

Specification for

Safety of household and similar electrical appliances —

Part 102: Particular requirements —

Section 102.71 Dispensing appliances
for food, drink and packaged consumer
products

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Light Electrical Engineering Standards Policy Committee (LEL/-) to Technical Committee LEL/161, upon which the following bodies were represented:

Association for Consumer Research (ACRE)
 Association of Consulting Scientists
 Association of Control Manufacturers — TACMA (BEAMA Ltd.)
 Association of Manufacturers of Domestic Electrical Appliances
 British Cable Makers' Confederation
 British Electrotechnical Approvals Board
 British Gas plc
 British Lawn Mower Manufacturers' Federation
 British Retailers' Association
 Catering Equipment Manufacturers' Association
 Consumer Policy Committee of BSI
 Department of Trade and Industry (Consumer Safety Unit, CA Division)
 ERA Technology Ltd.
 Electrical Installation Equipment Manufacturers' Association (BEAMA Ltd.)
 Electricity Supply Industry in England and Wales
 Home Office
 Institute of Trading Standards Administration
 Institution of Electrical Engineers
 Lighting Industry Federation Ltd.
 Loss Prevention Council
 Portable Electric Tool Manufacturers' Association
 Rotating Electrical Machines Association (BEAMA Ltd.)
 Royal Society for the Prevention of Accidents
 Small Electrical Appliances Marketing Association
 South of Scotland Electricity Board

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

Automatic Vending Association of Great Britain
 Crown Suppliers
 Health and Safety Executive
 Standards and Test Protocols
 Water Services Association of England and Wales

Amendments issued since publication

Amd. No.	Date of issue	Comments

This British Standard, having been prepared under the direction of the Light Electrical Engineering Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 31 January 1991

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The following BSI references relate to the work on this standard:
 Committee reference LEL/161
 Draft for comment 89/32288 DC

ISBN 0 580 19117 6

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Foreword

This Section of BS 3456-102 has been prepared under the direction of the Light Electrical Engineering Standards Policy Committee and supersedes BS 5071:1974 which is withdrawn. The scope of this standard has been widened, compared with that for BS 5071, and recent advances in technology and the Low Voltage Electrical Equipment (Safety) Regulations 1989, which have superseded the Electrical Equipment (Safety) Regulations 1975, have been taken into account during preparation of this document.

It gives the particular requirements for dispensing appliances for food, drink and packaged consumer products and is to be read in conjunction with BS 3456-101:1987 “*General requirements*” which it supplements or modifies.

In this British Standard the following print types are used to differentiate between requirements, test specifications and explanatory matter.

Requirements: in roman type.

Test specifications: in italic type.

Explanatory matter: in small roman type.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations. In particular, attention is drawn to the following documents:

The Electricity at Work Regulations 1989.

The Low Voltage Electrical Equipment (Safety) Regulations Statutory Instrument 1989 No. 728.

Health and Safety at Work etc. Act 1974.

The Food Hygiene (Market Stalls and Delivery Vehicles) Regulations 1966 and subsequent amendments.

Food Hygiene (Amendment) Regulations 1989.

Control of Substances Hazardous to Health Regulations 1988.

Statutory Instrument 1987 No. 1523.

The Food Act 1984.

The Materials and Articles in contact with Food Regulations 1987.

Model Water Byelaws 1986. Statutory Instrument 1989 No. 1147.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 20, an inside back cover 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.

Introduction Principles of safety

General

It is essential that designers should understand the underlying principles of safety requirements in order that they can engineer safe appliances. The following notes are not an alternative to the detailed requirements of relevant standards and regulations but are intended to provide designers with an appreciation of the principles on which these requirements are based.

Particular attention is drawn to a number of different definitions of terms which are used in various safety standards associated with this standard. This can be confusing to even the experienced engineer. They appear either as acronyms or written in full, and include:

- SELV (safety extra-low voltage);
- FELV (functional extra-low voltage);
- PELV (protected extra-low voltage);
- MELV (machine extra-low voltage).

Legislation and codes of practice, some issued by the European Community (such as the Machines Safety Directive) and some by more local sources (such as the Wiring Regulations of the Institution of Electrical Engineers), all need to be considered in the formulation of a standard for safety. With various documents providing conflicting definitions for the same term, a simple coherent approach was needed for this standard. This document only uses the term “safety extra-low voltage”.

Hazards

The application of standards is intended to prevent injury or damage due to such hazards as:

- electric shock;
- energy hazards;
- fire;
- mechanical hazards;
- radiation hazards;
- chemical and toxicity hazards;
- microbiological hazards;
- explosion;
- thermal hazards.

Electric shock

Electric shock is due to current passing through the human body. Currents of the order of 1 mA can cause a reaction in persons in good health and may cause indirect danger due to involuntary reaction. Higher currents can have more damaging effects. Voltages up to 42.4 V peak, or 60 V d.c., are not generally regarded as dangerous under dry spacious conditions but conductive parts which have to be handled or grasped should be at earth potential or be properly insulated. It should be noted that people working on dispensing appliances may have wet hands.

There are two groups of people who will normally have access to dispensing appliances and concern must be shown towards each:

- users/operators;
- skilled service personnel.

“User/operator” is the term applied to all other than skilled service personnel and requirements for protection should assume that such persons (including cleaners, casual visitors, etc.) are oblivious to electrical hazards but will not act intentionally in the sense of creating a hazard. It can be assumed that skilled service personnel will be reasonably careful in dealing with obvious hazards but design should protect against mishap by use of warning labels, shields for hazardous voltage terminals, the segregation of accessible extra-low voltage circuits from hazardous voltages, etc. It is essential that the design of the equipment ensures that service personnel should be protected against unexpected hazards.

It is normal to provide a protective measure for protection of personnel against electric shock resulting from a fault. This protective measure relies on the principle of two means of protection so that a single fault will not create a hazard, e.g. basic and supplementary insulation in double insulation. However, provision of additional protective measures, such as protective earthing or supplementary insulation, is not considered a substitute for, or a relief from, properly designed basic insulation.

Class I movable appliances are considered to present a slightly increased risk of shock due to possible extra strain on the supply cord, leading to rupture of the earth conductor and a consequent leakage current hazard. With hand-held ancillary equipment, this risk is increased, wear on the cord is more likely and further hazards could arise if the units were dropped.

Electric shock: Causes and prevention

Cause:

Contact with parts normally at hazardous voltage.

Breakdown of insulation between parts normally at hazardous voltage and accessible conductive parts.

Breakdown of insulation between parts normally at hazardous voltages and safety extra-low voltage circuits, thereby putting accessible parts at hazardous voltage.

Breakdown of insulation guarding parts at hazardous voltage.

Prevention:

Prevent operator access to parts at hazardous voltage by fixed or locked covers, interlocks, etc. Automatic discharge of capacitors charged to hazardous voltages.

Either connect the accessible conductive parts to earth so that the voltage which can develop is limited to a safe value and the circuit over current protection will disconnect the parts having low impedance faults; or use double or reinforced insulation between parts normally at hazardous voltages and accessible conductive parts, so that breakdown is not likely to occur.

Segregate hazardous and safety extra-low voltage circuits. Separate by earthed metal screens or double reinforced insulation.

For parts at hazardous voltage, insulation which is accessible to the operator should have adequate mechanical and electrical strength which does not rely solely on basic insulation to eliminate this danger.

Energy hazards

Shorting between adjacent poles of high current supplies or high capacitance circuits may cause arcing or ejection of molten metal resulting in burns. Even extra-low voltage circuits may be dangerous in this respect. Protect by separation, by shielding or by using safety interlocks. Design should give protection from hazards associated with materials such as pressurized fluids.

Fire

Temperatures which could cause a fire may result from, for example:

- overloads;
- water supply failure;
- component failure;
- insulation breakdown;
- high resistance;
- loose connections.

Fires within the appliance should be prevented but, if occurring, should be contained to avoid spreading beyond the immediate source.

Mechanical and thermal hazards

Design should be such as to prevent injury, for example from:

- high or low temperature of parts or dispensed products accessible to the user/operator;
- mechanical and structural instability;
- the presence of sharp edges and points;
- inadequate guarding or interlocking of dangerous moving parts including those with stored energy.

Radiation hazards

Where appliances emit any form of radiation, the design should prevent stray emissions and keep user/operator and service personnel exposure to acceptable levels. Examples of the types of radiation that may be encountered are sonic, radio frequency, high intensity visible, infra-red, laser, ultraviolet, ionizing, etc.

Some of these hazards and maximum exposure levels are defined in dedicated standards and/or national legislation, e.g. lasers.

Chemical and toxicity hazards

In food and drink dispensing appliances contact with hazardous chemicals, e.g. descaling agents, carbon dioxide, etc., or with their vapours, fumes, etc., may cause injuries and damage. Controls and training in their correct use, handling and disposal, including the provision of understandable container warning labels, are required to limit such contact in normal and abnormal use.

Attention is drawn to the Health and Safety Commission guidelines under the Control of Substances Hazardous to Health Regulations 1988.

Special care should be taken in the selection of materials to be used in the construction of the food-bearing surfaces installed within the appliance to ensure that these will have no harmful effect upon the consumer. This embraces all ingredient canisters, washers and seals, etc. within or through which any dry ingredient, water or finished drink will be brought into contact before consumption.

Microbiological hazards

The possible presence of water at temperatures of less than 70 °C, food products, and drink concentrates within dispensing appliances can give rise to a multiplication of micro-organisms. Organisms gain access from a variety of sources including:

- surfaces of appliances/components;
- water supply to the appliance;
- drink ingredients;
- stale food and crumbs;
- the environment (dust, etc.);
- service personnel;
- the general public (end users).

The three factors controlling bacterial growth are food, moisture and warmth and these form the basis of sanitation in food equipment.

The design should allow for ease of cleaning and avoidance of direct and consequential hazard. Special design attention should further be given to food dispensing appliances for close temperature control throughout food compartments to prevent spoilage and consequent bacterial growth.

General recommendations on safety

Materials used in the construction of appliances should be selected and arranged such that they can be expected to perform in a reliable manner and without adverse effect on the quality of the dispensed product.

Appliances should be so designed and constructed that under normal and likely fault conditions, injury and/or damage to property should not result. Sufficient information should be provided to the user by the manufacturer as to any conditions required to ensure that the equipment will not present a hazard in normal use.

Appliances should be designed to take account of the fact that they must be capable of being operated safely by the general public including infirm persons and young children without supervision.

Specific recommendations on safety

Safety Standards such as this standard provide detailed requirements for design of electrical appliances including:

- marking and instructions;
- protection against electric shock and high energy;
- insulation;
- accessible circuits and conductors;
- provision for protective earthing;
- means for electrical isolation and disconnection;
- overcurrent and earth fault protection;
- safety interlocks;
- creepage distances and clearances;
- distances through insulation;
- wiring and connections;
- stability and mechanical hazards;
- mechanical strength;
- construction details;
- resistance to fire;
- heating;
- earth leakage current;
- electric strength;
- abnormal operating and fault conditions;
- radiation, toxicity and other hazards.

1 Scope

This clause of Part 101 is applicable except as follows:

1.1 Replacement:

This section of BS 3456 applies to electrically operated dispensing appliances designed to prepare and/or deliver food, drink and packaged consumer products.

These dispensing appliances may be operated by coins, credit cards, etc.

Dispensing appliances include, for example:

- hot and cold beverage vending machines;
- refrigerated merchandisers;
- packaged food and drink vending machines;
- espresso coffee dispensers;
- bulk tea and coffee brewing and dispensing machines;
- newspaper or magazine vending machines, etc.

This standard does not apply to:

- appliances designed exclusively for industrial purposes;
- appliances designed exclusively for household use;
- electrode heaters used within an appliance;
- appliances intended to be used in locations where special conditions prevail, such as the presence of corrosive, flammable or explosive atmospheres (dust, vapour or gas).

For appliances intended to be used in vehicles or on board ships or aircraft, additional requirements may be necessary.

For appliances intended to be used in tropical countries special requirements may be necessary.

Attention is drawn to the fact that in many countries additional requirements may be specified by the health authorities and the national authorities responsible for water supplies and for the protection of labour.

In many countries additional requirements for pressure appliances are specified.

Appliances where applicable shall comply with other Sections of BS 3456-102.

This standard does not take into account the special hazards which exist in nurseries and other places where there are young children or aged or infirm persons without supervision. In such cases additional requirements may be necessary.

2 Definitions

This clause of Part 101 is applicable except as follows:

2.2.4 Addition:

The rated input is the sum of the rated inputs of all the individual elements in the appliance which can be on at one time; where there are several such combinations possible, that giving the highest input is used in determining the rated input.

2.2.21 Replacement:

Extra-low voltage denotes a voltage between conductors or between a conductor and earth not exceeding 42.4 V peak or 60 V d.c. existing in a secondary circuit which is separated from hazardous voltage by at least basic insulation, but which does not meet the requirements for a safety extra-low voltage circuit nor those of a limited current circuit.

2.2.22 Replacement:

Safety extra-low voltage denotes for dry spacious conditions a nominal voltage not exceeding 42.4 V peak or 60 V d.c. between conductors and earth, or for three-phase supply not exceeding 24 V between conductors and neutral, existing in a secondary circuit. When the safety extra-low voltage is obtained from the supply mains it is derived from a safety isolating transformer or converter with separate windings.

Under fault conditions higher voltages are permitted in this standard, as specified in subclause 8.102.

In the presence of conducting fluids, powders, etc. lower voltages may be required as specified in subclause 8.4.

The voltage limits given are based upon the assumption that the safety isolating transformer is operated at its rated supply voltage.

2.2.29 Replacement:

Conditions of adequate heat discharge denotes the conditions that apply when an appliance is operated normally.

For an appliance intended to be connected to the water supply, the appliance is installed in accordance with the manufacturer's instructions. The appliance is completely filled with water, ingredients, products, etc. required in the dispensing operation, to the indicated level. Where several levels are marked, that giving the most unfavourable condition is used. Cash boxes, overflow buckets, etc. are completely emptied and the device is adjusted according to the manufacturer's instructions. Controls intended to be operated by the user/operator are adjusted to the most onerous setting.

For all appliances the temperature of the cold water supplied during testing is 15 ± 5 °C and where applicable at a pressure within the operating range specified by the manufacturer.

The appliance is operated under standby conditions until temperatures have stabilized. The appliance is then operated at the maximum rate for dispensing until temperatures stabilize or the appliance becomes "sold out".

Appliances which may be refilled without the use of a tool or access key are refilled as soon as required and the next operating period is started as soon as possible, until temperatures stabilize, or the appliance becomes "sold out".

2.2.30 Replacement:

Normal load of a motor operated appliance denotes the load when the appliance is operated under conditions of adequate heat discharge.

2.2.35 Replacement:

Non-detachable part denotes a part that the operator is not instructed to remove for loading, routine cleaning or coin collection and that cannot be removed without the aid of a tool.

2.2.36 Replacement:

Detachable part denotes a part that can be removed without the aid of a tool or a part or cover which the user/operator is instructed to remove for loading, routine cleaning and coin collection, whether internal or external to the appliance, and whether a tool is required or not.

2.2.40 Replacement:

Self-resetting thermal cut-out denotes a thermal cut-out which automatically restores the current after the relevant part of the appliance has cooled down, or heated up, sufficiently to permit further safe operation of the appliance.

Additional definitions:

2.2.101 Indicated levels denotes marks or warning systems on the appliance to indicate the maximum and/or minimum levels for correct operation.

2.2.102 *Rated pressure* denotes the maximum working pressure assigned by the manufacturer to the pressurized parts of the appliance.

2.2.103 *User/operator access area* denotes an area to which, under normal operating conditions, the user/operator needs access where:

- access can be gained without the use of a tool;
- the means of access is deliberately provided to the user/operator; or
- the user/operator is instructed to enter, for the purposes of cleaning, refilling, emptying waste containers, coin collecting, etc. regardless of whether or not tools are needed to gain access.

In this standard the term “access” and “accessible”, unless qualified, relate to user/operator access as defined above.

2.2.104 *Service access area* denotes an area, other than a user/operator access area, where it is necessary for technically skilled or trained service personnel to have access for maintenance purposes even with the equipment switched on. (See Subclause 8.101).

2.2.105 *Food quality, non-toxic material* denotes a material which has no harmful effect on food, drink or drinking water with which it comes into contact.

2.2.106 *Conditions of inadequate heat discharge* denotes the conditions not covered by the definition of adequate heat discharge, e.g. inadequate water supply, inadequate ventilation with air inlets or outlets blocked.

2.2.107 *Backflow prevention device* denotes one of the following:

- a type A air gap (see BS 6281-1);
- a type B air gap (see BS 6281-2);
- a pipe interrupter (see BS 6281-3);
- a check valve (see BS 6282-1);
- a combination of check valve and vacuum breaker (see BS 6282-4);
- a double check valve assembly (see BS 6282-5);
- some other water fitting or arrangement of water fittings, designed to prevent the backflow or back siphonage of water into the mains water supply.

2.2.108 *Hazardous energy level* denotes a stored energy level of 20 J or more, or an available continuous power level of 240 V·A or more at a potential of 2 V or more.

2.2.109 *Cook-chill* denotes a catering system based on the full cooking of food followed by fast chilling and storage in controlled low temperature conditions above freezing point (0 °C to + 3 °C) and subsequent thorough reheating close to the consumer shortly before consumption.

(See Guidelines on Cook-Chill and Cook-Freezing Catering Systems from the Department of Health.)

2.2.110 *Cook-freeze* denotes a catering system based on full cooking followed by fast freezing and storage at controlled low temperature conditions well below freezing point (–18 °C or below) and subsequent thorough reheating close to the consumer shortly before consumption. (See Guidelines on Cook-Chill and Cook-Freezing Catering Systems from the Department of Health.)

2.2.111 *Health safety cut-out* denotes an automatic device, fitted to an appliance for dispensing chilled or frozen foods, having an accuracy of ± 1.0 °C, and which automatically prevents dispensing of the food if the most unfavourable storage temperature inside the dispenser rises above the safe temperature for storage of that food.

Attention is drawn to the Food Hygiene (Amendment) Regulations 1989.

2.2.112 *Limited current circuits* denotes a circuit which is so designed and protected that under both normal conditions and a likely fault condition the current which can be drawn is not hazardous.

The limiting values are specified in Subclause 2.4 of BS 7002:1989.

2.2.113 *Supply*, unless otherwise qualified, denotes electrical supply.

3 General requirements

This clause of Part 101 is applicable.

4 General conditions for the tests

This clause of Part 101 is applicable except as follows:

4.5 Addition:

Equipment specified by the manufacturer to be used within a temperature range shall be tested at the most adverse temperature within that range.

4.13 Not applicable.

Additional subclauses:

4.101 *Appliances, when assembled in combination with or incorporating other appliances, shall be tested in accordance with the requirements of this standard. The other appliances are operated simultaneously in accordance with the requirements of the relevant standards.*