

*Indian Standard*  
**SPECIFICATION FOR  
HIGH STRENGTH STRUCTURAL NUTS**  
( *First Revision* )

(Incorporating Amendment No. 1)

**1. Scope and Field of Application** — Covers the requirements for large series hexagon, high strength structural steel nuts in property classes 8 and 10 and in the size range M16 to M36 suitable for use in both friction-type and bearing-type structural steel joints. Nuts to this standard when matched with the appropriate bolts have been designed to provide an assembly with a high level of assurance against failure by thread stripping on overtightening.

**Note** — Attention is drawn to the importance of ensuring that the nuts are correctly used if satisfactory results are to be obtained.

**2. Dimensions and Tolerances**

**2.1** The dimensions of the nuts shall be as given in Table 1.

**2.2** Threads shall conform to tolerance class 6H of IS : 4218 (Part 6)-1978 'ISO metric screw threads: Part 6 Limits of sizes for commercial bolts and nuts (diameter range 1 to 52 mm) ( *first revision* )'. In case of hot-dip galvanized nuts, the nuts shall be tapped oversize after hot-dip galvanizing to the thread tolerance class 6X, the thread limits of which are included in Appendix A.

**3. Grade** — Unless otherwise specified, the nuts shall be of product grade B as specified in IS : 1367 (Part 2)-1979 'Technical supply conditions for threaded steel fasteners: Part 2 Product grades and tolerances ( *second revision* )'.

**4. Mechanical Properties** — The nuts shall be of property class 8 or 10 as specified in IS : 1367 (Part 6)-1980 'Technical supply conditions for threaded steel fasteners: Part 6 Mechanical properties and test methods for nuts with specified proof load ( *second revision* )' except that all nuts shall be hardened and then tempered at a temperature of at least 425°C and the proof load and hardness values shall be as given in Table 2.

**4.1** For nut proof load testing, the speed of testing as determined with a free running cross head shall not exceed 25 mm/min.

**5. Finish**

**5.1** Unless specified otherwise, the nuts shall be supplied in the dull black heat-treated condition with a residual coating of light oil.

**5.2** Where property class 10 nuts are required to be hot-dip galvanized, they shall be galvanized in accordance with the requirements of IS : 1367 (Part 13)-1983 'Technical supply conditions for threaded steel fasteners: Part 13 Hot-dip galvanized coatings on threaded fasteners ( *second revision* )'. For fasteners with hot-dip galvanized coatings, the nuts or the mating bolts shall be provided with a suitable lubricant coating which shall be clean and dry to the touch to ensure that seizure shall not take place in assembly. The hot-dip galvanized nuts shall be subjected to the anti-seizing test as specified in Appendix B.

**6. General Requirements**

**6.1** In regard to permissible surface discontinuities, the nuts shall conform to IS : 1367 (Part 10)-1979 'Technical supply conditions for threaded steel fasteners: Part 10 Surface discontinuities on nuts ( *second revision* )'.

**6.2** In regard to requirements not covered in the standard, the nuts shall conform to IS : 1367 (Part 1)-1980 'Technical supply conditions for threaded steel fasteners: Part 1 Introduction and general information ( *second revision* )'.

**6.3** The high strength structural bolts to be used with these nuts shall conform to the requirements of IS : 3757-1985 'High strength structural bolts ( *second revision* )'.

Adopted 26 July 1985

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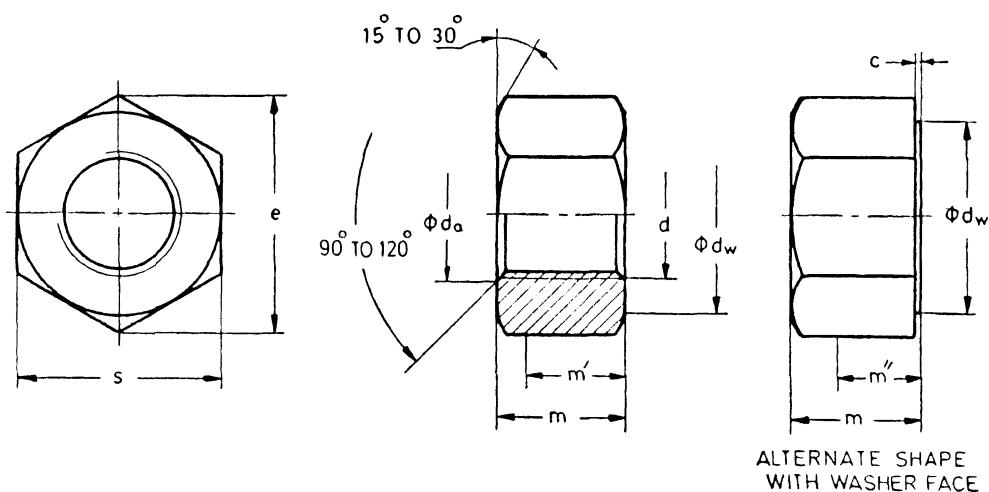
Price Group 3

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TABLE 1 DIMENSIONS FOR HIGH STRENGTH STRUCTURAL NUTS\*

( Clause 2.1 )

All dimensions in millimetres.



Thread Size, d		M16	M20	(M22)	M24	(M27)	M30	M36
P (Pitch of Thread)		2	2.5	2.5	3	3	3.5	4
$d_a$	Max	17.3	21.6	23.8	25.9	29.2	32.4	38.9
	Min	16	20	22	24	27	30	36
$d_w$	Max	†	†	†	†	†	†	†
	Min	24.9	31.4	33.3	38.0	42.8	46.5	55.9
e	Min	29.56	37.29	39.55	45.20	50.85	55.37	66.44
m	Max	17.1	20.7	23.6	24.2	27.6	30.7	36.6
	Min	16.4	19.4	22.3	22.9	26.3	29.1	35.0
$m'$	Min	13.1	15.5	17.8	18.3	21.0	23.3	28.0
$m''$	Min	11.5	13.6	15.6	16.0	18.4	20.4	24.5
c	Max	0.8	0.8	0.8	0.8	0.8	0.8	0.8
	Min	0.4	0.4	0.4	0.4	0.4	0.4	0.4
s	Max	27	34	36	41	46	50	60
	Min	26.16	33	35	40	45	49	58.8
Perpendicularity of bearing face	Max	0.47	0.50	0.63	0.72	0.80	0.87	1.05

**Note** — Sizes shown in brackets are of second preference.

\*For hot-dip galvanized nuts, the above dimensions apply before galvanizing.

† $d_w$  Max = s actual.

TABLE 2 PROOF LOAD AND HARDNESS VALUES FOR HIGH STRENGTH STRUCTURAL NUTS

( Clause 4 )

Thread Size <i>d</i>	Nominal Stress Area of Standard Test Mandrel <i>A<sub>s</sub></i>	Property Class						
		8S			10S			
		Finish						
		Plain			Plain	Hot-dip galvanized	Plain and hot-dip galvanized	
		Proof load ( <i>A<sub>s</sub></i> × <i>S<sub>p</sub></i> )	Hardness		Proof load ( <i>A<sub>s</sub></i> × <i>S<sub>p</sub></i> )		Hardness	
Rockwell	Vickers		Rockwell	Vickers				
mm	mm <sup>2</sup>	N	<i>HR</i>	<i>HV</i>	N		<i>HR</i>	<i>HV</i>
M16	157	168 900			195 500	182 900		
M20	245	263 400			305 000	285 400		
(M22)	303	325 700	B89	188	377 200	353 000	C 26	272
M24	353	379 500	to	to	439 500	411 200	to	to
(M27)	459	493 400	C38	372	571 500	534 700	C 38	372
M30	561	603 100			698 400	653 600		
M36	817	878 300			1017 200	951 800		

Note 1 — Based on the following proof load stresses (  $S_p$  ) :

- for nuts of property class 8S, plain : 1 075 N/mm<sup>2</sup>
- for nuts of property class 10S, plain : 1 245 N/mm<sup>2</sup>
- for nuts of property class 10S, hot-dip galvanized : 1 165 N/mm<sup>2</sup>

Note 2 — Sizes shown within the brackets are non-preferred.

**6.3.1** These bolts shall be of the property class and finish for each type of nut as follows:*Nut Property Class and Finish*

8S or 10S, dull black  
10S, hot-dip galvanized  
10S, dull black

*Bolt Property Class and Finish*

8.8S, dull black  
8.8S, hot-dip galvanized  
10.9S, dull black

**6.4** Hardened and tempered washers to be used with these nuts shall conform to the requirements of IS : 6649-1985 'Hardened and tempered washers for high strength structural bolts and nuts ( *first revision* )'.**7. Designation** — High strength structural nuts shall be designated by name, size, the number of this standard and the property class identification symbol 8S or 10S — the suffix letter S denotes a high strength structural nut with a large series hexagon. In case of hot-dip galvanized nuts the word 'galvanized' shall be added to the designation.*Example:*

A high strength structural nut of size M24, property class 8 and galvanized shall be designated as:

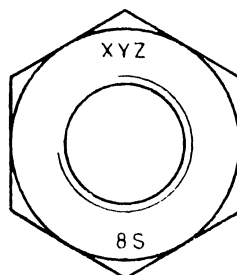
High Strength Structural Nut M24 IS : 6623 - 8S galvanized

**8. Sampling** — Sampling and criteria of acceptance shall be in accordance with IS : 2614-1969 'Methods for sampling of fasteners ( *first revision* )'.**9. Marking** — High strength structural nuts shall be marked with the following symbols as shown in the figure:

- a) The manufacturer's identification symbol
- b) The property class symbol 8S or 10S

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The markings shall be indented on either the top or bottom face of double-chamfered nuts and shall be either indented or embossed on the non-bearing face of washer-faced nuts.



**10. Mode of Delivery** — The nuts shall be delivered in accordance with IS : 1367 (Part 18)-1979 'Technical supply conditions for threaded steel fasteners: Part 18 Marking and mode of delivery (second revision)'.

**11. ISI Certification Marking** — Details available with the Indian Standards Institution.

## APPENDIX A

( Clause 2.2 )

### THREAD DIMENSIONS FOR HOT-DIP GALVANIZED NUTS FOR TOLERANCE CLASS 6X

**A-1.** This appendix gives information on screw thread limits for hot-dip galvanized nuts with a thread tolerance class 6X. The limits given in Table 3 apply after the hot-dip galvanized coating has been applied.

**TABLE 3 SCREW THREAD LIMITS FOR TOLERANCE CLASS 6X**

All dimensions in millimetres.

Thread Size <i>d</i>	Major Diameter <i>Min</i>	Pitch Diameter		Major Diameter	
		<i>Max</i>	<i>Min</i>	<i>Max</i>	<i>Min</i>
M16	16.400	15.313	15.101	14.610	14.235
M20	20.400	19.000	18.776	18.144	17.694
(M22)	22.400	21.000	20.776	20.144	19.694
M24	24.450	22.766	22.501	21.702	21.202
(M27)	27.500	25.816	25.551	24.752	24.252
M30	30.550	28.557	28.277	27.321	26.761
M36	36.600	34.302	34.002	32.870	32.270

**Note 1** — Nuts are tapped oversize to the above dimensions after galvanizing.

**Note 2** — Based on an allowance of:

400  $\mu\text{m}$  for M16, M20, and M22

450  $\mu\text{m}$  for M24

500  $\mu\text{m}$  for M27

550  $\mu\text{m}$  for M30

600  $\mu\text{m}$  for M36

**Note 3** — Sizes shown in brackets are of second preference.

**APPENDIX B**

( Clause 5.2 )

**ANTI-SEIZING TEST FOR HOT-DIP GALVANIZED FASTENERS**

**B-1.** Where bolts and the mating nuts and washers with hot-dip galvanized coating are specified, these shall be subject to the following anti-seizing test for testing the effectiveness of the lubricant coating applied to the hot-dip galvanized bolts or nuts:

- a) The test shall be carried out on bolts, nuts and washers in the condition as supplied by the manufacturer and shall be in accordance with, and include a lubricant coating as required by 5.2. There shall be no other lubricant applied for the purpose of this test. If the test is performed by the user it shall be carried out immediately after receipt of the bolts, nuts and washers from the manufacturer.
- b) The bolt with nut and washer selected for testing shall be placed with the washer directly under the nut in a steel joint with total thickness so that three to five full threads of the bolt are located between the bearing surfaces of the bolt head and nut. The diameter of the holes in the assembly shall have the same nominal diameter as the hole in the washer.
- c) The nut shall be initially tightened to produce a load in the bolt not less than 10 percent of the specified proof load. After this initial tightening, the bolt and the nut position shall be marked to provide the starting point for the rotational movement to be measured. During nut rotation the bolt head shall be restrained from turning, and the final tensioning shall be completed without stopping the motion of the nut. The nut shall be rotated in accordance with the requirements of Table 4 from the initial tightening position without fracture of the bolt, stripping of the bolt or nut thread.

**TABLE 4 NUT ROTATION REQUIREMENTS**

<b>Bolt Length (Nominal)</b>	<b>Nut Rotation ( Min )</b>
$l \leq 2d$	180°
$2d < l \leq 3d$	240°
$3d < l \leq 4d$	300°
$4d < l \leq 8d$	360°
$l > 8d$	420°

**EXPLANATORY NOTE**

IS : 3757 'Specification for high tensile friction grip fasteners for structural engineering purposes' was originally published in 1966. The first revision of IS : 3757 catered for high tensile friction grip bolts only; the corresponding nuts and washers were covered by separate standards. Thus, IS : 6623 'Specification for high tensile friction grip nuts' was first published in 1972. In the present revision of IS : 6623, the title of the standard has been changed to 'High strength structural nuts' to enable these nuts to be used along with the corresponding 'High strength structural bolts' for both friction type and bearing-type of structural steel connections with the same bolting installation procedure. Further, nut thicknesses and proof load values have been increased to provide an assembly with a high level of assurance against failure by thread stripping on overtightening. Also due to technical reasons, the width across flats for M20 size has been changed from 32 to 34 mm in line with IS : 9519-1980 'Width across flats for hexagon head bolts and nuts'. It is, however, recognised that some transition period would be essential during which the new across flat size would be introduced and the old across flat size phased out. During this transition

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period, the nuts may be supplied with the old across flat size and other related dimensions as mentioned below as being functionally equivalent. However, nuts with old across flat size should not be supplied with bolts with new across flat size and vice versa.

All dimensions in millimetres

Thread size <i>d</i>		M20
<i>s</i>	<i>Max</i>	32
	<i>Min</i>	31
<i>e</i>	<i>Min</i>	35.03
<i>d<sub>w</sub></i>	<i>Max</i>	<i>s</i> actual
	<i>Min</i>	29.5

The standard is based on ISO/DIS 4775 'High strength structural nuts — product grade B' issued by the International Organization for Standardization.

This edition 2.1 incorporates Amendment No. 1 (October 1987). Side bar indicates modification of the text as the result of incorporation of the amendment.