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(ISO 4759-1 : 2000)

(JFRI/JSA)

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

ICS 21.060.10; 21.060.20

Reference number : JIS B 1021 : 2003 (E)

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee, as the result of proposal for revision of Japanese Industrial Standard submitted by The Japan Research Institute for Screw Threads and Fasteners (JFRI)/ the Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14. Consequently **JIS B 1021 : 1985** is replaced with this Standard.

This revision has been made based on **ISO 4759-1 : 2000** *Tolerances for fasteners—Part 1 : Bolts, screws, studs and nuts—Product grades A, B and C* for the purposes of making easy to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of International Standard which is based on Japanese Industrial Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

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the original JIS is to be the final authority.

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

Introduction This Japanese Industrial Standard has been prepared based on the second edition of **ISO 4759-1 : 2000** *Tolerances for fasteners—Part 1 : Bolts, screws, studs and nuts—Product grades A, B and C* published in 2000 without modifying the technical contents.

1 Scope This Standard specifies a selection of tolerances for bolts, screws, studs and nuts with **ISO** metric threads and with product grades A, B and C and for tapping screws with product grade A.

NOTE 1 The product grades refer to the size of the tolerances where grade A is the most precise and grade C is the least precise.

NOTE 2 The International Standard corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are **IDT** (identical), **MOD** (modified), and **NEQ** (not equivalent) according to **ISO/IEC Guide 21**.

ISO 4759-1 : 2000 *Tolerances for fasteners—Part 1 : Bolts, screws, studs and nuts—Product grades A, B and C* (**IDT**)

The tolerances, except tolerances for threads, are selected from the system of limits and fits specified in **JIS B 0401-1** and **JIS B 0401-2**. The tolerances for metric threads are taken from the series of tolerance classes specified in **JIS B 0209-3**. The tolerances for tapping screw threads are covered in **JIS B 1007**.

The tolerances of form and position are specified and indicated in accordance with **JIS B 0021**, **JIS B 0023** and **JIS B 0024**.

The tolerances specified in this Standard apply to fasteners prior to coating unless otherwise specified. See also **JIS B 1044**.

Deviations from the tolerances specified in this Standard are only permitted in product standards where there are valid technical reasons. In cases where there is a difference between the tolerance requirements in this Standard and the product standard, the product standard takes precedence.

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

Dimensions and tolerances given in this Standard are in millimetres.

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS B 0021 *Geometrical product specification (GPS)—Geometrical tolerancing—Tolerancing of form, orientation, location and run-out*

NOTE : **ISO/DIS 1101** : 1996 *Geometrical product specifications (GPS)—Geometrical tolerancing—Tolerancing of form, orientation, location and run-out* is identical with the said standard.

JIS B 0023 *Technical drawings—Geometrical tolerancing—Maximum material requirement and least material requirement*

NOTE : **ISO 2692** : 1988 *Technical drawings—Geometrical tolerancing—Maximum material principle* is identical with the said standard.

JIS B 0024 *Technical drawings—Fundamental tolerancing principle*

NOTE : **ISO 8015** : 1985 *Technical drawings—Fundamental tolerancing principle* is identical with the said standard.

JIS B 0143 *Symbols and designations of dimensions for threaded fasteners*

NOTE : **ISO 225** : 1983 *Fasteners—Bolts, screws, studs and nuts—Symbols and designation of dimensions* is equivalent to the said standard.

JIS B 0209-3 *ISO general purpose metric screw threads—Tolerances—Part 3 : Deviations for constructional screw threads*

NOTE : **ISO 965-3** : 1988 *ISO general purpose metric screw threads—Tolerances—Part 3 : Deviations for constructional screw threads* is identical with the said standard.

JIS B 0401-1 *ISO system of limits and fits—Part 1 : Bases of tolerances, deviations and fits*

NOTE : **ISO 286-1** : 1988 *ISO system of limits and fits—Part 1 : Bases of tolerances, deviations and fits* is identical with the said standard.

JIS B 0401-2 *ISO system of limits and fits—Part 2 : Tables of standard tolerance grades and limit deviations for holes and shafts*

NOTE : **ISO 286-2** : 1988 *ISO system of limits and fits—Part 2 : Tables of standard tolerance grades and limit deviations for holes and shafts* is identical with the said standard.

JIS B 1005 *Radii under the head for external threaded fasteners*

NOTE : **ISO 885** : 2000 *General purpose bolts and screws—Metric series—Radii under the head* is identical with the said standard.

JIS B 1007 *Threads and thread ends for tapping screws*

NOTE : **ISO 1478** : 1999 *Tapping screws thread* is equivalent to the said standard.

JIS B 1012 *Cross recesses for screws*

NOTE : **ISO 4757** : 1983 *Cross recesses for screws* is equivalent to the said standard.

JIS B 1013 *Countersunk head screws—Head configuration and gauging*

NOTE : **ISO 7721** : 1983 *Countersunk head screws—Head configuration and gauging* is identical with the said standard.

JIS B 1015 *Hexalobular internal driving feature for bolts and screws*

NOTE : **ISO 10664** : 1999 *Hexalobular internal driving feature for bolts and screws* is identical with the said standard.

JIS B 1044 *Fasteners—Electroplated coatings*

NOTE : **ISO 4042** : 1999 *Fasteners—Electroplated coatings* is identical with the said standard.

JIS B 1123 *Hexagon head tapping screws*

NOTE : **ISO 1479** : 1983 *Hexagon head tapping screws* is equivalent to the said standard.

JIS B 1126 *Hexagon washer head tapping screws*

NOTE : **ISO 7053** : 1992 *Hexagon washer head tapping screws* is identical with the said standard.

JIS B 1127 *Hexagon flange head tapping screws*

NOTE : **ISO 10509** : 1992 *Hexagon flange head tapping screws* is identical with the said standard.

JIS B 1181 *Hexagon nuts and hexagon thin nuts*

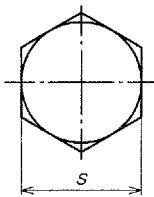
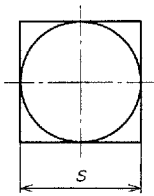
NOTE : **ISO 4032** : 1999 *Hexagon nuts, style 1—Product grades A and B* is equivalent to the said standard.

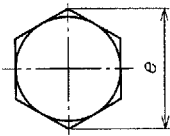
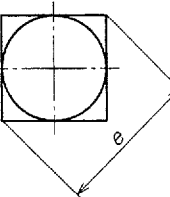
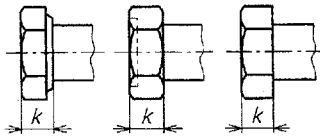
JIS B 1194 *Hexagon socket countersunk head screws*

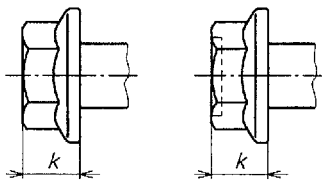
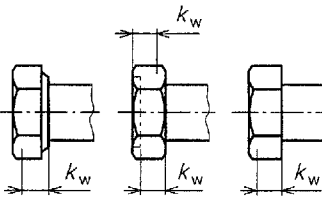
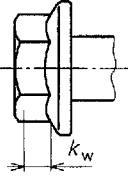
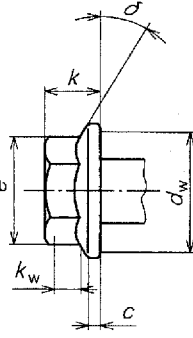
NOTE : **ISO 10642** : 1997 *Hexagon socket countersunk head screws* is identical with the said standard.

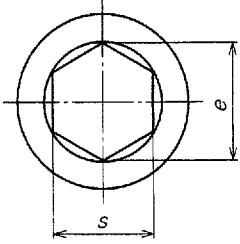
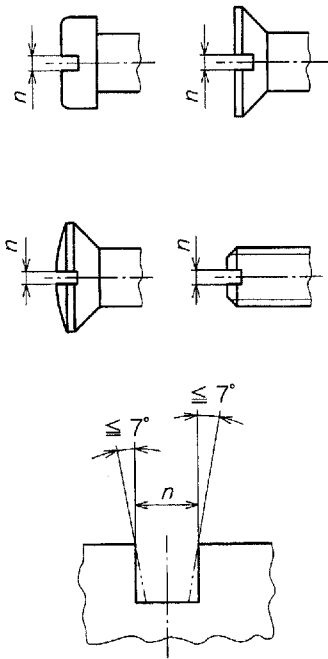
3 Tolerances for metric bolts, screws and studs

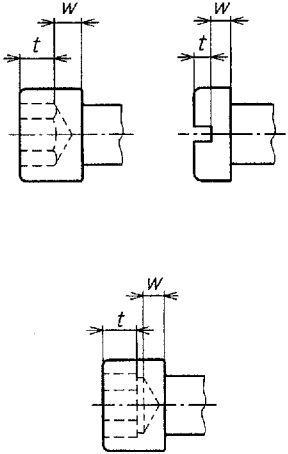
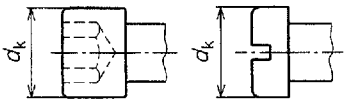
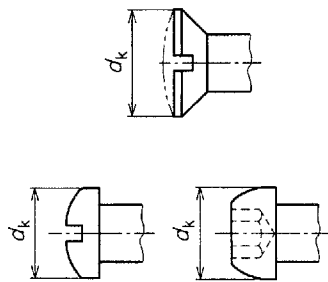
3.1 Dimensional tolerances Symbols and designations of dimensions are specified in JIS B 0143.

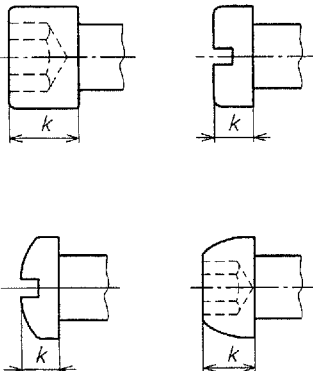
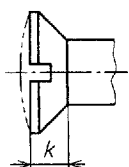
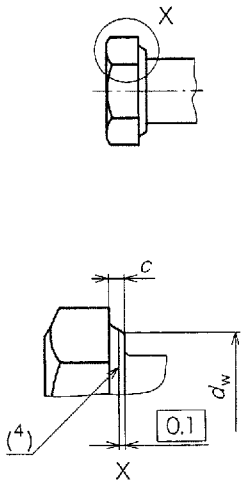
Feature	Tolerance for product grades			Notes
	A	B	C	
3.1.1 Tolerance level Shank and bearing surface Other features	close close	close wide	wide wide	
3.1.2 External thread	6g	6g	8g (but 6g for property class 8.8 and higher)	For certain products and coatings, other tolerance classes for threads may be specified in the relevant product and coating standards.
3.1.3 Driving features 3.1.3.1 External 3.1.3.1.1 Width across flats				
 Figure 1  Figure 2	s	Tolerance	s	Tolerance
	≤30	h13	≤ 18	h14
	>30	h14	> 18 ≤ 60	h15
			> 60 ≤180	h16
			>180	h17

Feature	Tolerance for product grades			Notes
	A	B	C	
3.1.3.1.2 Width across corners  Figure 3	$e_{\min} = 1.13s_{\min}$ $e_{\min} = 1.12s_{\min}$ for bolts and screws with flange and other cold forged heads without trimming operation			
 Figure 4	$e_{\min} = 1.13s_{\min}$			
3.1.3.1.3 Height of head  Figure 5	js14	js15		
			<i>k</i>	Tolerance
			< 10	js16
	≥ 10	js17		

Feature	Tolerance for product grades			Notes
	A	B	C	
 Figure 6	For hexagon bolts and screws with flange, k is defined only as a maximum.			
3.1.3.1.4 Wrenching height  Figure 7	$k_{w(1)\min} = 0.7k_{\min}$			k_w defines the length over which $e_{\min}$ applies but excluding any chamfer, washer face or radius specified in the appropriate product standard. The formulae for $k_{w\min}$ only apply to the products illustrated. Note (1) The symbol k_w replaces the previously used k'. Note (2) For gauging, see annex A of the product standards.
 Figure 8	$k_{w\min(2)}$ $= 0.7 \left[(k_{\max} - IT15) - \left(x + \frac{d_{w\min} - e_{\min}}{2} \tan \delta_{\max} \right) \right]$ x is the greater of $c_{\min} \times 1.25$ or $c_{\min} + 0.4$ δ is the flange angle Dimensions $k_{w(1)}$, k, d_w, e, c and δ are in accordance with JIS B 0143.  Figure 8 a)			

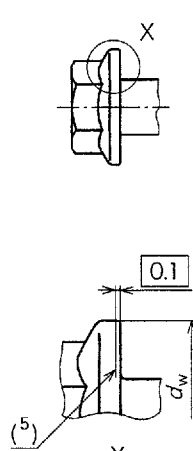
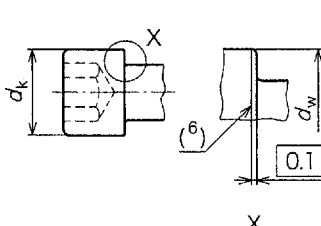
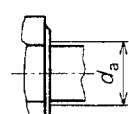
Feature	Tolerance for product grades			Notes
	A	B	C	
3.1.3.2 Internal 3.1.3.2.1 Hexagon sockets  Figure 9	$e_{\min} = 1.14 s_{\min}$		—	—
	<i>s</i>	Tolerance		
	0.7	EF8		
	0.9	JS9		
	1.3	K9		
	1.5	D11		
	2			
	2.5			
	3			
	4	E11		
	5	E12		
	6			
	8			
	10			
	12			
	14			
	>14	D12		
3.1.3.2.2 Slots  Figure 10	<i>n</i>	Tolerance	—	Tolerance field C13 for $n \leq 1$ C14 for $n > 1$
	≤ 1	+0.20 +0.06		
	$> 1 \leq 3$	+0.31 +0.06		
	$> 3 \leq 6$	+0.37 +0.07		

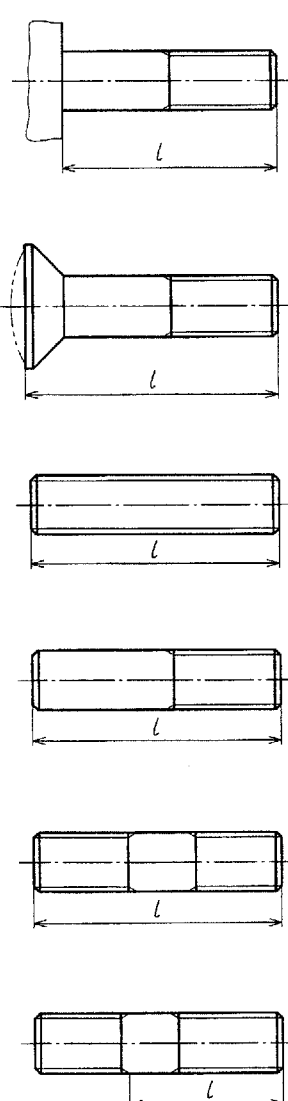
Feature	Tolerance for product grades			Notes
	A	B	C	
3.1.3.2.3 Depth of hexagon sockets and slots  Figure 11	The depth of hexagon sockets and slots is specified in product standards only as a minimum. It is restricted by the minimum wall thickness w.	—	—	For the time being generally applicable tolerances cannot be specified.
3.1.3.2.4 Cross recesses	See JIS B 1012 for all dimensions except penetration depths. For penetration depths see appropriate product standard.			
3.1.3.2.5 Hexalobular recesses	See JIS B 1015 for all dimensions except penetration depths. For penetration depths see appropriate product standard.			
3.1.4 Other features 3.1.4.1 Head diameter  Figure 12	$h13^{(3)}$	—	—	Note ⁽³⁾ $\pm IT13$ for knurled heads
 Figure 13	$h14$	—	—	Combined control of diameter and height for counter-sunk head screws in accordance with JIS B 1013 or JIS B 1194 .

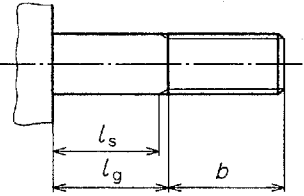
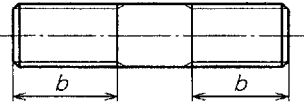
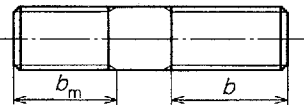
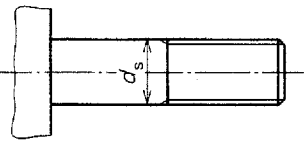
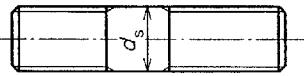
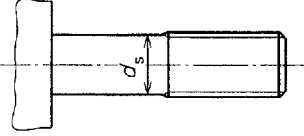
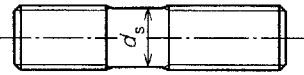
Feature	Tolerance for product grades			Notes																											
	A	B	C																												
3.1.4.2 Head height (except for hexagon heads)  Figure 14	$\leq M5 : h13$ $> M5 : h14$	—	—																												
 Figure 15	For countersunk head screws k is defined in product standards only as a maximum.			Combined control of diameter and height for countersunk head screws in accordance with JIS B 1013 or JIS B 1194 .																											
3.1.4.3 Bearing face diameter and height of washer-faced portion  Figure 16	$d_{w \min} = s_{\min} - IT16$ for width across flats < 21 mm $d_{w \min} = 0.95s_{\min}$ for width across flats ≥ 21 mm $d_{w \max} = s_{\text{actual}}$			For product grade C a washer face is not mandatory.																											
<table><tr><th rowspan="2">Thread diameter</th><th colspan="2">c</th></tr><tr><th>min.</th><th>max.</th></tr><tr><td>≤ 1.6</td><td>≤ 2.5</td><td>0.10</td><td>0.25</td></tr><tr><td>> 2.5</td><td>≤ 4</td><td>0.15</td><td>0.40</td></tr><tr><td>> 4</td><td>≤ 6</td><td>0.15</td><td>0.50</td></tr><tr><td>> 6</td><td>≤ 14</td><td>0.15</td><td>0.60</td></tr><tr><td>> 14</td><td>≤ 36</td><td>0.20</td><td>0.80</td></tr><tr><td>> 36</td><td></td><td>0.30</td><td>1.0</td></tr></table>			Thread diameter		c		min.	max.	≤ 1.6	≤ 2.5	0.10	0.25	> 2.5	≤ 4	0.15	0.40	> 4	≤ 6	0.15	0.50	> 6	≤ 14	0.15	0.60	> 14	≤ 36	0.20	0.80	> 36		0.30
Thread diameter	c																														
	min.	max.																													
≤ 1.6	≤ 2.5	0.10	0.25																												
> 2.5	≤ 4	0.15	0.40																												
> 4	≤ 6	0.15	0.50																												
> 6	≤ 14	0.15	0.60																												
> 14	≤ 36	0.20	0.80																												
> 36		0.30	1.0																												

Note ⁽⁴⁾ Reference datum for d_w

Note (*) Reference datum for d_w

Feature	Tolerance for product grades			Notes																											
	A	B	C																												
 Note (5) Reference datum for d_w Figure 17	d_w is defined in product standards only as a minimum.																														
 Note (6) Reference datum for d_w Figure 18	<table><tr><th colspan="2">Thread diameter</th><th>d_w</th></tr><tr><th>></th><th>≤</th><th>min.</th></tr><tr><td></td><td>2.5</td><td>$d_{k \min} - 0.14$</td></tr><tr><td>2.5</td><td>5</td><td>$d_{k \min} - 0.25$</td></tr><tr><td>5</td><td>10</td><td>$d_{k \min} - 0.4$</td></tr><tr><td>10</td><td>16</td><td>$d_{k \min} - 0.5$</td></tr><tr><td>16</td><td>24</td><td>$d_{k \min} - 0.8$</td></tr><tr><td>24</td><td>36</td><td>$d_{k \min} - 1$</td></tr><tr><td>36</td><td>—</td><td>$d_{k \min} - 1.2$</td></tr></table>			Thread diameter		d_w	>	≤	min.		2.5	$d_{k \min} - 0.14$	2.5	5	$d_{k \min} - 0.25$	5	10	$d_{k \min} - 0.4$	10	16	$d_{k \min} - 0.5$	16	24	$d_{k \min} - 0.8$	24	36	$d_{k \min} - 1$	36	—	$d_{k \min} - 1.2$	For product grade A only
Thread diameter		d_w																													
>	≤	min.																													
	2.5	$d_{k \min} - 0.14$																													
2.5	5	$d_{k \min} - 0.25$																													
5	10	$d_{k \min} - 0.4$																													
10	16	$d_{k \min} - 0.5$																													
16	24	$d_{k \min} - 0.8$																													
24	36	$d_{k \min} - 1$																													
36	—	$d_{k \min} - 1.2$																													
 Figure 19	d_a for products without undercut is specified in JIS B 1005 .			d_a for undercut products, see the appropriate product standard.																											

Feature	Tolerance for product grades			Notes
	A	B	C	
3.1.4.4 Length  Figure 20	js15	js17	$l \leq 150 : js17$ $l > 150 : \pm IT17$	

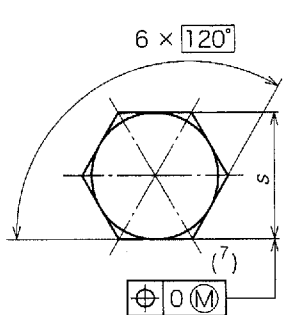
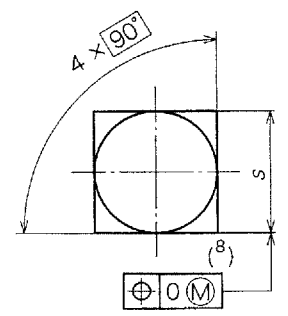
Feature	Tolerance for product grades			Notes
	A	B	C	
3.1.4.5 Thread length Bolt  Tie rod  Stud  Figure 21	b_0^{+2P}	b_0^{+2P}	b_0^{+2P}	P is the pitch of thread. l_s is the minimum length of the unthreaded (plain) shank. l_g is the maximum length of the unthreaded shank (thread run-out included) and is therefore the minimum clamping length. Tolerance $+2P$ related to dimension b applies only where l_s and l_g are not specified in the product standard. b_m refers to metal end of studs only.
3.1.4.6 Shank diameter     Figure 22	h13	h14	$\pm IT15$	The tolerance is not applicable in the areas of the underhead fillet and thread run-out.
	Reduced shank diameter $\approx$ pitch diameter			

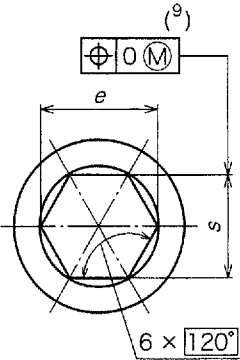
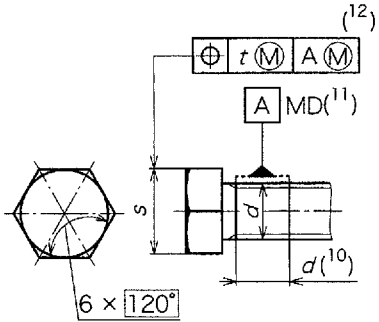
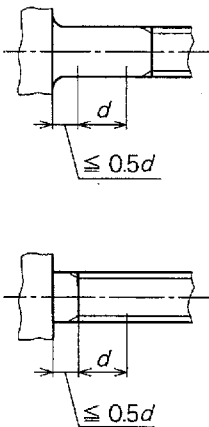
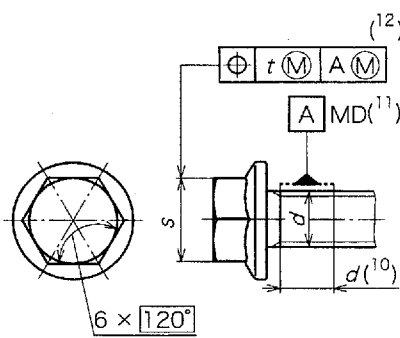
3.2 Geometrical tolerances In accordance with **JIS B 0021** and **JIS B 0023** the tolerances specified in Figures 23 to 57 do not necessarily imply the use of any particular method of production, measurement or gauging.

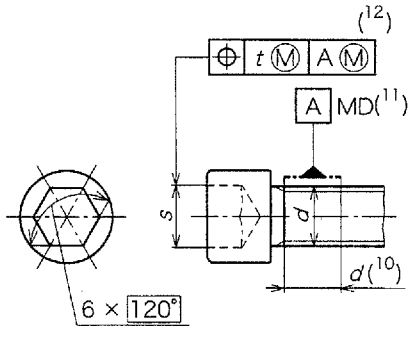
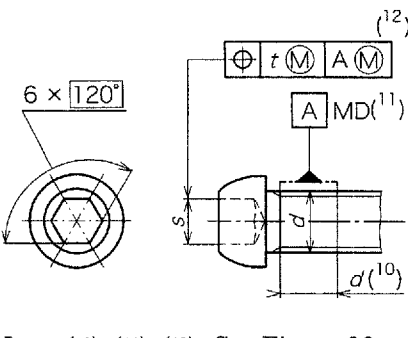
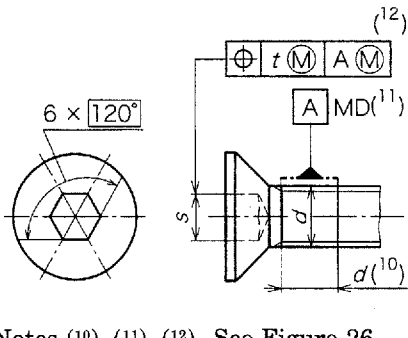
When the pitch diameter axis is specified as the datum and the coaxiality deviation of the major diameter axis relative to the pitch diameter axis is negligible, e.g. normally with rolled threads, the major diameter axis may be taken as the datum.

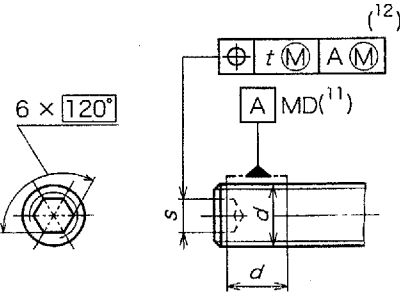
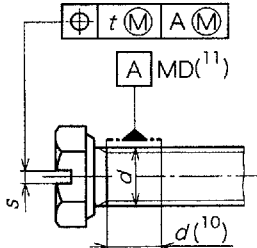
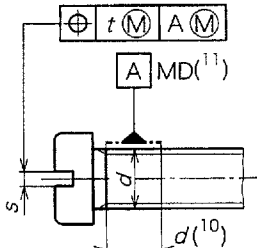
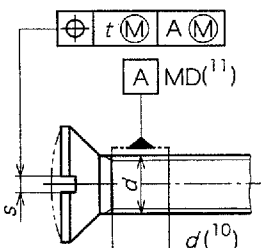
According to **JIS B 0021** when the datum is the thread axis the letters MD indicate that the datum reference is the major diameter axis.

The maximum material principle in accordance with **JIS B 0023** is used.

Feature	Tolerance t for product grades			Notes
	A	B	C	
3.2.1 Driving feature 3.2.1.1 Tolerances of form 3.2.1.1.1 External  Note (7) 3 × simultaneously. Figure 23  Note (8) 2 × simultaneously. Figure 24				

Feature	Tolerance t for product grades			Tolerance t based on dimensions	Notes
	A	B	C		
3.2.1.1.2 Internal  Note ⁽⁹⁾ 3 × simultaneously. Figure 25					
3.2.1.2 Tolerances of position  Note ⁽¹⁰⁾ The datum A shall be as close to the head as possible but within $0.5d$ distance of the head and shall be either wholly plain or wholly threaded but shall not include the thread run-out or underhead fillet. Note ⁽¹¹⁾ MD means that tolerance applies in relation to the axis of the cylinder derived from the major thread diameter (see JIS B 0021). Note ⁽¹²⁾ 3 × simultaneously. Figure 26	2IT13	2IT14	2IT15	s	
 Notes ⁽¹⁰⁾, ⁽¹¹⁾, ⁽¹²⁾ See Figure 26. Figure 27	2IT13	2IT14	—	s	

Feature	Tolerance t for product grades			Tolerance t based on dimensions	Notes
	A	B	C		
 Notes ⁽¹⁰⁾, ⁽¹¹⁾, ⁽¹²⁾ See Figure 26. Figure 28	2IT13	—	—	d	
 Notes ⁽¹⁰⁾, ⁽¹¹⁾, ⁽¹²⁾ See Figure 26. Figure 29	2IT13	—	—	d	
 Notes ⁽¹⁰⁾, ⁽¹¹⁾, ⁽¹²⁾ See Figure 26. Figure 30	2IT13	—	—	d	

Feature	Tolerance t for product grades			Tolerance t based on dimensions	Notes
	A	B	C		
 Notes ⁽¹¹⁾, ⁽¹²⁾ See Figure 26. Figure 31	2IT12	—	—	d	
 Notes ⁽¹⁰⁾, ⁽¹¹⁾ See Figure 26. Figure 32	2IT12	2IT13	2IT14	d	
 Notes ⁽¹⁰⁾, ⁽¹¹⁾ See Figure 26. Figure 33	2IT12	2IT13	2IT14	d	
 Notes ⁽¹⁰⁾, ⁽¹¹⁾ See Figure 26. Figure 34	2IT12	2IT13	2IT14	d	