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**Button head screws —**

**Part 1:**

**Hexagon socket button head screws**

*Vis à tête cylindrique bombée plate —*

*Partie 1: Vis à tête cylindrique bombée plate à six pans creux*





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## Foreword

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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 7380-1 was prepared by Technical Committee ISO/TC 2, *Fasteners*, Subcommittee SC 11, *Fasteners with metric external thread*.

This first edition of ISO 7380-1, together with ISO 7380-2, cancels and replaces ISO 7380:2004, which has been technically revised.

ISO 7380 consists of the following parts, under the general title *Button head screws*:

- *Part 1: Hexagon socket button head screws*
- *Part 2: Hexagon socket button head screws with collar*

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# Button head screws —

## Part 1: Hexagon socket button head screws

### 1 Scope

This International Standard specifies the characteristics of hexagon socket button head screws with threads from M3 up to and including M16, with product grade A and with reduced loadability according to Table 3.

If, in special cases, specifications other than those listed in this International Standard are required, they can be selected from existing International Standards, e.g. ISO 261, ISO 888, ISO 898-1, ISO 965-2, ISO 3506-1 and ISO 4759-1.

### 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 225, *Fasteners — Bolts, screws, studs and nuts — Symbols and descriptions of dimensions*

ISO 261, *ISO general purpose metric screw threads — General plan*

ISO 898-1, *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*

ISO 965-2, *ISO general purpose metric screw threads — Tolerances — Part 2: Limits of sizes for general purpose external and internal screw threads — Medium quality*

ISO 965-3, *ISO general purpose metric screw threads — Tolerances — Part 3: Deviations for constructional screw threads*

ISO 3269, *Fasteners — Acceptance inspection*

ISO 3506-1, *Mechanical properties of corrosion-resistant stainless steel fasteners — Part 1: Bolts, screws and studs*

ISO 4042, *Fasteners — Electroplated coatings*

ISO 4753, *Fasteners — Ends of parts with external ISO metric thread*

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

ISO 6157-1, *Fasteners — Surface discontinuities — Part 1: Bolts, screws and studs for general requirements*

ISO 6157-3, *Fasteners — Surface discontinuities — Part 3: Bolts, screws and studs for special requirements*

ISO 8992, Fasteners — General requirements for bolts, screws, studs and nuts

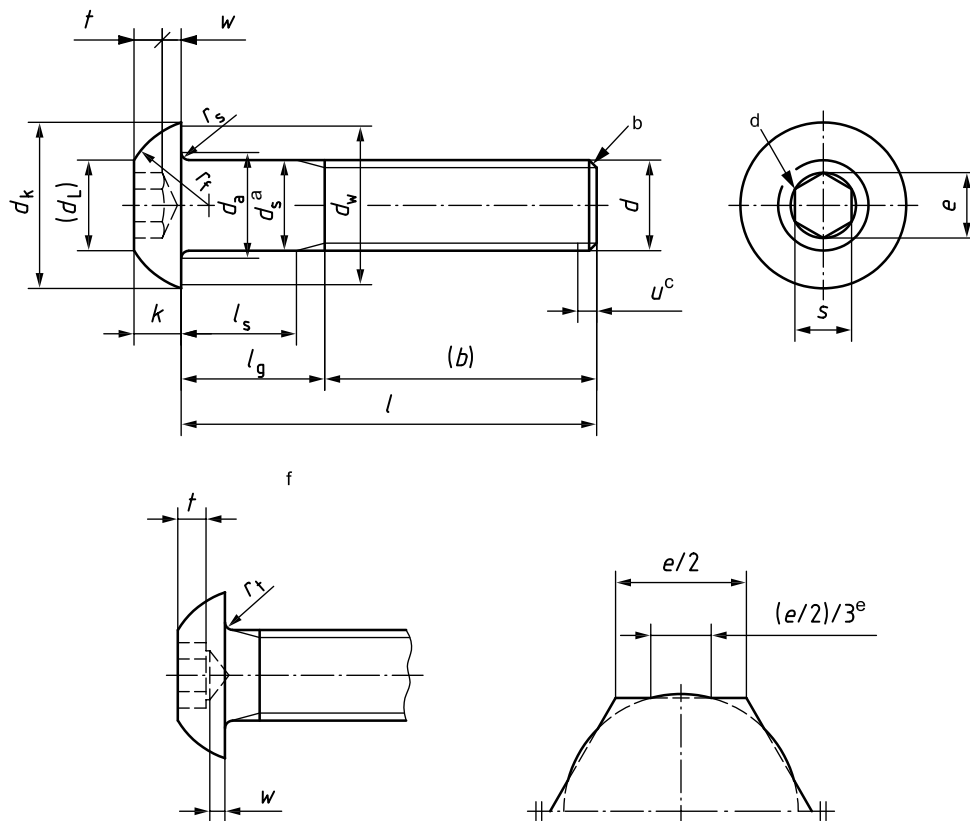
ISO 10683, Fasteners — Non-electrolytically applied zinc flake coatings

ISO 23429, Gauging of hexagon sockets

### 3 Dimensions

See Figure 1 and Table 1.

Symbols and descriptions of dimensions are specified in ISO 225.



#### Key

- $r_s$  underhead radius for a screw with unthreaded shank
- $r_t$  underhead radius for a fully threaded screw
- <sup>a</sup>  $d_s$  applies if values of  $l_{s,min}$  are specified.
- <sup>b</sup> In accordance with ISO 4753, point chamfered or for sizes  $\leq M4$  "as rolled".
- <sup>c</sup> Incomplete thread  $u \leq 2P$ .
- <sup>d</sup> A slight rounding or countersink at the mouth of the socket is permissible.
- <sup>e</sup> For broached sockets which are at the maximum limit of size, the overcut resulting from drilling shall not exceed one third of the length of any flat of the socket which is  $e/2$ .
- <sup>f</sup> Permissible alternative form of socket.

Figure 1 — Hexagon socket button head screw

Table 1 — Dimensions of hexagon socket button head screws

Dimensions in millimetres

Thread, $d$	M3	M4	M5	M6	M8	M10	M12	M16	
$p^a$	0,5	0,7	0,8	1	1,25	1,5	1,75	2	
$b^b$ ref.	18	20	22	24	28	32	36	44	
$d_a$ max.	3,6	4,7	5,7	6,8	9,2	11,2	13,7	17,7	
$d_k$	max.	5,70	7,60	9,50	10,50	14,00	17,50	21,00	28,00
	min.	5,40	7,24	9,14	10,07	13,57	17,07	20,48	27,48
$d_L$ ref.	2,6	3,8	5,0	6,0	7,7	10,0	12,0	16,0	
$d_s$	max.	3	4	5	6	8	10	12	16
	min.	2,86	3,82	4,82	5,82	7,78	9,78	11,73	15,73
$d_w$ min.	5,00	6,84	8,74	9,57	13,07	16,57	19,68	26,68	
$e^{cd}$ min.	2,303	2,873	3,443	4,583	5,723	6,863	9,149	11,429	
$k$	max.	1,65	2,20	2,75	3,30	4,40	5,50	6,60	8,80
	min.	1,40	1,95	2,50	3,00	4,10	5,20	6,24	8,44
$r_f$	max.	3,70	4,60	5,75	6,15	7,95	9,80	11,20	15,30
	min.	3,30	4,20	5,25	5,65	7,45	9,20	10,50	14,50
$r_s$ min.	0,10	0,20	0,20	0,25	0,40	0,40	0,60	0,60	
$r_t$ min.	0,30	0,40	0,45	0,50	0,70	0,70	1,10	1,10	
$s^d$	nom.	2	2,5	3	4	5	6	8	10
	max.	2,080	2,580	3,080	4,095	5,140	6,140	8,175	10,175
	min.	2,020	2,520	3,020	4,020	5,020	6,020	8,025	10,025
$t$ min.	1,04	1,30	1,56	2,08	2,60	3,12	4,16	5,20	
$w$ min.	0,20	0,30	0,38	0,74	1,05	1,45	1,63	2,25	

Table 1 (continued)

Dimensions in millimetres

Thread, <i>d</i>			M3		M4		M5		M6		M8		M10		M12		M16	
<i>l<sup>e</sup></i>			<i>l<sub>s</sub></i> and <i>l<sub>g</sub><sup>f</sup></i>															
nom.	min.	max.	<i>l<sub>s</sub></i> min.	<i>l<sub>g</sub></i> max.	<i>l<sub>s</sub></i> min.	<i>l<sub>g</sub></i> max.	<i>l<sub>s</sub></i> min.	<i>l<sub>g</sub></i> max.	<i>l<sub>s</sub></i> min.	<i>l<sub>g</sub></i> max.	<i>l<sub>s</sub></i> min.	<i>l<sub>g</sub></i> max.	<i>l<sub>s</sub></i> min.	<i>l<sub>g</sub></i> max.	<i>l<sub>s</sub></i> min.	<i>l<sub>g</sub></i> max.	<i>l<sub>s</sub></i> min.	<i>l<sub>g</sub></i> max.
6	5,76	6,24																
8	7,71	8,29																
10	9,71	10,29																
12	11,65	12,35																
16	15,65	16,35																
20	19,58	20,42																
25	24,58	25,42	4,5	7														
30	29,58	30,42	9,5	12	6,5	10	4	8										
35	34,5	35,5			11,5	15	9	13	6	11								
40	39,5	40,5			16,5	20	14	18	11	16	5,75	12						
45	44,5	45,5					19	23	16	21	10,75	17	5,5	13				
50	49,5	50,5					24	28	21	26	15,75	22	10,5	18				
55	54,4	55,6							26	31	20,75	27	15,5	23	10,25	19		
60	59,4	60,6							31	36	25,75	32	20,5	28	15,25	24		
65	64,4	65,6									30,75	37	25,5	33	20,25	29	11	21
70	69,4	70,6									35,75	42	30,5	38	25,25	34	16	26
80	79,4	80,6									45,75	52	40,5	48	35,25	44	26	36
90	89,4	90,6											50,5	58	45,25	54	36	46

- a *P* is the pitch of the thread.
- b For lengths between the bold, stepped lines in the unshaded area.
- c  $e_{\min} = 1,14 s_{\min}$ .
- d Combined gauging of socket dimensions, *e* and *s*, as specified in ISO 23429.
- e The range of preferred lengths is between the bold, stepped lines.
- f Lengths in the shaded area are threaded to the head within  $3P$ . Lengths below the shaded area have values of *l<sub>g</sub>* and *l<sub>s</sub>* in accordance with the following equations:  

$$l_{g,\max} = l_{\text{nom}} - b$$

$$l_{s,\min} = l_{g,\max} - 5P$$



## 4 Requirements and reference International Standards

See Tables 2 and 3.

**Table 2 — Requirements and reference International Standards**

Material		Steel	Stainless steel
<b>General requirements</b>	International Standard	ISO 8992	
	Tolerance class	5g6g for property class 12.9/ <u>12.9</u> 6g for other property classes	
<b>Thread</b>	International Standard	ISO 261, ISO 965-2, ISO 965-3	
	Property class/steel grade	8.8, 10.9, 12.9/ <u>12.9</u> <sup>a</sup>	A2-70, A3-70, A4-70, A5-70 A2-80, A3-80, A4-80, A5-80
<b>Mechanical property</b>	Marking symbol	08.8, 010.9, 012.9/ <u>012.9</u>	A2-070, A3-070, A4-070, A5-070 A2-080, A3-080, A4-080, A5-080 <sup>b</sup>
	International Standard	ISO 898-1 <sup>c</sup>	ISO 3506-1 <sup>d</sup>
	Product grade	A	
<b>Tolerance</b>	International Standard	ISO 4759-1	
	<b>Finish — Coating</b>	As processed. Requirements for electro-plating <sup>e</sup> are specified in ISO 4042. Requirements for non-electrolytically applied zinc flake coatings are specified in ISO 10683. Additional requirements or other finishes or coatings shall be agreed between the supplier and the purchaser.	As processed.
<b>Surface integrity</b>	Limits for surface discontinuities are specified in ISO 6157-1 and for property class 12.9/ <u>12.9</u> in ISO 6157-3.	—	
<b>Acceptability</b>	The acceptance inspection is specified in ISO 3269.		
<p><sup>a</sup> Caution is advised when the use of property class 12.9/<u>12.9</u> is considered. The capability of the fastener manufacturer, the service conditions and the wrenching methods should be considered. Environments can cause stress corrosion cracking of as processed fasteners as well as coated fasteners.</p> <p><sup>b</sup> The marking symbols for stainless steel fasteners with reduced loadability are intended to be included in the next revision of ISO 3506-1.</p> <p><sup>c</sup> Because of their head configurations, it is possible for these screws to not meet the minimum ultimate tensile loads specified in ISO 898-1. They shall nevertheless meet the other material and property requirements for the respective property class specified in ISO 898-1. In addition, when full-size screws are tensile tested in accordance with ISO 898-1, they shall withstand, without fracture, the minimum ultimate tensile loads given in Table 3. If tested to failure, the fracture may occur in the threaded section, the head, the shank or at the head/shank junction.</p> <p><sup>d</sup> Because of their head configurations, it is possible for these screws to not meet the minimum ultimate tensile loads specified in ISO 3506-1. They shall nevertheless meet the other material and property requirements for the respective steel grade specified in ISO 3506-1. In addition, when full-size screws are tensile tested in accordance with ISO 3506-1, they shall withstand, without fracture, the minimum ultimate tensile loads given in Table 3. If tested to failure, the fracture may occur in the threaded section, the head, the shank or at the head/shank junction. For reduced minimum ultimate tensile load values determined on the basis of <math>R_{m,min}</math> and <math>A_{s,nom}</math> in accordance with property classes 70 and 80 of ISO 3506-1, see Table 3.</p> <p><sup>e</sup> Electroplating should be avoided for screws of property class 12.9/<u>12.9</u>; see ISO 4042 for more information.</p>			

**Table 3 — Reduced minimum ultimate tensile loads for hexagon socket button head screws**

Thread, <i>d</i>	Property class				
	8.8 <sup>a</sup>	10.9 <sup>a</sup>	12.9/12.9 <sup>a</sup>	70 <sup>b</sup>	80 <sup>b</sup>
Reduced minimum ultimate tensile load N					
<b>M3</b>	3 220	4 180	4 910	2 810	3 220
<b>M4</b>	5 620	7 300	8 560	4 910	5 620
<b>M5</b>	9 080	11 800	13 800	7 950	9 080
<b>M6</b>	12 900	16 700	19 600	11 200	12 900
<b>M8</b>	23 400	30 500	35 700	20 400	23 400
<b>M10</b>	37 100	48 200	56 600	32 400	37 100
<b>M12</b>	53 900	70 200	82 400	47 200	53 900
<b>M16</b>	100 000	130 000	154 000	87 900	100 000

<sup>a</sup> 80 % of the values for  $F_{m,min}$  specified in ISO 898-1.

<sup>b</sup> 80 % of the values for  $F_{m,min}$  ( $R_{m,min} \times A_{s,nom}$ ).  $R_{m,min}$  and  $A_{s,nom}$  are specified in ISO 3506-1.

## 5 Designation

The designation and marking requirements for steel fasteners with reduced loadability shall apply as specified in ISO 898-1.

**EXAMPLE 1** A hexagon socket button head screw, thread M12, of nominal length  $l = 40$  mm and property class 10.9 in accordance with ISO 898-1, is designated as follows:

**Hexagon socket button head screw ISO 7380-1 - M12 × 40 - 010.9**

**EXAMPLE 2** A hexagon socket button head screw, thread M12, of nominal length  $l = 40$  mm, steel grade A2 and property class 70 in accordance with ISO 3506-1, is designated as follows:

**Hexagon socket button head screw ISO 7380-1 - M12 × 40 - A2-070**

## Bibliography

- [1] ISO 888, *Bolts, screws and studs — Nominal lengths, and thread lengths for general purpose bolts*

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