

BS 7419:2012



BSI Standards Publication

# Specification for holding down bolts

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## Contents

Foreword *ii*

- 1 Scope 1
- 2 Normative references 1
- 3 Dimensions 2
- 4 Characteristics 7
- 5 Complete designation for the purpose of an enquiry or order 7

Bibliography 10

### List of figures

- Figure 1 – Dimensions of square head bolts 4
- Figure 2 – Dimensions of hexagon head bolts 6

### List of tables

- Table 1 – Dimensions of square head bolts 3
- Table 2 – Dimensions of hexagon head bolts 5
- Table 3 – Tolerance on nominal length 7
- Table 4 – Preferred sizes 7
- Table 5 – Characteristics 8
- Table 6 – Recommended bolt and nut combinations 8

### Summary of pages

This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 10, an inside back cover and a back cover.

## Foreword

### Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 31 December 2012. It was prepared by Technical Committee FME/9, *Fasteners*. A list of organizations represented on this committee can be obtained on request to its secretary.

### Supersession

This British Standard supersedes BS 7419:1991, which is withdrawn.

### Information about this document

The fasteners in this British Standard are used in the steel construction industry, where their use might be subject to the requirements of the Construction Products Regulation. BS EN 15048 has been written to provide the harmonization requirements for non-preloaded structural fasteners, and gives details of CE marking. Assemblies produced in accordance with BS 7419 can be expected to meet the mechanical property requirements of BS EN 15048.

Requirements in this standard are drafted in accordance with *The BSI guide to standardization – Section 2: Rules for the structure, drafting and presentation of British Standards*, subclause 11.3.1, which states, “Requirements should be expressed using wording such as: ‘When tested as described in Annex A, the product shall ...’”. This means that only those products that are capable of passing the specified test will be deemed to conform to this standard.

### Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

*Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.*

### Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

**Compliance with a British Standard cannot confer immunity from legal obligations.**

## 1 Scope

This British Standard specifies the characteristics of holding down bolts with threads from M16 up to and including M64 of product grade C for use in connecting steel structures to their foundations and in similar applications.

Bolts with square heads and square necks are specified. Two possible forms of square neck are covered.

Bolts with hexagon heads are also specified.

Other forms of holding down bolts are not covered.

Holding down bolts are used with hexagon nuts in accordance with BS EN ISO 4032:2001 or BS EN ISO 4034:2001 and may, be used with washers in accordance with BS EN ISO 7091:2000, or alternatively, washers in accordance with BS 4320:1968, Form G may be specified.

## 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.

BS 3643-1:2007, *ISO metric screw threads – Part 1: Principles and basic data*

BS 3643-2:2007, *ISO metric screw threads – Part 2: Specification for selected limits of size.*

BS 4320:1968, *Metal Washers for general engineering purposes – Metric series*

BS 7371-8:2011, *Coatings on metal fasteners – Part 8: Specification for sherardized coatings*

BS EN 15048-2:2007, *Non-preloaded structural bolting assemblies – Part 2: Suitability test*

BS EN ISO 898-1:2009, *Mechanical properties of fasteners made of carbon steel and alloy steel – Part 1: Bolts, screws and studs with specified property classes – Coarse thread and fine pitch thread*

BS EN ISO 898-2:2012, *Mechanical properties of fasteners made of carbon steel and alloy steel – Part 2: Nuts with specified property classes – Coarse thread and fine pitch thread*

BS EN ISO 3269:2001, *Fasteners – Acceptance inspection*

BS EN ISO 4032:2001, *Hexagon nuts, style 1 – Product grades A and B*

BS EN ISO 4034:2001, *Hexagon nuts – Product grade C*

BS EN ISO 4042:2000, *Fasteners – Electroplated coatings*

BS EN ISO 4759-1:2001, *Tolerances for fasteners – Part 1: Bolts, screws, studs and nuts – Product grades A, B and C*

BS EN ISO 7091:2000, *Plain washers – Normal series – Product Grade C*

BS EN ISO 10684:2004, *Fasteners – Hot dip galvanized coatings*

BS ISO 965-5:1998, *ISO General purpose metric screw threads – Tolerances – Part 5: Limits of sizes for internal screw threads to mate with hot-dip galvanized external screw threads with maximum size of tolerance position h before galvanizing*

BS ISO 8992:2005, *Fasteners – General requirements for bolts, screws, studs and nuts*

### 3 Dimensions

The general dimensions and tolerances of holding down bolts with square heads and square necks shall be as given in Table 1, Table 3 and Figure 1.

The dimensions and tolerances of holding down bolts with hexagon heads shall be as given in Table 2, Table 3 and Figure 2.

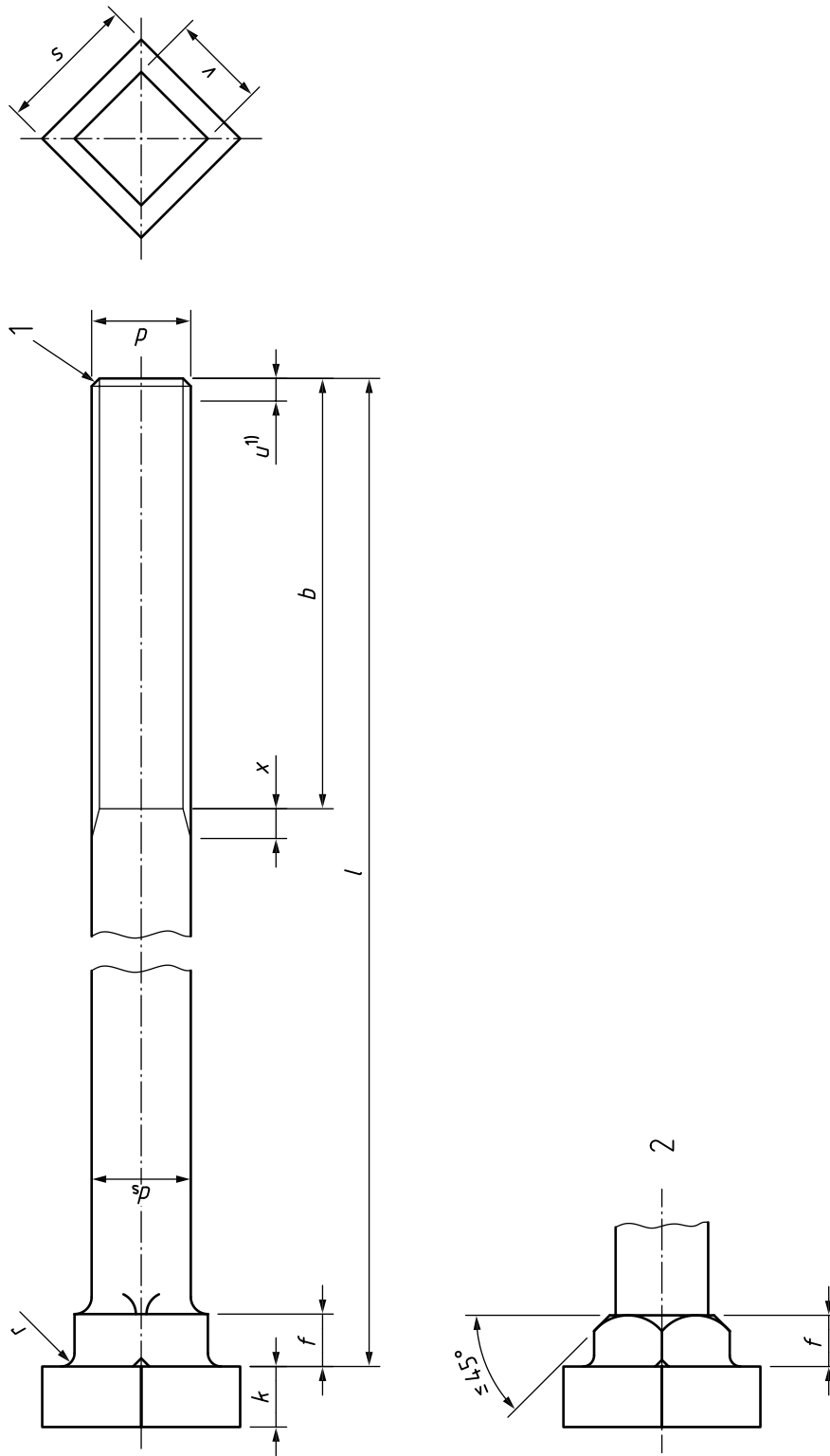
*NOTE 1 Preferred sizes for square and hexagon head holding down bolts are listed in Table 4.*

*NOTE 2 Symbols and descriptions of dimensions are in BS EN ISO 225:2010.*

Table 1 Dimensions of square head bolts

Thread ( <i>d</i> )	M16 mm	M20 mm	M24 mm	M30 mm	M36 mm	M42 mm	M48 mm	M56 mm	M64 mm
<i>P</i> (pitch)	2	2.5	3	3.5	4	4.5	5	5.5	6
<i>b</i>									
max.	122	127.5	133	140.5	148	155.5	163	172.5	182
min.	116	120	124	130	136	142	148	156	164
<i>d</i> <sub>5</sub>									
max.	16.7	20.84	24.84	30.84	37	43	49	57.2	65.2
min.	15.3	19.16	23.16	29.16	35	41	47	54.8	62.8
<i>k</i>									
nom.	10	12.5	15	18.7	22.5	26	30	35	40
min.	9.25	11.6	14.1	17.65	21.45	24.95	28.95	33.75	38.75
max.	10.75	13.4	15.9	19.75	23.55	27.05	31.05	36.25	41.25
<i>r</i>									
min.	0.6	0.8	0.8	1	1	1.2	1.6	2	2
<i>s</i>									
nom. = max	24	30	36	46	55	65	75	85	95
min.	23.16	29.16	35	45	53.8	63.1	73.1	82.8	92.8
<i>f</i>									
nom.	8	10	12	15	18	21	24	28	32
min.	7.25	9.25	11.1	14.1	17.1	19.95	22.95	26.95	30.75
max.	8.75	10.75	12.9	15.9	18.9	22.05	25.05	29.05	33.25
<i>v</i>									
max.	16.7	20.84	24.84	30.84	37	43	49	57.2	65.2
min.	15.3	19.16	23.16	29.16	35	41	47	54.8	62.8
<i>x</i>									
max.	5	6.3	7.5	9	10	11	12.5	14	15

Figure 1 Dimensions of square head bolts



1) Incomplete threads  $u \leq 2p$ .

**Key**

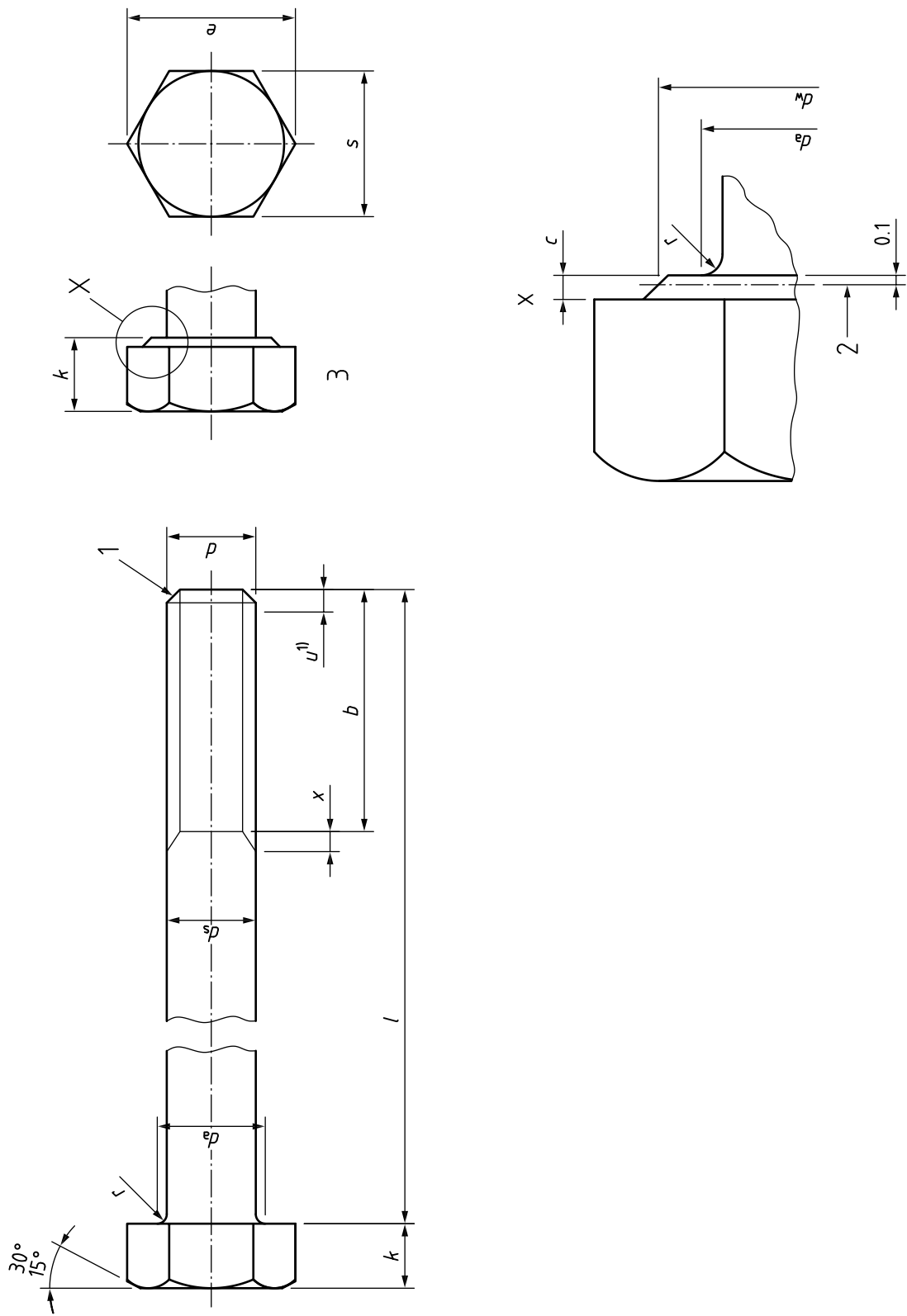
- 1 End without special requirements
- 2 Alternative head form



Table 2 Dimensions of hexagon head bolts

Thread ( <i>d</i> )	M16 mm	M20 mm	M24 mm	M30 mm	M36 mm	M42 mm	M48 mm	M56 mm	M64 mm
<i>P</i> (pitch)	2	2.5	3	3.5	4	4.5	5	5.5	6
<i>b</i>									
max.	122	127.5	133	140.5	148	155.5	163	172.5	182
min.	116	120	124	130	136	142	148	156	164
<i>c</i>									
max.	0.8	0.8	0.8	0.8	0.8	1	1	1	1
<i>d<sub>a</sub></i>									
max.	18.7	24.4	28.4	35.4	42.4	48.6	56.6	67	75
<i>d<sub>s</sub></i>									
max.	16.7	20.84	24.84	30.84	37	43	49	57.2	65.2
min.	15.3	19.16	23.16	29.16	35	41	47	54.8	62.8
<i>d<sub>w</sub></i>									
min.	22	27.7	33.25	42.75	51.11	59.95	69.45	78.66	88.16
<i>e</i>									
min.	26.17	32.95	39.55	50.85	60.79	71.3	82.6	93.56	104.86
<i>k</i>									
nom.	10	12.5	15	18.7	22.5	26	30	35	40
min.	9.25	11.6	14.1	17.65	21.45	24.95	28.95	33.75	38.75
max.	10.75	13.4	15.9	19.75	23.55	27.05	31.05	36.25	41.25
<i>r</i>									
min.	0.6	0.8	0.8	1	1	1.2	1.6	2	2
<i>s</i>									
nom. = max.	24	30	36	46	55	65	75	85	95
min.	23.16	29.16	35	45	53.8	63.1	73.1	82.8	92.8
<i>x</i>									
max.	5	6.3	7.5	9	10	11	12.5	14	15

Figure 2 Dimensions of hexagon head bolts



<sup>1)</sup> Incomplete threads  $u \leq 2p$ .

**Key**

- 1 End without special requirements
- 2 Reference datum for  $d_w$
- 3 Alternative head form with washer face

Table 3 Tolerance on nominal length

Nominal length mm	Tolerance mm
250 < l ≤ 315	±5.2
315 < l ≤ 400	±5.7
400 < l ≤ 500	±6.3
500 < l ≤ 630	±7
630 < l ≤ 800	±8
800 < l ≤ 1 000	±9
1 000 < l ≤ 1 250	±10.5

Table 4 Preferred sizes

Nominal length/for thread (d)				
M16 mm	M20 mm	M24 mm	M30 mm	M36 mm
300	300	–	–	–
375	375	375	–	–
450	450	450	450	450
525	525	525	525	525
600	600	600	600	600
–	750	750	750	750
–	1 000	1 000	1 000	1 000
–	–	1 250	1 250	1 250

## 4 Characteristics

Materials, tolerances, mechanical properties and associated nuts for holding down bolts shall be as given in Table 5.

## 5 Complete designation for the purpose of an enquiry or order

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

- general product description, i.e. Holding down bolts;
- head form, i.e. Square square, or Hexagon;
- the nominal size (thread diameter) of the product in millimetres;
- the nominal length in millimetres;
- the property class;
- the identifier of this British Standard, i.e. BS 7419:2012;
- details of the associated nut in accordance with the appropriate British Standard, e.g. BS EN ISO 4032:2001 or BS EN ISO 4034:2001;
- details of the washer (if required), in accordance with the appropriate British Standard (e.g. BS EN ISO 7091:2000, BS 4320:1968 Form G or other); and

- i) details of the coating (if required), in accordance with the appropriate British Standard (e.g. BS EN ISO 10684:2004, BS 7371-8:2011, BS EN ISO 4042:2000 or other).

**EXAMPLE**

*Square head holding down bolts 20 mm in diameter, 450 mm long, property class 4.6 with nuts BS EN ISO 4032:2001 and BS 4320:1968 Form G washers, hot dip galvanized would be designated:*

*1) Holding down bolts, Square square M20 × 450, 4.6 to BS 7419:2012, with nuts to BS EN ISO 4032:2001 and BS 4320:1968 Form G washers, hot dip galvanized to BS EN ISO 10684:2004.*

Table 5 Characteristics

Material		Steel
General Requirements	Standard	BS ISO 8992:2005
Thread	Tolerance class	8g <sup>A)</sup>
	Standards	BS 3643-1:2007 and BS 3643-2:2007
Mechanical properties	Property classes	$d \leq 39\text{mm}$ : 4.6, 8.8
	Standard	$d > 39\text{mm}$ : as agreed <sup>B)</sup> BS EN ISO 898-1:2009
Tolerance	Product grade Standard	C BS EN ISO 4759-1:2001
Finish - Coating	Normal	As processed <sup>C)</sup>
	Hot dip galvanized	BS EN ISO 10684:2004
	Sherardized	BS 7371-8
	Zinc electroplated	BS EN ISO 4042:2000
	Others	To be agreed <sup>D)</sup>
Associated nuts	Standards	BS EN ISO 4032:2001 and BS EN ISO 4034:2001
	Property classes	5, 8, 10 <sup>E)</sup>
	Standard	BS EN ISO 898-2:2012
	Thread tolerance	6H, 7H or 6AZ
	Standards	BS 3643-2:2007 or BS ISO 965-5:1998
Associated washers (if required)	Standards	BS EN ISO 7091:2000 or BS 4320:1968 Form G
	Others	to be agreed <sup>F)</sup>
Acceptability	Standard	BS EN ISO 3269:2001
Suitability test	Standard	BS EN 15048-2:2007

<sup>A)</sup> The tolerance class specified applies before hot dip galvanizing or coating with any thick protective coating.

<sup>B)</sup> The designation symbol for the property classes according to BS EN ISO 898-1:2009 may also be used for thread sizes above M39, provided that the finished product has all the properties assigned to the designation symbols in BS EN ISO 898-1:2009.

<sup>C)</sup> As processed means the normal finish resulting from manufacture with a light oil coating.

<sup>D)</sup> Other coatings may be negotiated between the purchaser and the manufacturer provided they do not impair the mechanical properties or the functional characteristics. Coatings of cadmium or cadmium alloy are not permitted.

<sup>E)</sup> Recommended bolt and nut combinations are shown in Table 6.

<sup>F)</sup> Other washers may be supplied by agreement between the purchaser and the manufacturer.

Table 6 Recommended bolt and nut combinations

Bolt property class	4.6	4.6 <sup>A)</sup>	8.8	8.8 <sup>A)</sup>

Table 6 Recommended bolt and nut combinations

Recommended nut property class	5 <sup>B)</sup>	8 or 10	8 or 10	10
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<sup>A)</sup> When a thick protective coating such as hot dip galvanizing or sherardizing is applied, which requires the nut thread to be tapped oversize to 6AZ, higher property class nuts shall be used to meet the loadability requirements of BS EN 15048-2007.

<sup>B)</sup> Nuts of higher property class may also be used.

## Bibliography

### Standards publications

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS EN ISO 225:2010, *Fasteners – Bolts, screws, studs and nuts – Symbols and descriptions of dimensions*



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