

Specification for

General requirements for equipment in aircraft —

Part 2: All equipment —

Section 3: Environmental conditions —

Subsection 3.2: Temperature —
pressure requirements

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Foreword

This British Standard is part of a composite standard in the Aerospace series of British Standards specifying general requirements for equipment in aircraft. An introduction to the complete British Standard is given in BS 3G.100-0¹⁾.

This subsection of BS 3G.100 replaces in part the environmental requirements specified in Clauses **202** to **209** of BS 2G.100-2:1962. It details climatic environments against which aircraft equipment should be designed, and also defines climatic tests from which the necessary selection should be made to demonstrate that the equipment will be satisfactory for its operational environments. These functional characteristics do not necessarily determine the life or reliability of the equipment which should be dealt with by the individual relevant specification. Although in practice an almost infinite variety of environmental conditions may be encountered, depending on the class of aircraft and grade of equipment, etc., it is considered highly desirable to group together standardized test conditions which, when applied in a standard sequence, will demonstrate the operational capability of an item of equipment and yet, as an aid to equipment manufacturers, keep to a minimum the number of grades. The standard contains a schedule listing the tests and operational environments applicable to various equipment grades.

This Standard makes reference to the following British Standards:

BS 3G.100-2.3.0, *Standard test requirements*.

BS 3G.100-2.3.7, *Tropical exposure*.

BS 3G.100-2.3.X¹⁾, *Icing requirements*.

NOTE Information concerning SI units is given in BS 350, “*Conversion factors and tables*”, and PD 5686, “*The use of SI units*”.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ In course of preparation.

1 Scope

This subsection of BS 3G.100-2 specifies climatic design and test requirements in addition to providing guidance in the test procedures for those responsible for the formulation of the climatic requirements clauses that will appear in detailed equipment design or requirement specifications. It is intended that this document will permit the selection of specific test conditions and methods that will unambiguously define the climatic acceptance requirements for specific equipment in aircraft.

2 Field of application

Although this British Standard is intended to apply to equipment for general aircraft use, it may also be useful for application to equipment designed for use in specific aircraft. In such cases the relevant individual specifications should state what additional tests or amendments to these standard tests are necessary to meet precise requirements, e.g., in the case of transonic or high performance aircraft having a short-term high-speed capability, the conditions and duration of Test G, H, or J may not be adequate and may need to be supplemented. Not all the tests listed are necessarily applicable to a particular equipment (e.g., the low-altitude high-speed flight condition, Test G). Furthermore, although the tests are shown in the sequence considered to be the most practical and logical, it may not be ideal for a particular test programme. In these circumstances the individual specification should select from this standard the appropriate tests and state the sequence in which the tests are to be applied.

Information on the basis of the climatic temperature levels is given in Appendix A.

3 Definitions

For the purposes of this subsection of this British Standard the following definitions apply:

3.1 idle

isolated from the source or sources of power

3.2 operate

to cause an equipment to carry out some or all of the services and functions (as stated in the relevant specification) for which it is intended

3.3 performance

the demonstration in quantitative terms of the function(s) of an equipment to defined requirements

4 Classification and grading

For the purposes of this subsection of this British Standard, the environmental tests applicable to equipment shall be graded as below; a complete description of the environmental tests require the main grade identification letter with suffix numeral (e.g. **C.3**). Table 1 and Table 2 state the environmental test parameters for each grade.

4.1 Aircraft classification. The classes of aircraft specified in this subsection are as follows:

Class I Rotorcraft and low-performance aircraft.

This class includes all low-performance aircraft such as helicopters, "club" aircraft, piston-engined executive aircraft and, in general, all unpressurized aircraft with a nominal ceiling of 6 100 m (20 000 ft). It is probable that these aircraft will use outside air for cooling and have a simple heating system using waste engine heat.

Class II. Subsonic aircraft. This class includes most passenger civil aircraft, flying up to speeds of Mach 0.95, and having ceilings of 15 220 m (50 000 ft). Certain compartments will be pressurized and/or provided with heating and cooling systems.

Test G is a special test that has been included for military aircraft that have low-level speeds up to about Mach 0.95, although remaining subsonic at altitude. The reason for this special test is that the high temperatures experienced at low level will not be encountered by high-altitude civil aircraft.

Class III. Transonic aircraft. This class is primarily for military aircraft with maximum speeds up to Mach 1.3 and altitudes up to 18 300 m (60 000 ft) but with low-altitude speeds not greater than 1 300 km/h (700 knots) (i.e. Mach 1.06 at sea-level).

Test H has been introduced to this class of aircraft because the combination of flight temperature and air density can be a hazard not covered by the conditions of Tests G and J.

Class IV. Supersonic or high-performance aircraft.

This class includes all high-performance aircraft, but for the purpose of this standard is restricted to aircraft having, in the main, light alloy airframes, the temperature limit of which is considered to provide a convenient boundary. This limit is taken as a temperature of 150 °C and represents Mach numbers up to about 2.2 in cool ambient conditions. Short bursts of high speed may occur, but only equipment of low thermal capacity will be affected.

Maximum low-altitude speed will be about 1 500 km/h (800 knots) (i.e. Mach 1.2 at sea level) but for economic cruising Mach numbers of 0–9 and 0–95 would be more common. The maximum altitude is likely to be 21 300 m (70 000 ft) with minimum cruising speeds of Mach 0–7 to 0.9.

NOTE For aircraft having a performance outside the maximum speeds indicated for Class IV, there is insufficient evidence at present to give detailed temperature environments. Such aircraft would have airframes of heat-resisting material. However, it is not likely that temperature- and pressure-controlled zones will differ from Class IV. For unconditioned bays the temperature will depend upon the degree of insulation and flight time. For externally mounted equipment and for equipment in uninsulated bays temperatures will be of the following order:

Mach No.	Temperature
2.5	185 °C
3.0	290 °C
3.5	415 °C

This information is offered for guidance; the aircraft manufacturer should be consulted for more details.

4.2 Equipment grading

4.2.1 Civil and military grades

Grade A	Equipment mounted in the temperature controlled and pressurized region of Class II or IV aircraft, with pressure not lower than that corresponding to an altitude of 3 000 m (10 000 ft).
Grade B	Equipment in the temperature controlled but unpressurized region of a Class I aircraft.
Grade C	Equipment in the temperature controlled but unpressurized region of a Class II aircraft.
Grade D	Equipment in the temperature controlled but unpressurized region of a Class IV aircraft.
Grade E	Equipment in non-temperature controlled and unpressurized regions and in externally exposed locations of Class I aircraft.
Grade F	Equipment in non-temperature controlled and unpressurized regions and in externally exposed locations of Class II aircraft.
Grade G	Equipment in non-temperature controlled and unpressurized regions and in externally exposed locations of Class IV aircraft.
Grade H	Equipment located in the engine bay of a Class I aircraft.

Grade J Equipment located in the engine bay of a Class II aircraft.

Grade K Equipment located in the engine bay of a Class IV aircraft.

4.2.2 Additional military grades

Grade Q Equipment mounted in the temperature controlled and pressurized region of Classes II, III and IV aircraft, with pressure not lower than that corresponding to an altitude of 9 100 m (30 000 ft).

Grade R Equipment in the temperature controlled but unpressurized region of a Class III aircraft.

Grade S Equipment in the temperature controlled but unpressurized region of a Class IV aircraft, but having prolonged capability of high performance flying at low or intermediate altitudes.

Grade T Equipment in non-temperature controlled and unpressurized regions and in externally exposed locations of Class II aircraft, but having capability for prolonged high-speed flight at low altitudes.

Grade U Equipment in non-temperature controlled and unpressurized regions and in externally exposed locations of Class III aircraft, but having capability for prolonged high-speed flight at low and intermediate altitudes.

Grade V Equipment in non-temperature controlled and unpressurized regions and in externally exposed locations of Class IV aircraft, but having capability for prolonged high-speed flight at low and intermediate altitudes.

Grade W Equipment located in the engine bay of a Class III aircraft.

4.2.3 Grade suffix

Grade – .1 Equipment installed in aircraft intended for world wide use and with the equipment located in the aircraft such that when deployed in tropical regions the equipment would be significantly influenced by solar radiation*.