INTERNATIONAL STANDARD 1711

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Hand operated wrenches and sockets — Technical specifications

Clés de serrage et douilles à main — Spécifications techniques

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Descriptors : tools, wrenches, socket wrenches, dimensions, tests.

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (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 set up 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.

Prior to 1972, the results of the work of the Technical Committees were published as ISO Recommendations; these documents are now in the process of being transformed into International Standards. As part of this process, Technical Committee ISO/TC 29 has reviewed ISO Recommendation R 1711 and found it technically suitable for transformation. International Standard ISO 1711 therefore replaces ISO Recommendation R 1711-1970 to which it is technically identical.

ISO Recommendation R 1711 was approved by the Member Bodies of the following countries :

Australia	India	Spain
Austria	Ireland	Switzerland
Belgium	Israel	Thailand
Brazil	Italy	Turkey
Czechoslovakia	Japan	United Kingdom
Egypt, Arab Rep. of	Korea, Rep. of	U.S.A.
France	New Zealand	U.S.S.R.
Germany	Poland	Yugoslavia
Greece	Portugal	
Hungary	South Africa, Rep. of	

The Member Body of the following country expressed disapproval of the Recommendation on technical grounds :

Sweden*

The Member Body of the following country disapproved the transformation of ISO/R 1711 into an International Standard :

Poland

* Subsequently, this Member Body approved the Recommendation.

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AMENDMENT 1

Amendment 1 to International Standard ISO 1711-1975 was developed by Technical Committee ISO/TC 29, *Small tools*, and was circulated to the member bodies in September 1981.

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

Australia	Hungary	Spain
Austria	India	Sri Lanka
Belgium	Israel	Sweden
Brazil	Italy	Switzerland
China	Japan	United Kingdom
Czechoslovakia	Korea, Dem. P. Rep. of	USSR
Egypt, Arab Rep. of	Poland	Yugoslavia
France	Romania	
Germany, F.R.	South Africa, Rep. of	

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

USA

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ISO 1711-1975/A1-1982 (E)

Page 3

Replace table 3 by the following table :

Table 3 — Torques M in N·m for dimensions in millimetres

Width across flats s**** mm	Torques M in N·m						
	Series A	Series C	Series E				
			Nominal dimensions of the driving square***				
			6,3	10	12,5	20	25
3,2	4,04	1,02	7,08				
(3,5)	4,98	1,31	8,26				
4	6,81	1,90	10,4				
(4,5)	8,97	2,64	12,6				
5	11,5	3,55	15,1				
5,5	14,4	4,64	17,8				
(6)	17,6	5,92	20,6				
7	25,2	9,12	26,8	33,2			
8	34,5	13,3	33,6	45,5			
(9)	45,4	18,4	41,1	59,9			
10	58,1	24,8	49,1	76,7	147		
11	72,7	32,3	57,8	96,0	178		
(12)	89,1	41,2	67,0	118	212		
13	107	51,6	68,6*	141	249		
(14)	128	63,5	68,6*	169	288		
15	150	77,0		198	331		
16	175	92,3		225*	377		
(17)	201	107		225*	425		
18	230	128		225*	477		
(19)	261	149		225*	531		
(20)	294	172		225*	569*		
21	330	198		225*	569*		
(22)	368	225		225*	569*	569*•	
(23)	408	255			569*	569**	
24	451	287			569*	569*•	
(25)	496	322			569*	583	
(26)	544	359			569*	624	
27	594	399			569*	665	
(28)	647	442			569*	707	
30	760	536			569*	795	
(32)	884	643			569*	888	
34	1 019	761			569*	984	
36	1 165	894				1 084	
41	1 579	1 154				1 353	
46	2 067	1 453				1 569*	2 143
50	2 512	1 716				1 569*	2 329
55	3 140	2 077					2 562
60	3 849	2 471					2 795

• The value of the test torque has been voluntarily limited. Driving squares have lower strengths than sockets for the same steel grade.

** These values are greater than those which might have been obtained by computation. They were nevertheless adopted as it would be abnormal for the strength of sockets with driving squares of 20 mm to be lower than the strength of sockets with driving squares of 12,5 mm.

*** For dimensions of driving squares, see ISO 1174.

**** Values in brackets are not standardized across-flats, but still in use provisionally.

Hand operated wrenches and sockets — Technical specifications

1 SCOPE AND FIELD OF APPLICATION

This International Standard, relating to assembly tools for bolts and screws, specifies minimum values for hardness and torsional strength which should be satisfied by hand operated wrenches and sockets.

It provides for three series of torsion torques, namely :

— **series A** : usual ring wrenches and socket wrenches (examples[1] : wrenches Nos. 5 — 6 — 8 — 9 — 10 — 11 — 15 — 16 — 17 — 18 — 19 — 20 — 21 — 26 — 27);

— **series C** : alloy steel open jaw wrenches (examples[1] : wrenches Nos. 1 — 4);

— **series E** : hand operated square drive sockets (example[1] : socket No. 24).

Torques to be applied during tests have been determined by empirical formulae given for guidance in table 1.

2 REFERENCES

ISO/R 80, *Rockwell hardness test (B and C scales) for steel.*

ISO/R 272, *Hexagon bolts and nuts — Widths across flats, heights of heads, thicknesses of nuts — Metric series.*

ISO 1174, *Assembly tools for bolts and screws — Driving squares for power socket wrenches and hand socket wrenches.*

TABLE 1 — **Formulae giving test torques *M* as a function of width across flats *s***

Series			*s** in millimetres	*s** in inches
			Test torque *M*	
			N·m	lbf·ft
A			$0{,}2657\ s^{2{,}34}$	$1429 \times 0.2657\ s^{2.34}$
C	Widths across flats *s*	$s \leqslant 36$ mm ($1\frac{13}{32}$ in)	$0{,}0392\ s^{2{,}8}$	$6329 \times 0.0392\ s^{2.8}$
		$s > 36$ mm ($1\frac{13}{32}$ in)	$0{,}6865\ s^{2}$	$475.8 \times 0.6865\ s^{2}$
E	Dimension for driving square mm	6.3	$0{,}9807\ s^{1{,}7}$	$180.5 \times 0.9807\ s^{1.7}$
		10	$0{,}3507\ s^{2{,}34}$ **	$1429 \times 0.3507\ s^{2.34}$ **
		12,5	$1{,}4710\ s^{2}$	$475.8 \times 1.4710\ s^{2}$
		20	$2{,}4517\ s^{1{,}7}$	$180.5 \times 2.4517\ s^{1.7}$
		25	$46{,}5816\ s$	$18.73 \times 46.5816\ s$

* *s* : width across flats.

** Torque *M* applicable to series A multiplied by the coefficient 1,32.

1) The wrenches and socket listed are taken from ISO 1703, *Assembly tools for screws and nuts — Nomenclature.*

3 HARDNESS TESTING

The hardness test shall be carried out according to the conditions specified in ISO/R 80.

The values given in table 2 are minimum values.

TABLE 2 — **Hardness HRC for wrenches and sockets**

Width across flats *s*		Hardness HRC	
		for alloy steel open jaw wrenches*	for all other wrenches or sockets
over	up to	min.	min.
—	32 mm ($1\frac{1}{4}$ in)	39	39
32 mm ($1\frac{1}{4}$ in)	60 mm ($2\frac{3}{8}$ in)	39	35

* For carbon steel open jaw wrenches : 36 HRC.

4 TORQUE TESTING

4.1 Procedure

Place the wrench or socket over a hexagonal test mandrel and apply the corresponding torque.

Do not jerk or strike the wrench or socket when testing and apply the load gradually until the minimum testing torque is reached. The torque is calculated as the product of the magnitude of the load by the distance measured between the point of application of the load and the centre of the test mandrel.

The nominal across flats dimension of the test mandrel shall be equal to the nominal dimension *s* with a tolerance of h8. The mandrel shall be hardened to not less than 55 HRC.

A device in which the mandrel can be rotated at a certain torque determined with an accuracy of ± 2,5 % may also be used for this test.

Following the application of the minimum test torque, the wrench or socket shall not show permanent deformation or other damage which could influence usability.

4.2 Test of hexagonal wrenches or open jaw wrenches

The test mandrel shall touch the bottom of the jaw opening.

Apply the load as far along the shaft of the wrench as possible, perpendicular to its longitudinal axis. Use an extension tube when testing large wrenches.

Load the wrench once in each direction during the test.

4.3 Test of socket wrenches

The hexagonal test mandrel shall be inserted in the socket up to a depth of 0,8 *d* with a tolerance of h13 (*d* being the diameter of the bolt according to ISO/R 272.

Apply the load as far along the shaft of the wrench as possible, perpendicular to its longitudinal axis. Use an extension tube when testing large wrenches.

4.4 Test of hand operated square drive sockets

The hexagonal test mandrel shall be inserted in the socket up to a depth of 0,8 *d* (*d* being the nominal diameter of the bolt according to ISO/R 272).

A square mandrel of hardness not less than 55 HRC shall be used for driving the socket. The nominal across flats dimension of this mandrel shall be equal to the maximum dimension, with a tolerance of h8, of the corresponding driving square.

4.5 Minimum test torque *M*

TABLE 3 – **Torques *M* in N·m for dimensions in millimetres**

Width across flats *s*	Torques *M* in N·m						
	Series A	Series C	Series E				
			Nominal dimensions of the driving square***				
			6,3	10	12,5	20	25
3,2	4,04	1,02	7,08				
3,5	4,98	1,31	8,26				
4	6,81	1,90	10,4				
4,5	8,97	2,64	12,6				
5	11,5	3,55	15,1				
5,5	14,4	4,64	17,8				
6	17,6	5,92	20,6				
7	25,2	9,12	26,8	33,2			
8	34,5	13,3	33,6	45,5			
9	45,4	18,4	41,1	59,9			
10	58,1	24,8	49,1	76,7	147		
11	72,7	32,3	57,8	96,0	178		
12	89,1	41,2	67,0	118	212		
13	107	51,6	68,6 *	141	249		
14	128	63,5	68,6 *	169	288		
15	150	77,0		198	331		
16	175	92,3		225 *	377		
17	201	107		225 *	425		
18	230	128		225 *	477		
19	261	149		225 *	531		
20	294	172		225 *	569 *		
21	330	198		225 *	569 *		
22	368	225		225 *	569 *	569 **	
23	408	255			569 *	569 **	
24	451	287			569 *	569 **	
25	496	322			569 *	583	
26	544	359			569 *	624	
27	594	399			569 *	665	
28	647	442			569 *	707	
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32	884	643			569 *	888	
36	1 165	894				1 084	
41	1 579	1 154				1 353	
46	2 067	1 453				1 569 *	2 143
50	2 512	1 716				1 569 *	2 329
55	3 140	2 077					2 562
60	3 849	2 471					2 795

* The value of the test torque has been voluntarily limited. Driving squares have lower strengths than sockets for the same steel grade.

** These values are greater than those which might have been obtained by computation. They were nevertheless adopted as it would be abnormal for the strength of sockets with driving squares of 20 mm to be lower than the strength of sockets with driving squares of 12,5 mm.

*** For dimensions of driving squares, see ISO 1174.

TABLE 4 – **Torques *M* in lbf·ft for dimensions in inches**

Width across flats *s* in	Torques *M* in lbf·ft						
	Series A	Series C	Series E				
			Nominal dimensions of driving square***				
			1/4	3/8	1/2	3/4	1
3/16	7.56	2.29	10.3				
1/4	14.8	5.12	16.8				
5/16	25.0	9.56	24.5	33.0			
11/32	31.2	12.5	28.8	41.2			
3/8	38.3	15.9	33.4	50.5	98.5		
7/16	54.9	24.5	43.4	72.4	134		
1/2	75.0	35.6	50.8*	99.0	175		
9/16	98.8	49.6		130	222		
5/8	126	66.6		167 *	274		
11/16	158	87.0		167 *	331		
3/4	194	111		167 *	394	419 **	
13/16	234	142		167 *	419 *	419 **	
7/8	278	171		167 *	419 *	419 **	
15/16	327	207			419 *	419 **	
1	380	248			419 *	442	
1 1/16	438	301			419 *	490	
1 1/8	500	345			419 *	540	
1 1/4	640	464			419 *	646	
1 5/16	718	532				702	1 145
1 7/16	888	675				819	1 254
1 1/2	981	735				883	1 309
1 5/8	1 183	863				1 009	1 418
1 11/16	1 292	930				1 165 *	1 473
1 13/16	1 527	1 073				1 165 *	1 582
1 7/8	1 654	1 148				1 165 *	1 636
2	1 923	1 307				1 165 *	1 745
2 1/16	2 067	1 390				1 165 *	1 800
2 3/16	2 372	1 563				1 165 *	1 909
2 1/4	2 533	1 654				1 165 *	1 963
2 3/8	2 875	1 842				–	2 072

* The value of the test torque has been voluntarily limited. Driving squares have lower strengths than sockets for the same steel grade.

** These values are greater than those which might have been obtained by computation. They were nevertheless adopted as it would be abnormal for the strength of sockets with driving squares of 3/4 in to be lower than the strength of sockets with driving squares of 1/2 in.

*** For dimensions of driving squares, see ISO 1174.