

27 April 1936

NRL Report No. B-1266

DR-1266

NAVY DEPARTMENT
BUREAU OF ENGINEERING

Report of

Test on Transformers, Gun Firing.
Manufactured and Submitted
by
American Transformer Company
Newark, New Jersey

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NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON D C

Number of Pages: Text - 5 Plates - 2
Authorization: Bu.Eng.ltr. S62-2(S)/L5(9-23-Ds) of 21 Feb. 1936.
Date of Test: March-April 1936.
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Distribution:
Bu.Eng. (5)

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MAY 6 1936

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Transformers submitted for test	Plate 1.
Transformers with case covers opened.	Plate 2.

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AUTHORIZATION FOR TEST

1. This test was authorized by reference (a), and other additional references pertinent to this problem are listed as references (b) and (c).

Reference: (a) Bu.Eng.ltr.S62-2(S)/L5(9-23-Ds) of 21 Feb. 1936.
(b) Specifications 17T19b of 1 May 1935.
(c) Bu.Eng.ltr.CL42/S71(2-20-Df) of 14 March 1936
to INM, Camden, N.J.

OBJECT OF TEST

2. The object of this test was to determine whether the subject transformers conformed to the specifications, reference (b), and their suitability for Naval use in connection with gun firing circuits.

ABSTRACT OF TEST

3. The subject transformers, shown by Plates 1 and 2, were set up at this Laboratory in suitable test circuits and carefully checked for compliance with the specifications, reference (b). The usual inspection of the transformers relative to materials, design and workmanship concluded the test.

CONCLUSIONS

(a) In so far as the electrical characteristics were concerned, the subject transformers complied with the specifications, reference (b), except that the secondary winding of the 200 VA transformer had a temperature rise 1°C above the allowable 50°C.

(b) The weight of the 200 VA transformer exceeds the allowable weight by 0.5 pounds.

(c) The aluminum cases are not provided with tapped bosses as specified under reference (b), par. E-3d(2).

(d) The grooves in the cases are too shallow to properly secure the 1/4" rubber gaskets. It was noted that adhesive tape was used to hold the gaskets in the grooves at the corners of the case.

(e) The sheet metal clips, securing the laminations, are not properly fastened and are easily removed. If retained, they should be so secured that they cannot be accidentally knocked off.

(f) Although the words "Primary" and "Secondary" have been engraved on the terminal block, the voltages have not been included as specified under par. D-6, reference (b).

RECOMMENDATIONS

(a) In view of the satisfactory test results pertaining to the electrical characteristics, it is recommended that these transformers be approved for Naval use subject to corrections covered by Bureau letter reference (c) and corrections noted under "CONCLUSIONS" of this report.

(b) It is also recommended that the 1/2 pound excess weight and 1°C excess temperature rise of the 200 VA transformer be not considered as sufficient cause for rejection.

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DESCRIPTION OF MATERIAL UNDER TEST

4. These gun firing transformers were manufactured by the American Transformer Company, 178 Emmet Street, Newark, New Jersey. They are intended for installation on the USS SAVANNAH and NASHVILLE (CL42-3) Main and A.A. batteries.
5. They are of the dry type, with cores made of thin iron laminations, adequately insulated from each other.
6. Located on each of the cores are primary and secondary windings insulated from each other and the core. One transformer is designed for 100 volt-amperes, the other for 200 volt-amperes, both having an input voltage of 115 volts, A.C., 60 cycles, and a secondary voltage of 18 volts.
7. The laminated cores, embodying their respective windings, are clamped together with the use of four flat steel strips $1/2" \times 3/16"$ and four fillister head steel machine screws provided with nuts. The two lower strips, secured to tapped bosses with four fillister head steel machine screws, secure the transformer to the case.
8. Lugs are provided for the Primary and Secondary lead wires and connect to a terminal block of phenolic material. Engraved on this block are the words "Pri." and "Sec.".
9. The aluminum alloy cases in which the transformers are mounted are identical in construction. Located on one end is a boss of sufficient size to accommodate two standard Navy terminal tubes. The case embodies four mounting lugs and is made watertight when the knife-edge of the cover is forced partly into a $1/4$ -inch rubber gasket recessed into the top of the case. Eight hexagon head steel through bolts, cadmium plated, secure the case cover.
10. The transformer cases are finished on the inside with black insulating varnish and in battleship gray on the outside.
11. Further details in their construction are shown by Plates 1 and 2.

METHOD OF TEST

12. Each transformer was first tested for voltage regulation by measuring the secondary voltage at no load and at full load with the application of 115 volts, A.C., 60 cycles to the primary.
13. Following this, each was tested for its efficiency by comparing the primary input with the secondary output at full rated load.
14. Each was then placed in a compartment having an ambient temperature of 40°C (104°F) and operated for 8 hours at rated load to determine the temperature rise of its windings.
15. A short circuit test was then given each transformer by placing a short across the secondary for a period of 15 seconds, when the primary was energized with a potential of 120 volts, A.C., 60 cycles.

16. Then followed the insulation resistance test, the dielectric test and a second insulation resistance test. The insulation resistance between the windings and the cores of each transformer was measured by a 1000 volt megger.

17. The test was concluded with the usual inspection of the transformers relative to their design, materials and workmanship.

RESULTS OF TEST

18. The test results obtained follow:

<u>Requirements</u>	<u>Test Values</u>	
	<u>Type</u> <u>100 VA</u>	<u>Type</u> <u>200 VA</u>
Secondary voltage: At a potential of 115 V. applied to the primary, the secondary voltage shall not exceed 20 volts at no load.	18.7 volts	18.95 volts
Voltage regulation: At a potential of 115 V. applied to the primary, the secondary voltage shall be 18 volts at full rated load, 100% P.F.	18.1 volts	18.0 volts
Efficiency: Shall not be less than 85%.	88.1%	89.28%
Temperature rise: No winding shall exceed a 50°C rise at ambient temperature of 40°C at full rated load.	Note: Resistance method used, case covers closed. Pri. - 28.5°C Pri. - 43.5°C Sec. - 29.0°C *Sec. - 51.0°C	
Rating: Transformers shall be capable of operating continuously at 120 volts on primary without exceeding the allowable temperature rise.	Temperature rises after 8 hours' operation were as given.	
Short circuit test: With a potential of 120 volts applied to the primary, the secondary shall be shorted for 15 seconds without causing damage.	No damage occurred to either of the transformers as a result of this test.	
Insulation resistance: Not specified.	The approximate insulation resistance by 1000 volt megger, prior to and after the application of the dielectric test, was 200 megohms.	

Requirements

Type
100 VA

Type
200 VA

Dielectric strength:

Each transformer shall withstand 2500 V. A.C., 60 cycles, applied for 1 minute between primary and case with secondary grounded to core and 1250 V. A.C., 60 cycles applied between secondary and case with primary grounded to core.

Satisfactory, no breakdowns occurring.

Dimensions:

Transformer complete shall not exceed the overall dimensions of 6"x6"x12".

6"x6"x12"

Weight:

Total weight shall not exceed 15 pounds.

14.5 lbs.

*15.5 lbs.

Terminal block:

Shall be of approved phenolic insulating material containing terminals for both primary and secondary windings.

Terminal blocks as specified.

Terminal marking:

Primary and secondary leads and their respective voltages shall be clearly marked.

*This requirement has not been complied with.

Watertight integrity:

No leaks shall occur when played with a stream of water from a 1" nozzle under a head of 35 feet from a distance of 10 feet.

Satisfactory, no leaks occurring.

Nameplate:

Shall be in accordance with specifications, par. D-8.

*The type has been marked "A" and "B" instead of "GF" and there is no available space for stamping date and number of specifications.

*Denoted failure to comply with the specifications.

CONCLUSIONS

19. In so far as the electrical characteristics were concerned, the subject transformers complied with the specifications, reference (b), except that the secondary winding of the 200 VA transformer had a temperature rise 1°C above the allowable 50°C.

20. The weight of the 200 VA transformer exceeds the allowable weight by 0.5 pounds.

21. The aluminum cases are not provided with tapped bosses as specified under reference (b), par. E-3d(2).

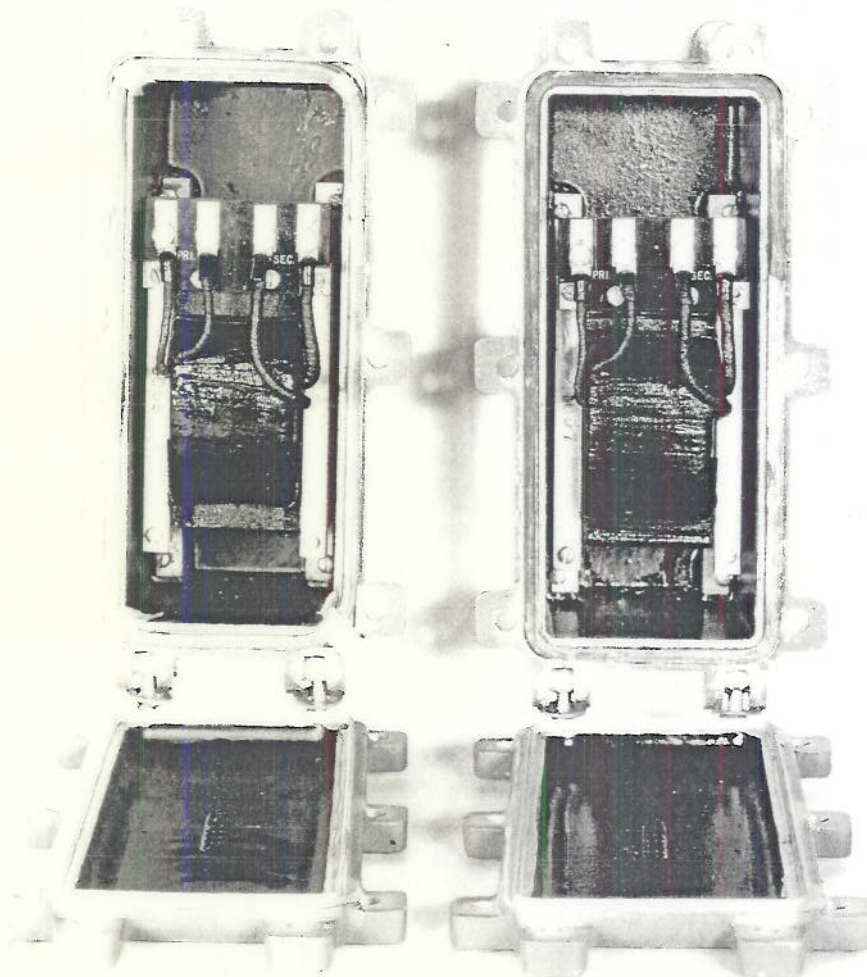
22. The grooves in the cases are too shallow to properly secure the 1/4" rubber gaskets. It was noted that adhesive tape was used to hold the gaskets in the grooves at the corners of the case.

23. The sheet metal clips securing the laminations are not properly fastened and are easily removed. If retained, they should be so secured that they cannot be accidentally knocked off.

24. Although the words "Primary" and "Secondary" have been engraved on the terminal block, the voltages have not been included as specified under par. D-6, reference (b).

100 VA.

200 VA.



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