
International Standard



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Laboratory glassware — Methods for thermal shock tests

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 718 was developed by Technical Committee ISO/TC 48, *Laboratory glassware and related apparatus*, and was circulated to the member bodies in September 1979.

It has been approved by the member bodies of the following countries:

Australia	India	Portugal
Brazil	Italy	Romania
Canada	Korea, Rep. of	South Africa, Rep. of
Czechoslovakia	Libyan Arab Jamahiriya	Spain
France	Mexico	United Kingdom
Germany, F. R.	Netherlands	USSR
Hungary	Poland	

No member body expressed disapproval of the document.

This International Standard cancels and replaces ISO Recommendation R 718-1968 of which it constitutes a technical revision.

Laboratory glassware — Methods for thermal shock tests

1 Scope and field of application

This International Standard specifies general methods of test intended to assess the resistance of glassware used in laboratories to a shock arising from a predetermined change in temperature.

Three methods are prescribed :

- a) Method A, for testing whole articles at temperature differences of less than 100 °C.
- b) Method B, for testing whole articles at temperature differences of 80 °C or more;
- c) Method C, for testing the rims of articles.

NOTE — Method B is recommended also for testing small articles at temperature differences of less than 100 °C, in cases for which Method A is inappropriate.

2 Definitions

For the purposes of this International Standard, the following definitions apply :

2.1 thermal shock : The difference between the upper temperature t_1 , to which the article is heated, and the lower temperature t_2 of the cold water bath, in which the article is placed.

2.2 temperature variation : The difference at any moment between the temperature at the centre of the working space and at any other point in the working space of the test oven.

2.3 temperature fluctuation : The short-term changes in temperature at any point in the working space of the test oven.

3 Apparatus

3.1 Method A : For testing whole articles at temperature differences less than 100 °C

3.1.1 Bath (warm), having a capacity of at least double the total volume¹⁾ of the articles being tested at one time, and in

any case having a capacity not less than 5 l. This bath shall be fitted with a thermometer and with a means of heating and stirring so that the temperature variation does not exceed ± 1 °C.

3.1.2 Bath (cold), having a capacity of at least 5 times the total volume¹⁾ of the articles being tested at one time. The bath shall be fitted with a circulator and thermometer, and shall be capable of being maintained at a stated temperature between 0 and 27 °C as required.

3.1.3 Basket, for testing two or more articles simultaneously. The basket shall be made from, or coated with, a material which will not scratch or scuff the articles during the test procedure. It shall be capable of holding the articles upright and separate and of allowing a free passage of water between them.

3.2 Method B : For testing whole articles at temperature differences of 80 °C or more

3.2.1 Oven, having a temperature range up to at least 300 °C and fitted with an air-stirrer or circulator to ensure that the temperature variation does not exceed ± 5 °C. The oven shall be fitted with a thermostat capable of maintaining the temperature fluctuation within ± 1 °C up to 180 °C and within ± 2 °C between 180 and 300 °C.

3.2.2 Bath, the bath shall be similar to that described for the cold bath (3.1.2) specified for Method A.

3.2.3 Basket, for testing two or more articles simultaneously. The basket shall be made from, or coated with, a material which will not scratch or scuff the articles during the test procedure. It shall be capable of holding the articles upright and separate and of allowing a free passage of water and air between them.

3.3 Method C : For testing the rims of articles

As for Method B.

1) The total volume of the articles is taken as the sum of the volumes of the individual articles, each article being regarded as a solid.

4 Sampling

The number of articles to be taken as a sample from a consignment should be specified in the appropriate national standard for the article under test or, in default, this shall be agreed between the interested parties. The articles comprising the sample shall be taken at random from the whole consignment.

5 Procedure

5.1 Method A : For testing whole articles at temperature differences less than 100 °C

Fill both baths (3.1.1 and 3.1.2) with water and adjust the temperature to t_1 and t_2 respectively; t_2 is conveniently taken as the temperature of the tap-water supply which shall be between the limits 0 and 27 °C, and t_1 is selected to give the required thermal shock ($t_1 - t_2$) °C.

The difference in temperature of the baths which is determined by reading both thermometers, shall not differ more than ± 1 °C from the required value at the time of transfer of the articles to the cold bath.

Immerse the articles in the bath at temperature t_1 so that they are filled with water, and then allow them to soak for a period which ensures that temperature equilibrium is obtained between glass and water. In practice, 15 min will be sufficient for most articles.

NOTE — Experience has shown that the time to obtain the temperature equilibrium depends on the maximum glass thickness and is at least 30 s per millimetre if the article is heated on both sides.

The temperature shall be maintained within ± 1 °C and noted.

Then transfer each article, filled with water, to the bath at temperature t_2 . The process of transference shall be completed in 10 ± 2 s for each article.

The articles shall be immersed in the bath as completely as possible without allowing cold water to enter them and allowed to remain for a specified period of at least 8 s, but not exceeding 2 min.

5.2 Method B : For testing whole articles at temperature differences of 80 °C or more

Place the articles in the oven (3.2.1), previously heated to the upper temperature t_1 , and maintain them at that temperature for a period which ensures that the glass has reached temperature equilibrium. In practice, 30 min will be sufficient for most articles.

NOTE — Experience has shown that the time to obtain the temperature equilibrium depends on the maximum glass thickness and is at least 6 min per millimetre.

Then remove the articles from the oven one at a time by means of tongs with heat-insulated tips and immerse them for a specified period of at least 8 s but not exceeding 2 min to half the height of the body (i.e. half the total height less neck, if any) in the cold water bath (3.2.2), which should be located near the oven and which has been maintained at the lower temperature t_2 within the limits 0 and 27 °C.

The difference in temperature between the oven and the bath, which is determined by reading both thermometers, shall not differ more than ± 3 °C from the required value at the time of transfer of the articles to the bath.

NOTE — The heat-insulated tips of the tongs should be kept dry.

Complete the process of transference in 5 ± 1 s for each article.

NOTE — The process of transference starts by opening the oven and ends with the immersion of the article in the cold water.

5.3 Method C : For testing the rims of the articles

Place the articles in the oven (3.2.1), previously heated to the upper temperature t_1 , and maintain them at that temperature for at least 30 min. Then remove the articles from the oven one at a time by means of tongs with heat-insulated tips, and transfer to the cold-water bath (3.2.2), which has been maintained at the lower temperature t_2 within the limits 0 and 27 °C. Immerse the articles, upside down, to a depth of about 25 mm, taking care to ensure that entrapped air is not allowed to escape. Complete the process of transference in 5 ± 1 s for each article, and maintain then immersed for a specified period of at least 8 s but not exceeding 2 min.

NOTE — The heat-insulated tips of the tongs should be kept dry.

6 Expression of results

Articles, which do not chip, crack or break when inspected immediately after removal from the cold-water bath are held to have passed the test.

NOTE — Articles which have not broken in test ^{shall} should not be used for further testing.

7 Test report

The test report shall state

- the number of articles in the consignment;
- the number of articles taken as a sample;
- the methods of test used (i.e. A, B or C);
- the number of articles passing the test;
- the thermal shock, expressed as ($t_1 - t_2$) °C.