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**Road vehicles — Flat attachment fixing  
nuts for commercial vehicles — Test  
methods**

*Véhicules routiers — Écrous de fixation des roues à attache plate pour  
véhicules utilitaires — Méthodes d'essai*



Reference number  
ISO 10597:2012(E)

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 10597 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 19, *Wheels*.

This third edition cancels and replaces the second edition (ISO 10597:2004), of which this constitutes a minor revision.

## Introduction

This International Standard was developed to provide test methods for evaluating flat attachment fixing nuts for use as wheel fasteners. The test methods are based on the needs of the wheel in order to function properly. These fasteners were first standardized dimensionally in ISO 7575 and this International Standard extends this standardization.



# Road vehicles — Flat attachment fixing nuts for commercial vehicles — Test methods

## 1 Scope

This International Standard specifies test methods and performance requirements for ensuring proper wheel or rim assembly on road vehicles by means of hexagonal nuts with a flat seating captive washer used with 18 mm, 20 mm and 22 mm studs. It is applicable to commercial vehicles as defined in ISO 3833 and to those nuts as specified in ISO 7575. It is not applicable to fasteners for less common or special applications.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6157-2, *Fasteners — Surface discontinuities — Part 2: Nuts*

## 3 Test method for nut body

### 3.1 Proof load test procedure

Use only fully processed nut assemblies with required corrosion protection which are production parts intended for the vehicle.

Measure the initial height of the nut,  $H$ , before beginning the proof load/compression test.

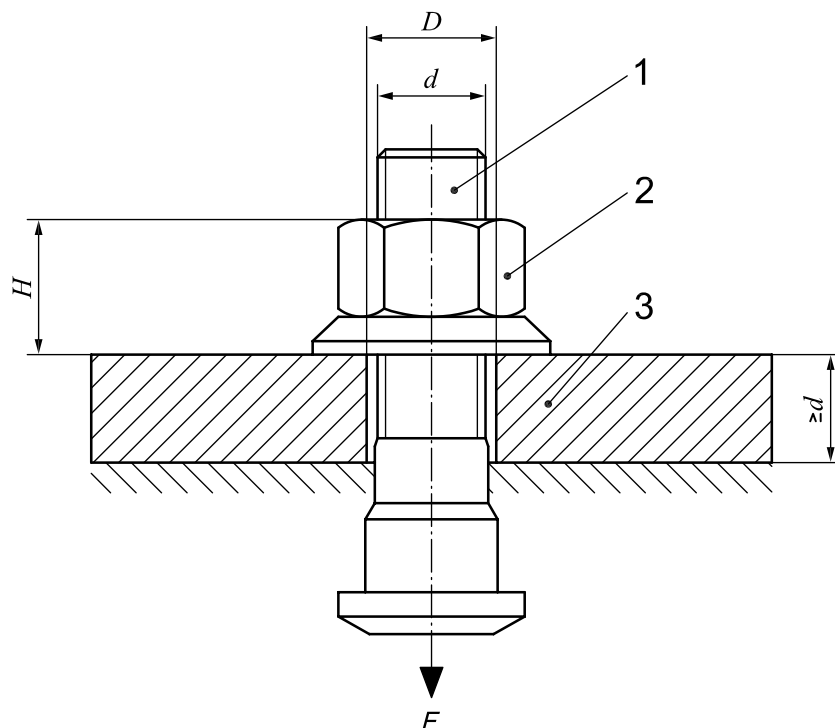
Load the nut on a threaded fixture or bolt as shown in Figure 1 or 2. The complete nut assembly shall be loaded axially through the threads three times to a load of  $0,6 \times$  proof load ( $F$ ).

Measure the final height of the nut,  $H$ .

After three loadings, apply a fourth loading of  $1 \times F$ . The values for proof load  $F$  calculated for nuts in property class 10 shall be according to Table 1. Hold the load for 15 s.

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. The test fixture or test bolt (suggested class 10.9 or higher) used shall be threaded to a tolerance class that is representative of the parts to be used in production.

It could 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.



$$D = d_{+0,25}^{+0,40}$$

where

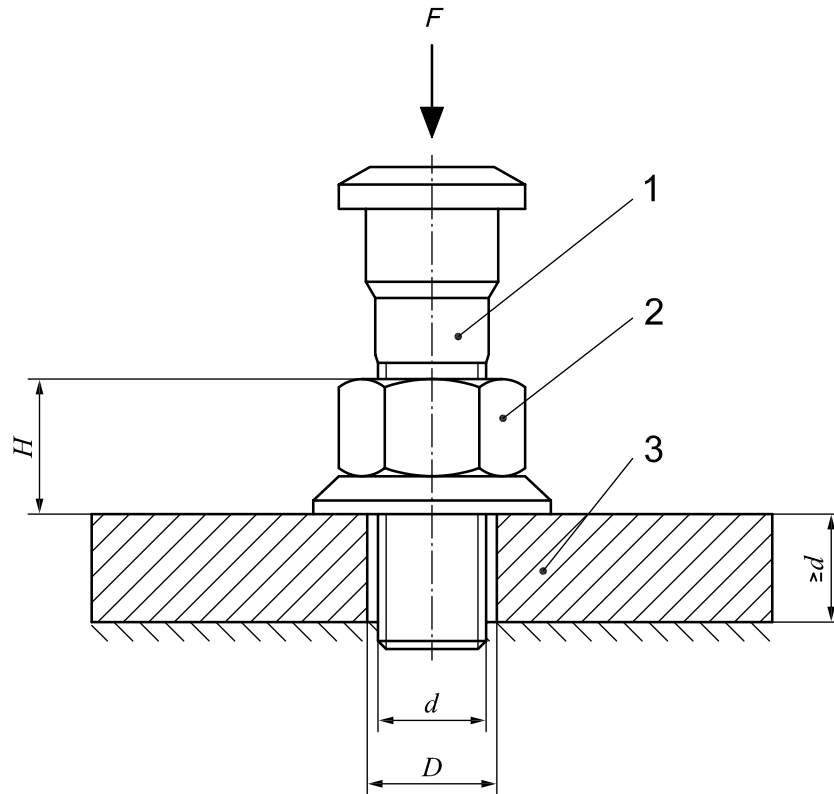
- $D$  is the diameter of the clearance hole, in millimetres;
- $d$  is the nominal diameter of the thread, in millimetres.

**Key**

- 1 bolt or threaded fixture
- 2 nut assembly
- 3 fixed plate

**Figure 1 — Two-piece flange nut proof/tension test arrangement**





$$D = d^{+0,40}_{+0,25}$$

where

$D$  is the diameter of the clearance hole, in millimetres;

$d$  is the nominal diameter of the thread, in millimetres.

#### Key

- 1 bolt or threaded fixture
- 2 nut assembly
- 3 fixed plate

Figure 2 — Two-piece flange nut proof/compression test arrangement

Table 1 — Proof loads

Thread	Proof load values
	$F$ kN
M18 × 1,5	235
M20 × 1,5	295
M22 × 1,5	360

### 3.2 Rejection criteria

The criteria for rejection due to cracks or other surface discontinuities shall be according to ISO 6157-2.

The permanent deformation in nut height  $H$  after unloading shall not exceed 0,13 mm.

Thread deformation shall be checked with a go/no-go thread gauge built to the specifications of the particular thread designation.

## 4 Nut assembly test methods

### 4.1 Torque/tension — Clamping force

#### 4.1.1 Purpose

The purpose of this test is to ensure the ability of the nut assembly with required corrosion protection to provide proper clamping force. If the use of a lubricant is found to be necessary in order for components to conform to the acceptance criteria, this shall be stated in the test results. The specification of the lubricant, details of the surfaces lubricated and the frequency of reapplication shall also be stated. The coefficient of friction should be representative of production parts. The wheel or vehicle manufacturer may determine the friction levels necessary for actual applications.

#### 4.1.2 Selection

Use only fully processed nut assemblies with required corrosion protection which are representative of production parts intended for the vehicle. New and separate nuts and studs or bolts should be used for each test.

#### 4.1.3 Test procedure

Test the nut on a bolt test stand which can display all necessary data. Record the overall tightening torque and the bolt tension; optionally, the head friction torque/thread friction torque may also be recorded.

Apply the force using a tightening device with a rotational speed of 2 r/min to 10 r/min. The washer reaction face on the fixture should be secured against rotation. Test bolts shall be representative of those used in production. Torque to the initial value given in Table 2, take measurements of the tension of the bolt and then continue to torque to the final value according to Table 2, again measuring the tension of the bolt. Table 2 gives minimum and maximum test torques and tensions.

Table 2 — Test torques and tensions

Thread	Initial torque	Minimum initial tension	Final torque	Maximum final tension
	N·m	kN	N·m	kN
M18 × 1,5	250	80	420	225
M20 × 1,5	339	100	610	295
M22 × 1,5	500	133	700	310

#### 4.1.4 Rejection criteria

The component shall be rejected if any of the following occurs:

- a) inability to reach minimum tension value at initial torque;
- b) exceeding of maximum tension value at final torque;
- c) stripping of the nut thread;
- d) inability to withstand final torque;
- e) new, visible crack penetrating through a section (commercially available crack detection devices and techniques may be used to supplement visual inspection).

If the threads of the test bolt are damaged during testing, the test shall be discarded. Nuts shall be evaluated for cracks prior to, as well as after, the test.

If any of the criteria listed in items a) to e) are noted, it may be necessary to rerun the torque tension test on a hardened mandrel, in order to determine which part (nut or bolt) is the cause of the failure. This mandrel should be hardened to 45 HRC minimum and have threads representative of production bolts.

## **4.2 Torque/tension — Retorque**

### **4.2.1 Purpose**

The purpose of this test is to ensure the repeatability of the torque/tension curve.

### **4.2.2 Selection**

Use only fully processed nut assemblies with required corrosion protection and bolt surfaces which are representative of production parts intended for the vehicle. New and separate nuts and studs or bolts should be used for each test.

### **4.2.3 Test procedure**

Retorque the nut to the final torque shown in Table 2 five times on a machine according to the procedure given in 4.1.3.

### **4.2.4 Rejection criteria**

Rejection criteria shall be the same as those given in 4.1.4 and, in addition, a 30 % drop in tension between the initial and fifth retorque shall also constitute a failure.

## Bibliography

- [1] ISO 898-6, *Mechanical properties of fasteners — Part 6: Nuts with specified proof load values — Fine pitch thread*
- [2] ISO 3833, *Road vehicles — Types — Terms and definitions*
- [3] ISO 3894, *Road vehicles — Wheels/rims for commercial vehicles — Test methods*
- [4] ISO 3911, *Wheels and rims for pneumatic tyres — Vocabulary, designation and marking*
- [5] ISO 4107, *Commercial vehicles — Wheel-hub attachment dimensions*
- [6] ISO 7575, *Commercial road vehicles — Flat attachment wheel fixing nuts*



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