BRITISH STANDARD

BS 2761:1983

Specification for

Spherical ground joints

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Laboratory Apparatus Standards Committee (LBC/-) to Technical Committee LBC/25 upon which the following bodies were represented:

British Laboratory Ware Association
British Lampblown Scientific Glassware Manufacturers' Association Ltd.
Chemical Industries Association
Department of Health and Social Security
Department of Industry (Laboratory of the Government Chemist)
Glass Manufacturers' Federation
Institute of Medical Laboratory Sciences
Institute of Science Technology
Royal Society of Chemistry

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Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

Foreword

This British Standard has been prepared under the direction of the Laboratory Apparatus Standards Committee. It is a revision of BS 2761:1963, which is withdrawn.

BS 2761 was first published in 1956 under the title "*Spherical ground glass joints*". It was revised in 1963 to take account of recommendations made at that time by the International Organization for Standardization (ISO), with the aim of ensuring that spherical ground glass joints made in Britain would be interchangeable with those made abroad. The present edition, which has been re-titled, represents a further step towards full international harmonization; its technical requirements are the same as those of ISO 641 "*Laboratory glassware — Interchangeable spherical ground joints*" published by ISO in 1975 and confirmed in 1981, although a marking clause similar to that in the 1963 edition of BS 2761 has been retained as a recommendation in this British Standard.

The principal differences from the previous edition of this standard include the addition of four extra sizes of joint (S7, S64, S76 and S102) and the omission of size 13C as a standard joint. Minor changes have been made to the tolerances for maximum diameter at the narrow end of the ground zone for joints S13, S19, S29 and S35. The maximum external diameter of adjacent tubing remains unchanged, but the bore of the tubing is no longer specified. The previous "blueing test" method recommended for inspecting cups with steel balls has been deleted, although an additional modified version of the leakage test, using gauging balls, has been included in an appendix.

As with previous editions of this standard, the materials for the construction of the joints have not been specified. Whilst glass joints have traditionally been used, the description "glass" has been omitted from the title and from the text because it is the intention that the development of joints made from other materials should not be discouraged, provided that they meet the requirements of this standard.

Two appendices are included for information. Appendix A describes leakage tests which can be used as a simple check on the quality of a joint; for example, when comparing a joint of unknown quality with one which is known to be satisfactory. The results obtained by these methods are not easily reproducible to a high degree of accuracy, nor is comparison easy between different sizes of joints. Although limits for leakage are suggested, neither these nor the associated tests have been included as requirements of the standard. It is considered that the provisions of clauses **3**, **4** and **5** ensure adequate resistance to leakage.

Appendix B lists for information the sizes of spherical joints adopted for this British Standard and ISO 641:1975 alongside the corresponding designations in an American Standard.

It is strongly recommended that the joints should be marked as indicated in Appendix C.

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.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 6, 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.

1 Scope

This British Standard specifies requirements for a series of ten sizes of interchangeable spherical ground joints for general laboratory use.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard the following definitions apply.

2.1
ball

the inner (male) component of the joint

2.2
cup

the outer (female) component of the joint

3 Size designation

The size designation shall be the code letter "S" in conjunction with a number that corresponds to the approximate spherical diameter (in millimetres) of the joint.

4 Dimensions

The dimensions of the joint components and the adjacent tubing shall be as specified in Table 1.

NOTE The dimensional parameters referred to in Table 1 are illustrated in Figure 1.

5 Finish of ground surfaces

Each ball and each cup shall have a ground matt surface, the roughness value (R_a)[1)] of which shall not exceed 1 μm when tested in accordance with BS 1134-1[2)].

NOTE The R_a value should preferably be less than 0.5 μm.

6 Testing of dimensional tolerances

Normal engineering techniques, e.g. pneumatic or radius gauges, shall be used to test for compliance with the dimensional tolerances specified in Table 1.

[1)] The parameter R_a is identical to that which was previously known as CLA (centre-line-average) and which was referred to in earlier editions of this standard

[2)] BS 1134-1 describes methods by which surface irregularities are evaluated in accordance with the parameters R_a and R_z as defined in ISO 468. The clause on surface finish in ISO 641 makes reference only to ISO 468.

Table 1 — Dimensions and tolerances of spherical ground joints

Size designation	Spherical diameter			Minimum diameter at wide end of ground zone	Maximum diameter at narrow end of ground zone	Maximum[b] external diameter of adjacent tubing
	Nominal dimension	Tolerance[a] on inner component (ball)	Tolerance[a] on outer component (cup)			
	mm	mm	mm	mm	mm	mm
S7	7.144	+0 –0.025	+0.025 –0	6.9	2.0	4.5
S13	12.700	+0 –0.025	+0.025 –0	12.5	7.0	9
S19	19.050	+0 –0.025	+0.025 –0	18.7	12.5	14
S29	28.575	+0 –0.025	+0.025 –0	28.0	19.0	22
S35	34.925	+0 –0.025	+0.025 –0	34.3	27.5	30
S41	41.275	+0 –0.025	+0.025 –0	40.5	30.0	34
S51	50.800	+0 –0.025	+0.025 –0	50.0	36.0	43
S64	63.500	+0 –0.035	+0.035 –0	62.5	47.0	53
S76	76.200	+0 –0.040	+0.040 –0	75.0	58.0	64
S102	101.600	+0 –0.050	+0.050 –0	100.0	84.0	85

[a] These tolerances ensure that the actual diameter of the inner component is not greater than the nominal diameter, and that the actual diameter of the outer component is not less than the nominal diameter.
[b] It is important to limit the external diameter of the tubing in order to facilitate interchangeability of clamps. The bore of the tubing which may be used is determined only by the maximum diameter at the narrow end of the ground zone.

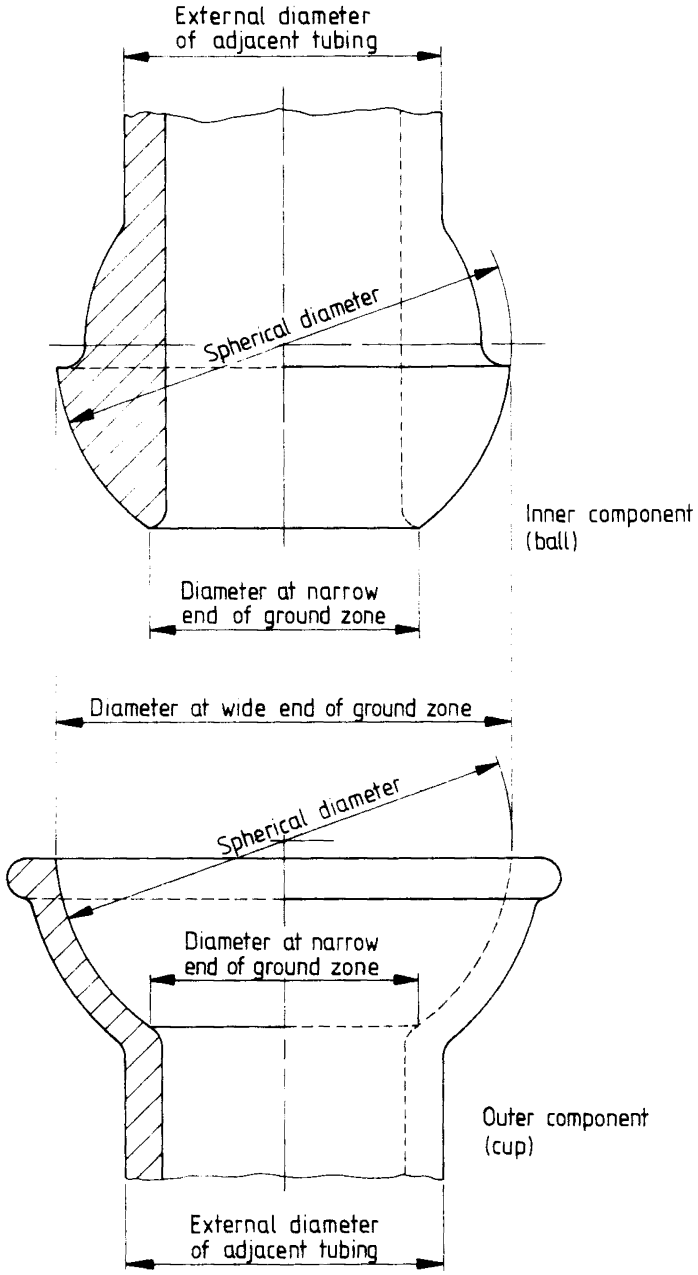

Figure 1 — Dimensions of spherical joints

Appendix A Leakage test for spherical joints

The leakage test described in this appendix is recommended for testing dry (ungreased) joints, primarily in the laboratory, where suitable gauges may not be available. It does not form part of the requirements of this standard and therefore should not be construed as overriding any of its provisions.

A suitable testing apparatus is illustrated in Figure 2. Different designs can be used, provided that the total capacity of the system is approximately 1.5 L.

The test is carried out by observing the rate of increase in pressure in a previously evacuated system by leakage from the atmosphere into the system via the dry ground surfaces of the joint under test. It is essential to render all other joints in the testing apparatus leak proof and to check the apparatus before coupling in the joint to be tested. It is also essential that any leakage found during checking be negligible in comparison with the leakage measured during the test.

It is necessary to ensure that the ground surfaces of the components are thoroughly clean, otherwise spurious results can be obtained. The following cleaning procedure should be used.

Rub the ground surfaces of the components to be tested with a clean cloth which has previously been soaked in a suitable solvent such as cyclohexane, then dip the components in the solvent. Remove the components from the solvent and allow them to dry. Any particles which may be adhering to the ground surfaces after drying should be removed by brushing with a camel-hair brush.

Test each component in turn by placing it in a vertical position in the apparatus (see Figure 2). Evacuate the system. No pressure, other than that exerted by the atmosphere, should be applied to the joint.

When the mercury gauge indicates that the pressure has been reduced to a value pre-selected by the operator, close the stopcock and note the scale reading. After a suitable time interval[3)], note the scale reading again.

Equalize the pressures inside and outside the system. Lift the component, turn it on its axis through 90°, and repeat the test.

Record and average the results, expressed as the rate of increase in pressure in the system in Pa/min. State the time intervals used.

A modified version of the test may be used for testing cup members with gauging balls made, for example, from steel, and having the dimensions shown in Table 2. In this modified test, the gauging ball replaces the ball member of the joint. This modified test may also be used to test ball members of joints in a two-stage procedure, i.e. a cup member which has been tested against a gauging ball and found to be satisfactory may itself be used to test the ball member of unknown quality.

The methods described above are not easily reproducible to a high degree of accuracy, but practical experience has shown that the following figures for leakage should not be exceeded:

for sizes S13 and smaller: an increase in pressure of 930 Pa/min;

for sizes S19 and larger: an increase in pressure of 2 kPa/min.

Table 2 — Diameters of gauging balls for testing cups

Size designation of cup	Spherical diameter of ball	
	Nominal dimension	Tolerance
	mm	mm
S7	7.144	+ 0.003 – 0
S13	12.700	+ 0.005 – 0
S19	19.050	+ 0.005 – 0
S29	28.575	+ 0.008 – 0
S35	34.925	+ 0.008 – 0
S41	41.275	+ 0.008 – 0
S51	50.800	+ 0.008 – 0
S64	63.500	+ 0.010 – 0
S76	76.200	+ 0.013 – 0
S102	101.600	+ 0.015 – 0

[3)] For comparative laboratory tests, it is recommended that the first reading be taken 30 s after closing the stopcock and the second reading be taken after a further interval of 2 min. If a manufacturer wishes to use the leakage test as an additional routine production test, the first reading can be taken immediately after closing the stopcock and the second reading 1 min later.

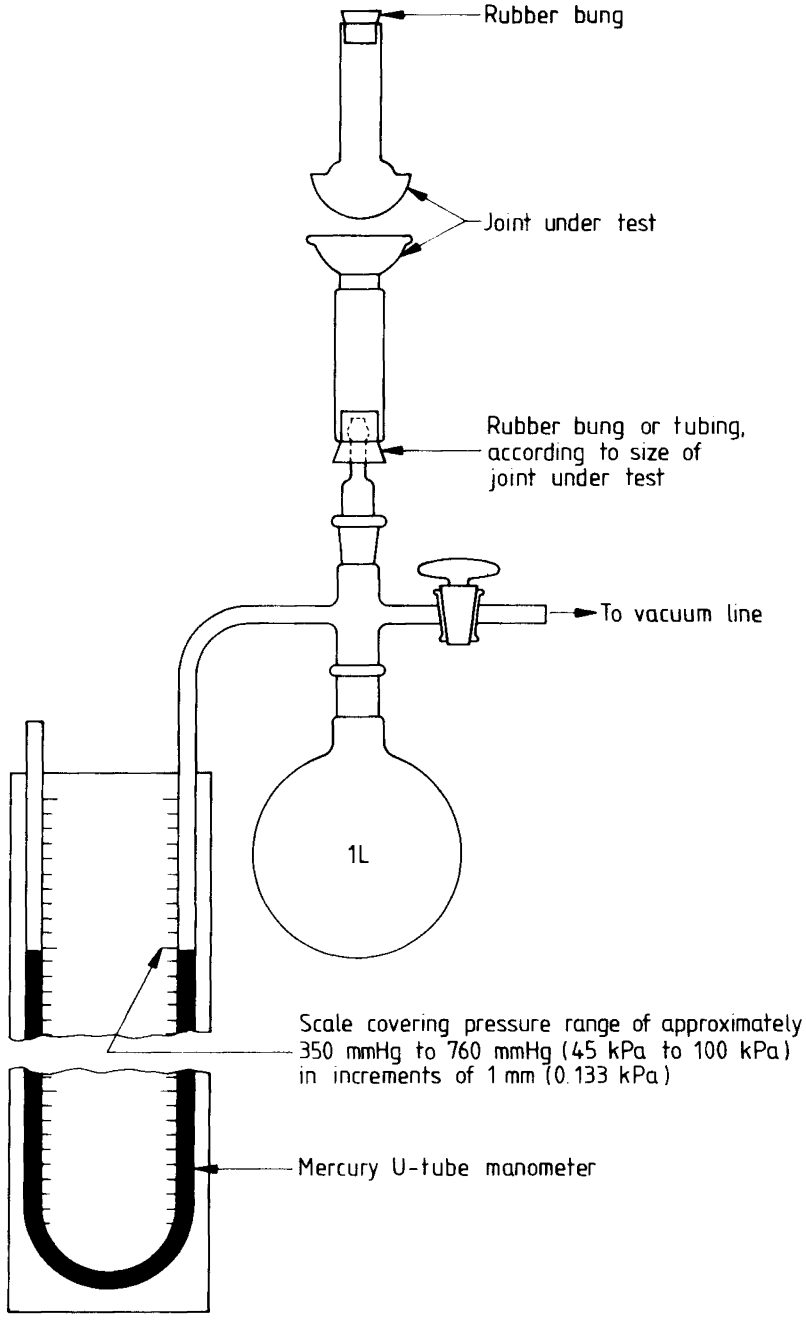

Figure 2 — Typical apparatus for testing leakage of spherical joints

Appendix B Size designations of spherical joints

The size designations adopted for joints complying with this British Standard are identical to those complying with ISO 641. For the convenience of users, they are listed in Table 3 alongside the designations of the corresponding joints listed in the American Standard CS 21-58 issued by the US Department of Commerce, Office of Technical Services.

Table 3 — Corresponding size designations

BS 2761 and ISO 641	CS 21-58
S7	7/1
S13	12/1 12/1.5 12/2 12/3 12/5
S19	18/7 18/9
S29	28/12 28/15
S35	35/20 35/25
S41	40/25
S51	50/30
S64	65/40
S76	75/50
S102	102/75

Appendix C Marking

It is strongly recommended that permanent legible marks, placed as close as practicable to the ground portion, should be made on each ball and each cup as follows:

a) an inscription indicating the joint size (e.g. S13);

b) a reference to this British Standard, i.e. BS 2761:1983[4)]

c) the maker's or vendor's name or mark.

These markings should be used regardless of whether the balls and cups are supplied as individual items, or whether they form integral parts of other apparatus. If a ball or cup forms part of other apparatus, the positioning of the markings should be such that they comply with the general requirement for positioning and that their association with the ball or cup to which they refer is obvious.

[4)] Marking BS 2761:1983 on or in relation to a product is a claim by the manufacturer that the product has been manufactured to the requirements of the standard. The accuracy of such a claim is therefore solely the manufacturer's responsibility. Enquiries as to the availability of third party certification to support such claims should be addressed to the Director, Quality Assurance Division, BSI, Maylands Avenue, Hemel Hempstead, Herts HP2 4SQ for certification marks administered by BSI or to the appropriate authority for other certification marks.

Publications referred to

BS 1134, *Method for the assessment of surface texture.*
BS 1134-1, *Method and instrumentation.*
ISO 468, *Surface roughness — Parameters, their values and general rules for specifying requirements.*
ISO 641, *Laboratory glassware — Interchangeable spherical ground joints.*
CS 21-58, *Interchangeable taper-ground joints, stopcocks, stoppers and spherical-ground joints.*

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