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ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 1115

FINISHES WITH EXTERNAL SCREW THREAD FOR GLASS CONTAINERS AND GAUGES FOR THE INSPECTION OF SCREW CLOSURES

1st EDITION

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BRIEF HISTORY

The ISO Recommendation R 1115, *Finishes with external screw thread for glass containers and gauges for the inspection of screw closures,* was drawn up by Technical Committee ISO/TC 63, *Screw threads for glass containers and closures,* the Secretariat of which is held by the Úřad pro normalizaci a měřeni (CSN).

Work on this question led to the adoption of a Draft ISO Recommendation.

In February 1968, this Draft ISO Recommendation (No. 1469) 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 :

Chile	Israel	South Africa, Rep. of
Czechoslovakia	Italy	Sweden
Denmark	Japan	Switzerland
France	Netherlands	United Kingdom
Germany	Norway	Yugoslavia
India	Poland	
Ireland	Romania	

One Member Body opposed the approval of the Draft :

New Zealand

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in September 1969, to accept it as an ISO RECOMMENDATION.

ISO Recommendation R 1115 September 1969

FINISHES WITH EXTERNAL SCREW THREAD FOR GLASS CONTAINERS

AND GAUGES FOR THE INSPECTION OF SCREW CLOSURES

INTRODUCTION

This ISO Recommendation has been prepared with the object of establishing certain basic rules for the manufacture of external screw thread finishes and at the same time of reducing the number of types and facilitating the interchangeability of screw closures.

This ISO Recommendation has been prepared on the basis of the following considerations :

Finishes for glass containers

To select thread characteristics which would not give rise to difficulties due to excessive depth of thread and excessive height of finish.

To facilitate filling and capping by defining the minimum through bore and the minimum wall thickness at the top of the finish.

- To provide for the use of certain special methods and types of closure in a series of tall finishes, but restricted to a smaller range of diameters.

Screw closures

No definite specifications can be recommended for screw closures due to the wide range of materials used. The characteristics of screw closures vary according to the materials used (aluminium, tinplate, thermoplastics, thermosetting resins, etc.), which affect their shape, thread profile and tolerances.

The intention has therefore been to recommend gauges for the inspection of threaded closures.

1. SCOPE

This ISO Recommendation defines the characteristics of glass finishes with external screw threads and provides a method of inspecting the corresponding screw closures.

It applies to

- shallow finishes with continuous thread of one or more starts;
- tall finishes with single start continuous thread.

2. SYMBOLS

The following symbols should be used to define finishes with screw threads for glass containers :

d	major diameter
d_1	minor diameter
d_2	pitch diameter
d_3	through bore diameter
d_4	internal diameter at the top of the finish*
c	height of thread
s	lead
P	pitch
k	factor**
α	included angle
β	relief angle on bead
n	number of starts of thread
R_1	radius at the top of the thread
R_2	radius at the root of the thread
R_3	radius joining the minor diameter to the bead
t	minimum wall thickness
b	width of thread
h	overall height of the finish
h_1	height of the start of thread

3. PRINCIPLES

This ISO Recommendation is based on the following principles :

3.1 The threads are right-handed.

3.2 The R 20 series of preferred numbers*** is used as a basis for the selection of diameters.

3.3 The pitch diameter is stated as a theoretical basis for the construction of the thread and for the calculation of the helix angle for determining the angle of inclination of the cutter. The inclusion of the pitch diameter thus provides a complete definition of the thread.

3.4 The included angle of the thread flanks is fixed at 60°.

3.5 The width of the thread is defined as the product of the pitch and a factor k :

$$b = P \times k$$

3.6 The height of the thread is fixed at half the width of the thread :

$$c = \frac{b}{2}$$

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* The symbol d_4 is included to enable users, should they so desire, to define it on the basis of the minimum wall thickness t measured at a distance of 2 to 3 mm below the sealing surface of the finish.

** See clause 3.5.

*** See ISO Recommendation R 3, *Preferred numbers – Series of preferred numbers.*

3.7 The following values have been adopted for the factor k :

$k = 0.7$ for $P = 2$

$k = 0.675$ for $P = 2.5 - 3 - 3.5 - 4$

$k = 0.6$ for $P = 5$

These values have been adopted to produce a height of thread which, in conjunction with its width, provides a mass of glass tending to reduce the increase of deformation or other defects during production. Furthermore, the resulting thread profile provides the necessary seat on the blow mould in the manufacture of finishes without bead.

3.8 For shallow screw finishes 1.5 full turns of thread are recommended and for normal tall screw finishes a minimum of 1.5 full turns of thread.

3.9 The recommended height of the start of thread is as follows :

- for shallow finishes : in principle, at half of the pitch, 1.5 mm minimum;
- for normal tall finishes : see Table 2.

3.10 Except for the overall height of the finish h and the height of the start of thread h_1, all other characteristics of both shallow and tall finishes are identical.

3.11 The following method of calculation applies to finishes with multistart threads :

The pitch of a single start thread is multiplied by the number of starts of thread. The number of turns of full thread in the shallow finish with single start thread is divided by the number of starts of thread.

3.12 The tolerances of diameters are always expressed as negative and they include ovalization.

4. DIMENSIONS

4.1 The thread characteristics for glass containers should be in compliance with Table 1.

4.2 The dimensions of shallow and tall finishes with continuous thread should be in compliance with Table 2.

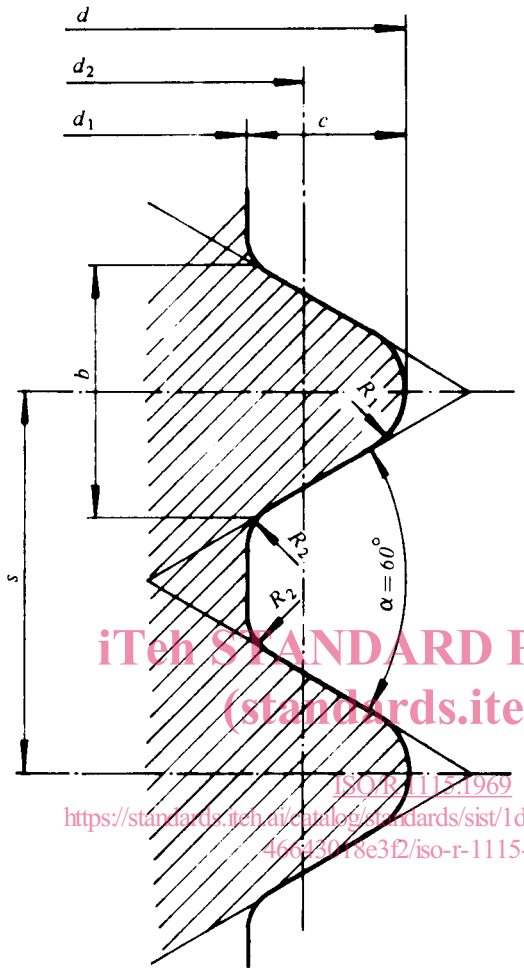
4.3 The dimensions given in Table 1 and Table 2 should be subject to the tolerances specified in those tables.

5. IDENTIFICATION

Glass threads should be identified by the letters GL followed by the nominal diameter d. In the case of multistart threads, the nominal diameter should be followed by a hyphen and a figure indicating the number of starts.

Example : A finish with 3 starts of thread and having a nominal diameter d of 125 mm is identified as follows :

GL 125 – 3



$b = P \cdot k$

$c = \frac{b}{2}$

$R_1 = 0.366\ b$

$s = P \cdot n$

NOTE. – The diameter d_2 and the tolerances relating to it are shown to assist in thread construction only. The formula giving the values of d_2 is

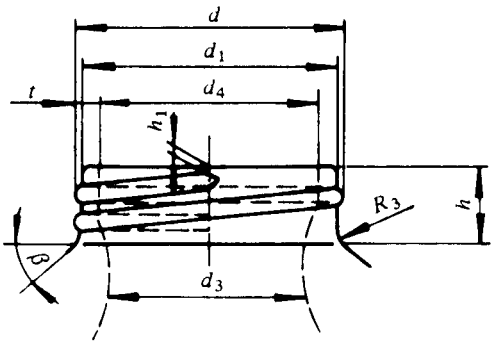
$$d_2 = d - P\left[\frac{\sqrt{3}}{2} + k\,(1-\sqrt{3})\right]$$

TABLE 1 – **Screw threads for glass containers**

Dimensions shown are for finished containers and expressed in millimetres.

Designation	Major diameter		Pitch diameter*		Minor diameter		Pitch	Lead	Number of starts of thread	Width of thread	Height of thread	Radius	Radius
	d	Tolerance	d_2	Tolerance	d_1	Tolerance	P	s	n	b	c	R_1	R_2 max.
GL 10	10	0 – 0.35	9.293	0 – 0.350	8.6	0 – 0.35	2	2	1	1.4	0.7	0.51	0.3
GL 12	12		11.293		10.6								
GL 14	14	0 – 0.40	13.071	0 – 0.400	12.32	0 – 0.40	2.5	2.5		1.69	0.84	0.62	0.4
GL 16	16		15.071		14.32								
GL 18	18	0 – 0.50	16.885	0 – 0.500	15.98	0 – 0.50	3	3		2.02	1.01	0.74	0.5
GL 20	20		18.885		17.98								
GL 22	22	0 – 0.60	20.699	0 – 0.600	19.64	0 – 0.60	3.5	3.5		2.36	1.18	0.86	
GL 25	25		23.699		22.64								
GL 28	28	0 – 0.70	26.512	0 – 0.700	25.30	0 – 0.70	4	4		2.7	1.35	0.99	0.6
GL 32	32		30.512		29.30								
GL 36	36	0 – 0.80	34.512	0 – 0.800	33.30	0 – 0.80							
GL 40	40		38.512		37.30								
GL 45	45		43.512		42.30								
GL 50	50		48.512		47.30			4 (8)	1 (2)				
GL 56	56		54.512		53.30								
GL 63	63	0 – 1.00	60.866	0 – 1.000	60.0	0 – 1.00	5	5 (10)		3.0	1.5	1.1	0.8
GL 70	70		67.866		67.0								
GL 80	80		77.866		77.0								
GL 90	90		87.866		87.0								
GL 100	100	0 – 1.20	97.866	0 – 1.200	97.0	0 – 1.20		5 (10) (15)	1 (2) (3)				
GL 112	112		109.866		109.0								
GL 125	125		122.866		122.0								

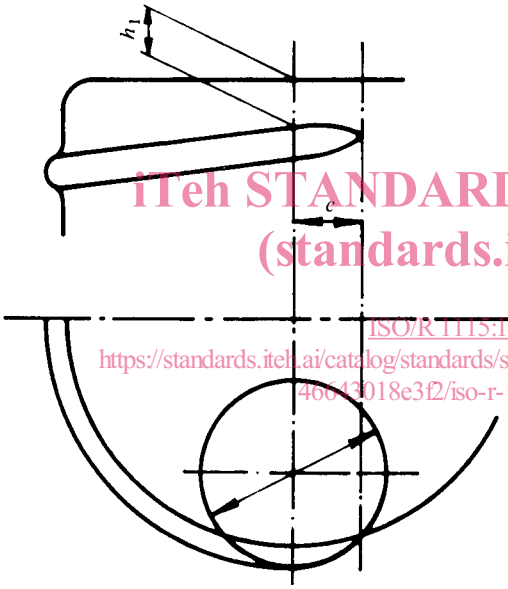
* For information only



$R_3 = c$

$\beta = 5°$ *minimum*

The height h is measured vertically along the thread from the plane of the top of the finish.



Diameter of cutter

NOTES

1. The minimal values for the thickness of the glass, represented by the letter t, are provided only as an illustration. The wall thickness should be measured at a distance of 2 to 3 mm from the top of the finish.

2. The height h of shallow finish is calculated as follows :

$$h = 1.5 + b + \frac{3P}{2} + 1.8 \quad \text{for } P = 2 \text{ and } 2.5$$

$$h = \frac{1}{2}P + b + \frac{3P}{2} + 1.8 \quad \text{for } P = 3 \text{ and } 3.5$$

$$h = \frac{1}{2}P + b + \frac{3P}{2} + 2 \quad \text{for } P = 4$$

3. The height h of tall finish is calculated as follows :

$$h = h_1 + b + \frac{3P}{2} + 1.8 \quad \text{for } P = 2 - 2.5 - 3 - 3.5$$

$$h = h_1 + b + \frac{3P}{2} + 2 \quad \text{for } P = 4$$

TABLE 2 – **Glass finish – shallow and tall**

Dimensions shown are for finished containers and expressed in millimetres.

Designation	Glass finish – Shallow*				Glass finish – Tall				Diameter of cutter recommended	Through bore diameter	Wall thickness
	h	Tolerance	h_1	Tolerance	h	Tolerance	h_1	Tolerance		d_3 min.	t min.
GL 10	7.7	+ 0.4 0	1.5	+ 0.4 0	–		–		6.75	2.3	2
GL 12					11.5	+ 0.4 0	5.3	+ 0.4 0		4.3	
GL 14	8.7				13		5.8		9.5	6.0	2.25
GL 16										8.0	
GL 18	9.8	+ 0.6 0		+ 0.6 0	15		6.7			9.5	
GL 20										11.5	
GL 22	11.2		1.75		16.5		7.0		12.7	12.6	
GL 25						+ 0.6 0		+ 0.6 0		15.6	
GL 28	12.7		2		18		7.3			17.3	
GL 32										21.3	
GL 36										24.3	2.5
GL 40										28.3	
GL 45										33.3	
GL 50										38.3	
GL 56										44.3	
GL 63	15.0		2.5							50.0	2.75
GL 70										57.0	
GL 80										67.0	
GL 90										77.0	
GL 100										86.8	3
GL 112										98.8	
GL 125										111.8	

* Values rounded to first decimal place.