

PRODUCT SHEET

Type TS Three-Phase to Single-Phase Converter Transformer DOE 2016 Efficient, Low Voltage, Dry-Type Isolation Transformer



Product Description

- ! Unlike a conventional high-leg delta configuration, the Type TS transformer supplies its single-phase secondary load from its three primary phases
- ! 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
- ! Enclosure size can be altered to match available space
- ! Standard sound level is 3dB (50%) below NEMA ST 20 requirements

High Efficiency

- ! Meets/Exceeds DOE 2016 efficiency requirements
- ! Meets/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
- ! Low Excitation (no-load) Losses provide high efficiency during periods of light-loading (<15% FL)
- ! Significantly lower Impedance (load) Losses 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
- ! Financial benefits increase with rising energy costs

Type TS – DOE 2016 Efficient low voltage dry-type isolation transformers exceed all existing and pending energy efficiency requirements. Energy efficiency requirements are determined at 35% of the transformer's full load (FL) rating. As a result, manufacturers generally optimize their transformers' efficiencies at approximately 35% FL.

Type TS – DOE 2016 transformers' 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 Type TS – DOE 2016 transformers' peak efficiencies can be matched to anticipated or measured average loading above 35% FL.

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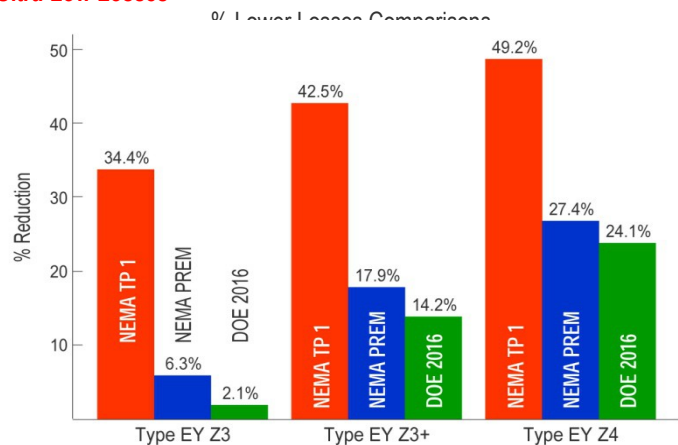
Type TS Three-Phase to Single-Phase Converter Transformer

Required vs. PQI Energy Efficiencies ^[1]						
kVA	NEMA	NEMA	DOE	PQI Z3	PQI Z3+	PQI Z4
Rating	TP 1 2002 ^[2] exceeds CSA C802.2	Premium ^[2]	2016 ^[3]	exceeds CSL 3 ^[4]		CSL 4
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



Weights & Dimensions

Industry Standard Approximate Weight (lbs.) Standard Enclosure (inches)

kVA Rating	W	D	H	
15	280	20.50	20.75	26.25
30	400	20.50	20.75	26.25
45	580	24.50	21.75	31.50
75	800	30.75	21.75	31.50
112.5	1100	30.75	21.75	31.50
150	1450	40.00	38.00	46.00
225	2300	40.00	38.00	46.00
300	2800	40.00	38.00	46.00
500	3200	46.00	50.00	64.50

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 29.75" D x 36.75" 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 PQI for detailed product information for other than standard configurations.

Technical Specifications

Type:

TS – Delta:Delta Hybrid

Primary & Secondary Connections:

H1, H2, H3 & X1, X2 (Neutral), X3

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 1561, 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, U.S. DOE 2016

Listings:

UL Listed and CSA Approved

Warranty:

2 Years Pro-rated

Product Selection

Frequency:

60Hz, 50Hz, 400Hz, Other

Rating:

009 – 1000kVA

Primary Voltage:

600, 480, 240, 208, Other

Secondary Voltage:

120/240, Other

Transformer Application

Type TS – DOE 2016 transformers provide efficient alternatives to conventional single-phase distribution transformers. Type TS – DOE 2016 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 TS – DOE 2016 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.

Temperature Rise:

150°C ^[1], 115°C, 80°C, Other

K-Factor:

K1 ^[1], K4, K9, K13

Taps:

4 Taps, ±2.5%, ±5% ^[1]

6 Taps, ±2.5%, ±5%, +7.5%, +10% (6T)

Low Sound:

3dB below NEMA ST 20 ^[1]

Enclosure:

NEMA 1 or 3R (Indoor) ^[1]

NEMA 3R w/ Weather Shield (N3R),

NEMA 4 (N4), 4X (N4X)

Enclosure Color:

PQI White ^[1]

ANSI 61 Gray (61), Other

Winding Material:

Copper (CU) ^[1], Aluminum (AL),

Efficiency:

All exceed NEMA TP 1 & DOE 2016

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-K-Rating-[Taps-Low Sound-Enclosure-Enclosure Color-Winding Material ^[1]]-Options (1 – 4)-Efficiency-Option 5

Sample Model Number

TS-60-015-480:120/240-150-AL-ZS

Product Selection Note ^[1]

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

e-Rated[®]



All Specifications are subject to change without notice.

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