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TECHNICAL NOTE No. 1731

MECHANICAL DEPARTMENT

ADMIRALTY ENGINEERING LABORATORY

WEST DRAYTON, MIDDLESEX

PRESSURE GAUGE TYPE TESTS - BUDENBERG GAUGE CO. LTD.

(PHOSPHOR-BRONZE TUBES)

Copy No. 95

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A.E.L. TECHNICAL NOTE No. 1731.

DECEMBER, 1964.

ADMIRALTY ENGINEERING LABORATORY
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PRESSURE GAUGE TYPE TESTS - BUDENBERG GAUGE CO. LTD.

(PHOSPHOR-BRONZE TUBES)

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SUMMARY

Two 4" gauges, one surface mounting, 0-200 p.s.i. for use with Oxygen, and one flush mounting, 0-600 p.s.i., were resubmitted by Budenberg Gauge Co.Ltd. for type test approval in accordance with ADSPEC.1001A. The Oxygen gauge met all the specified requirement, except for two minor points in construction. The other gauge failed the shock tests in that physical damage occurred during these tests.

A.E.L. TECHNICAL NOTE No.1731.

DECEMBER, 1964.

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DECEMBER, 1964.

ADMIRALTY ENGINEERING LABORATORY
WEST DRAYTON.

PRESSURE GAUGE TYPE TESTS - BUDENBERG GAUGE CO.LTD.
(PHOSPHOR-BRONZE TUBES)

INTRODUCTION

1. Two 4" gauges, one surface mounting, 0-200 p.s.i. range for use with Oxygen, and one flush mounting, 0-600 p.s.i. range, were resubmitted for type test approval in accordance with ADSPEC. 1001A.

2. Beryllium copper bourdon tubes are fitted as standard to gauges of this type and size at present supplied by this firm. The gauges reported upon herein are fitted with phosphor bronze tubes.

3. The Oxygen gauge as originally received, with an orifice check in the inlet connection, would not respond to pressure, even with the orifice check removed. Whatever caused the restriction was corrected by the makers and the gauge returned without the orifice check for testing.

4. Tests were conducted between 26th September and 8th December, 1964, under A.E.L., R & D Programme, Work Item No.406/1.

TEST PROCEDURE

5. Each gauge was examined and then tested for accuracy at the various stages of the type tests as detailed in ADSPEC. 1001A. up to the point when physical damage occurred.

6. A Budenberg dead weight tester was used to carry out the accuracy tests.

TEST RESULTS

7. These are displayed graphically in Figs. 1 and 2, which also include inspection remarks.

8. The straight line boundaries on each graph indicate the specified limits of error for the relevant accuracy test.

9. Damage to the flush mounting, 0-600 p.s.i. range gauge that occurred during the shock tests is shown in Figs. 3 and 4.

CONCLUSIONS

10. The surface mounting, 0 - 600 p.s.i., Oxygen gauge withstood all tests and its accuracy throughout remained within the specified limits, but it did not meet the specification in two relatively minor points. Although with the distance pieces assembled the fixing holes are the correct diameter it is considered that the 5/16" diameter holes on the specified P.C.D. in the mounting flange excessively weakens the flange. The minimum thickness of metal between the holes and the outside diameter of the flange is less than 1/16".

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The Adspec does not favour the use of plastic material for the back plate, but it withstood the shock tests without damage.

11. The flush mounting, 0-600 p.s.i., gauge failed to meet the specified requirements, in that physical damage occurred during the shock tests. It is recommended that future submissions should not include any fitments restricting free movement of the bourdon tube during testing. Also, if countersunk securing holes are required in the aluminium back plate its thickness should be increased.

Experimental Work by - G.C.J. HARNER,
(Senior D'man.)

Head of Section - M. RICHARDS,
(Commander, R.N.)

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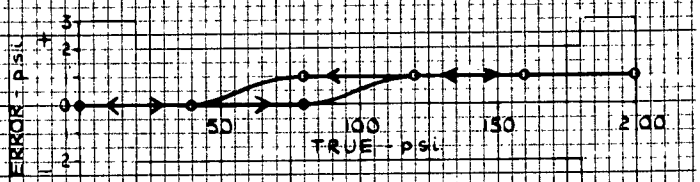
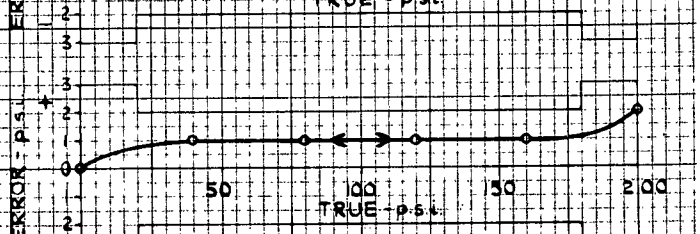
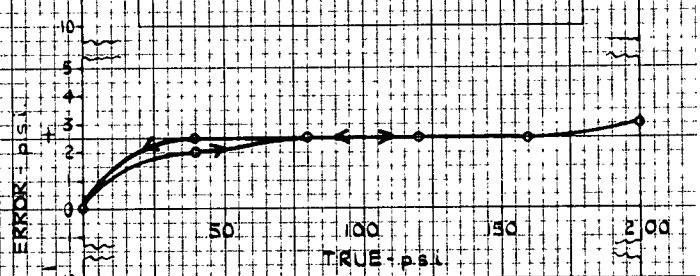
(1) INITIAL ACCURACY WITHIN SPECIFIED LIMITS.



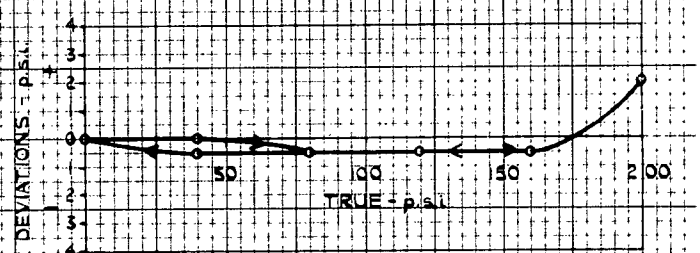
(2) AFTER OVERLOAD WITHIN SPECIFIED LIMITS.



(3) AFTER SHOCK WITHIN SPECIFIED LIMITS.



(4) AFTER PULSING WITHIN SPECIFIED LIMITS.



(5) INSPECTION REMARKS.

GAUGE MEETS THE SPECIFIED REQUIREMENTS, EXCEPT IN THE FOLLOWING RESPECTS :-

a.) DIAMETER OF HOLES IN MOUNTING FLANGE IS 5/16". THESE HOLES ARE DRILLED TO SUIT DISTANCE PIECES PROVIDED WITH THE GAUGE. THE DISTANCE PIECES ARE DRILLED FOR 2BA SCREWS, THE SIZE SPECIFIED FOR THE MOUNTING FLANGE IN TABLE 4, COLUMN 3 OF BS.1780:1960.

b.) A PLASTIC BACK PLATE IS FITTED, THE WHOLE PLATE FORMING THE BLOW OUT FEATURE. THE BACK PLATE IS HELD IN POSITION BY ONE METAL STRIP SECURED TO THE CASE BY TWO SCREWS.

BUDENBERG, 4" S, 0-200 p.s.i. OXYGEN GAUGE, TEST RESULTS.

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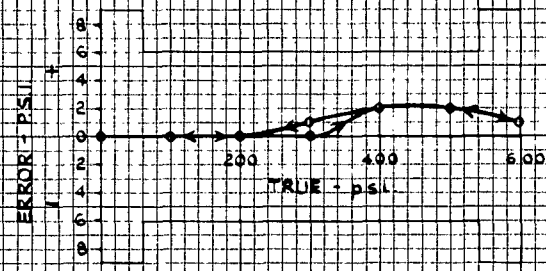
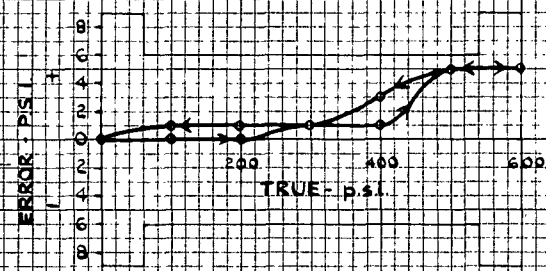
① INITIAL ACCURACY WITHIN SPECIFIED LIMITS.



② AFTER OVERLOAD WITHIN SPECIFIED LIMITS.



③ SHOCK TEST

DAMAGE OBSERVED DURING AND IMMEDIATELY AFTER SHOCK TESTS :-

1ST. DROP (GAUGE MOUNTED VERTICALLY AND CONNECTION AT 6 O'CLOCK.

- POINTER BENT SLIGHTLY (SEE FIG. 3.).

4TH. DROP (GAUGE MOUNTED HORIZONTALLY AND DIAL FACING UPWARDS.

- BACK PLATE EXTRUDED OVER ONE OF ITS SECURING SCREWS. (SEE FIG. 4) AND ZERO ERROR APPROXIMATELY +70 p.s.i. (SEE FIG. 3.). ROTATION OF POINTER ON PINION HAD NOT OCCURRED AS FAR AS CAN BE ASCERTAINED. HAIRSPRING DISTORTED TO SOME EXTENT.

BOURDON TUBE END PIECE HAD CONTACTED BACK OF DIAL AND BRASS STOP (SEE FIG. 3). SECURED TO BACK PLATE IN WAY OF TUBE END PIECE. FORCE ON STOP CAUSED EXTRUSION OF BACK PLATE.

④ INSPECTION REMARKS.

GAUGE MEETS THE DIMENSIONAL AND MATERIAL REQUIREMENTS OF ADSPEC. 1001A., BUT THE 22 S.W.G. ALUMINIUM BACK PLATE IS COMPARATIVELY WEAK AT THE COUNTERSUNK SECURING HOLES.

THE BRASS STOP, FITTED PRESUMABLY TO PREVENT FREE MOVEMENT OF TUBE TOWARDS BACK PLATE WHEN UNDER VIBRATION, IS CONSIDERED TO BE AN UNDESIRABLE ITEM, ALTHOUGH FITTING OF SUCH ITEMS IS NOT PRECLUDED IN THE SPECIFICATION.

BUDENBERG, 4" F, 0-600 p.s.i. GAUGE, TEST RESULTS.

FIG.3.

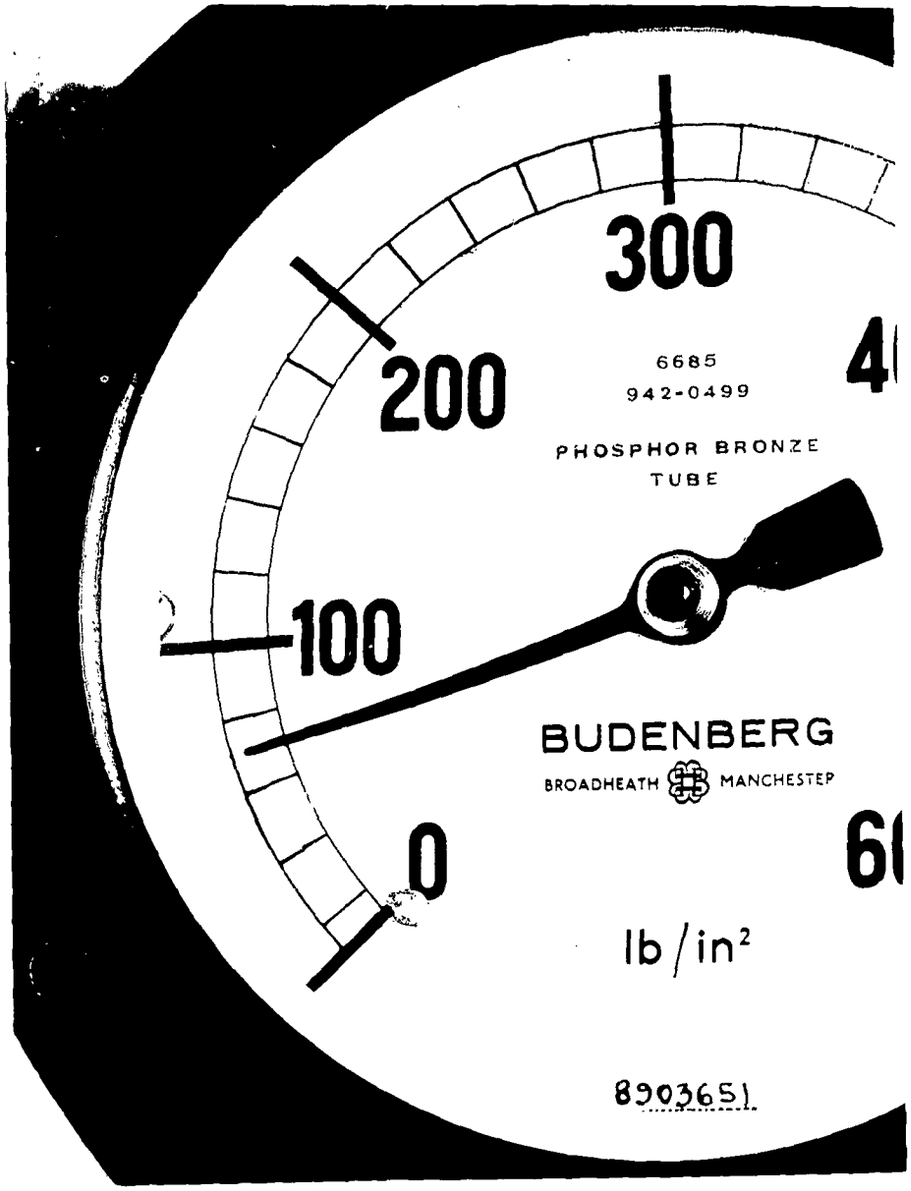


FIG.3. BUDENBERG, 4"(F), 0-600 p.s.i. GAUGE -DIAL INDICATING BENT POINTER AND ZERO ERROR AFTER SHOCK TESTS.

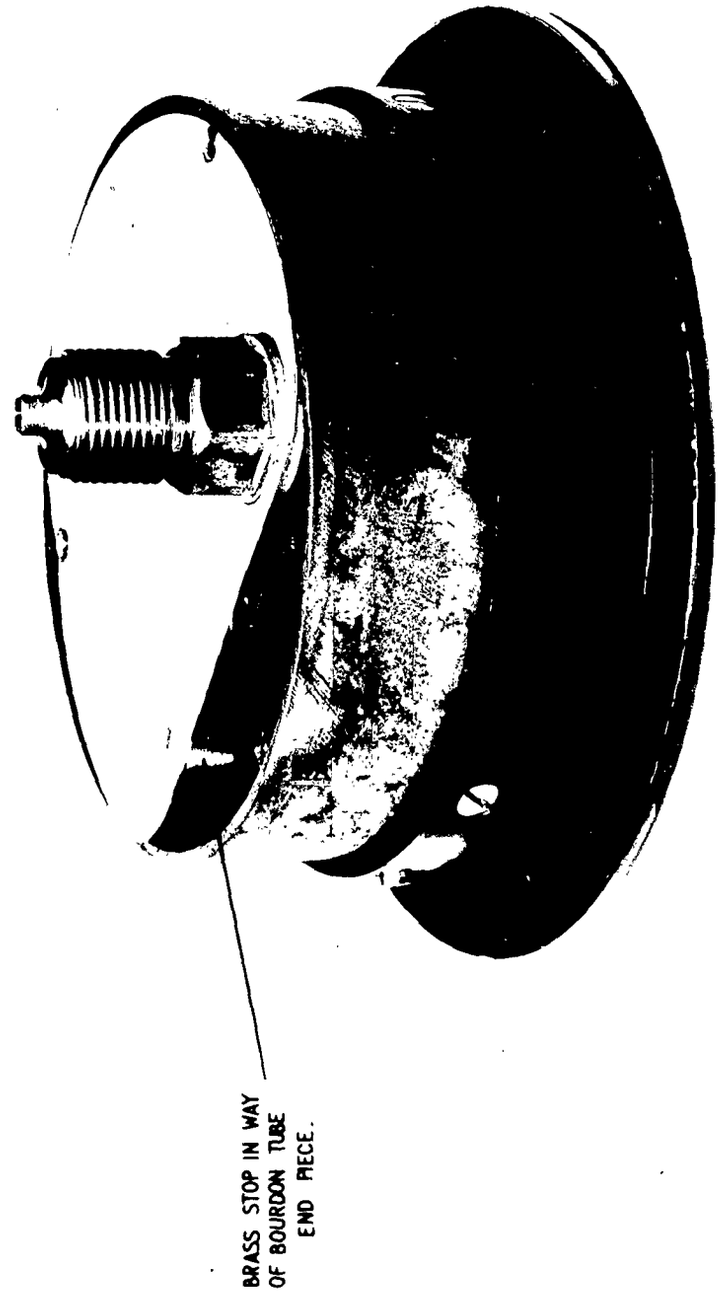


FIG.4. BUDENBERG, 4" (F), 0600 p.s.i. GAUGE - VIEW INDICATING DAMAGE TO BACK PLATE DURING SHOCK TESTS.

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