

Department of Energy

§ 431.196

by electromagnetic induction from 1 coil to another to change the original voltage or current value.

Transformer with tap range of 20 percent or more means a transformer with multiple voltage taps, the highest of which equals at least 20 percent more than the lowest, computed based on the sum of the deviations of the voltages of these taps from the transformer's nominal voltage.

Underground mining distribution transformer means a medium-voltage dry-type distribution transformer that is built only for installation in an underground mine or inside equipment for use in an underground mine, and that has a nameplate which identifies the transformer as being for this use only.

Uninterruptible power supply transformer means a transformer that is used within an uninterruptible power system, which in turn supplies power to loads that are sensitive to power failure, power sags, over voltage, switching transients, line noise, and other power quality factors.

Waveform correction means the adjustment(s) (mathematical correction(s)) of measurement data obtained with a test voltage that is non-sinusoidal, to a value(s) that would have been obtained with a sinusoidal voltage.

Welding transformer means a transformer designed for use in arc welding equipment or resistance welding equipment.

[70 FR 60416, Oct. 18, 2005, as amended at 71 FR 24995, Apr. 27, 2006; 71 FR 60662, Oct. 16, 2006; 72 FR 58239, Oct. 12, 2007]

TEST PROCEDURES

§ 431.193 Test procedures for measuring energy consumption of distribution transformers.

The test procedures for measuring the energy efficiency of distribution transformers for purposes of EPCA are specified in appendix A to this subpart.

[71 FR 24997, Apr. 27, 2006]

Single-phase		Three-phase	
kVA	Efficiency (%)	kVA	Efficiency (%)
10	98.62	15	98.36
15	98.76	30	98.62
25	98.91	45	98.76
37.5	99.01	75	98.91
50	99.08	112.5	99.01

ENERGY CONSERVATION STANDARDS

§ 431.196 Energy conservation standards and their effective dates.

(a) *Low-Voltage Dry-Type Distribution Transformers*. The efficiency of a low-voltage dry-type distribution transformer manufactured on or after January 1, 2007, shall be no less than that required for their kVA rating in the table below. Low-voltage dry-type distribution transformers with kVA ratings not appearing in the table shall have their minimum efficiency level determined by linear interpolation of the kVA and efficiency values immediately above and below that kVA rating.

Single phase		Three phase	
kVA	Efficiency (%) ¹	kVA	Efficiency (%) ¹
15	97.7	15	97.0
25	98.0	30	97.5
37.5	98.2	45	97.7
50	98.3	75	98.0
75	98.5	112.5	98.2
100	98.6	150	98.3
167	98.7	225	98.5
250	98.8	300	98.6
333	98.9	500	98.7
		750	98.8
		1000	98.9

¹ Efficiencies are determined at the following reference conditions: (1) for no-load losses, at the temperature of 20 °C, and (2) for load-losses, at the temperature of 75 °C and 35 percent of nameplate load.

(Source: Table 4-2 of National Electrical Manufacturers Association (NEMA) Standard TP-1-2002, "Guide for Determining Energy Efficiency for Distribution Transformers.")

(b) *Liquid-Immersed Distribution Transformers*. The efficiency of a liquid-immersed distribution transformer manufactured on or after January 1, 2010, shall be no less than that required for their kVA rating in the table below. Liquid-immersed distribution transformers with kVA ratings not appearing in the table shall have their minimum efficiency level determined by linear interpolation of the kVA and efficiency values immediately above and below that kVA rating.

Single-phase		Three-phase	
kVA	Efficiency (%)	kVA	Efficiency (%)
75	99.17	150	99.08
100	99.23	225	99.17
167	99.25	300	99.23
250	99.32	500	99.25
333	99.36	750	99.32
500	99.42	1000	99.36
667	99.46	1500	99.42
833	99.49	2000	99.46
	2500	99.49.	

Note: All efficiency values are at 50 percent of nameplate-rated load, determined according to the DOE Test-Procedure. 10 CFR Part 431, Subpart K, Appendix A.

(c) *Medium-Voltage Dry-Type Distribution Transformers.* The efficiency of a medium-voltage dry-type distribution transformer manufactured on or after January 1, 2010, shall be no less than that required for their kVA and BIL rating in the table below. Medium-volt-

age dry-type distribution transformers with kVA ratings not appearing in the table shall have their minimum efficiency level determined by linear interpolation of the kVA and efficiency values immediately above and below that kVA rating.

TABLE I.2—STANDARD LEVELS FOR MEDIUM-VOLTAGE, DRY-TYPE DISTRIBUTION TRANSFORMERS, TABULAR FORM

Single-phase				Three-phase			
BIL kVA	20–45 kV efficiency (%)	46–95 kV efficiency (%)	≥96 kV efficiency (%)	BIL kVA	20–45 kV efficiency (%)	46–95 kV efficiency (%)	≥96 kV efficiency (%)
15	98.10	97.86		15	97.50	97.18	
25	98.33	98.12		30	97.90	97.63	
37.5	98.49	98.30		45	98.10	97.86	
50	98.60	98.42		75	98.33	98.12	
75	98.73	98.57	98.53	112.5	98.49	98.30	
100	98.82	98.67	98.63	150	98.60	98.42	
167	98.96	98.83	98.80	225	98.73	98.57	98.53
250	99.07	98.95	98.91	300	98.82	98.67	98.63
333	99.14	99.03	98.99	500	98.96	98.83	98.80
500	99.22	99.12	99.09	750	99.07	98.95	98.91
667	99.27	99.18	99.15	1000	99.14	99.03	98.99
833	99.31	99.23	99.20	1500	99.22	99.12	99.09
				2000	99.27	99.18	99.15
				2500	99.31	99.23	99.20

Note: BIL means basic impulse insulation level.

Note: All efficiency values are at 50 percent of nameplate rated load, determined according to the DOE Test-Procedure. 10 CFR Part 431, Subpart K, Appendix A.

(d) *Underground Mining Distribution Transformers.* [Reserved]

[70 FR 60416, Oct. 18, 2005, as amended at 71 FR 24997, Apr. 27, 2006; 72 FR 58239, Oct. 12, 2007]

COMPLIANCE AND ENFORCEMENT

SOURCE: 71 FR 24997, Apr. 27, 2006, unless otherwise noted.

APPENDIX A TO SUBPART K OF PART 431—UNIFORM TEST METHOD FOR MEASURING THE ENERGY CONSUMPTION OF DISTRIBUTION TRANSFORMERS

1.0 DEFINITIONS.

The definitions contained in §§431.2 and 431.192 are applicable to this appendix A.

2.0 ACCURACY REQUIREMENTS.

(a) Equipment and methods for loss measurement shall be sufficiently accurate that measurement error will be limited to the values shown in Table 2.1.