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ANSI C82.8-1988
Revision of ANSI C82.8-1981

American National Standard

for lamp transformers –

incandescent filament lamp transformers – constant-current (series) supply type

Approved January 25, 1988

Secretariat: National Electrical Manufacturers Association

1. Scope

This standard is intended to cover incandescent filament lamp transformers for operation on constant-current (series) supply circuits.

2. Referenced and Related American National Standards

2.1 Referenced Standard. This standard is intended for use in conjunction with the following American National Standard. When the referenced standard is superseded by a revision approved by the American National Standards Institute, Inc, the latest revision shall apply.

ANSI/IEEE 100-1984, Dictionary of Electrical and Electronics Terms

2.2 Related Standards. The following standard is listed for information only and is not essential for the completion of the requirements of this standard.

ANSI C78.109-1949 (R1981), Incandescent Lamps – Street Series Service

3. Definitions

The following definitions apply specifically to the subject treated in this document. For additional definitions, see ANSI/IEEE 100-1984.

3.1 Constant-Current Transformer. A constant-current transformer is a transformer that automatically maintains an approximately constant current in its secondary circuit under varying conditions of load impedance when supplied from an approximately constant-potential source.

NOTE: In this specification only the moving-coil type is considered.

3.2 Constant-Current (Series) Incandescent Filament Lamp Transformer. A constant-current (series) incandescent filament lamp transformer is one that receives power from a current-regulated series circuit and that transforms the power to another circuit at the same or different current from that in the primary circuit.

3.3 Individual-Lamp Insulating Transformer. An individual-lamp insulating transformer is an insulating transformer used to protect the secondary circuit,

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casing, lamp, and associated luminaire of an individual street light from the high-voltage hazard of the primary circuit.

3.4 Group-Series Loop Insulating Transformer. A group-series loop insulating transformer is an insulating transformer whose secondary is arranged to operate a group of series lamps, a series group of individual-lamp transformers, or both.

3.5 Series Transformer Rating. The lamp rating of a series transformer is the lumen rating of the series lamp, or the wattage rating of the multiple lamps, which the transformer is designed to operate.

3.6 Excitation Losses of a Series Transformer. The excitation losses of a series transformer are the losses in the transformer with the secondary winding open-circuited when the primary winding is excited at rated frequency and at a voltage that corresponds to the primary voltage obtained when the transformer is operating at nominal rated load. The measurement should be made with a constant voltage source of supply with not more than 3 percent harmonic deviation from sine wave.

3.7 Load Losses (Copper Losses) of a Series Transformer. The load losses of a series transformer are the I^2R losses, computed from the rated currents for the windings and the measured direct-current resistances of the windings corrected to 75°C.

3.8 Current Ratio of a Series Transformer. The current ratio of a series transformer is the ratio of the rms (root-mean-square) primary current to the rms secondary current under specified conditions of load.

3.9 Transient Insulation Level (TIL). A transient insulation level is a reference impulse insulation strength expressed in terms of the crest value of the withstand voltage of a standard full impulse voltage wave.

3.10 Standard Full Impulse Voltage Wave. The standard full impulse voltage wave is an impulse that rises to crest value of voltage in 1.5 microseconds (nominal time) and drops to 0.5 crest value of voltage in 40 microseconds (nominal time), both times being measured from the same time origin and in accordance with established standards of impulse testing techniques.

4. Transformer Marking

4.1 Nameplate Marking. Transformers shall be provided with a readily visible nameplate, which shall be permanently marked to indicate the following minimum information:

(1) Manufacturer's name or trade-mark
(2) Catalog number
(3) Primary and secondary ampere ratings[1]
(4) Frequency
(5) Maximum primary circuit voltage rating
(6) Output rating (lamp watts, lamp lumens,[1] or kilovolt-amperes)

4.2 Lead Marking. The leads of a constant-current (series) incandescent filament lamp transformer with taps on either winding from which connections are brought out shall be distinctly marked with their rated current. The leads of transformers without taps need not be marked.

5. Transformer Ratings

5.1 Ratings for individual-lamp insulating transformers for series incandescent filament lamps shall be in accordance with Table 1. The design voltage of the secondary winding of such transformers shall be appropriate for the lamp type (or types) that the transformers are intended to operate (see Appendix for a tabulation of lamp characteristics). If the transformer is intended for use under conditions where the lamp will not be mounted in the immediate proximity of the transformer, an additional allowance should be made for the voltage drop in the conductors between the transformer and the lamp.

5.2 Ratings for individual-lamp insulating transformers for voltage-rated incandescent filament lamps shall be in accordance with Table 2.

5.3 Ratings for group-series loop insulating transformers shall be in accordance with Table 3.

6. Performance Requirements

6.1 Load Current Regulation

6.1.1 Individual-Lamp Transformer for Series Incandescent Filament Lamp. When the transformer is supplied with rated primary current and frequency, the secondary current shall not vary more than 1 percent below or above the rated value when the secondary voltage varies between 15 percent above and 5 percent below the voltage at rated load. The higher value corresponds to the highest lumen rating; the lower to the lowest lumen rating appearing on the nameplate.

[1] A virgule (/) shall be used to separate: (1) lumen ratings and (2) currents obtained by the use of taps.

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Table 1
Ratings for Transformers for Series Incandescent Filament Lamps

Lamp Rating, Lumens	Transformer Current Rating, Amperes	
	Primary	Secondary
600/800/1,000	6.6 or 20.0	6.6
1,000/2,500	6.6 or 20.0	6.6
2,500/4,000	6.6 or 20.0	6.6/15*
4,000/6,000	6.6 or 20.0	15/20*
6,000/10,000	6.6 or 20.0	20
10,000/15,000	6.6 or 20.0	20

*The two secondary currents are obtained by means of a secondary tap.

Table 2
Ratings for Transformers for Voltage-Rated Incandescent Filament Lamps

Lamp Rating, Watts	Secondary Voltage at Rated Load, Volts	Transformer Current Rating, Amperes	
		Primary	Secondary
40	120	6.6 or 20.0	0.316
60	120	6.6 or 20.0	0.475
100	120	6.6 or 20.0	0.800
200	120	6.6 or 20.0	1.60
500	120	6.6 or 20.0	4.00
750	120	6.6 or 20.0	6.00
1,000	120	6.6 or 20.0	8.00

NOTE: A film-cutout protective device (not a part of the transformer) must be used with all ratings.

Table 3
Ratings for Group-Series Loop Insulating Transformers

Kilovolt-Ampere Rating	Secondary Voltage at Rated Load, Volts†	Current Rating, Amperes	
		Primary	Secondary
0.25	38	6.6 or 20.0	6.6
0.50	76	6.6 or 20.0	6.6
1.00*	152	6.6 or 20.0	6.6
2.00*	304	6.6 or 20.0	6.6
3.00*	455	6.6 or 20.0	6.6
4.00*	607	6.6 or 20.0	6.6
5.00*	758	6.6 or 20.0	6.6

*A film-cutout protective device must be used with these ratings. It may be an integral part of the transformer.

†Voltage at rated load is the volt-ampere rating divided by the secondary current.

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Table 4
Temperature Rise Limits

Type of Apparatus	Insulation Class	Winding Max Temp Rise, C*		Case Max Temp, C*
		Normal	Abnormal†	Normal
Independent Aerial	A	70	95	65
	B	95	120	65
Pole-Base or Vault	A	70	95	65
	B	95	120	65

*It is recognized that field conditions will permit rises different from those shown in this table, which are based on draft-free conditions. Revised values are to be developed.

†Abnormal heating condition is defined as that obtained with one or more lamps either inoperative in the circuit or removed from the circuit, whichever produces maximum temperature in any coil of the transformer assembly.

Table 5
Test Potentials

Transformer Type	Test Potential, rms Kilovolts	
	Primary Winding	Secondary Winding
Individual-Lamp Insulating	22.0	2.5
Group-Series Insulating	22.0	4.0

6.1.2 Individual-Lamp Transformer for Voltage-Rated (Multiple) Incandescent Filament Lamp. When the transformer is supplied with rated primary current and frequency, the secondary current shall not vary more than 1 percent below or above the rated value when the secondary voltage varies between 5 percent below and 15 percent above the voltage at rated load.

6.1.3 Group-Series Loop Insulating Transformer. When the transformer is supplied with rated primary current and frequency, the secondary current with unity power factor load shall not vary more than 1 percent above or below the rated value when the secondary voltage varies between 80 and 110 percent of the voltage at rated load.

6.2 Temperature Rise. The transformer shall be supplied with rated primary current and frequency from a constant-current source of the type defined in 3.1, and shall operate at rated load until the transformer is thermally stable in an ambient air temperature of 25°C ± 5°C. The temperature rise of any coil, when measured by the resistance method under the above conditions, shall not exceed the values given in Table 4.

In the temperature rise test, the transformer shall be loaded to deliver rated output at:

(1) Rated secondary current when the transformer has a single current rating.

(2) The secondary current rating that gives the higher loss when the transformer has a double current rating.

6.3 Dielectric Requirements

6.3.1 Applied Potential Test. Transformers, while hot from heating tests, shall be capable of withstanding for 1 minute, between windings and between each winding and core or enclosure, the successive application of a 60-cycle alternating voltage (essentially sinusoidal) from an external source in accordance with Table 5.

6.3.2 Transient Insulation Level. The transformer shall have a TIL as follows:

Type	TIL, Kilovolts[2]
Independent	50

6.4 Input Characteristics. When rated primary current and frequency are supplied from a constant-current source, the following shall apply:

6.4.1 Input Power Factor. The primary power factor of individual-lamp insulating transformers and group-series loop transformers shall not be less than 98 per-

[2] This value shall be determined by the application of a standard full impulse voltage wave between the input winding and core and case.

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cent when operating incandescent filament lamps at rated lamp or kilovolt-ampere ratings.

6.4.2 Input Current. The input current shall be one of the following:

(1) 6.6 amperes (rms)

(2) 20.0 amperes (rms)

6.4.3 Rated Circuit Voltage. The insulating series transformer shall be designed to operate with its primary winding at the rated circuit voltage, which is the highest rated voltage of the secondary winding of the constant-current transformer supplying the series circuit. The rated circuit voltage of the transformer shall be 10.5 kilovolts for independent transformers.

7. Physical Requirements

7.1 Mounting Dimensions. The mounting bracket for mounting an aerial-type transformer shall be of the satchel-handle type, with provision for accepting two 5/8-inch-diameter bolts whose center-line mounting dimensions may vary up to 4-5/8 inches.

The clearance between the transformer housing and the inside of the satchel handle shall be a minimum of 1 inch.

7.2 Length of Flexible Leads. The flexible leads shall have a minimum length of 8 inches.

Appendix (This Appendix is not part of American National Standard C82.8-1988, but is included for information only.)

Lamp Data

The following summary of lamp data is presented in Table A1 for information. Inclusion in Table A1 does not establish availability of lamp sizes shown.

Static-type transformers used for constant-current airport lighting circuits are almost identical to those described herein. See Federal Aviation Administration Advisory Circular 150/5345-47 Transformers, Isolation. Copies may be obtained from the Department of Transportation, Subsequent Distribution Unit, M-494.3, Washington, DC 20590.

Table A1
Operating Voltage of Series Incandescent Filament Lamps

Rated Lamp, Lumens	Bulb Size	Rated Current, Amperes	Approximate Initial Rated Voltage, Volts*†	
			2,000 Rated Hours Life	3,000 Rated Hours Life
600	PS 25	6.6	6.2–6.4	6.6–6.7
1,000	PS 25	6.6	9.4–9.6	9.8–10.0
2,500	PS 25	6.6	21.2–21.5	21.2–23.0
2,500	PS 35	6.6	21.3–21.6	22.4–23.0
4,000	PS 35	15.0	13.8–14.5	14.4–15.1
6,000	PS 40	20.0	14.7–15.5	15.5–16.1
10,000	PS 40	20.0	24.3–26.0	25.3–28.5
15,000	PS 40	20.0	35.4–36.0	37.5–38.7

*At rated current.

†In the listing of voltages the two values represent the extremes of those published in lamp manufacturers' catalogs from which these tabulations were prepared. Normal production variations are not included. The operating voltage will increase during life by approximately 5 to 10 percent.

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