

# JIS

JAPANESE  
INDUSTRIAL  
STANDARD

Translated and Published by  
Japanese Standards Association

---

---

**JIS B 1186** : 2013

(JSSC)

**Sets of high strength hexagon bolt,  
hexagon nut and plain washers for  
friction grip joints**

JIS B1186-2013(en) (1)

---

ICS 21.060.10;21.060.20;21.060.30

Reference number : JIS B 1186 : 2013 (E)

PROTECTED BY COPYRIGHT

11 S

B 1186 : 2013

Date of Establishment: 1964-06-01

Date of Revision: 2013-06-20

Date of Public Notice in Official Gazette: 2013-06-20

Investigated by: Japanese Industrial Standards Committee

Standards Board

Technical Committee on Machine Elements

---

JIS B 1186 : 2013, First English edition published in 2014-02

Translated and published by: Japanese Standards Association  
Mita MT Building, 3-13-12, Mita, Minato-ku, Tokyo, 108-0073 JAPAN

---

In the event of any doubts arising as to the contents,  
the original JIS is to be the final authority.

© JSA 2014

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Printed in Japan

KK/HN

PROTECTED BY COPYRIGHT

## Contents

	Page
Introduction .....	1
1 Scope .....	1
2 Normative references .....	1
3 Terms and definitions .....	2
4 Composition and class/grade of set .....	2
4.1 Composition of set .....	2
4.2 Class/grade .....	2
4.3 Composition of lot .....	3
5 Mechanical properties .....	4
5.1 Mechanical properties of bolts .....	4
5.2 Mechanical properties of nuts .....	4
5.3 Hardness of washers .....	5
6 Torque coefficient values of sets .....	5
7 Shapes and dimensions .....	5
8 Screw threads .....	8
9 Appearance .....	8
9.1 Appearance of bolts .....	8
9.2 Appearance of nuts .....	8
9.3 Appearance of washers .....	8
10 Materials .....	8
11 Lubricating and anticorrosive treatment .....	8
12 Test and measuring method .....	8
12.1 Tests on mechanical properties of bolts .....	8
12.2 Tests on mechanical properties of nuts .....	11
12.3 Hardness test on washers .....	11
12.4 Test on torque coefficient values of sets .....	11
13 Inspections .....	12
13.1 Inspection on shapes and dimensions .....	12
13.2 Inspection on screw threads .....	12
13.3 Inspection on appearance .....	12
13.4 Inspections on mechanical properties .....	13
13.5 Inspection on torque coefficient values of sets .....	14
14 Designation of products .....	15

B 1186 : 2013

15	Marking .....	15
15.1	Marking on products .....	15
15.2	Marking on package .....	16

## 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 Japanese Society of Steel Construction (JSSC) 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 1186: 2007** is replaced with this Standard.

However, **JIS B 1186: 2007** may be applied in the **JIS** mark certification based on the relevant provisions of Article 19 Clause 1, etc. of the Industrial Standardization Law until June 19, 2014.

This **JIS** document is protected by the Copyright Law.

Attention is drawn to the possibility that some parts of this Standard may conflict with patent rights, applications for a patent after opening to the public or utility model rights. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying any of such patent rights, applications for a patent after opening to the public or utility model rights.

## Sets of high strength hexagon bolt, hexagon nut and plain washers for friction grip joints

### Introduction

This Japanese Industrial Standard was established in 1964 and has gone through seven revisions up to the present ; however, it has not undergone the substantial revision since 1995. The revision at this time is to correspond to the subsequent advancement and quality improvement of manufacturing technologies.

No corresponding International Standard has been established at this point.

### 1 Scope

This Standard specifies the sets of high strength hexagon bolt, hexagon nut and plain washers for friction grip joints (hereafter referred to as "sets") used mainly for steel structures.

### 2 Normative references

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

- JIS B 0101 *Screw threads and fasteners — Vocabulary*
- JIS B 0205-3 *ISO general purpose metric screw threads — Part 3 : Selected sizes for screws, bolts and nuts*
- JIS B 0209-2 *ISO general purpose metric screw threads — Tolerances — Part 2 : Limits of sizes for general purpose external and internal screw threads — Medium quality*
- JIS B 0251 *Limit gauges for metric screw threads*
- JIS B 4652 *Hand torque tools — Requirements and test methods*
- JIS Z 2241 *Metallic materials — Tensile testing — Method of test at room temperature*
- JIS Z 2245 *Rockwell hardness test — Test method*
- JIS Z 2320 (series) *Non-destructive testing — Magnetic particle testing*
- JIS Z 2343-1 *Non-destructive testing — Penetrant testing — Part 1 : General principles — Method for liquid penetrant testing and classification of the penetrant indication*
- JIS Z 8401 *Guide to the rounding of numbers*
- JIS Z 9003 *Single sampling inspection plans having desired operation characteris-*

*tics by variables (standard deviation known)*

### 3 Terms and definitions

For the purposes of this Standard, the terms and definitions given in **JIS B 0101** and the following apply.

#### 3.1 axial tension

tensile force acting in axial direction of a bolt when a member is fastened with a bolt and a nut for application

#### 3.2 proof load

maximum axial tension permissible for the threaded part when a member is fastened with the thread part of a bolt and a nut for application

#### 3.3 torque coefficient value

value obtained by dividing the fastening torque when a member is fastened with a bolt and a nut by the product of the generated axial tension and the nominal bolt diameter

### 4 Composition and class/grade of set

#### 4.1 Composition of set

A set shall be composed of one piece of the high strength hexagon bolt for friction grip joint (hereafter, referred to as "a bolt"), one piece of high strength hexagon nut for friction grip joint (hereafter, referred to as "a nut") and two pieces of high strength plain washers for friction grip joint (hereafter, referred to as "washers") specified in 4.2.

#### 4.2 Class/grade

The sets shall be classified into Class 1 and Class 2 according to the mechanical properties of the components thereof, and each shall be further classified into A and B according to the torque coefficient values. The grades of components of the sets shall be determined according to the respective mechanical properties given in table 2 to table 5.

The combination of the classes of sets and the grades according to the mechanical properties of components shall be as given in table 1.

**Table 1 Combination of classes of sets and grades according to mechanical properties of components**

Class of set		Grade according to mechanical properties of applicable component		
Class according to mechanical properties	Class according to torque coefficient value	Bolt	Nut	Washer
Class 1	A	F8T	F10	F35
	B			
Class 2	A	F10T		
	B			

### 4.3 Composition of lot

#### 4.3.1 General

The lot includes the manufacturing lot of each component and the set lot of the combination thereof, and shall be as specified in 4.3.2 to 4.3.5, respectively.

#### 4.3.2 Manufacturing lot of bolts

The manufacturing lot of bolts shall consist of the following.

- a) Heat number of material (steel product)
- b) Grade according to mechanical properties
- c) Designation of screw threads
- d) Length (*l*)
- e) Machining process
- f) Heat treatment conditions
- g) Surface treatment conditions when performed

The bolts having slight variations in length *l* may be considered to be of an identical lot.

#### 4.3.3 Manufacturing lot of nuts

The manufacturing lot of nuts shall consist of the following.

- a) Heat number of material (steel product)
- b) Designation of screw threads
- c) Machining process
- d) Heat treatment conditions
- e) Surface treatment conditions when performed

#### 4.3.4 Manufacturing lot of washers

The manufacturing lot of washers shall consist of the following.

- a) Heat number of material (steel product)
- b) Designation of washers
- c) Machining process
- d) Heat treatment conditions
- e) Surface treatment conditions when performed

#### 4.3.5 Set lot

The set lot shall be determined according to the combination of the bolt, nut and washers that constitute a set, and shall be based on the combination composed of one manufacturing lot, respectively. However, if the manufacturing lot of bolts is the same, for washers or nuts, even if the small amount of products of different manufacturing



lots are set, the set lot can be treated as the same set lot as long as they can be considered as the same steel grade, the same manufacturer and the equivalent torque coefficient value.

## 5 Mechanical properties

### 5.1 Mechanical properties of bolts

#### 5.1.1 Mechanical properties of bolt test piece

The mechanical properties of test pieces sampled from the bolts, when tested as specified in 12.1 a), shall conform to table 2.

**Table 2 Mechanical properties of bolt test pieces**

Grade according to mechanical properties of bolt	Proof stress	Tensile strength	Elongation	Reduction of area
	N/mm <sup>2</sup>	N/mm <sup>2</sup>	%	%
F8T	640 min.	800 to 1 000	16 min.	45 min.
F10T	900 min.	1 000 to 1 200	14 min.	40 min.

#### 5.1.2 Mechanical properties of bolt products

The mechanical properties of bolt products, when tested as specified in 12.1 b), shall be such that these are not broken at under the tensile load (minimum) in table 3, and the head separation is not caused when the tensile load is increased. In addition, when tested as specified in 12.1.c), the results shall conform to the requirements of hardness in table 3. For the bolt products that have passed the tensile test, the hardness test may be omitted.

**Table 3 Mechanical properties of bolt products**

Grade according to mechanical properties of bolt	Tensile load (min.) (kN)							Hardness
	Designation of screw thread							
	M12	M16	M20	M22	M24	M27	M30	
F8T	68	126	196	243	283	368	449	18 HRC to 31 HRC
F10T	85	157	245	303	353	459	561	27 HRC to 38 HRC

### 5.2 Mechanical properties of nuts

The mechanical properties of nuts, when tested as specified in 12.2, shall conform to table 4.

**Table 4 Mechanical properties of nuts**

Grade according to mechanical properties of nut	Hardness		Proof load
	Min.	Max.	
F10	20 HRC	35 HRC	Same as tensile load (min.) of bolt in table 3

### 5.3 Hardness of washers

The hardness of washers, when tested as specified in 12.3, shall conform to table 5.

The surface hardening such as the carburization quenching and tempering shall not be performed on washers.

**Table 5 Hardness of washer**

Grade according to mechanical properties of washer	Hardness
F35	35 HRC to 45 HRC

### 6 Torque coefficient values of sets

The torque coefficient values of sets, when tested as specified in 12.4, shall conform to table 6. In this case, the torque coefficient values shall be obtained according to the following formula.

$$k = \frac{T}{d \times N} \times 1\,000$$

- where,
- $k$  : torque coefficient value
  - $T$  : torque (moment to fasten nut) (N·m)
  - $d$  : basic dimension of major diameter of screw thread of bolt (mm)
  - $N$  : axial tension of bolt (N)

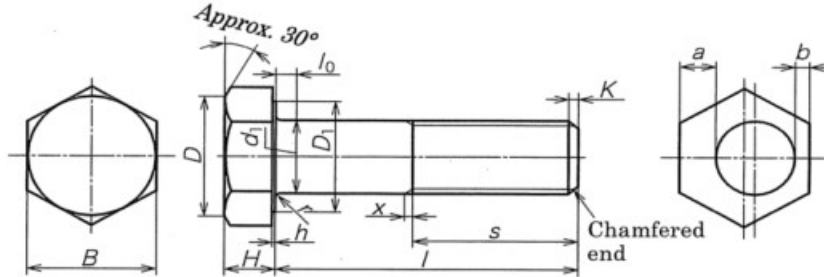
**Table 6 Torque coefficient values of sets**

Division	Class of set according to torque coefficient value	
	A	B
Mean value of torque coefficient values of one set lot	0.110 to 0.150	0.150 to 0.190
Standard deviation of torque coefficient values of one set lot	0.010 max.	0.013 max.
NOTE : The set lot mentioned herein means the set lot as specified in 4.3.		

### 7 Shapes and dimensions

The shapes and dimensions of bolts, nuts and washers shall be as given in table 7 to table 9.

**Table 7 High strength hexagon bolts for friction grip joints**



Unit : mm

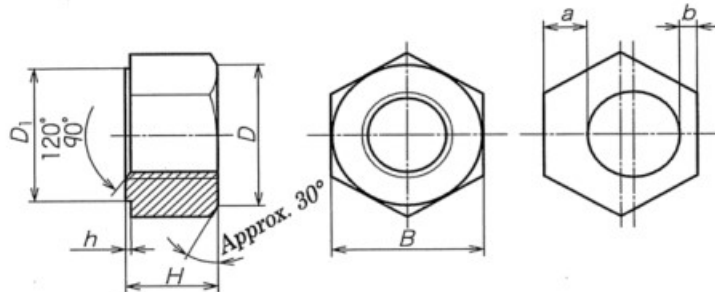
Designation of screw threads	$d_1$		$H$		$B$		$D$	$D_1$	$r$	$K$	$a-b$	$h$	$s$																												
	Basic dimension	Tolerance	Basic dimension	Tolerance	Basic dimension	Tolerance	(Informative)	Min.					Basic dimension	Tolerance																											
M12	12	+0.7	8	+0.8	22	0	20	20	0.8 to 1.6	2	0.7	0.4 to 0.8	25	+5																											
M16	16	-0.2	10		27	-0.8	25	25					1.2 to 2.0	0.8	30	0																									
M20	20	+0.8	13	+0.9	32	0	30	29	1.6 to 2.4	2.5	0.9		35	+6																											
M22	22	-0.4	14		36	-1	34	33					1.1		40	0																									
M24	24		15		41		39	38					1.2	45																											
M27	27		17		46		44	43		1.3	50																														
M30	30		19	+1.0	50		48	47	2.0 to 2.8	3.5	1.5		55																												
Designation of screw threads	$l$																																								
	Basic dimension																																								
	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	190	200	210	220						
M12	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○																										
M16			○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○				
M20				○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○			
M22					○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
M24						○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
M27							○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
M30								○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Tolerance on $l$	±1.0				±1.4								±1.8																												

- The position for measurement of  $d_1$  shall be  $l_0 \approx d_1/4$ .
- The length  $x$  of incomplete thread portion shall be about two threads and that of full threaded about three threads.
- The end portion of screw threads shall be chamfered irrespective of the end shape.
- The dimensions  $l$  marked with  $\circ$  indicate the preferable lengths  $l$ .
- The dimensions  $l$  and  $s$  other than those given in the table, if particularly required, may be used upon the agreement between the purchaser and the manufacturer, provided that  $s$  shall not be shorter than the dimensions in the table.
- The dimension  $d_1$  may be approximately the same as the pitch diameter of screw thread upon the agreement between the purchaser and the manufacturer.  
In this case, the radius under head  $r$  may be made as follows.

Unit : mm

Designation of screw threads	M12	M16	M20	M22	M24	M27	M30
$r$	1.2 to 2.4		2.0 to 3.3		2.5 to 3.8		

Table 8 High strength hexagon nuts for friction grip joints

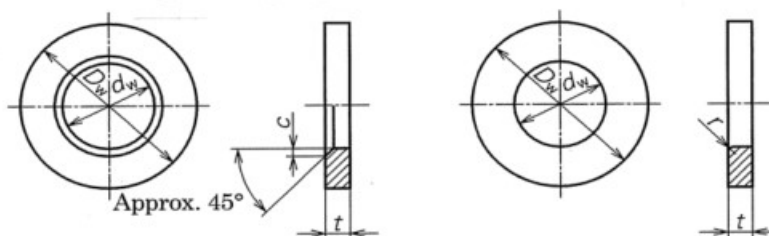


Unit : mm

Designation of screw threads	Major diameter of external thread ( $d$ )	$H$		$B$		$D$	$D_1$	$a-b$	$h$
		Basic dimension	Tolerance	Min.	Tolerance	(Informative)	Min.	Max.	
M12	12	12	$\pm 0.35$	22	0	20	20	0.7	0.4 to 0.8
M16	16	16	$\pm 0.4$	27	-0.8	25	25	0.8	
M20	20	20		32	0	30	29	0.9	
M22	22	22		36	-1	34	33	1.1	
M24	24	24		41		39	38	1.2	
M27	27	27		46		44	43	1.3	
M30	30	30		50		48	47	1.5	

Note : The chamfer of the threaded portion of the nut bearing surface side shall be of  $1.0 d$  to  $1.05 d$  in diameter.

Table 9 High strength plain washers for friction grip joints



Unit : mm

Designation of screw threads	$d_w$		$D_w$		$t$		$c$ or $r$ (Informative)
	Basic dimension	Tolerance	Basic dimension	Tolerance	Basic dimension	Tolerance	
12	13	+0.7 0	26	0 -0.8	3.2	$\pm 0.4$	1.5
16	17	+0.7 0	32	0 -1	4.5	$\pm 0.5$	
20	21	+0.8 0	40	0 -1.2	6	$\pm 0.7$	2
22	23		44				2.4
24	25		48		2.4		
27	28	+1.0 0	56	0	8		2.8
30	31		60	-1.2			2.8

NOTE : The figures above indicate the washer chamfered (about  $45^\circ$ ) and that rounded ( $r$ ), and either of them may be used.

## 8 Screw threads

The screw threads of bolts and nuts shall be the metric coarse screw threads specified in **JIS B 0205-3**, and the thread pitch shall be as given in table 10. Furthermore, the tolerance class shall be 6H/6g in **JIS B 0209-2**.

Further, the screw threads of bolts shall be those which have been processed by the thread rolling.

**Table 10 Pitch of screw threads**

	Unit : mm						
Designation of screw thread	M12	M16	M20	M22	M24	M27	M30
Pitch	1.75	2	2.5	2.5	3	3	3.5

## 9 Appearance

### 9.1 Appearance of bolts

The appearance of bolts shall be free from quenching cracks and such defects detrimental to use as flaw, flash, rust and damage of screw threads.

### 9.2 Appearance of nuts

The appearance of nuts shall be free from quenching cracks and such defects detrimental to use as flaw, flash and rust.

### 9.3 Appearance of washers

The appearance of washers shall be free from quenching cracks and such defects detrimental to use as flaw, flash, rust, or noticeable curvature.

## 10 Materials

The material of bolts, nuts and washers shall be such that the products satisfy clause 5 to clause 9.

## 11 Lubricating and anticorrosive treatment

The bolts, nuts and washers may be processed with any lubricating and anticorrosive treatment that will have no detrimental effect on their qualities.

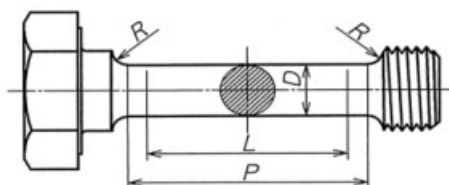
## 12 Test and measuring method

### 12.1 Tests on mechanical properties of bolts

The tests on mechanical properties of bolts shall consist of the tensile test on bolt test pieces, the tensile test on bolt products and the hardness test on bolts, and shall be as the following a), b) and c).

- a) **Tensile test on bolt test pieces** The tensile test on bolt test pieces shall be as follows.

- 1) **Bolt test piece** The bolt test piece shall be the cut-out test piece sampled from the bolt as given in figure 1.



$L$  (gauge length for measurement of elongation after breakage) : 50 mm

$D$  (diameter of parallel portion) : 14 mm

$P$  (length of parallel portion) : approx. 60 mm

$R$  (radius of fillet) : 15 mm or more

When the test piece of the dimensions given in figure 1 cannot be obtained, the substitute test piece that satisfies the following conditions may be used.

$L$  :  $3.54D$

$D$  : value given in table 11 or more

$P$  :  $L + D$

$R$  : 4 mm or more

**Figure 1 Sampling method of bolt test piece**

**Table 11 Minimum dimension of diameter of substitute bolt test piece**

Designation of screw threads	Unit : mm
	$D$
M12	4
M16	6
M20	6
M22	6
M24	8
M27	10
M30	12

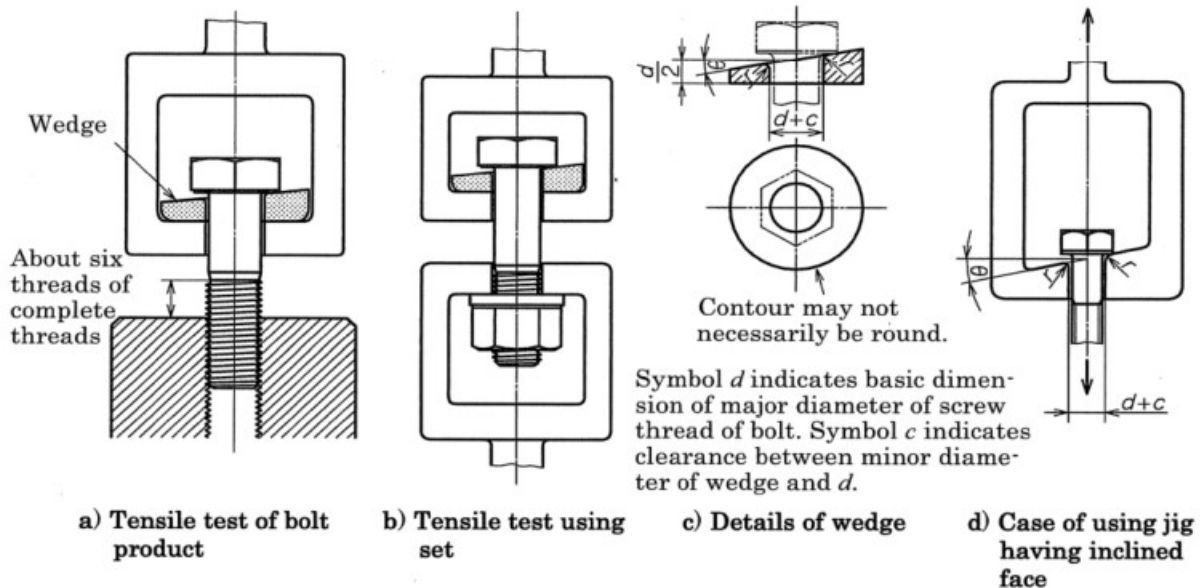
- 2) **Test method** The test method shall be that specified in **JIS Z 2241**.
- b) **Tensile test on bolt products** For the tensile test on bolt products, the test shall be carried out under the condition of **a)** of figure 2 or **b)** of figure 2 using the jig having an appropriate structure, shapes and dimensions, as well as sufficient rigidity. For the test indicated in **a)** of figure 2, the wedge [see **c)** of figure 2] of 45 HRC or more in hardness shall be inserted into the bearing surface of the bolt allowing its inclined surface to be in contact with the side of hexagon head. The jig shall be engaged so that about six threads of the complete threads remain at the head side of

the bolt. For the test indicated in b) of figure 2, instead of the jig, the nut that is a component of the set shall be engaged.

For the test, a tensile load shall be applied in the axial direction until the bolt is broken, and it shall be checked that the bolt does not break under the tensile load (minimum) given in table 3, and that the head separation of the bolt and the falling out of the nut does not take place.

For the bolt products that have passed the test of set in b) of figure 2, the proof load test of nut may be omitted.

In addition, when the jig for the tensile test has the specified inclination and hardness as indicated in d) of figure 2, the wedge need not be inserted.



Length of bolt shank	Under $2d$	$2d$ or more	Unit : mm			
			Designation of screw threads	M12	M16 to M22	M24 to M30
$\theta$	$6 \pm 0.5^\circ$	$10 \pm 0.5^\circ$	$r$	1.6	2.0	2.4
			$c$	1.2	1.6	2.0

Figure 2 Tensile test method of bolt product

- c) **Hardness test on bolts** The hardness test on bolts shall be carried out according to the test method specified in **JIS Z 2245**. In this case, the measuring positions shall be the side faces of the head, three positions shall be measured per one piece of the sample, and the mean value thereof shall be rounded off to an integer according to the method specified in **JIS Z 8401**. This value shall be taken as the hardness of the sample.

For the bolt on which the tensile test has been carried out, the hardness test may be omitted (see 5.1.2).

## **12.2 Tests on mechanical properties of nuts**

### **12.2.1 General**

The tests on mechanical properties of nuts includes the hardness test and the proof load test, and shall be as specified in **12.2.2** and **12.2.3**.

### **12.2.2 Hardness test on nuts**

The hardness test on nuts shall be carried out according to the test method specified in **JIS Z 2245**.

In this case, the measuring positions shall be on the bearing surface of the nut, three positions shall be measured per one piece of the sample, and the mean value thereof shall be rounded off to an integer according to the method specified in **JIS Z 8401**. This value shall be taken as the hardness of the sample.

### **12.2.3 Proof load test on nuts**

The proof load test on nuts shall be carried out by the same method as the tensile test on bolt products specified in **12.1 b)** by engaging the sample of nut instead of the internal thread jig and applying the proof load given in table 4, and the presence of abnormality shall be examined on the sample. In this case, a wedge shall not be used. In addition, an external thread jig for testing may be used instead of the bolt.

## **12.3 Hardness test on washers**

The hardness test on washers shall be carried out according to the test method specified in **JIS Z 2245**. In this case, the measuring positions shall be on the bearing surface of the washer, it shall be measured at three positions per one piece of the sample, and the mean value thereof shall be rounded off to an integer according to the method specified in **JIS Z 8401**. This value shall be taken as the hardness of the sample.

## **12.4 Test on torque coefficient values of sets**

The test on torque coefficient values of sets shall be as follows.

- a) The test on torque coefficient values of sets shall be carried out under the service conditions, and the repeated tests on the same sample shall not be carried out.
- b) The test shall be carried out using a torque tester or an axial force meter. When the torque tester is used, the torque and the axial tension shall be read to the numerical values of 1/2 the respective scale intervals from the torque-axial tension diagram recorded on the measuring apparatus which is connected to the tester. In addition, when a meter other than the torque tester is used, the sample is mounted on the axial tension meter, the torque shall be applied to the nut gradually so as not to cause error, and the torque shall be measured by the torque tool specified in **JIS B 4652**, and the bolt axial tension by the axial tension meter to the numerical values of 1/2 the scale intervals of respective meters.

In this case, the washer shall not be rotated. In addition, when the hardness of the jig being in contact with the bolt bearing surface is equal to or harder than that of the washer, the washer of the bolt bearing surface may also be omitted.



- c) The measurements of the torque being applied to the nut and the bolt axial tension generated by this torque shall be carried out on three positions where the value of the bolt axial tension is within the range of the values given in table 12. However, in the case of the measurement by the torque tester, it may be made on one position near the median of the values given in table 12.

**Table 12 Axial tension for measuring torque coefficient value**

Unit : kN

Grade according to mechanical properties of bolts	Axial tension of bolt						
	Designation of screw threads						
	M12	M16	M20	M22	M24	M27	M30
F8T	38 to 51	71 to 95	110 to 148	136 to 184	159 to 214	206 to 279	252 to 341
F10T	54 to 72	99 to 134	155 to 209	191 to 259	223 to 301	290 to 392	354 to 479

- d) The mean value of three calculated values obtained by substituting the torque and the bolt axial tension measured according to the method specified in c) and the basic dimension of major diameter of bolt into the calculation formula indicated in clause 6 (when only one point is measured by using the torque tester, its calculated value) shall be rounded off to three decimal places as specified in **JIS Z 8401**, and this shall be taken as the torque coefficient value of the sample.
- e) The scale intervals of the torque-axial tension diagram obtained by the torque tester shall be 10 N·m or under for the torque, and 1 % or under of the axial tension to be measured for the axial tension.
- f) The scale interval of the axial tension meter shall be 1 % or under of the axial tension to be measured, and its instrumental error shall be 2 % or under the value indicated by each scale within the range of the values of the axial tension to be measured.

### 13 Inspections

#### 13.1 Inspection on shapes and dimensions

The inspection on shapes and dimensions shall be carried out on the bolt, nut and washers as the components by the direct measurement, limit gauges or other methods, and the results shall conform to clause 7, respectively.

#### 13.2 Inspection on screw threads

The inspection on screw threads of the bolt and nut shall be carried out by using the limit gauges (for 6H and for 6g) for metric coarse screw threads specified in **JIS B 0251** or other screw thread inspecting instruments than these, and the results shall conform to clause 8.

#### 13.3 Inspection on appearance

The inspection on appearance shall be carried out on the bolt, nut and washers as the components by the visual observation, and the results shall conform to 9.1 to 9.3,

respectively. When quenching cracks and such defects as flaws detrimental to use are found, they shall be judged according to the liquid penetrant testing method specified in **JIS Z 2343-1** or the magnetic particle testing method specified in **JIS Z 2320** (series).

#### 13.4 Inspections on mechanical properties

##### 13.4.1 Inspection on mechanical properties of bolt test pieces

The inspection on mechanical properties of bolt test pieces shall be carried out on the proof stress, tensile strength, elongation and reduction of area as specified in **12.1 a)**, and the results shall conform to **5.1.1**. In addition, the certified quality level of the inspection lot <sup>1)</sup> in this inspection shall be  $P_0 \leq 0.125 \%$  <sup>2)</sup> ( $\alpha \approx 0.05$ ) and  $P_1 \leq 12.5 \%$  <sup>3)</sup> ( $\beta \approx 0.10$ ).

Further, the sampling inspection shall be according to the sampling inspection plans specified in **JIS Z 9003**.

NOTE : The meanings of the symbols  $P_0$ ,  $P_1$ ,  $\alpha$  and  $\beta$  are as specified in **JIS Z 9015-0**.

Notes <sup>1)</sup> This inspection lot mentioned herein means the one manufacturing lot indicated in **4.3.2**.

<sup>2)</sup> The value 0.125 % of  $P_0$  is a representative value, and it represents the value of  $P_0$  within the range of 0.113 % to 0.140 %.

<sup>3)</sup> The value 12.5 % of  $P_1$  is a representative value, and it represents the value of  $P_1$  within the range of 11.3 % to 14.0 %.

##### 13.4.2 Inspection on mechanical properties of bolt products

The inspection on mechanical properties of bolt products shall be carried out on the tensile load and hardness as specified in **12.1**, and the results shall conform to **5.1.2**. In addition, the certified quality level of the inspection lot <sup>4)</sup> in this inspection shall be  $P_0 \leq 0.125 \%$  <sup>2)</sup> ( $\alpha \approx 0.05$ ) and  $P_1 \leq 8 \%$  <sup>5)</sup> ( $\beta \approx 0.10$ ).

Further, the sampling inspection shall be according to the sampling inspection plans specified in **JIS Z 9003**.

Notes <sup>4)</sup> This inspection lot mentioned herein means the one manufacturing lot indicated in **4.3.2**.

<sup>5)</sup> The value 8 % of  $P_1$  is a representative value, and it represents the value of  $P_1$  within the range of 7.11 % to 9.00 %.

##### 13.4.3 Inspection on mechanical properties of nuts

The inspection on mechanical properties of nuts shall be carried out on the hardness and proof load as specified in **12.2**, and the results shall conform to **5.2**. In addition, the certified quality level of the inspection lot <sup>6)</sup> in this inspection shall be as follows.

a) The certified quality level of the inspection lot <sup>6)</sup> in the hardness inspection of nuts shall be  $P_0 \leq 0.125 \%$  <sup>2)</sup> ( $\alpha \approx 0.05$ ) and  $P_1 \leq 8 \%$  <sup>5)</sup> ( $\beta \approx 0.10$ ).

Further, the sampling inspection shall be according to the sampling inspection plans specified in **JIS Z 9003**.

- b) In the proof load inspection on the nuts, the inspection shall be carried out on two pieces or more in sample size for one inspection lot <sup>6)</sup>, and all of the samples shall conform to 5.2.

Note <sup>6)</sup> This inspection lot mentioned herein means the one manufacturing lot specified in 4.3.3.

#### 13.4.4 Inspection on hardness of washers

The inspection on hardness of washers shall be carried out as specified in 12.3, and the results shall conform to 5.3. In addition, the certified quality level of the inspection lot <sup>7)</sup> in this inspection shall be  $P_0 \leq 0.125\%$  <sup>2)</sup> ( $\alpha \approx 0.05$ ) and  $P_1 \leq 8\%$  <sup>5)</sup> ( $\beta \approx 0.10$ ).

Further, the sampling inspection shall be according to the sampling inspection plans specified in JIS Z 9003.

Note <sup>7)</sup> This inspection lot mentioned herein means the one manufacturing lot specified in 4.3.4.

#### 13.5 Inspection on torque coefficient values of sets

The inspection on the torque coefficient values of sets shall be carried out as specified in 12.4, and the results shall conform to clause 6. In addition, the certified quality level of the inspection lot <sup>8)</sup> in this inspection shall be as follows.

- a) The certified quality level of the standard deviation on the torque coefficient values of the inspection lot <sup>8)</sup> shall be 5 % or under in risk rate and 8 % or under in relative standard error. In the application, when the process is under the stable condition, quality control data or inspection data may be used. When particularly required, the sample size may be reduced by making the relative standard error a little larger than the specified value.
- b) The certified quality level of the mean value of the torque coefficient values of the inspection lot <sup>8)</sup> shall be the value given in table 13 or more. The value obtained in a) shall be used for the standard deviation

Note <sup>8)</sup> This inspection lot mentioned herein means the one set lot indicated in 4.3.5.

**Table 13 Certified quality level of mean value of torque coefficient values**

Class according to torque coefficient value	Value in respect to lower limit		Value in respect to upper limit	
	$m_0''$ ( $\alpha \approx 0.05$ )	$m_1''$ ( $\beta \approx 0.10$ )	$m_0'$ ( $\alpha \approx 0.05$ )	$m_1'$ ( $\beta \approx 0.10$ )
A	0.110	0.100	0.150	0.160
B	0.150	0.140	0.190	0.200

NOTE : The meanings of the symbols  $m_0'$ ,  $m_1'$ ,  $m_0''$  and  $m_1''$  shall be as specified in JIS Z 9003.

## 14 Designation of products

The set shall be designated by the number of this Standard or the title of this Standard, class according to mechanical properties of set, type according to torque coefficient values of set, designation of screw threads  $\times$  bolt length ( $l$ ) and designated item <sup>9)</sup>.

Note <sup>9)</sup> When there is a designated item particularly, it shall be indicated in parentheses.

<b>Example</b>	<b>JIS B 1186</b>	Class 1	B	M16 $\times$ 50
	Set of high strength hexagon bolt, hexagon nut and plain washers <u>for friction grip joint</u>			
		<u>Class 2</u>	<u>A</u>	<u>M20 <math>\times</math> 60</u> <u>(Flat point)</u>
	(Number of this Standard or title of this Standard)	(Class according to mechanical properties of set)	(Class according to torque coefficient value of set)	(Designation of screw thread $\times$ bolt length $l$ ) (Designated item)

## 15 Marking


### 15.1 Marking on products

The marking in respect to the components of the set shall be as follows.

- a) The following information shall be embossed or stamped on the upper face of the bolt head.
  - 1) The marking symbol indicating the grade according to the mechanical properties of bolt (F8T or F10T)
  - 2) Registered trademark or symbol of manufacturer
- b) On the upper face of the nut, the marking symbol indicating the grade according to the mechanical properties of the nut shall be embossed or stamped by using the marking symbol of table 14.

Further, upon agreement between the purchaser and the manufacturer, the registered trademark or the symbol of the manufacturer may be marked.

**Table 14 Marking symbol of nut**

Grade according to mechanical properties of nut	Marking symbol
F10	

- c) On the washer, the symbol indicating the grade of mechanical properties shall not be marked.

Further, upon agreement between the purchaser and the manufacturer, the registered trademark or symbol of the manufacturer may be marked.

16.  
B 1186 : 2013

### 15.2 Marking on package

The package shall be clearly marked with the following information.

- a) Title of this Standard
- b) Class according to mechanical properties of set
- c) Class according to torque coefficient value of set
- d) Designation of screw threads × bolt length (*l*)
- e) Quantity
- f) Designated item
- g) Manufacturer's name or registered trademark
- h) Lot number of set
- i) Year and month of inspection of set

---

### Bibliography

- JIS Z 9015-0** *Sampling procedures for inspection by attributes — Part 0 : Introduction to the JIS Z 9015 attribute sampling system*

Errata for JIS (English edition) are printed in *Standardization and Quality Control*, published monthly by the Japanese Standards Association, and also provided to subscribers of JIS (English edition) in *Monthly Information*.

Errata will be provided upon request, please contact:

**Standards Publishing Department, Japanese Standards Association**  
Mita MT Building, 3-13-12, Mita, Minato-ku, Tokyo, 108-0073 JAPAN  
TEL. 03-4231-8550 FAX. 03-4231-8665