IS 5371 (1982): - Multi-tooth Lock Washers [PGD 31: Bolts, Nuts and Fasteners Accessories]

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Indian Standard (Reaffirmed 2001)

SPECIFICATION FOR MULTI-TOOTH LOCK WASHERS

(First Revision)

Bolts, Nuts and Fasteners Accessories Sectional Committee, EDC 27 [Ref : Doc : EDC 27 (3658)]

1. Scope — Covers the requirements for multi-tooth lock washers for use with screws in the diameter range 1·6 to 30 mm.

2. Types — The multi-tooth lock washers shall be of the following three types:

Type A — Externally toothed
Type B — Internally toothed
Type C — Countersunk

3. Grades — The multi-tooth lock washer shall conform to precision grade of IS : 5369 - 1975 ' General requirements for plain washers and lock washers (*first revision*) '.

4. Dimensions — The dimensions and tolerances for multi-tooth lock washers shall be as given in Table 1.

4.1 Details not specified shall be left to the choice of the manufacturer.

5. Material — The multi-tooth lock washers shall be made from carbon spring steel of any suitable grade specified in IS : 4072-1975 ' Specification for steel for spring washers (*first revision*) '.

6. Hardness — The multi-tooth lock washers made of spring steel shall be suitably hardened and tempered to result in a hardness range of 410 to 490 HV or 42 to 49 HRC. Vicker's hardness tested in accordance with IS : 1501-1968 'Method for Vicker's hardness test for steel (*first revision*)' shall be taken as the reference value.

7. Finish — The multi-tooth lock washers shall be supplied in natural black finish unless otherwise specified by the purchaser. At the request of the purchaser, lock washers may be phosphated, tinned, galvanized, nickel plated, copper plated, cadmium plated, etc.

7.1 Plated lock washers shall be stress relieved after plating to avoid hydrogen embrittlement and shall be subjected to an embrittlement test (*see* **9.3**).

8. Designation — The multi-tooth lock washers shall be designated by the name, type, nominal size, number of the standard, and the surface protection, if any.

Example:

A multi-tooth lock washer of type A, nominal size 2·8 mm, and phosphate coated shall be designated as:

Multi-Tooth lock washer A 2.8 IS : 5371 Phospate Coated

In case the lock washer is intended for screws with left hand threads, the designation shall be:

Multi-Tooth lock washer A 2.8 LH IS : 5371 Phosphate Coated

9. Tests

9.1 *Temper Test* — Washers after being compressed to a height equal to the actual material thickness plus 0·127 mm and then released, shall have a free height greater than the compressed height. Compression shall be accomplished between parallel flat surfaces for flat varieties of tooth washers and between mating countersunk holes and cones for countersunk tooth washers. The hardness of surfaces, between which the washers are compressed, shall be more than that of the washers under test.

9.2 *Spread Test* — The rim of the lock washer shall be cut or severed with a cold chisel or cutting pliers and the severed ends shall be gripped by pliers or vice and pliers. Separation of the ends in the form of a helix to a distance equal to the inside diameter of the washer shall not result in fracture. When the ends are separated to a greater distance and the washer fractures, the structure at the point of fracture shall show a fine, grain, and the washer up to the instant of fracture shall deliver a tough, springy reaction.

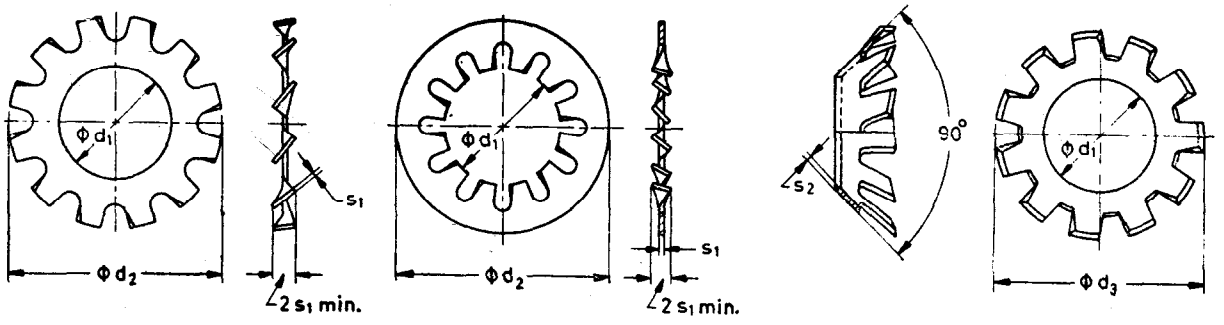
Adopted 29 October 1982 Gr 2

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

TABLE 1 DIMENSIONS AND TOLERANCES FOR MULTI-TOOTH LOCK WASHERS

(*Clause* 4)

All dimensions in millimetres.



TYPE A EXTERNALLY TOOTHED TYPE B INTERNALLY TOOTHED TYPE C COUNTERSUNK

Nominal Size d_1 H13	d_2 h14	d_3 ≈	s_1	s_2	Number of Teeth *Min* Types A and B	Number of Teeth *Min* Types C	Suitable Screw Size
1·7	3·6	—	0·3	—	6	—	M1·6
(1·9)	4	—	0·3	—	6	—	M1·8
2·2	4·5	4·2	0·3	0·2	6	6	M2
2·7	5·5	5·1	0·4	0·2	6	6	M2·5
3·2	6	6	0·4	0·2	6	6	M3
(3·7)	7	7	0·5	0·25	6	6	M3·5
4·3	8	8	0·5	0·25	8	8	M4
5·1*	9	—	0·5	—	8	—	M5
5·3	10	9·8	0·6	0·3	8	8	M5
6·4	11	11·8	0·7	0·4	8	10	M6
(7·4)	12·5	—	0·8	—	8	—	M7
8·2*	14	—	0·8	—	8	—	M8
8·4	15	15·3	0·8	0·4	8	10	M8
10·5	18	19	0·9	0·5	9	10	M10
12·5	20·5	23	1	0·5	10	10	M12
(14·5)	24	26·2	1	0·6	10	12	M14
16·5	26	30·2	1·2	0·6	12	12	M16
(19)	30	—	1·4	—	12	—	M18
21	33	—	1·4	—	12	—	M20
(23)	36	—	1·5	—	14	—	M22
25	38	—	1·5	—	14	—	M24
(28)	44	—	1·6	—	14	—	M27
31	48	—	1·6	—	14	—	M30

Note — Sizes shown within the brackets are non-preferred.

*Only for hexagon head bolts.

9.3 *Embrittlement Test* — Plated washer shall be clamped to a height equal to the actual material thickness plus 0·127 mm for a minimum period of 24 hours without breaking. The clamping shall be accomplished between parallel flat surfaces for flat varieties of tooth washers and between mating countersunk holes and cones for countersunk tooth washers. The hardness of surfaces, between which the washers are compressed, shall be more than that of washers under test.

10. General Requirements

10.1 The surface of washers shall be free from scales and burrs.

10.2 For other requirements like packing and marking, not covered in this standard, the lock washers shall conform to IS : 5369-1975.

11. Sampling and Acceptance — The sampling and acceptance criteria for testing and inspection of lock washers shall be in accordance with IS : 6821-1973 'Methods for sampling non-threaded fasteners'.

12. *Certification Marking* — Details available with the Bureau of Indian Standards.

EXPLANATORY NOTE

Multi-tooth lock washers are used with screws and nuts to effectively add spring take-up to the screw elongation and to increase the frictional resistance under the screw head or nut face. These are normally used where security of assembly is critical.

Lock washers of Type A (externally toothed) are used with normal hexagon head and other screws where projection or teeth beyond screw head or nut is not objectionable.

Lock washers of Type B (internally toothed) are used where projection of teeth beyond screw head or nut is objectionable, that is, with cheese head screws or cap screws used in counter bores.

This standard was first published in 1969. The following changes have been made in the present revision:

a) Tolerances have been added to the internal and external diameters.

b) Lock washers suitable for screws of sizes M 2·2 and M 4·5 have been deleted. Sizes M 5 and M 8 have been added for lock washers of Type C.

The outside diameters for toothed lock washers of Type C have been altered for some sizes to suit the slotted countersunk screws [IS : 1365-1978 Slotted countersunk head screws (*third revision*), IS : 8911-1978 Slotted raised countersunk head screws], and recessed screws [IS : 7485-1974 Cross recessed countersunk head screws (dia 2·5 to 10 mm), IS : 7486- 1974 Cross recessed raised countersunk head screws (dia 2·5 to 10 mm)].

Reference to material has been updated and provisions for surface protection of lock washers included not covered in the earlier edition. In the revision, a reference is also made to IS : 6821-1973 for sampling plans and acceptance criteria.

Embrittlement test has been incorporated to check the stress relieving and also method of conducting temper test has been simplified.

In the preparation of this standard, assistance has been taken from DIN 6797-1971 'Toothed lock washers' issued by Deutsches Institut für Normung (DIN).