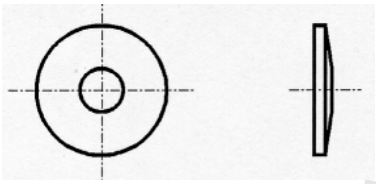
CONICAL SPRING WASHERS FOR INCORPORATION WITH SCREWS OF QUALITY CLASS 8.8 AND 10.9

FOREWORD

This norme is in technical conformity with the definition of washers of norme NF E 25-130 (April 1986), with the exception of diameter 4, which is not defined in the latter.



1.OBJECT AND FIELD OF APPLICATION

This norme defines the characteristics of plain conical spring washers of nominal diameter 4 to 14 mm inclusive, to be incorporated with screws of quality class 8.8 and possibly 10.9.

2.INSTRUCTIONS FOR USE

These washers must be used where it is necessary to obtain a reserve of elasticity in the assembly:

- either to compensate for a possible loss of pre-load in the screw (risk of compression when the parts are together for example),
- or to create a reserve of elasticity (short screws for example).

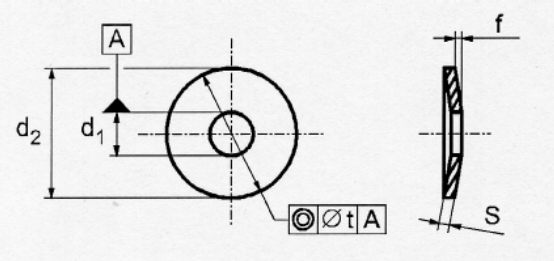
Application:

These washers are the only ones which must be incorporated in the screws of quality class 8.8 and possibly 10.9. In this latter case, the washers are less suited for restitution of the load, they have been calculated to be flat under a load equal to 60 % of the elastic limit of a quality class 8.8 screw of the same nominal diameter (Norme C10 0020).

This value allows the flattening in service to be guaranteed not withstanding the actual pre-load scatter. They must never be used with screws of quality class < 8.8 or be used with an intentionally reduced pre-load, their flattening then being insufficient.

3.DIMENSIONS

Deformation of internal diameter d1:
See norme A32 4125



Nominal diameter of the screw	NORMAL AND LARGE SERIES		NORMAL SERIES						LARGE SERIES					
	d1		d2		S		f	t	d2		S		f	t
	nom.	tol.	nom.	tol.	nom.	tol.	max.		nom.	tol.	nom.	tol.	max.	
4	3,60	+ 0,12 0	9	0 - 0,36	0,9	±0,04	0,45	0,28	12	0 - 0,43	1,1	±0,04	0,50	0,36
5	4,55	+ 0,12 0	11	0 - 0,43	1,2	±0,05	0,50	0,36	15	0 - 0,43	1,4	±0,05	0,65	0,36
6	5,45	+ 0,15 0	12	0 - 0,43	1,4	±0,05	0,55	0,36	18	0 - 0,43	1,7	±0,05	0,65	0,36
8	7,35	+ 0,20 0	16	0 - 0,43	1,9	±0,05	0,70	0,36	22	0 - 0,52	2,2	±0,08	0,75	0,42
10	9,25	+ 0,25 0	20	0 - 0,52	2,2	±0,08	0,80	0,42	27	0 - 0,52	2,8	±0,08	0,80	0,42
12	11,2	+ 0,30 0	24	0 - 0,52	2,8	±0,08	0,80	0,42	30	0 - 0,52	3,2	±0,08	1,00	0,42
(14)	13	+ 0,40 0	28	0 - 0,52	3,0	±0,08	0,90	0,42	36	0 - 0,62	3,8	±0,08	1,20	0,50

() Size not recommended.

4.CHARACTERISTICS

4.1.MATERIAL

Washers must be produced in fine grain carbon steel with a carbon content ≥ 0,50 %.
Suppliers must be able to justify, at all time, the content of "hydrogen present" in base material.

4.2.APPEARANCE

- Washers must not be oxidised and must not exhibit any trace of scale.
- Traces left by the cutting or forming tools must not be prejudicial to the correct use of washers:
  - parts must be free from any folds, cracks, shortage of material, shrinkage cracks, loose burrs,
  - the bearing faces must be smooth (no sharp cutting burrs). A finishing operation (deburring) must mandatorily be carried out. The choice of process * (abrasive band, tumbling...) is left to the discretion of the supplier.
- A growth (residual from burr) after the finishing operation of 0,02 mm maximum is allowed on the bearing faces of the spring washers.

*** Note:** *Chemical deburring is prohibited.*

4.3.COATING

Washers produced without any specific protection must be lightly oiled with an anti-corrosion oil. This oil must be easily removed and not hinder any subsequent final protection.

The final coating must be produced on the screw-washer assembly.

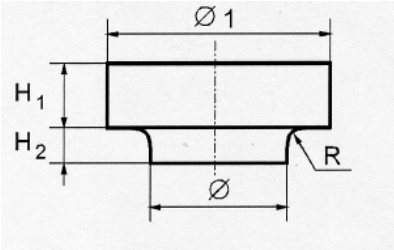
Any risk of embrittlement by hydrogen inclusion in the manufacturing process must be eliminated by an appropriate stress relieving operation allowing the test of § Sensitivity to delayed fracture. This operation is imperative whatever the quality class of the screw.

4.4.HARDNESS

Washers must undergo a bainitic transformation enabling a hardness HV 430-510 to be obtained.

4.5.ELASTICITY

The washer is crushed between a steel plate treated to HRC ≥ 50 and a steel mandrel treated to HRC 32-39 with dimentions confrming to the figure and the table below.

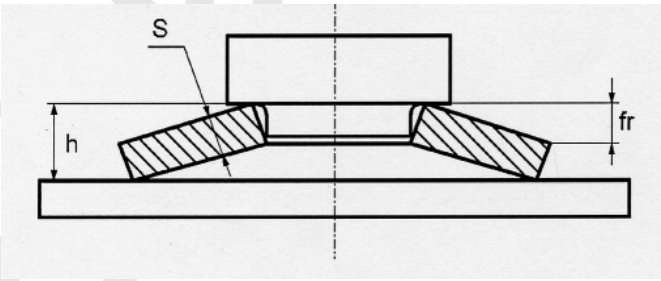


Øscrew	Øh 13	Ø 1 h13	H 1 Js14	H 2	R
4	3,5	7	3	0,5 to 0,6	0,1 to 0,2
5	4,5	8	3,5	0,7 to 0,8	0,2 to 0,3
6	5,4	10	4	0,8 to 0,9	0,25 to 0,4
8	7,3	13	5,5	1,2 to 1,3	0,4 to 0,6
10	9,2	17	7	2,0 to 2,1	0,4 to 0,6
12	11	19	8	2,6 to 2,7	0,6 to 1
14	12,8	22	9	2,8 to 2,9	0,6 to 1

The flattening of the washer is guaranteed effective under a load equal to 80 % of the minimal yield point of a screw of quality class 8.8 of the same nominal diameter. The load applied for this test is conventionally 90 % of the minimal yield point of the quality class 8.8 (norme C10 0020).

The load is maintained for 3 minutes, the test is repeated 3 times.

After the third flattening, the residual deflection fr = h - S must not be less than the minimal deflection (fr min) of the table below, h and S being the actual measured values.



Ø screw	Minimal arrow (F R min.)	
	Normal series	Broad series
4	0,12	0,15
5	0,15	0,25
6	0,15	0,25
8	0,20	0,30
10	0,25	0,35
12	0,25	0,40
14	0,30	0,45

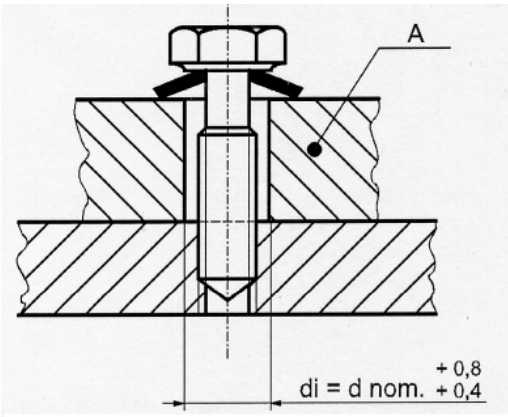
Note: *This test may be carried out on the washer incorporated to the screw taking all the necessary precautions when measuring.*

4.6.SENSITIVITY TO DELAYED FRACTURE

The purpose of this test is to check the behaviour of washers under stress during a period of time, before or after incorporation to screws and coating.

When the test is carried out on the coated screw-washer assembly, the height of the support part "A" must guarantee a number of free threads sufficient to ensure tightening to a pre-load.

In all the cases, the support parts "A" must have a hardness of HV 510 min. and provide a free surface grater than that of the external diameter of the washer to be tested.



Torque tightening is carried out so that a pre-load, between 80 and 90 % of the elastic limit of the screw to which the washer is incorporated, is induced after calibration on a rig for the measurement of the torque/pre-loads.

After maintaining under the pre-load for 48 hours, no start of fracture, cracks or ovality of the washer must be observed, under X10 magnification, under load and in a free state.

Note: *This test may be carried out under the conditions of norme C22 5820 taking all necessary precautions for extracting the washer by destruction of the screw.*

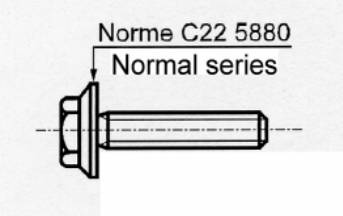
5.SUPPLY OF PARTS

The general requirements concerning the supply of parts are those of the screws to which they are incorporated.

6.EXPRESSION ON DOCUMENTS

The designation of washers is indicated on the definition documents of screws by reference to the index of this norme, followed by the series adopted.

Example:



7.IDENTIFICATION NUMBERS

The following identification numbers are supplied as an additional element to the mode of expression when necessary (integrated manufacture), they should not be shown in the basic parts list (NEN).

Nominal diameter	Identification numbers	
	NORMAL (N)	BROAD (L)
4	79 03 058 094	79 03 058 101
5	79 03 058 095	79 03 058 102
6	79 03 058 096	79 03 058 103
8	79 03 058 097	79 03 058 104
10	79 03 058 098	79 03 058 105
12	79 03 058 099	79 03 058 106
14	79 03 058 100	79 03 058 107

8.RECORDS AND REFERENCE DOCUMENTS

8.1.RECORDS

8.1.1.CREATION

- OR: 01/05/1980 – CREATION OF THE NORME

8.1.2.SUBJECT OF THE MODIFICATION

- H: 01/06/1994 – MODIFICATION OF § 5.1, 5.3, AND 5.4
- J: 27/11/1996 – INTRODUCTION TO IDEM (French only)

8.2.REFERENCE DOCUMENTS

8.2.1.PSA DOCUMENTS

8.2.1.1.Normes

A324125, C100020, C225820.

8.2.1.2.Others

8.2.2.DOCUMENTS EXTERIEURS

8.3.EQUIVALENT TO:

8.4.CONFORM TO:

8.5.KEY WORDS