

भारतीय मानक

इस्पात के चूड़ीदार बंधकों की तकनीकी पूर्ति शर्तें

भाग 8 प्रचलित बल आघूर्ण किस्म के इस्पात की
षटकोणी ढिबरियों के लिए यांत्रिक और कार्यकारिता गुणधर्म
(तीसरा पुनरीक्षण)

Indian Standard

**TECHNICAL SUPPLY CONDITIONS FOR
THREADED STEEL FASTENERS**

**PART 8 PREVAILING TORQUE TYPE STEEL HEXAGON NUTS —
MECHANICAL AND PERFORMANCE PROPERTIES**

(Third Revision)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

NATIONAL FOREWORD

This Indian Standard (Part 8) (Third Revision) which is identical with ISO 2320 : 1997 'Prevailing torque type steel hexagon nuts — Mechanical and performance properties' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of the Bolts, Nuts and Fasteners Accessories Sectional Committee and approval of the Basic and Production Engineering Division Council.

This standard was originally published in 1961 and subsequently revised in 1967 and 1992. The last revision was in conformity with ISO 2320 : 1993. Consequent upon the revision of ISO 2320 : 1983 the Committee decided to take up the revision of this standard aligning with ISO 2320 : 1997 by adoption under dual numbering system.

The text of ISO Standard has been approved as suitable for publication as Indian Standard without deviations. Certain terminology and conventions are, however, not identical to those used in Indian Standards. Attention is drawn especially to the following:

- a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.
- b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their place are listed below along with their degree of equivalence for the editions indicated:

<i>International Standard</i>	<i>Corresponding Indian Standard</i>	<i>Degree of Equivalence</i>
ISO 68-1 : ¹⁾	IS 4218 (Part 1) : 2001 ISO General purpose metric screw threads: Part 1 Basic profile (<i>second revision</i>)	Identical
ISO 261 : ¹⁾	IS 4218 (Part 2) : 2001 ISO General purpose metric screw threads: Part 2 General plan (<i>second revision</i>)	do
ISO 898-1 : 1999	IS 1367 (Part 3) : 2002 Technical supply conditions for threaded steel fasteners: Part 3 Mechanical properties of fasteners made of carbon steel and alloy steel — Bolts, screws and studs (<i>fourth revision</i>)	do
ISO 898-2 : 1992	IS 1367 (Part 6) : 1994 Technical supply conditions for threaded steel fasteners: Part 6 Mechanical properties and test methods for nuts with specified proof loads (<i>third revision</i>)	do
ISO 898-6 : 1994	IS 13096 : 2000 Fasteners — Hexagon nuts with specified proof load values — Fine pitch thread — Mechanical properties (<i>first revision</i>)	do

¹⁾ Since published in 1998.

**TECHNICAL SUPPLY CONDITIONS FOR
THREADED STEEL FASTENERS**
**PART 8 PREVAILING TORQUE TYPE STEEL HEXAGON NUTS —
MECHANICAL AND PERFORMANCE PROPERTIES**
(Third Revision)

1 Scope

This International Standard specifies the mechanical and performance properties for prevailing torque type steel hexagon nuts (including those with flange) when tested over an ambient temperature range of 10 °C to 35 °C. Properties will vary at higher and lower temperature.

It applies to prevailing torque type nuts

- with nominal thread diameters up to and including 39 mm;
- of triangular ISO thread according to ISO 68;
- with diameter/pitch combinations according to ISO 261;
- with thread tolerances 6H according to ISO 965-2;
- with specific mechanical requirements;
- with dimensions as specified in product standards provided they make reference to this International Standard;
- within the temperature range –50 °C to +300 °C for all metal type nuts;
- within the temperature range –50 °C to +120 °C for non-metallic insert type nuts¹⁾.

It does not apply to nuts requiring special properties which may require special materials or coatings to improve

- weldability;
- corrosion resistance;
- performance outside the above specified temperature ranges.

Prevailing torque performance decreases with increasing re-use. The nut user should consider the implications of decreased performance prior to re-use.

NOTE — Information on torque/clamping force performance requirements and testing are given in the annex C. These functional requirements and the accompanying test procedure are still under discussion and cannot be specified mandatorily for the time being.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 68-1 : –²⁾, *ISO general purpose screw threads – Basic profile – Part 1: Metric screw threads.*

ISO 261 : –³⁾, *ISO general purpose metric threads – General plan.*

1) By careful choice of non-metallic materials higher service temperature properties can be attained by agreement between user and manufacturer.

2) To be published. (Revision of ISO 68:1973)

3) To be published. (Revision of ISO 261:1973)

IS 1367 (Part 8) : 2002

ISO 2320 : 1997

ISO 898-1:-⁴⁾, *Mechanical properties of fasteners made of carbon steel and alloy steel – Part 1: Bolts, screws and studs.*

ISO 898-2:1992, *Mechanical properties of fasteners – Part 2: Nuts with specified proof load values – Coarse thread.*

ISO 898-6:1994, *Mechanical properties of fasteners – Part 6: Nuts with specified proof load values – Fine pitch thread.*

ISO 965-2:-⁵⁾, *ISO general purpose metric screw threads – Tolerances – Part 2: Limits of sizes for general purpose bolt and nut threads – Medium quality.*

ISO 4042:-⁶⁾, *Fasteners – Electroplated castings.*

ISO 4753:-⁷⁾, *Fasteners – End of parts with external metric ISO thread.*

ISO 6506:1981, *Metallic materials – Hardness test – Brinell test.*

ISO 6507-1:-⁸⁾, *Metallic materials – Vickers hardness test – Part 1: Test method.*

ISO 6508:1986, *Metallic materials – Hardness test – Rockwell test (scales A – B – C – D – E – F – G – H – K).*

3 Definitions

For the purposes of this International Standard the following definitions apply.

3.1 prevailing torque type nut: Nut which is not free-running on a mating thread by virtue of a self-contained prevailing torque feature, and which provides a degree of resistance to rotation independent of clamping or compression forces.

3.2 prevailing torque developed by a nut: Torque necessary to rotate the nut on its mating, externally threaded component and with no axial load in the mating component.

4 Designation system

The property classes specified for prevailing torque type nuts are the same as specified in ISO 898-2 and ISO 898-6 for hexagon nuts, namely

– nuts with nominal heights $\geq 0,8 d$ (effective lengths of thread $\geq 0,6 d$) are designated by a number to indicate the maximum appropriate property class of bolts with which they may be mated, see table 1;

– nuts with nominal heights $\geq 0,5 d$ and $< 0,8 d$ (effective height of thread $\geq 0,4 d$ and $< 0,6 d$) are designated by a combination of two numbers: the second indicates the nominal stress under proof load on a hardened test mandrel, while the first indicates that the loadability of a bolt-nut assembly is reduced in comparison with the loadability on a hardened test mandrel and also in comparison with a bolt-nut assembly described in table 1. Table 2 gives the designation system and the stresses under proof load of these nuts.

4) To be published. (Revision of ISO 898-1:1988)

5) To be published. (Revision of ISO 965-2:1980)

6) To be published. (Revision of ISO 4042:1989)

7) To be published. (Revision of ISO 4753:1983)

8) To be published. (Revision of ISO 6507-1:1982; ISO 6507-2:1983; ISO 6507-3:1989; ISO 409-1:1982; ISO 409-2:1983 and ISO/DIS 409-3)

Table 1 — Designation system for nuts with nominal heights $\geq 0,8 d$

Property class of the nut	Coarse thread	5	6	8	9	10	12
	Fine pitch thread	—	6	8	—	10	12
Property class of the mating bolt or screw		≤ 5.8	≤ 6.8	≤ 8.8	9.8 ≤ 8.8	10.9 9.8 8.8	12.9 10.9 8.8

NOTE — In general, nuts of a higher property class can replace nuts of lower property class. However it is not recommended that a heat-treated all-metal nut be combined with a bolt of lower property class.

Table 2 — Designation system and stresses under proof load for nuts with nominal heights $\geq 0,5 d$ and $< 0,8 d$

Property class of nut	Nominal stress under proof load N/mm ²	Actual stress under proof load N/mm ²
04	400	380
05	500	500

5 Materials and processes

5.1 Materials

Nuts shall be made of steel conforming to the chemical composition limits specified in table 3. The prevailing torque element of insert-type nuts may be made of a material other than steel. It is recommended that users and manufacturers consider the maximum limits for sulphur, manganese, boron and other intentionally added elements which may result in component failure, when in excessive amounts.

Table 3 — Limits of chemical composition

Property class		Chemical composition limit (check analysis), %			
Coarse thread	Fine pitch thread	C max.	Mn min.	P max.	S min.
5 ¹⁾ ; 6 ¹⁾	6	0,50	—	0,060	0,150
8; 9; 04 ¹⁾	8	0,58	0,25	0,060	0,150
10 ²⁾ ; 05 ²⁾	10 ²⁾	0,58	0,30	0,048	0,058
12 ²⁾	12 ²⁾	0,58	0,45	0,048	0,058

1) Nuts may be manufactured from free cutting steel, unless otherwise agreed between the user and the manufacturer. In such cases the following maximum sulfur, phosphorus and lead contents are permissible:

S 0,34 %, P 0,11 % and Pb 0,35 %.

2) Alloying elements may be added if necessary to develop the mechanical properties of the nuts.

5.2 Heat treatment

5.2.1 Nuts with coarse thread

Nuts of property classes 05, 8 (style 1, > M16), 10 and 12 shall be quenched and tempered. Case hardening is not allowed for any property class.

5.2.2 Nuts with fine pitch thread

Nuts of property classes 05, 8 (style 1), 10 and 12 shall be quenched and tempered. Case hardening is not allowed for any property class.

5.3 Thread

The thread of the prevailing torque type nuts must conform to ISO 965-2 except for the prevailing torque element.

In the case of prevailing torque type nuts with non-metallic insert, the go gauge must be capable of being screwed in freely by hand as far as the insert.

In the case of all-metal nuts the go gauge must be capable of being screwed in freely by hand for at least one thread.

5.4 Finish

All-metal nuts shall be lubricated and nuts with non-metallic insert may be lubricated to meet the stated performance requirements. The lubricant shall not constitute a health hazard to the user, nor emit an unpleasant odour during assembly and shall be suitable for automatic or robotic assembly.

Lubricant, when used, must be suitable for assembly speeds from 10 to 500 r/min.

The performance of nuts which are supplied with a protective coating and/or lubricant shall not deteriorate when the nuts are stored indoors for a period of six months. The storage temperature shall be within the range $-5\text{ }^{\circ}\text{C}$ to $+40\text{ }^{\circ}\text{C}$.

NOTE — In the case where nuts are given a protective coating or cleaning following delivery to the user, the nut manufacturer shall not be held responsible for failure of the nut to meet dimensional, mechanical or performance properties traceable to the plating or coating.

5.5 Hydrogen embrittlement

For hydrogen embrittlement see ISO 4042.

6 Mechanical properties

When tested by methods described in 8.1 and 8.2, the nuts shall have the mechanical properties set out in tables 4 and 5.

Nuts shall withstand the proof load values specified in tables 6 and 7 for the applicable property class when tested as specified in 8.1.

Table 4 — Mechanical properties, coarse thread

Thread		Property class									
		04					05				
mm	over to	Stress under proof load σ_p N/mm ²	Vickers hardness HV		Nut		Stress under proof load σ_p N/mm ²	Vickers hardness HV		Nut	
			min.	max.	state	style		min.	max.	state	style
—	M4	380	188	302	neither quenched nor tempered	thin	500	272	353	quenched and tempered	thin
M4	M7										
M7	M10										
M10	M16										
M16	M39										

Thread		Property class																											
		5 ¹⁾						6						8															
mm	over to	Stress under proof load σ_p N/mm ²	Vickers hardness HV		Nut		Stress under proof load σ_p N/mm ²	Vickers hardness HV		Nut		Stress under proof load σ_p N/mm ²	Vickers hardness HV		Nut		Stress under proof load σ_p N/mm ²	Vickers hardness HV		Nut									
			min.	max.	state	style		min.	max.	state	style		min.	max.	state	style		min.	max.	state	style								
—	M4	520	130	302	neither quenched nor tempered	1	600	150	302	neither quenched nor tempered	1	800	180	200	302	neither quenched nor tempered	1	—	—	—	—	—							
M4	M7	580					855					920	233										353	quenched and tempered	890	180	302	neither quenched nor tempered	2
M7	M10	590					870																						
M10	M16	610					880																						
M16	M39	630					146					720	170										920	233	353	quenched and tempered	890	180	302

Table 4 (concluded)

Thread		Property class																					
		9"						10						12									
mm		Stress under proof load σ_p	Vickers hardness HV		Nut		Stress under proof load σ_p	Vickers hardness HV		Nut		Stress under proof load σ_p	Vickers hardness HV		Nut		Stress under proof load σ_p	Vickers hardness HV		Nut			
over	to	N/mm ²	min.	max.	state	style	N/mm ²	min.	max.	state	style	N/mm ²	min.	max.	state	style	N/mm ²	min.	max.	state	style		
-	M4	900	170	302	neither quenched nor tempered	2	1 040	272	353	quenched and tempered	1	1 140	295	353	quenched and tempered	1	1 150	272	353	quenched and tempered	2		
M4	M7	915					1 040										1 140						1 150
M7	M10	940					1 040										1 140						1 160
M10	M16	950					1 050										1 170						1 190
M16	M39	920					1 060										-						1 200

NOTE — Minimum hardness is mandatory only for heat-treated nuts and nuts too large to be proof-load tested. For all other nuts, minimum hardness is not mandatory but is provided for guidance only. For nuts which are not quenched and tempered, and which satisfy the proof load test, minimum hardness shall not be cause for rejection.

1) The maximum bolt hardness of property classes 5.6 and 5.8 will be changed to be 220 HV in the next revision of ISO 898-1 as this is the maximum bolt hardness in the thread engagement area whereas only the thread end or the head may have a maximum hardness of 250 HV. Therefore the values of stress under proof load are based on a maximum bolt hardness of 220 HV.

Table 5 — Mechanical properties, fine pitch thread

Nominal thread diameter <i>d</i> mm	Property class									
	04					05				
	Stress under proof load S_p N/mm ²	Vickers hardness HV		Nut		Stress under proof load S_p N/mm ²	Vickers hardness HV		Nut	
min.		max.	state	style	min.		max.	state	style	
$8 \leq d \leq 39$	380	188	302	neither quenched nor tempered	thin	500	272	353	quenched and tempered	thin

Nominal thread diameter <i>d</i> mm	Property class														
	6							8							
	Stress under proof load S_p N/mm ²	Vickers hardness HV		Nut		Stress under proof load S_p N/mm ²	Vickers hardness HV		Nut		Stress under proof load S_p N/mm ²	Vickers hardness HV		Nut	
min.		max.	state	style	min.		max.	state	style	min.		max.	state	style	
$8 \leq d \leq 10$	770	188	302	neither quenched nor tempered ¹⁾	1	955	250	353	quenched and tempered	1	890	195	302	neither quenched nor tempered	2
$10 < d \leq 16$	780					233	1 030				295	-	-		
$16 < d \leq 33$	870	-	-	-	-		-	-							
$33 < d \leq 39$	930					1 090			295	295	295	295	295		

Nominal thread diameter <i>d</i> mm	Property class														
	10							12							
	Stress under proof load S_p N/mm ²	Vickers hardness HV		Nut		Stress under proof load S_p N/mm ²	Vickers hardness HV		Nut		Stress under proof load S_p N/mm ²	Vickers hardness HV		Nut	
min.		max.	state	style	min.		max.	state	style	min.		max.	state	style	
$8 \leq d \leq 10$	1 100	295	353	quenched and tempered	1	1 055	250	353	quenched and tempered	2	1 200	295	353	quenched and tempered	2
$10 < d \leq 16$	1 100					1 080	260				260	260	260		
$16 < d \leq 39$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

NOTE — Minimum hardness is mandatory for heat-treated nuts and for nuts too large to be proof-load tested. For all other nuts, minimum hardness is not mandatory but is provided for guidance only. For nuts which are not quenched and tempered, and which satisfy the proof-load test, minimum hardness shall not be cause for rejection.

1) For thread diameters above 16 mm, nuts may be quenched and tempered at the discretion of the manufacturer.

Table 6 — Proof load values – Coarse thread
(see also ISO 898-2)

Thread	Pitch of the thread mm	Nominal stress area of the mandrel A_s mm ²	Property class									
			04	05	5	6	8		9	10	12	
			Proof load ($A_s \times S_p$) N									
			thin	thin	style 1	style 1	style 1	style 2	style 2	style 1	style 1	style 2
M3	0,5	5,03	1 910	2 500	2 600	3 000	4 000	–	4 500	5 200	5 700	5 800
M4	0,7	8,78	3 340	4 400	4 550	5 250	7 000	–	7 900	9 150	10 000	10 100
M5	0,8	14,2	5 400	7 100	8 250	9 500	12 140	–	13 000	14 800	16 200	16 300
M6	1	20,1	7 640	10 000	11 700	13 500	17 200	–	18 400	20 900	22 900	23 100
M7	1	28,9	11 000	14 500	16 800	19 400	24 700	–	26 400	30 100	32 900	33 200
M8	1,25	36,6	13 900	18 300	21 600	24 900	31 800	–	34 400	38 100	41 700	42 500
M10	1,5	58,0	22 000	29 000	34 200	39 400	50 500	–	54 500	60 300	66 100	67 300
M12	1,75	84,3	32 000	42 200	51 400	59 000	74 200	–	80 100	88 500	98 600	100 300
M14	2	115	43 700	57 500	70 200	80 500	101 200	–	109 300	120 800	134 600	136 900
M16	2	157	59 700	78 500	95 800	109 900	138 200	–	149 200	164 900	183 700	186 800
M18	2,5	192	73 000	96 000	121 000	138 200	176 600	170 900	176 000	203 500	–	230 400
M20	2,5	245	93 100	122 500	154 400	176 400	225 400	218 100	225 400	259 700	–	294 000
M22	2,5	303	115 100	151 500	190 900	218 200	278 800	269 700	278 800	321 200	–	363 600
M24	3	353	134 100	176 500	222 400	254 200	324 800	314 200	324 800	374 200	–	423 600
M27	3	459	174 400	229 500	289 200	330 500	422 300	408 500	422 300	486 500	–	550 800
M30	3,5	561	213 200	280 500	353 400	403 900	516 100	499 300	516 100	594 700	–	673 200
M33	3,5	694	263 700	347 000	437 200	499 700	638 500	617 700	638 500	735 600	–	832 800
M36	4	817	310 500	408 500	514 700	588 200	751 600	727 100	751 600	866 000	–	980 400
M39	4	976	370 900	488 000	614 900	702 700	897 900	868 600	897 900	1 035 000	–	1 171 000

Table 7 — Proof load values – Fine pitch thread
(see also ISO 898-6)

Thread $d \times P^{(1)}$	Nominal stress area of the mandrel A_s mm ²	Property class							
		04	05	6	8		10		12
		Proof load ($A_s \times S_p$) N							
		thin	thin	style 1	style 1	style 2	style 1	style 2	style 2
M8 x1	39,2	14 900	19 600	30 200	37 400	34 900	43 100	41 300	47 000
M10 x1	64,5	24 500	32 200	49 600	61 600	57 400	71 000	68 000	77 400
M10 x1,25	61,2	23 300	30 600	47 100	58 400	54 500	67 300	64 600	73 400
M12 x1,25	92,1	35 000	46 000	71 800	88 000	82 000	102 200	97 200	110 500
M12 x1,5	88,1	33 500	44 000	68 700	84 100	78 400	97 800	92 900	105 700
M14 x1,5	125	47 500	62 500	97 500	119 400	111 200	138 700	131 900	150 000
M16 x1,5	167	63 500	83 500	130 300	159 500	148 600	185 400	176 200	200 400
M18 x1,5	215	81 700	107 500	187 000	221 500	–	–	232 200	–
M18 x2	204	77 500	102 000	177 500	210 100	–	–	220 300	–
M20 x1,5	272	103 400	136 000	236 600	280 200	–	–	293 800	–
M20 x2	258	98 000	129 000	224 500	265 700	–	–	278 600	–
M22 x1,5	333	126 500	166 500	289 700	343 000	–	–	359 700	–
M22 x2	318	120 800	159 000	276 700	327 500	–	–	343 400	–
M24 x2	384	145 900	192 000	334 100	395 500	–	–	414 700	–
M27 x2	496	188 500	248 000	431 500	510 900	–	–	535 700	–
M30 x2	621	236 000	310 500	540 300	639 600	–	–	670 600	–
M33 x2	761	289 200	380 500	662 100	783 800	–	–	821 900	–
M36 x3	865	328 700	432 500	804 400	942 800	–	–	934 200	–
M39 x3	1 030	391 400	515 000	957 900	1 123 000	–	–	1 112 000	–

P is the pitch of thread

**Table 8 — Clamping forces and prevailing torques for hexagon nuts and hexagon nuts
with flange with coarse thread**

Thread (d)	Clamping force, kN								Prevailing torque, N·m					
	Property class								Property classes 04, 5, 6, 8 and 9			Property classes 05, 10 and 12		
									First assembly ¹⁾	First removal	Fifth removal	First assembly ¹⁾	First removal	Fifth removal
	04	05	5	6	8	9	10	12	max.	min.	min.	max.	min.	min.
M3	1,4	1,9	1,4	1,7	2,2	2,5	3,1	3,7	0,43	0,12	0,08	0,6	0,15	0,1
M4	2,5	3,3	2,5	2,9	3,8	4,3	5,5	6,4	0,9	0,18	0,12	1,2	0,22	0,15
M5	4	5,2	4	4,7	6,2	6,9	8,9	10,4	1,6	0,29	0,2	2,1	0,35	0,24
M6	5,7	7,4	5,7	6,6	8,7	9,8	12,5	14,6	3	0,45	0,3	4	0,55	0,4
M7	8,2	10,7	8,3	9,5	12,6	14,1	18,0	21,0	4,5	0,65	0,45	6	0,85	0,6
M8	10,3	13,5	10,4	12,1	15,9	17,8	22,8	26,6	6	0,85	0,6	8	1,15	0,8
M10	16,4	21,5	16,5	19,1	25,3	28,3	36,1	42,4	10,5	1,5	1	14	2	1,4
M12	23,8	31,2	24	27,8	36,7	41,1	52,5	61,4	15,5	2,3	1,6	21	3,1	2,1
M14	32,5	42,5	32,8	38	50	56,1	71,6	84	24	3,3	2,3	31	4,4	3
M16	44,4	58	45	51,8	68,2	76,5	97,5	114	32	4,5	3	42	6	4,2
M18	56,1	73	55	63,4	86,2	—	119	140	42	6	4,2	56	8	5,5
M20	71,7	94	70	81	110	—	152	178	54	7,5	5,3	72	10,5	7
M22	88,7	116	86	100	136	—	189	220	68	9,5	6,5	90	13	9
M24	103	135	101	116	159	—	220	256	80	11,5	8	106	15	10,5
M27	134	175	107	152	206	—	286	334	94	13,5	10	123	17	12
M30	164	215	131	185	253	—	350	408	108	16	12	140	19	14
M33	203	265	161	229	312	—	432	505	122	18	14	160	21,5	15,5
M36	234	306	190	269	368	—	509	594	136	21	16	180	24	17,5
M39	285	373	227	322	440	—	608	710	150	23	18	200	26,5	19,5

NOTES

1 The clamping forces for property class 5 nuts are equal to 75 % of the proof loads of property class 5.8 bolts for nominal diameters $d = 3$ mm to 24 mm inclusive, and 75 % of the proof loads of property class 4.8 bolts for nominal diameters $d < 24$ mm. The clamping forces for property class 6, 8, 9, 10 and 12 nuts are equal to 75 % of the proof loads of property class 6.8, 8.8, 9.8, 10.9 and 12.9 bolts, respectively. Proof loads of bolts are given in ISO 898-1.

2 The evaluation of results from the prevailing torque test by statistical process control (SPC) methods has no statistical relevance.

1) The prevailing torques for the first assembly apply for all-metal nuts only. For nuts with non-metallic insert the maximum torques for the first assembly shall be 50 % of these values.

Table 9 — Clamping forces and prevailing torques for hexagon nuts and hexagon nuts with flange with fine pitch thread

Thread <i>d × P</i>	Clamping force, kN						Prevailing torque, N·m					
	Property class						Property classes 04, 6 and 8			Property classes 05, 10 and 12		
	04	05	6	8	10	12	First assembly ¹⁾	First removal	Fifth removal	First assembly ¹⁾	First removal	Fifth removal
							max.	min.	min.	max.	min.	min.
M8 × 1	11,1	14,5	12,9	17	24,4	28,5	6	0,85	0,6	8	1,15	0,8
M10 × 1	18,2	23,8	21,3	28,1	40,1	47	10,5	1,5	1	14	2	1,4
M10 × 1,25	17,3	22,6	20,2	26,6	38,1	44,6	10,5	1,5	1	14	2	1,4
M12 × 1,25	26	34,1	30,4	41	57,3	67	15,5	2,3	1,6	21	3,1	2,1
M12 × 1,5	24,9	32,6	29,1	38,3	54,8	64	15,5	2,3	1,6	31	3,1	2,1
M14 × 1,5	35,3	46,2	41,3	54,4	78	91	24	3,3	2,3	31	4,4	3
M16 × 1,5	47,2	61,8	55,1	72,7	104	121	32	4,5	3	42	6	4,2
M18 × 1,5	63,4	82,9	71,3	97,5	134	157	42	6	4,2	56	8	5,5
M18 × 2	59,7	78	67,6	92,3	127	149	42	6	4,2	56	8	5,5
M20 × 1,5	79,5	104	90	122	169	198	54	7,5	5,3	72	10,5	7
M20 × 2	75,5	98,7	85,4	116	161	187	54	7,5	5,3	72	10,5	7
M22 × 1,5	97,5	127	110	150	207	242	68	9,5	6,5	90	13	9
M22 × 2	93	122	105	143	198	231	68	9,5	6,5	90	13	9
M24 × 2	112	147	127	173	239	279	80	11,5	8	106	15	10,5
M27 × 2	145	190	164	224	309	361	94	13,5	10	123	17	12
M20 × 2	182	238	205	280	386	451	108	16	12	140	19	14
M33 × 2	223	291	251	343	474	554	122	18	14	160	21,5	15,5
M36 × 3	253	331	286	389	539	629	136	21	16	180	24	17,5
M39 × 3	301	394	340	464	641	749	150	23	18	200	26,5	19,5

NOTE — see notes to table 8.

1) The prevailing torques for the first assembly apply for all-metal nuts only. For nuts with non-metallic insert the maximum torques for the first assembly shall be 50 % of these values.

7 Performance requirements

7.1 Prevailing torque

The prevailing torque developed by nuts (see 3.2) during their first assembly, or any subsequent assembly or removal, shall not exceed the maximum first assembly torque specified for the applicable property class in tables 8 and 9 when tested as specified in 8.3. In addition, the prevailing torques developed by nuts during their first and fifth removals shall be not less than the removal torques specified in tables 8 and 9 when tested as specified in 8.3.

7.2 Torque/clamping force

By agreement between customer and supplier the torque/clamping force values as given in annex C may apply.

7.3 Tempering resistance of prevailing torque type nuts with non-metallic insert

By agreement between customer and supplier a tempering resistance test for prevailing torque type nuts with non-metallic insert as given in annex B may be carried out.

8 Test methods

8.1 Proof load test

The nut to be tested shall be assembled on a test bolt (8.1.1) or on a hardened mandrel (8.1.2). The maximum prevailing torque to assemble the nut through 360° rotation shall be recorded after the first full thread has passed through the prevailing torque feature and assembly continues until three full threads protrude through the nut. For referee test purposes, a hardened mandrel shall be used for non-metallic insert nuts and a test bolt shall be used for all-metal nuts. The maximum prevailing torque occurring during the assembly of the nut on the test bolt or mandrel shall be recorded after the first full form thread has passed through the prevailing torque feature.

A load equal to the specified proof load for the nut, as given in tables 6 and 7, shall be applied through the test bolt or mandrel against the nut bearing surface in an axial direction and shall be held for 15s. The nut shall resist this load without thread stripping or rupture. The proof load test is decisive.

The maximum prevailing torque occurring during disassembly of the nut after a half-turn to full disengagement measured with the nut in motion shall not exceed the recorded maximum prevailing torque during assembly.

8.1.1 Test bolt for proof load test

The bolt used for proof load testing nuts shall be as specified in 8.3.4 but shall have a proof load in excess of the proof load of the nut to be tested.

8.1.2 Hardened mandrel for proof load test

The mandrel used shall be threaded to tolerance class 5h6g, except that the tolerance of the major diameter shall be in the last quarter of the 6g range on the minimum material side.

The hardness for the test mandrel shall be 45 HRC minimum.

8.2 Hardness test

For routine inspection, hardness tests may be carried out on the bearing surface of the nut and the hardness shall be taken as the mean of three values spaced 120° apart. In case of dispute, the hardness tests shall be carried out on a longitudinal section through the nut axis and with impressions placed as close as possible to the nominal major diameter of the nut thread.

The Vickers hardness test is the reference test and where practicable a load of HV30 shall be applied.

If Brinell and Rockwell hardness tests are applied, the conversion tables in accordance with the appropriate ISO documents shall be used.

The Vickers hardness test shall be carried out in accordance with the provisions of ISO 6507-1.

The Brinell hardness test shall be carried out in accordance with the provisions of ISO 6506.

The Rockwell hardness test shall be carried out in accordance with the provisions of ISO 6508.

8.3 Prevailing torque test

NOTE — A recommended test fixture is described in annex A.

8.3.1 Test programme

The prevailing torque test shall be conducted at room temperature using a clamping force measuring device (8.3.3).

A test bolt (8.3.4) shall be inserted in the clamping force measuring device, a test washer (8.3.5) placed on the bolt and the sample nut then assembled on the bolt. Nut tightening may be either manually with a torque wrench or with an equivalent torque-measuring device (8.3.2). The nut shall be advanced on the bolt until a minimum of two full bolt threads protrude through the nut. The maximum torque occurring while the nut is being advanced through the next 360° of nut rotation shall be measured. For the nut to be acceptable, this torque shall not exceed the first installation prevailing torque value as specified for the applicable nut in tables 8 and 9.

Tightening shall be continued until the nut is seated against the test washer. The length of the test bolt shall be such that seating of the nut occurs when a length equivalent to four to seven thread pitches of the test bolt protrudes through the top of the nut, measured from the end of the bolt. The nut shall then be tightened until a clamping force, as specified in tables 8 and 9, is achieved. The test washer shall be prevented from turning during nut tightening.

The nut shall then be slackened by the application of reverse torque until the clamping force in the bolt has been reduced to zero. The maximum torque occurring while the nut is being slackened through the next 360° of rotation shall be measured. For the nut to be acceptable, this torque shall be not less than the first removal prevailing torque value specified for the applicable nut in tables 8 and 9.

After the first removal prevailing torque has been measured, the nut shall be slackened until the prevailing torque element is disengaged from the bolt thread.

The nut shall then be reassembled and removed four more times. On each assembly, the nut shall be advanced sufficiently to allow a length equivalent to four to seven thread pitches to protrude through the nut. On each removal, the prevailing torque element shall be disengaged from the bolt thread. This portion of the test does not need to be carried out in the force measuring device.

During the fifth removal, the maximum torque occurring while the nut is being slackened through the first 360° of rotation shall be measured. For the nut to be acceptable, this torque shall be not less than the fifth removal prevailing torque value as specified in tables 8 and 9. In addition, at no time during these four additional assemblies and removals shall the torque exceed the maximum first assembly prevailing torque value as specified in tables 8 and 9.

To avoid overheating of the test assembly, sufficient time shall elapse between the torque application cycles.

The speed of revolution during assembly and removal of the nut shall not exceed 25 r/min, and shall be continuous and uniform.

8.3.2 Torque measuring device

The torque measuring device (torque wrench or power device) shall be accurate to $\pm 2\%$ of the torque specified for the nut to be tested. The measuring device shall be chosen so that all readings fall within the upper half of its torque range.

8.3.3 Clamping force measuring device

The clamping force measuring device used in the prevailing torque test shall be an instrument capable of measuring the actual clamping force induced in the test bolts as the nut is tightened. The device shall be accurate to $\pm 5\%$ of the test clamping force being used. The bolt clearance hole in the backing plate shall have the same diameter and tolerance as the test washer.

8.3.4 Test bolt for torque testing

The bolt thread shall be in accordance with ISO 965-2. Threads on all bolts of 24 mm diameter and smaller shall be produced by rolling. Bolt length shall be such that four to seven thread pitches as measured from the end of the bolt will protrude through the nut when the nut is seated against the test washer. The thread length shall be such that a minimum of two full threads are within the grip after the nut is seated. The bolt shall have a chamfered end according to ISO 4753. The thread surface shall be free of burrs or other non-conformities that might affect accurate determination of the performance of the nut.

The bolt shall have an ultimate strength related to the specified property class of the nut to be tested and the properties shall be in accordance with ISO 898-1.

For the testing of thin nuts the test bolts as specified in table 10 shall be used.

Table 10 — Test bolts for testing thin nuts

Property class of nut to be tested	Property class of test bolt
04	8.8
05	10.9

A new bolt shall be used for testing each nut.

Zinc plated nuts shall be tested with non-lubricated zinc plated bolts. All other nuts shall be tested with a zinc phosphated and oiled bolt unless otherwise specified by agreement between user and manufacturer.

8.3.5 Test washer

Test washers shall be made from carbon steel quenched and tempered to a surface hardness of 500 HV30 to 600 HV30 and a core hardness of 450 HV30 to 490 HV30 and shall be unplated.

The dimensions shall be as specified in table 11.

Table 11 — Dimensions of test washers

Dimensions in millimeters

Nominal thread diameter of test bolt	Clearance hole		Outside diameter	Thickness
	max.	min.		
3	3,3	3,2	6,7	0,45
4	4,4	4,3	8,9	0,7
5	5,4	5,3	12,4	0,9
6	6,6	6,4	15,6	1,4
7	7,6	7,4	17,7	1,4
8	8,6	8,4	19,8	1,4
10	10,7	10,5	24,5	1,8
12	13,2	13,0	29,3	2,3
14	15,2	15,0	33,6	2,3
16	17,2	17,0	38,5	2,7
18	19,2	19,0	42,4	2,7
20	21,2	21,0	47,3	2,7
22	23,2	23,0	52	2,7
24	25,2	25,0	56	3,7
27	28,3	28,0	62	3,7
30	31,3	31,0	70	3,7
33	34,6	34,0	76	4,4
36	37,6	37,0	82	4,4
39	40,6	40,0	88	5,4

The faces shall be flat and parallel within a tolerance of 4 % of the specified minimum thickness. The surface roughness R_a of both faces shall not exceed 0,2 μm to 0,4 μm . Test washers shall be designed such that when assembled in the test equipment, rotation of the washer is prevented during tightening of the nut. Any device used to prevent rotating shall not intrude into a diameter equal to the maximum width across corners of the nuts to be tested. Alternatively, square washers or multi-holed plates with a minimum width equal to the minimum outside diameter as given in table 11 may be used provided that they conform to the requirements for hardness, hole dimensions and surface condition.

9 Marking

Nuts of nominal diameter 5 mm and larger shall be marked legibly to identify property class and manufacturer. Property class identification symbols shall conform to ISO 898-2 and ISO 898-6 respectively. Manufacturer's identification symbols shall be at the manufacturer's discretion.

Marking may be raised or indented at the manufacturer's discretion. However, raised markings shall not project beyond the specified maximum width or height of the nut. Indented marking may be located on any surface, but preferably not on the nut bearing surface; raised marking shall not be on the nut bearing surface.

Annex A
 (normative)

Recommended testing technique using manual torque wrenches to determine torque performance characteristics of prevailing torque type steel hexagon nuts

A.1 Application

This annex describes a recommended test fixture for measuring the torque and performance characteristics of prevailing torque type nuts, employing a manual torque wrench or other slow speed drive technique. It is intended primarily for product quality assessment and reference testing.

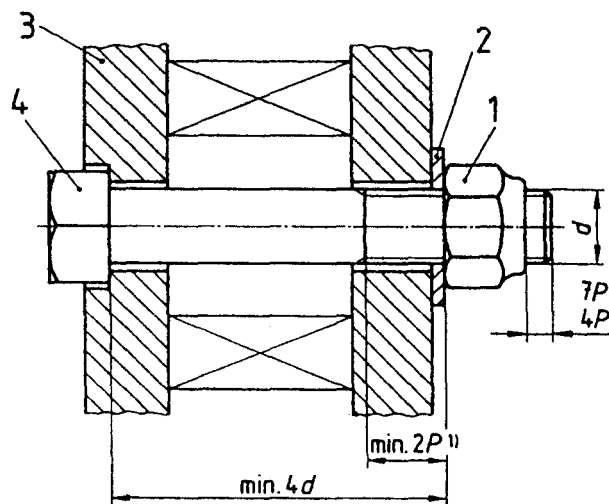
A.2 Apparatus

A.2.1 Hand torque wrenches of a size suitable for the range of test values anticipated. A mechanical drive unit of max 25 min^{-1} driving speed and having a means of measuring torque is optional.

A.2.2 Clamping force measuring device to hold the test bolt, nut and test washer, and to measure the clamping force produced by tightening the nut. A strain gauge load cell is preferred, but a hydraulic cell is acceptable. A suitable fixture is shown in figure A.1.

A.3 Test procedure

The test method to determine prevailing torque performance is specified in 8.3. For torque/clamping force requirements, see annex C.



Key

- 1 Nut under test
- 2 Test washer²⁾
- 3 Test device
- 4 Test bolt

- 1) P is the pitch of thread.
- 2) The washer shall be prevented from rotating.

Figure A.1 — Clamping force measuring device

Annex B
(normative)

Tempering resistance test for prevailing torque type nuts with non-metallic insert

The specifications given in this annex may be agreed between customer and supplier if suitable.

At room temperature ($20\text{ °C} \pm 5\text{ °C}$) the nut shall be assembled on to a test bolt until 4 to 7 full threads protrude through the top of the nut but no clamping force is induced.

The assembly shall be placed in a chamber at $120\text{ °C} \pm 2\text{ °C}$; after one hour, it shall be removed from the chamber to recover naturally to room temperature.

The assembly shall then be placed in a chamber at $-50\text{ °C} \pm 2\text{ °C}$; after one hour, it shall be removed from the chamber to cool naturally to room temperature.

With the assembly at room temperature, the prevailing torque test according to the test programme given in 8.3.1 shall be carried out, disregarding first on-torque and clamping force. The prevailing torques measured at the first and the fifth removals shall not be lower than the relevant values specified in tables 8 and 9.

Upon agreement between customer and supplier, the temperature range may be modified to suit application requirements.

Annex C
(informative)

Torque/clamping force requirements and testing

The specifications given in this annex may be agreed between customer and supplier if suitable.

C.1 Definition

C.1.1 torque/clamping force: Tightening torque required to generate the specified clamping force in the test bolt.

C.2 Torque/clamping force requirements

Requirements for the clamping force as a function of the applied torque are given in tables C.1 to C.4.

C.3 Testing of torque/clamping force values

The torque/clamping force test shall be conducted in connection with the test programme specified in 8.3.1. Thus, when tightening the nut, until the clamping force specified in tables C.1 to C.4 and appropriate to the property class of the nut is achieved, the applied torque shall be measured and shall be within the values specified in tables C.1 to C.4.

NOTE — A test fixture is described in annex A.

Table C.1 — Clamping forces and applied torques for hexagon nuts with coarse thread

Thread (d)	Clamping force, kN								Applied torque, N·m															
	Property class								Property class															
	04	05	5	6	8	9	10	12	04		05		5		6		8		9		10		12	
									min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
M3	1,4	1,9	1,4	1,7	2,2	2,5	3,1	3,7	0,7	1,1	0,9	1,3	0,7	1,1	0,8	1,2	1,1	1,6	1,2	1,7	1,5	2,3	1,8	2,7
M4	2,5	3,3	2,5	2,9	3,8	4,3	5,5	6,4	1,6	2,4	2,1	3,1	1,6	2,4	1,9	2,7	2,5	3,7	2,8	4,1	3,7	5,3	4,2	6,2
M5	4	5,2	4	4,7	6,2	6,9	8,9	10,4	3,2	4,8	4,2	6,3	3,2	4,8	3,8	5,6	5,0	7,4	5,6	8,2	7,2	10,6	8,4	12,4
M6	5,7	7,4	5,7	6,6	8,7	9,8	12,5	14,6	5,4	8,1	7,1	10,7	5,4	8,1	6,4	9,5	8,4	12,4	9,5	14,0	12,1	17,8	14,1	20,8
M7	8,2	10,7	8,3	9,5	12,6	14,1	18	21	9,2	13,7	12,0	17,9	9,3	13,8	10,7	16,0	14,2	16,9	15,8	23,6	20,2	30,2	23,6	35,2
M8	10,3	13,5	10,4	12,1	15,9	17,8	22,8	26,6	13,2	19,8	17,3	26,0	13,3	20,0	15,5	23,1	20	30	23	34	29	43	34	50
M10	16,4	21,5	16,5	19,1	25,3	28,3	36,1	42,4	26,3	39,5	34	52	26,4	39,6	30,6	45,9	41	60	46	68	59	85	69	100
M12	23,8	31,2	24	27,8	36,7	41,1	52,5	61,4	45,8	68,7	60	90	46	69	53	80	71	105	80	118	102	150	119	175
M14	32,5	42,5	32,8	38	50	56,1	71,6	84	73,8	109,0	95	143	73	110	85	127	112	168	127	187	161	240	189	282
M16	44,4	58	45	51,8	68,2	76,5	97,5	114	113	170	148	223	115	173	133	199	175	260	198	292	250	371	293	434
M18	56,1	73	55	63,4	86,2	—	119	140	161	242	211	317	158	238	183	273	255	372	—	—	353	513	415	603
M20	71,7	94	70	81	110	—	152	178	229	344	300	450	224	336	260	389	355	520	—	—	491	718	574	840
M22	88,7	116	86	100	136	—	189	220	312	468	408	613	303	454	351	527	500	705	—	—	675	989	787	1 161
M24	103	135	101	116	159	—	220	256	397	595	519	778	388	582	447	670	620	928	—	—	857	1 283	997	1 493
M27	134	175	77	152	206	—	286	334	579	869	757	1 136	333	500	655	982	900	1 330	—	—	1 249	1 845	1 459	2 155
M30	164	215	95	185	253	—	350	408	789	1 183	1 031	1 547	456	684	889	1 334	1 230	1 810	—	—	1 701	2 503	1 982	2 918
M33	203	265	117	229	312	—	432	505	1 071	1 606	1 400	2 100	597	895	1 208	1 812	1 665	2 460	—	—	2 305	3 457	2 695	3 982
M36	234	306	138	269	368	—	509	594	1 348	2 022	1 763	2 644	795	1 192	1 551	2 326	2 140	3 160	—	—	2 961	4 368	3 455	5 092
M39	285	373	165	322	440	—	608	710	1 783	2 674	2 331	3 497	1 029	1 544	2 008	3 012	2 775	4 095	—	—	3 936	5 657	4 480	6 606

NOTES

- 1 The applied torque figures are for the assessment of test results and may not necessarily be suitable for actual assembly conditions.
- 2 The evaluation of results from the torque/clamping force test by statistical process control (SPC) methods has no statistical relevance.

Table C.2 — Clamping forces and applied torques for hexagon nuts with fine pitch thread

Thread (d × P)	Clamping force, kN						Applied torque, N·m											
	Property class						Property class											
	04	05	6	8	10	12	04		05		6		8		10		12	
min.							max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	
M8 ×1	11,1	14,5	12,9	17	24,4	28,5	14,2	21,3	18,5	27,8	16,5	24,5	22	33	31	47	37	55
M10 ×1	18,2	23,8	21,3	28,1	40,1	47	29,2	43,8	38,2	57,2	34	51	45	67	64	96	75	113
M10 ×1,25	17,3	22,6	20,2	26,6	38,1	44,6	27,7	41,5	36,2	54,3	33	48	43	64	61	91	71	107
M12 ×1,25	26	34,1	30,4	41	57,3	67	50	75	65	98	59	87	79	118	110	165	129	193
M12 ×1,5	24,9	32,6	29,1	38,3	54,8	64	48	72	63	94	56	83	74	110	105	158	123	185
M14 ×1,5	35,3	46,2	41,4	54,4	78	91	79	119	104	155	92	138	122	183	175	262	203	305
M16 ×1,5	47,2	61,8	55,1	72,7	104	121	121	181	158	237	141	211	186	279	267	401	311	467
M18 ×1,5	63,4	82,9	71,3	97,5	134	157	183	274	239	358	205	308	280	421	387	580	454	680
M18 ×2	59,7	78,0	67,6	92,3	127	149	172	258	225	337	195	292	266	399	367	550	430	646
M20 ×1,5	79,5	103,9	90	122	169	198	254	381	333	499	288	432	390	586	542	814	634	950
M20 ×2	75,5	98,7	85,4	116	161	187	242	362	316	474	273	410	371	557	515	772	600	900
M22 ×1,5	92,5	122,7	110	150	207	242	343	515	449	673	385	578	528	792	729	1 093	853	1 279
M22 ×2	93	122	105	143	198	231	327	491	428	642	368	552	503	755	697	1 095	815	1 222
M24 ×2	112	147	127	173	239	279	431	646	563	845	487	730	664	996	918	1 376	1 071	1 607
M27 ×2	145	190	164	224	309	361	628	941	821	1 231	706	1 059	968	1 452	1 335	2 003	1 559	2 338
M30 ×2	182	238	205	280	386	451	873	1 309	1 141	1 712	983	1 474	1 344	2 016	1 853	2 779	2 167	3 251
M33 ×2	223	291	251	343	474	554	1 176	1 765	1 538	2 307	1 327	1 592	1 811	2 716	2 502	3 754	2 922	4 384
M36 ×3	253	331	286	389	539	629	1 457	2 186	1 905	2 859	1 646	2 469	2 241	3 361	3 104	4 656	3 625	5 437
M39 ×3	301	394	340	464	641	749	1 880	2 820	2 458	3 688	2 120	3 180	2 895	4 343	4 000	6 000	4 675	7 013

NOTE — see notes to table C.1.

Table C.3 — Clamping forces and applied torques for hexagon nuts with flange and coarse thread

Thread (<i>d</i>)	Clamping force, kN						Applied torque, N·m											
	Property class						Property class											
	5		6		8		5		6		8		9		10		12	
	5	6	8	9	10	12	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
M5	4	4,7	6,2	6,9	8,9	10,4	3,6	5,1	4,2	6,0	5,6	7,9	6,2	8,8	8,0	11,4	9,3	13,3
M6	5,7	6,6	8,7	9,8	12,5	14,6	6,2	8,9	7,2	10,3	9,5	13,6	10,7	15,3	13,7	19,5	16,0	22,8
M7	8,3	9,5	12,6	14,1	18	21	10,1	14,5	11,6	16,6	15,4	22,0	17,2	24,7	22,0	31,5	25,6	36,7
M8	10,4	12,1	15,9	17,8	22,8	26,6	14,9	21,3	17,3	24,7	22,7	32,5	25,5	36,4	32,6	46,6	38	54,4
M10	16,5	19,1	25,3	28,3	36,1	42,4	29,3	42,0	33,9	48,6	44,9	64,4	50,3	72,0	64,1	91,8	75,3	108,0
M12	24	27,8	36,7	41,1	52,5	61,4	51,5	73,9	59,6	85,6	78,7	113,0	88,2	127,0	113	162	132	189
M14	32,8	38	50	56,1	71,6	84	81,6	117,0	94,6	136,0	124	179	140	200	178	256	209	300
M16	45	51,8	68,2	76,5	97,5	114	127	183	146	211	192	277	216	311	275	396	321	463
M20	70	81	110	—	152	178	246	355	285	411	387	558	—	—	534	771	626	903

Table C.4 — Clamping forces and applied torques for hexagon nuts with flange and fine pitch thread

Thread (<i>d</i> × <i>P</i>)	Clamping force, kN				Applied torque, N·m							
	Property class				Property class							
	6		8		6		8		10		12	
	6	8	10	12	min.	max.	min.	max.	min.	max.	min.	max.
M8 × 1	12,9	17	24,4	28,5	18,1	26,1	23,8	34,4	34,2	49,3	39,9	57,6
M10 × 1	21,3	28,1	40,1	47	36,6	53,2	48,3	70,2	68,9	100,0	80,8	117,0
M10 × 1,25	20,2	26,6	38,1	44,6	35,3	50,9	46,5	67,0	66,6	96,0	77,9	112,0
M12 × 1,25	30,4	41	57,3	67	63,5	92,2	85,6	124,0	120	174	140	203
M12 × 1,5	29,1	38,3	54,8	64	61,6	88,9	81,1	117,0	116	167	136	196
M14 × 1,5	41,4	54,4	78	91	101	146	132	192	190	275	221	321
M16 × 1,5	55,1	72,7	104	121	152	222	201	292	287	418	334	486
M20 × 1,5	90	122	169	198	306	448	415	607	575	842	673	986
M20 × 2	85,4	116	161	187	295	429	401	583	557	809	647	940

(Continued from second cover)

<i>International Standard</i>	<i>Corresponding Indian Standard</i>	<i>Degree of Equivalence</i>
ISO 965-2 : ¹⁾	IS 14962 (Part 2) : 2001 ISO General purpose metric screw threads — Tolerances: Part 2 Limits of sizes for general purposes external and internal screw threads — Medium quality	Identical
ISO 4042 : ¹⁾	IS 1367 (Part 11) : 2002 Technical supply conditions for threaded steel fasteners: Part 11 Electroplated coatings (<i>third revision</i>)	do
ISO 4753 : ²⁾	IS 1368 : 2002 Fasteners — Ends of parts with external ISO metric thread (<i>fourth revision</i>)	do
ISO 6506 : 1981	IS 1500 : 1993 Method for Brinell hardness test for metallic materials (<i>second revision</i>)	Technically equivalent
ISO 6507 : ³⁾	IS 1501 (Part 1) : 1984 Method for Vickers hardness test for metallic materials: Part 1 HV 5 to HV 100 (<i>second revision</i>)	do
ISO 6508 : 1986	IS 1586 : 2000 Method for Rockwell hardness test for metallic materials (Scale A-B-C-E-F-G-H-K 15N, 30N, 45N, 15T, 30T and 45T) (<i>third revision</i>)	do

In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'.

¹⁾ Since published in 1998.

²⁾ Since published in 1999.

³⁾ Since published in 1997.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Telephone

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