

Tyres and wheels —

Part 2: Wheels and rims —

Section 3: Specification for road-wheel nuts, studs, and bolts for commercial vehicles

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- British Pressure Gauge Manufacturers' Association
- British Rubber Manufacturers' Association
- Bus and Coach Council
- Department of Transport
- Freight Transport Association
- Institute of Road Transport Engineers (Inc)
- Motor Cycle Industry's Association of Great Britain Ltd.
- Motor Industry Research Association
- National Tyre Distributors' Association
- Retread Manufacturers' Association
- Road Haulage Association Ltd.
- Society of Motor Manufacturers and Traders Ltd.

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Foreword

This section of BS AU 50 has been prepared under the direction of the Automobile Standards Policy Committee, and it forms part of the series of documents which relate to tyres and wheels for motor vehicles.

There has been no attempt to fully define road-wheel components in a design-restrictive sense, but necessary requirements are specified to achieve secure fixing of commercial vehicle road-wheels.

First, in order to improve the alignment and fit of mating parts, certain important dimensions with tolerances have been specified in this document for fixings, and a new size of 24 mm, which is already in limited use, has been introduced. The corresponding tolerances on wheel dimensions have been introduced in BS AU 50-2.2.

Secondly, performance requirements for nuts, studs, and bolts are specified to suit the specialized shapes of wheel-fixings to ensure both adequate mechanical strength and repeatable torque/clamping-force characteristics during long periods of operation and repeated vehicle servicing. However, reference has been made to existing BS fastener specifications for the majority of performance tests.

It is expected that studs and bolts will, in general, be formed by forging and rolling, and this is the recommended method of manufacture.

Also in connection with road-wheel security, attention is drawn to BS AU 50-2.7 *Code of practice for the selection and care of wheels for commercial vehicles*.

Tyre, wheel, rim and valve requirements are given in the following parts and sections of BS AU 50:

- *Part 1: Tyres;*
- *Section 0: General;*
- *Section 1: Car tyres;*
- *Section 2: Commercial vehicle tyres;*
- *Section 3: Off-the-road tyres;*
- *Section 4: Agricultural tractor and machine tyres;*
- *Section 5d: Industrial vehicle tyres;*
- *Section 6: Motorcycle tyres;*
- *Section 7: Moped tyres;*
- *Section 8: Code of practice for the storage of tyres, inner tubes and flaps;*
- *Part 2: Wheels and rims;*
- *Section 0: General (including terms and definitions, and construction and workmanship);*
- *Section 1b: Rim profiles and dimensions (including openings for valves);*
- *Section 2: Specification for dimensions of wheel naves and hub centres for commercial vehicles;*
- *Section 3: Specification for road-wheel nuts, studs and bolts for commercial vehicles;*
- *Section 4: Not published;*
- *Section 5b: Road wheels manufactured wholly or partly of cast light alloy for passenger cars;*
- *Section 6: Specification for road wheels manufactured wholly or partly of light alloy for mopeds and motor cycles;*
- *Section 7: Code of practice for the selection and care of wheels for commercial vehicles;*
- *Section 8: Code of practice for the selection and care of wheels for passenger cars (including caravans and light trailers);*
- *Part 3: Valves;*

- *Section 1: Specification for valve dimensions;*
- *Section 2: Tyre valve threads 5V1, 5V2, 6V1 and 8V1;*
- *Section 3: Tyre valve threads 9V1, 10V2, 12V1 and 13V1;*
- *Section 4a: Tyre valve threads 8V2, 10V1, 11V1, 13V2, 15V1, 16V1, 17V1, 17V2, 17V3, 19V1 and 20V1;*
- *Section 5: Dimensions for ISO core chamber No. 1 for tyre inflation valves;*
- *Section 6: Dimensions for ISO core chamber No. 2 for tyre inflation valves;*
- *Section 7: Code of practice for the selection and care of tyre inflation valves for passenger cars (including caravans and light trailers);*
- *Section 8: Code of practice for the selection and care of tyre inflation valves for commercial vehicles;*
- *Part 4: Rim profiles and dimensions;*
- *Section 0: General;*
- *Section 1: Car rims;*
- *Section 2: Commercial vehicle rims;*
- *Section 3: Off-the-road rims;*
- *Section 4: Agricultural tractor and machine rims;*
- *Section 5: Industrial vehicle rims;*
- *Section 6: Motorcycle rims;*
- *Section 7: Moped rims.*

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 22, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 3. Specification

3.1 Scope

This Section of BS AU 50-2 specifies dimensions and performance requirements for a range of sizes of wheel and hub nuts, bolts, and studs for road vehicles. The range of sizes covered is normally used on heavy commercial vehicles, but if used on other types of vehicle the requirements of this standard are still applicable.

This standard does not cover back-nuts which are used to secure certain types of stud to wheel-hubs but it does cover that part of the stud on which the back-nut fits.

The standard is applicable to fasteners for spigot-located wheels employing 18 mm, 20 mm, 22 mm, and 24 mm studs with hexagonal nuts fitted with flat-seating, captive washers (type A mounting), cone-fixings of 18 mm, 7/8 in British Standard Fine (BSF), and 1 in BSF sizes (type B mounting), and spherical-faced nuts for 18 mm, 20 mm and 22 mm sizes.

NOTE Mounting types A and B are defined in BS AU 50-2.2. BSF threads are specified in BS 84, which is obsolescent, and such threads should be used only for replacement components for existing vehicles. Spherical-faced nuts are specified in DIN 74361 and dimensional details are given in Annex A.

In addition to the definitive requirements, this standard also requires the items listed in 3.4 to be documented. For compliance with this standard, both the definitive requirements and the documented items have to be satisfied.

3.2 References

3.2.1 Normative references

This Section of BS AU 50-2 incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on the inside back cover. Subsequent amendments to, or revisions of, any of these publications apply to this Section of BS AU 50-2 only when incorporated in it by updating or revision.

3.2.2 Informative references

This Section of BS AU 50-2 refers to other publications that provide information or guidance. The editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

3.3 Definitions

For the purposes of this Section of BS AU 50-2, the following definitions apply:

3.3.1

nut

hexagonal component with an axial, threaded hole and with its intended contact face of conical shape, spherical shape, or carrying a flat-faced, captive washers; used to secure the road-wheel to the hub

3.3.2

captive washer

washer secured to a nut so as to prevent loss of the washer but to permit rotation of the nut on the washer about the axis of the thread

3.3.3

bolt

externally threaded fixing with a head on one end and usually with a portion of unthreaded shank adjacent to the head

3.3.4

stud

externally threaded component with threads at both ends and usually with a flat-faced, cone-faced, or spherical-faced collar near to the centre portion

3.3.5

critical dimensions

dimensions which ensure interchangeability and avoid the creation of features likely to result in poor fatigue strength

3.3.6

clamping force

the force which is applied by the bearing face of the fastener against a mating component after application of a specified tightening torque

3.4 Information and requirements to be agreed and to be documented

The following items to be agreed between the contracting parties, which are specified in the clauses referred to, shall be fully documented. Both the definitive requirements specified throughout this Section of BS AU 50-2 and the following documented items shall be satisfied before a claim of conformity can be made and verified:

- the type of stud or bolt material, i.e. through-hardened or case-hardened (see 3.7);
- special coatings of nuts, studs or bolts (see 3.9);
- any lubrication requirements (see 3.14.5);
- the sampling rates for design evaluation and conformity of production (see B.1, B.2).

3.5 Surface condition

Nuts and captive washers, bolts, and studs shall be free from loose scale and corrosion.

Nuts shall conform to BS EN 493:1992 in respect of surface discontinuities.

Bolts and studs shall conform to BS EN 26157-3:1992 in respect of surface discontinuities.

3.6 Captive washers for spigot-type wheel-nuts

Nuts intended for spigot-type wheels shall incorporate a captive washer.

Where a captive washer is retained on the nut by means of a swaged, thin-wall extension to the nut, such swaging shall:

- be free from splits;
- securely retain the washer;
- permit the washer sufficient general freedom such that the self-aligning properties of the nut on the washer are not impaired.

3.7 Materials

3.7.1 Bolts and studs

3.7.1.1 *Through-hardened and tempered materials*

The material shall conform to either condition V of BS 970-1:1991 or BS 970-3:1991 or property class 10.9 of BS EN 20898-1:1992 (see 3.4).

3.7.1.2 *Case-hardened materials*

For bolts requiring high surface hardness, case-hardened or surface-hardened steels shall be used (see 3.4).

The metallurgical conditions after heat-treatment shall be:

- surface hardness between 380 HV 5 and 500 HV 5;
- case depth 0.25 mm maximum;
- core hardness between 300 HV 30 and 380 HV 30.

3.7.2 Nuts

Nuts shall be made of steel conforming to either condition U of BS 970-1:1991 or property class 10 of BS EN 20898-6:1992.

3.8 Forming of bolts and studs

In any manufacturing operation, a smooth fillet radius shall be formed at the junction of any head or collar with the shank.

For fillet radii having a 90° arc, the sizes shall conform to Table 3 and Table 4 of 3.11.4, which are sizes equivalent to those in ISO 885:1976.

Where fillet radii need to be undercut to prevent interference with the corners of mating holes, such radii shall be formed axially into the face of the head or collar rather than radially into the shank (see also 3.11.4).

NOTE 1 Heads and collars should preferably be formed by hot or cold forging, and machining of such features from blanks or bar-stock should be permitted only by special agreement between the stud/bolt manufacturer and the vehicle or hub manufacturer, or, in the case of obsolete designs where the vehicle manufacturer is no longer in business, by special agreement between the stud/bolt manufacturer, the component supplier, and the user.

NOTE 2 Screw threads and spline serrations should preferably be formed by rolling. If threads or splines are to be machine-cut and either left in a machined state or finished by rolling, this should be permitted only by special agreement between the stud/bolt manufacturer and the vehicle or hub manufacturer, or, in the case of obsolete designs where the vehicle manufacturer is no longer in business, by special agreement between the stud/bolt manufacturer and the component distributor.

3.9 Coatings and surface treatments

If the purchaser requires studs, bolts or nuts to be coated or to have a special surface treatment, the type of coating or treatment required shall be fully documented (see 3.4).

In order to avoid delayed brittle fracture, parts with a surface hardness greater than 390 HV shall not be subjected to acidic processes or be electro-plated, and parts with a surface hardness of 320 HV to 390 HV shall be baked after electroplating in accordance with ISO 4042:1989.

NOTE Certain coatings, either metallic or organic, reduce friction which improves the efficiency of screw threads. However, some types of coating, particularly metal plating, can have an adverse effect on thread efficiency when applied similarly to mating parts (i.e. studs and nuts, or nuts and captive washers). Therefore, the torque/clamping-force tests and the corrosion-resistance tests specified in 3.14.5 and 3.14.6, respectively, of this Section of the standard should be used to evaluate the effects of such treatments.

3.10 Thread form and quality

3.10.1 Metric threads

The thread forms and tolerances shall be as defined in BS 3643-2:1981, tolerance classes 6 g and 6 H.

3.10.2 BSF threads

The thread forms and tolerances shall be as defined in BS 84:1956, medium class.

3.10.3 Gauging

Thread forms and dimensions shall be gauged before the application of any protective or lubricative coating.

3.11 Dimensions

3.11.1 Nuts with flat-seating, captive washers

The principal dimensions and tolerances shall be as given in Figure 1 and Table 1.

The captive washer shall have sufficient swivelling action or the assembly shall be suitably accurate to ensure that the wheel contact face of the washer is perpendicular to the axis of the thread within 15'.

3.11.2 Nuts with conical faces

The principal dimensions and tolerances shall be as given in Figure 2 and Table 2.

The cone axis shall be concentric with the axis of the thread within 0.006 in.

The cone axis shall be parallel with the axis of the thread within 15'.

