



SURFACE VEHICLE RECOMMENDED PRACTICE

J1965™

FEB2022

Issued 1993-02
Revised 2017-10
Reaffirmed 2022-02

Superseding J1965 OCT2017

(R) Road Vehicles - Wheels for Commercial Vehicles and Multipurpose
Passenger Vehicles - Fixing Nuts - Test Methods

RATIONALE

SAE J1965 has been reaffirmed to comply with the SAE Five-Year Review policy.

1. SCOPE

This SAE Recommended Practice applies to fasteners/fixing nuts as specified in SAE J694 and SAE J1835 used for disc wheels and demountable rim attachment respectively.

Only the test methods necessary to ensure proper wheel or rim assembly are specified. Fasteners for less common and special applications are not included.

1.1 Purpose

To ensure proper assemblies this recommended practice specifies test methods and performance requirements for Metric or English, one- or two-piece flange nuts, single ball seat nuts, inner and outer ball seat nuts, and rim clamp nuts.

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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 J122	Surface Discontinuities on Nuts
SAE J429	Mechanical and Material Requirements for Externally Threaded Fasteners
SAE J694	Disc Wheel and Hub or Drum Interface Dimensions - Truck and Bus
SAE J1102	Mechanical and Material Requirements for Wheel Bolts
SAE J1199	Mechanical and Material Requirements for Metric Externally Threaded Steel Fasteners
SAE J1835	Fastener Hardware for Wheels for Demountable Rims

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 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 J267	Wheels/Rims - Truck and Bus - Performance Requirements and Test Procedures for Radial and Cornering Fatigue
SAE J393	Nomenclature - Wheels, Hubs, and Rims for Commercial Vehicles
SAE J1992	Wheels/Rims - Military Vehicles - Test Procedures and Performance Requirements

2.2.2 ISO Publications

Copies of these documents are available online at <http://webstore.ansi.org/>.

ISO 10597	Road Vehicles - Flat Attachment Fixing Nuts for Commercial Vehicles - Test Methods
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3. TEST METHODS FOR ALL TYPES OF WHEEL NUTS

3.1 Proof Load/Compression Test Procedures

Use only fully processed nuts/nut assemblies, which are production parts intended for the vehicle. For inner dual ball seat nuts, the recommended test method can be seen in Figure 1. For two-piece flange nuts, the initial height of the nut (H) must be measured before beginning the proof load/compression test. The one- and two-piece flange nuts shall be loaded on a threaded fixture or bolt as shown in Figure 2. For outer ball seat nuts and rim clamp nuts, the recommended test method can be seen in Figure 3. The test fixture or bolt used shall be threaded to a tolerance class that is representative of the parts to be used in production.

The test procedure is:

1. The complete nut/nut assembly shall be loaded axially through the thread three times to a load of $0.6X$ proof load value (F) (see Table 1).
2. After three loadings, a fourth loading of $1.0X$ F shall be applied (see Table 1).
3. The load shall be maintained for 15 seconds.
4. The nut shall resist the load without failure by stripping or rupture and shall be removable by hand after the load is released. If the threads on the bolt or test fixture are damaged during the test, the test should be discarded. (It may be necessary to use a manual wrench to start the nut in motion. Such wrenching is permissible provided that it is restricted to one-half turn and that the nut is then removable by hand.)

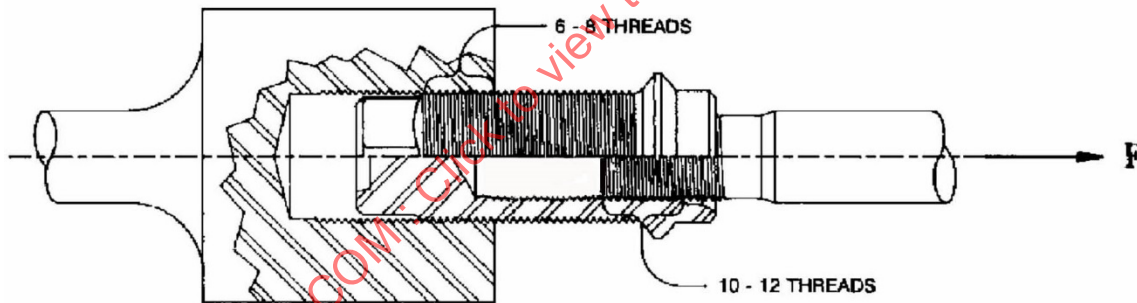


Figure 1 - Inner dual ball seat nut proof load test method

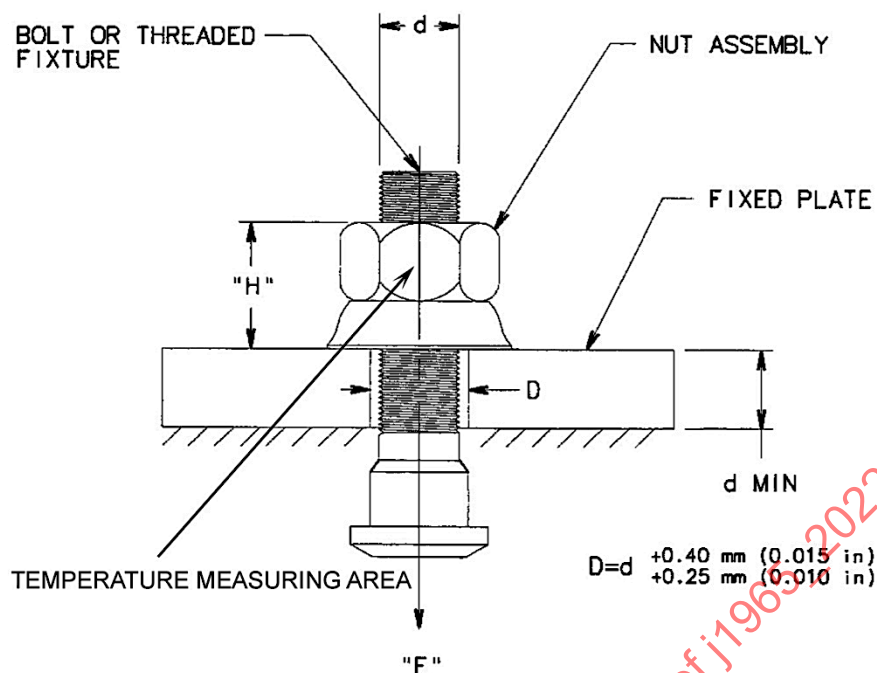


Figure 2 – One- or two-piece flange nut proof load/compression test method

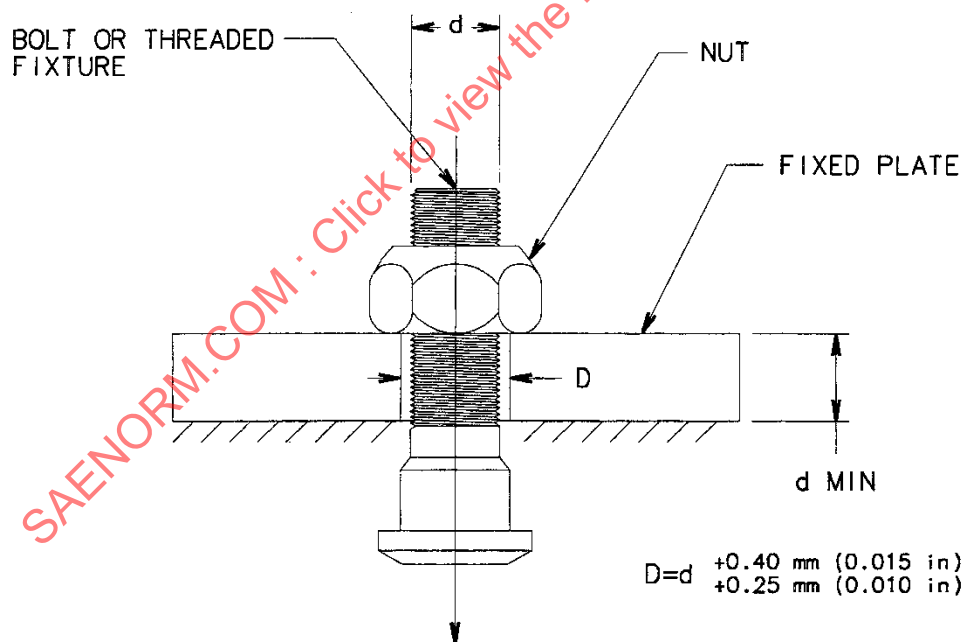


Figure 3 - Single and outer ball seat or rim clamp nut proof load test method

3.2 Proof Load Values

See Table 1.

Table 1 - Proof load values

	F (Kn) Min	F (lb) Min
Inner Dual Ball Seat Nuts		
3/4-16 Class 10.9 (Grade 8) mechanical properties	249.1	56000
3/4-16 Class 8.8 (Grade 5) mechanical properties	164.6	37000
15/16-12	278.9	62700
M20x1.5 Class 10.9 (Grade 8) mechanical properties	225.1	50600
One-Piece Flange Nuts		
9/16-18	98.3	22100
5/8-18	124.1	27900
11/16-16	149.0	33500
Two-Piece Flange Nuts		
9/16-18	108.5	24400
5/8-18	136.6	30700
7/8-14	271.3	61000
M14x1.5	103.2	23200
M18x1.5	179.3	40300
M20x1.5	225.1	50600
M22x1.5	276.2	62100
Single or Outer Ball Seat Nuts		
3/4-16	164.6	37000
1 1/8-16	222.4	50000
15/16-12	278.9	62700
1 5/16-12	378.1	85000
M18x1.5	179.3	40300
M20 X1.5	225.1	50600
M30x1.5	225.1	50600
Rim Clamp Nut		
3/4-10	197.5	44400

3.3 Failure Criteria and Surface Discontinuities

- The criteria for rejection due to cracks or other surface discontinuities are shown in Section 5.
- For two-piece flange nuts, the permanent deformation in nut height (H) after unloading must not exceed 0.13 mm (0.005 inch).

4. NUT ASSEMBLY TEST METHODS (TWO-PIECE FLANGE NUT ONLY)

4.1 Torque/Tension - Clamping Force

The purpose of this test is to assure the ability of the nut assembly to provide proper clamping force. The coating protection and lubrication if specified should be representative of the production parts to provide the representative coefficient of friction. Two test methods are acceptable: static torque using a load cell and torque wrench, and dynamic torque using load cell and torque transducer.

4.1.1 Selection

Use only fully processed nut assemblies and studs, which are representative of production parts intended for the vehicle. New nuts and studs should be used for each test. A minimum of five fasteners shall be tested.

4.1.2 Equipment and Test Methods

4.1.2.1 Static Torque

4.1.2.1.1 Equipment - Static Torque

The nut shall be tested on a load cell of sufficient capacity for the size of nut to be tested. A torque wrench of sufficient capacity shall be used for tightening the nut. The following shall be recorded:

- a. Tightening torque, Initial (A)
- b. Stud tension, Initial (B)
- c. Tightening torque, Final (C)
- d. Stud tension, Final (Max) (E)
- e. Temperature of the nut body at the center of the face of the hex (Figure 2)

4.1.2.1.2 Test Method - Static Torque

The torque is applied to the nut with a torque wrench using a smooth, steady pull as each torque level (initial and final) is approached and attained. Test studs must be representative of those used in production. The wheel mounting faces and all other surfaces of the nut are to be kept dry and clean.

4.1.2.2 Dynamic Torque

4.1.2.2.1 Equipment - Dynamic Torque

The nut shall be tested on a bolt test machine capable of displaying all necessary data. The following are to be recorded:

- a. Tightening torque, Initial (A)
- b. Stud tension, Initial (B)
- c. Head friction torque/thread friction torque, Initial (optional)
- d. Tightening torque, Final (C)
- e. Stud Tension, Final (Max) (E)
- f. Head friction torque/thread friction torque, Final (optional)
- g. Temperature of the nut body at the center of the face of the hex (Figure 2)

4.1.2.2.2 Test Method - Dynamic Torque

The force is to be applied to the nut continuously from start through final torque using a rotational speed of approximately 10 rpm once the nut is engaged with the surface. Test studs must be representative of those used in production. The wheel mounting face and all other surfaces are to be kept dry and clean.