SAE INTERNATIONAL

SURFACE VEHICLE STANDARD

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Mechanical and Material Requirements for Steel Nuts

RATIONALE

Add “Heavy Hex Slotted” to the column heading in Tables 6, 7, and 8 that now contains “Hex High Slotted and Hex Thick Slotted Nuts”.

1. SCOPE

This SAE Standard covers the mechanical and material requirements for three grades of steel nuts suitable for use in automotive and related engineering applications, in sizes 1/4 to 1-1/2 inches, inclusive, and with dimensions conforming with the requirements of the latest issue of SAE J482 or ASME B18.2.2, except for machine screw nuts which are not covered in this standard.

This document does not include limits for surface discontinuities. Where usage requires such control, limits may be specified separately. For sizes 1/4 through 1 inch, this may be done by the statement: “Surface discontinuities shall not exceed the limits specified in ASTM F812/F812M.”

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J409	Product Analysis – Permissible Variations from Specified Chemical Analysis of a Heat or Cast of Steel
SAE J417	Hardness Tests and Hardness Number Conversions
SAE J482	Hexagon High Nuts

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

2.1.2 ASME Publications

Available from ASME, P.O. Box 2900, 22 Law Drive, Fairfield, NJ 07007-2900, Tel: 800-843-2763 (U.S./Canada), 001-800-843-2763 (Mexico), 973-882-1170 (outside North America), www.asme.org.

ASME B18.2.2 NUTS FOR GENERAL APPLICATIONS - MACHINE SCREW NUTS, HEX, SQUARE, HEX FLANGE, AND COUPLING NUTS (INCH SERIES)

ASME B18.18 Quality Assurance for Fasteners

2.1.3 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM F606 Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, and Rivets

ASTM F812/F812M Surface Discontinuities of Nuts, Inch and Metric.

ASTM F1470 Fastener Sampling for Specified Mechanical Properties and Performance Inspection

3. DESIGNATION

The three grades of nuts are designated Grades 2, 5, and 8.

4. MATERIAL

Nuts shall be made of steel conforming to the chemical composition limits specified in Table 1.

Table 1 - Chemical composition requirements[(1)]

Nut Grade	C Max	Mn Min	P Max	S Max
2	0.55	-	0.12[(2)]	0.15[(3)]
5	0.55	0.30	0.05[(4)(5)]	0.15[(3)(5)]
8	0.55	0.30	0.04	0.05[(6)]

(1) All values are for ladle analysis (percent by weight) and subject to standard variations for check analysis as given in SAE J409.
(2) Resulfurized and rephosphorized material is not subject to rejection based on check analysis for sulfur.
(3) If agreed between purchaser and producer, sulfur content may be 0.23 maximum.
(4) Phosphorus content may be 0.13 maximum for acid bessemer steel only.
(5) If agreed between purchaser and producer, sulfur content may be 0.35 maximum and phosphorus content may be 0.12 maximum provided that manganese content is 0.70 minimum.
(6) If agreed between purchaser and producer, sulfur content may be 0.33 maximum provided that manganese content is 1.35 minimum.

5. MECHANICAL REQUIREMENTS

5.1 Proof Load

Nuts described in this document shall withstand the proof load stress specified in Table 2 for the nut grade, size, and thread series.

Table 2 - Proof load requirements for nuts(1)

Nut Grade	2		5				8	
Nut Size	1/4 thru 1-1/2	1/4 thru 1-1/2	1/4 thru 1	1/4 thru 1	Over 1 thru 1-1/2	Over 1 thru 1-1/2	1/4 thru 1-1/2	1/4 thru 1-1/2
Thread Series	UNC and 8UN	UNF, 12 UN and Finer	UNC and 8UN	UNF, 12 UN and Finer	UNC and 8UN	UNF, 12UN and Finer	UNC and 8UN	UNF, 12UN and Finer
Nut Type	Proof Load Stress, psi (1)	Proof Load Stress, psi (1)	Proof Load Stress, psi (1)	Proof Load Stress, psi (1)	Proof Load Stress, psi (1)	Proof Load Stress, psi (1)	Proof Load Stress, psi (1)	Proof Load Stress, psi (1)
Hex	90000	80000	120000	109000	105000	94000	150000	150000
Hex Flange	90000	80000	120000	109000	105000	94000	150000	150000
Hex Jam(2)	54000	48000	72000	65000	63000	57000	90000	90000
Heavy Hex Jam(2)	54000	48000	72000	65000	63000	57000	90000	90000
Hex Slotted(2)	71000	65000	96000	87000	84000	75000	120000	120000
Heavy Hex(2)	100000	90000	133000	120000	116000	105000	165000	150000
Hex Thick(2)	100000	90000	133000	120000	116000	105000	165000	150000
Hex Thick Slotted(2)	79000	71000	105000	96000	92000	84000	132000	120000
Hex High(2)	100000	90000	133000	120000	116000	105000	165000	150000
Hex High Slotted(2)	79000	71000	105000	96000	92000	84000	132000	120000
Square	90000	80000	105000	96000	92000	84000	132000	120000
Heavy Square	100000	90000	133000	120000	116000	105000	165000	150000

NOTE:

(1) The proof load in pounds for nuts is computed by multiplying the proof load stress, in psi (lbf/in^2), for the nut grade, size, thread series, and type, as shown in Table 2, and tensile stress area in square inches (in^2), for the applicable size and thread series shown in Table 3. (For tabulated values see Appendix A.)

To convert the inch based pounds per square inch (psi) values above to metric Megapascal (MPa) units, multiply the above values by .00689.

(2) Proof load stress values for hex jam, heavy hex jam, hex slotted, heavy hex, hex thick, heavy hex slotted, and hex thick slotted nuts are based on the requirement for hex nuts. Primarily, each value is derived from the ratio of the minimum thickness of the product involved to the minimum thickness of similar hex or square machine screw nuts and hex nuts (see B18.2.2) of the same size.