
INTERNATIONAL STANDARD



4759 / I

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Tolerances for fasteners —

**Part I : Bolts, screws and nuts with thread diameters $\geq 1,6$
and ≤ 150 mm and product grades A, B and C**

Tolérances pour éléments de fixation —

Partie I : Boulons, vis et écrous de diamètre de filetage $\geq 1,6$ et ≤ 150 mm et de niveau de finition A, B et C

First edition — 1978-12-15

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UDC 621.882 : 621.753.1

Ref. No. ISO 4759/I-1978 (E)

Descriptors : fasteners, bolts, screws, nuts (fasteners), dimensional tolerances, form tolerances, tolerances of position.

Price based on 18 pages

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 4759/1 was developed by Technical Committee ISO/TC 2, *Fasteners*, and was circulated to the member bodies in April 1977.

It has been approved by the member bodies of the following countries :

Austria	Germany	Norway
Belgium	Hungary	Poland
Brazil	India	Romania
Bulgaria	Ireland	South Africa, Rep. of
Canada	Italy	Spain
Chile	Japan	Switzerland
Czechoslovakia	Korea, Rep. of	Turkey
Denmark	Mexico	United Kingdom
Finland	Netherlands	U.S.S.R.
France	New Zealand	Yugoslavia

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Australia
Sweden
U.S.A.

Tolerances for fasteners — Part I : Bolts, screws and nuts with thread diameters $\geq 1,6$ and ≤ 150 mm and product grades A, B and C

1 SCOPE AND FIELD OF APPLICATION

This International Standard gives a selection of tolerances specified in ISO/R 286, *ISO system of limits and fits — Part I : General, tolerances and deviations*, and in ISO 965/III, *ISO general purpose metric screw threads — Tolerances — Part III : Deviations for constructional threads*, for use in the preparation of ISO product standards for bolts, screws and nuts with thread diameters from 1,6 up to an including 150 mm and product grades A, B and C.

Deviations from the tolerances in this International Standard are permitted in product standards only for valid technical reasons.

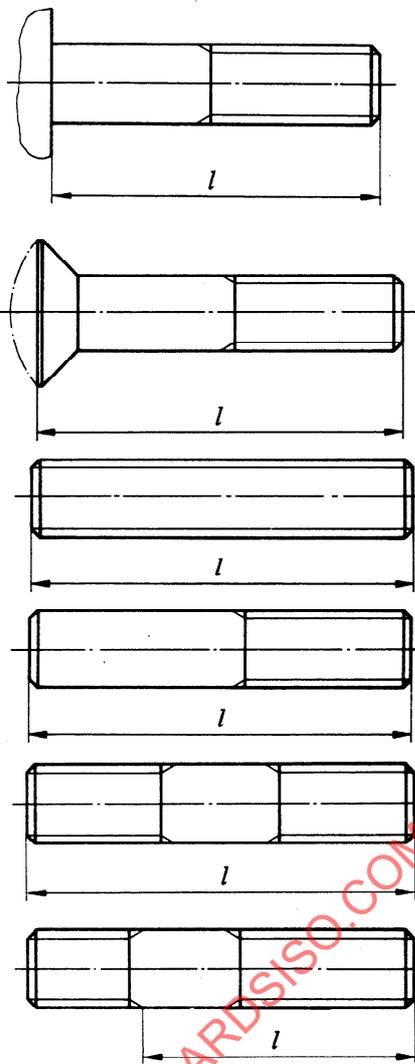
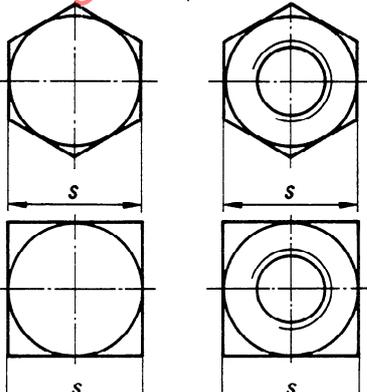
It is recommended that these tolerances should also be used for non-standardized fasteners.

The tolerances of form and of position conform to ISO/R 1101/I, *Technical drawings — Tolerances of form and of position — Part I : Generalities, symbols, indications on drawings*.

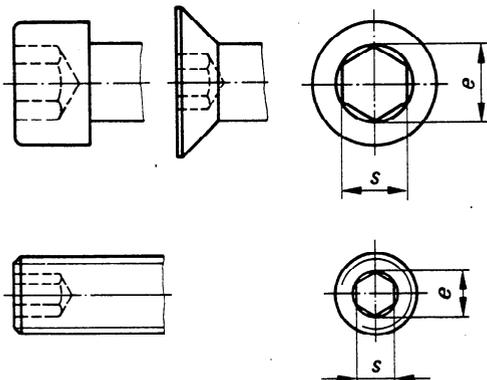
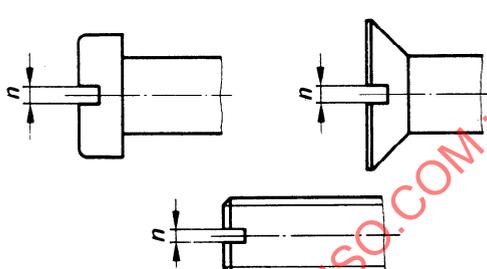
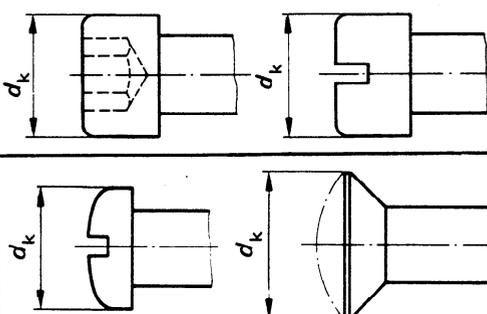
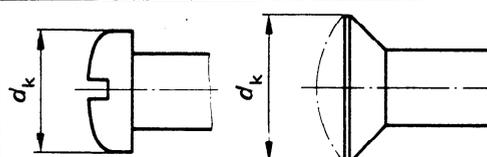
In cases where the maximum material principle according to ISO 1101/II, *Technical drawings — Tolerances of forms and of position — Part II : Maximum material principle*, is appropriate to certain features of certain products in these ISO product standards, other tolerances may be applicable.

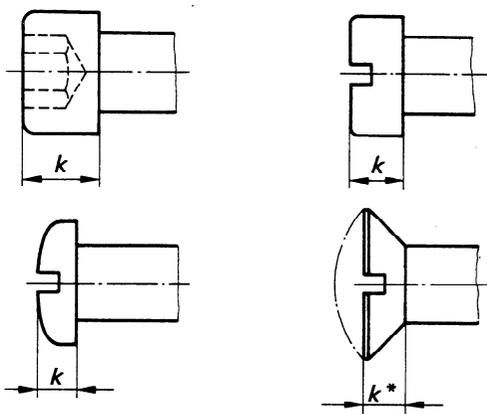
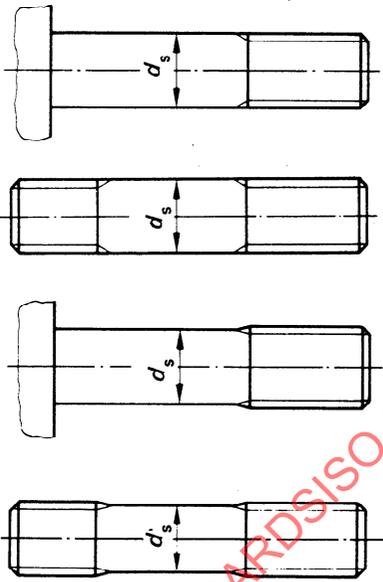
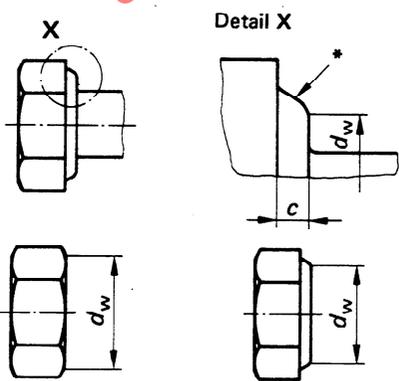
NOTE — The product grades refer to the quality of the product and to the size of the tolerances where grade A is the most precise and grade C is the least precise.

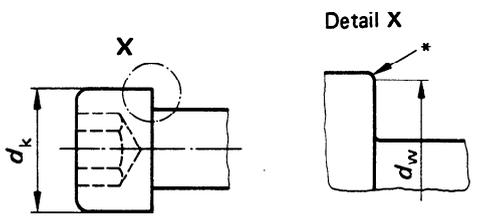
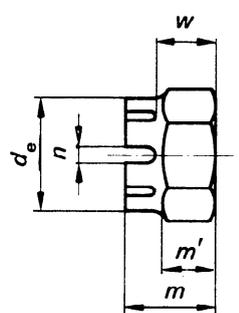
Feature	Tolerance for product grades			Notes
	A	B	C	
2 TOLERANCE LEVEL Shank and bearing surface Other features	close close	close wide	wide wide	
3 THREAD 3.1 Internal (nuts)	6H	6H	7H	For electroplated coatings and hot dip galvanizing, International Standards are in preparation. For all nuts of heights $\geq 0,8 d$ the minor diameter shall be within the specified tolerances for a minimum of $0,5 m$ nominal (only for sizes $\geq M3$). For all nuts of heights $\geq 0,5 d < 0,8 d$ the minor diameter shall be within the specified tolerances for a minimum of $0,35 m$ nominal. For prevailing torque type nuts the minor diameter may exceed the specified tolerance for a maximum height of $0,35 d$ from the non-restricted end.
3.2 External (bolts and screws)	6g	6g	8g	For electroplated coatings and hot dip galvanizing, International Standards are in preparation.
4 THREAD LENGTH				P = pitch of thread l_s is the minimum length of the unthreaded (plain) shank. l_g is the maximum length of the unthreaded shank (thread run-out included) and is therefore the minimum clamping length. Tolerance $+ 2 P$ only for such bolts where l_s and l_g are not fixed in the product standard * Only stud end of studs.
	$b + \frac{+ 2 P}{0}$	$b + \frac{+ 2 P}{0}$	$b + \frac{+ 2 P}{0}$	
	$b + \frac{+ 2 P}{0}$	$b + \frac{+ 2 P}{0}$	$b + \frac{+ 2 P}{0}$	
	$b + \frac{+ 2 P}{0}$ $b_1 j_s 16$	$b + \frac{+ 2 P}{0}$ $b_1 j_s 17$	$b + \frac{+ 2 P}{0}$ $b_1 j_s 17$	

Feature	Tolerance for product grades			Notes															
	A	B	C																
<p>5 NOMINAL LENGTH</p> 	<p>$j_s 15$ $j_s 16$ for machine screws with $l > 50$ mm</p>	<p>$j_s 17$</p>	<p>$l \leq 150 : j_s 17$ $l > 150 : 2 j_s 17$</p>																
<p>6 DRIVING GEOMETRIES</p> <p>6.1 External</p> <p>6.1.1 Widths across flats</p> 	<table border="1"> <thead> <tr> <th>s</th> <th>Tolerance</th> </tr> </thead> <tbody> <tr> <td>≤ 32</td> <td>h13</td> </tr> <tr> <td>> 32</td> <td>h14</td> </tr> </tbody> </table>	s	Tolerance	≤ 32	h13	> 32	h14	<table border="1"> <thead> <tr> <th>s</th> <th>Tolerance</th> </tr> </thead> <tbody> <tr> <td>≤ 19</td> <td>h14</td> </tr> <tr> <td>$> 19 \leq 60$</td> <td>h15</td> </tr> <tr> <td>$> 60 \leq 180$</td> <td>h16</td> </tr> <tr> <td>> 180</td> <td>h17</td> </tr> </tbody> </table>	s	Tolerance	≤ 19	h14	$> 19 \leq 60$	h15	$> 60 \leq 180$	h16	> 180	h17	
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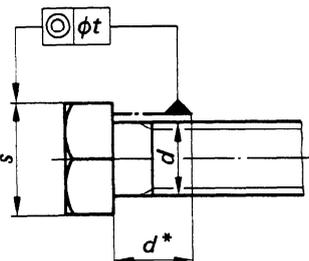
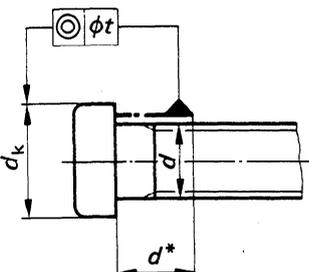
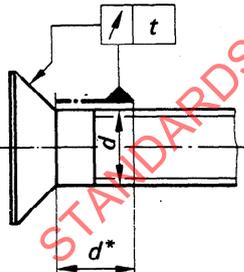
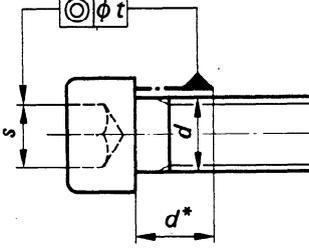
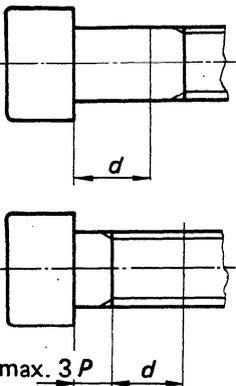
Feature	Tolerance for product grades			Notes						
	A	B	C							
<p>6.1.2 Widths across corners</p>	<p>$e_1 \text{ min.} \geq 1,13 s \text{ min.}$ $e_1 \text{ min.} \geq 1,12 s \text{ min.}$ for flanged products and other cold forged heads without trimming operation</p>									
	<p>$e_2 \text{ min.} \geq 1,3 s \text{ min.}$</p>									
<p>6.1.3 Height of heads</p>	<p>$j_s 14$</p>	<p>$j_s 15$</p>	<table border="1"> <thead> <tr> <th>k</th> <th>Tolerance</th> </tr> </thead> <tbody> <tr> <td>< 10</td> <td>$j_s 16$</td> </tr> <tr> <td>≥ 10</td> <td>$j_s 17$</td> </tr> </tbody> </table>	k	Tolerance	< 10	$j_s 16$	≥ 10	$j_s 17$	<p>* Shape of indentation by agreement between customer and supplier.</p>
k	Tolerance									
< 10	$j_s 16$									
≥ 10	$j_s 17$									
<p>6.1.4 Height of nuts</p>	<p>$\leq M12 : h14$ $> M12 \leq M18 : h15$ $> M18 : h16$</p>			<p>$h17$</p>						
<p>6.1.5 Effective gauging position</p>	<p>$k' \geq 0,7 k \text{ min.}$ k'' see product standard</p>									
	<p>$m' \geq 0,8 m \text{ min.}$ $m'' \geq 0,7 m \text{ min.}$</p>									

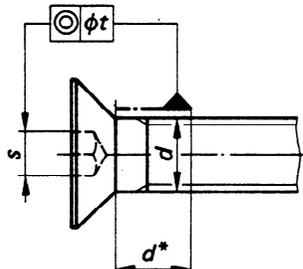
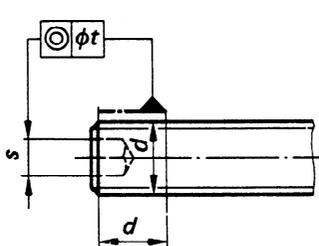
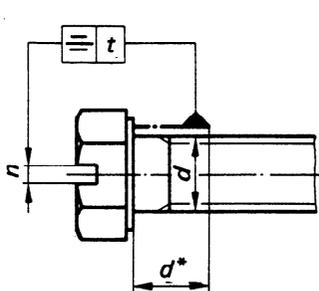
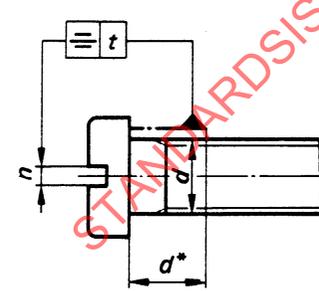
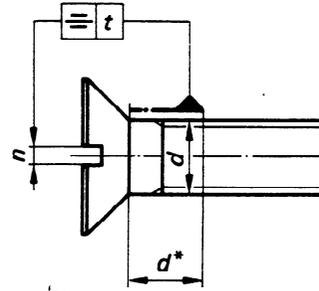
Feature	Tolerance for product grades			Notes																																					
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<p>6.2 Internal 6.2.1 Hexagon sockets</p> 	<table border="1"> <thead> <tr> <th rowspan="2">s</th> <th colspan="2">Tolerance</th> </tr> <tr> <th>*</th> <th>**</th> </tr> </thead> <tbody> <tr> <td>0,7</td> <td colspan="2">EF8</td> </tr> <tr> <td>0,9</td> <td colspan="2">JS9</td> </tr> <tr> <td>1,3</td> <td colspan="2">K9</td> </tr> <tr> <td>1,5</td> <td rowspan="2">D9</td> <td rowspan="2">D10</td> </tr> <tr> <td>2</td> </tr> <tr> <td>2,5</td> <td>D10</td> <td rowspan="2">D11</td> </tr> <tr> <td>3</td> <td>D11</td> </tr> <tr> <td>4</td> <td rowspan="4">E11</td> <td rowspan="4">E12</td> </tr> <tr> <td>5</td> </tr> <tr> <td>6</td> </tr> <tr> <td>8</td> </tr> <tr> <td>10</td> <td rowspan="3">E11</td> <td rowspan="3">E12</td> </tr> <tr> <td>12</td> </tr> <tr> <td>14</td> </tr> <tr> <td>> 14</td> <td colspan="2">D12</td> </tr> </tbody> </table>	s	Tolerance		*	**	0,7	EF8		0,9	JS9		1,3	K9		1,5	D9	D10	2	2,5	D10	D11	3	D11	4	E11	E12	5	6	8	10	E11	E12	12	14	> 14	D12				<p>* Tolerance fields for socket set screws (at present under consideration with the aim to use this tolerance field for 12.9 socket head cap screws too).</p> <p>** Tolerance fields for socket head cap screws.</p> <p>e min. ≥ 1,14 s min. Values for e min. see product standards.</p>
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<p>6.2.2 Slots</p> 	<table border="1"> <thead> <tr> <th>n</th> <th>Tolerance*</th> </tr> </thead> <tbody> <tr> <td>≦ 1</td> <td>+ 0,20 + 0,06</td> </tr> <tr> <td>> 1 ≦ 3</td> <td>+ 0,31 + 0,06</td> </tr> <tr> <td>> 3 ≦ 6</td> <td>+ 0,37 + 0,07</td> </tr> </tbody> </table>	n	Tolerance*	≦ 1	+ 0,20 + 0,06	> 1 ≦ 3	+ 0,31 + 0,06	> 3 ≦ 6	+ 0,37 + 0,07			<p>* Tolerance field C13 for n ≤ 1 C14 for n > 1</p>																													
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<p>6.2.3 Depth of hexagon sockets and slots</p>				<p>Tolerance depends on the method of measurement. See product standard.</p>																																					
<p>7 HEAD DIMENSIONS OF ROUND HEAD SCREWS 7.1 Diameters</p> 	<p>h13*</p>	<p>h14**</p>		<p>* ± IT13 for knurled heads ** ± IT14 for knurled heads</p>																																					
	<p>h14</p>	<p>h14</p>		<p>Combined control of diameter and height for countersunk head screws is recommended.</p>																																					

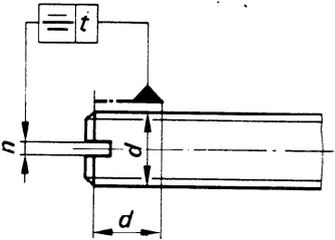
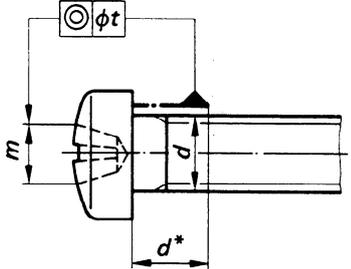
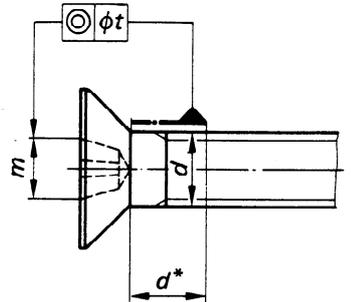
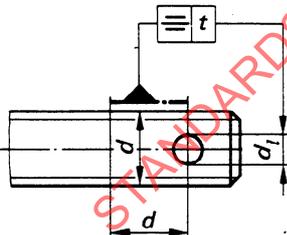
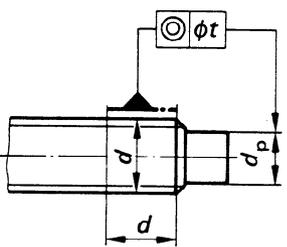
Feature	Tolerance for product grades			Notes																					
	A	B	C																						
<p>7.2 Heights</p> 	$\leq M 5 : h13$ $> M 5 : h14$	h14	—	<p>* Tolerance for heights of countersunk heads, see product standard.</p> <p>Combined control of diameter and height for countersunk head screws is recommended.</p>																					
<p>8 SHANK DIAMETERS</p> 	h13	h14	$\pm IT15$	<p>Allowance for the swelling under the head, see the relevant product standard.</p>																					
<p>9 BEARING AREA</p> 	<p>$d_w \text{ min.} = s \text{ min.} - IT16$ for width across flats $< 21 \text{ mm}$ $d_w \text{ min.} = 0,95 s \text{ min.}$ for width across flats $\geq 21 \text{ mm}$ $d_w \text{ max.} = s \text{ effective}$</p> <table border="1" data-bbox="718 1758 1045 2027"> <thead> <tr> <th rowspan="2">Thread diameter</th> <th colspan="2">c</th> </tr> <tr> <th>min.</th> <th>max.</th> </tr> </thead> <tbody> <tr> <td>3 and 4</td> <td>0,15</td> <td>0,4</td> </tr> <tr> <td>5 and 6</td> <td>0,15</td> <td>0,5</td> </tr> <tr> <td>8 to 14</td> <td>0,15</td> <td>0,6</td> </tr> <tr> <td>16 to 36</td> <td>0,2</td> <td>0,8</td> </tr> <tr> <td>over 36</td> <td>0,3</td> <td>1</td> </tr> </tbody> </table>			Thread diameter	c		min.	max.	3 and 4	0,15	0,4	5 and 6	0,15	0,5	8 to 14	0,15	0,6	16 to 36	0,2	0,8	over 36	0,3	1	<p>Shank diameter \approx pitch diameter</p>	<p>For product grade C a washer face is not mandatory.</p> <p>Values for $d_w \text{ min.}$, see product standard.</p> <p>* Form of the runout at the manufacture's discretion.</p>
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16 to 36	0,2	0,8																							
over 36	0,3	1																							

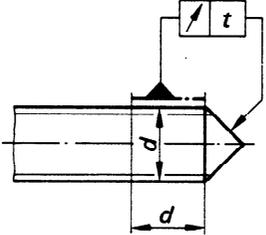
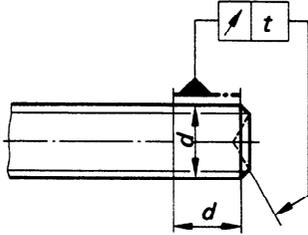
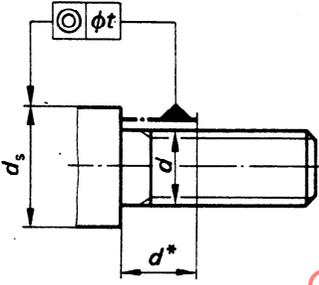
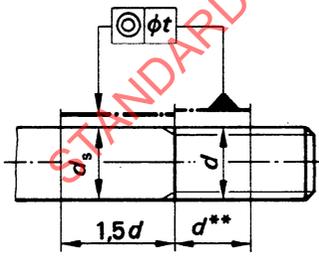
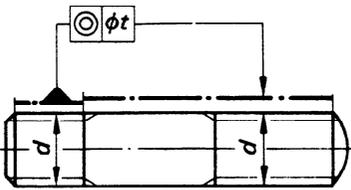
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<p>9 BEARING AREA (concluded)</p> 	<table border="1"> <thead> <tr> <th colspan="2">Thread diameter</th> <th>d_w min.</th> </tr> <tr> <th>over</th> <th>to</th> <th></th> </tr> </thead> <tbody> <tr> <td>2,5</td> <td>5</td> <td>d_k min. - 0,14</td> </tr> <tr> <td>5</td> <td>10</td> <td>d_k min. - 0,25</td> </tr> <tr> <td>10</td> <td>16</td> <td>d_k min. - 0,4</td> </tr> <tr> <td>16</td> <td>24</td> <td>d_k min. - 0,5</td> </tr> <tr> <td>24</td> <td>36</td> <td>d_k min. - 0,8</td> </tr> <tr> <td>36</td> <td></td> <td>d_k min. - 1</td> </tr> <tr> <td></td> <td></td> <td>d_k min. - 1,2</td> </tr> </tbody> </table>			Thread diameter		d_w min.	over	to		2,5	5	d_k min. - 0,14	5	10	d_k min. - 0,25	10	16	d_k min. - 0,4	16	24	d_k min. - 0,5	24	36	d_k min. - 0,8	36		d_k min. - 1			d_k min. - 1,2	<p>Values for d_w min. see product standard.</p> <p>* Form of the edge (rounded or chamfered) at the manufacture's discretion.</p>
Thread diameter		d_w min.																													
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36		d_k min. - 1																													
		d_k min. - 1,2																													
<p>10 OTHER DIMENSIONS</p> 	<table border="1"> <tbody> <tr> <td>d_e</td> <td>h14</td> <td>h15</td> <td>h16</td> </tr> <tr> <td>m</td> <td>h14</td> <td>h15</td> <td>h17</td> </tr> <tr> <td>m'</td> <td colspan="3">see 6.1.4</td> </tr> <tr> <td>n</td> <td>H14</td> <td>H14</td> <td>H15</td> </tr> <tr> <td>w</td> <td>h14</td> <td>h15</td> <td>h17</td> </tr> </tbody> </table>	d_e	h14	h15	h16	m	h14	h15	h17	m'	see 6.1.4			n	H14	H14	H15	w	h14	h15	h17										
d_e	h14	h15	h16																												
m	h14	h15	h17																												
m'	see 6.1.4																														
n	H14	H14	H15																												
w	h14	h15	h17																												

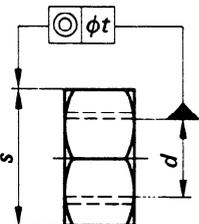
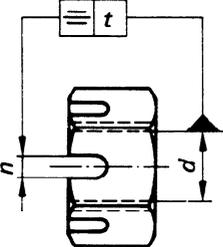
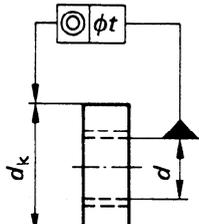
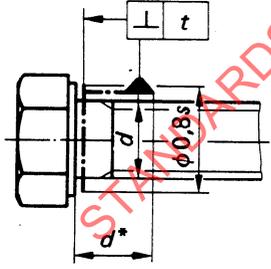
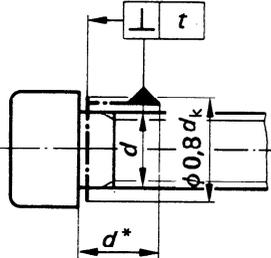
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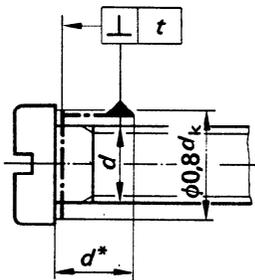
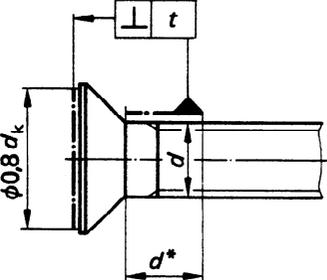
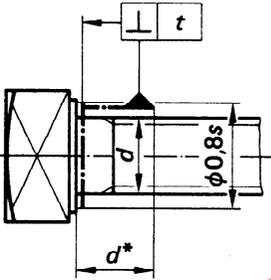
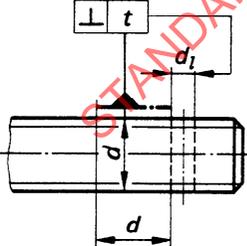
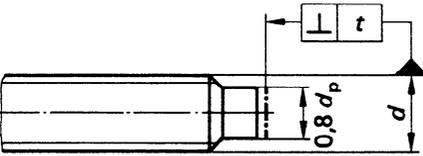
Feature	Tolerance t for product grades			Tolerance t based on dimension	Notes
	A	B	C		
11 TOLERANCES OF FORM AND POSITION In accordance with ISO 1101/I the tolerances of form and position indicated in figures 1 to 36 do not necessarily imply the use of any particular method of production measurement or gauging. For the use of the maximum material principle, see clause 1.					
11.1 Concentricity, symmetry and run-out					
 <p>FIGURE 1</p>	2 IT13	2 IT14	2 IT15		
 <p>FIGURE 2</p>	2 IT13	2 IT14	2 IT15	d_k	
 <p>FIGURE 3</p>	2 IT13	2 IT14	2 IT15	d	* The datum feature must not be partly shank partly thread. If necessary the datum feature d should be displaced at sufficient distance (max. $3P$) from the head of the screw (to avoid thread run-out X).
 <p>FIGURE 4</p>	2 IT13	—	—	d	

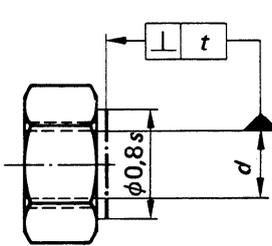
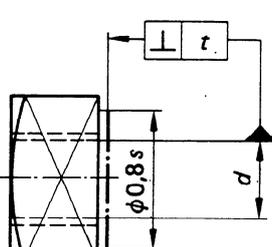
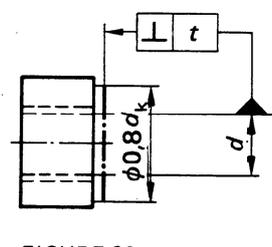
Feature	Tolerance t for product grades			Tolerance t based on dimension	Notes
	A	B	C		
 <p>FIGURE 5</p>	2 IT13	—	—	d	
 <p>FIGURE 6</p>	2 IT12	—	—	d	
 <p>FIGURE 7</p>	2 IT12	2 IT13	2 IT14	d	* see page 8
 <p>FIGURE 8</p>	2 IT12	2 IT13	2 IT14	d	
 <p>FIGURE 9</p>	2 IT12	2 IT13	2 IT14	d	

Feature	Tolerance t for product grades			Tolerance t based on dimension	Notes
	A	B	C		
 <p>FIGURE 10</p>	2 IT12	—	—	d	
 <p>FIGURE 11</p>	2 IT13	—	—	d	
 <p>FIGURE 12</p>	2 IT13	—	—	d	* see page 8
 <p>FIGURE 13</p>	2 IT13	2 IT14	2 IT15	d	
 <p>FIGURE 14</p>	2 IT13	—	—	d	

Feature	Tolerance t for product grades			Tolerance t based on dimension	Notes
	A	B	C		
 <p>FIGURE 15</p>	2 IT13	—	—	d	
 <p>FIGURE 16</p>	2 IT13	—	—	d	
 <p>FIGURE 17</p>	2 IT13	2 IT14	2 IT15	d	* see page 8
 <p>FIGURE 18</p>	2 IT13	2 IT14	2 IT15	d	** or length of the GO screw ring gauge for tolerance class 6 h.
 <p>FIGURE 19</p>	2 IT13	2 IT14	—	d	

Feature	Tolerance t for product grades			Tolerance t based on dimension	Notes
	A	B	C		
 <p>FIGURE 20</p>	2 IT13	2 IT14	2 IT15	s	
 <p>FIGURE 21</p>	2 IT13	2 IT14	2 IT15	d	
 <p>FIGURE 22</p>	2 IT13	—	—	d_k	
<p>11.2 Perpendicularity</p>  <p>FIGURE 23</p>	Values for t , see table, page 13.				<p>* see page 8</p> <p>measuring circle : 0,8 x width across flats or 0,8 x head diameter</p>
 <p>FIGURE 24</p>					

Feature	Tolerance t^{**} for product grades			Notes
	A	B	C	
 <p>FIGURE 25</p>				<p>d</p> <p>(.6)</p> <p>2</p> <p>2,5</p> <p>3</p> <p>3,5</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>10</p> <p>12</p> <p>14</p> <p>16</p> <p>18</p> <p>20</p> <p>22</p> <p>24</p> <p>27</p> <p>30</p> <p>33</p> <p>36</p> <p>39</p> <p>42</p> <p>45</p> <p>48</p> <p>52</p> <p>* see page 8</p> <p>measuring circle : 0,8 x width across flats or 0,8 x head diameter</p> <p>** Tolerance t calculated from an angle of 1° for product grades A and B and 2° for product grade C up to $d = 39$ mm and 30' or 1° respectively for sizes over 39 mm (in accordance with common practice).</p>
	0,05			
 <p>FIGURE 26</p>	0,1			
	0,15		0,3	
 <p>FIGURE 27</p>	0,18		0,36	
	0,24		0,48	
	0,27		0,54	
	0,31		0,62	
	0,34		0,68	
	0,38		0,76	
	0,42		0,84	
	0,45		0,90	
	0,50		1,00	
	0,57		1,14	
	0,64		1,28	
 <p>FIGURE 28</p>	0,70		1,40	
	0,77		1,54	
	0,84		1,68	
	0,45		0,90	
	0,49		0,98	
	0,52		1,04	
	0,56		1,12	
 <p>FIGURE 29</p>				

Feature	Tolerance τ^{**} for product grades			Notes
	A	B	C	
 <p>FIGURE 30</p>	0,05	-	d	measuring circle : 0,8 x width across flats or 0,8 x outside diameter ** see page 13.
			1,6	
			2	
			2,5	
			3	
			3,5	
			4	
			5	
			6	
			7	
 <p>FIGURE 31</p>	0,1	-	8	
			10	
			12	
			14	
			16	
			18	
			20	
			22	
			24	
			27	
 <p>FIGURE 32</p>	0,15	0,3	30	
			33	
			36	
			39	
			42	
			45	
			48	
			52	
			56	
			52	

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