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ISO RECOMMENDATION

R 383

INTERCHANGEABLE CONICAL GROUND GLASS JOINTS

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BRIEF HISTORY

The ISO Recommendation R 383, *Interchangeable Conical 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 1950 and led, in 1960, to the adoption of a Draft ISO Recommendation.

In April 1960, this Draft ISO Recommendation (No. 346) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	Germany	Romania
Austria	Greece	Spain
Belgium	India	Sweden
Canada	Israel	United Kingdom
Chile	Japan	U.S.A.
Colombia	Netherlands	U.S.S.R.
Czechoslovakia	New Zealand	
France	Poland	

One Member Body opposed the approval of the Draft :

Italy.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in September 1964, to accept it as an ISO RECOMMENDATION.

ISO Recommendation R 383 September 1964

INTERCHANGEABLE CONICAL GROUND GLASS JOINTS

INTRODUCTION

The purpose of this ISO Recommendation is to ensure interchangeability between standard conical ground glass joints, irrespective of where they are manufactured. In order to achieve interchangeability, it is necessary that each of the following requirements should be adequately specified, including appropriate tolerances:

(*a*) Taper,
(*b*) Large end diameter,
(*c*) Length of ground zone,
(*d*) Surface finish.

The nominal dimensions listed below are based on the series of joints already widely used in many countries; in particular, the series of large end diameters represents the nearest acceptable compromise to the R 40/3 series of preferred numbers (5.3... 100) laid down in ISO Recommendation R 3, *Preferred Numbers — Series of Preferred Numbers.*

From the practical point of view, and especially because of the difficulty of carrying out precise measurements on the ground portions of the finished joints, it is desirable to apply a gauging system which allows rapid checking of the essential dimensions. The definition of these dimensions in section 5 is an integral part of this ISO Recommendation, but the system of gauging described in Annex A, while it has been proved in practice as fully satisfactory, is not the only one which can be applied for the purpose.

The leakage test described in Annex B is one which is commonly used for testing joints, but its inclusion in this ISO Recommendation is not intended to preclude the use of other tests which may be found more convenient for particular purposes. Attention is specifically drawn to the method of pneumatic gauging.*

1. SCOPE

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

2. TAPER

The taper of the joints should be such as to give one increment on diameter for ten increments on axial length, with a tolerance of $\pm$ 0.006 on the diameter increment, i.e. a taper of $(1.00 \pm 0.006)/10$.

* This method is described in *Laboratory Practice*, March 1958, Vol. 7, No. 3, "Pneumatic gauging applied to standard ground glass joints", by I.C.P. Smith.

3. LARGE END DIAMETERS

The following series of large end diameters should be adopted:

5 - 7.5 - 10 - 12.5 - 14.5 - 18.8 - 21.5 - 24 - 29.2 - 34.5 - 40 - 45 - 50 - 60 - 71 - 85 - 100 mm.

4. LENGTH OF GROUND ZONE

The length of the ground zone (l), in millimetres, should be calculated from the formula

$$l = k \sqrt{d}$$

where k = a constant,

d = large end diameter, expressed in millimetres,

the calculated length being rounded off to the nearest whole number.

The four series of joints listed in Table 1 are obtained by using the values 2, 4, 6 and 8 for the constant k.

TABLE 1. — **Series of joints**

Dimensions in millimetres

Large end diameter	Length of ground zone				Large end diameter	Length of ground zone			
	k2 series	k4 series	k6 series	k8 series		k2 series	k4 series	k6 series	k8 series
5		9	13	18	**34.5**	12	23	35	47
7.5		11	16	22	**40**	13		38	
10		13	19	25	**45**	13		40	
12.5		14	21	28	**50**	14		42	
14.5		15	23	30	**60**			46	
18.8	9	17	26	35	**71**			51	
21.5		19	28	37	**85**			55	
24	10	20	29	39	**100**			60	
29.2	11	22	32	43					

5. TOLERANCES ON DIAMETER AND LENGTH

The diameter and length of the ground zone should be such that, when it is placed with its axis in the plane of the dimensional frame shown in Figure 1, it fits in such a way that the upper and lower edges of the ground surface fall within the zones of height h_1 and h_2 respectively, the values of d, l, h_1 and h_2 for any particular joint size being taken from Table 2. For special purposes, the ground surface may extend beyond these limits, provided that the zone of length l is always included within this ground portion.

A system of gauging suitable for finding out whether joints fall within these limits is described in Annex A.

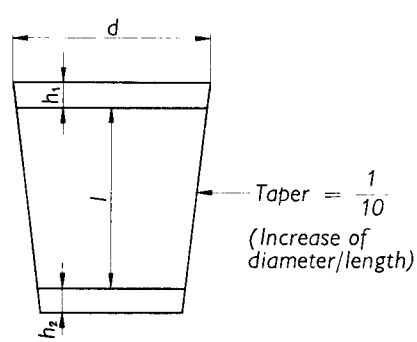

FIG. 1

TABLE 2. — **Dimensions and tolerances**

(see section 5 and Fig. 1)

Dimensions in millimetres

Nominal diameter of joint	d	$k2$ series			$k4$ series			$k6$ series			$k8$ series		
		l *	h_1 **	h_2 **	l *	h_1 **	h_2 **	l *	h_1 **	h_2 **	l *	h_1 **	h_2 **
5	5.1±0.008				8	2	2	12	2	2	17	2.5	2
7.5	7.6 ”				10	”	”	15	”	”	21	”	”
10	10.1 ”				12	”	”	18	”	”	24	”	”
12.5	12.6±0.010				13	”	”	20	”	”	27	”	”
14.5	14.6 ”				14	”	”	22	”	”	29	”	”
18.8	18.9±0.015	8	2.5	2	16	”	”	25	”	”	34	”	”
21.5	21.6 ”				18	”	”	27	”	”	36	”	”
24	24.1 ”	9	”	”	19	”	”	28	”	”	38	”	”
29.2	29.3 ”	10	”	”	21	”	”	31	”	”	40	”	3.5
34.5	34.6 ”	11	”	”	22	”	”	34	”	”	43	”	”
40	40.1 ”	11	”	2.5				37	”	”			
45	45.1 ”	11	”	”				39	”	”			
50	50.1 ”	12	”	”				41	”	3			
60	60.1 ”							45	”	”			
71	71.1±0.020							50	”	”			
85	85.1 ”							54	”	”			
100	100.1 ”							59	”	”			

* Tolerance on $l = \pm 0.015$.

** Tolerance on h_1 and $h_2 = \pm 0.010$.

6. 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 “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*.*

7. DESIGNATION

For convenience of reference to joints complying with the geometric requirements of this ISO Recommendation, the use is recommended of a designation consisting of the following dimensions, expressed in millimetres:

large end diameter of the joint (7.5 - 12.5 - 14.5 - 18.8 - 21.5 - 29.2 and 34.5
being rounded to 7 - 12 - 14 - 19 - 21 - 29 and 34 respectively)

length of ground zone,

separated by an oblique or horizontal stroke,

e.g. 19/26 or $\frac{19}{26}$.

ANNEX A

SUITABLE GAUGING SYSTEM FOR DIAMETER AND LENGTH OF CONICAL JOINTS

The suggested gauges are made of hardened steel or other suitable material. The gauges for sockets are conical plugs with a step at each end and the gauges for cones are conical rings with a step at each end; they are shown in Figures 2 and 3. The cone semi-angle of each gauge is $2° 51' 45'' \pm 15''$. (The sine of the specified angle is $0.049\ 94 \pm 0.000\ 07$).

A separate gauge is required for each size of cone or socket, the gauge dimensions being given in Table 2. When a socket or cone is fitted to its appropriate gauge, it should rest in such a position that the upper and lower ends of the ground zone lie wholly within the steps of height h_1 and h_2 respectively. For special purposes, the ground surface may extend beyond the outer extremity of the step at the smaller end, provided that it also extends to at least the inner extremity of the step at the larger end.

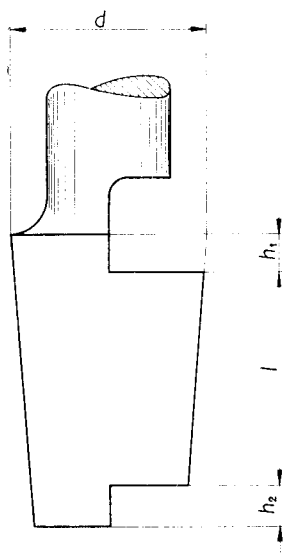

FIG. 2. — **Gauge for sockets**

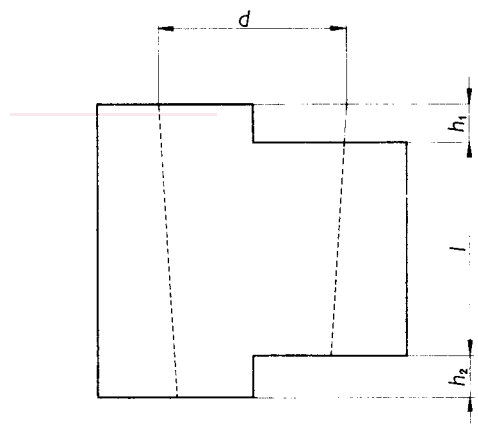

FIG. 3. — **Gauge for cones**

ANNEX B

LEAKAGE TEST FOR CONICAL JOINTS

The leakage test is carried out on dry joints by observing the rate of increase in pressure in a previously evacuated system in communication with the atmosphere via the leaking joint. A suitable apparatus is used, as illustrated in Figure 4, the details not being essential, provided the total capacity of the system is approximately 1.5 litres. It is essential to render all joints in the testing apparatus leak-proof and to check the apparatus before coupling in the joint to be tested. Any leakage found during checking must be negligible in comparison with the leakage measured during the test.

The degree of cleanliness of the ground surface 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 380 mm, the stopcock is closed and after one minute the scale reading is noted. After a further five minutes, 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.

NOTE. — It has been found that when cones and sockets complying with the geometric requirements are tested under the above conditions, the rise in pressure in the system does not exceed 10 mm of mercury over a period of five minutes, the total capacity being 1.5 litres. For total capacities differing slightly from 1.5 litres the corresponding maximum pressure rise is in inverse proportion to the capacity.

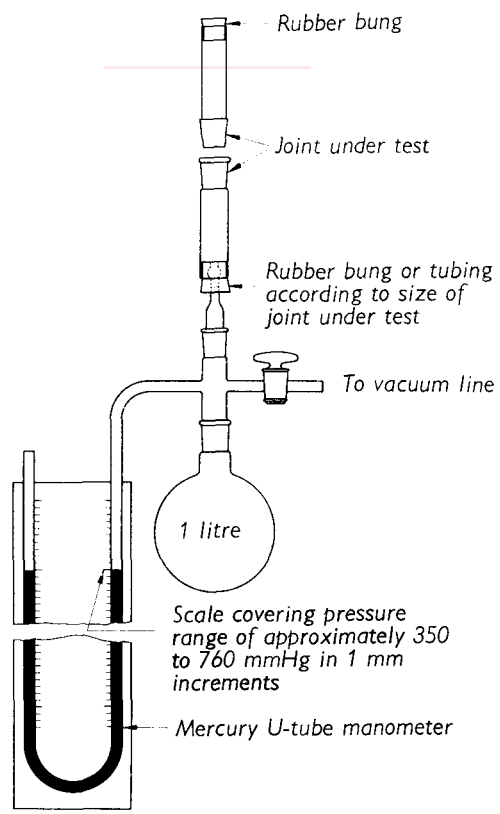

FIG. 4. — **Suitable apparatus for leakage test on conical joints**