

Direct tension indicators

Part 2. Specification for nut face and bolt face washers

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the General Mechanical Engineering Standards Policy Committee (GME/-) to Technical Committee GME/9, upon which the following bodies were represented:

BEAMA Ltd.
British Constructional Steelwork Association Ltd.
British Industrial Fasteners Federation
British Railways Board
British Steel Industry
British Steel Industry (Wire Section)
Gauge and Tool Makers' Association
Society of Motor Manufacturers and Traders Ltd.
Washer Manufacturers' Association of Great Britain

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

Galvanizers' Association
Steel Construction Institute

This British Standard, having been prepared under the direction of the General Mechanical Engineering Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 April 1993

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The following BSI references relate to the work on this standard:
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Foreword

This Part of BS 7644 has been prepared under the authority of the General Mechanical Engineering Standards Policy Committee.

It is one Part of a standard for direct tension indicators for use in bolted joints.

BS 7644 : Part 1 provides a specification for compressible washers which, if used with the washers specified in this standard as part of a bolted joint, provide an indication of the tension developed in the bolt used in the joint when the joint is tightened.

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

Specification

1 Scope

This Part of BS 7644 specifies requirements for the general dimensions, tolerances, materials and marking of nut face washers and bolt face washers for use with compressible washer-type direct tension indicators of grades 1 and 2 of BS 7644 : Part 1 : 1993 and high strength friction grip bolts and nuts to BS 4395 : Part 1 : 1969 and Part 2 : 1969.

Guidance on the use of nut face and bolt face washers is given in annex A of BS 7644 : Part 1 : 1993.

2 Normative references

This Part of BS 7644 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 Part of BS 7644 only when incorporated in it by updating or revision.

3 Dimensions

The general dimensions and tolerances of nut face and bolt face washers shall be as given in tables 1 and 2 and figure 1.

Table 1. Dimensions of nut face washers						
Dimensions in millimetres						
Nominal bolt diameter	Internal diameter d_1		External diameter, d_2		Thickness h	
	Min.	Max.	Min.	Max.	Min.	Max.
M12	12.1	12.35	22.7	24	2.7	4.6
M16	16.1	16.35	27.7	29	3.1	4.6
M20	20.1	20.40	34.4	36	3.1	4.6
M22	22.3	22.60	37.4	39	3.1	4.6
M24	24.2	24.50	39.4	41	3.4	4.6
M27	27.2	27.55	45.4	47	3.4	4.6
M30	30.2	30.55	49.1	51	3.4	4.6
M33	33.2	33.55	54.1	56	3.4	4.6
M36	36.2	36.55	60.1	62	3.4	4.6

¹⁾The washers are intended to fit over the major diameter of the bolt thread only. In some cases the washer internal diameter, d_1 , is less than the bolt shank maximum diameter specified in BS 4395 : Parts 1 and 2.

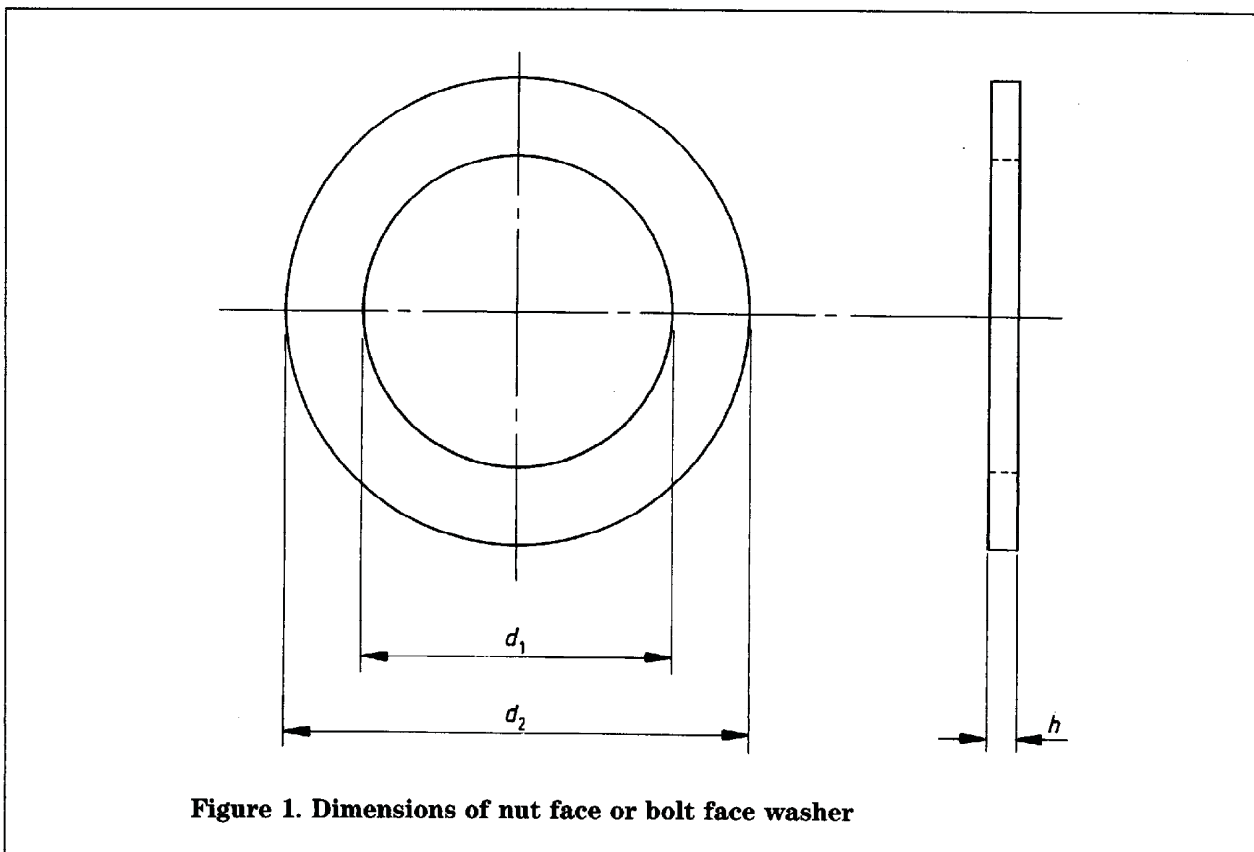


Figure 1. Dimensions of nut face or bolt face washer

Table 2. Dimensions of bolt face washers						
Dimensions in millimetres						
Nominal bolt diameter	Internal diameter, d_1		External diameter, d_2		Thickness, h	
	Min.	Max.	Min.	Max.	Min.	Max.
M12	13.20	13.70	22.7	24	2.7	4.6
M16	17.20	17.70	27.7	29	3.1	4.6
M20	21.34	21.84	34.4	36	3.1	4.6
M22	23.34	23.84	37.4	39	3.1	4.6
M24	25.34	25.84	39.4	41	3.4	4.6
M27	28.34	28.84	45.4	47	3.4	4.6
M30	31.34	31.84	49.1	51	3.4	4.6
M33	34.50	35	54.1	56	3.4	4.6
M36	37.50	38	60.1	62	3.4	4.6

4 Characteristics

The characteristics of the washers shall be as given in table 3.

Table 3. Characteristics	
Characteristic	Requirement
Material	Steel
Heat treatment	Hardened and tempered
Hardness	31 to 38 HRC (300 to 360 HV30)
Tolerances ¹⁾	As specified for product grade C in BS 6322 : Part 3 : 1992
Finish	Any one of the following: a) as processed; b) sherardized coating conforming to BS 4921 : 1988; c) mechanical plating to the thickness specified in BS 729 : 1971 or BS 1706 : 1990 as appropriate
Associated bolts and nuts	BS 4395 : Part 1 : 1969 and Part 2 : 1969
Direct tension indicators	BS 7644 : Part 1 : 1993
Acceptability	BS 6587 : 1985

¹⁾For dimensions not given in tables 1 and 2.

5 Marking and identification

5.1 Nut faced washers

All nut faced washers shall be marked with an indented letter 'M' on one face.

5.2 Bolt faced washers

All bolt faced washers shall be marked with the indented letters 'BM' on one face.

6 Designation

When designating for the purpose of an enquiry or order, the following information shall be given:

- general product description, i.e. nut face washer;
- the letter 'M' indicating that the product is ISO metric;
- the nominal size (thread diameter of associated bolt) of the product in millimetres;
- the number of this British Standard, i.e. BS 7644 : Part 2 : 1993;
- details of coating (if required), and the relevant British Standard, e.g. BS 4921.

Example: The designation of a nut face washer, with sherardized coating conforming to class 2 of BS 4921, for use with M20 compressible washer-type direct tension indicator of grade 1 as specified in BS 7644 : Part 1 and bolts and nuts conforming to BS 4395 : Part 1 is as follows:

Nut face washer, M20 of BS 7644 : Part 2, sherardized to BS 4921 Class 2.

List of references (see clause 2)

Normative references

BSI standards publications

BRITISH STANDARDS INSTITUTION, London

BS 729 : 1971	<i>Specification for hot dip galvanized coatings on iron and steel articles</i>
BS 1706 : 1990	<i>Method for specifying electroplated coatings of zinc and cadmium on iron and steel</i>
BS 4395 :	<i>Specification for high strength friction grip bolts and associated nuts and washers for structural engineering</i>
BS 4395 : Part 1 : 1969	<i>General grade</i>
BS 4395 : Part 2 : 1969	<i>Higher grade bolts and nuts and general grade washers</i>
BS 4921 : 1988	<i>Specification for sherardized coatings on iron or steel</i>
BS 6322 :	<i>Tolerances for fasteners</i>
BS 6322 : Part 3 : 1992	<i>Specification for tolerances of plain washers for bolts, screws and nuts with nominal thread diameters from 1 mm up to and including 150 mm. Product grades A and C</i>
BS 6587 : 1985	<i>Method of acceptance inspection for fasteners</i>
BS 7644 :	<i>Direct tension indicators</i>
BS 7644 : Part 1 : 1993	<i>Specification for compressible washers</i>

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