International Standard

ISO 7721

Countersunk head screws — Head configuration and gauging

Vis à tête fraisée — Configuration de la tête et vérification par calibre

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been authorized has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

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 7721 was developed by Technical Committee ISO/TC 2, *Fasteners*, and was circulated to the member bodies in December 1981.

It has been approved by the member bodies of the following countries:

Australia	Germany, F.R.	New Zealand
Austria	Hungary	Norway
Belgium	India	Poland
Canada	Ireland	Romania
China	Italy	South Africa, Rep. of
Czechoslovakia	Japan	Spain
Denmark	Korea, Dem. P. Rep. of	Sri Lanka
Egypt, Arab Rep. of	Korea, Rep. of	Sweden
Finland	Mexico	Switzerland
France	Netherlands	USA

The member body of the following country expressed disapproval of the document on technical grounds:

United Kingdom

Countersunk head screws — Head configuration and gauging

1 Scope and field of application

This International Standard specifies the characteristics of head configurations of slotted and recessed countersunk head screws, and recommends a gauging method for the head dimensions laid down in the respective product standards.

2 Head configuration
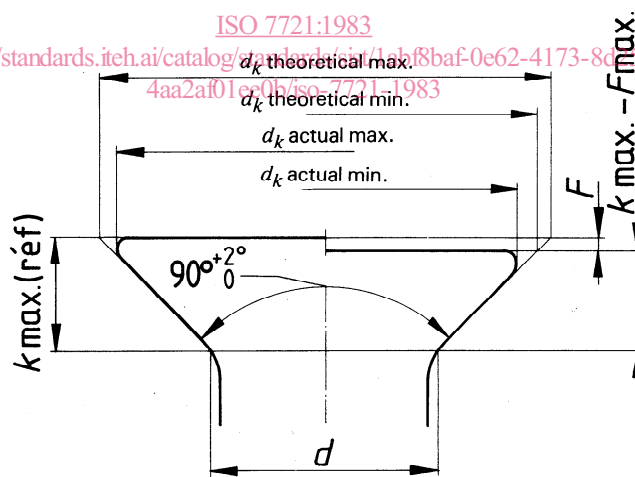
Table 1

Dimensions in millimetres

Thread size, d		metric	M 1,6	M 2	M 2,5	M 3	M 3,5	M 4	M 5	—	M 6	M 8	M 10	M 12	M 14	M 16	M 18	M 20
		tapping	—	ST 2,2	—	ST 2,9	ST 3,5	ST 4,2	ST 4,8	ST 5,5	ST 6,3	ST 8	ST 9,5	—	—	—	—	—
d_k	theoretical	max.	3,6	4,4	5,5	6,3	8,2	9,4	10,4	11,5	12,6	17,3	20	24	28	32	36	40
		min.	3,3	4,1	5,1	5,9	7,7	8,9	9,8	10,9	11,9	16,5	19,2	23,1	27	30,8	34,7	38,5
	actual	max.	3	3,8	4,7	5,5	7,3	8,4	9,3	10,3	11,3	15,8	18,3	22	25,5	29	32,5	36
		min.	2,7	3,5	4,4	5,2	6,9	8	8,9	9,9	10,9	15,4	17,8	21,5	25	28,5	31,9	35,4
F		max.	0,15	0,15	0,2	0,2	0,25	0,25	0,3	0,3	0,35	0,4	0,4	0,45	0,5	0,6	0,65	0,75
k max. (ref.)		metric	1	1,2	1,5	1,65	2,35	2,7	2,7	—	3,3	4,65	5	6	7	8	9	10
		tapping	—	1,1	—	1,7	2,35	2,6	2,8	3	3,15	4,65	5,25	—	—	—	—	—

3 Gauging method

Flushness gauge
for the head height

Ring gauge
No go gauge for d_k actual min.

$90°\begin{smallmatrix}0\\-30'\end{smallmatrix}$
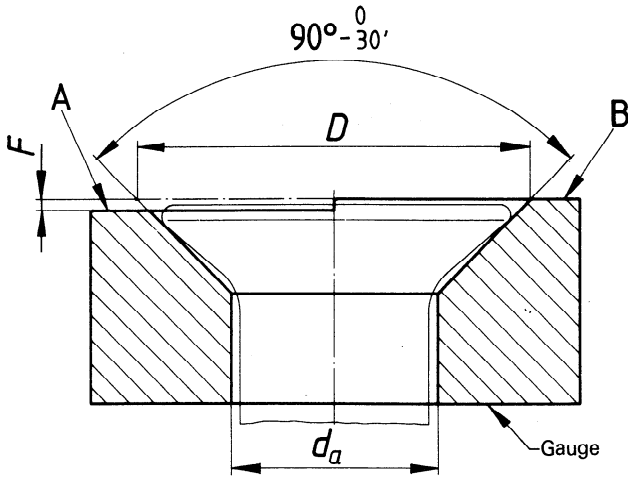
The top surface of the screw head must
lie between gauge surfaces A and B.
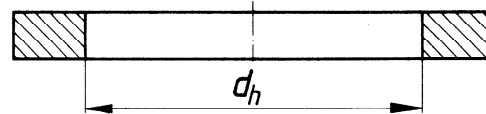
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Table 2

Dimensions in millimetres

Thread size, d	metric	M 1,6	M 2	M 2,5	M 3	M 3,5	M 4	M 5		M 6	M 8	M 10
	tapping	–	ST 2,2	–	ST 2,9	ST 3,5	ST 4,2	ST 4,8	ST 5,5	ST 6,3	ST 8	ST 9,5
D	max.	3,6	4,4	5,5	6,3	8,2	9,4	10,4	11,5	12,6	17,3	20
	min.	3,55	4,35	5,45	6,25	8,15	9,35	10,35	11,45	12,55	17,25	19,95
d_a	max.	1,84	2,36	2,74	3,3	3,9	4,4	5,5	5,68	6,6	8,54	10,62
	min.	1,74	2,26	2,64	3,2	3,8	4,3	5,4	5,58	6,5	8,44	10,52
F	max.	0,15	0,15	0,2	0,2	0,25	0,25	0,3	0,3	0,35	0,4	0,4
	min.	0,14	0,14	0,19	0,19	0,24	0,24	0,29	0,29	0,34	0,39	0,39
d_h	min.	2,68	3,48	4,38	5,18	6,88	7,98	8,88	9,88	10,88	15,38	17,78
	max.	2,7	3,5	4,4	5,2	6,9	8	8,9	9,9	10,9	15,4	17,8

NOTE — Diameters d_a min. are based on fillet radius $r = 0,25\,d$ for metric screws and $0,4\,d$ for tapping screws.

Annex

Calculation basis for the maximum head diameter of countersunk heads for screws
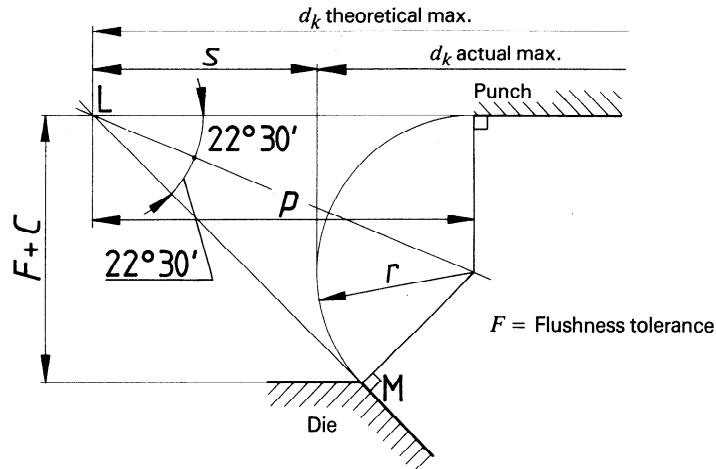
Basic assumptions

1. When heads are being formed with minimum heights, the clearance between punch and die will have minimum values C as follows :

Thread size, d	metric	M 1,6	M 2	M 2,5	M 3	M 3,5	M 4	M 5	—	M 6	M 8	M 10
	tapping	—	ST 2,2	—	ST 2,9	ST 3,5	ST 4,2	ST 4,8	ST 5,5	ST 6,3	ST 8	—
C	min.	0,2	0,22	0,28	0,3	0,32	0,35	0,38	0,4	0,42	0,5	0,63

2. When heads are being formed with maximum heights and maximum actual diameters, the peripheral contour of the head and the clearance between punch and die will be as shown in the above diagram.

From the diagram :

$$s = p - r$$

but $p =$ LM $= (F + C) \sec 45°$
and $r =$ LM $\tan 22°30' = (F + C) \sec 45° \times \tan 22°30'$

$$\begin{aligned} s &= (F + C) \sec 45° - (F + C) \sec 45° \times \tan 22°30' \\ &= (F + C) (\sec 45°) (1 - \tan 22°30') \approx 0,83 \, (F + C) \end{aligned}$$

d_k actual max. $= d_k$ theoretical max. $- 2s = d_k$ theoretical max. $- 1,66 \, (F + C)$

It is also assumed that the relationship between theoretical and actual diameters is roughly constant :

d_k actual min. $\simeq d_k$ theoretical min. $- (d_k$ theoretical max. $- d_k$ actual max.)

where d_k theoretical min. $= d_k$ theoretical max. $- 2 F$.

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