL. Type DV transformers' published efficiencies can be matched to anticipated or measured average loading above 35% FL, when required.

kVA Rating	Required vs. PQI Energy Efficiencies <sup>[1]</sup>					
	NEMA TP 1 2002 <sup>[2]</sup> CSA C802.2	NEMA Premium <sup>[2]</sup>	DOE 2016 <sup>[3]</sup>	PQI Z3 exceeds CSL 3 <sup>[4]</sup>	PQI Z3+	PQI Z4 exceeds CSL 4 <sup>[4]</sup>
15	97.00	97.90	97.89	97.97	98.25	98.43
30	97.50	98.25	98.23	98.29	98.52	98.68
45	97.70	98.39	98.40	98.45	98.66	98.81
75	98.00	98.60	98.60	98.64	98.82	98.95
112.5	98.20	98.74	98.74	98.77	98.93	99.05
150	98.30	98.81	98.83	98.86	99.01	99.12
225	98.50	98.95	98.94	98.97	99.10	99.20
300	98.60	99.02	99.02	99.04	99.16	99.26
500	98.70	99.09	99.14	99.16	99.26	99.35
750	98.80	99.16	99.23	99.24	99.33	99.41
1000	98.90	99.23	99.28	99.29	99.38	99.45

#### Notes:

- [1] Efficiency values are measured at 35% of nameplate rating.
- [2] The efficiency of transformers manufactured after January 1, 2007, but before January 1, 2016 must meet the efficiency requirements of NEMA TP 1-2002 (US) or CSA C802.2-12 (Canada).
- [3] The efficiency of transformers manufactured after January 1, 2016 must meet the US DOE 2016 efficiency requirements.
- [4] PQI Z3 & Z4 efficiencies exceed the requirements of DOE Candidate Standard Level 3 & 4 (CSL 3 & CSL 4) respectively.

#### Ultra-Low Losses



Type DV Transformers with Z3 and Optional Z3+ & Z4 Efficiencies,  
vs.  
NEMA TP 1, NEMA Premium™ & US DOE 2016 Efficiencies

# Type DV e-Rated® Ultra-Efficient, Low Voltage, Dry-Type Isolation Transformer

Weights & Dimensions				
Industry Standard kVA Rating	Approximate Weight (lbs.)	Standard Enclosure No. Based on Efficiency Levels & Options		
		Z3	Z3+	Z4
15	280	#6	#6	#7
30	400	#6	#6	#7
45	580	#7	#7	#8
75	800	#8	#8	#9
112.5	1100	#8	#8	#9
150	1450	#9	#9	#9
225	2300	#9	#9	#9
300	2800	#9	#9	#10
500	3200	#10	#10	#11

To meet CSA C802.4 and [nationalgrid](#)® 'right sizing' recommendations, nonstandard kVA ratings, up to 1000kVA, are available upon request.

Standard Enclosure Numbers and Dimensions			
#6 – 20.50" W x 20.75" D x 26.25" H	#9 – 40.00" W x 38.00" D x 46.00" H		
#7 – 24.50" W x 21.75" D x 31.50" H	#10 – 46.00" W x 50.00" D x 64.50" H		
#8 – 30.75" W x 21.75" D x 31.50" H	#11 – 60.00" W x 55.00" D x 69.00" H		

To accommodate space limitations, enclosure dimensions can normally be adjusted to meet installation requirements, at no additional cost.

## Notes:

The weights & dimensions shown apply to three-phase, single output transformers. Options, such as higher K-Ratings, aluminum windings, lower temperature rise, lower frequency, nonstandard impedance and special terminal arrangements may change these weights & dimensions. Enclosure size can be altered to match available space. Contact PQL for detailed product information for other than standard configurations.

## Technical Specifications

**Type:**  
DV – Delta:Wye Equivalent

**Primary-Secondary Phase-Shift:**  
0°, -15°, -20°, -30°, -40°, -45° Std. (-7.5° & -10° increments also available at no additional cost)

**Voltage Class:**  
1.2kV

**Insulation Class:**  
R (220°C) Nomex

**BIL Rating:**  
10kV (Std. for Class)

**Cooling:**  
ANN (Air, Internal/External Circ., Natural)

**Seismic Withstand:**  
Per IBC & CBC requirements with OSHPD Seismic Certification ( $S_{DS} = 2.1g$ )

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

## Related Standards:

ANSI/UL 1560, ANSI/NFPA 70, ANSI/IEEE C57.110, NEMA ST 20, NEMA TP 1-2002, NEMA TP 2, NEMA TP 3, CSA C9-M1981, CSA C9-02, CSA No. 47-M90, CSA C802.2-12, IBC, CBC & OSHPD

**Listings:**  
UL Listed and CSA Approved

**Warranty:**  
10 Years Pro-rated

## Product Selection

**Frequency:**  
60Hz, 50Hz, 400Hz, Other

**Rating:**  
009 – 1000kVA

**Primary Voltage:**  
600, 480, 240, 208, Other

**Secondary Voltage:**  
600/346, 480/277, 208/120, Other

**Temperature Rise:**  
115°C, 105°C, 80°C, Other

## Transformer Application

Type DV Distribution TransFilters' ultra-low zero-sequence impedances effectively reduce voltage distortion (THD<sub>V</sub>) at their subsystem's loads, the principal cause of reduced load efficiency. Type DV 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 DV transformers are confirmed using NEMA TP 2-2005 (*Standard Test Method for Measuring the Energy Consumption of Distribution Transformers*). These results can then be subjected to CSA C802.5 (*Guide for Selection of Efficient Dry-Type Transformers for Nonlinear Loading*) calculations to determine their *nonlinear* efficiencies at any load level, with any defined or measured harmonic current profile.

## The PQI Solution™

Power Quality International's Application Engineers use IEEE Std. C57.110 and CSA C802.5 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.

## Taps:

4 Taps, ±2.5%, ±5% <sup>[1]</sup>  
6 Taps, ±2.5%, ±5%, +7.5%, +10% (6T)

## Low Sound:

3dB below NEMA ST 20 <sup>[1]</sup>  
6dB below NEMA ST 20 (LS6)  
9dB below NEMA ST 20 (LS9)

## Enclosure:

NEMA 3R <sup>[1]</sup>  
NEMA 3R w/ Weather Shield (N3R),  
NEMA 4 (N4), 4X (N4X)

## Enclosure Color:

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

## Winding Material:

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

## Efficiency:

All exceed NEMA TP 1, NEMA Premium, DOE 2016 & DOE CSL 3 Exceeds DOE CSL 3 (Z3) <sup>[1]</sup>  
Exceeds Z3 (Z3+)  
Exceeds DOE CSL 4 (Z4)

**Transformer Performance 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

## Model Number Sequencing

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

## Sample Model Number

DV0-60-075-480:208/120-115-6T-TM-ES-AL-Z4

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

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

