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**BRITISH STANDARD SPECIFICATION FOR
GENERAL PURPOSE PLATINUM WIRE
THERMOMETER BULBS
AND CONNECTORS FOR AIRCRAFT**

FOREWORD

This British Standard, prepared as a revision of British Standard G.148 : March 1955, relates to general purpose thermometer bulbs for use in aircraft. Bulbs suitable for the measurement of outside air temperatures will be the subject of another British Standard in the 'G' series. Although the bulbs are intended for use on d.c. electrical supplies, they may, if non-inductively wound, be suitable for use in a.c. systems up to 400 c/s.

The revised standard differs from the 1955 edition in the following respects:

- a. The introduction of details of a connector suitable for use in ambient temperatures up to 180°C.
- b. The deletion of the provision for bulbs designed to be dimensionally interchangeable with nickel wire thermometer bulbs complying with British Standard G.149.
- c. The omission of specific requirements relating to the hermetic sealing of the bulbs, the material to be used for the locking bushes and fixing nuts, and the method for determining the purity of the platinum wire.
- d. The introduction of a clause stating the characteristics to be declared by the manufacturer.
- e. Minor changes in the tests of resistance accuracy, cold end effect, thermal lag, self-heating and sealing resulting from experience of working to the 1955 edition of the standard and the use of the connectors at temperatures greater than 100°C.

The standard requires reference to the following British Standards:

- 2G.100: General requirements for electrical equipment and indicating instruments for aircraft.
G.114: Direct current ratiometer indicators for aircraft.
84: Parallel screw threads of Whitworth form.
2779: Fastening threads of BSP sizes.

NOTE. Where metric equivalents are stated the figures in British units are to be regarded as the standard. The metric conversions are approximate. More accurate conversions should be based on the tables in B.S. 350, 'Conversion factors and tables'. A table for the conversion of inches to millimetres are given in Appendix D.



SPECIFICATION

SCOPE

1. This British Standard specifies the requirements for bulbs with temperature-sensitive elements made of platinum wire and preferably unballasted, contained in a sheath, forming a thermometer bulb for use in conjunction with electrical indicators made in accordance with the latest issue of British Standard G.114. Platinum resistance thermometer elements are suitable for measuring temperatures over a wide range, beyond that given in Table 1, which covers the normal requirements on aircraft, but the operating range of various types of bulb depends on their construction and is to be declared by the manufacturer.

The specification deals with both normal response bulbs and high response bulbs. The normal response bulb is designed from the point of view of range of temperature operation rather than for speed of response. The high response bulb is designed to attain the highest response practicable and is further characterized by reduced self-heating effects but is generally restricted to a lower maximum operating temperature, usually of the order of 250°C.

Details of appropriate connectors are also given.

DEFINITIONS

2. For the purpose of this British Standard the following definitions shall apply:

a. Fundamental interval. The resistance change of a resistance element over the temperature range 0°C to 100°C. (Expressed as $R_{100} - R_0$).

b. Resistance element. An electrical resistor which changes its resistance with temperature according to a specified law.

SECTION ONE: GENERAL REQUIREMENTS

GENERAL CONSTRUCTION

3. The bulb shall be sound, suitable for its purpose, and its design and construction shall comply with the relevant requirements of British Standard 2G.100.

SECTION TWO: PARTICULAR REQUIREMENTS

CONSTRUCTION

4. *a.* Bulbs shall conform to Fig. 1 *a* or *b* and Fig. 2.

b. The plug and socket shall have solid pins and spring sockets and shall conform to those dimensions shown in Fig. 2 and Fig. 3 which affect interchangeability. The design shall be such that the plug and socket form an effective seal when submitted to the sealing test specified in Clause 17.

c. Bulbs shall be effectively sealed to ensure stability of operation over their declared operating life.

d. Bulbs intended for the measurement of the temperatures of liquids shall be made of a suitable corrosion-resisting material and shall withstand an external pressure of 5000 lbf/in² (352 kgf/cm²) when tested at a temperature not exceeding 100°C.

e. The locking bushes and fixing nuts shown in Figs. 1*a* and 1*b* shall conform in detail with Figs. 4 or 5, as appropriate, and shall be made of material suitable for the particular application of the bulb.

CALIBRATION

5. The temperature resistance characteristics of the bulb shall be in accordance with the formula and Table 1.

DECLARATIONS

6. In addition to the relevant declarations required by British Standard 2G.100: Part 1, the following information shall be supplied by the manufacturer:

- a.* bulb type, i.e. normal response or high response
- b.* operating temperature range of the element and connectors.

SECTION THREE: TESTS

GENERAL

7. *a.* Tests shall be made to prove compliance with all the requirements of this British Standard. It is not intended or recommended that complete tests shall be made on every bulb supplied.

Two kinds of tests, therefore, are specified as follows:

A. Type tests (Clauses 8 to 17), which shall be made on representative samples of each particular design and range of bulb.

B. Production routine tests (Clause 18), which shall be made on every bulb manufactured in accordance with this British Standard.

b. For the guidance of users, minimum tests recommended to verify the serviceability of bulbs manufactured in compliance with this British Standard are indicated in Appendix A.

A. TYPE TESTS

RESISTANCE ACCURACY

8. The resistance calibration of the bulbs shall be within the limits specified in Table 1 when tested at a current not exceeding one milliamp. The test shall be made at a sufficient number of points over the working range of the bulb to establish that the calibration is within the limits specified.

VIBRATION, ACCELERATION AND CLIMATIC TESTS

9. *a.* The bulb shall be subjected to the grade of vibration, acceleration and climatic tests specified in British Standard 2G.100: Part 2, appropriate to the performance grading declared by the manufacturer.

b. The functioning tests required by British Standard 2G.100: Part 2, in the vibration, acceleration and climatic tests shall each consist of a resistance accuracy test in accordance with Clause 8, taken at the prevailing temperature.

INSULATION RESISTANCE

10. The bulb shall be tested for insulation resistance, with the plug and socket combined, by the methods described in British Standard 2G.100: Part 2.

The minimum insulation resistance to earth shall be not less than 2½ megohms.

NOTE. Any device used for this test should be operated in such a way that the test voltage is not exceeded.

TABLE 1. STANDARD CURVE AND TOLERANCES AT BULB CURRENT OF 1 mA.

$$R_t = 130(1 + 0.0039583t - 0.000000583t^2).$$

where R = resistance at temperature t (ohms.)
 t = temperature ($^{\circ}\text{C}$).

Temperature	Resistance	Tolerances	Temperature	Resistance	Tolerances
$^{\circ}\text{C}$	ohm	ohm $\pm$	$^{\circ}\text{C}$	ohm	ohm $\pm$
-100	77.67	0.4	200	229.88	0.7
- 90	83.00	0.4	210	234.72	0.7
- 80	88.30	0.4	220	239.54	0.7
- 70	93.58	0.3	230	244.34	0.8
- 60	98.83	0.3	240	249.13	0.8
- 50	104.07	0.3	250	253.91	0.8
- 40	109.29	0.3	260	258.67	0.8
- 30	114.49	0.3	270	263.41	0.9
- 20	119.68	0.3	280	268.14	0.9
- 10	124.85	0.3	290	272.85	0.9
0	130.00	0.3	300	277.55	0.9
10	135.14	0.3	310	282.24	1.0
20	140.26	0.3	320	286.90	1.0
30	145.37	0.3	330	291.56	1.0
40	150.46	0.3	340	296.20	1.0
50	155.54	0.3	350	300.82	1.0
60	160.60	0.4	360	305.43	1.1
70	165.65	0.4	370	310.02	1.1
80	170.68	0.4	380	314.60	1.1
90	175.70	0.5	390	319.16	1.1
100	180.70	0.5	400	323.71	1.2
110	185.69	0.5	410	328.24	1.2
120	190.66	0.5	420	332.75	1.2
130	195.61	0.5	430	337.26	1.2
140	200.56	0.5	440	341.74	1.3
150	205.48	0.6	450	346.21	1.3
160	210.39	0.6	460	350.67	1.3
170	215.29	0.6	470	355.11	1.3
180	220.17	0.6	480	359.54	1.4
190	225.03	0.7	490	363.95	1.4
			500	368.34	1.4