INTERNATIONAL STANDARD ISO 3585

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Glass plant, pipeline and fittings — Properties of borosilicate glass 3.3

Appareillage, tuyauterie et raccords en verre — Propriétés du verre borosilicaté 3.3

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FOREWORD

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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 3585 was drawn up by Technical Committee ISO/TC 128, *Glass plant, pipeline and fittings,* and circulated to the Member Bodies in October 1974.

It has been approved by the Member Bodies of the following countries :

Austria	Italy	Turkey
Bulgaria	Poland	United Kingdom
Czechoslovakia	South Africa, Rep. of	U.S.A.
France	Spain	U.S.S.R.
Germany	Switzerland	

No Member Body expressed disapproval of the document.

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Glass plant, pipeline and fittings – Properties of borosilicate glass 3.3

0 INTRODUCTION

It is the purpose of this International Standard to define and to facilitate the identification of a type of glass appropriate for glass plant, pipeline and fittings.

The design of glass components is dependent on the linear thermal coefficient of expansion and the ultimate tensile strength, while utilization requires not only a product design which is satisfactory within temperature and pressure limitations, but one which will also satisfy certain criteria for chemical resistance.

The glass, therefore, as distinct from the components made from it, must satisfy certain specified requirements, while it is accepted that methods of working the glass to achieve the various forms required in practice can have their effect on the properties of the glass.

The glass used for this application, referred to as "borosilicate glass 3.3", is both heat and chemically resistant. Its heat resistance characteristics are defined by the nominal values given for physical and mechanical properties. Its chemical resistance characteristics are specified within stated limits, using standard test methods to which reference is made.

The glass is deemed to be satisfactory for the construction of glass plant, pipeline and fittings, while for the glass components themselves, the relevant clauses of International Standards should be consulted.

Where nominal properties are given, they relate, unless otherwise specified, to the range of temperatures of 20 to 300 °C, although this does not imply that products manufactured from this glass can necessarily be used freely within this range, nor that they cannot be used outside this range.

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the characteristics of a type of glass designated "borosilicate glass 3.3" used for the construction of glass plant, pipeline and fittings (see ISO 3586, ISO 3587 and ISO 4704).

2 REFERENCES

ISO 695, *Glass – Determination of resistance to attack by a boiling aqueous solution of mixed alkali.*

ISO/R 719, *Determination of the hydrolytic resistance of glass grains at 98 °C.*

ISO/R 720, *Determination of the hydrolytic resistance of glass grains at 121 °C.*

ISO 3586, *Glass plant, pipeline and fittings – General rules for testing, handling and use.*

ISO 3587, *Glass plant, pipeline and fittings – Pipeline and fittings of nominal bore 15 to 150 mm – Compatibility and interchangeability.*

ISO 4704, *Glass plant, pipeline and fittings – Glass plant components.*[1)]

3 CHEMICAL RESISTANCE

3.1 Hydrolytic resistance at 98 °C

$\leqslant 31\ \mu g\ Na_2O\ g^{-1}$ glass (1 ml of 0,01 N hydrochloric acid solution $\triangleq 310\ \mu g$ of Na_2O).

Method of test : ISO/R 719.

3.2 Hydrolytic resistance at 121 °C

$\leqslant 62\ \mu g\ Na_2O\ g^{-1}$ glass (1 ml of 0,02 N sulphuric acid solution $\triangleq 620\ \mu g$ of Na_2O).

Method of test : ISO/R 720.

3.3 Acid resistance

NOTE – It is recognized that an important property of borosilicate glass 3.3 is its resistance to acid corrosion, but unfortunately there is, at the time of drafting this International Standard, no satisfactory method for measuring this property in glass plant, pipeline and fittings. It is intended that ISO/R 1776, *Determination of the resistance of glass to attack by 6 N hydrochloric acid at 100 °C,* may be developed in the future so that it would be suitable for this purpose. In this case, an appropriate limiting value for acid resistance would be included in a revised edition of this International Standard.

1) In preparation.

3.4 Resistance to attack by a boiling aqueous solution of mixed alkali

Loss in mass $\leqslant$ 175 mg dm^{-2}

Method of test : ISO 695.

4 PHYSICAL PROPERTIES

4.1 Mean linear thermal coefficient of expansion

$3{,}3 \times 10^{-6}\ K^{-1}$

4.2 Density at 20 °C

2,23 g cm^{-3}

4.3 Mean thermal conductivity (20 °C to 100 °C)

1,2 W $m^{-1}\ K^{-1}$

4.4 Mean specific heat

0,98 J $g^{-1}\ K^{-1}$

4.5 Strain point, viscosity $10^{14,5}$ dPa s

510 °C

4.6 Annealing point, viscosity 10^{13} dPa s

560 °C

4.7 Softening point, viscosity $10^{7,6}$ dPa s

820 °C

4.8 Working point, viscosity 10^{4} dPa s

1 260 °C

5 MECHANICAL PROPERTIES

5.1 Ultimate tensile strength

35 to 100 N mm^{-2}

The wide range of ultimate tensile strength given indicates the wide scatter of test results obtainable with normal commercial glass to which this specification relates when smooth, pressed, drawn or fire-polished samples are used as test specimens. Surface damage will reduce the failure stresses. The figures given are not intended as a guide to design stresses.

5.2 Modulus of elasticity *E*

64 kN mm^{-2}

5.3 Poisson's ratio

0,2