

Federal Aviation Agency

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AIRPORTS

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SUBJECT : SPECIFICATION FOR L-833 INDIVIDUAL LAMP SERIES-TO-SERIES TYPE
INSULATING TRANSFORMER FOR 600 VOLT OR 3,000 VOLT SERIES CIRCUITS

1. PURPOSE. This circular describes the subject specification requirements for an insulating transformer. The specification is for the guidance of the public, and its use is required for project activity under the Federal-aid Airport Program.
2. CANCELLATION. This advisory circular replaces Federal Aviation Agency Specification L-833, "Individual Lamp Series-to-Series Type Insulating Transformer for 600 Volt or 3,000 Volt Series Circuits," dated August 6, 1962, without substantive change.
3. SCOPE OF SPECIFICATION. The specification requirements are for a completely enclosed rubber-covered insulating transformer for use with 6.6 ampere series airport lighting circuits having nominal voltage ratings up to 3,000 volts. The transformer shall be watertight and shall be designed for direct burial in the earth or installed in a base.
4. APPLICABLE SPECIFICATIONS. The following FAA specifications of the issue in effect on the date of application for qualification (see paragraph 10) apply to this circular. This circular shall govern in case of conflict.
 - a. Specification for L-823 Plug and Receptacle, Cable Connectors (AC 150/5345-26)
 - b. Specification for L-824 Underground Electrical Cables for Airport Lighting Circuits (AC 150/5345-7)
5. SOURCE OF APPLICABLE SPECIFICATIONS. Obtain copies of FAA specifications from the Federal Aviation Agency, Distribution Section, HQ-438, Washington, D. C. 20553.

6. TYPES. The transformer shall be built in one size. The primary shall be rated at 6.6 amperes, 60 cycles, and the secondary at 6.6 amperes. The transformer shall be rated 30-45 watts to permit operation of either a 30 or 45 watt, 6.6 ampere series lamps.
7. PERFORMANCE REQUIREMENTS.
- a. Transformer Characteristics. The characteristics of the transformer shall be within the limits set forth in Table 1.

Table 1TRANSFORMER CHARACTERISTICS

<u>Transformer Rating (Watts)</u>	<u>Primary Amperes</u>	<u>Primary Power Factor (Min.)</u>	<u>Efficiency (Min.)</u>	<u>Secondary Amperes</u>	<u>Load</u>
30-45	6.6	95%	80%	6.53 - 6.67	1.15 ohms (45 watt lamp plus losses)
30-45	6.6	95%	---	6.53 - 6.73	0.80 ohms (30 watt lamp plus losses)
30-45	6.6	---	---	6.6 - 7.1	Short-Circuited

- b. Temperature Rise. The temperature rise when a transformer is operated, at rated load or when short-circuited with rated current and frequency in the primary, shall not exceed 55 degrees Centigrade (131 degrees F.) as determined by the resistance method.
- c. Insulation. The transformer shall be insulated for operation from a 3000 volt primary circuit.
- d. Continuous Outdoor Service. The transformer shall be constructed for continuous outdoor service, i.e., buried directly in the ground, installed in an open or sealed base, or submerged in water. The range in ambient temperature for continuous outdoor service shall be from a minimum of -45°F. to a maximum of +120°F. at sea level.
- e. Core and Coil. The windings shall be completely insulated from the core and from each other.

8. DETAIL REQUIREMENTS.

a. Housing.

- (1) The housing shall completely enclose the core and coil assembly with leads sealed into the housing in such a way as to produce a completely watertight unit. All exposed parts of the transformer assembly shall be capable of withstanding outdoor exposure, immersion in water, or direct burial in earth containing large concentrations of oils, acids, or alkalis.
- (2) The housing material shall consist of rubber, synthetic rubber, or rubber-like compound. Other synthetic compounds may be used for the housing subject to prior inspection and approval by the Federal Aviation Agency, Airports Service, Washington, D. C.
- (3) In the housing, no portion of the case shall be less than $\frac{1}{4}$ inch thick and all seams shall be closed by permanent bonds. The housing shall also be permanently bonded to the sheath of the primary and secondary leads. There shall be a minimum of internal air pockets or voids, and the assembly shall be sufficiently rugged to withstand rough handling.
- (4) The shape of the transformer housing may be optional, but the over-all dimensions of the housing, excluding the leads, shall be such that the finished product can fit easily inside a space defined as a cylinder of 7 inches in diameter by 8 inches in height, inside dimensions.
- (5) The following information shall be molded on the surface of the transformer case or permanently marked on a nameplate attached to the transformer.
 - (a) Transformer, Series-Series 6.6/6.6 Amperes, 60 Cycles
 - (b) Watts 30-45 Volts 3000V
 - (c) Manufacturer's Name or Trademark _____
 - (d) Manufacturer's Catalog Number _____

b. Transformer Leads.

- (1) Each transformer shall be equipped with two single-conductor primary leads and one two-conductor secondary lead for applications where mating connectors are attached to the supply cables for plugging directly into the transformer connectors described below.

- (a) One primary lead shall be equipped with a plug type connector conforming to Figure 6a of AC 150/5345-26 "Specification for L-823 Plug and Receptacle, Cable Connectors". The other primary lead shall be equipped with a receptacle conforming to Figure 6b of Specification L-823. The cable for the primary leads shall be 19 strand, single-conductor insulated for not less than 5000 volts and shall be #8 AWG. It shall conform to the requirements of AC 150/5345-7 "Specification for L-824 Underground Electrical Cables for Airport Lighting Circuits". Each primary lead shall extend not less than 19 inches, plus or minus 3 inches, beyond the housing, including the cable connector.
 - (b) The secondary lead shall be equipped with a receptacle conforming to Figure 1c of Specification L-823. The cable for the secondary lead shall be 600 volt, two-conductor, #14 AWG and shall conform to the provisions of Underwriters' Laboratories requirements for Type SO cord and shall extend 42 inches, plus or minus 3 inches, beyond the housing, including the cable connector.
- (2) An approved watertight cap or plug shall be furnished on each mating part of each plug or receptacle for protection during shipment and installation.
 - (3) When specific orders require extra pigtail leads, equipped with plug-in connectors, for field splicing to primary supply cable, they shall be furnished as specified below.
 - (a) A length of Specification L-824, Type B, #8 AWG, 5 KV cable with a mating plug, Figure 6a of Specification L-823, vulcanized to one end having an over-all length of not less than 15 inches.
 - (b) A length of Specification L-824, Type B, #8 AWG, 5 KV cable with a mating receptacle, Figure 6b of Specification L-823, vulcanized to one end having an over-all length of not less than 15 inches.

9. TESTING.

- a. Qualification Testing. A sample transformer equipped with pigtail leads shall be tested by a disinterested testing laboratory as follows:

- (1) Performance Test. The performance of the transformer shall comply with the requirements defined in paragraph 7a and 7b.
- (2) Impact Test. The transformer shall be dropped twice from a height of four feet upon a concrete surface, once so it hits on the bottom of the case and once so it hits on the side of the case. This test should be conducted subsequent to the electrical characteristic tests required for paragraph 7a. Following this impact test, the transformer shall again be subjected to the electrical characteristic tests. Any failure or a change of more than 1 percent in the results obtained in the electrical characteristic tests shall be cause for rejection.
- (3) Insulation Resistance Test. For this test, the transformer shall be equipped with the pigtail leads. The joints where the connectors come together shall be taped to prevent separation from handling.
 - (a) The transformer shall be subjected to a continuous 20 cycle test. For each test cycle, the transformer shall be operated for a minimum of 5 hours in air, at room temperature, with 6.6 amperes flowing in the primary and with the secondary open-circuited. The transformer and its three connectors (with mating connectors installed) shall be immediately immersed in tap water, at room temperature, and soaked for not less than 12 hours.
 - (b) The direct current insulation resistance shall be measured immediately after immersion (before the transformer cools) and measured again after the soaking period. The insulation resistance shall be measured after the voltage shown in Table 2 has been applied for one minute between each coil and ground with the other coil grounded. An insulation resistance less than the values specified in Table 2 shall be cause for rejection. Zero and maximum readings of the test instrument shall be periodically checked by suspending the high voltage lead in air and immersing it in water.

Table 2

<u>Coil</u>	<u>DC Test Voltage</u>	<u>Minimum Insulation Resistance</u> <u>In Megohms</u>	
		<u>Cold</u>	<u>Hot</u>
Secondary (600V)	3,000	1,000	300
Primary (3000V)	10,000	1,428	500

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b. Production Testing. The following tests shall be made on each transformer after final assembly, and each transformer shall withstand the following tests successfully.

(1) Each transformer shall be tested by the manufacturer for current ratio at rated frequency and current on the primary and rated load on the secondary. The secondary current of each transformer shall be within the limits specified in Table 1.

(2) Each transformer shall be subjected to one complete cycle of the test specified in paragraph 9a(3).

c. Additional Inspection and Tests. Additional inspection and tests will be made as deemed necessary by the Federal Aviation Agency to determine compliance with this specification.

10. QUALIFICATION. The manufacturer shall furnish a sample transformer to a disinterested testing laboratory acceptable to the Federal Aviation Agency to be tested as described in paragraph 9a to obtain certification regarding the ability to manufacture the transformer meeting the requirements of this specification. The manufacturer shall furnish two copies of the test report to the Federal Aviation Agency, Airports Service, Washington, D. C. 20553, for review and approval consideration. The cost of testing shall be borne by the manufacturer offering the equipment for approval.

a. In addition to the test performed by the above independent testing laboratory, the manufacturer shall:

(1) Furnish a production model to the Airports Service for physical inspection. Cost of submitting the production model shall be borne by the manufacturer.

(2) Furnish parts list, installation instructions, and drawings to the Federal Aviation Agency, Airports Service, Washington, D. C. 20553, for review and approval.

b. Upon approval of the disinterested independent laboratory's test reports and the additional data required in paragraph 10a, which have shown satisfactory conformance to the specification requirements, the Airports Service will list the name of the qualified manufacturer and a description of their transformer in Advisory Circular No. 150/5345-1, "Approved Airport Lighting Equipment".

- c. At any time after approval has been granted under the above conditions, a certified copy of factory test reports on the latest production run of transformers produced under this specification shall be made available by the manufacturer upon written request from the Federal Aviation Agency

11. HOW TO GET THIS CIRCULAR. Obtain additional copies of this circular, AC 150/5345-31, "Specification For L-833 Individual Lamp Series-to-Series Type Insulating Transformer For 600 Volt or 3,000 Volt Series Circuits," from the Federal Aviation Agency, Distribution Section, HQ-438, Washington, D. C. 20553.


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