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षट्कोणी वेल्ड ढिबरियाँ – विशिष्टि

(IS 8856 *का दूसरा पुनरीक्षण*)

Draft Indian Standard

Hexagon Weld Nuts — Specification

(*Second Revision of* IS 8856)

ICS 21.060.20

General Engineering and Fasteners Standards Sectional Committee, PGD 37	Last date for receipt of comment is **10 July 2024**

FOREWORD

(*Formal Clauses will be added later*)

Weld nuts are specialized fasteners designed to be welded on to metal surfaces, creating strong and secure attachment points. They are typically projection welded, a process where the nut's protrusions focus the welding current and pressure, ensuring a strong bond with minimal distortion. To use a weld nut, it is positioned over a pre-drilled hole in the metal surface. The protrusions melt when current and pressure are applied, fusing the nut to the metal substrate. Once the weld is cooled and solidified, the nut provides a robust threaded anchor point for bolts or screws, facilitating the assembly of various components. This method is widely used in automotive, construction, and manufacturing industries to ensure durable and reliable joints.

IS 8856 was first published in 1973 and subsequently revised in 1991. In this revision, the following modifications have been made:

a) The scope of the standard has been revised;
b) Various designs of hexagonal weld nuts have been added;
b) Mechanical requirements have been revised; and
c) References have been updated;

The standard also specifies informative Annex A, Annex B and Annex C for the assembly of hexagon weld nuts, peel strength to pressing, and peel strength to torque, respectively.

In preparation of this standard assistance has been derived from the following standards:

DIN 929 : 2013	Hexagon weld nuts
JIS B 1196 : 2010	Weld nuts

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2: 2022 ‘Rules for rounding off numerical values (*second revision*)’. ’The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Draft Indian Standard

HEXAGON WELD NUTS — SPECIFICATION

(*Second Revision of* IS 8856)

1 SCOPE

This standard specifies the requirements for hexagonal weld nuts with metric coarse pitch threads from sizes M3 to M16 and with metric fine pitch threads from sizes M8 to M16.

2 REFERENCES

The standards listed below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below:

IS No	*Title*
IS 513 (Part 1) : 2016	Cold reduced carbon steel sheet and strip: Part 1 Cold forming and drawing purpose (*sixth revision*)
IS 1367 (Part 1) : 2014/ ISO 8992 : 2005	Technical supply conditions for threaded steel fasteners: Part 1 General requirements for bolts, screws, studs and nuts (*fourth revision*)
IS 1367 (Part 2) : 2002/ ISO 4759-1	Technical supply conditions for threaded steel fasteners: Part 2 Tolerances for fasteners — Bolts, screws, studs and nuts — Product grades A, B and C (*third revision*)
IS 1367 (Part 3) : 2017/ ISO 898-1 : 2013	Technical supply conditions for threaded steel fasteners: Part 3 Mechanical properties of fasteners made of carbon steel and bolts, screws and studs (*fifth revision*)
IS 1367 (Part 6) : 2018/ ISO 898-2 : 2012	Technical supply conditions for threaded steel fasteners: Part 6 Mechanical properties of fasteners made of carbon steel and alloy steel — Nuts with specified property classes — Coarse thread and fine pitch thread (*fourth revision*)
IS 1367 (Part 11) : 2020	Technical supply conditions for threaded steel fasteners: Part 11 Electroplated coating systems (*fourth revision*)
IS 1367 (Part 17) : 2023/ ISO 3269 : 2019	Technical supply conditions for threaded steel fasteners: Part 17 Inspections sampling and acceptance procedure.
IS 4218 (Part 3) : 1999/ ISO 724	ISO general purpose metric screw threads: Part 3 Basic dimensions (*second revision*)
IS 14962 (Part 1) : 2018/ ISO 965-1 : 2013	ISO general purpose metric screw threads — Tolerances: Part 1 Principles and basic data (*first revision*)

3 TYPES

3.1 Weld nuts shall be of the types as specified in Table 1.

Table 1 Types of Weld Nuts
(*Clause* 3.1)

Sl No.	Type	Existence of pilot
(1)	(2)	(3)
i)	Type A1[1), 2)]	Yes
ii)	Type A2[2)]	Yes
ii)	Type B[1)]	No
iii)	Type F[3)]	

[1)]The classification A and B gives the division of existence of pilot.

[2)]The classification A1 and A2 gives the division of 2 designs of weld nuts with the existence of pilot.

[3)]F refers to type B without undercut on upper and lower surfaces.

3.2 Hexagonal weld of type A2, B and F shall be of 2 strength classes 5T and 8T based on the dimensional and proof load requirements.

4 DIMENSIONS

4.1 The dimensions of hexagonal weld nuts of type A1 shall be as given in Fig. 1 and Table 2.

4.2 The dimensions of hexagonal weld nuts of type A2 and B shall be as given in Fig. 2 and Table 3.

4.3 The dimensions of hexagonal weld nuts of type F shall be as given in Fig. 3 and Table 4.

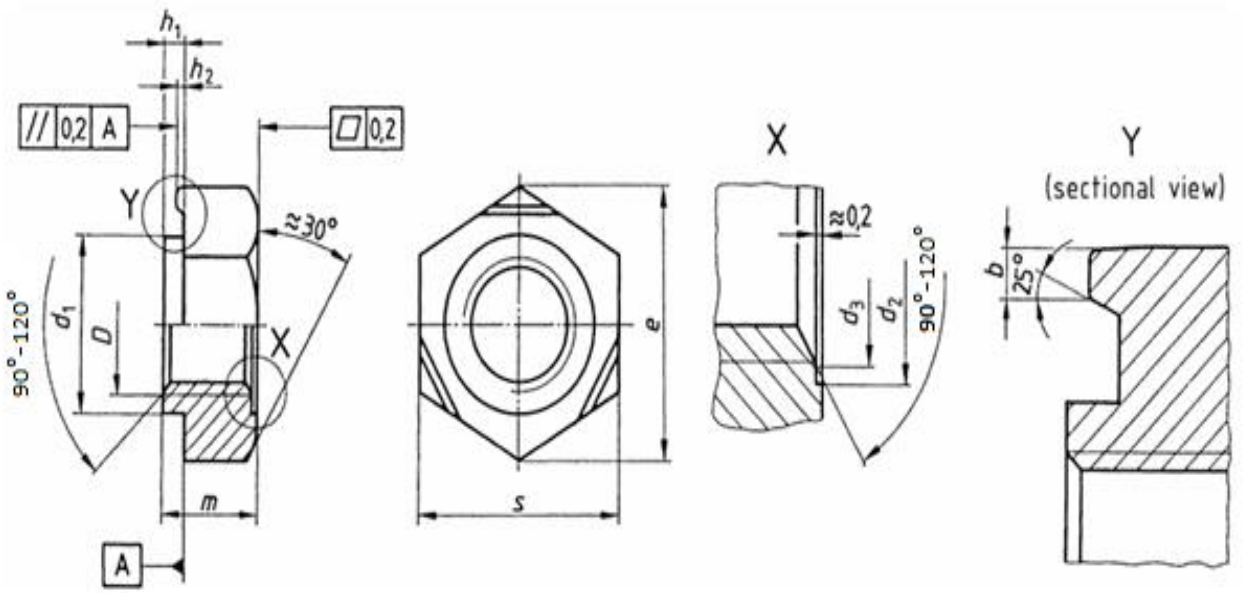

FIG. 1 DIMENSIONS OF HEXAGONAL WELD NUTS (TYPE A1)

Table 2 Dimensions of Hexagonal Weld Nuts (Type A1)

(*Clause* 4.1)

All dimensions are in millimetres.

Sl No.	Thread Size *d*		M3	M4	M5	M6	M8	M10	M12	M14	M16
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
i)	P[1)]	Coarse	0.5	0.7	0.8	0.1	1.25	1.5	1.75	2	2
		Fine	-	-	-	-	M8 × 1	M10 × 1.25, M10 × 1	M12 × 1.5, M12 × 1.25	M14 × 1.5	M16 × 1.5
ii)	b[2)]	Nominal	0.8	0.8	0.8	0.9	1.0	1.25	1.25	1.5	1.5
		Tolerance	±0.2	±0.2	±0.2	±0.22	±0.25	±0.3	±0.3	±0.4	±0.4
iii)	d_1 (d11)		4.50	6.00	7.00	8.00	10.50	12.50	14.80	16.80	18.80
iv)	d_2 (H*13*)		4.50	6.00	7.00	8.00	10.50	12.50	14.80	16.80	18.80
v)	d_3, *Max*		3.45	4.60	5.75	6.75	8.75	10.80	12.96	15.12	17.28
vi)	e[3)], *Min*		8.15	9.83	10.95	12.02	15.38	18.74	20.91	24.27	26.51
vii)	h_1	Nominal	0.55	0.65	0.70	0.75	0.90	1.15	1.40	1.80	1.80
		Tolerance	0 -0.1	0 -0.1	0 -0.1	0 -0.15	0 -0.15	0 -0.2	0 -0.2	0 -0.2	0 -0.2
viii)	h_2	Nominal	0.25	0.35	0.40	0.40	0.50	0.65	0.80	1.00	1.00
		Tolerance	0 -0.1	0 -0.1	0 -0.1	0 -0.1	0 -0.15	0 -0.15	0 -0.2	0 -0.2	0 -0.2
ix)	m (h14)		3.0	3.5	4.0	5.0	6.5	8.0	10.0	11.0	13.0
x)	s (h13)		7.5	9.0	10.0	11.0	14.0	17.0	19.0	22.0	24.0

[1)]P is the pitch of the thread.

[2)]Unless otherwise agreed between the user/purchaser and the manufacturer, the dimensions of leg width *b* shall be as given in the Table. However, the tolerance values shall be as specified in the Table.

[3)]$e_{min} = 1.12 s_{min}$

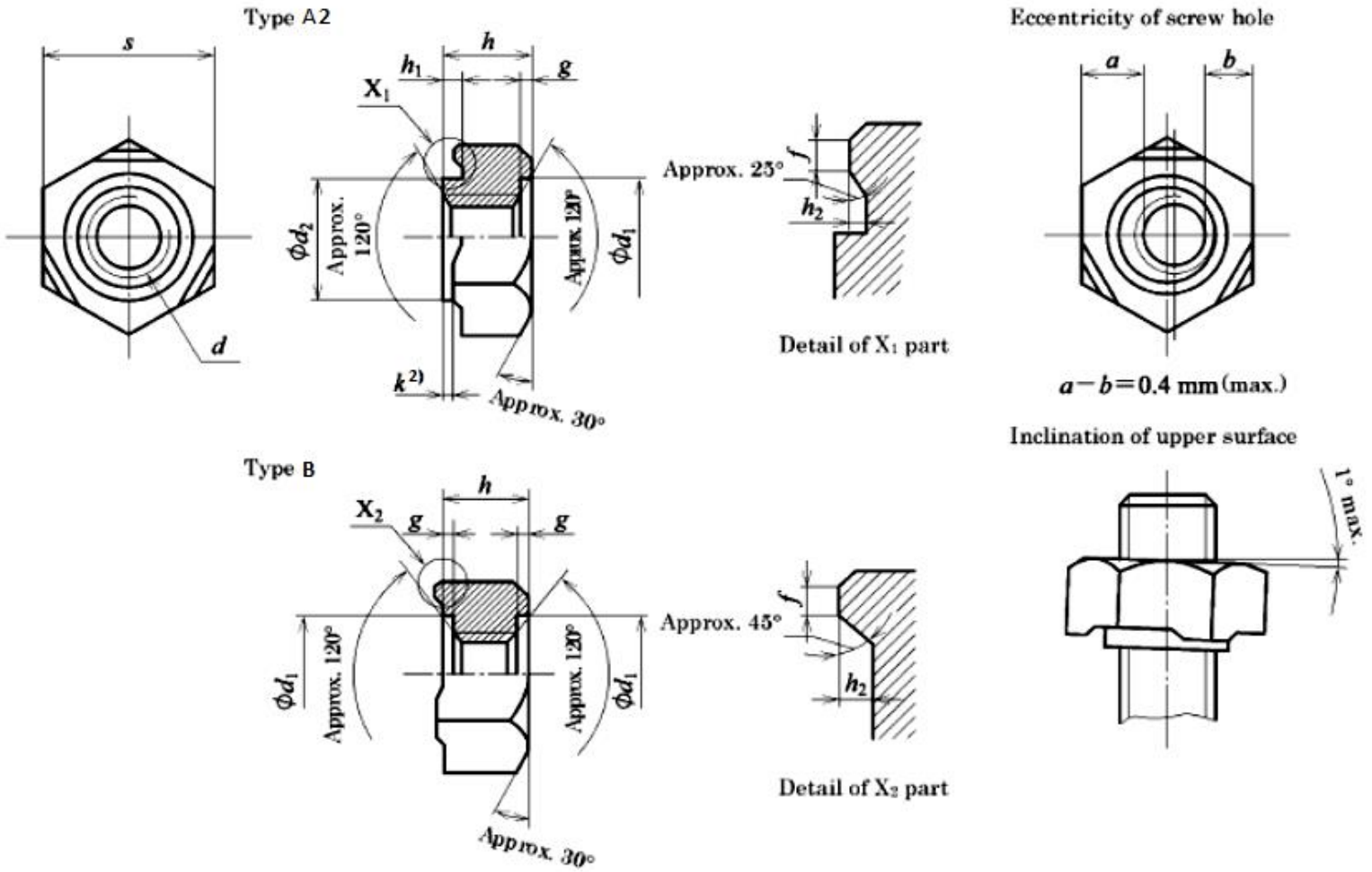

FIG. 2 DIMENSIONS OF HEXAGONAL WELD NUTS (TYPE A2 AND B)

Table 3 Dimension of Hexagon Weld Nut (Type A2 and Type B)

(*Clause* 4.2)

All dimensions are in millimetres.

Sl No.	**Thread Size *d***			**M4**	**M5**	**M6**	**M8**	**M10**	**M12**
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)
i)	Pitch		Coarse	0.7	0.8	0.1	1.25	1.5	1.75
			Fine	-	-	-	M8 × 1	M10 × 1.25, M10 × 1	M12 × 1.5, M12 × 1.25
ii)	Outline	*S*	Nominal	11	11	13	15	17	19
			Tolerance	0 -0.43	0 -0.43	0 -0.43	0 -0.43	0 -0.43	0 -0.52
		h	Nominal value for strength class 5T	5	5	6	7.5	9	11
			Nominal value for strength class 8T	5	5	6	7.5	10	12
			Tolerance	0 -0.30	0 -0.30	0 -0.30	0 -0.36	0 -0.36	0 -0.43
iii)	Undercut	d_1	≈	7	7	9	11	13	15
		g	Type A2	0.5	0.5	0.5	0.8	0.8	0.8
			Type B	0.5	0.5	0.5	0.5	0.5	0.5
iv)	Pilot	d_2	Nominal	7	7	9	11	13	15
			Tolerance	-0.1 -0.3	-0.1 -0.3	-0.1 -0.3	-0.1 -0.3	-0.1 -0.3	-0.1 -0.3
		h_1	Nominal	0.8	0.8	0.8	0.8	1.2	1.2
			Tolerance	0 -0.2	0 -0.2	0 -0.2	0 -0.2	1.2	1.2
v)	Weld Protection[1)]	*f*		0.2 to 1	0.2 to 1	0.2 to 1	0.2 to 1.2	0.2 to 1.2	0.2 to 1.2
		h_2	Nominal value for type A2	0.5	0.5	0.5	0.5	0.7	0.7

			Nominal value for type B	0.8	0.8	0.8	0.8	1	1
			Tolerance	0 -0.2	0 -0.2	0 -0.2	0 -0.2	0 -0.2	0 -0.2

[1)]The difference between the maximum value and the minimum value of height ($h - h_1 + h_2$ for type A2, and $h + h_2$ for type B) including the weld projection shall be 0.15 mm or less, and the difference between the maximum value and the minimum value of width (f) of the weld projection shall be 0.7 mm or less per a nut.

[2)] The difference (k) between levels of the pilot and the end point of weld projection shall be 0.15 mm or more (*see* Fig.2).

NOTE — The threaded portion of lower surface of type A2 nut should be chamfered to the extent that its diameter becomes (nominal diameter of screw thread + 0.5 mm) or more and surely leave a flat surface at a lower surface of pilot. The threaded portions of upper surface of type A2 nut and upper surface/lower surface of type B nut should be chamfered to the extent that their diameters become slightly larger than the major diameter of the internal thread.

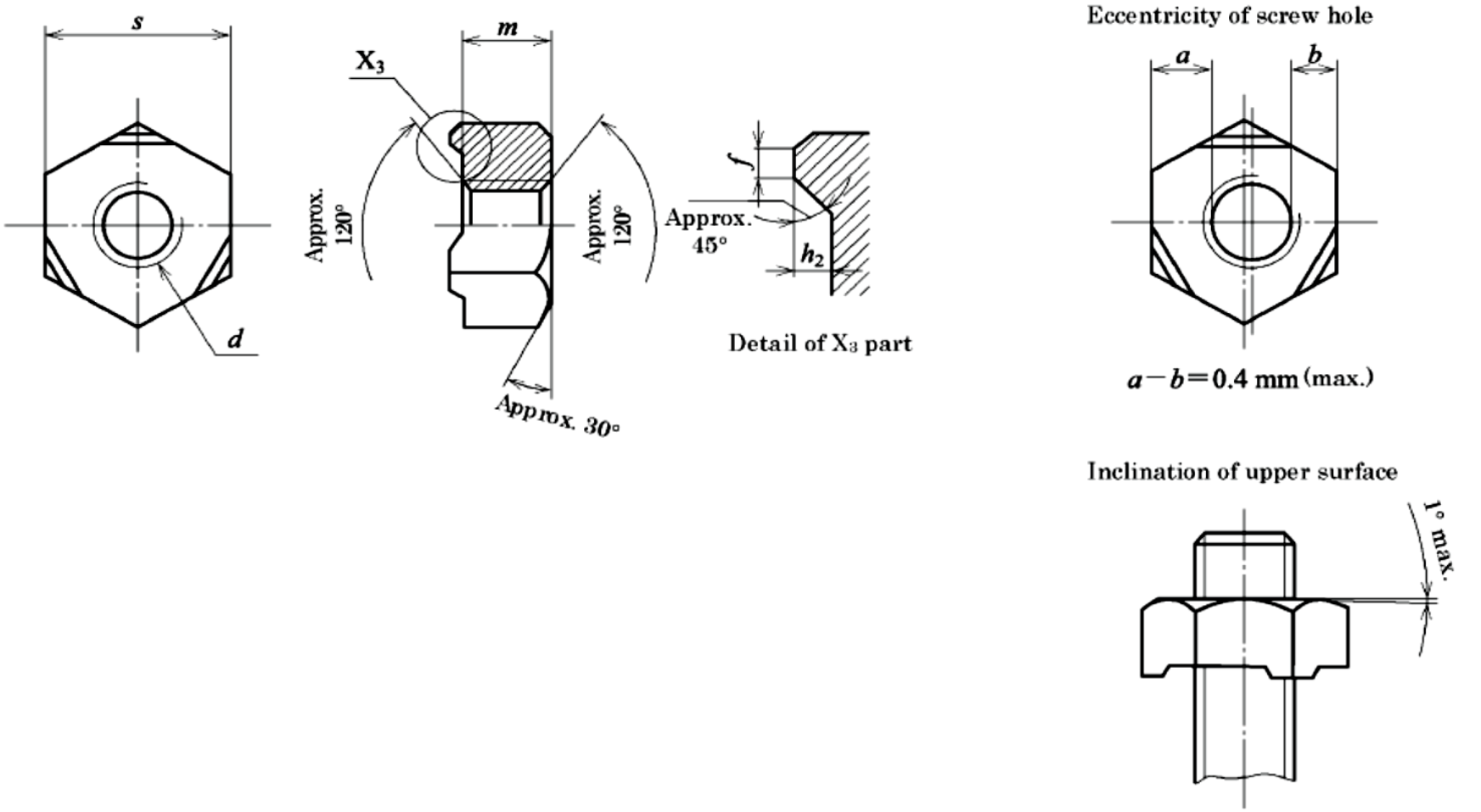

FIG. 3 DIMENSIONS OF HEXAGONAL WELD NUTS (TYPE F)

Table 4 Dimension of Hexagon Weld Nuts (Type F)

(*Clause* 4.3)

All dimensions are in millimetres.

Sl No.	**Thread Size** *d*			**M4**	**M5**	**M6**	**M8**	**M10**	**M12**
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)
i)	Pitch		Coarse	0.7	0.8	0.1	1.25	1.5	1.75
			Fine	-	-	-	M8 × 1	M10 × 1.25, M10 × 1	M12 × 1.5, M12 × 1.25
ii)	Outline	*S*	Nominal	11	11	13	15	17	19
			Tolerance	0 -0.43	0 -0.43	0 -0.43	0 -0.43	0 -0.43	0 -0.52
		m	Standard dimension for strength division 5T	4	4	5	6.5	8	10
			Standard dimension for strength division 8T	5	5	6	7.5	10	12
			Tolerance (h14)	0 -0.30	0 -0.30	0 -0.30	0 -0.36	0 -0.36	0 -0.43
iii)	Weld Protection[1)]	*f*		0.2 to 1	0.2 to 1	0.2 to 1	0.2 to 1.2	0.2 to 1.2	0.2 to 1.2
		h_2	Nominal	0.8	0.8	0.8	0.8	1	1
			Tolerance	0 -0.2	0 -0.2	0 -0.2	0 -0.2	0 -0.2	0 -0.2

[1)]The difference between the maximum value and the minimum value of height ($m + h_2$) including the weld projection shall be 0.15 mm or less and the difference between the maximum value and the minimum value of width (*f*) of the weld projection shall be 0.7 mm or less per a nut.

NOTE — The threaded portion of lower surface of nut should be chamfered to the extent that its diameter becomes approximately (nominal diameter of screw thread + 1 mm), and the threaded portion of upper surface of nut should be chamfered to the extent that its diameter becomes slightly larger than the major diameter of the internal thread.

4 REQUIREMENTS

The various requirements of hexagon weld nuts shall be as given in Table 5, Table 6 and Table 7.

Table 5 Requirements
(*Clause* 4)

Material		Steel with a maximum carbon mass of 0.25 percent
General requirements	Standard	IS 1367 (Part 1)
Thread	Tolerance class	6G for type A1; 6H for types A2, B and F
	Standard	IS 14962 (Part 1)
Mechanical properties	Proof loads	*see* Tables 6 and 7
	Proof load test	IS 1367 (Part 6)
Limit deviations, geometrical tolerances	Product grade	A
	Standard	IS 1367 (Part 2)
Surface finish — Coating		Plain (Clean and bright) IS 1367 (Part 11) applies with regard to electroplating The requirements of additional coating shall in agreement between the user and the manufacturer.
Acceptance inspection		IS 1367 (Part 17) applies with regard to acceptance inspection.

Table 6 Proof Load Values for Hexagon weld Nuts with Coarse Pitch Threads
(*Clause* 4)

Sl No.	Thread Size *D*	Proof Load N, *Min*		
		A1	A2, B and F	
			Strength class 5T	Strength class 8T
(1)	(2)	(3)	(4)	
i)	M3×0.5	3 800	2452	3 932
ii)	M4×0.7	6 800	4 315	6 865
iii)	M5×0.8	11 000	6 963	11 180
iv)	M6×0.1	15 500	9 807	15 690
v)	M8×1.25	28 300	1 795	2 844
vi)	M10×1.5	44 800	2 844	4 511
ix)	M12 ×1.75	65 300	4 129	6 571
xi)	M14×2	89 700	5 639	9 022
xii)	M16×2	123 000	7 698	12 360

Table 7 Proof Load Values for Hexagon weld Nuts with Fine Pitch Threads
(*Clause* 4)

Sl No.	Thread Size *D*	Proof Load N, *Min*		
		A1	A2, B and F	
			Strength class 5T	Strength class 8T
(1)	(2)	(3)	(4)	
i)	M8×1	30 200	19 220	30 400
ii)	M10×1.25	47 800	31 600	50 630
iii)	M10×1	50 200	30 010	48 050
iv)	M12×1.25	72 100	45 110	72 570
v)	M12×1.5	68 200	43 170	69 160
vi)	M14×1.5	97 500	61 290	98 070
vii)	M16×1.5	132 000	81 890	131 400

6 DESIGNATION

Hexagon weld nuts confirming to the requirements of this standard shall be designated by the IS number of this standard, the thread size, and the strength class (if applicable).

Examples:

a) A hexagon weld nut of size M8 × 1.25, of type A1 shall be designated as:
IS 8856 — M8 × 1.25 — A1

b) A hexagon weld nut of size M8 × 1, of type B, strength class 5T shall be designated as:
IS 8856 — M8 × 1 — B — 5T

7 MARKING

7.1 Hexagon weld nuts shall be marked with the following items on the outside surface of the packaging:

a) Designation;
b) Batch number/lot number/date of manufacturing; and
b) Manufacturer’s name/initials or trademark.

7.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the standard mark.

ANNEX A
(*National Foreword*)
(*Informative*)

DIMENSIONS OF ASSEMBLY

A-1 DIMENSIONS OF ASSEMBLY

The dimensions of assembly of hexagon weld nuts (before welding) shall be as given in Fig. 4, Table 8 and Table 9 .

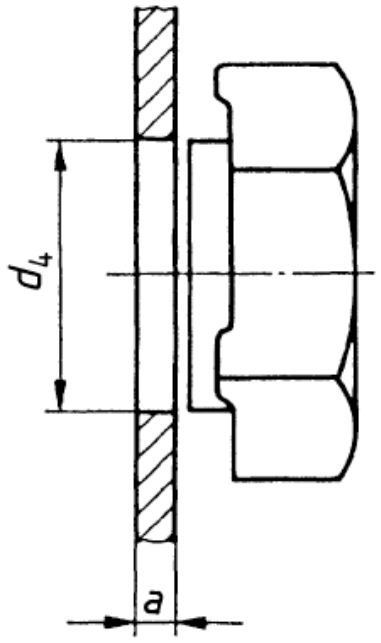

FIG. 4 CONNECTING DIMENSIONS (NUT NOT WELDED ON)

Table 8 Connecting Dimensions (Type A1)
(*Clause* A-1)

Sl No.	***D***	**Sheet Thickness** *a*		**Hole Diameter** d_4 H11
		Min	*Max*	
(1)	(2)	(3)	(4)	(5)
i)	M3	0.63	1.5	4.5
ii)	M4	0.75	1.5	6.0
iii)	M5	0.88	2.0	7.0
iv)	M6	0.88	2.5	8.0
v)	M8	1.00	3.0	10.5
vi)	M10	1.25	4.0	12.5
viii)	M12	1.50	5.0	14.8
ix)	M14	2.00	6.0	16.8
x)	M16	2.00	6.0	18.8

Table 9 Connecting Dimensions (Type A2, B and F)
(*Clause* A-1)

Sl No.	***D***	**Sheet Thickness** *a*		**Hole Diameter** d_4		
		Min	*Max*	A2	B	F
(1)	(2)	(4)	(5)	(6)	(7)	(8)
ii)	M4	0 .80	1.5	7	5	5
iii)	M5	1.0	1.2	7	6	6
iv)	M6	1.2	1.6	9	7	7
v)	M8	1.6	2.0	11	9	9
vi)	M10	2.0	2.3	13	11	11
viii)	M12	2.3	3.2	15	13	13

ANNEX B

(*National Foreword*)

(*Informative*)

PEEL STRENGTH TO PRESSING AND ITS TEST METHOD

B-1 PEEL STRENGTH TO PRESSING

B-1.1 The peel strength to pressing when a nut (Type A2, B or F) is tested in accordance with the method specified in **B-2** is given in Table 10 for reference.

B-1.2 The welded assembly is deemed satisfactory even if the weld is deformed in the peel test by pressing when the load at the test is not less than the relevant value in Table 10.

Table 10 Peel Strength to Pressing

(*Clauses* B-1 *and* B-2.2)

Sl No.	Nominal diameter of screw thread (mm)	4	5	6	8	10	12
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Peel strength to pressing, kN	3.24	3.24	3.24	3.73	6.03	6.03

NOTE — The peel strength to pressing (F) is obtained by the following formula:

$$F = S \times n \times \sigma$$

where,

S = cross sectional area at root of one weld point, in mm^2;

n = number of weld points per a nut;

σ = tensile strength of weld (σ = 294 N/mm^2);

S and n are obtained by the calculation with the median of standard values for the hexagon weld nut type A2 in Table 2.

B-2 METHOD FOR PEEL TEST BY PRESSING

B-2.1 The nut is welded to the steel sheet given in Table 11, the welded assembly is placed on a spacer as shown in Fig. 3, screw a bolt into the welded nut, compressive load is gradually applied to the bolt head so that the centre of load coincides with the centre of screw as much as possible, and the load when the bolt peels off is measured.

B-2.2 When the test steel sheet bends noticeably at a load not more than that given in Table 10, retest is carried out by using a thicker steel sheet within the nominal thickness given in Table 11, by increasing the temper grade of sheet, or by decreasing the space between the inside diameter of spacer and the nut as much as possible.

B-2.3 Test Conditions

B-2.3.1 The hole diameter on steel sheet (*d'*) (see Fig. 3) should be according to the hole diameter of corresponding plate specified in Table 9 for reference.

B-2.3.2 The welding condition of nut shall be based upon the agreement between the parties concerned with delivery

B-2.3.3 When the steel sheet with other thickness than the nominal thickness specified in Table 11 is used, it shall be based upon the agreement between the parties concerned with delivery.

NOTE — The bolt employed in the test should have tolerance class of 6g and should be of property class 8.8 or better.

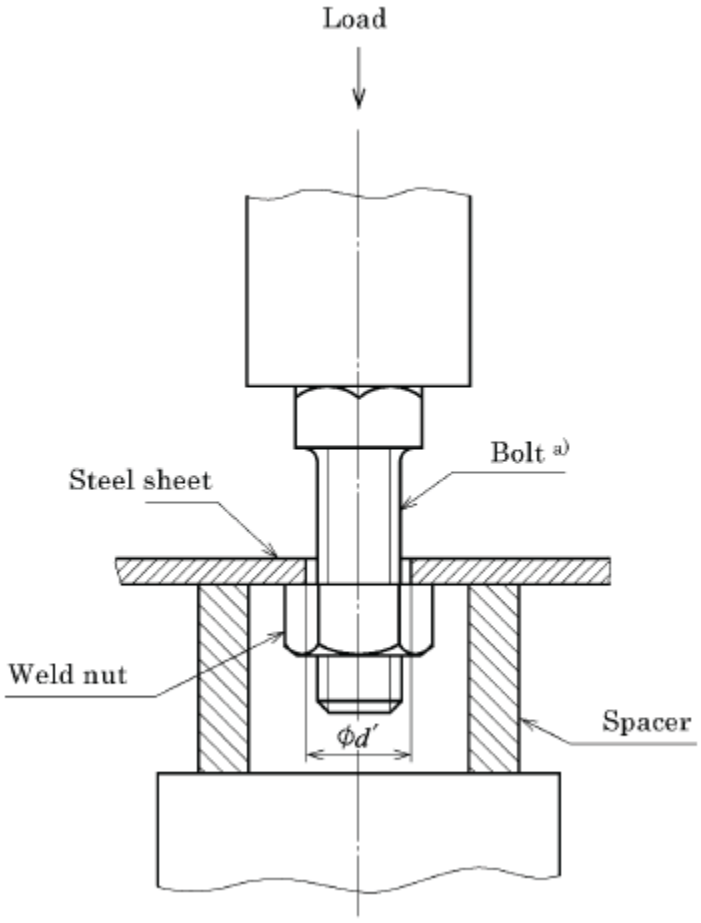

FIG. 3 METHOD FOR PEEL TEST BY PRESSING

Table 11 Steel Sheet to Which Nut is Welded

(*Clauses* B-2 *and* C-2)

Sl No.	**Nominal Diameter of Screw Thread (mm)**	**Steel Sheet to which Nut is Welded**	
		Applicable standard	Nominal thickness, mm
(1)	(2)	(3)	(4)
i)	4	Cold rolled carbon steel sheet of grade CR1 as specified in IS 513 (Part 1).	0.8 to 1.0
ii)	5		1.0 to 1.2
iii)	6		1.2 to 1.6
iv)	8		1.6 to 2.0
v)	10		2.0 to 2.3
vi)	12		2.3 to 3.2

ANNEX C
(*National Foreword*)
(*Informative*)

PEEL STRENGTH TO TORQUE AND ITS TEST METHOD

C-1 PEEL STRENGTH TO TORQUE

C-1.1 The peel strength to torque when a nut is tested in accordance with the method specified in **C-2** is given in Table 12 for reference.

C-1.2 The welded assembly is deemed satisfactory even if the weld is deformed in the pee test by torque when the torque at the test is not less than the relevant value in Table 12.

Table 12 Peel Strength to Torque
(*Clause* C-1)

Sl No.	**Nominal Diameter of Screw Thread (mm)**	**4**	**5**	**6**	**8**	**10**	**12**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Peel strength to torque, N-m	12.7	12.7	15.5	20.5	37.3	42.2

NOTE — The peel strength to torque (T) is obtained by the following formula:

$$T = S \times n \times \tau \times L$$

where,

S = cross sectional area at root of one weld point, in mm^2;
n = number of weld points per a nut;
L = distance from screw centre to weld point; and
τ = tensile strength of weld ($\tau = \sigma \times 0.7 = 206$ N/mm^2)

S, n, and L are obtained by the calculation with the median of standard values for the hexagon weld nut type A2 in Table 2.

C-2 METHOD FOR PEEL TEST BY TORQUE

C-2.1 The nut is welded to the steel sheet given in Table 11, the steel sheet is fixed firmly as shown in Fig.4, the torque is applied along a plane perpendicular to the centre of screw as much as possible, and the torque when the weld of nut peels off is measured.

C-2.2 When the test sheet at the weld is torn off by the torque not more than that given in Table 12, retest is carried out by using a thicker sheet within the nominal thickness given in Table 11 or by increasing the temper grade of the sheet.

C-2.3 B-2.3 Test Conditions

C-2.3.1 The hole diameter on steel sheet (*d*') should be according to the hole diameter of corresponding plate specified in Table 9 for reference. For that, without pilot, the holding may be omitted.

C-2.3.2 The socket for hexagon weld nut may be either one with hexagon hole or square hole or slotted socket which engages with the width across flats, *s*.

C-2.3.3 The weld condition of nut shall be based upon the agreement between the parties concerned with delivery.

C-2.3.4 In case the steel sheet with nominal thickness other than that specified in Table 11 is used, it shall be based upon the agreement between the parties concerned with delivery.

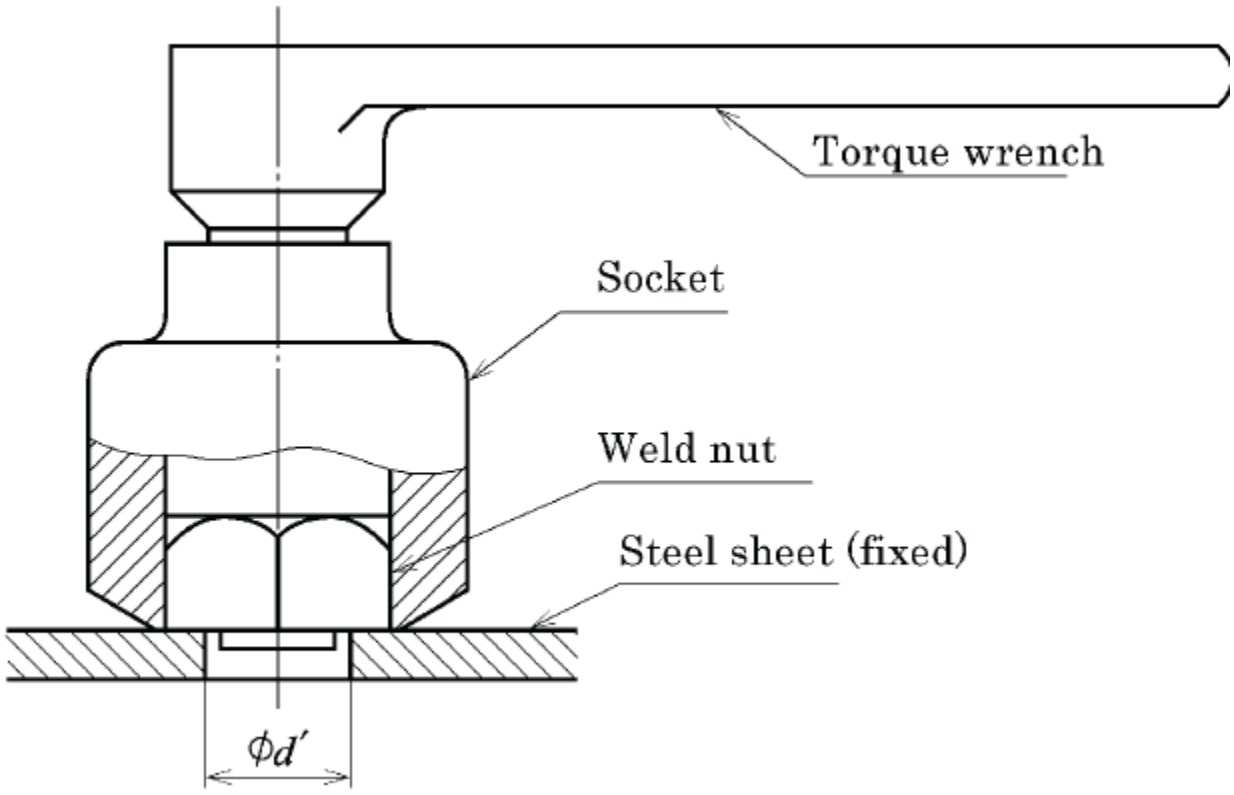

FIG. 4 METHOD FOR PEEL TEST BY TORQUE