SAE International

SURFACE VEHICLE STANDARD

SAE J238 APR2013

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Superseding J238 MAY1998

Nut and Conical Spring Washer Assemblies

RATIONALE

J238 has been reaffirmed to comply with the SAE five-year review policy.

Foreword—This Reaffirmed Document has been changed only to reflect the new SAE Technical Standards Board Format. References were added as Section 2. All other section numbers have changed.

1. Scope—This SAE Standard covers general, dimensional data, and methods of test for two types of general purpose nut and conical spring washer assemblies, designated Type LN and Type HN, intended for mass production and other operations where speed and convenience are paramount factors.

1.1 Both the Type LN and Type HN assemblies are available in three washer series (narrow, regular, and wide), having varied proportions designed to fulfill specific purposes of distributing the load over various areas, as shown in Table 1.

1.2 Where so specified by user, assemblies shall be supplied with toothed washers for nonslip or positive electrical grounding purposes. Toothed washers shall have six teeth, of proportions depicted in Figure 1, equally spaced on the outer periphery. Teeth shall have sharp edges.

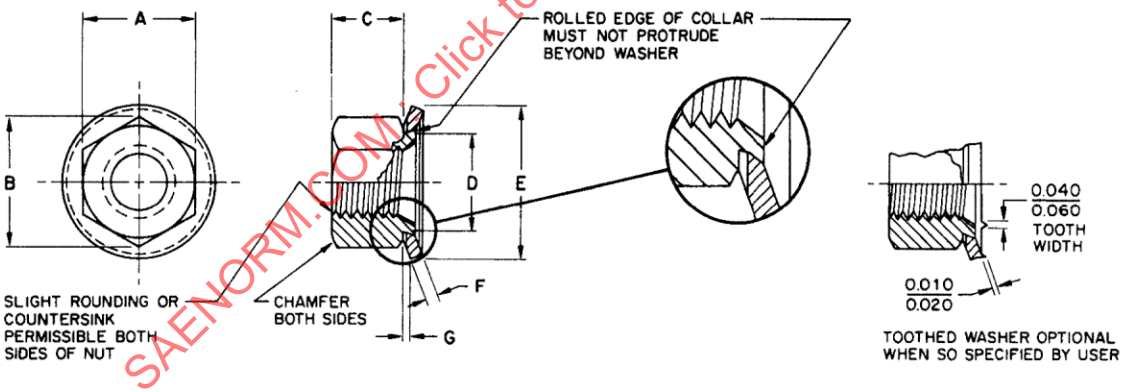

FIGURE 1—NUT AND CONICAL SPRING WASHER ASSEMBLY

1.3 The inclusion of dimensional data in this standard is not intended to imply that all of the products described are stock production items. Users should consult with manufacturers concerning availability.

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TABLE 1—DIMENSIONS OF NUT AND CONICAL SPRING WASHER ASSEMBLIES

Nom Size	Basic Major Dia of Thread	Thds per in	Types LN and HN Washer Series	Types LN and HN Washer OD E ±0.010	Types LN and HN Nut A Max	Types LN and HN Nut A Min	Types LN and HN Nut B Min	Types LN and HN Nut D Max	Types LN and HN Nut D Min	Type LN Nut C Max	Type LN Nut C Min	Type LN Washer F Max	Type LN Washer F Min	Type LN Washer G Max	Type LN Washer G Min	Type HN Nut C Max	Type HN Nut C Min	Type HN Washer F Max	Type HN Washer F Min	Type HN Washer G Max	Type HN Washer G Min
			Narrow	0.375								0.040	0.033	0.025	0.015						
No. 8	0.1540	32	Regular	0.500	0.343	0.332	0.378	0.236	0.232	0.130	0.117	0.040	0.033	0.025	0.015	—	—	—	—	—	—
			Wide	0.625								0.040	0.033	0.035	0.025						
			Narrow	0.438								0.040	0.033	0.025	0.015			0.043	0.037	0.025	0.015
No. 10	0.1900	24	Regular	0.562	0.375	0.365	0.413	0.274	0.270	0.130	0.117	0.040	0.033	0.025	0.015	0.207	0.187	0.051	0.042	0.025	0015
			Wide	0.750								0.046	0.037	0.030	0.020			0.056	0.047	0.030	0.020
			Narrow	0.625								0.051	0.042	0.025	0.015			0.065	0.055	0.025	0.015
1/4	0.2500	20	Regular	0.750	0.437	0.428	0.488	0.332	0.328	0.193	0.178	0.056	0.047	0.025	0.015	0.226	0.212	0.079	0.066	0.025	0.015
			Wide	1.000								0.065	0.055	0.030	0.025			0.087	0.074	0.030	0.020
			Narrow	0.750														0.079	0.066	0.025	0.015
5/16	0.3125	18	Regular	1.000	0.500	0.489	0.557	0.405	0.400	—	—	—	—	—	—	0.273	0.258	0.103	0.090	0.030	0.020
			Wide	1.125														0.103	0.090	0.032	0.022
			Narrow	1.000														0.103	0.090	0.025	0.015
3/8	0.3750	15	Regular	1.125	0.562	0.551	0.628	0.470	0.465	—	—	—	—	—	—	0.337	0.320	0.120	0.106	0.032	0.022
			Wide	1.250														0.120	0.106	0.035	0.025
			Narrow	1.125														0.126	0.112	0.027	0.017
7/16	0.4375	14	Regular	1.250	0.687	0.675	0.768	0.550	0.545	—	—	—	—	—	—	0.385	0.365	0.136	0.122	0.036	0.026
			Wide	1.500														0.136	0.122	0.036	0.026
			Narrow	1.250														0.140	0.126	0.027	0.017
1/2	0.5000	13	Regular	1.500	0.750	0.736	0.840	0.610	0.605	—	—	—	—	—	—	0.448	0.427	0.150	0.136	0.035	0.025
			Wide	1.750														0.150	0.136	0.035	0.025

2. *References*

2.1 Applicable Publications—The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest version of SAE publications shall apply.

SAE J429—Mechanical and Material Requirements for Externally Threaded Fasteners
SAE J995—Mechanical and Material Requirements for Steel Nuts

3. ***Designation*—**Nut and conical spring washer assemblies shall be specified or designated as shown in the following examples: 1/4-20 nut and conical spring washer assembly, Type LN, wide; No. 10-24 nut and toothed conical spring washer assembly, Type HN, regular. (Unless otherwise specified, threads will be furnished as Class UNC 2B.)

4. ***Identification*—**Assemblies for No. 10 and 1/4 in. nominal sizes are available in Types LN and HN. To identify the HN type in these sizes, parts should be finished in accordance with Section 8.

5. ***Use and Application*—**Type LN assemblies are intended for use with mating fasteners equivalent to SAE Grades 1 and 2, and Type HN assemblies are for use with mating fasteners equivalent to SAE Grade 5. (See SAE J429.)

5.1 In the installed position, it is desirable to have the washer compressed flat. Such flattening is designed to occur at a load in the bolt equivalent to approximately 27 500 psi for the Type LN assemblies and 60 000 psi for the Type HN assemblies.

5.2 The relatively high load supporting and spring return characteristics of the washer components make these assemblies very effective in applications where bolt tension may be subject to loss due to such factors in brinneling, thermal set of parts, compression set of gaskets, etc.

6. ***Dimensions*—**All dimensions in this standard are in inches unless otherwise specified. Dimensions for both Type LN and Type HN assemblies are given in Table 1.

6.1 Nut Manufacturing Detail—The nut thickness specified in Table 1 is the overall distance, measured parallel to the axis of nut, from the top of nut to the surface which bears against top of washer. No transverse section through the nut between 25 and 75% of the actual nut thickness, as measured from the top of the nut, shall be less than the minimum width across flats. The maximum width across flats shall not be exceeded. Tops of nuts shall be flat. Corners on top and bottom of hexagon portion of nuts shall be chamfered to a diameter equal to the maximum width across flats within a tolerance of –15%. The length of chamfer at hexagon corners shall be 5–15% of the basic thread diameter. The surface of chamfer may be slightly convex or rounded. A rounding or lack of fill at the junction of hexagon corners with chamfer shall be permissible provided the minimum width across corners is reached and maintained beyond a distance equal to 17.5% of the basic thread diameter from the chamfered faces.

6.1.1 TAPER OF SIDES OF HEX—Nut (angle between one side and the axis) shall not exceed 2 degrees, the specified width across flats being the largest dimension.

6.2 Washer Manufacturing Detail—The washers shall be symmetrical in shape and shall be tumbled (except toothed washers) or otherwise processed to remove sharp edge at top inner periphery prior to assembly to nuts.

6.2.1 A diametral section through the washer shall show the surface element to be straight, subject to the following tolerances (see Figure 2):

Wall Dimension	Tolerance (convex upward only), in
Up to 1/4	0.010
Over 1/4 to 1/2	0.015
Over 1/2	0.020

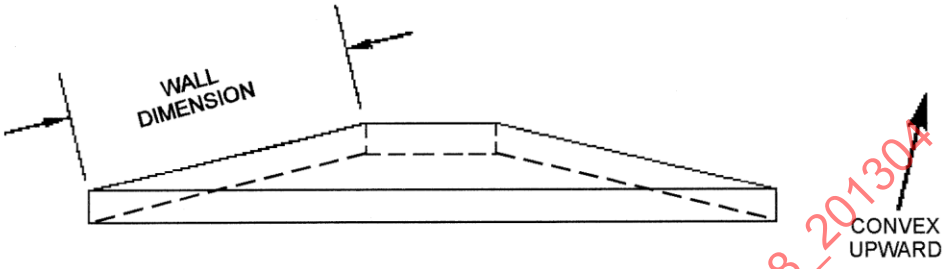

FIGURE 2—CONICAL WASHER TOLERANCE

6.3 Assembly Detail—The size and shape of the hole in washers and the collar on the nuts shall be such that washers after assembly to nuts—by spinning, swaging, or staking of collar—will be firmly retained on the nuts and yet be free to rotate at a torque not to exceed 5 lb-in. The length of the collar on the nuts shall be such as to be wholly contained within the thickness of the washer after the assembly operation. No protrusion of the collar beyond the washer in the retention area shall be permissible.

6.3.1 COLLAR CRACKS—Collar cracks may occur due to the application of pressure to the collar lip during assembly of the washer. Providing these cracks are limited to the contour of the collar, such cracks shall be permissible discontinuities and not considered cause for rejection of otherwise acceptable assemblies.

7. Material—Nut and washer components of assemblies shall be made from materials specified below:

7.1 Nuts shall be manufactured in accordance with SAE J995 (latest issue). Type LN shall be Grade 2 and Type HN shall be Grade 5.

7.2 Washers shall be made from SAE 1050 to 1065 carbon steel, fabricated and heat treated to a hardness of Rockwell C44-48 (or equivalent) and shall be capable of meeting the embrittlement tests set forth in 9.2. When the austempering process is used, washers shall be heat treated to a Rockwell C 46-50.

When heat treatment takes place after assembly of the washer and nut, a hardness range of Rockwell C 40-48 is permitted. Washer hardness shall be checked by grinding or filing a flat spot on the top side of the washer to rest on the anvil with the reading to be taken on the undisturbed inner face of the washer. If washer hardness, as thus obtained, is not within specification, washers may be qualified by checking hardness on a cutout section of the washer on which both sides have been ground flat and parallel. Excessive decarburization which adversely affects the performance of the washer may be grounds for rejection of the assembly.