

GENERAL INFORMATION & REFERENCE SPECIFICATIONS

FLAT WASHER AVAILABILITY - The flat washers listed in this catalog represent only a small portion of the many that are available. The WCL inventory contains over 7000 different sizes, in different materials, etc. All of these cannot be listed here because of space limitations. Source tooling is available for many others not shown. Pages 29 and 30 show some of the more commonly used specials that are available, cross-referenced to appropriate ordnance numbers.

QUALITY ASSURANCE - WCL has a Quality Assurance Department and Program to confirm the integrity of all the products it sells. We represent only those manufacturers that have an outstanding reputation for consistently providing high quality parts, and we maintain complete procurement data and certifications from our suppliers and processors on pertinent Stock Reference items.

SPECIFICATIONS, TESTING AND CERTIFICATIONS - A detailed explanation of the test requirements called for under the various military specifications and a listing of the many certifications available through WCL, appear on pages 8 and 9. WCL can be an indispensable source for parts conforming to all MIL-SPEC requirements. If parts are not tested to MIL-SPEC requirements, they are not MIL-SPEC parts. If parts are not plated to MIL-SPEC requirements, they are not MIL-SPEC parts.

NOMINAL DIMENSIONS - Nominal dimensions are provided on all flat washers and are so identified. They are provided for reference only. Parts are produced to standard commercial tolerance and are appropriate for all commercial applications. With regards to thickness dimensions indicated, parts conform to stamping industry standards. WCL frequently stocks popular washer sizes in more than one thickness and this is indicated in the charts. For specific tolerances and thicknesses on other referenced parts, please contact WCL. Parts with special tolerances and thicknesses can be provided as specified.

INSIDE DIAMETER PROFILE - The inside diameter of a conventional flat washer traditionally has three distinct profiles as a result of the punch press process. As the punch enters, there is some pushing in of the material which results in a rounded corner section (A). Then, as the punch advances, it creates a substantially parallel section until it approaches the exit point and a tapered breakout occurs (B). Dimensions given for inside diameters, and their accepted tolerances, apply to the parallel sections. At the break out side of the washer, the specified maximum inside diameter may be exceeded by a maximum of 25% of the specified thickness. (See figure 1.)

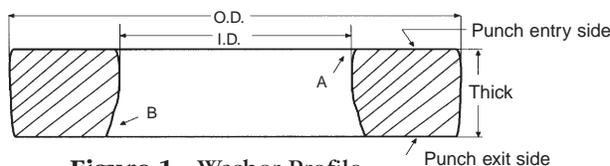


Figure 1 - Washer Profile
(Exaggerated for clarity)

MATERIALS AND PLATING - The charts on the following pages show the availability of washers in the more popular materials. Many of these washers are available in other non-ferrous materials and non-metallics. In the appropriate materials availability columns, standard dash reference numbers are used for AN, MS and NAS parts as well as for some commercial parts to indicate the availability of these parts in the designated materials and finishes. For commercial parts, an "X" designation is used. (See figure 2.)

METRIC WASHERS - The many metric flat washers available from WCL are designated with an (M-) prefix for the metric screw or bolt size in the "Size" column. Metric washers are available in either DIN or ANSI/ASME B18.22M specifications and the relevant specification is indicated in the particular "Reference" column. (Example of M6 see Figure 2.) Material thicknesses on metric parts generally conform to conventional U.S. washer manufacturing tolerances unless the parts have been stamped from material produced to metric thickness.

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NAS 620 - washers are used to mount small items with vent radii and other interferences, most commonly found in electronic components. Stocked in steel, stainless steel, brass and aluminum.

NAS 1149 - this new specification was introduced in 1992 to eventually replace the AN960 specification which is now classified, per revision 21, as “inactive for new design.” This means that on all new products NAS1149 washers may be specified. AN960 washers may continue to be ordered and used in the ongoing production or repair of already designed products. NAS1149 duplicates most of the AN960 parts, but additional, material options permit specification of Titanium and other special high strength alloy materials. Selected NAS1149 parts are referenced in the following charts as an indication of the availability of this series. WCL stocks many of these washers and can supply detailed information and prints when requested. Boeing is one particular used who requires this series. (See Figure 3).

Size	Nominal Dimensions			Reference Part Number	Steel Plated	AN-MS-NAS Dash Numbers						
	I.D.	O.D.	Thick			Stainless Steel		Brass		Aluminum Alloy		
						Pass.	Plated	Plain	Plated	Plain	Chem Treat	Anodize
5/8	.640	1.188	.063	AN960	1016	C1016	XC1016	B1016	961-1016	D1016	JD1016	KD1016
5/8	.640	1.188	.063	NAS1149	F1062P	C1063R	B1062H		D1063H	D1063J	D1063K	
5/8	.640	1.312	.010	STK STD	X							

Figure 3

MS 15795 - designates general purpose washers and the Dash Numbers show Stainless Steel, Brass and Aluminum. Other materials are available, as well as conventional plated steel. Not specifically listed, but also available from stock are Copper (-500 series) and Nickel Copper alloy (-400 series). The NASM series supercedes the MS15795, but the part numbers remain the same.

MS 27183 - specifies general purpose washers in Steel, grades 1008 through 1020 ASTM-A109, #4 temper with Cadmium II plating. This series is also available commercially with zinc and other finishes. MS27183 supersedes MS 15795-200 series.

MS 51496 - these Army and Air Force customer numbers have a reduced outside diameter (narrow series) and are made from Stainless Steel, 20 HRC minimum, passivated, with a 2.0 magnetic permeability or less. This specification may be subject to modification by the Committee on MIL Specifications as a result of difficulties experienced in meeting some dimensional, material and hardness requirements.

MS 9321 and MS 9549 - made from AMS 5510 stainless steel in a variety of sizes.

MS 14151 - washers are made from Stainless Type 304 and are normally used in electrical and other non-corrosive applications.

MS 16212 - specifies a medium series washer made from non-magnetic Stainless having minimum tensile strength of 50,000 psi.

N 400, N 401, N 402 - this series of washers are General Electric reference numbers for flat washers. Many of these G.E. part numbers cross over to MS series, but have tighter tolerances. WCL supplies MS series to G.E.'s tighter tolerances.

OTHER REFERENCED PART NUMBERS - washers meeting other specific OEM references are also shown. These include Martin Marietta, Boeing, Ordnance, etc. WCL offers many other Mil Spec parts, see High Strength-Heat Treated and Non-Metallic sections for numbers that fall under these categories.