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NAVY DEPARTMENT

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BUREAU OF ENGINEERING

Report of
Test of Transformer
Gun Firing - 100 Volt-Amperes

FR-1518

Submitted by
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WASHINGTON, D.C.

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| Photograph of transformer case with cover removed | Plate 1 |
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AUTHORIZATION

1. This test was authorized by reference (a) and another reference pertinent to this problem is listed as reference (b).

Reference: (a) BuEng. ltr. S62-2/L5 (11-2-Ds) of 9 Nov. 1938.
(b) Specifications 17 T 19b of 1 December 1936
as modified by 17 T 19c of 2 August 1937.

OBJECT OF TEST

2. The object of this test was to determine whether the subject transformer complied with the specifications, reference (b), and its suitability for Naval use.

ABSTRACT OF TEST

3. The subject transformer was set up at this Laboratory in standard test circuits where its performance was carefully checked to ascertain whether it was in strict accordance with the specifications. An inspection of the sample transformer, relative to approved materials, design, workmanship and shock integrity, concluded the test.

Conclusions

(a) The subject transformer, manufactured and submitted by Control Instrument Company, Brooklyn, New York, as a Navy Type GF, has complied with the requirements of the specifications except for the nameplate. A paper one is used instead of the required copper-nickel alloy.

Recommendations

(a) It is recommended that this type of transformer be approved for Naval use provided that an approved nameplate is used and sufficient clearance be allowed in the case mounting holes for 3/8 inch bolts.

(b) It is further recommended that the Bureau require that the case be modified so that the longest dimension is parallel to the bulkhead on which the transformer is to be mounted. It is understood that such transformers are usually mounted overhead and the present design unnecessarily reduces the overhead clearance.

(c) The Bureau's attention is invited to the values obtained at no load and the comparatively low power factor at rated load, given under Results of Test, paragraph 20.

DESCRIPTION OF MATERIAL UNDER TEST

4. The sample transformer is manufactured by Control Instrument Company, Brooklyn, New York, as a Navy Type GF, ratio 115/20, 100 volt-amperes.

5. It is of the dry type, having a core made up of separately punched thin laminations of steel insulated from one another when assembled. The core supports a primary and a secondary winding insulated from each other and the transformer core. The primary winding is wound over the secondary winding. Both windings are impregnated with insulating varnish.

6. The core rests on four (4) bosses located in the bottom of the cast aluminum alloy watertight case. Each boss contains a threaded steel insert for the transformer securing screws.

7. A terminal block of phenolic material, equipped with primary and secondary terminals, is provided. The windings are identified by engravings P1 P2 and S1 S2. The input voltage (115 volts) and the output voltage (20 volts) are also engraved on the terminal block. The block is supported by the transformer mounting screws.

8. A flange, cast integral with the case, has four (4) holes, one in each corner, to accommodate 5/16-inch mounting screws.

9. The case is provided with three (3) bosses, one each on three of the sides. One boss is tapped for a 3/4-inch terminal tube and the remaining two for 1/2-inch terminal tubes.

10. The cover is of cast aluminum alloy and contains a knife edge which contacts a 1/4-inch square rubber gasket, recessed in the rim of the case, when the cover is secured by four (4) 1/4-20 steel hexagon head machine screws, used as through bolts. The bolts are provided with steel washers and lockwashers. They are plated for protection against corrosion.

11. The case and cover, both internally and externally, have a base coat of zinc chromate paint. The inside is finished with a coat of insulating varnish and the outside with a coat of grey paint, each over a coat of aluminum paint.

12. A paper nameplate is provided on the case cover.

13. Further details in the design of the transformer are given by photographs, Plates 1 and 2.

METHOD OF TEST

14. The sample was first tested for voltage regulation by

comparing the secondary voltage at full rated load (100 V.A.) with the no load voltage.

15. The temperature rise of the windings was obtained by the resistance method, by placing the transformer in a temperature controlled cabinet, having a temperature of 37.2° C. (99° F.) and operating it for one (1) hour at full load (100 V.A.) at a primary voltage of 120 volts.

16. Next followed a short circuit test during which a short was placed across the secondary for a period of 15 seconds with the primary energized with 120 volts, a.c. 60 cycles.

17. The insulation resistance between the windings and the core was measured with a 1,000 volt megger, prior to, and following, the dielectric tests.

18. The ruggedness of the transformer was determined by placing it on a standard Bureau of Engineering shock stand and subjecting it to 20 shocks of 250 foot pounds each while mounted on the face of the panel, six inches below the point of impact.

19. The test was concluded with an inspection of the transformer for conformance with the specifications in the matter of design, materials, and workmanship.

RESULTS OF TESTS

20. The test results which follow were obtained when the sample transformer was tested in the order required by the specifications.

| <u>Requirements</u> | <u>Test Values</u> |
|---|--|
| Primary voltage: 115 volts | 115 volts. |
| Secondary voltage: Not over 20 volts with 115 volts primary. | 19.8 volts |
| Frequency and phase: 60 cycles, S.P. | 60 cycles, S.P. |
| Voltage regulation: The secondary voltage shall be not less than 18 volts at rated load, 100% P.F. with 115 volt primary. | 19.4 volts |
| Efficiency: Shall be not less than 85% at rated load (100 V.A.) P.F. 100%. | 85.47% (Primary, P.F. 66.1%) |
| Temperature rise: Shall not exceed 50° C. at ambient temperature of 37.2° C. at rated load for 1 hour. | Primary - 24.16° C. Secondary - 23.06° C. |

Requirements

Test Values

Short circuit test: Transformer shall withstand a short circuit on the secondary for 15 seconds with a 120 volt primary.

Satisfactory, no apparent damage to the transformer.

Insulation resistance: Not specified.

Following short circuit test - 200 megohms by 1,000 V. megger. Following dielectric test - 200 megohms by 1,000 V. megger.

Dielectric strength: Shall withstand 2500 V. A.C. 60 cycles for 1 minute, between primary and core, and between primary and secondary, and 1250 V. A.C. 60 cycles for one minute between secondary and core.

Complied.

Watertightness: No leaks shall occur in the case when immersed in water to a depth of 3 feet for a period of 12 hours.

Complied.

Shock integrity: Shall withstand 20 shocks of 250 foot pounds each.

Transformer withstood 20 blows of 250 foot pounds each while mounted on BuEng. shock stand.

Transformer mounting: Bosses provided on inside of case.

Bosses provided with steel inserts for transformer mounting screws.

Terminal block: Phenolic material equipped with terminals for both primary and secondary leads and line connections.

Complied.

Bosses for terminal tubes: Shall be drilled and tapped for two size "A" and one size "E" terminal tubes.

Complied.

Dimensions: Shall not exceed 6" x 12" x 6".

6"0 x 6.0 x 9"125

Case construction: Aluminum alloy case provided with four mounting lugs and a square rubber gasket recessed into the rim, and a cover provided with a knife-edge and secured with through bolts.

Complied.

Requirements

Test Values

Total weight: Shall not exceed 18.5 lbs. 14 lbs.13 oz.

Painting: Priming coat of zinc chromate followed with 2 coats of aluminum paint and 2 coats of varnish on the inside of case and two coats of gray over the same base coats on the outside.

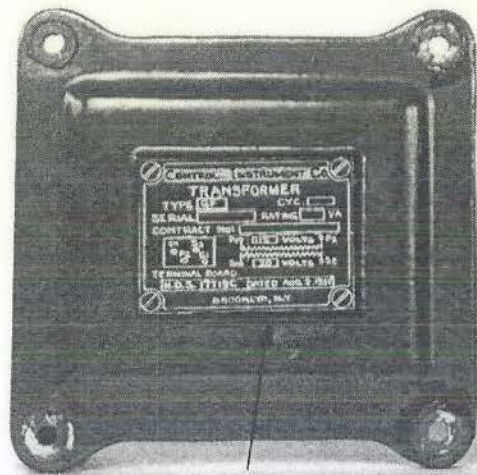
Complied.

No load conditions: Not specified.

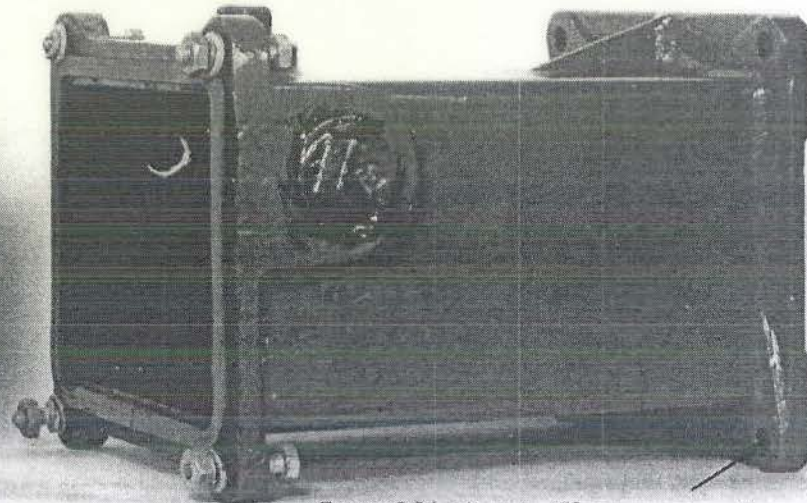
Primary - 115 volts
Amperes - 1.18
Watts - 21
Volt-Amps - 135.7
P.F. - 15.48%

CONCLUSIONS

21. The subject transformer, manufactured and submitted by Control Instrument Company, Brooklyn, New York, as a Navy Type GF, has complied with the requirements of the specifications except for the nameplate. A paper one is used instead of the required copper-nickel alloy.



Paper Nameplate



Insufficient Clearance for
3/8" Mounting Screws.

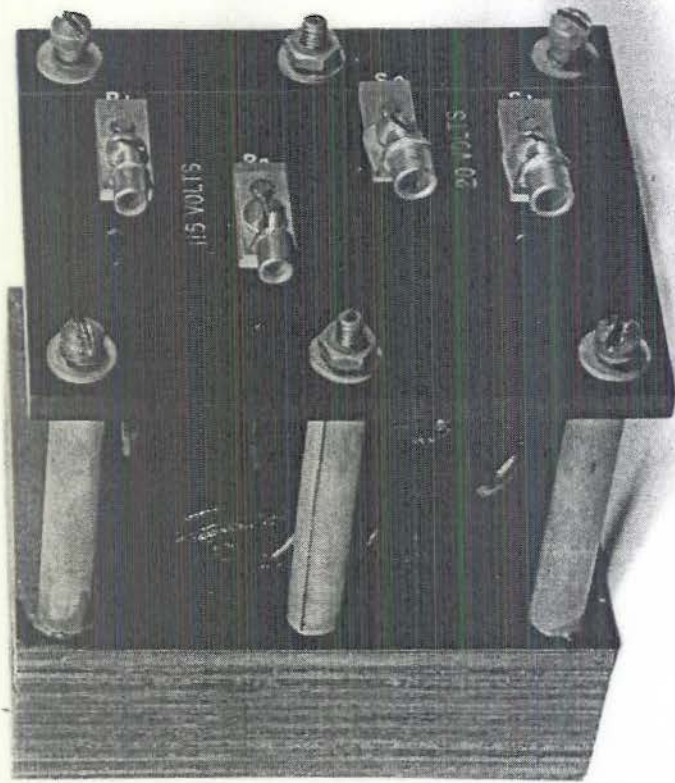


Plate 2