PUBLICLY AVAILABLE SPECIFICATION

PAS 54:2003

# Specification for domestic ceramicware and glassware — Articles intended for contact with foodstuffs, and vases

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# Foreword

This Publicly Available Specification, PAS 54:2003, has been prepared by BSI to provide an interim specification for ceramic tableware and glassware. It is not intended to be applicable to articles that are designed primarily for ornamental uses.

This PAS specifies important safety requirements relating to the release of metals from ceramic tableware and glassware in contact with foodstuffs, in accordance with legislative requirements, i.e. The Ceramic Ware (Safety) Regulations 1988, SI 1988 no. 1647. This PAS also specifies other important requirements relevant to ceramic tableware and glassware for home and domestic use.

This specification is not intended to restrict new developments in design and materials.

This PAS is not to be regarded as a British Standard. It will be withdrawn upon publication of its content in, or as, a British Standard.

Acknowledgement is given to the following organisations that were consulted in the development of this specification.

BSI Product Services

CERAM Research Limited

A consortium of British retailers, manufacturers, multiples and importers.



**Summary of pages**

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 9 and a back cover.

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## 1 Scope

This PAS specifies requirements for ceramicware and glassware intended primarily for home and domestic use.

This PAS acts as an umbrella PAS, referring to a variety of standards on ceramicware and glassware. It covers the following:

— requirements for ceramicware, glassware and glass ceramicware:
  • chemical composition;
  • integrity of handle attachments;
  • resistance to impact breakage in service;
  • thermal shock endurance;
  • metal marking;
  • performance of vessels for pouring;
  • handle and knob temperature;
  • stability;
  • water retention;
  • metal release;
  • metal release: lip/rim test.

— additional requirements for ceramicware:
  • water absorption;
  • crazing resistance;
  • translucency.

— additional requirements for glassware:
  • durability – hand washing;
  • temper level.

— additional requirements for special applications:
  • microwave usage;
  • resistance to freezing and freezer to oven usage;
  • freezer to microwave usage;
  • dishwasher usage (durability);

— conformity marking.

NOTE This specification is not applicable to vitrified hotelware or corporate ware, for which there is a separate specification, BS 4034.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ASTM C 148[1)], *Standard test methods for polariscopic examination of glass containers.*

ASTM C 927-80[1)], *Standard test method for lead and cadmium extracted from the lip and rim area of glass tumblers externally decorated with ceramic glass enamels.*

BS 3828, *Specification for crystal glass.*

BS 5416, *Specification for china tableware.*

BS 6748, *Specification for limits of metal release from ceramicware, glassware, glass ceramicware and vitreous enamel ware.* (Derived from EEC Directive 84/500/EEC.)

[1)] Available from ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, Pennsylvania, USA 19428-2959, http://www.astm.org.

BS EN 1183, *Materials and articles in contact with foodstuffs — Test methods for thermal shock and thermal shock endurance.*

BS EN 1217, *Materials and articles in contact with foodstuffs — Test methods for water absorption of ceramic articles.*

BS EN 12980, *Materials and articles in contact with foodstuffs — Non-metallic articles for catering and industrial use — Method of test for the determination of impact resistance.*

BS EN 13258, *Materials and articles in contact with foodstuffs — Test methods for crazing resistance of ceramic articles.*

BS EN 12875-2, *Mechanical dishwashing resistance of domestic utensils — Part 2: Inspection of non-metallic articles.*

CERAM PT32[2)], *Modification of BS EN 12980 for handle strength.*

CERAM PT34[2)], *Determination of the resistance of ceramic and glass to microwave heating.*

CERAM PT35[2)], *Tabletop testing.*

CERAM PT36[2)], *Determination of the resistance of ceramic and glass to freezing and freezer to oven usage.*

CERAM PT37[2)], *Determination of the resistance of ceramic and glass to freezer to microwave usage.*

CERAM BCRL WW1[2)3)], *Test method for static immersion for the determination of the resistance of decorated ware to alkaline detergent attack.*

European Community Regulation no. 679/72, *Customs classification of products to be allied to porcelain; "Vitreous china" or "Semi-vitreous china" type.*[4)]

European Commission Combined Nomenclature 2003 Codes 6911, 6912 and 6913.[4)]

## 3 Terms and definitions

For the purposes of this PAS, the following terms and definitions apply.

### 3.1 Ceramic

**3.1.1**
**ceramic**
inorganic non-metallic material made by firing a mixture of raw materials at high temperature. The firing temperature is high enough to give the necessary strength to the article which is already shaped, but lower than the temperature which is necessary to achieve complete fusion of the mixture
[BS EN 1900:1998, definition **3.3.1**]

**3.1.2**
**glaze**
substance resulting from the melting or sintering of inorganic constituents and designed to form a surface layer which is fused, in one or more coats, and the firing temperature of which is higher than 500 °C

NOTE Glazes can be opaque or transparent.

[BS EN 1900:1998, definition **3.5**]

[2)] Contact CERAM Research Ltd, Queens Road, Penkhull, Stoke-on-Trent, ST4 7LQ, United Kingdom.
Tel: +44 (0) 1782 764444, Fax: +44 (0) 1782 412331, e-mail: info@ceram.com.
[3)] CERAM BCRL WW1 is to be replaced by EN 12875-4, which is currently under development.
[4)] Available from The Stationery Office, Customer Services, PO Box 29, Norwich, NR3 1GN, United Kingdom.
Tel: +44 (0) 870 60 05 522, Fax: +44 (0) 870 60 05 533, e-mail: book.orders@theso.co.uk, website: http://www.tso.co.uk.

**3.1.3**
**china; porcelain**
glazed ceramic material, vitrified, impervious, white (or artificially coloured), translucent and resonant. The water absorption of the body is less than 0.5 % (determined according to method A of BS EN 1217). China or porcelain is made generally from kaolin (or other china clays), silica, feldspar or felspathic fluxes and sometimes calcium carbonate or alumina
[BS EN 1900:1998, definition **3.3.4**]

**3.1.3.1**
**bone china**
bone china is a particular type of china containing at least 35 % by mass of the fired body of tricalcium orthophosphate which can be introduced in the form of bone ash
[BS EN 1900:1998, definition **3.3.4**]

**3.1.3.2**
**hard-paste porcelain**
china made from a body composed of kaolin, quartz, feldspar and sometimes calcium carbonate

NOTE After an initial low temperature firing, it is normally covered with a colourless transparent glaze fired at the same time as the body and thus fused together with it.

**3.1.3.3**
**soft-paste porcelain**
china usually containing less alumina but more silica and fluxes than hard-paste porcelain

NOTE After an initial high temperature firing to produce a vitreous biscuit piece, it is normally covered with a colourless transparent glaze and then fired at a lower temperature to mature the glaze.

**3.1.3.4**
**biscuit porcelain**
unglazed porcelain

**3.1.3.5**
**parian ware**
fine-grained unglazed porcelain containing more feldspar than hard porcelain

NOTE Parian ware often resembles Paros marble in appearance.

**3.1.3.6**
**vitreous china**
glazed ceramic bodies vitrified, impervious, white (or artificially coloured), slightly translucent, made of clays, silica, feldspar and sometimes alumina. The water absorption of the body is less than 0.5 % (determined according to BS EN 1217)
[Adapted from BS EN 1900:1998, definition **3.3.5**]

**3.1.4**
**stoneware**
glazed ceramic material, partially vitrified, impervious, generally naturally coloured, hard and opaque. Its body is generally made of clays, silica and flux. The water absorption of the body is less than 3 % (determined according to BS EN 1217)
[Adapted from BS EN 1900:1998, definition **3.3.6**]

**3.1.5**
**earthenware**
glazed ceramic material of low vitrification, white to cream (or artificially coloured), opaque, with a porous and fine texture. The different elements of the body (grains, pores) are 0.15 mm or less and therefore not visible to the naked eye. Its body is generally made of clays, silica, feldspar or feldspathic fluxes and/or calcium carbonate. The water absorption of the body is greater than 3 % (determined according to BS EN 1217)
[Adapted from BS EN 1900:1998, definition **3.3.7**]

**3.2 Glass**

**3.2.1**
**glass**
inorganic non-metallic material produced by the complete fusion of a mixture of raw materials at high temperature into a homogeneous liquid which is then cooled to a rigid condition essentially without crystallisation

**3.2.2**
**soda-lime-silicate glass**
glass in which the main constituents are silica, sodium oxide and calcium oxide
[BS EN 1900:1998, definition **3.1.2**]

**3.2.3**
**crystal glass**

1) silicate glass with an oxide content of 10 % by mass or more of the following: zinc oxide, barium oxide, lead oxide, and/or potassium oxide;

2) silicate glass containing barium oxide, lead oxide and potassium oxide; one of these oxides or the sum of all the oxides being 10 % by mass or more

[BS EN 1900:1998, definition **3.1.3**]

**3.2.4**
**lead crystal glass**
silicate glass containing 24 % by mass or more of lead oxide
[BS EN 1900:1998, definition **3.1.4**]

**3.2.5**
**full lead crystal glass**
silicate glass containing 30 % by mass or more of lead oxide
[BS EN 1900:1998, definition **3.1.5**]

**3.2.6**
**borosilicate glass**
thermal shock resistant glass containing usually about 10 % by mass of boron oxide
[BS EN 1900:1998, definition **3.1.6**]

**3.3**
**glass ceramic**
inorganic non-metallic material, produced by the complete fusion of a mixture of raw materials at high temperature, into a homogeneous liquid which is then cooled into a rigid material and heat treated to achieve a certain degree of crystallisation, mainly sub-microscopic small crystallites
[BS EN 1900:1998, definition **3.2**]

**3.4**
**flatware**
articles having an internal depth of 25 mm or less

**3.5**
**holloware**
articles having an internal depth of more than 25 mm

NOTE Small holloware has a capacity less than 1.1 litres and large holloware has a capacity of 1.1 litres or more.

**3.6**
**water absorption**
capacity of a ceramic body to absorb water

**3.7**
**thermal shock endurance, $\Delta t_{50}$**
value for the resistance against sudden change in temperature corresponding to the temperature difference at which, for the first time, 50 % of the samples fail
[BS EN 1183:1997, definition **2.2**]

**3.8**
**translucency**
ability of a ceramic body to transmit a proportion of the light incident upon it

**3.9**
**crazing**
formation of very fine cracks in the glaze caused by either moisture expansion of the body or thermal stress which creates sufficient tension in the glaze to cause it to craze

**3.10**
**temper level (number)**
relative evaluation of the annealing process of glassware as determined using polaroscopic examination

## 4 Requirements

### 4.1 Ceramicware, glassware and glass ceramicware

#### 4.1.1 *Chemical composition*

**4.1.1.1** *Bone china*

Bone china shall contain at least 35 % by mass of the fired body of tricalcium orthophosphate.

**4.1.1.2** *Crystal glassware*

Crystal glassware shall conform to the requirements of BS 3828.

#### 4.1.2 *Integrity of handle attachments*

When tested in accordance with CERAM PT32 the failure shall not be at the handle/body interface.

#### 4.1.3 *Resistance to impact breakage in service*

**4.1.3.1** *Rim tests*

When holloware, consisting of cups, mugs, ovenware or vases, is impact tested at the rim in accordance with BS EN 12980, the impact energy to produce failure shall be not less than 0.05 J (0.04 ft·lbf).

When flatware is subjected to the impact test at the rim in accordance with BS EN 12980, the impact energy to produce failure shall be not less than 0.05 J (0.04 ft·lbf).

**4.1.3.2** *Handle strength*

When tested in accordance with CERAM PT32 the average impact energy to produce handle failure shall not be less than 0.05 J (0.04 ft·lbf).

#### 4.1.4 *Thermal shock endurance, $\Delta t_{50}$*

**4.1.4.1** *Ovenware*

When tested in accordance with BS EN 1183, articles that are designated “ovenware”, “oven-proof”, “oven-safe”, “oven to table ware” or any other similar description which suggests that the articles can be safely used in an oven, shall have a thermal shock endurance, $\Delta t_{50}$, of not less than 150 °C.

**4.1.4.2** *Cups, mugs, teapots and coffee pots*

When tested in accordance with BS EN 1183, cups, mugs, teapots and coffee pots or any articles that are designed to have hot liquids poured into them shall have a thermal shock endurance, $\Delta t_{50}$, of not less than 90 °C.

**4.1.5** ***Metal marking***

NOTE It is intended that the resistance to metal marking shall be included as a performance criterion for ceramicware, glassware and glass ceramicware. However, until such time that a suitable analytical method has been developed for the determination of this property, it is considered that such a performance criterion should be excluded from this specification.

**4.1.6** ***Performance of articles designed for pouring liquids***

**4.1.6.1** *Lid security*

When tested in accordance with CERAM PT35, the lids of lidded vessels intended for pouring liquids shall not separate from the body at an angle of <90°.

**4.1.6.2** *Pouring characteristics*

When tested in accordance with CERAM PT35, vessels intended for pouring liquids shall pour in a single stream.

**4.1.7** ***Handle and knob temperature***

When tested in accordance with CERAM PT35, the surface temperature of any handle or knob on cups, mugs, teapots and coffee pots, or any articles that are designed to have hot liquids poured into them, shall not exceed 55 °C.

**4.1.8** ***Stability***

When tested in accordance with CERAM PT35 to an angle of 15°, free-standing ware with a maximum height to minimum base ratio greater than three shall remain stable.

**4.1.9** ***Water retention***

All holloware with a water absorption of 0.5 % or greater shall be tested for water retention. There shall be no visible sign of leakage when tested in accordance with CERAM PT35.

**4.1.10** ***Metal release***

**4.1.10.1** *General*

Articles that are intended to be, or might be, in contact with food shall meet the requirements of BS 6748.

NOTE For products intended for markets outside the UK, note should be taken of the statutory metal release requirements for that market.

**4.1.10.2** *Lip/rim test*

When tested in accordance with ASTM C 927-80, articles with lip/rim or external decoration shall meet the Society of Glass and Ceramic Decorators (SGCD) voluntary limits for lead and cadmium release of 4.0 ppm lead and 0.4 ppm cadmium.

**4.2 Ceramicware**

**4.2.1** ***Water absorption***

**4.2.1.1** *China and porcelain*

All categories of china and porcelain shall meet the requirements of BS 5416.

**4.2.1.2** *Other categories of ceramicware*

When tested in accordance with BS EN 1217, Method A, other categories of ceramicware shall meet the water absorption requirements of the European Community Regulation No. 679/72 and European Commission Combined Nomenclature Code 6912 as shown in Table 1.

**Table 1 — Water absorption requirements for other ceramicware**

| Type of ceramicware | Water absorption |
|---|---|
| Earthenware | No less than 5 % |
| Stoneware | <3 % |
| Common pottery | No less than 5 % |

**4.2.2** ***Crazing resistance***

All ceramicware, except articles with a water absorption of less then 0.5 %, shall be tested for crazing resistance. The Ceramicware Crazing Resistance Index shall exceed 10 h when tested in accordance with BS EN 13258, Method A. Both holloware and flatware items of the same pattern shall be tested for crazing resistance.

**4.2.3** ***Translucency of china and porcelain***

All categories of china and porcelain shall meet either of the following requirements:

1) the translucency requirements of the European Community Regulation no. 679/72 or Code 6911 of the Combined Nomenclature of the European Commission (Custom Tariffs);

2) the translucency requirements of BS 5416.

**4.3 Glassware**

**4.3.1** ***Durability — hand washing***

When tested in accordance with CERAM PT35, decorated glassware shall show no visible effect.

**4.3.2** ***Temper level***

All transparent soda-lime-silicate glassware other than thermally toughened glassware shall achieve a real temper number not exceeding 2 when tested in accordance with ASTM C 148, Test Method B.

## 5 Specific application requirements

**5.1 Microwave usage**

When tested in accordance with the method defined in CERAM PT34, articles that are designated “microwave resistant”, “microwavable”, “microwave proof”, “microwave safe” or any other similar description that suggests that the articles can be safely used in a microwave oven, shall not show any visible adverse effect compared with untreated tableware.

NOTE The method for The Determination of the Resistance of Ceramic, Glass, Glass-ceramic or Plastic Cookware to Microwave Heating is under development by Working Group 3 of CEN Technical Committee 194 as Work Item 00194102 and it is intended that the method developed by this committee will be adopted when approved and issued.

**5.2 Resistance to freezing and freezer to oven usage**

When tested in accordance with CERAM PT36, articles that are designated “freezer resistant”, “freezer proof”, “freezer safe”, “freezer to ovenware” or any other similar description that suggests that the articles can be safely used in a freezer, shall not show any visible adverse effect.

**5.3 Resistance to freezer to microwave usage**

When tested in accordance with CERAM PT37, articles that are designated “freezer to microwave” or any other similar description that suggests that the articles can be safely used straight from a freezer to a microwave oven shall not show any visible adverse effect.

### 5.4 Dishwasher usage (durability)

When tested in accordance with CERAM BCRL WW1, articles that are designated "dishwasher resistant", "dishwasher proof", "dishwasher safe" or any other similar description that suggests that the articles can be safely cleaned in a dishwasher shall, on average, either show no visible change compared with untreated tableware (Classification 0) or show very slight visible change (Classification 1) but shall not show clearly visible change (Classification 2).

NOTE The classifications referred to in **5.4** are given in BS EN 12875-2:2002, Table 2. These are 0 = no visible change, 1 = first discernible change and 2 = clearly visible change.

## 6 Conformity marking

All products or their packaging shall be labelled with the following information so that it is visible at the point of sale:

a) the number and date of this Publicly Available Specification, i.e. PAS 54:2003;

b) the name, identification or trademark of the manufacturer, importer or retailer;

c) where required, the words denoting the appropriate type of ceramicware or glassware e.g. "Bone china", "Hard-paste porcelain", "Soft-paste porcelain", "Parian ware", "Stoneware", "Lead crystal glass", "Full lead crystal glass", "Borosilicate glass", etc.;

d) where appropriate, the words and/or symbols "Microwave", "Oven", "Freezer" and/or "Dishwasher" "safe", "resistant" or other appropriate terminology.

NOTE Marking "PAS 54:2003" on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of this Publicly Available Specification. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third party certification, which might also be desirable.

# Bibliography

**Standards publications**

BS 4034:1990*, Specification for vitrified hotelware.*

BS EN 1900*, Materials and articles in contact with foodstuffs — Non-metallic tableware — Terminology.*

**Further reading**

ENV 13834:2000*, Cookware — Ovenware for use in conventional domestic ovens.*

Society of Glass and Ceramic Decorators, *TechNoteBook.*[5)]

[5)] Available from Society of Glass and Ceramic Decorators, 47 N. Fourth Street/PO Box 2489, Zanesville, OH 43702, Tel: 740-588-9882, Fax: 740-588-0245, e-mail: sgcd@sgcd.org, website: http://www.sgcd.org/profile.html.

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London
W4 4AL