

JIS

JAPANESE INDUSTRIAL STANDARD

**Cross recessed head screws
with captive washer**

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Cross recessed head screws
with captive washer

B 1188-1995

1. Scope This Japanese Industrial Standard specifies steel or brass made cross recessed head screws with captive washer for general purposes. The cross recessed head screw with captive washer is a screw of which the threads are rolled after a washer has been assembled on the screw blank so as to prevent the disassembly of the washer from the screw.

Remarks 1. The steel made cross recessed head screws with captive washer are steel made cross recessed head screws assembled with steel captive washers, and the brass made cross recessed head screws with captive washers are brass made cross recessed head screws assembled with brass made or phosphor bronze made captive washers. In this Standard, the steel made cross recessed head screws with captive washer and the brass made cross recessed head screws with captive washer are referred to as "steel screws with washer" and "brass screws with washer", respectively, and in the generic term, they are briefly referred to as "screws with washer".

2. In this Standard, the cross recessed head screws alone of the steel screws with captive washer and of the brass screws with captive washer are referred to as "steel screws" and "brass screws", respectively, and in the generic term, they are briefly referred to as "screws".

The steel washers and brass and phosphor bronze washers of various types assembled on the screws are referred to as "steel washers" and "copper alloy washers" and, in the generic term, they are briefly referred to as "washers".

3. Strength class 4T of mechanical properties specified in this Standard will be withdrawn on April 1, 1999.

4. The standards cited in this Standard are given in Attached Table 8.

2. Definitions For the purpose of this Standard, definitions in JIS B 0101 apply.

3. Classification

3.1 Classification of steel screws with washer The steel screws with washer shall be defined by combinations of types of steel screws and of steel washers marked with ○ given in Table 1.

Table 1. Classification of steel screws with washer

Type of steel screw	Type of steel washer								Range of nominal diameter mm	
	Plain washer		(1) Spring lock washer	Toothed lock washer		(2) Conical spring washer	(1) Spring lock washer and small round	(1) Spring lock washer and polished round		External toothed lock washer and polished round
				External tooth type	Counter-sunk type					
Cross recessed head	Pan head screw	○	○	○	○	○	○	○	○	2 to 8
	Countersunk head screw					○				3 to 8
	Raised countersunk head screw					○				3 to 8
	Truss head screw		○	○	○		○	○	○	2 to 8
	Binding head screw		○	○	○		○	○	○	2 to 8

Notes (1) The spring lock washers to be assembled on the steel screw shall be of steel made No. 2 for assembly.

No. 2 washers for assembly are the same as No. 2 washers specified in JIS B 1251 in sectional shape and dimensions, but different from those in inside diameter.

(2) The conical spring washers to be assembled on the steel screw shall be of steel made Class 1 light load for assembly.

Class 1 light load steel washers for assembly are the same in thickness and outside diameter as Class 1 light load washers specified in JIS B 1252, but different from those in inside diameter.

3.2 Classification of brass screws with washer The brass screws with washer shall be defined by combinations of types of brass screw and of copper alloy washer marked with ○ given in Table 2.

Table 2. Classification of brass screws with washer

Type of brass screw	Type of copper alloy washer							Range of nominal diameter mm
	Plain washer		(3) Spring lock washer	Toothed lock washer		(3) Spring lock washer and small round	(3) Spring lock washer and polished round	Polished round and external toothed lock washer
	Small round	Polished round		External tooth type	Counter-sunk type			
Cross recessed head								
Pan head screw	○	○	○	○		○	○	○
Countersunk head screw					○			
Raised countersunk head screw					○			
Truss head screw		○	○	○			○	○
Binding head screw		○	○	○			○	○

Note (3) For the spring lock washers to be assembled on the brass screw, No. 2 washers of phosphor bronze for assembly shall be used.

This No. 2 washer for assembly shall have the same cross-sectional shape and dimension as No. 2 washer specified in JIS B 1251 and a different inside diameter.

3.3 Expression of classification The classification of the screws with washer shall be expressed in the order of the type of screw and the type of washer assembled on it, as given below.

Examples 1. When a small round plain washer is assembled on a cross recessed pan head screw

Cross recessed pan head screw with small round plain washer

2. When a spring lock washer and a polished round plain washer are assembled on a cross recessed truss head screw

Cross recessed truss head screw with spring lock washer and polished round plain washer

4. Mechanical properties

4.1 Mechanical properties of steel screw The mechanical properties of the steel screws shall be as given in Table 3.

Table 3. Mechanical properties of steel screw

Type of steel screw		Mechanical properties		
		Strength class		Applicable standards
Cross recessed head	Pan head screw, countersunk head screw, raised countersunk head screw, truss head screw and binding head screw	Column 1	4.8	Body of JIS B 1051
		Column 2	4T	Annex to JIS B 1051

4.2 Mechanical properties of brass screw The mechanical properties of the brass screws shall be subject to agreement between the parties concerned with delivery.

4.3 Mechanical properties of washers The mechanical properties of the washers shall be as specified in Table 4.

Table 4. Mechanical properties of washers

Type of washer		Plain washer	Spring lock washer	Toothed lock washer	Conical spring washer
Mechanical property	Hardness	Not specified	For steel washer, 42 HRC to 50 HRC (4) For phosphor bronze washer, 90 HRB min.	For steel washer, 40 HRC to 50 HRC For phosphor bronze washer, 85 HRB min.	For steel washer, 40 HRC to 48 HRC
	Spring function	—	When tested in accordance with the provisions of Table 8, the free height shall reach the "free height after compression test" specified in Attached Tables 1, 4 and 5.	When tested in accordance with the provisions of Table 8, the free height shall be $\frac{5}{6}$ or more of the free height before compression.	When tested in accordance with the provisions of Table 8, the free height shall reach the "height after the test" specified in Attached Tables 1, 4 and 5.
	Toughness	—	When tested in accordance with the provisions of Table 8, it shall not fracture at torsion angle less than 90°.	When tested in accordance with the provisions of Table 8, it shall not fracture.	When tested in accordance with the provisions of Table 8, it shall be free from any crack and fissure.

Note (4) For the washers made of patenting material, the minimum hardness may be 40 HRC subject to agreement between the parties concerned.

5. Shape and dimensions The shape and dimensions of the screw with washer shall comply with the following:

- (1) The shape and dimensions of the cross recess formed on the head of the screw shall be as type H specified in JIS B 1012. However, the wing length (m) of cross recess and the penetration depth (q) of gauge shall be as given in Attached Tables 1 to 5.
- (2) The shape and dimensions of parts other than cross recess shall be as given in Table 5.

Table 5. Shape and dimensions of screws with washer

Type of screw	Shape and dimensions
Cross recessed pan head screw	As given in Attached Table 1.
Cross recessed countersunk head screw	As given in Attached Table 2.
Cross recessed raised countersunk head screw	As given in Attached Table 3.
Cross recessed truss head screw	As given in Attached Table 4.
Cross recessed binding head screw	As given in Attached Table 5.

6. Screw threads The screw threads of the screws with washer shall be metric coarse screw threads as specified in the body of JIS B 0205, and the tolerance class shall be 6g of JIS B 0209.

The maximum permissible dimensions of electroplated threads shall be the same as those of 4h.

7. Conditions of washers assembled The washer assembled on the screw shall be capable of freely rotating but shall not be easily disassembled from the threaded portion of the screw.

There shall be no harmful interference, which might adversely affect the serviceability, between the inside diameter of the washer and the underhead fillet of the screw.

8. Appearance The appearance of the screws with washer shall comply with the following:

- (1) The surface roughness except the thread end shall be $25 \mu mR_y$ specified in JIS B 0601 and the surface shall be free from harmful defects such as flaws, flashes and burrs which might adversely affect the serviceability.

Unless otherwise specified, the permissible limit to the surface discontinuity of steel screws should preferably be referred to JIS B 1041.

- (2) The appearance of washers shall be smooth in surface and free from any quenching cracks and harmful defects such as flaws, burrs, rough surface and rust which might adversely affect the serviceability.

The roughness of flat surface of plain washer shall be $25 \mu mR_y$ specified in JIS B 0601.

The cut ends of the spring lock washer shall never lie one upon another, when the washer is fully compressed.

9. Materials

9.1 Materials of screws The materials of the steel screws and brass screws shall comply with the following:

- (1) Material of steel screw The material of the steel screws shall be such carbon steel that its product can meet the requirements for the mechanical properties prescribed in 4.1.
- (2) Material of brass screw The material of the brass screws shall generally be the brass wire (C2700W) specified in JIS H 3260.

9.2 Materials of washers The materials of washers shall generally be as given in Table 6.

Table 6. Materials of washers

Type of washer	Material of steel washer	Material of copper alloy washer
Plain washer	SPCC of JIS G 3141	Brass sheet (C2600P, C2680P, C2720P, C2801P) or brass strip (C2600R, C2680R, C2720R, C2801R) of JIS H 3100
Spring lock washer	SWRH 57 (A·B) to SWRH 77 (A·B) of JIS G 3506	Phosphor bronze wire (C5191W) of JIS H 3270
Toothed lock washer	S50CM to S70CM of JIS G 3311	Phosphor bronze sheet (C5191P, C5212P) of JIS H 3110
Conical spring washer	S50CM to S70CM of JIS G 3311	—

10. Surface treatment The surface treatment of screws with washer, if necessary, shall be specified by the purchaser.

When electroplating is performed, it shall be in accordance with JIS B 1044.

11. Inspections

11.1 Inspection for mechanical property

11.1.1 Inspection for mechanical properties of steel screws The inspection for the mechanical properties of the steel screws shall be made in accordance with Table 7 according to their strength classes and the results shall conform to the requirements for the mechanical properties of 4.1. This inspection shall be carried out for the steel screw with washer as being assembled.