

SPECIFICATION FOR ELECTRICALLY-HEATED CATERING EQUIPMENT

Part 7. Water boilers

BS 4167 : Part 7 : 1969

THIS BRITISH STANDARD, having been approved by the Electrical Industry Standards Committee, was published under the authority of the Executive Board on 26th November, 1969.

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The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 5000, fully indexed and with a note of the contents of each, will be found in the British Standards Yearbook, price 20s. The BS Yearbook may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards:

- BS 729. Zinc coatings on iron and steel articles.
- BS 1224. Electroplated coatings of nickel and chromium.
- BS 1344. Methods of testing vitreous enamel finishes.
- BS 1358. Colours for vitreous enamel finishes.
- BS 1484. 10-gallon tinned steel milk can and lid.
- BS 1872. Electroplated coatings of tin.
- BS 2135. Capacitors for radio interference suppression.
- BS 2660. Colours for building and decorative paints.
- BS 3042. Standard test fingers for checking protection against electric shock and mechanical hazard.
- BS 3535. Safety isolating transformers for industrial and domestic purposes.

AMD 594

Amendment Slip No. 1, published 16 September, 1970

to BS 4167 : Part 7 : 1969

Electrically-heated catering equipment

Part 7. Water boilers

Additions

Clause 5. Finish

5.5 In the reference to BS 1224 delete '(Service grade No. 3S or 3C)' and substitute ' (Service condition no. 2) ' .

- BS 3831. Vitreous enamel finishes for domestic and catering appliances.
- BS 4410. The connection of flexible cables and cords to appliances.
- BS 6500. Insulated flexible cords.

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

The following BSI references relate to the work on this standard:
Committee reference ELE/75 Draft for comment 68/28042

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CO-OPERATING ORGANIZATIONS

The Electrical Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

Associated Offices' Technical Committee
Association of Consulting Engineers
Association of Mining Electrical and Mechanical Engineers
*Association of Supervising Electrical Engineers
*British Electrical and Allied Manufacturers' Association
British Radio Equipment Manufacturers' Association
British Railways Board
Crown Agents for Oversea Governments and Administrations
*Department of Employment and Productivity
Electric Cable Makers' Confederation
Electric Lamp Industry Council
Electric Light Fittings Association
Electrical Contractors' Association (Incorporated)
Electrical Contractors' Association of Scotland
Electrical Research Association
*Electricity Council, the Central Electricity Generating Board
and the Area Boards in England and Wales
Electronic Engineering Association
Engineering Equipment Users' Association
Institution of Electrical Engineers
Ministry of Defence
Ministry of Defence, Army Department
Ministry of Defence, Navy Department
Ministry of Power
*Ministry of Public Building and Works
Ministry of Technology
Municipal Passenger Transport Association (Incorporated)
National Inspection Council for Electrical Installation
Contracting
National Physical Laboratory (Ministry of Technology)
Oil Companies Materials Association
Post Office
Public Transport Association (Incorporated)
South of Scotland Electricity Board

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committees entrusted with the preparation of this British Standard:

Association of Supervisory Staffs, Executives and Technicians
Caterers' Association of Great Britain
Catering Equipment Manufacturer's Association
Cookery and Food Association
County Councils Association
Department of Education and Science
Department of Health and Social Security
Electrical Association for Women
Greater London Council
Hospital Caterers' Association
Industrial Catering Association
Institute of Hospital Engineers
Institutional Management Association
National Association of Restaurant Engineers
Tea Bureau

BRITISH STANDARD SPECIFICATION FOR ELECTRICALLY-HEATED CATERING EQUIPMENT

Part 7. Water boilers

FOREWORD

This British Standard has been prepared under the authority of the Electrical Industry Standards Committee.

Users of this standard should satisfy themselves that the installation of equipment conforming to the standard meets the requirements of any byelaws issued by the Ministry of Housing and Local Government and the Department of Health for Scotland. Pressure generating appliances shall additionally comply with the requirements of The Factory Act, 1961, where applicable.

This standard covers appliances for a.c. and d.c. but as appliances for d.c. are necessarily more complex than for a.c., organizations inviting tenders to this specification should make it clear in their initial enquiry whether the equipment is for use on a.c. or d.c.

The equipment described in this standard is not necessarily suitable for use in ships or road vehicles.

NOTE. The values of force are expressed in this standard in terms of the newton (symbol N). This is the unit of force in the international (SI) system. The newton is that force which, when acting on a body of mass one kilogramme, gives it an acceleration of one metre per second squared.

SPECIFICATION

1. SCOPE

This Part of BS 4167 specifies the general requirements and tests for automatic boiling water appliances. These are appliances designed to give continuous service with delivery of boiling water at the turn of the draw-off tap. Tests are laid down for two types of appliance:

(1) Appliances providing boiling water at a continuous rate proportional to the electrical input.

(2) Appliances with automatic controls which permit storage of heat and/or boiling water when the draw-off tap is closed.

The general requirements and tests will apply to both atmospheric and pressure type water boiling appliances. Specific constructional requirements for pressure appliances are also laid down.

The standard applies to equipment for operation on either single phase or polyphase supplies where the voltage to earth does not exceed 250 V a.c. or d.c.

It establishes a satisfactory standard of safety and performance when the equipment is used under normal conditions.

2. DEFINITIONS

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

NOTE. The terms ' voltage ' and ' current ' imply the r.m.s. values, unless otherwise specified.

(1) *Rated voltage*. The voltage (for a 3-phase appliance, the line to line voltage) assigned to the equipment and marked on it.

(2) *Rated current or input*. The current or input assigned to the appliance by the maker and marked on it.

(3) *Rated voltage range*. The voltage limits assigned to the appliance by the maker and marked on it.

(4) *Maximum rated input*. The maximum rated input, when an input range is marked on the appliance, is the highest input of the range. When the mean input is marked, the maximum rated input is given by the formula:

$$\text{Mean rated input} \times \left[\frac{\text{maximum rated voltage}}{\text{mean rated voltage}} \right]^2$$

(5) *Extra low voltage*. Voltage normally not exceeding 50 V a.c. with a maximum voltage to earth of 30 V, or 50 V d.c.

(6) *Non-detachable flexible cord or cable*. A flexible cord, or cable, so connected to the equipment that it can only be removed with the use of tools.

(7) *Thermostat*. A pre-set or adjustable device which, in normal use, keeps the temperature of appliances, or of parts of it, between certain limits by automatically opening and closing the circuit or by varying the current.

(8) *Thermal cut-out*. A safety device limiting the temperature of an appliance under abnormal conditions by automatically opening the circuit or by reducing the current. The device may be re-set by hand or may be self-resetting and is so constructed that there is no provision for adjustment of the setting by the user.

(9) *Energy regulator*. A device which provides a variable rate of energy transmitted to an electrically-heated appliance by changing the ratio of the ON and OFF periods in a progressive manner between the minimum and maximum setting.

(10) *Float switch*. A liquid level float-operated electrical switch.

(11) *Transportable appliance*. An appliance which can readily be removed from one place to another.

(12) *Stationary appliance*. An appliance intended to be fixed to its supporting surface or used in one place.

(13) *Output.* The output of any boiling water appliance is the number of litres per hour of boiling water raised from 13°C delivered from the draw-off tap under steady conditions at the rated input.

(14) *Storage output.* The storage output of any boiling water appliance is the amount of boiling water delivered in excess of the continuous flow output in a period of one hour from storage conditions at rated input.

(15) *Storage conditions.* A water boiler has reached storage conditions when operated at rated input with the draw-off tap closed, when it reaches that condition at which the automatic controls come into operation and the input is reduced to a maintenance rate.

(16) *Safe working pressure.* The operating pressure assigned to the appliance by the maker.

(17) *Test pressure.* Twice the safe working pressure.

(18) *Indicated level.* The maximum level to which an appliance may be filled for correct operation.

3. GENERAL REQUIREMENTS

3.1 The appliance shall be so designed and constructed that in normal use it is reliable and will operate without danger to the user or surroundings.

3.2 Where an appliance incorporating a water boiler also incorporates other electrically heated units, the other units shall comply with the relevant Parts of this standard.

3.3 TEST. Compliance shall be in general checked by carrying out the relevant tests specified.

3.4 Instructions for connecting, maintaining and operating the equipment shall be available for each appliance.

4. GENERAL CONDITIONS OF TESTS

4.1 The tests are type tests and are made on a single sample as delivered which shall pass all the relevant tests and specific requirements.

4.2 Unless otherwise specified, the tests shall be carried out in the order of the clauses.

4.3 The tests shall be carried out at an ambient temperature of $20 \pm 5^{\circ}\text{C}$ unless otherwise specified. Details of the test room and of the preparation of the appliance before testing are given in Appendix A.

4.4 The temperature of the water shall be measured by means of a mercury in glass thermometer. Surface, floor and wall temperature shall be measured by

fine wire thermocouples which are positioned so that they have the minimum effect on the temperature of the part under test.

4.5 Appliances designed for both a.c. and d.c. operation shall be tested using the system of supply which will prove most exacting to the appliance. When testing with d.c. the possible influence of polarity on the operation of switching devices shall be taken into account.

4.6 When it is specified that the appliance shall be connected to a test voltage so that the input is greater than the rated input, the test voltage as defined in the relevant clauses applies only to heating elements without appreciable positive temperature coefficient of resistance (in general the temperature coefficient is deemed to be appreciable if, at rated voltage, the input of the equipment in the cold condition differs by more than 25% from the input at operating temperature).

For the other heating elements the test voltage shall be determined in the following manner:

The rated voltage shall be applied until the heating element reaches its operating temperature. The voltage shall then be rapidly increased to the value necessary to give the required test loading, and the tests are made as specified, this value of the voltage being maintained throughout.

4.7 Where it is stipulated that equipment shall be operated at extra low voltage from a particular transformer supplied with it the test shall be made with this transformer.

5. FINISH

5.1 Finishes shall not be subject to excessive deterioration in normal use and shall adequately protect against corrosion at the temperature and in the humidity conditions to which they will be subjected in normal use.

Surfaces in contact with comestible liquid being heated shall be of such a material or so protected as to avoid contamination of the contents.

The finish of parts which are liable to come in contact with liquid shall be capable of being kept hygienically clean.

5.1.1 TEST. Compliance shall be checked by visual examination for signs of pin holes, blistering, peeling roughness or exposed untreated areas and for paint finishes by the tests of 5.2 and 5.3.

5.2 The appliance shall be set up as described in 9.1.1 and operated at its rated input with the draw-off tap closed for a continuous period of 5 h. Afterwards there shall be no appreciable change of colour on any part of the appliance and the finish shall not become tacky or show other signs of deterioration.

After the initial burning-off period, there shall be no detectable odour from the paint when the appliance is operated normally.

5.3 Paint films shall be subjected to a scratch test with a steel ball 1 mm in diameter. The ball shall be mounted in an apparatus in such a way that it shall be pressed against the surface with a force of 16 N (1.63 kgf) and it shall be caused to move once over the surface for a distance of approximately 65 mm at a speed of 30–40 mm/s. The design of the apparatus shall be such that the ball shall be applied to the surface gently, e.g. by allowing the ball carrier to run down a ramp.

The ball shall not penetrate completely through the film and if flakes are lifted from the edge of the scratch the major dimension of every flake shall be less than 1 mm. For electrically conducting paints penetration shall be determined by visual observation. For other paints penetration shall be shown by an electrical contact indicator, the voltage applied between the ball and the metal surface to which the paint shall be applied being not greater than 6 V.

The ball shall be cleaned after each test and inspected frequently to ensure that it has not worn significantly.

5.4 The colour of paint and similar finishes on exterior surfaces shall be in accordance with BS 1358* or BS 2660†.

5.4.1 TEST. Compliance shall be checked by inspection.

5.5 Finishes other than painted finishes shall comply with one of the following British Standards as appropriate:

BS 729, 'Zinc coatings on iron and steel articles'.

BS 1224, 'Electroplated coatings of nickel and chromium' (Service grade No. 3S or 3C).

BS 1344, 'Methods of testing vitreous enamel finishes'.

BS 1484, '10-gallon tinned steel milk can and lid'.

BS 1872, 'Electroplated coatings of tin' (classification 12S or 12C).

BS 3831, 'Vitreous enamel finishes for domestic and catering appliances'.

5.5.1 TEST. Compliance shall be checked as detailed in the appropriate standard.

6. VOLTAGE RATING

6.1 The highest rated voltage shall be 250 V for single-phase a.c. or d.c. or 440 V for 3 phase—4 wire a.c. No individual component other than the contact assembly of switching devices shall have a rated voltage exceeding 250 V.

6.1.1 TEST. Compliance shall be checked by inspection of the marking.

* BS 1358, 'Colours for vitreous enamel finishes'.

† BS 2660, 'Colours for building and decorative paints'.

7. MARKING

7.1 The equipment shall be marked with the following particulars:

- (1) The number of this British Standard, i.e. BS 4167 : Part 7.
- (2) Rated voltage or voltage range in volts.
- (3) Nature of supply, if necessary for the correct operation of the appliance (e.g., single-phase a.c. or 3 phase—4 wire a.c. or d.c.).
- (4) Rated input in watts or kilowatts.
- (5) Safe working pressure.
- (6) Maker's name or trade mark.
- (7) Maker's model or serial number.

7.2 Heating elements shall be marked with the rated voltage in volts, rated input in watts or kilowatts.

7.3 Any cover giving access to live parts at a voltage exceeding 250 V shall be marked with the word WARNING and the appropriate voltage. This marking shall not be incorporated with the markings specified in 7.1.

7.4 If the appliance can be set to different rated voltages, the voltage to which the appliance is set shall be easily and clearly discernible.

It shall be sufficient if the rated voltage to which the appliance is set is determined from instructions given on the appliance.

7.5 For an appliance where the difference between the limits of the rated voltage range is more than 10% of the mean value of the range, the upper and lower limits of the rated input shall be marked on the equipment so that the relation between input and voltage appears distinctly.

If the difference between the limits of the rated voltage range is not more than 10% of the mean value of the range, the marking of rated input shall relate to the mean of the voltage range. (Alternatively, the upper and lower limits of the rated input may be marked.)

If the input of the appliance in the cold condition differs by more than 25% from the input at operating temperature, the input in cold condition shall be marked in addition and shall be placed between brackets.

7.6 Appliances shall have the maximum level to which they may be filled, i.e. the 'indicated level', marked in such a position as to be visible to the operator when being filled by hand. The indicated level shall be at least 75 mm below the overflow.

7.7 If abbreviations are employed the following letters shall be used:

- | | |
|------------------------|---------|
| (1) Volts | V |
| (2) Amperes | A |
| (3) Watts or kilowatts | W or kW |
| (4) Pressure | P |