

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 641

INTERCHANGEABLE SPHERICAL GROUND GLASS JOINTS

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BRIEF HISTORY

The ISO Recommendation R 641, *Interchangeable spherical ground glass joints*, was drawn up by Technical Committee ISO/TC 48, *Laboratory glassware and related apparatus*, the Secretariat of which is held by the British Standards Institution (BSI).

Work on this question by the Technical Committee began in 1957 and led, in 1961, to the adoption of a Draft ISO Recommendation.

In December 1963, this Draft ISO Recommendation (No. 714) was circulated to all the ISO Member Bodies for enquiry. It was approved by the following Member Bodies:

Argentina	Greece	Spain
Australia	Hungary	Switzerland
Austria	India	Turkey
Belgium	Israel	U.A.R.
Brazil	Italy	United Kingdom
Canada	Japan	U.S.A.
Chile	Netherlands	U.S.S.R.
Colombia	New Zealand	Yugoslavia
Czechoslovakia	Poland	

One Member Body opposed the approval of the Draft:

France

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in February 1968, to accept it as an ISO RECOMMENDATION.

INTERCHANGEABLE SPHERICAL GROUND GLASS JOINTS

INTRODUCTION

The purpose of this ISO Recommendation is to ensure interchangeability between standard spherical ground glass joints, irrespective of where they are manufactured.

Limiting dimensions for the ground glass zone and the external diameter of adjacent tubing, which will ensure interchangeability, are given in Table 1, page 5. The finish of the ground surface is also specified, and this is similar to the finish specified in ISO Recommendation R 383, *Interchangeable conical ground glass joints*.

A conventional designation is adopted, which consists of the code letter "S" in conjunction with the approximate spherical diameter of the joint in millimetres. The bore diameter which may be employed with each size of joint is controlled, for the purposes of this ISO Recommendation, only by the maximum diameter at the narrow end of the ground zone.

A convenient leakage test, to be carried out on ungreased joints, is described in Appendix Y, but this does not form an integral part of this ISO Recommendation. In Appendix Z are listed, for convenience, the size designations of the joints specified in the British and U.S.A. standards which correspond to, or are interchangeable with, the joints listed in this ISO Recommendation.

While reference is made, in this ISO Recommendation, only to glass joints, these having come into general use, it is not thereby intended to exclude the development of joints made of other materials, which should be manufactured to the same dimensions.

1. SCOPE

This ISO Recommendation covers the essential geometric requirements for interchangeability in relation to a series of ground glass joints for laboratory use.

2. NOMINAL SPHERICAL GROUND JOINT DIAMETER

The diameter of the ground spherical zone should be in accordance with the dimensions specified in Table 1, columns 2, 3 and 4. These tolerances ensure that the diameter of the inner component (or ball member) is not greater than the nominal diameter and that the diameter of the outer component (or cup member) is not less than the nominal diameter.

3. DIMENSIONS

The diameter at the wide end of the ground zone should not be less than the corresponding dimension given in Table 1, column 5, and the diameter at the narrow end of the ground zone should not be greater than the corresponding dimension given in Table 1, column 6. The relationship of the dimensions is illustrated in Figure 1, page 4.

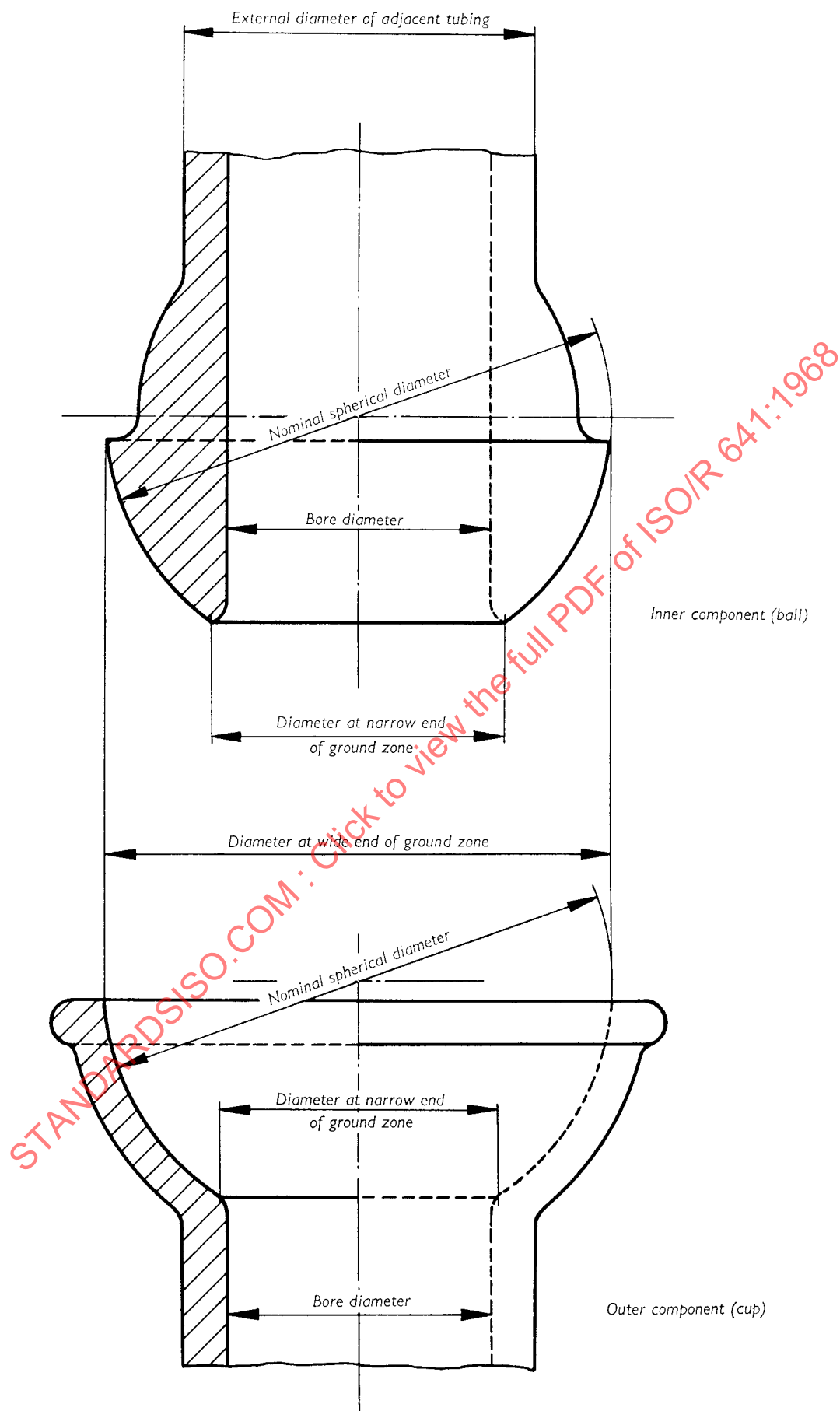


FIG. 1 — Dimensions of spherical joints

4. DIAMETER OF TUBING

The external diameter of tubing adjacent to the joint should not exceed the dimensions given in Table 1, column 7.

NOTE. — It is important to limit the external diameter of the tubing in order to facilitate interchangeability of clamps.

TABLE 1 — Dimensions and tolerances of spherical ground joints

Dimensions in millimetres

1	2	3	4	5	6	7
Size designation	Spherical diameter			Minimum diameter at wide end of ground zone	Maximum diameter at narrow end of ground zone	Maximum external diameter of adjacent tubing
	Nominal dimension	Tolerance on inner component (ball)	Tolerance on outer component (cup)			
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

5. SURFACE FINISH

The centre-line-average height of the ground surface should not exceed 1 μm and should preferably be less than 0.5 μm .

NOTE. — The term "centre-line-average height" of the ground surface is the average value R_a of the roughness, as defined in ISO Recommendation R 468, *Surface roughness*.

6. TESTING OF INNER AND OUTER COMPONENTS (BALL AND CUP) OF SPHERICAL JOINTS

For checking for compliance with the dimensional tolerances, normal engineering techniques (including pneumatic or radius gauges) are used.

The degree of cleanliness of the ground surfaces is a vital factor affecting the rate of leakage. The components are first rubbed with a cloth soaked in a suitable solvent, e.g. cyclohexane, then dipped in the solvent and allowed to dry. Any particles adhering to the surfaces are removed with a camel's-hair brush. The components are then placed in turn in a vertical position in the apparatus and the system evacuated. No pressure, other than that exerted by the atmosphere, is applied to the joint.

When the mercury gauge reading is above a value preselected by the operator, the stopcock is closed and the scale reading is noted. After a further 1 minute or more, the scale reading is noted again.

Having equalized the pressures inside and outside the system, the component is turned on its axis through 90° and the test is then repeated.

The results are expressed as the increase in pressure in the system in millimetres of mercury per minute, averaged over the time interval between the two readings.

For routine production testing, it is satisfactory to take the first reading immediately after closing the stopcock and the second reading 1 minute later. For comparative laboratory tests, the first reading should be taken 30 seconds after closing the stopcock and the second reading after a further interval of 2 minutes.

Cup members may conveniently be tested by this method in conjunction with gauging balls (e.g. of steel) of the dimensions shown in Table 2.

TABLE 2 — Diameters of gauging balls for testing cups

Size designation of cup	Spherical diameter of steel 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

Ball members may also be tested by this method, using a two-stage procedure, in which the cup members are first tested against steel balls and then the ball members are tested against cup members known to be satisfactory.

For joints complying with the tolerances in Table 1, practical experience shows that the following figures for leakage should not be exceeded:

for sizes S13 and smaller: an increase in pressure of 7 mmHg per minute,

for sizes S19 and larger: an increase in pressure of 15 mmHg per minute.