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Spring lock washers

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Spring lock washers

J I S

B 1251-1995

1. Scope This Japanese Industrial Standard specifies the spring lock washers made of steel, stainless steel and phosphor bronze (hereafter, referred to as "washers".) used for the bolts, screws([1]) and the like for general use.

Note ([1]) The bolts and screws for general use mean those specified in JIS B 1180, JIS B 1101, JIS B 1111 and the similar to them. However, bolts of "regular" in the degree of finish specified in JIS B 1180 are excluded.

Remarks 1. The standards cited in this Standard are given in the following:

JIS B 1101 Slotted head machine screws

JIS B 1111 Cross recessed head screws

JIS B 1180 Hexagon head bolts and hexagon head screws

JIS G 3506 High carbon steel wire rods

JIS G 4308 Stainless steel wire rods

JIS H 3270 Copper beryllium alloy, phosphor bronze and nickel silver rods, bars and wires

JIS Z 2244 Method of Vickers hardness test

JIS Z 2245 Method of Rockwell and Rockwell superficial hardness test

JIS Z 2251 Method of Knoop hardness test

2. The units and numerical values given in { } in this Standard are in accordance with the traditional units, and are appended for informative reference.

2. Classification The washers shall be classified into two types as shown in Table 1 according to cross-sectional dimensions.

Table 1

Type	Material of washer	Use
No. 2	Hard steel, stainless steel, phosphor bronze	General use
No. 3	Hard steel	For heavy load

3. Hardness The hardness of washers shall be as given in the following, when subjected to the test in accordance with the specifications of 10.1.

(1) The steel washers shall be 42 HRC to 50 HRC or 412 HV to 513 HV in hardness. However, in the case where any patenting material is used, the minimum hardness value may be prescribed as 40 HRC or 392 HV, subject to agreement between the purchaser and supplier.

Furthermore, the steel washers shall be free from considerable decarburization.

(2) The stainless steel washers shall be 34 HRC or harder, or 336 HV or harder in hardness.

(3) The phosphor bronze washers shall be 90 HRB or harder, or 192 HV or harder in hardness.

4. Spring action The spring action of the washers, when subjected to the test in accordance with the specifications of 10.2, shall satisfy the value of free height after test specified in Attached Table. However, the spring action of the stainless steel washers shall be subject to agreement between the purchaser and supplier.

5. Toughness The toughness of the washers, when subjected to the test in accordance with the specifications of 10.3, shall be such that these are not broken at less than 90° in torsional angle.

6. Shape and dimensions The shape and dimensions of the washers shall be in accordance with Attached Table.

7. Appearance The surfaces of the washers shall be smooth, crackless, free from flaws, rough surface, rust, etc. harmful in use, and be free from sharp edges on outside periphery.

Furthermore, cut ends of the washers shall be free from remarkable burrs, and clearances and angles of the cut ends shall be in such degree that any washer does not cause lapping when it has been compressed completely and two or more of washers can not be linked in chain shape.

8. Materials The materials of the washers shall be as given in Table 2.

Table 2

Washers	Material
Steel washers	SWRH57 (A, B) to SWRH77 (A, B) of JIS G 3506
Stainless steel washers	SUS304, 305, 316 of JIS G 4308
Phosphor bronze washers	C5191W of JIS H 3270

9. Surface treatment Generally the washers shall not be processed with surface treatment. In the case where plating or other surface treatment is required, it shall be so designated by the purchaser. However, the steel washers which have been processed with the electroplating shall generally be processed with the treatment of brittleness elimination.

10. Test methods

10.1 Hardness test The hardness test shall be carried out in accordance with the method specified in JIS Z 2245, JIS Z 2244 or JIS Z 2251.

Furthermore, the steel washers shall be measured after grinding their surfaces lightly.

10.2 Compression test In the compression test, measure the free height, after the operation to apply for about one second the test load given in Attached Table has been repeated 3 times continuously.

10.3 Torsion test In the torsion test, insert the washer between the vice and the mouth of the wrench as given in Figure 1, and twist in the direction to increase the free height. In this case, the angle of vice and wrench shall not be excessively rounded.

The distance H between the vice and the mouth of the wrench shall be as given in Table 3.

Figure 1

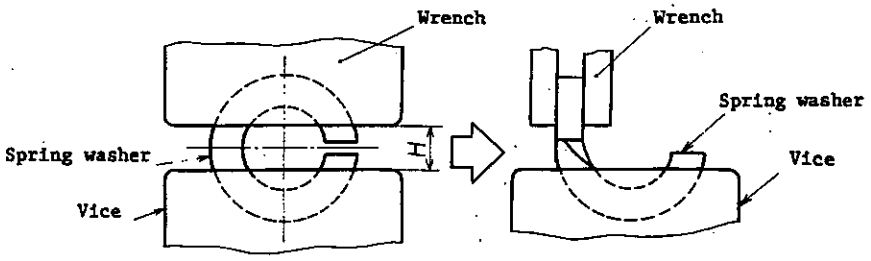


Table 3

Unit: mm

Nominal size	H	Nominal size	H
2	1.5	14	7
2.5		16	8
3		18	9
3.5	2	20	10
4		22	11
4.5	2.5	24	12
5		27	14
6	3.5	30	15
7		33	17
8	4	36	18
10	5	39	19
12	6		

11. Inspection The inspection of washers shall be carried out on the hardness, spring action, toughness, shape and dimensions, and appearance, and the results shall conform to the specifications of 3. to 7. However, in the case where a lot inspection is to be carried out, the sampling inspection plan shall be subject to agreement between the purchaser and supplier.

12. Designation The washers shall be designated by the number or title of Standard, type, nominal size, abbreviation mark of material (S for steel, SUS for stainless steel or PB for phosphor bronze) and designated matter.

Examples:

JIS B 1251	No. 2	8	S	MFZnII
Spring lock washer	No. 2	12	SUS	
(Number of Standard or title of Standard)	(Type)	(Nominal size)	(Abbreviation mark of material)	(Designated matter)

13. Marking The package of washers shall be clearly marked with the following information by means of a tag or other appropriate methods:

(1) Title of Standard

(2) Type

(3) Nominal size

(4) Material used

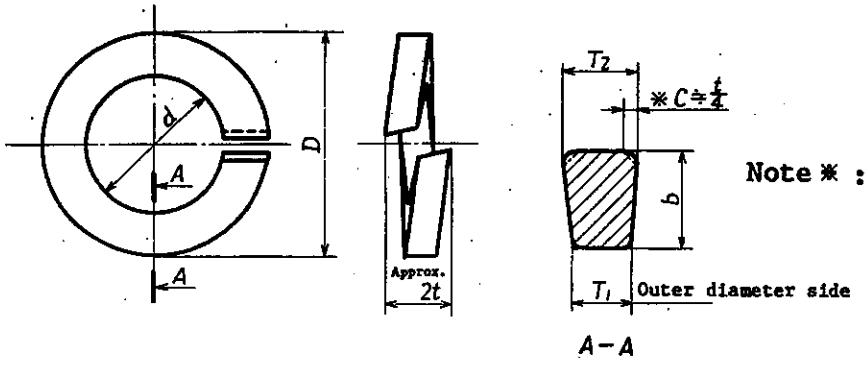
(5) Quantity

(6) Designated matter

(7) Manufacturing number

(8) Manufacturer's name or registered trademark

Attached Table



Note ※ : Chamfer or roundness

Unit: mm

Nominal size	Inner diameter d		Sectional size (Min.)		Outer diameter D (Max.)		Free height after compression test (Min.)		Test load kN{kgf}
	Basic dimension	Tolerances	No. 2 Width × Thickness(2) $b \times t$	No. 3 Width × Thickness(2) $b \times t$	No. 2	No. 3	No. 2	No. 3	
2	2.1	+0.25 0	0.9×0.5	—	4.4	—	0.85	—	0.42 { 43}
2.5	2.6	+0.3 0	1 ×0.6	—	5.2	—	1	—	0.69 { 70}
3	3.1		1.1×0.7	—	5.9	—	1.2	—	1.03 { 105}
(3.5)	3.6		1.2×0.8	—	6.6	—	1.35	—	1.37 { 140}
4	4.1	+0.4 0	1.4×1	—	7.6	—	1.7	—	1.77 { 180}
(4.5)	4.6		1.5×1.2	—	8.3	—	2	—	2.26 { 230}
5	5.1		1.7×1.3	—	9.2	—	2.2	—	2.94 { 300}
6	6.1		2.7×1.5	2.7×1.9	12.2	12.2	2.5	3.2	4.12 { 420}
(7)	7.1		2.8×1.6	2.8×2	13.4	13.4	2.7	3.35	5.88 { 600}
8	8.2	+0.5 0	3.2×2	3.3×2.5	15.4	15.6	3.35	4.2	7.45 { 760}
10	10.2		3.7×2.5	3.9×3	18.4	18.8	4.2	5	11.8 { 1 200}
12	12.2	+0.6 0	4.2×3	4.4×3.6	21.5	21.9	5	6	17.7 { 1 800}
(14)	14.2		4.7×3.5	4.8×4.2	24.5	24.7	5.85	7	23.5 { 2 400}
16	16.2	+0.8 0	5.2×4	5.3×4.8	28	28.2	6.7	8	32.4 { 3 300}
(18)	18.2		5.7×4.6	5.9×5.4	31	31.4	7.7	9	39.2 { 4 000}
20	20.2		6.1×5.1	6.4×6	33.8	34.4	8.5	10	49.0 { 5 000}
(22)	22.5	+1.0 0	6.8×5.6	7.1×6.8	37.7	38.3	9.35	11.3	61.8 { 6 300}
24	24.5		7.1×5.9	7.6×7.2	40.3	41.3	9.85	12	71.6 { 7 300}
(27)	27.5	+1.2 0	7.9×6.8	8.6×8.3	45.3	46.7	11.3	13.8	93.2 { 9 500}
30	30.5		8.7×7.5	—	49.9	—	12.5	—	118 {12 000}
(33)	33.5	+1.4 0	9.5×8.2	—	54.7	—	13.7	—	147 {15 000}
36	36.5		10.2×9	—	59.1	—	15	—	167 {17 000}
(39)	39.5		10.7×9.5	—	63.1	—	15.8	—	197 {20 000}

Note (2) $t=\frac{T_1+T_2}{2}$ where, difference T_2-T_1 shall not exceed the value $0.064\,b$. However, b is the minimum value specified in this Table.

Remarks: Nominal sizes given in ( ) should not preferably be used as far as possible.

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Edition 2

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