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SUBJECT

Report of Qualification Test

on

Contact Maker-Type L-Class 1

RR-1566

by

J. S. Bryant
W. B. Roberts

NAVAL RESEARCH LABORATORY

BELLEVUE, D. C.

26 October 1939

NRL Report No. B-1566

NAVY DEPARTMENT

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on

Contact Maker-Type L-Class 1

Submitted by

Henschel Corporation, Amesbury, Massachusetts

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D. C.

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Authorization: Bueng. ltr. S62-2/L5(9-28-Ds) of 2 October 1939.

Date of Test: October 1939

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APPENDICES

Photostat copy of Manufacturer's Plan 60-161 . . . . . Plate 1
Photograph of Contact Maker, Case Cover Removed. . . . . Plate 2

AUTHORIZATION FOR TEST

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

Reference: (a) Bueng. ltr. S62-2/L5(9-28-Ds) of 2 October 1939.
(b) Specification 17C16(INT) of 1 February 1939.
(c) Henschel Corporation Plan 60-161.

OBJECT OF TEST

2. The object of this test was to determine how closely the subject contact maker complied with the specification, reference (b), and its suitability for installation in lubricating oil systems.

ABSTRACT OF TEST

3. The sample contact maker, shown by photograph, Plate 2, was set up at this Laboratory and its performance carefully observed while under test for conformance with the specification, reference (b). A close examination of the sample, to determine compliance with plan, reference (c), and the requirements in the matter of materials, design and workmanship, concluded the test.

Conclusions

(a) The subject contact maker has complied with the specification except for its accuracy following the overpressure test. Prior to this, it was within the limits of ±0.5 pounds/sq.in. of its operating point.

(b) It is of rugged design, of first class workmanship, and it checks with manufacturer's plan, reference (c).

Recommendations

(a) It is recommended that the subject sample be given type approval as a type L, class 1 contact maker.

DESCRIPTION OF MATERIAL

4. This contact maker is manufactured by Henschel Corporation, Amesbury, Massachusetts, as a Type L, class 1, and is designed for installation in lubricating oil systems to operate an alarm when the pressure drops below a predetermined setting.

5. It consists of a micro-switch, piece 13, normally open, which is actuated by lever arm, piece 8, hinged on yoke portion of piece 34. The lever arm is actuated by steel plunger, piece 22, located inside of brass plunger, piece 25. Pressure in the system enters through an orifice in the bottom of outside base, piece 35. Adjustment is accomplished by threading steel screw, piece 21, in or out, thereby increasing or decreasing the tension of spring, piece 24, in order to obtain an operating point between 0-15 pounds per square inch.

6. The plunger is in contact with the diaphragm, and lost motion between the micro-switch and the plunger, is prevented by inside spring, piece 23.

7. The pressure chamber is sealed by soldering the brass diaphragm, piece 38, to the outside base, piece 35. Injury to the mechanism at overpressure is prevented by limiting the travel of the diaphragm. A 1/4-inch drain plug is located in the bottom of the pressure chamber. Four (4) fillister headed screws, piece 17, secure the inside base, piece 34, to the outside base, piece 35.

8. The mechanism is enclosed in a cast aluminum alloy case and cover. Watertightness is obtained with the use of "Velumoid" gaskets located between the outside base and case and between the cover and case. The case is provided with a boss, tapped for a 3/4-inch (IPS) terminal tube and three (3) mounting lugs, drilled for 1/4-inch mounting screws.

9. The case and cover, both inside and outside, are protected with a coat of zinc chromate paint. The inside is finished with black insulating varnish and the outside with "Glyptal" battleship gray. All steel parts are zinc plated.

10. A terminal block of phenolic material is located on the inside base, piece 34, to accommodate line connections. Nameplates of copper-nickel alloy are located on the cover and are secured by copper-nickel alloy machine screws,

11. Further details are given by Plates 1 and 2.

METHOD OF TEST

12. The sample was first checked to determine its operating

range. It was then set to operate an alarm circuit at a pressure of 5 pounds per square inch and then subjected to an endurance test of "on" 2 seconds, "off" 2 seconds for 24 hours at an ambient temperature of 10° C. and 24 hours at an ambient temperature of 70° C.

13. It was next checked for accuracy, followed by placing it on a standard Bureau of Engineering shock machine and subjecting it to 20 shocks of 250 foot pounds each while operating as under the endurance test.

14. It was then placed on a vibration machine, while operating as under endurance, and subjected to six tests of 30 minutes each, during which time shocks of 3 foot pounds each were delivered at frequencies of 100, 150, 200, 250, 300, and 350 shocks per minute.

15. Following the shock and vibration tests it was again checked to determine any change in the operating point.

16. The sample was next subjected to 15 pressure cycles, of 200 pounds per square inch, of 10 seconds each, applied at the rate of pressure increase of 200 pounds per square inch per second, followed by again checking to determine any change in its operating point.

17. The test was concluded with tests for dielectric strength, insulation resistance, watertight integrity, and an inspection to determine compliance with the specification, in the matter of design, workmanship and materials.

RESULTS OF TEST

18. The results which follow were obtained when the sample contact maker was tested in the order outlined by the specification.

Requirements	Test Values
Operation Range: Shall be adjustable over a range of 0 to 15 pounds.	1.5 to 15 lbs.
Endurance: Shall withstand 48 hours of operation, "on" 2 seconds, "off" 2 seconds, the first 24 hours at 10°C. and the final 24 hours at 70°C.	Complied, breaking the required load of 4 amperes, 0.5 P.F. at 115 volts (See table)
Accuracy: Operating point shall not vary more than ±1/2 pound.	Complied, no apparent injury to the mechanism. (See table)
Shock and vibration tests: Shall operate satisfactorily under conditions specified in paragraphs F-2e(2) to F-2e(5) inclusive.	Complied. (See table)

Requirements	Test Values
Overpressure: Shall withstand 15 pressure cycles of 200 pounds per square inch for 10 seconds each, applied at the rate of pressure increase not exceeding the rate of 200 lbs/sq.in./sec.	A change of 0.7 pounds occurred following the shock and vibration tests. (See table)
Inclination: Shall operate satisfactorily when inclined 45° from normal in all planes.	Complied.
Watertightness: Shall not leak when submerged in 3 feet of water for 1 hour.	Complied
Dielectric: Shall withstand 1500 volts, a.c., 60 cycles for 1 minute between all electrical parts and ground.	Complied
Insulation resistance: Shall be not less than 10 megohms at 500 volts.	Complied. 100 megohms.
Weight: Not specified.	5 pounds.

CONCLUSIONS

19. The subj[redacted] has complied with the specification except for its accuracy following the overpressure test. Prior to this, it was within the limits of ±0.5 pounds/sq.in. of its operating point.

20. It is of rugged design, of first class workmanship, and it checks with manufacturer's plan, reference (c).

TABLE

Operating Points During Tests (Lbs.per sq.in.)

	Contacts Closed	Contacts Opened	Differential
At start of test	5.0	5.4	0.4
Endurance at 10° C.	5.1	5.5	0.4
Endurance at 70° C.	4.5	5.6	1.1
After endurance	4.6	5.7	1.1
After shock test	4.6	5.7	1.1
After vibration test	4.6	5.8	1.2
After 15 operations at 200 lbs/sq.in.	3.9	4.8	0.9

Note: The estimated accuracy of the pressure gauge is $\pm$0.1 pounds.

Plate 2