

Specification for

Power and current transformers for use in aircraft electrical power supply systems

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Foreword

This revision of BS G 127:1950 has been based upon Ministry of Aviation Specification EL. 2018, Issue B. It is intended to be used in conjunction with individual specifications for particular designs of transformer.

Reference is made in the standard to the following:

BS 2G 100, *General requirements for electrical equipment and indicating instruments for aircraft*¹⁾.

BS G 178, *Crimped joints for general purpose aircraft electrical cables*.

BS SP 20, *Panel type air filter elements for use with internal combustion engines and compressors on aircraft*.

BS 89, *Electrical indicating instruments*.

BS 171, *Power transformers*.

BS 205, *Glossary of terms used in electrical engineering*.

BS 822, *Terminal markings for electrical machinery and apparatus — Part 3: Terminal markings for power transformers*.

BS 3489, *Sound level meters (industrial grade)*.

NOTE The figures in British units are to be regarded as the standard. Metric conversions are approximate. More accurate conversions should be based on the tables in BS 350, “*Conversion factors and tables*”.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 13 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⁾ References to BS 2G 100-3 relate to the draft revision of that part (D65/11997).

1 Scope

This British Standard states the general design and test requirements for power transformers of 25 VA rating and larger and for current transformers for use in aircraft electrical power supply systems. It is intended to apply to single-phase, three-phase or Scott connected transformers used in distribution, load sharing and protective circuits etc., but not to transformers specifically designed for use in electronic equipment.

2 Definitions

For the purpose of this British Standard the definitions in BS 205 apply.

3 Construction

3.1 The design and construction of the transformer shall comply with the relevant requirements of BS 2G 100 and of the individual specification.

3.2 Unless otherwise required by the individual specification, the transformer shall be suitable for operation at altitudes up to 60 000 ft (18 300 m), and over a temperature range of -65°C to 70°C . For special applications operation at temperatures up to 125°C may be required.

4 Rating

4.1 Transformers for general applications shall be rated with a unity power factor load at sea level and at a temperature of 70°C , with no thermal conductance through the mountings. Transformers designed to be force-cooled shall also be subjected, whilst being rated, to the appropriate conditions of air flow specified in the individual specification.

4.2 For transformers for special applications the rating conditions, ambient temperature, altitude and cooling, shall be as specified in the individual specifications with any thermal conductance through the mountings taken into account when this can be defined.

4.3 If a transformer rated for general purposes is to be used for a specific application it will be necessary to repeat some of the rating tests under the relevant conditions in order to check its suitability for the particular application.

4.4 The rating under the most adverse combination of pressure and temperature conditions shall be declared.

5 Supply characteristics

5.1 Power transformers shall be designed to operate from the constant frequency or variable frequency a.c. power supply specified in BS 2G 100-3. The particular supply applicable shall be stated in the individual specification.

5.2 It cannot be assumed that the maximum frequency will necessarily occur at the maximum voltage, or that the minimum frequency will occur at the minimum voltage.

5.3 The transformer shall be capable of withstanding and operating under the conditions of transient and over voltage input indicated by the appropriate curves in BS 2G 100-3.

6 Efficiency and regulation

Unless otherwise stated in the individual specification, power transformers shall have an efficiency of at least 90 % on full load, and a voltage regulation (hot) of not more than 3 %.

NOTE Voltage regulation (hot) is the difference between the no-load secondary voltage with the windings at room temperature and the full-load secondary voltage with the windings at maximum temperature, expressed as a percentage of the no-load secondary voltage with the windings at room temperature.

7 Surges

7.1 Unless the inrush current characteristics of the transformer are such that a fuse of rating 2 amp or less will not be ruptured, the maximum peak value of inrush current of the transformer shall be declared with its I^2t value.

7.2 Power transformers shall also be designed to withstand without damage the voltage surges induced when they are switched off line with their loads disconnected.

8 Voltage balance

8.1 For three-phase transformers the difference between line to line voltages, and the difference between line to neutral voltages, shall not exceed 2 % of their nominal values, when tested using balanced nominal input voltages and balanced loads at all values between half full load and full load.

9 Environmental conditions

9.1 The transformer shall comply with the requirements of BS 2G 100-2 in respect of:

- 1) Vibration: Grade A, unless otherwise specified
- 2) Normal acceleration: Grade D, Class 1 (A) (i)
- 3) Crash acceleration: Grade F, Class 11
- 4) Climatic proofness: Class 1, unless otherwise specified.

9.2 If required by the individual specification, the transformer shall also comply with the requirements of **18.15**, **18.16** and **18.17** of this British Standard in respect of resistance to salt corrosion, dust and sand, and contaminating fluids, and with the requirements of BS 2G 100-2 in respect of:

- 1) Waterproofness: Grade B
- 2) Resistance to fire
- 3) Explosion proofness: to the category stated in the individual specification.

10 Arrangement and construction

10.1 There should be no limitation in the performance of the transformer in respect of the attitude in which it may be mounted. Any such limitations shall be declared.

10.2 The mounting arrangements for the transformer shall be such that its satisfactory operation is not affected under the specified conditions of vibration, acceleration and temperature variation.

10.3 Transformers bearing the same manufacturer's identification number shall be interchangeable mechanically and electrically.

10.4 The design and construction of the transformer should be such that it is suitable for 1 000 hours operation at maximum operating temperature, and for an operating life of 30 000 hours at 25 °C.

10.5 Transformers shall be designed to operate from a fully insulated system and the windings shall be insulated from the frame. In 3-phase star connected arrangements the neutral point shall be brought out to an insulated terminal, unless otherwise required by the individual specification.

10.6 If an electrostatic screen is required, this shall be stated in the individual specification. In transformers with electrostatic screens provision shall be made for earthing the core.

10.7 The maximum temperature of the external surface of the transformer whilst in operation shall be declared (see **18.5.1.1**).

11 Terminals

11.1 Screwed terminals, having Unified threads unless otherwise agreed by the Design Authority, shall be provided for external connections. They shall be designed in accordance with the requirements of BS 2G 100-1, and shall accommodate cable terminations of appropriate design of a rating adequate for the current and temperature to be carried, and crimped to the cables in accordance with the requirements of BS G 178.

11.2 The terminals shall be clearly and indelibly marked to identify the associated windings, in accordance with the requirements of BS 822-3.

12 Acoustic noise

12.1 Unless otherwise specified the noise emitted by the transformer, when measured in accordance with **18.10**, shall not exceed the following limits:

Transformer rating	Noise level
	dB
Below 1 kVA	60
1 kVA and above	75

13 Compass interference

13.1 The transformer shall be designed so that the external magnetic fields produced are as small as practicable. The compass safe distance, measured in accordance with BS 2G 100-2, shall be declared by the manufacturer.

14 Cooling

14.1 The transformer shall have adequate cooling facilities so that continuous operation at full load is possible at ground level at the maximum operating ambient temperature. The temperature conditions required at altitude will depend on the particular application, and will be stated in the individual specification.

14.2 For self-cooled, including fan-cooled, transformers the manufacturer shall supply curves indicating the limiting altitude for various ambient air temperatures when the transformer is supplying full load at nominal input voltage.

14.3 For force-cooled transformers curves shall be supplied showing the mass flow and pressure head of cooling air required for various inlet air temperatures at ground level, 30 000 ft (9 150 m) and 60 000 ft (18 300 m) and with the transformer supplying full load at nominal input voltage.

14.4 Information shall be provided on the installation drawings about the minimum clearances of the air exhaust and the quantity and head of air required for force-cooled transformers.