

MIL-STD-1764
31 JANUARY 1980

MILITARY STANDARD

WASHERS
PREFERRED FOR DESIGN,
LISTING OF



FSC 5310

SECTION 304
WASHER, FLAT, SQUARE WITH RADIUS
APPLICABLE DOCUMENT, NAS1401

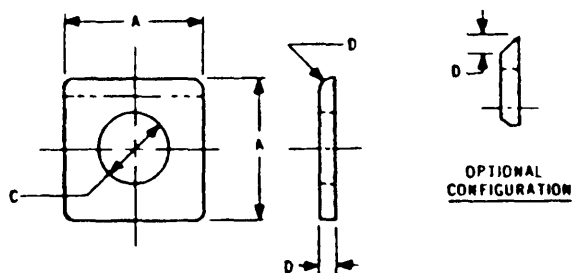


TABLE I Part numbers

Material			Aluminum alloy	Carbon steel	CRES
Protective finish			Anodize	Cadmium plate	Passivate
C Min	A Max	D	NAS1401 - Dash no.		
.193	.490	.090	-303	-3-3	-3C3
		.160	-305	-3-5	-3C5
.255	.570	.090	-403	-4-3	-4C3
		.160	-405	-4-5	-4C5
.318	.640	.090	-503	-5-3	-5C3
		.160	-505	-5-5	-5C5
.380	.710	.090	-603	-6-3	-6C3
		.160	-605	-6-5	-6C5
		.250	-608	-6-8	-6C8
.443	.780	.090	-703	-7-3	-7C3
		.160	-705	-7-5	-7C5
		.250	-708	-7-8	-7C8
.505	.930	.090	-803	-8-3	-8C3
		.160	-805	-8-5	-8C5
		.250	-808	-8-8	-8C8
.630	1.150	.090	-1003	-10-3	-10C3
		.160	-1005	-10-5	-10C5
		.250	-1008	-10-8	-10C8
.755	1.290	.090	-1203	-12-3	-12C3
		.160	-1205	-12-5	-12C5
		.250	-1208	-12-8	-12C8

SECTION 401
WASHER KEY BEARING
APPLICABLE DOCUMENTS MS19069, MS19070, MS17271 thru MS172320

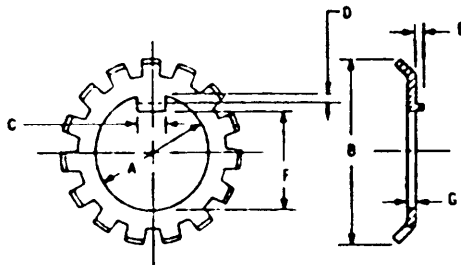


TABLE I. Part numbers.

Material							Steel	Carbon steel	Carbon steel	CRES	Alloy steel
Protective finish							Phosphate	None	Zinc or Cd plate	Passivate	Phosphate
A	B	C	D	E	F	G	Part number	MS19070 - Dash no.			MS19069 - Dash no.
Min	Max	Max	Max	Min	Min	Nom					
.406	.828	.120	.030	.062	--	.042	--	--	--	--	-A00
.406	.875	.120	.030	.062	--	.042	--	-001	-002	-003	--
.484	.922	.120	.030	.062	--	.042	--	--	--	--	-A01
.484	1.016	.120	.030	.062	--	.042	--	-011	-012	-013	--
.515	1.156	.120	--	.062	.443	.040	MS172271	--	--	--	--
.601	1.094	.120	.030	.062	--	.042	--	--	--	--	-A02
.601	1.156	.120	.030	.062	--	.042	--	-021	-022	-023	--
.641	1.312	.120	--	.062	.567	.040	MS172273	--	--	--	--
.679	1.203	.120	.030	.062	--	.042	--	--	--	--	-A03
.679	1.328	.120	.030	.062	--	.042	--	-031	-032	-033	--
.770	1.578	.176	--	.062	.677	.040	MS172275	--	--	--	--
.801	1.344	.176	.030	.062	--	.042	--	--	--	--	-A04
.801	1.531	.176	.030	.062	--	.042	--	-041	-042	-043	--
.895	1.719	.176	--	.094	.802	.050	MS172277	--	--	--	--
.989	1.562	.176	.030	.094	--	.050	--	--	--	--	-A05
.989	1.719	.176	.030	.094	--	.050	--	-051	-052	-053	--
1.020	1.891	.176	--	.094	.927	.050	MS172279	--	--	--	--
1.145	2.047	.176	--	.094	1.052	.050	MS172281	--	--	--	--
1.193	1.859	.176	.050	.094	--	.050	--	--	--	--	-A06
1.193	1.922	.176	.050	.094	--	.050	--	-061	-062	-063	--
1.270	2.172	.176	--	.094	1.177	.050	MS172283	--	--	--	--
1.333	2.250	.176	.050	.094	--	.050	--	-0651	-0652	-0653	--
1.385	2.297	.176	--	.094	1.302	.050	MS172285	--	--	--	--
1.386	2.078	.176	.050	.094	--	.050	--	--	--	--	-A07
1.386	2.250	.176	.050	.094	--	.050	--	-071	-072	-073	--
1.520	2.406	.239	--	.094	1.411	.063	MS172287	--	--	--	--
1.583	2.250	.300	.050	.094	--	.058	--	--	--	--	-A08
1.583	2.469	.290	.050	.094	--	.058	--	-081	-082	-083	--
1.775	2.719	.239	--	.125	1.661	.063	MS172291	--	--	--	--
1.792	2.500	.300	.050	.125	--	.058	--	--	--	--	-A09
1.792	2.734	.290	.050	.125	--	.058	--	-091	-092	-093	--
1.992	2.688	.300	.050	.125	--	.058	--	--	--	--	-A10
1.992	2.922	.290	.050	.125	--	.058	--	-101	-102	-103	--
2.025	2.969	.239	--	.125	1.911	.063	MS172295	--	--	--	--
2.182	2.953	.300	.050	.125	--	.063	--	--	--	--	-A11
2.182	3.109	.290	.050	.125	--	.063	--	-111	-112	-113	--
2.281	3.234	.239	--	.125	2.161	.063	MS172299	--	--	--	--
2.400	3.188	.300	.070	.125	--	.063	--	--	--	--	-A12
2.400	3.344	.290	.070	.125	--	.063	--	-121	-122	-123	--
2.531	3.484	.239	--	.125	2.411	.063	MS172303	--	--	--	--
2.588	3.375	.300	.070	.125	--	.063	--	--	--	--	-A13
2.588	3.578	.290	.070	.125	--	.063	--	-131	-132	-133	--

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TABLE I Part numbers - Continued

Material							Steel	Carbon steel	Carbon steel	CRES	Alloy steel
Protective coating							Phosphate	None	Zinc or cad plate	Passivate	Phosphate
A Min	B Max	C Max	D Max	E Min	F Min	G Nom	Part number	MS19070 - Dash no.			MS19069 - Dash no.
2701	3.594	.300	.070	.188	---	.063	---	---	---	---	-A14
2751	3.826	.290	.070	.188	---	.063	---	-141	-142	-143	---
2873	3.511	.300	.070	.188	---	.063	---	---	---	---	-A15
2972	4.109	.290	.070	.188	---	.072	---	-151	-152	-153	---
3177	4.141	.360	.070	.188	---	.063	---	---	---	---	-A16
3177	4.375	.290	.070	.188	---	.072	---	-161	-162	-163	---
3353	4.315	.300	.070	.188	---	.063	---	---	---	---	-A17
3355	4.621	.350	.070	.188	---	.072	---	-171	-172	-173	---
3582	4.547	.360	.070	.188	---	.063	---	---	---	---	-A18
3582	4.938	.350	.070	.188	---	.094	---	-181	-182	-183	---
3800	4.812	.360	.070	.188	---	.063	---	---	---	---	-A19
3800	5.219	.290	.070	.188	---	.094	---	-191	-192	-193	---
3988	5.500	.360	.085	.250	---	.063	---	---	---	---	-A20
3988	5.090	.350	.085	.250	---	.094	---	-201	-202	-203	---
4192	5.188	.360	.085	.250	---	.063	---	---	---	---	-A21
4192	5.703	.350	.085	.250	---	.094	---	-211	-212	-213	---
4395	5.406	.360	.085	.250	---	.063	---	---	---	---	-A22
4395	6.052	.350	.085	.250	---	.125	---	-221	-222	-223	---
4801	6.469	.350	.085	.250	---	.125	---	-241	-242	-243	---
5191	7.021	.435	.105	.250	---	.125	---	-261	-262	-263	---
5582	7.438	.520	.105	.250	---	.125	---	-281	-282	-283	---
5983	8.062	.590	.105	.312	---	.156	---	-301	-302	-303	---
6389	8.438	.590	.105	.312	---	.156	---	-321	-322	-323	---
6764	9.062	.715	.105	.312	---	.156	---	-341	-342	-343	---
7171	9.438	.715	.105	.312	---	.156	---	-361	-362	-363	---
7577	9.812	.715	.105	.312	---	.156	---	-381	-382	-383	---
7982	10.312	.840	.105	.312	---	.156	---	-401	-402	-403	---

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SECTION 402
WASHER, KEY, CUP, LOCK
APPLICABLE DOCUMENT MS9080

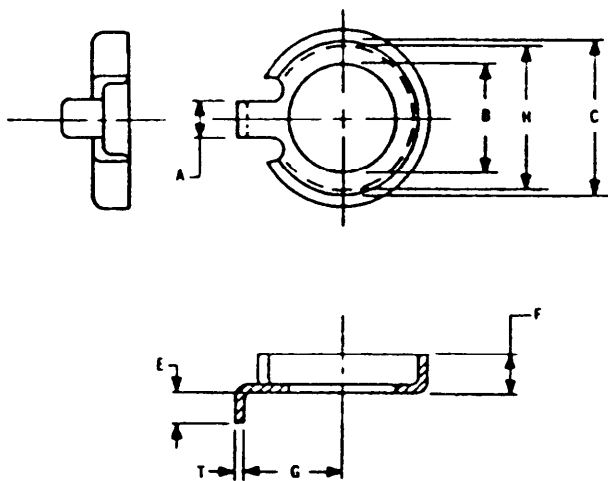


TABLE I Part numbers.

Material								CRES
Protective finish								None
B Min	A Min	C Min	E Min	F Min	G Min	T Max	H	MS9080, Dash no.
.230	.110	.377	.095	.140	.225	.025	.347	-09
.290	.110	.440	.100	.165	.270	.035	.410	-10
.352	.140	.502	.100	.165	.330	.035	.472	-11
.415	.140	.564	.140	.165	.370	.035	.534	-12

SECTION 403
WASHER, KEY, CUP, LOCK, SPANNER NUT
APPLICABLE DOCUMENT MS9952

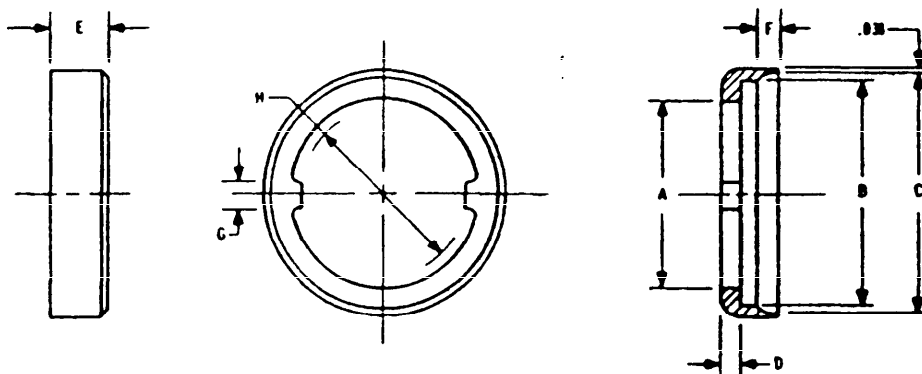


TABLE I. Part numbers.

Material								CRES
Protective finish								None
Hardness (BHN)								140-220
A Min	B Min	C	D	E	F	G Max	H Min	MS9952 - Dash no.
.378	.600	.615	.125	.425	.200	.120	.2756	-02
.441	.750	.775	.125	.425	.200	.120	.3346	-03
.503	.900	.925	.125	.425	.200	.120	.3906	-04
.628	.925	.950	.125	.425	.200	.120	.5156	-06
.753	1.075	1.100	.125	.425	.200	.120	.6406	-08
.878	1.200	1.225	.125	.425	.200	.150	.7656	-10
1.003	1.350	1.375	.125	.425	.200	.150	.8906	-12
1.128	1.475	1.500	.150	.475	.225	.150	1.0156	-14
1.253	1.625	1.650	.150	.475	.225	.180	1.130	-16
1.378	1.750	1.775	.150	.475	.225	.180	1.250	-18
1.503	1.900	1.925	.150	.475	.225	.180	1.375	-20
1.753	2.175	2.200	.150	.475	.225	.245	1.630	-24
2.003	2.450	2.475	.150	.475	.225	.245	1.865	-28
2.253	2.700	2.750	.150	.525	.275	.245	2.115	-32
2.503	2.975	3.025	.150	.525	.275	.245	2.365	-36
2.753	3.250	3.300	.150	.525	.275	.245	2.590	-39
3.003	3.525	3.575	.150	.525	.275	.245	2.835	-41

SECTION 404
WASHER, KEY, DRIVE (SYNCHRO)
APPLICABLE DOCUMENT: MS17186

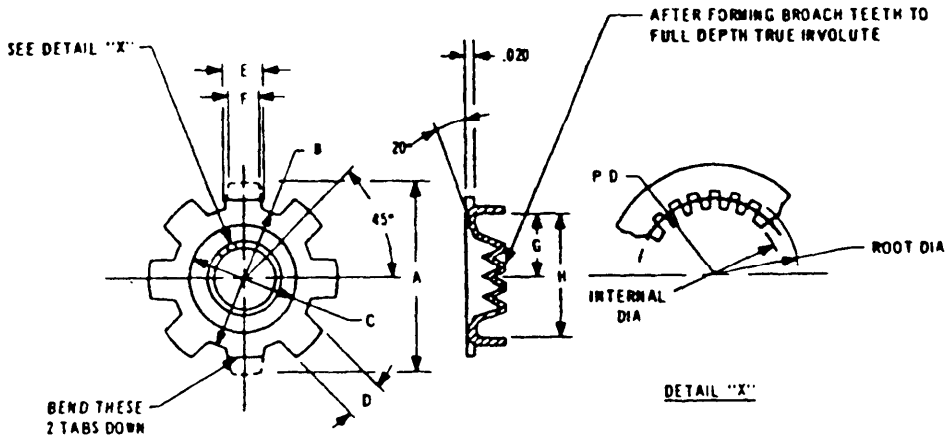


TABLE I. Part numbers.

Material														Aluminum alloy	Brass
Protective finish														Dichromate	Black nickel plating
C Min	A	B	D Min	E	F	G	H	Gear data						MS17186 - Dash no.	
								Press angle	Number of teeth	D. P.	P. D. Min	Root Min	Internal Min		
.215	.432	.287	.09	.093	.078	.146	.292	20°	13	120	.108	.125	.091	-1	-5
.291	.516	.350	.09	.125	.093	.177	.355	20°	15	96	.156	.177	.135	-3	-7
									21	120	.175	.192	.158	-2	-6
.350	.625	.437	.12	.125	.093	.208	.417	20°	22	96	.229	.250	.208	-4	-8

SECTION 405
WASHER, KEY, FLAT, GENERAL PURPOSE
APPLICABLE DOCUMENT MSZ7111

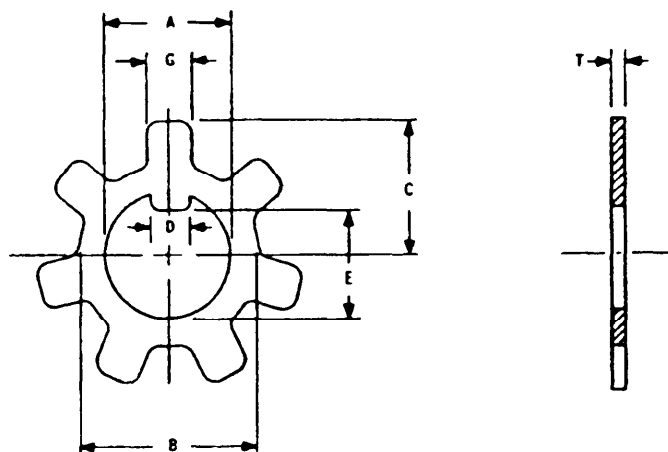


TABLE I. Part numbers.

Material							Carbon steel
Protective finish							Cadmium plate
A	B	C	D	E	G	T Max	MSZ7111 + Dash no.
.256	.374	.317	.055	.223	.094	.033	-1
.319	.436	.364	.055	.286	.116	.033	-2
.381	.499	.411	.086	.333	.140	.033	-3
.444	.560	.458	.086	.386	.164	.033	-4
.506	.624	.546	.117	.442	.188	.033	-5
.631	.896	.705	.148	.551	.234	.052	-7
.756	1.019	.798	.180	.661	.280	.052	-8
.881	1.206	.934	.180	.786	.328	.052	-9
1.006	1.367	1.057	.242	.880	.374	.065	-10
1.131	1.517	1.211	.242	1.005	.422	.065	-11
1.256	1.698	1.361	.305	1.097	.468	.065	-12
1.381	1.880	1.487	.305	1.222	.516	.065	-13
1.506	2.029	1.623	.367	1.316	.562	.081	-14
1.756	2.397	1.875	.430	1.534	.656	.081	-15
2.006	2.754	2.127	.492	1.753	.750	.081	-16

SECTION 406
WASHER, KEY, LOCKING
APPLICABLE DOCUMENTS W39276, W39581, W39582

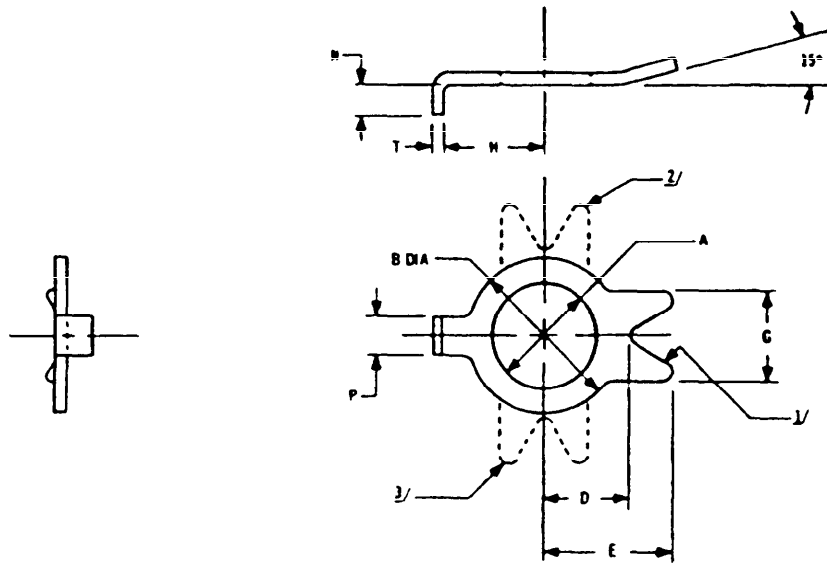


TABLE I. Part numbers.

Material										GRES		
Protective finish										Not specified	Not specified	Not specified
Configuration										1/	2/	3/
Angle										180°	90°	270°
A Min	B Max	D Min	E Min	G Max	H Max	N Min	P Max	T Max		W39276 - Dash no.	W39581 - Dash no.	W39582 - Dash no.
.170	.320	.160	.275	.185	.191	.080	.085	.075		-08	-08	-04
.195	.380	.190	.295	.210	.231	.095	.115	.025		-09	-09	-09
.255	.450	.220	.350	.260	.275	.100	.115	.036		-10	-10	-10
.320	.505	.250	.410	.290	.335	.100	.145	.036		-11	-11	-11
.390	.570	.280	.450	.330	.375	.140	.145	.036		-12	-12	-12
.450	.695	.345	.525	.400	.425	.150	.175	.040		-13	-13	-13
.515	.755	.375	.590	.435	.475	.150	.205	.040		-14	-14	-14
.640	.940	.470	.680	.540	.575	.150	.205	.040		-16	-16	-16
.765	1.065	.530	.730	.560	.675	.150	.235	.040		-17	-17	-17
.890	1.255	.625	.860	.610	.800	.150	.265	.040		-18	-18	-18
1.015	1.440	.715	.950	.660	.875	.150	.295	.040		-19	-19	-19

SECTION 407
WASHER, KEY, LOCKING, SPECIAL DESIGN
APPLICABLE DOCUMENT: MS15820

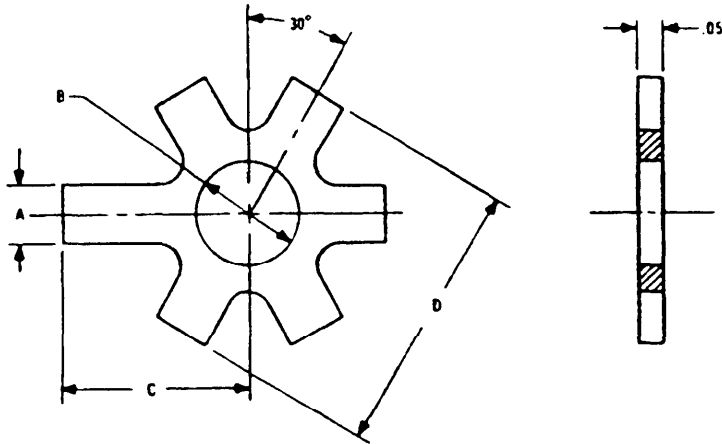


TABLE I. Part numbers.

Material				Steel
Protective finish				Galvanized
B	A	C	D	MS15820 - Dash no.
13/32	1/4	1	1-1/4	-1
17/32	5/16	1-1/8	1-1/2	-2
21/32	3/8	1-1/4	1-3/4	-3
25/32	3/8	1-3/8	2	-4
29/32	5/16	1-1/2	2-1/4	-5
1-1/16	1/2	1-3/4	2-1/2	-6
1-3/16	1/2	1-3/4	2-1/2	-7
1-5/16	1/2	1-7/8	2-5/8	-8

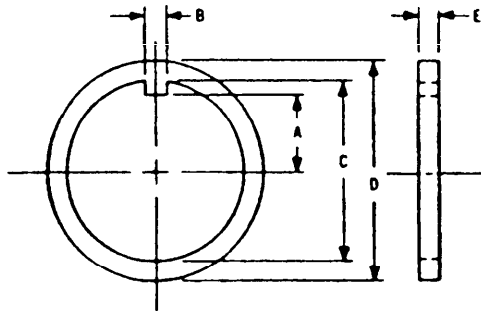
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WASHER, KEY, RETAINING, WHEEL BEARING
APPLICABLE DOCUMENT MS21258

TABLE I. Part numbers.

Material					Steel	
Protective finish					Cadmium plate	Zinc plate
A Min	B Max	C Min	D Max	E Max	MS21258 - Dash no.	
.388	.125	.944	1.405	.098	C15	Z15
.419	.166	1.005	1.530	.130	C16	Z16
.541	.166	1.255	1.780	.130	C20	Z20
.630	.166	1.440	1.905	.130	C23	Z23
.665	.166	1.510	1.905	.130	C24	Z24
.750	.166	1.755	2.280	.130	C28	Z28
.845	.229	1.945	2.405	.130	C31	Z31
.875	.229	2.005	2.655	.130	C32	Z32
1.100	.229	2.445	3.092	.130	C39	Z39
1.302	.291	2.943	3.718	.130	C47	Z47
1.552	.291	3.443	4.780	.130	C55	Z55
2.052	.291	4.445	5.405	.192	C71	Z71

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SECTION 409
WASHER, KEY, TAB
APPLICABLE DOCUMENTS MS25081, NAS1636

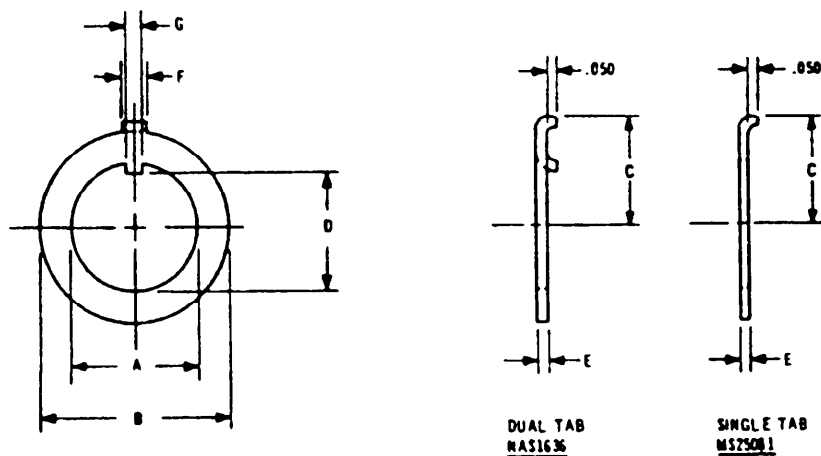
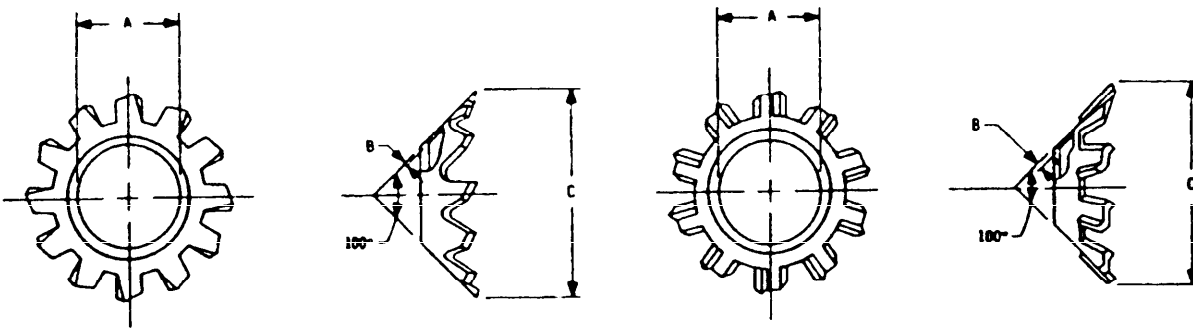


TABLE I. Part numbers.

Material							Carbon steel	CRES		
Protective Finish							Cadmium plate	Passivate		
A Min	B Max	C Max	D Min	E Max	F Max	G Max	MS25081 - Dash no.		NAS1636 - Dash no.	
.250	.414	.250	.220	.035	.067	.051	-0	CO	-	
.377	.642	.370	.340	.035	.115	.065	-	CI	-3	
.470	.735	.397	.433	.045	.115	.067	-4	CI	-	
.470	.735	.417	.433	.055	.115	.065	-	-	-1	
.625	.891	.522	.589	.045	.115	.067	-5	CS	-	
.625	.891	.494	.589	.035	.115	.065	-	-	-2	
.647	.891	.475	.591	.045	.115	.067	-6	CS	-	
.747	1.000	.533	.633	.045	.115	.067	-7	CS	-	
1.005	1.264	.710	.951	.045	.115	.067	-8	CS	-	

SECTION 501
WASHER LOCK EXTERNAL TOOTH, COUNTERSUNK
APPLICABLE DOCUMENT MS35790

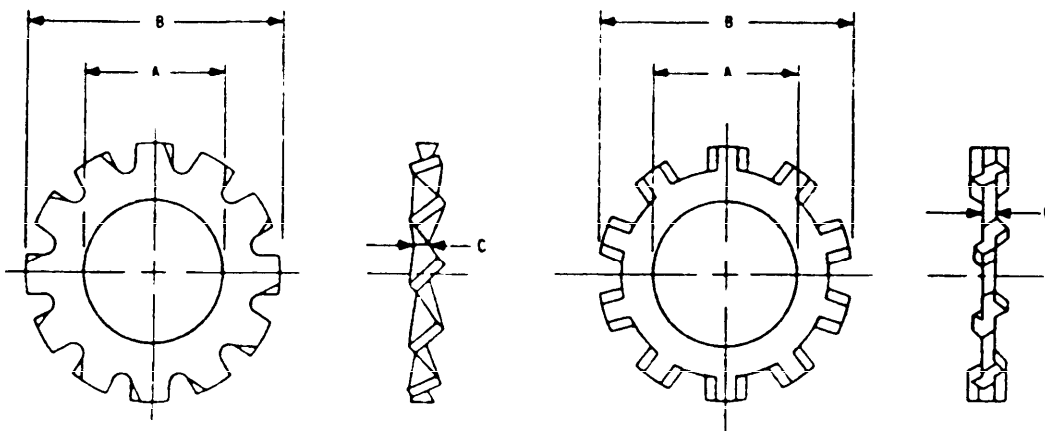


OPTIONAL DESIGNS

TABLE I. Part numbers.

Material			Carbon steel	Tin brass or phosphor bronze
Protective finish			Cadmium plate	None
A Min	B Max	C Max	MS35790 - Dash no.	
.089	.010	.193	-101	-117
.113	.019	.280	-109	-119
.140	.021	.319	-1	-121
.167	.021	.360	-9	-123
.195	.025	.394	-17	-125
.255	.025	.493	-25	-127
.318	.028	.653	-33	-129
.383	.034	.850	-41	-131

SECTION 502
WASHER LOCK, EXTERNAL TOOTH, FLAT
APPLICABLE DOCUMENT MS35335

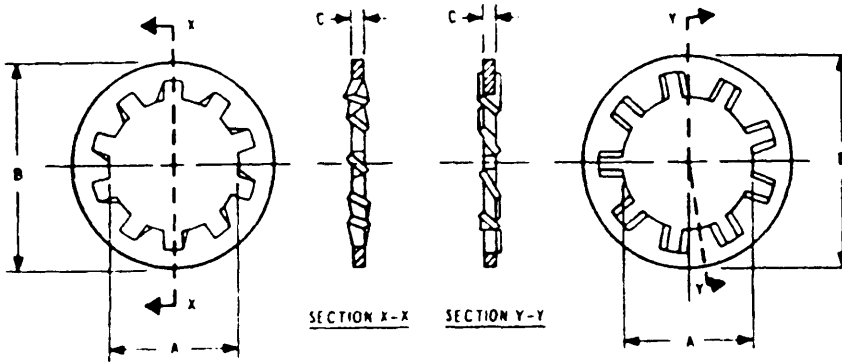


OPTIONAL DESIGNS

TABLE I Part numbers.

Material			Carbon steel	CRES	Tin, brass or phosphor bronze
Protective finish			Cadmium plate	Passivate	Uncoated
A Min	B Max	C Max	MS35335 - Dash no.		
.115	.250	.019	-29	-57	-85
.141	.320	.022	-30	-58	-86
.168	.381	.023	-31	-59	-87
.195	.410	.025	-32	-60	-88
.256	.510	.028	-33	-61	-89
.320	.610	.034	-34	-62	-90
.384	.694	.040	-35	-63	-91
.448	.760	.040	-36	-64	-92
.513	.900	.045	-37	-65	-93
.576	.985	.045	-38	-66	-94
.641	1.070	.050	-39	-67	-95
.768	1.260	.055	-40	-68	-96
.897	1.410	.060	-41	-69	-97
1.025	1.620	.067	-42	-70	-98

SECTION 503
WASHER, LOCK, INTERNAL TOOTH, FLAT
APPLICABLE DOCUMENTS MS35333, MS35334

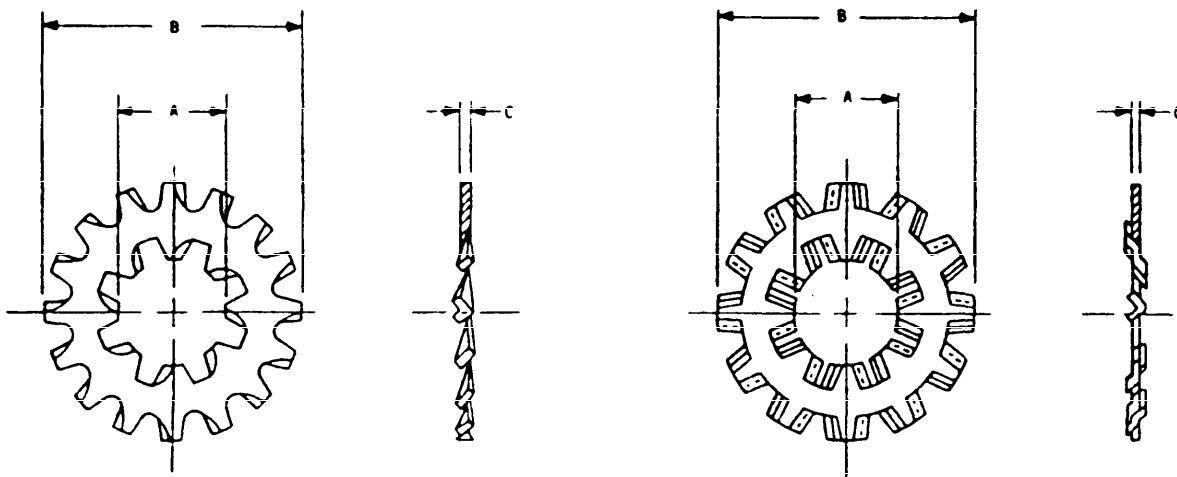


OPTIONAL DESIGNS

TABLE I Part numbers

Material			Carbon steel		CRES	Tin brass or phosphor bronze
Protective finish			Cadmium plate		Passivate	None
A Min	B Max	C Max	MS35333 - Dash no.	MS35334 - Dash no.	MS35333 - Dash no.	
.089	.200	.015	-35	---	-69	-103
.115	.270	.019	-36	---	-70	-104
.141	.295	.021	-37	---	-71	-105
.168	.340	.023	-38	---	-72	-106
.195	.381	.025	-39	---	-73	-107
.256	.410	.020	-125	---	-135	-145
	.478	.028	-40	---	-74	-108
	.536	.045	---	-19	---	---
.320	.607	.050	---	-20	---	---
	.610	.034	-41	---	-75	-109
.384	.692	.040	-42	---	-76	-110
	.748	.050	---	-21	---	---
.440	.592	.020	-131	---	-141	-151
.448	.789	.040	-43	---	-77	-111
.512	.900	.045	-44	---	-78	-113
	.924	.067	---	-23	---	---
.630	.800	.027	-128	---	-138	-148
.640	1.071	.050	-46	---	-80	-115
	1.135	.067	---	-25	---	---
.768	1.265	.084	---	-26	---	---
.769	1.245	.055	-47	---	-81	-116
.775	1.077	.027	129	---	-139	-149
.894	1.410	.060	-48	---	-82	-117
	1.447	.084	---	-27	---	---
1.010	1.390	.028	-130	---	-140	-150
1.019	1.637	.067	-49	---	-83	-118
1.225	1.975	.067	-51	---	-85	-120

SECTION 504
WASHER LOCK INTERNAL AND EXTERNAL TOOTH, FLAT
APPLICABLE DOCUMENT MS45904

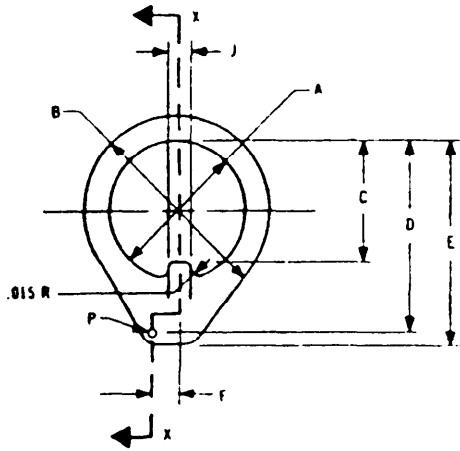


OPTIONAL DESIGNS

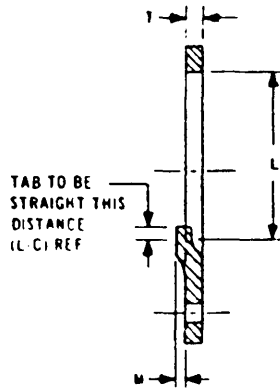
TABLE I. Part numbers.

Material			Carbon steel
Protective finish.			Cadmium plate
A Min	B Max	C Max	MS45904, Dash no.
.115	.475	.021	-51
.141	.510	.028	-54
.168	.610	.034	-57
	.690	.034	-58
	.760	.034	-59
.195	.610	.034	-60
	.690	.040	-61
	.760	.040	-62
	.900	.040	-63
.256	.760	.040	-68
	.900	.040	-69
	.985	.045	-70
	1.070	.045	-71
.320	.900	.040	-72
	.985	.045	-73
	1.070	.050	-74
.384	.985	.045	-76
	1.070	.050	-77
	1.155	.050	-78
	1.260	.050	-79
.512	1.260	.055	-84
	1.410	.060	-86
	1.620	.067	-87
.640	1.410	.060	-92
	1.620	.067	-93

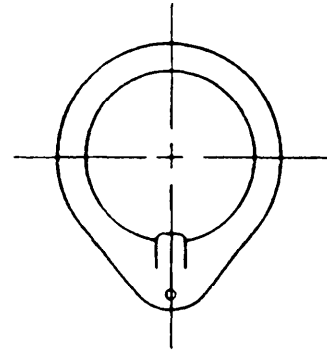
SECTION 505
WASHER LOCK ROD END
APPLICABLE DOCUMENT WASS13



-4 THRU -20



SECTION X-X



-22 THRU -36

TABLE I. Part numbers.

Material											Spring steel
Protective finish											Cadmium plate
Hardness (Rockwell)											C 60 45
A	B	C	D	E	F	J	L	M	T	P	WASS13 Dash no.
.272	.44	.214	.406	.500	.125	.052	.293	.036	.050	.062	-4
.334	.50	.273	.484	.578	.125	.052	.355	.036	.050	.062	-5
.396	.56	.327	.562	.656	.125	.082	.418	.036	.050	.062	-6
.459	.63	.366	.625	.719	.125	.082	.463	.049	.063	.062	-7
.520	.75	.450	.719	.813	.156	.082	.542	.049	.063	.062	-8
.647	1.00	.559	.937	1.031	.188	.114	.675	.057	.071	.071	-10
.772	1.12	.681	1.062	1.156	.188	.114	.800	.057	.071	.071	-12
.897	1.31	.795	1.250	1.344	.188	.142	.944	.066	.080	.080	-14
1.022	1.50	.918	1.422	1.516	.188	.142	1.088	.074	.090	.090	-16
1.147	1.62	1.028	1.547	1.656	.219	.174	1.213	.074	.090	.090	-18
1.272	1.75	1.154	1.687	1.796	.219	.174	1.280	.096	.112	.112	-20
1.387	1.88	1.254	1.859	1.969	--	.236	1.405	.096	.112	.112	-22
1.518	2.00	1.379	1.969	2.078	--	.236	1.530	.096	.112	.112	-24
1.643	2.12	1.495	2.109	2.219	--	.236	1.638	.109	.125	.125	-26
1.766	2.25	1.607	2.260	2.375	--	.298	1.763	.109	.125	.125	-28
1.891	2.38	1.732	2.375	2.484	--	.298	1.888	.109	.125	.125	-30
2.016	2.63	1.857	2.594	2.703	--	.298	2.076	.109	.125	.125	-32
2.141	2.75	1.973	2.750	2.860	--	.298	2.201	.109	.125	.125	-34
2.266	2.88	2.098	2.875	2.984	--	.298	2.326	.109	.125	.125	-36

SECTION 506
WASHER LOCK SPRING HELICAL
APPLICABLE DOCUMENTS MS35338, MS35340, MSS1848

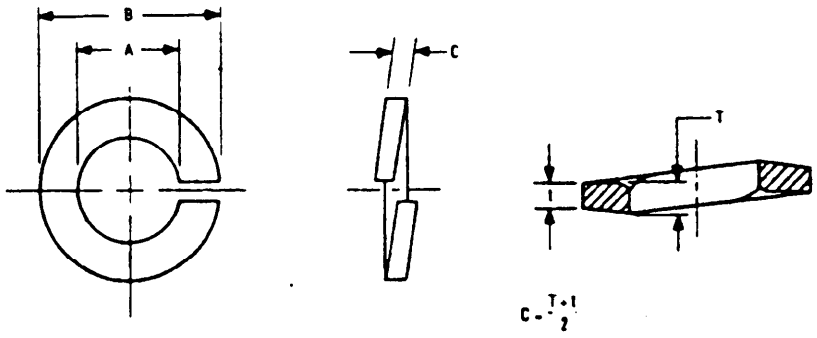


TABLE I. Part numbers.

Material			Carbon steel					CRES					Ph brz or tin brs	Nickel copper alloy
								Series						
Protective finish			Cadmium plate		Phosphate			Passivate		Black oxide		Cadmium plate	None	
Hardness (Rockwell)			C45-43	C45-53	C45-53	Not specified		C35-43	C35-43	C45-53	C35-43	C45-53	None	
A Min	B Max	C Min	MSS1848 - Dash no.	MS35338 - Dash no.	MS35340 - Dash no.	MS35338 - Dash no.	MSS1848 - Dash no.	MSS1848 - Dash no.	MS35338 - Dash no.					
.062	.092	.016	-1	--	--	--	-21	-41	--	--	--	--	--	--
.088	.135 .172 .208	.020 .020 .027	-3 -- --	-- -39 --	-- -- -39	-- -- --	-23 -- --	-43 -- --	-- -134 --	-- -153 --	-- -134B --	-- -153B --	-- -96 --	-- -115 --
.114	.173 .115	.022 .034	-5 --	-- --	-- -40	-- --	-25 --	-45 --	-- --	-- --	-- --	-- --	-- --	-- --
.115	.209	.025	--	-40	--	-59	--	--	-135	-154	-135B	-154B	-97	-116
.141	.216 .250 .314	.030 .031 .045	-7 -- --	-- -41 --	-- -- -41	-- -60 --	-27 -- --	-47 -- --	-- -136 --	-- -155 --	-- -136B --	-- -155B --	-- -98 --	-- -117 --
.167	.267 .168	.047 .057	-8 --	-- --	-- -42	-- --	-28 --	-48 --	-- --	-- --	-- --	-- --	-- --	-- --
.168	.293	.040	--	-42	--	-61	--	--	-137	-156	-137B	-156B	-99	-118
.193	.294 .194	.047 .068	-9 --	-- --	-- -43	-- --	-29 --	-49 --	-- --	-- --	-- --	-- --	-- --	-- --
.194	.334	.047	--	-43	--	-62	--	--	-138	-157	-138B	-157B	-100	-119
.254	.365 .255	.078 .084	-10 --	-- --	-- -44	-- --	-30 --	-50 --	-- --	-- --	-- --	-- --	-- --	-- --
.255	.489	.062	--	-44	--	-63	--	--	-139	-158	-139B	-158B	-101	-120
.317	.460 .318	.093 .108	-11 --	-- --	-- -45	-- --	-31 --	-51 --	-- --	-- --	-- --	-- --	-- --	-- --

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TABLE I Part numbers - Continued

Material			Carbon steel					CRES					Ph brz or tin brs	Nickel copper alloy
								Series						
Protective finish			Cadmium plate			Phosphate		Passivate			Black oxide		Cadmium plate	None
Hardness (Rockwell)			C45-S3	C45-S3	C45-S3	C45-S3		C35-43	C35-43	C45-S3	C35-43	C45-S3	None	
A Min	B Max	C Min	MSS1848 - Dash no.	MSS3538 - Dash no.	MSS3540 - Dash no.	MSS3538 - Dash no.	MSS1848 - Dash no.	MSS1848 - Dash no.	MSS3538 - Dash no.					
.318	.586	.078	--	-45	--	-64	--	--	-140	-159	-140B	-159B	-102	-121
.387	.553 .741	.125 .123	-12 --	-- -46	--	--	-32 --	-52 --	-- --	-- --	-- --	-- --	-- --	-- --
.387	.683	.094	--	-46	--	-65	--	--	-141	-160	-141B	-160B	-103	-122
.443	.647	.140	-13	--	--	--	-33	-53	--	--	--	--	--	--
.446	.779	.109	--	-47	--	-66	--	--	-142	-161	-142B	-161B	-104	-123
.509	.737 .939	.172 .162	-14 --	-- -48	--	--	-34 --	-54 --	-- --	-- --	-- --	-- --	-- --	-- --
.509	.873	.125	--	-48	--	-67	--	--	-143	-162	-143B	-162B	-105	-124
.572	.971	.141	--	-49	--	-68	--	--	-144	-163	-144B	-163B	-106	-125
.636	.923 1.157	.203 .202	-15 --	-- -50	--	--	--	-55 --	-- --	-- --	-- --	-- --	-- --	-- --
.636	1.079	.156	--	-50	--	-69	--	--	-145	-164	-145B	-164B	-107	-126
.763	1.111 1.361	.218 .241	-16 --	-- -51	--	--	--	--	--	--	--	--	--	--
.763	1.271	.188	--	-51	--	-70	--	--	-146	-165	-146B	-165B	-108	-127
.887	1.296	.234	-17	--	--	--	--	--	--	--	--	--	--	--
.890	1.464	.219	--	-52	--	-71	--	--	-147	-166	-147B	-166B	-109	-128
1.017	1.483 1.661 1.799	.250 .250 .330	-18 -- --	-- -53 -53	-- -- --	-- -72 --	-- -- --	-- -- --	-148 -167 --	-167 -148B --	-167B -167B --	-- -- --	-- -110 --	-- -129 --
1.144	1.853	.281	--	-54	--	--	--	--	-149	-168	-149B	-168B	-111	-130
1.271	2.045 2.231	.312 .417	-- --	-55 -55	-- --	-- --	-- --	-- --	-150 -169	-169 --	-150B -169B	-169B --	-112 --	-131 --
1.388	2.239	.344	--	-56	--	--	--	--	-151	-170	-151B	-170B	-113	-132
1.525	2.430 2.638	.375 .496	-- --	-57 -57	-- --	-- --	-- --	-- --	-152 -171	-171 --	-152B -171B	-171B --	-114 --	-133 --

SECTION 601
WASHER, RECESSED, COUNTERSUNK, ONE SURFACE
APPLICABLE DOCUMENTS NAS1587, MS20002, MS21206

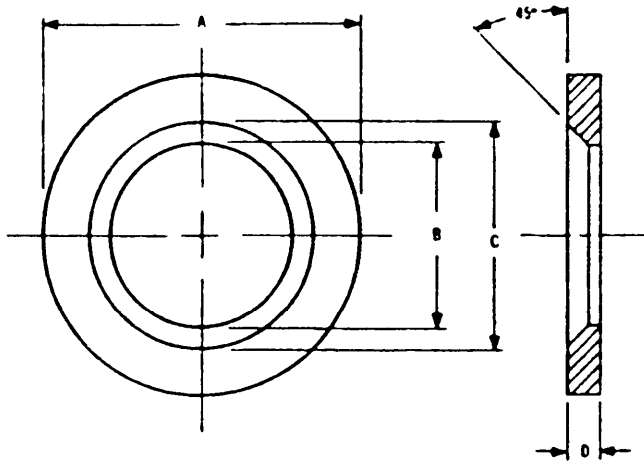


TABLE I. Part numbers.

Material				CRES Type 321 or 347	Alloy steel		
Protective finish				Passivate	Cadmium plate		
Tensile strength (psi)				75,000 Min	125,000 to 145,000	Not specified	
Hardness (Rockwell)				Not specified	Not specified	C38-45	
B Min	C Min	A Max	D Max	NAS1587 + Dash no.	MS20002 + Dash no.	MS21206 + Dash no.	
.191	.280	.372	.069	—	—	C3	
.192	.222	.479	.072	-3C	—	—	
.251	.340	.470	.069	—	—	C4	
.252	.334	.541	.088	-4C	C4	—	
.314	.402	.573	.069	—	—	C5	
.315	.396	.593	.078	-5C	C5	—	
.376	.497	.679	.085	—	—	C6	
.378	.483	.697	.088	-6C	C6	—	
.439	.559	.783	.085	—	—	C7	
.441	.543	.791	.088	-7C	C7	—	
.501	.622	.898	.085	—	—	C8	
.504	.604	.085	.088	-8C	C8	—	
.627	.778	1.125	.085	—	—	C10	
.631	.765	1.072	.088	-10C	C10	—	
.752	.903	1.350	.085	—	—	C12	
.757	.890	1.260	.088	-12C	C12	—	
.877	1.028	1.572	.085	—	—	C14	
.884	1.015	1.447	.088	-14C	C14	—	
1.002	1.153	1.798	.119	—	—	C16	
1.010	1.140	1.635	.088	-16C	C16	—	
1.127	1.278	2.188	.119	—	—	C18	
1.135	1.265	1.885	.088	-18C	C18	—	
1.252	1.435	2.260	.119	—	—	C20	
1.260	1.427	2.135	.104	-20C	C20	—	
1.377	1.560	2.490	.119	—	—	C22	
1.385	1.552	2.323	.104	—	C22	—	
1.502	1.685	2.723	.119	—	—	C24	
1.510	1.677	2.510	.104	—	C24	—	

SECTION 602
WASHER, RECESSED, COUNTERSUNK, TWO SURFACES
APPLICABLE DOCUMENTS: MS9482, MS9768, MS14155, MS14177

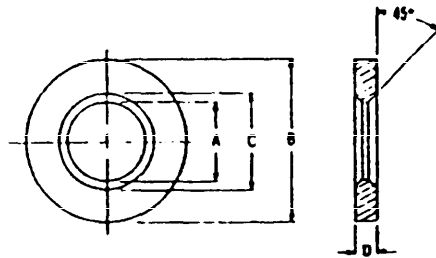


TABLE I. Part numbers.

Material				Steel	CRES	Alloy steel	
Protective finish				Diffused nickel-cadmium plate	None	Cadmium plate	
Hardness (Rockwell)				C50-56	C29-39	C39-43	
A Min	B Max	C Min	D Max	MS9482 - Dash no.	MS9768 - Dash no.	MS14155 - Dash no.	MS14177 - Dash no.
.140	.340	.176	.076	—	-07	—	—
.143	.315	.178	.070	-07	—	—	—
.166	.385	.202	.076	—	-08	—	—
.169	.375	.214	.085	-08	—	—	—
.192	.448	.236	.085	—	-08	—	—
.195	.435	.250	.095	-09	—	—	—
.251	.505	.337	.124	—	—	-4	—
	.532	.337	.133	—	—	—	-4
.252	.635	.296	.085	—	-10	—	—
.255	.570	.332	.135	-10	—	—	—
.314	.620	.399	.124	—	—	-5	—
	.651	.399	.133	—	—	—	-5
.315	.760	.359	.105	—	-11	—	—
.317	.700	.394	.160	-11	—	—	—
.376	.766	.494	.158	—	—	-6	—
	.795	.494	.167	—	—	—	-6
.378	.885	.422	.117	—	-12	—	—
.380	.855	.489	.195	-12	—	—	—
.439	.878	.556	.158	—	—	-7	—
	.912	.556	.167	—	—	—	-7
.441	1.010	.495	.130	—	-13	—	—
.443	.980	.552	.215	-13	—	—	—
.501	1.004	.619	.163	—	—	-8	—
	1.038	.619	.167	—	—	—	-8
.504	1.198	.558	.165	—	-14	—	—
.505	1.170	.614	.260	-14	—	—	—
.627	1.266	.775	.226	—	—	-10	—
	1.302	.775	.198	—	—	—	-10
.630	1.405	.771	.315	-16	—	—	—
.752	1.507	.900	.278	—	—	-12	—
	1.546	.900	.198	—	—	—	-12
.755	1.670	.896	.375	-17	—	—	—
.877	1.747	1.025	.320	—	—	-14	—
	1.791	1.025	.198	—	—	—	-14
.880	1.935	1.021	.430	-18	—	—	—
1.002	1.978	1.150	.368	—	—	-16	—
1.005	2.195	1.146	.480	-19	—	—	—

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SECTION 603
WASHER, RECESSED, TAPER PIN
APPLICABLE DOCUMENT AN975

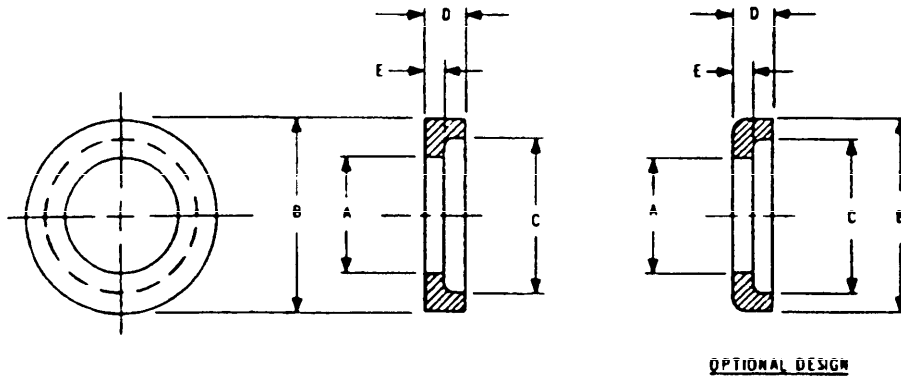


TABLE I. Part numbers

Material					Steel
Protective finish					Cadmium plate
A	B	C	D	E	AN975 - Dash no.
13/64	15/32	11/32	3/16	1/16	-3
17/64	9/16	13/32	13/64	5/64	-4
21/64	11/16	17/32	13/64	5/64	-5
25/64	25/32	19/32	13/64	5/64	-6
29/64	27/32	21/32	13/64	5/64	-7
33/64	15/16	23/32	7/32	3/32	-8
49/64	1- 9/32	1	15/64	7/64	-12
57/64	1-15/32	1- 3/16	15/64	7/64	-14

SECTION 701
WASHER SHOULDERED AND RECESSED DIMPLED 100
APPLICABLE DOCUMENT NAS1169

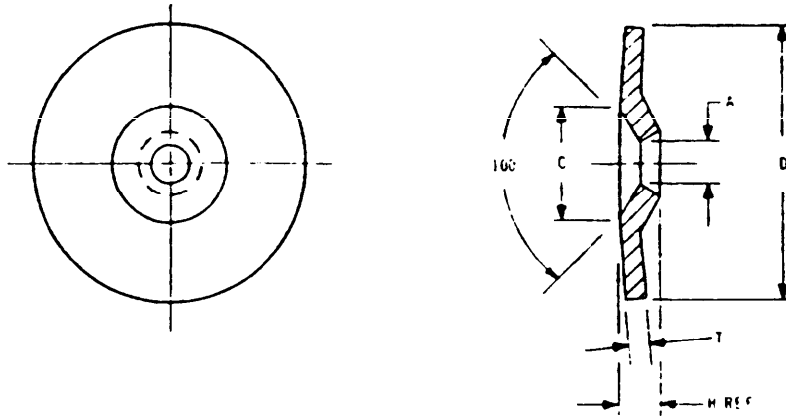


TABLE I Part numbers

Material					Carbon steel	Aluminum alloy		CRES	Titanium
Protective finish					Cadmium plate	5052	2024	Passivate	Not specified
Hardness or tensile strength (ksi)					Rockwell C42-47	Not specified		160 tensile	None
A Min	D Max	C Min	H Ref	T	NAS1169 - Dash no.				
.140	.495	.279	.068	.008	--	D6E	--	--	--
			.076	.016	-6L	--	DD6L	C6L	T6L
			.082	.025	-6	--	DD6	C6	T6
.166	.582	.332	.079	.008	--	D8E	--	--	--
			.087	.016	-8L	--	DD8L	C8L	T8L
			.094	.025	-8	--	DD8	C8	T8
.192	.645	.385	.091	.008	--	D10E	--	--	--
			.099	.016	-10L	--	DD10L	C10L	T10L
			.101	.025	-10	--	DD10	C10	T10
.252	.770	.507	.117	.008	--	D416E	--	--	--
			.125	.016	-416L	--	DD416L	C416L	T416L
			.132	.025	-416	--	DD416	C416	T416
.314	.958	.635	.145	.008	--	D516E	--	--	--
			.153	.016	-516L	--	DD516L	C516L	T516L
			.160	.025	-516	--	DD516	C516	T516
.377	1.020	.762	.172	.008	--	D616E	--	--	--
			.180	.016	-616L	--	DD616L	C616L	T616L
			.188	.025	-616	--	DD616	C616	T616
.440	1.208	.890	.200	.008	--	D716E	--	--	--
			.206	.016	-716L	--	DD716L	C716L	T716L
			.215	.025	-716	--	DD716	C716	T716
.502	1.332	1.017	.225	.008	--	D816E	--	--	--
			.237	.016	-816L	--	DD816L	C816L	T816L
			.245	.025	-816	--	DD816	C816	T816

SECTION 801
WASHER, SPRING TENSION
APPLICABLE DOCUMENT MIL-W-12133/1

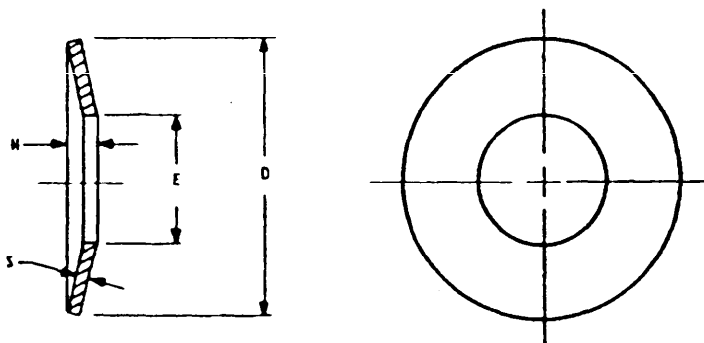


TABLE I. Part numbers.

Material				Spring steel	
Protective finish				Plain	Cadmium plate
E Min	D Max	S Nom	H Nom	M 12133/1 - Dash no.	
.125	.250	.013	.020	-1	-1P
.156	.312	.017	.025	-2	-2P
.195	.375	.015	.027	-3	-3P
.254	.500	.020	.035	-4	-4P
.317	.625	.032	.051	-5	-5P
.382	.750	.032	.054	-6	-6P
.445	1.000	.035	.067	-7	-7P
.512	1.000 1.102	.039 .049	.075 .083	-8 -9	-8P -9P
.637	1.375	.059	.102	-10	-10P
.761	1.500	.059 .070	.114 .121	-11 -12	-11P -12P
.880	1.750	.085	.128	-13	-13P
1.016	2.000 2.375	.079 .090	.138 .177	-14 -15	-14P -15P

Aeronautical Systems Division (AFSC)
Wright-Patterson AFB, OH 45433

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INSTRUCTIONS This form is provided to solicit beneficial comments which may improve this document and enhance its use. DoD contractors, government activities, manufacturers, vendors, or other prospective users of the document are invited to submit comments to the government. Fold on lines on reverse side, staple in corner, and send to preparing activity. Attach any pertinent data which may be of use in improving this document. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity. A response will be provided to the submitter, when name and address is provided, within 30 days indicating that the 1426 was received and when any appropriate action on it will be completed.

NOTE This form shall not be used to submit requests for waivers, deviations or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

DOCUMENT IDENTIFIER (Number) AND TITLE

MIL-STD-1764 WASHERS, PREFERRED FOR DESIGN, LISTING OF

NAME OF ORGANIZATION AND ADDRESS OF SUBMITTER

VENDOR USER MANUFACTURER

1 HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? IS ANY PART OF IT TOO RIGID, RESTRICTIVE, LOOSE OR AMBIGUOUS? PLEASE EXPLAIN BELOW.

A. GIVE PARAGRAPH NUMBER AND WORDING

B. RECOMMENDED WORDING CHANGE

C. REASON FOR RECOMMENDED CHANGE(S)

2. REMARKS

SUBMITTED BY (Printed or typed name and address - Optional)

TELEPHONE NO

DATE

DD FORM 1426
1 OCT 76

EDITION OF 1 JAN 72 WILL BE USED UNTIL EXHAUSTED.

MIL-STD-1764
31 January 1980

DEPARTMENT OF DEFENSE
Washington, DC 20301

Washers Preferred for Design, Listing of

MIL-STD-1764

1. This Military Standard is approved for use by all Departments and Agencies of the Department of Defense.
2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Aeronautical Systems Division (AFSC), ATTN: ASD/ENESS, Wright-Patterson Air Force Base, Ohio 45433 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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FOREWORD

1. The purpose of this bookform standard is to provide a commodity type parts document on washers to aid military equipment designers and engineers in the selection of preferred washers.
2. This document consists of an index of preferred standardization documents and a listing of preferred parts within these documents that have been selected with respect to configuration, sizes, lengths, materials, and finishes for washers.
3. The selection of preferred documents listed in this standard and the selection of part numbers within the preferred documents were made as follows:
 - a. Selection of Documents
 - (1) Documents listed or scheduled for listing in the Department of Defense Index of Specifications and Standards (DODISS).
 - (2) Documents which are active for design.
 - (3) Documents specifying part numbers (dash numbers) which designate specific sizes, materials and finishes.
 - b. Selection of Part Numbers
 - (1) By conducting a thorough search and evaluation of existing DoD procurement information.
 - (2) By evaluation of preferred parts listed in recent weapon system contracts.
 - (3) By evaluation of preferred parts lists obtained from industry.
4. To increase the scope and versatility of this washer standard, periodic revisions will be developed. Results from Standardization studies, MILITARY PARTS CONTROL ADVISORY GROUP (MPCAG) evaluations, evaluation of a new family of washers and recommendations from interested activities will form the basis for these revisions.

MIL-SJD-1764
31 January 1980

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1. SCOPE

1.1 Scope. This standard provides a listing of preferred washers encompassing the following characteristics:

- a. Configuration
- b. Size
- c. Materials
- d. Protective Coatings and Finishes

1.2 Purpose. The purpose of this standard is as follows:

- a. Provide the designer with a listing of preferred washers to promote their use in design of weapon systems and equipments.
- b. Control and minimize the variety of washers used in military equipment thereby facilitating logistic support of the equipment during its life cycle.

1.3 Application. To minimize the proliferation of washers, only the preferred part number listed herein is authorized for use in new design. All other part numbers, even though shown on current Military Specification Sheets, Military Standards (MS), National Aerospace Standards (NAS), Aeronautical Standards (AS), and Air Force/Navy Aeronautical Standards (AN), are not approved for use in new design unless approved by the cognizant Government procuring activity.

1.4 Intended Use. Implement this standard by including one of the following options in the contract:

- a. Require this standard as a supplement to an end use type standard such as MIL-STD-1471 or MIL-STD-1515. When thus required, only the washers listed in both the end use type and this standard are acceptable. Use of other washers requires approval of the Government procuring activity.
- b. Require this standard as a guide to be used with an end use type standard such as MIL-STD-1471 or MIL-STD-1515. When thus required, the washers listed in the end use type standard and this standard are acceptable. The designer must assure himself the washers listed in both the end use type standard and this standard are not adequate for his requirement before using washers not listed herein. Use of washers not listed in the end use type standard requires approval of the Government procuring activity.
- c. Require this standard and indicate exceptions to it. When thus required, only the washers listed in this standard and not excluded by the exceptions are acceptable. Use of other washers requires approval of the Government procuring activity.
- d. Require this standard as a guide. When thus required, the designer must assure himself the washers listed in this standard are not adequate for the requirement before using other washers.

2. REFERENCED DOCUMENTS

2.1 Issues of Documents. The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this standard to the extent specified herein.

SPECIFICATIONS

MILITARY

MIL-W-12133/1 - Washer, Spring Tension (Belleville Spring).

STANDARDS

MILITARY

MS9276 - Washer, Key-Cres, AMS 5510, 180° Locking.
 MS9320 - Washer, Flat - AMS 6350.
 MS9321 - Washer, Flat - AMS 5510.
 MS9482 - Washer, Flat - Steel AMS 6437 or AMS 6485, Diffused Nickel - Cadmium Plated, Countersunk.
 MS9549 - Washer, Flat - AMS 5510.
 MS9581 - Washer, Key-Cres, AMS 5510, 90° Locking.

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STANDARDS

MILITARY - Continued

- MS9582 - Washer, Key-Cres, AMS 5510, 270° Locking.
- MS9768 - Washer, Flat-Cres, AMS 5525 or AMS 5737, Countersunk.
- MS9880 - Washer, Cup, Lock-Cres, AMS 5510.
- MS9952 - Washer, Cup, Lock-Spanner Nut Cres, AMS 5646.
- MS14151 - Washer, Flat, Round, Corrosion Resisting Steel (for Electrical Applications).
- MS14155 - Washer, Recessed Countersunk Two Surfaces, for Use with Wheel Bolts and Nuts up to and Including 180 KSI Ft_u.
- MS14177 - Washer, Recessed, Countersunk Two Surfaces, for Use with Wheel Bolts and Nuts up to and Including 220 KSI Ft_u.
- MS15795 - Washer, Flat-Metal, Round, General Purpose (IN./MM).
- MS15820 - Washers, Lock Special Design, Galvanized Steel.
- MS16212 - Washer, Flat, Metal, Round, Medium Series, Nonmagnetic.
- MS17186 - Washer, Drive (Synchro).
- MS19069 - Washers, Key, Retaining, Ball and Roller Bearing, Light Series.
- MS19070 - Washers, Key, Retaining, Ball and Roller Bearing, Regular Series.
- MS20002 - Washer, Countersunk and Plain, High Strength.
- MS21206 - Washer, Countersunk and Plain, for Use with Bolts and Nuts up to and Including 220 KSI Ft_u.
- MS21258 - Washer, Key, Retaining, Wheel Bearing.
- MS21307 - Washer, Flat (Square).
- MS25081 - Washer, Key.
- MS25440 - Washers, for Use with Aircraft Aluminum Terminals.
- MS27111 - Washer, Key-Flat, General Purpose.
- MS27129 - Washer, Finishing-Countersunk.
- MS27183 - Washer, Flat-Round, Steel, Cadmium Plated, General Purpose (IN./MM).
- MS35333 - Washer, Lock, Flat-Internal Tooth.
- MS35334 - Washer, Lock-Flat, Heavy, Internal Tooth.
- MS35335 - Washer, Lock, Flat-External Tooth (IN./MM).
- MS35338 - Washer, Lock-Spring, Helical, Regular (Medium) Series, (IN./MM).
- MS35340 - Washer, Lock-Helical Spring, Extra Duty.
- MS35790 - Washer, Lock-Countersunk, 100°, External Tooth (IN./MM).
- MS45904 - Washer, Lock, Internal and External Tooth.
- MS51848 - Washer, Lock-Helical Spring, Hi-Collar.
- MS51859 - Washer, Flat-Plastic (Nylon).

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STANDARDS

MILITARY - Continued

- MSS1867 - Washer, Metal, Flat, Plain, Rectangular.
MS172271 thru
MS172320 - Washer, Key-Single, Bearing Retaining, AMS 6350.

AIR FORCE-NAVY AERONAUTICAL

- AN960 - Washer, Flat.
AN961 - Washer-Flat, Electrical.
AN970 - Washer, Flat, for Wood.
AN975 - Washer-Taper Pin.

(Copies of specifications, standards, drawings and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other Publications. The following documents form a part of this standard to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC. (AIA)

NATIONAL AEROSPACE STANDARDS

- NAS390 - Washer-Flush Type Finishing.
NAS513 - Washer-Rod End Locking.
NAS549 - Washer, Nonmetallic-Insulating, Electrical.
NAS620 - Washer, Flat-Reduced Outside Diameter.
NAS1099 - Washer-Bevel 9-1/2°.
NAS1169 - Washer, Dimpled, 100°.
NAS1197 - Washer - 5052 Aluminum Alloy.
NAS1252 - Washer - 7075 Aluminum Alloy Flat.
NAS1401 - Washer, Radius.
NAS1515 - Washers-Plastic and Synthetic Rubber.
NAS1587 - Washer Plain and CSK, 1200°F.
NAS1636 - Washer, Key, Dual Tab.

(Application for copies should be addressed to the Aerospace Industries Association of America, Inc., 1725 De Sales Street, N.W., Washington, DC 20036.)

3. DEFINITIONS

3.1 Adopted Industry Standards. Any Industry Specification or Standard which is listed in the Department of Defense Index of Specifications and Standards (DODISS).

3.2 Commodity Type Document. A document which lists preferred parts within a Federal Supply Classification class or Item Name. This document is to be used for selecting preferred parts for a new design when the document is invoked as a contractual requirement in conjunction with a parts control requirement.

3.3 End Use Type Document. A document that lists preferred documents and establishes parts requirements which are contractually binding for the design and construction/manufacture of a weapon system or an established equipment category such as MIL-STD-1515.

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3.4 Military Parts Control Advisory Group (MPCAG). A Department of Defense organization which provides advice to the Military Departments and military contractors on the selection of parts in assigned commodity classes, and collects data on nonstandard parts for developing or updating military specifications and standards.

3.5 Definitions of approved item names used in this standard are as follows:

a. Washer. A perforated piece of metal, leather, or other material of various shapes and forms. It is used primarily as a seat for a bolt, nut, screw, rivet, or nail to distribute pressure and to prevent endwise motion over an area surrounding a hole; to increase wear resistance in that area, and/or to prevent movement between two parts by means of restraining features created by the shape of its edges.

(1) Washer, Bevel. An item having a centrally located hole and two flat bearing surfaces which are not parallel.

(2) Washer, Finishing. An item that is flush flanged and of a cone or disk shape with a centrally located hole.

(3) Washer, Flat. An item with a centrally located hole, a solid (not laminated) cross-section and two flat parallel bearing surfaces. The flat parallel bearing surfaces may have a rough or machine finish, or a specified surface designation between 32 and 125 microinch arithmetical average (AA) if required for specified high torque wrenching requirements, but must not have any of the following conditions: visible or detectable means of lubrication; grooves; indentations or self-lubrication. The dimension of the centrally located hole must be 75 percent of the outside diameter or less. The thickness must be 0.006 inch or more for items less than 1/4 inch outside diameter and 0.016 inch or more for items with 1/4 inch or more outside diameter. The thickness shall not exceed 25 percent of the outside diameter or the shortest distance between peripheral flats. The maximum limit of the tolerance or range applied to the thickness and/or outside diameter must be used to determine compliance. Do not use nominal values.

(4) Washer, Key. A washer of nonresilient material usually having two parallel bearing surfaces. The outside and/or inside edges have one or more protuberances. The ends and/or edges may be present at any angle to the bearing surfaces. The keys or lugs may be fitted into keyways in adjacent material or they may be bent over after application to hold or lock one or more items in place.

(5) Washer, Lock. An item which is usually round with a centrally located hole. Its edges and two bearing surfaces are so designed that applied pressure brings into play the spring tension and/or frictional locking principle which materially resists any tendency toward turning.

(6) Washer, Recessed. An item round in shape and having a centrally located hole. Both bearing surfaces are parallel and flat, but one or both of the bearing surfaces must be broken by a counterbore, countersink, or similarly shaped recess.

(7) Washer, Shouldered and Recessed. An item round in shape having a centrally located hole. One bearing surface is flat, the other surface is in the form of a raised boss (shoulder) having a flat bearing surface. Either or both of the bearing surfaces must be broken by a counterbore, countersink or similar shaped recess. The thickness of the boss must not exceed 25 percent of the boss diameter.

(8) Washer, Spring Tension. A bent spring metal washer with a centrally located hole. It is designed to exert pressure axially when assembled in place.

Note: Reference must be made to 3.5.a above (the indicated name), in order to understand the basic concept which is inherent in the total concept of the item names of 3.5.a.(1) thru 3.5.a.(8) above.

4. GENERAL STATEMENTS

4.1 Selection Procedure

4.1.1 Document Selection. The applicable section shall be selected after reviewing the table of contents.

4.1.2 Part Number Selection (Preliminary). A preliminary selection of the applicable part number shall be made after reviewing the nominal parameters (sizes, materials, tensile strength) listed in the sections.

4.1.3 Part Number Selection (Final). A final selection of the applicable part number shall be made after reviewing the detailed requirements specified in the referenced washer documents for suitability in the particular military equipment being designed (considering the application and environmental conditions).

5. DETAILED REQUIREMENTS

5.1 The detailed requirements for preferred washers are contained in the applicable washer document and associated procurement specification. If there is disagreement between the nominal parameters listed in this standard and the parameters specified in the applicable washer document or associated procurement specification, the parameters specified in the applicable washer document or associated procurement specification shall prevail.

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6. NOTES

6.1 Dimensions. Dimensions shown in the sections contained herein are in inches.

6.1.1 Unreferenced dimensions are nominal.

Custodians:

Army - AR
Navy - None
Air Force - 11

Review Activities:

Army - EA, MI
Navy - OS
Air Force - None
DLA - IS
NS

User Activities

Army - ME
Navy - EC, SH
Air Force - None

Preparing activity:

Air Force - 11

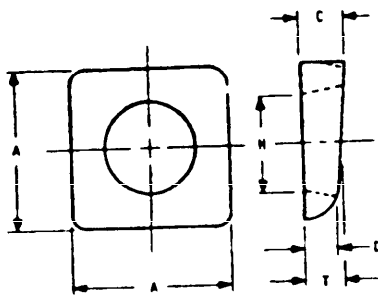
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DLA - IS

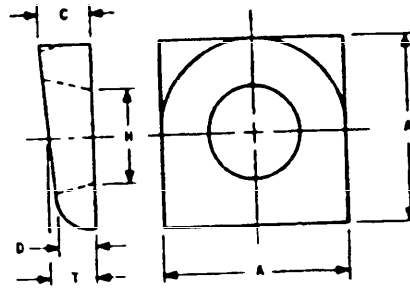
(Project 5310-0904)

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SECTION 101
WASHER BEVEL, 9-L/2"
APPLICABLE DOCUMENT NAS1099



PARTS - 4, 5, 6, 8



PARTS 10, 12, 14, 16, 18

TABLE I. Part numbers.

Material					Malleable iron - cast
Protective finish					Cadmium plate
H lbs	A	T	C	D	NAS1099 - Dash no
.28	.75	.19	.25	.13	-4
.35	1.00	.19	.27	.11	-5
.47	1.25	.28	.34	.19	-6
.63	1.31	.31	.38	.22	-8
.72	1.56	.28	.36	.13	-10
.81	1.56	.28	.41	.16	-12
.94	1.75	.28	.44	.19	-14
1.06	1.81	.28	.44	.19	-16
1.22	2.06	.34	.50	.19	-18

SECTION 201
WASHER, FINISHING, COUNTERSUNK
APPLICABLE DOCUMENT: MSZ7129

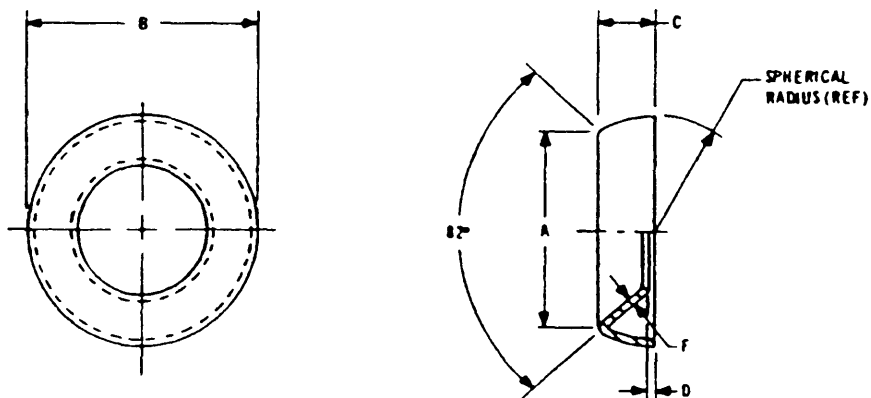


TABLE I. Part numbers.

Material						Brass	Steel	CRES
Protective finish						Chromium or nickel plate	Cadmium plate	Passivate
Hardness (BHN) min						104		
Size	A Max	B Max	C Max	D Max	F Min	MSZ7129 + Dash no.		
.112	.247	.385	.036	.036	.012	-1	2	-3
.138	.303	.448	.102	.036	.014	-4	-5	-6
.164	.357	.541	.112	.036	.014	-7	-8	-9
.190	.437	.603	.122	.036	.018	-10	-11	-12
.250	.546	.791	.170	.051	.018	-16	-17	-18
.3125	.678	.947	.222	.051	.020	-19	-20	-21
.375	.810	1.135	.260	.051	.025	-22	-23	-24

SECTION 282
WASHER, FINISHING, FLUSH
APPLICABLE DOCUMENT: NAS390

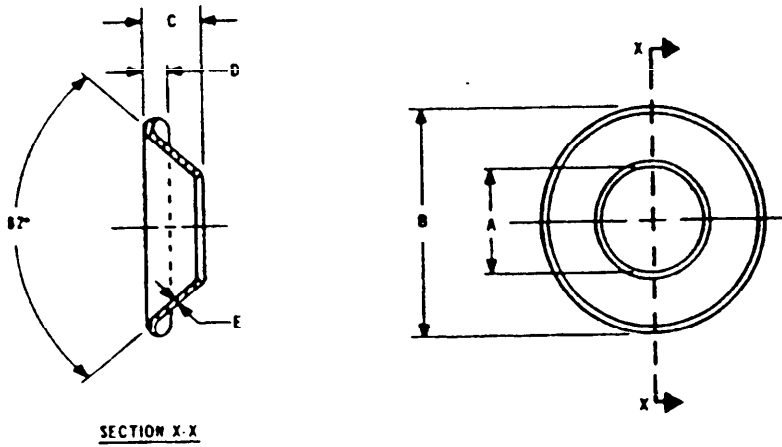


TABLE I. Part numbers.

Material					Carbon steel	Brass
Protective finish					Cadmium plate	Chromium or nickel plate
A Min	B Max	C Max	D Max	E Max	NAS390 - Dash no. 1/	
.120	.320	.093	.046	.016	4	
.150	.390	.100	.046	.018	6	
.180	.443	.113	.046	.018	8	
.193	.500	.135	.046	.022	10	
.252	.650	.162	.061	.022	14	

1/ Add "B" in front of dash number for brass.
Add "S" in front of dash number for steel.
Add dash in place of code letter when material is optional.
Add "T" after dash number for chromium or nickel plate.

SECTION 301
WASHER, FLAT, RECTANGULAR
APPLICABLE DOCUMENT WSS1867

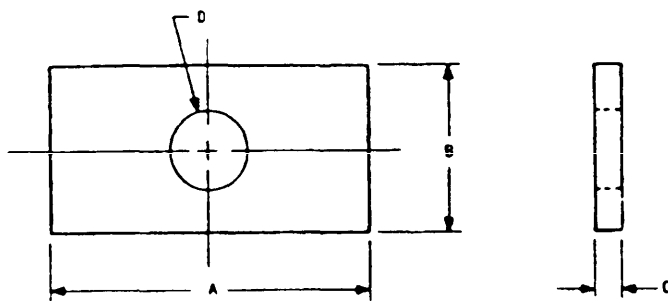


TABLE I. Part numbers.

Material				Carbon steel	CRES	Aluminum
Protective finish				Cadmium plate	Passivate	Anodize
D Min	A	B	C Max	WSS1867 - Desh no.		
.120	.375	.312	.040	-S1	-C1	-A1
.151	.438	.375	.065	-S2	-C2	-A2
.183	.500	.438	.065	-S3	-C3	-A3
.214	.625	.500	.065	-S4	-C4	-A4
.276	1.000	.625	.080	-S6	-C6	-A6
.339	1.125	.688	.080	-S7	-C7	-A7
.401	1.500	.812	.080	-S8	-C8	-A8
.526	2.000	1.062	.121	-S9	-C9	-A9
.649	2.500	1.312	.121	-S10	-C10	-A10
.805	2.750	1.469	.160	-S11	-C11	-A11
1.055	3.500	2.000	.192	-S12	-C12	-A12
1.368	5.000	2.500	.192	-S13	-C13	-A13
1.618	6.000	3.000	.192	-S14	-C14	-A14
1.865	8.000	4.000	.213	-S15	-C15	-A15
2.115	9.000	4.500	.213	-S16	-C16	-A16

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TABLE I. Part numbers (aluminum alloy). - Continued

Material			Aluminum alloy					
			5052			7075		
Protective finish			None			Anodize		
A Min	B Max	C	NAS620 - Dash no.	NAS1197 - Dash no.	AMS90 - Dash no.	NAS1252 - Dash no.	MS15795 - Dash no.	
.443	.770	.016 .032 .063	-- -- --	-716L -- -716	D716L -- D716	PD716L -- PD716	-- -716L -716H	-- -- --
.495	1.280	.083	--	--	--	--	--	-717
.505	.895	.016 .032 .063	-- -- --	-816L -- -816	D816L -- D816	PD816L -- PD816	-- -816L -816H	-- -- --
.630	1.208	.016 .032 .063	-- -- --	-1016L -- -1016	D1016L -- D1016	PD1016L -- PD1016	-- -1016L -1016H	-- -- --
.681	1.780	.134	--	--	--	--	--	-721
.755	1.332	.016 .032 .063 .090	-- -- -- --	-1216L -- -- -1216	D1216L -- -- D1216	PD1216L -- -- PD1216	-- -1216L -1216H --	-- -- -- --
.805	1.499 2.030	.134 .148	-- --	-- --	-- --	-- --	-- --	-722 -723
.880	1.520	.016 .032 .063 .090	-- -- -- --	-1416L -- -- -1416	D1416L -- -- D1416	PD1416L -- -- PD1416	-- -1416L -1416H --	-- -- -- --
.931	1.780 2.280	.134 .165	-- --	-- --	-- --	-- --	-- --	-724 -725
1.005	1.770	.016 .032 .063 .090	-- -- -- --	-1616L -- -- -1616	D1616L -- -- D1616	PD1616L -- -- PD1616	-- -1616L -1616H --	-- -- -- --
1.130	1.895	.016 .032 .063 .090	-- -- -- --	-- -- -- --	D1816L -- -- D1816	PD1816L -- -- PD1816	-- -1816L -1816H --	-- -- -- --
1.243	2.780	.165	--	--	--	--	--	-728
1.255	2.020	.016 .032 .063 .090	-- -- -- --	-- -- -- --	D2016L -- -- D2016	PD2016L -- -- PD2016	-- -2016L -2016H --	-- -- -- --
1.368 1.490	3.030 3.295	.165 .180	-- --	-- --	-- --	-- --	-- --	-729 -730
1.630	2.395	.016 .032 .063 .090	-- -- -- --	-- -- -- --	D2516L -- -- D2516	PD2516L -- -- PD2516	-- -2516L -2516H --	-- -- -- --
1.740	3.795	.180	--	--	--	--	--	-732
1.880	2.645	.016 .032 .063 .090	-- -- -- --	-- -- -- --	D3016L -- -- D3016	PD3016L -- -- PD3016	-- -3016L -3016H --	-- -- -- --
1.990	4.295	.180	--	--	--	--	--	-734
2.255	3.020	.016 .032 .063 .090	-- -- -- --	-- -- -- --	D3516L -- -- D3516	PD3516L -- -- PD3516	-- -3516L -3516H --	-- -- -- --
2.365	4.795	.220	--	--	--	--	--	-736
2.505	3.270	.016 .032 .063 .090	-- -- -- --	-- -- -- --	D4016L -- -- D4016	PD4016L -- -- PD4016	-- -4016L -4016H --	-- -- -- --
2.615 2.865 3.115	5.045 5.315 5.565	.238 .258 .284	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-737 -738 -739

SECTION 302
WASHER, FLAT, ROUND
APPLICABLE DOCUMENTS: NAS549, NAS629, NAS1197, NAS1252, NAS1515, NAS1587,
AN960, AN961, AN970, MS9320, MS9321, MS9549, MS14151, MS15795, MS16212,
MS20002, MS21206, MS25440, MS27183, MS51859

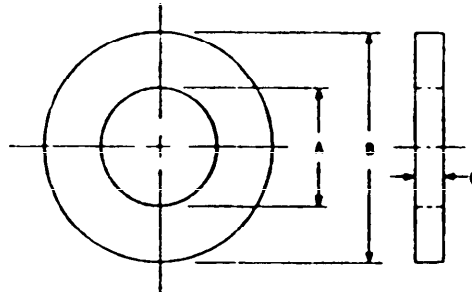


TABLE I. Part numbers (aluminum alloy).

Material			Aluminum alloy				
			5052		7075		
Protective finish			None		Anodize		
A Min	B Max	C	NAS620 - Dash no.	NAS1197 - Dash no.	AN960 - Dash no.	NAS1252 - Dash no.	MS15795 - Dash no.
.063	.114	.016	A0	—	—	—	—
.089	.164	.016	A2	—	—	—	—
.089	.250	.020	—	—	—	—	-702
.095	.270	.016	—	-2L	—	—	—
		.032	—	-2	—	—	—
.115	.224	.016	A4L	—	—	—	—
		.032	A4	—	—	—	—
.120	.250	.022	—	—	—	—	-703
.115	.332	.016	—	-4L	D4L	PD4L	—
.120		.032	—	-4	D4	PD4	-4L
.143	.282	.016	A6L	—	—	—	—
		.032	A6	—	—	—	—
.139	.395	.016	—	-6L	D6L	PD6L	—
		.032	—	-6	D6	PD6	-6L
.164	.395	.016	—	-8L	D8L	PD8L	—
		.032	—	-8	D8	PD8	-8L
.169	.319	.016	A8L	—	—	—	—
		.032	A8	—	—	—	—
.183	.390	.049	—	—	—	—	-707
	.453	.049	—	—	—	—	-741
.193	.498	.016	—	-10L	D10L	PD10L	—
		.032	—	-10	D10	PD10	-10L
		.063	—	—	—	—	-10H
.195	.369	.032	A10L	—	—	—	—
		.063	A10	—	—	—	—
.245	.577	.065	—	—	—	—	-709
.255	.403	.032	A416L	—	—	—	—
		.063	A416	—	—	—	—
.255	.520	.016	—	-416L	D416L	PD416L	—
		.032	—	—	D416	PD416	-416L
		.063	—	-416	—	—	-416H
.307	.749	.065	—	—	—	—	-711
.318	.982	.016	—	-516L	D516L	PD516L	—
		.032	—	—	D516	PD516	-516L
		.063	—	-516	—	—	-516H
.370	.905	.083	—	—	—	—	-713
.380	.645	.016	—	-616L	D616L	PD616L	—
		.032	—	—	D616	PD616	-616L
		.063	—	-616	—	—	-616H
.433	1.030	.083	—	—	—	—	-715

TABLE II. Part numbers (alloy steel).

Material			Alloy steel		
Protective finish			Nickel-cadmium plate	Cadmium plate	
Hardness (Rockwell)			C35-40	—	C38-45
Tensile strength (psi)			—	125,000 to 145,000	—
A Min	B Max	C	M39120 - Dash no.	M320002 - Dash no.	M321206 - Dash no.
.130	.322	.031	-05	—	—
.154	.385	.043	-07	—	—
.179	.385	.050	-08	—	—
.191	.372	.062	—	—	-3
.208	.448	.062	-09	—	—
.251	.470	.062	—	—	-4
.252	.541	.062	—	-4	—
.271	.510	.062	-10	—	—
.314	.573	.062	—	—	-5
.315	.603	.062	—	-5	—
.333	.635	.062	-11	—	—
.376	.679	.062	—	—	-6
.378	.697	.062	—	-6	—
.396	.760	.078	-12	—	—
.439	.783	.062	—	—	-7
.441	.791	.062	—	-7	—
.458	.885	.094	-13	—	—
.501	.898	.062	—	—	-8
.504	.885	.062	—	-8	—
.521	1.010	.109	-14	—	—
.627	1.125	.062	—	—	-10
.631	1.072	.062	—	-10	—
.646	1.260	.141	-16	—	—
.752	1.350	.062	—	—	-12
.757	1.260	.062	—	-12	—
.771	1.510	.172	-17	—	—
.877	1.572	.062	—	—	-14
.884	1.447	.062	—	-14	—
.896	1.760	.203	-18	—	—
1.002	1.798	.062	—	—	-16
1.010	1.635	.062	—	-16	—
1.021	2.010	.234	-19	—	—
1.127	2.188	.062	—	—	-18
1.135	1.885	.062	—	-18	—
1.252	2.260	.062	—	—	-20
1.260	2.135	.062	—	-20	—
1.377	2.490	.062	—	—	-22
1.385	2.323	.062	—	-22	—
1.502	2.723	.062	—	—	-24
1.510	2.510	.062	—	-24	—

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TABLE III. Part numbers (carbon steel).

Material			Carbon steel				
Protective finish			Coilform plate				
A Min	B Max	C	AN560 - Dash no.	AN570 - Dash no.	MS2520 - Dash no.	MS25440 - Dash no.	MS27183 - Dash no.
.063	.114	.016	--	--	-0	--	--
.089	.164	.016	--	--	-2	--	--
.089	.250	.020	--	--	--	--	-2
.115	.224	.016	--	--	-4	--	--
		.032	--	--	-4	--	--
.115	.332	.016	-4L	--	--	--	--
		.032	-4	--	--	--	--
.120	.750	.022	--	--	--	--	-3
.120	.320	.032	--	--	--	--	-4
.139	.395	.016	-6L	--	--	--	--
		.032	-6	--	--	--	--
.143	.282	.016	--	--	-6L	--	--
		.032	--	--	-6	--	--
.164	.395	.016	-8L	--	--	--	--
		.032	-8	--	--	--	--
.169	.319	.016	--	--	-8L	--	--
		.032	--	--	-8	--	--
.183	.390	.049	--	--	--	--	-7
	.453	.049	--	--	--	--	-41
.193	.688	.074	--	--	--	-3	--
	.438	.032	-10L	--	--	--	--
		.063	-10	--	--	--	--
.193	.815	.063	--	-3	--	--	--
.195	.369	.032	--	--	-10L	--	--
		.063	--	--	-10	--	--
.245	.575	.065	--	--	--	--	-9
.255	.483	.032	--	--	-416L	--	--
		.063	--	--	-416	--	--
.255	.520	.032	-416L	--	--	--	--
		.063	-416	--	--	--	--
	1.135	.063	--	-4	--	--	--
.260	.688	.093	--	--	--	-4	--
	.875	.093	--	--	--	-4A	--
.307	.749	.065	--	--	--	--	-11
	.582	.032	-516L	--	--	--	--
		.063	-516	--	--	--	--
.314	1.385	.063	--	-5	--	--	--
.320	.875	.093	--	--	--	-5	--
.370	.905	.083	--	--	--	--	-13
	.645	.032	-616L	--	--	--	--
		.063	-616	--	--	--	--
.380	1.635	.063	--	-4	--	--	--
.385	.875	.125	--	--	--	-6	--
	1.187	.125	--	--	--	-6A	--
.433	1.030	.083	--	--	--	--	-15
	.770	.032	-716L	--	--	--	--
		.063	-716	--	--	--	--
.443	1.822	.109	--	-7	--	--	--
.495	1.280	.083	--	--	--	--	-17
.510	1.187	.125	--	--	--	-8	--
	.895	.032	-816L	--	--	--	--
		.063	-816	--	--	--	--
.505	2.010	.109	--	-8	--	--	--
	1.288	.032	-1016L	--	--	--	--
		.063	-1016	--	--	--	--
.630	2.385	.125	--	-10	--	--	--
.681	1.788	.134	--	--	--	--	-22

TABLE III. Part numbers (carbon steel). - Continued

Material			Carbon steel				
Protective finish			Cadmium plate				
A Min	B Max	C	AW960 . Dash no.	AW970 . Dash no.	WAS620 . Dash no.	MS25440 . Dash no.	MS27183 . Dash no.
.755	1.332	.032 .090	-1216L -1216	--	--	--	--
.805	1.499 2.030	.134 .148	--	--	--	--	-23 -24
.880	1.520	.032 .090	-1416L -1416	--	--	--	--
.931	1.780 2.280	.134 .165	--	--	--	--	-25 -26
1.005	1.770	.032 .090	-1616L -1616	--	--	--	--
1.130	1.895	.032 .090	-1816L -1816	--	--	--	--
1.243	2.780	.165	--	--	--	--	-29
1.255	2.020	.032 .090	-2016L -2016	--	--	--	--
1.368	3.030	.165	--	--	--	--	-30
1.490	3.295	.180	--	--	--	--	-31
1.630	2.395	.032 .090	-2616L -2616	--	--	--	--
1.740	3.795	.180	--	--	--	--	-33
1.880	2.645	.032 .090	-3016L -3016	--	--	--	--
1.990	4.295	.180	--	--	--	--	-35
2.255	3.020	.032 .090	-3616L -3616	--	--	--	--
2.365	4.795	.220	--	--	--	--	-37
2.505	3.270	.032 .090	-4016L -4016	--	--	--	--
2.615	5.045	.238	--	--	--	--	-38
2.865	5.315	.299	--	--	--	--	-39
3.115	5.565	.284	--	--	--	--	-40

TABLE IV. Part numbers (CRES).

Material			CRES							
Protective finish			Black oxide	Uncoated			Passivate			
Tensile strength (psi) min.			Not specified						75,000	90,000
A Min	B Max	C	AMS60 - Dash no.	MS9321 - Dash no.	MS9549 - Dash no.	NAS620 - Dash no.	MS14151 - Dash no.	MS15795 - Dash no.	NAS1387 - Dash no.	MS16212 - Dash no.
.063	.114	.016	--	--	--	C18	--	--	--	--
.089	.164	.016	--	--	--	C17	--	--	--	--
.089	.250	.020	--	--	--	--	--	-802	--	--
.115	.224	.016	--	--	--	CAL	--	--	--	--
		.032	--	--	--	C4	--	--	--	--
.115	.332	.016	XC8L	--	--	--	--	--	--	--
		.032	XC4	--	--	--	--	--	--	--
.120	.250	.022	--	--	--	--	--	-803	--	--
.130	.322	.016	--	--	-05	--	--	--	--	--
		.031	--	-05	--	--	--	--	--	--
.139	.395	.016	XC6L	--	--	--	--	--	--	--
		.032	XC6	--	--	--	--	--	--	--
.143	.282	.016	--	--	--	C6L	--	--	--	--
		.032	--	--	--	C6	--	--	--	--
.144	.490	.020	--	--	--	--	-1	--	--	--
.154	.385	.016	--	--	-07	--	--	--	--	--
		.043	--	-07	--	--	--	--	--	--
.164	.395	.016	XC8L	--	--	--	--	--	--	--
		.032	XC8	--	--	--	--	--	--	--
.167	.560	.020	--	--	--	--	-4	--	--	--
.169	.319	.016	--	--	--	C8L	--	--	--	--
		.032	--	--	--	C8	--	--	--	--
.179	.385	.016	--	--	-08	--	--	--	--	--
		.020	--	-08	--	--	--	--	--	--
.183	.390	.049	--	--	--	--	--	-807	--	--
	.453	.049	--	--	--	--	--	-841	--	--
.192	.479	.032	--	--	--	--	--	--	-3	--
.193	.458	.032	XC10L	--	--	--	--	--	--	--
		.063	XC10	--	--	--	--	--	--	--
.195	.369	.032	--	--	--	C10L	--	--	--	--
		.063	--	--	--	C10	--	--	--	--
.198	.620	.020	--	--	--	--	-2	--	--	--
.203	.448	.032	--	--	.09	--	--	--	--	--
		.062	--	-09	--	--	--	--	--	--
.245	.577	.065	--	--	--	--	--	-809	--	--
.252	.541	.062	--	--	--	--	--	--	-4	--
.255	.483	.032	--	--	--	C416L	--	--	--	--
		.063	--	--	--	C416	--	--	--	--
	1.090	.020	--	--	--	--	-3	--	--	--
.255	.520	.032	XC416L	--	--	--	--	--	--	--
		.063	XC416	--	--	--	--	--	--	--
.271	.510	.032	--	--	-10	--	--	--	--	--
		.062	--	-10	--	--	--	--	--	--
.302	.760	.080	--	--	--	--	--	--	--	-11
	.307	.759	--	--	--	--	--	-811	--	--
.315	.603	.062	--	--	--	--	--	--	-5	--
	.318	1.090	--	--	--	--	-4	--	--	--

TABLE IV Part numbers (CRES) - Continued

Material			CRES							
Protective Finish			Black oxide	Uncoated			Passivate			
Tensile strength (psi) min			Not specified						75,000	50,000
A Min	B Max	C	AMS60 . Dash no.	MS9321 . Dash no.	MS9549 . Dash no.	NAS620 . Dash no.	MS14151 . Dash no.	MS15795 . Dash no.	NAS1987 . Dash no.	MS16212 . Dash no.
.318	.582	.032 .063	XC516L XC516	--	--	--	--	--	--	--
.333	.572 .635	.032 .062	--	--	-11	--	--	--	--	--
.365 .370	.760 .905	.080 .083	--	--	--	--	--	-813	--	-12
.378 .380	.697 1.090	.062 .070	--	--	--	--	-5	--	-6	--
.380	.645	.032 .063	XC616L XC616	--	--	--	--	--	--	--
.396	.635 .760	.032 .078	--	--	-12	--	--	--	--	--
.427 .433	.885 1.030	.104 .083	--	--	--	--	--	-815	--	-13
.441	.791	.062	--	--	--	--	--	--	-7	--
.443	.770	.032 .063	XC716L XC716	--	--	--	--	--	--	--
.458	.760 .885	.032 .094	--	--	-13	--	--	--	--	--
.495 .504	1.280 .885	.083 .062	--	--	--	--	--	-817	-8	--
.505	.895	.032 .063	XC816L XC816	--	--	--	--	--	--	--
.521	.802 1.010	.032 .109	--	--	-14	--	--	--	--	--
.552 .631	1.260 1.072	.132 .062	--	--	--	--	--	--	-10	-14
.630	1.208	.032 .063	XC1016L XC1016	--	--	--	--	--	--	--
.646	1.810 1.280	.032 .141	--	--	-16	--	--	--	--	--
.677	1.510	.160	--	--	--	--	--	--	--	-15
.681 .757	1.780 1.260	.134 .062	--	--	--	--	--	-821	-12	--
.756	1.332	.032 .090	XC1216L XC1216	--	--	--	--	--	--	--

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TABLE IV Part numbers (CRES) - Continued

Material			CRES							
Protective finish			Black oxide	Uncoated			Passivate			
Tensile strength (psi) min.			Not specified						75,000	50,000
A Min	B Max	C	AMS960 - Dash no.	MS9321 - Dash no.	MS9549 - Dash no.	MS9520 - Dash no.	MS14151 - Dash no.	MS15795 - Dash no.	MS1587 - Dash no.	MS16212 - Dash no.
.771	1.198 1.510	.032 .172	-- --	-- -17	-- --	-- --	-- --	-- --	-- --	-- --
.802	1.760	.177	--	--	--	--	--	--	--	-16
.805	1.499 2.000	.134 .148	-- --	-- --	-- --	-- --	-- --	-822 -823	-- --	-- --
.880	1.520	.032 .090	XC1416L XC1416	-- --	-- --	-- --	-- --	-- --	-- --	-- --
.884	1.447	.062	--	--	--	--	--	--	-14	--
.896	1.385 1.760	.032 .203	-- --	-- -18	-18 --	-- --	-- --	-- --	-- --	-- --
.927	2.010	.192	--	--	--	--	--	--	--	-17
.931	1.750 2.250	.134 .165	-- --	-- --	-- --	-- --	-- --	-824 -835	-- --	-- --
1.010	1.635	.062	--	--	--	--	--	--	-16	--
1.005	1.770	.032 .090	XC1616L XC1616	-- --	-- --	-- --	-- --	-- --	-- --	-- --
1.821	1.572 2.010	.032 .234	-- --	-- -19	-- --	-- --	-- --	-- --	-- --	-- --
1.052	2.260	.192	--	--	--	--	--	--	--	-18
1.130 1.135 1.243	1.895 1.885 2.730	.090 .062 .165	XC1816 -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- -825	-- -18 --	-- -- --
1.255 1.260 1.302	2.020 2.730 3.010	.090 .062 .213	XC2016 -- --	-- -- --	-- -- --	-- -- --	-- -- --	-- -- -20	-- -- --	-- -- -19
1.368 1.490 1.552	3.030 3.295 3.260	.165 .180 .213	-- -- --	-- -- --	-- -- --	-- -- --	-- -- --	-829 -830 --	-- -- --	-- -- -20
1.630 1.740 1.880	2.395 3.795 2.645	.090 .180 .090	XC2516 -- XC3016	-- -- --	-- -- --	-- -- --	-- -- --	-- -832 --	-- -- --	-- -- --
1.990 2.255 2.365	4.295 3.020 4.795	.180 .090 .220	-- XC3616 --	-- -- --	-- -- --	-- -- --	-- -- --	-834 -- -836	-- -- --	-- -- --
2.905 2.615 2.865 3.115	3.770 5.045 5.565 5.315	.090 .738 .759 .284	XC4016 -- -- --	-- -- -- --	-- -- -- --	-- -- -- --	-- -- -- --	-- -837 -838 -839	-- -- -- --	-- -- -- --

TABLE V Part numbers (brass)

Material			Brass			
Protective finish			Not specified	Cadmium plate	Tin or silver plate	Black oxide
A Min	B Max	C	AN960 - Dash no.	NAS620 - Dash no.	AN961 - Dash no. L/	MS15795 - Dash no.
.062	.114	.016	--	B0	--	--
.089	.164	.016	--	B2	--	--
.089	.250	.020	--	--	--	-902
.115	.224	.016	--	B4L B4	--	--
.115	.332	.032	B4	--	-4	--
.120	.250	.022	--	--	--	-903
	.320	.032	--	--	--	-904
.139	.395	.032	B6	--	-6	--
.143	.282	.016	--	B6L B6	--	--
		.032	--	--	--	--
.164	.395	.032	B8	--	-8	--
.169	.319	.016	--	B8L B8	--	--
		.032	--	--	--	--
.183	.390	.049	--	--	--	-907
	.453	.049	--	--	--	-941
.193	.458	.032	--	--	-10	--
		.063	B10	--	--	--
.195	.369	.032	--	B10L B10	--	--
		.063	--	--	--	--
.245	.577	.065	--	--	--	-909
.255	.483	.032	--	B416L B416	--	--
		.063	--	--	--	--
.255	.520	.063	B416	--	--	--
		.064	--	--	-416	--
.307	.749	.065	--	--	--	-911
.318	.582	.063	B516	--	--	--
		.064	--	--	-516	--
.330	.645	.063	B616	--	--	--
		.064	--	--	-616	--
.370	.905	.083	--	--	--	-913
.433	1.030	.083	--	--	--	-915
.443	.770	.063	B716	--	--	--
.495	1.280	.083	--	--	--	-917
.505	.895	.063	B816	--	--	--
		.064	--	--	-816	--
.630	1.208	.063	B1016	--	--	--
		.064	--	--	-1016	--
.681	1.280	.134	--	--	--	-921
.755	1.332	.090	B1216	--	--	--
.805	1.499	.134	--	--	--	-922
	2.030	.148	--	--	--	-923

1/ Add "S" after dash number for silver plate.

Add "T" after dash number for tin plate.

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TABLE V. Part numbers (brass) - Continued

Material			Brass			
Protective finish			Not specified	Cadmium plate	Tin or silver plate	Black oxide
A Min	B Max	C	AN960 - Dash no.	WAS620 - Dash no.	AN961 - Dash no.]	MS15795 - Dash no.
880	1.520	.090	B1416	--	--	--
.931	1.780 1.280	.134 .165	-- --	-- --	-- --	-924 -925
1.005	1.770	.090	B1616	--	--	--
1.130 1.243 1.255	1.895 2.780 2.020	.090 .165 .090	B1816 -- B2016	-- -- --	-- -- --	-- -928 --
1.368 1.490 1.630	3.030 3.295 2.395	.165 .180 .050	-- -- B2616	-- -- --	-- -- --	-929 -930 --
1.740 1.880 1.990	3.795 2.645 4.250	.180 .090 .180	-- B3016 --	-- -- --	-- -- --	-932 -- -934
2.255 2.365 2.505	3.020 4.795 3.270	.090 .220 .090	B3616 -- B4016	-- -- --	-- -- --	-- -936 --
2.615 2.865 3.115	5.045 5.315 5.565	.238 .299 .284	-- -- --	-- -- --	-- -- --	-937 -938 -939

] Add "S" after dash number for silver plate.

Add "T" after dash number for tin plate.

TABLE VI Part numbers (copper alloys)

Material			Copper	Nickel-copper alloy	Copper-silicon alloy
Protective finish			Uncoated		Passivate
Tensile strength (psi) min.			Not specified		50,000
A Min	B Max	C	MS15795 - Dash no.		MS16212 - Dash no.
.089	.250	.020	-502	-402	--
.120	.250 .320	.022 .032	-503 -504	-403 -404	-- --
.182	.442	.065	--	--	-21
.183	.390 .453	.049 .049	-507 -541	-407 -441	-- --
.215	.577	.065	-509	-409	--
.245	.567	.065	--	--	-22
.302	.760	.080	--	--	-1
.307	.749	.065	-511	-411	--
.365	.760	.080	--	--	-2
.370	.905	.083	-513	-413	--
.427	.885	.104	--	--	-3
.433	1.030	.083	-515	-415	--
.495	1.280	.083	-517	-417	--
.552	1.260	.132	--	--	-4
.677	1.510	.160	--	--	-5
.681	1.780	.134	-521	-421	--
.802	1.760	.177	--	--	-6
.805	1.469	.134	-522	-422	--
.805	2.030	.148	-523	-423	--
.927	2.010	.192	--	--	-7
.931	1.780 2.280	.134 .165	-524 -425	-424 -425	-- --
1.052	2.260	.192	--	--	-8
1.243	2.780	.165	-528	-428	--
1.302	3.010	.213	--	--	-9
1.368	3.030	.165	-529	-429	--
1.490	3.295	.180	-530	-430	--
1.552	3.260	.213	--	--	-10
1.740	3.795	.180	-532	-432	--
1.990	4.295	.180	-534	-434	--
2.365	4.795	.220	-536	-436	--
2.615	5.045	.238	-537	-437	--
2.865	5.315	.259	-538	-438	--
3.115	5.565	.284	-539	-439	--

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TABLE VII Part numbers (non-metallic materials)

Material			1/	2/	Nylon
Protective finish			None		
A Min	B Max	C	WAS549 - Dash no	WAS1515 - Dash no	WSS1859 - Dash no
.090	.203	031	—	—	-1
.100	.770	031 .063	L3 3	02L G7	— —
.115	.297	047	—	—	-2
.120	.332	031 .063	L4 4	04L 04	— —
.140	.328	047	—	—	-3
.144	.395	031 .063	L6 6	06L 06	— —
.169	.395	031 .063	L8 8	08L 08	— —
.170	.406	047	—	—	-4
.198	.458	031 .063 .094	L10 10 M10	10L 3 3H	— — —
.200	.469	047	—	—	-5
.255	.520	031 .063 .094	L416 416 M416	4L 4 4H	— — —
.260	.688	047	—	—	-6
.318	.582	031 .063 .094	L516 516 M516	5L 5 5H	— — —
.334	.708	047	—	—	-7
.380	.645	031 .063 .094	L616 616 M616	6L 6 6H	— — —
.396	.832	047	—	—	-8
.443	.770	031 .063 .094	L716 716 M716	7L 7 7H	— — —
.459	.942	047	—	—	-9
.505	.895	031 .063 .094	L816 816 M816	8L 8 8H	— — —
.521	1.082	047	—	—	-10
.630	1.208	031 .063 .094	L1016 1016 M1016	10L 10 10H	— — —
.755	1.332	031 .063 .094	L1216 1216 M1216	12L 12 12H	— — —
.880	1.520	031 .063 .094	L1416 1416 M1416	14L 14 14H	— — —
1.005	1.770	031 .063 .094	L1616 1616 M1616	16L 16 16H	— — —

1/ WAS 549

2/ WAS 1515

Letter before dash number indicates type of material.

- F Fiber - insulation
- Phenolic - paper
- M Phenolic - cotton (mechanical grade)
- B Phenolic - cotton (general purpose grade)
- E Phenolic cotton - (electrical grade)
- P Melamine - glass
- G Epoxy - glass

Letter before dash number indicates type of material

- A Silicone - low temp (-100°F)
- B Silicone - high temp (450°)
- C Syn rubber - fuel resistant
- D Syn rubber - oil resistant
- E Syn rubber - oil resistant for use with acrylic
- F Buta N-ester syn oil resistant
- H Nylon
- J Chloroprene - weather resistant
- K Butyl - inorganic ester resistant
- L Kel-F-temp max 250°F, volt./mil 2200
- M Teflon-temp max 500°F, volt./mil 350

SECTION 303
WASHER, FLAT, SQUARE
APPLICABLE DOCUMENT: MS21307

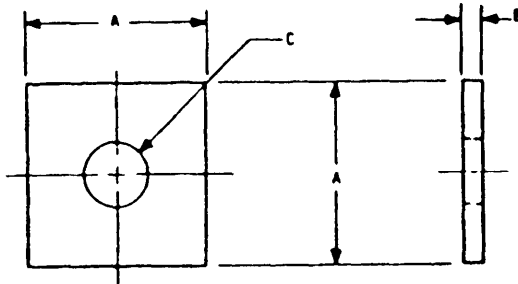


TABLE I Part numbers.

Material		Steel	
Protective finish		Galvanized	
C	A	B	MS21307 - Dash no.
11/16	2	1/8	-1
	2-1/4	3/16	-2
13/16	2-1/4	3/16	-3
	3	3/16	-4
		1/4	-5
15/16	3-1/2	3/8	-6
1-1/8	4	1/2	-7

SECTION 304
WASHER, FLAT, SQUARE WITH RADIUS
APPLICABLE DOCUMENT, NAS1401

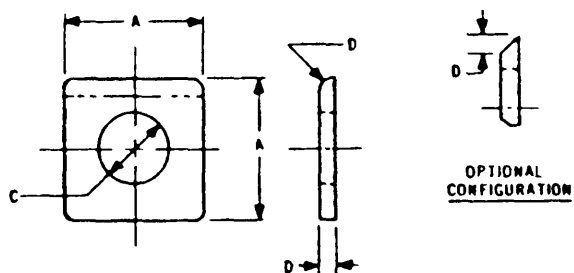


TABLE I Part numbers

Material			Aluminum alloy	Carbon steel	CRES
Protective finish			Anodize	Cadmium plate	Passivate
C Min	A Max	D	NAS1401 - Dash no.		
.193	.490	.090	-303	-3-3	-3C3
		.160	-305	-3-5	-3C5
.255	.570	.090	-403	-4-3	-4C3
		.160	-405	-4-5	-4C5
.318	.640	.090	-503	-5-3	-5C3
		.160	-505	-5-5	-5C5
.380	.710	.090	-603	-6-3	-6C3
		.160	-605	-6-5	-6C5
		.250	-608	-6-8	-6C8
.443	.780	.090	-703	-7-3	-7C3
		.160	-705	-7-5	-7C5
		.250	-708	-7-8	-7C8
.505	.930	.090	-803	-8-3	-8C3
		.160	-805	-8-5	-8C5
		.250	-808	-8-8	-8C8
.630	1.150	.090	-1003	-10-3	-10C3
		.160	-1005	-10-5	-10C5
		.250	-1008	-10-8	-10C8
.755	1.290	.090	-1203	-12-3	-12C3
		.160	-1205	-12-5	-12C5
		.250	-1208	-12-8	-12C8

SECTION 401
WASHER KEY BEARING
APPLICABLE DOCUMENTS MS19069, MS19070, MS17271 thru MS172320

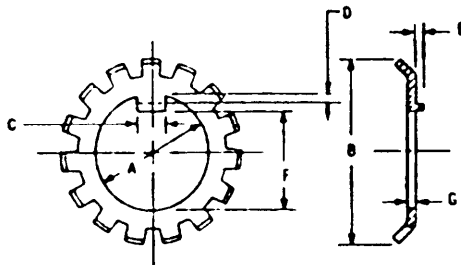


TABLE I. Part numbers.

Material								Steel	Carbon steel	Carbon steel	CRES	Alloy steel
Protective finish								Phosphate	None	Zinc or Cd plate	Passivate	Phosphate
A Min	B Max	C Max	D Max	E Min	F Min	G Nom	Part number	MS19070 - Dash no.			MS19069 - Dash no.	
.406	.828	.120	.030	.062	--	.042	--	--	--	--	-A00	
.406	.875	.120	.030	.062	--	.042	--	-001	-002	-003	--	
.484	.922	.120	.030	.062	--	.042	--	--	--	--	-A01	
.484	1.016	.120	.030	.062	--	.042	--	-011	-012	-013	--	
.515	1.156	.120	--	.062	.443	.040	MS172271	--	--	--	--	
.601	1.094	.120	.030	.062	--	.042	--	--	--	--	-A02	
.601	1.156	.120	.030	.062	--	.042	--	-021	-022	-023	--	
.641	1.312	.120	--	.062	.567	.040	MS172273	--	--	--	--	
.679	1.203	.120	.030	.062	--	.042	--	--	--	--	-A03	
.679	1.328	.120	.030	.062	--	.042	--	-031	-032	-033	--	
.770	1.578	.176	--	.062	.677	.040	MS172275	--	--	--	--	
.801	1.344	.176	.030	.062	--	.042	--	--	--	--	-A04	
.801	1.531	.176	.030	.062	--	.042	--	-041	-042	-043	--	
.895	1.719	.176	--	.094	.802	.050	MS172277	--	--	--	--	
.989	1.562	.176	.030	.094	--	.050	--	--	--	--	-A05	
.989	1.719	.176	.030	.094	--	.050	--	-051	-052	-053	--	
1.020	1.891	.176	--	.094	.927	.050	MS172279	--	--	--	--	
1.145	2.047	.176	--	.094	1.052	.050	MS172281	--	--	--	--	
1.193	1.859	.176	.050	.094	--	.050	--	--	--	--	-A06	
1.193	1.922	.176	.050	.094	--	.050	--	-061	-062	-063	--	
1.270	2.172	.176	--	.094	1.177	.050	MS172283	--	--	--	--	
1.333	2.250	.176	.050	.094	--	.050	--	-0651	-0652	-0653	--	
1.385	2.297	.176	--	.094	1.302	.050	MS172285	--	--	--	--	
1.386	2.078	.176	.050	.094	--	.050	--	--	--	--	-A07	
1.386	2.250	.176	.050	.094	--	.050	--	-071	-072	-073	--	
1.520	2.406	.239	--	.094	1.411	.063	MS172287	--	--	--	--	
1.583	2.250	.300	.050	.094	--	.058	--	--	--	--	-A08	
1.583	2.469	.290	.050	.094	--	.058	--	-081	-082	-083	--	
1.775	2.719	.239	--	.125	1.661	.063	MS172291	--	--	--	--	
1.792	2.500	.300	.050	.125	--	.058	--	--	--	--	-A09	
1.792	2.734	.290	.050	.125	--	.058	--	-091	-092	-093	--	
1.992	2.688	.300	.050	.125	--	.058	--	--	--	--	-A10	
1.992	2.922	.290	.050	.125	--	.058	--	-101	-102	-103	--	
2.025	2.969	.239	--	.125	1.911	.063	MS172295	--	--	--	--	
2.182	2.953	.300	.050	.125	--	.063	--	--	--	--	-A11	
2.182	3.109	.290	.050	.125	--	.063	--	-111	-112	-113	--	
2.281	3.234	.239	--	.125	2.161	.063	MS172299	--	--	--	--	
2.400	3.188	.300	.070	.125	--	.063	--	--	--	--	-A12	
2.400	3.344	.290	.070	.125	--	.063	--	-121	-122	-123	--	
2.531	3.484	.239	--	.125	2.411	.063	MS172303	--	--	--	--	
2.588	3.375	.300	.070	.125	--	.063	--	--	--	--	-A13	
2.588	3.578	.290	.070	.125	--	.063	--	-131	-132	-133	--	

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TABLE I Part numbers - Continued

Material							Steel	Carbon steel	Carbon steel	CRES	Alloy steel
Protective coating							Phosphate	None	Zinc or cad plate	Passivate	Phosphate
A Min	B Max	C Max	D Max	E Min	F Min	G Nom	Part number	MS19070 - Dash no.			MS19069 - Dash no.
2701	3.594	.300	.070	.188	---	.063	---	---	---	---	-A14
2751	3.826	.290	.070	.188	---	.063	---	-141	-142	-143	---
2873	3.511	.300	.070	.188	---	.063	---	---	---	---	-A15
2972	4.109	.290	.070	.188	---	.072	---	-151	-152	-153	---
3177	4.141	.360	.070	.188	---	.063	---	---	---	---	-A16
3177	4.375	.290	.070	.188	---	.072	---	-161	-162	-163	---
3353	4.315	.300	.070	.188	---	.063	---	---	---	---	-A17
3355	4.621	.350	.070	.188	---	.072	---	-171	-172	-173	---
3582	4.547	.360	.070	.188	---	.063	---	---	---	---	-A18
3582	4.938	.350	.070	.188	---	.094	---	-181	-182	-183	---
3800	4.812	.360	.070	.188	---	.063	---	---	---	---	-A19
3800	5.219	.290	.070	.188	---	.094	---	-191	-192	-193	---
3988	5.500	.360	.085	.250	---	.063	---	---	---	---	-A20
3988	5.090	.350	.085	.250	---	.094	---	-201	-202	-203	---
4192	5.188	.360	.085	.250	---	.063	---	---	---	---	-A21
4192	5.703	.350	.085	.250	---	.094	---	-211	-212	-213	---
4395	5.406	.360	.085	.250	---	.063	---	---	---	---	-A22
4395	6.052	.350	.085	.250	---	.125	---	-221	-222	-223	---
4801	6.469	.350	.085	.250	---	.125	---	-241	-242	-243	---
5191	7.021	.435	.105	.250	---	.125	---	-261	-262	-263	---
5582	7.438	.520	.105	.250	---	.125	---	-281	-282	-283	---
5983	8.062	.590	.105	.312	---	.156	---	-301	-302	-303	---
6389	8.438	.590	.105	.312	---	.156	---	-321	-322	-323	---
6764	9.062	.715	.105	.312	---	.156	---	-341	-342	-343	---
7171	9.438	.715	.105	.312	---	.156	---	-361	-362	-363	---
7577	9.812	.715	.105	.312	---	.156	---	-381	-382	-383	---
7982	10.312	.840	.105	.312	---	.156	---	-401	-402	-403	---

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SECTION 402
WASHER, KEY, CUP, LOCK
APPLICABLE DOCUMENT MS9080

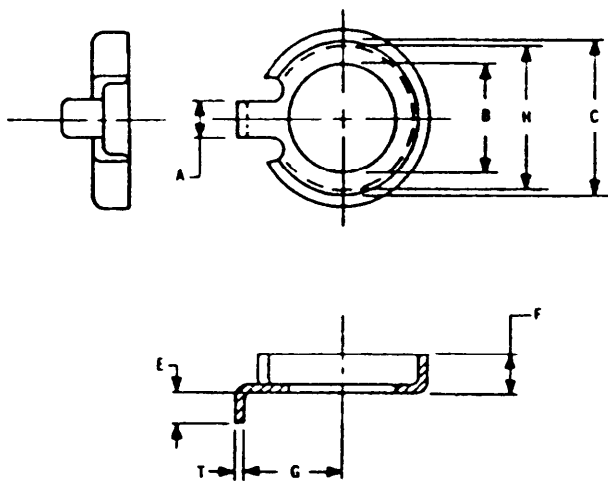


TABLE I Part numbers.

Material								CRES
Protective finish								None
B Min	A Min	C Min	E Min	F Min	G Min	T Max	H	MS9080, Dash no.
.230	.110	.377	.095	.140	.225	.025	.347	-09
.290	.110	.440	.100	.165	.270	.035	.410	-10
.352	.140	.502	.100	.165	.330	.035	.472	-11
.415	.140	.564	.140	.165	.370	.035	.534	-12

SECTION 403
WASHER, KEY, CUP, LOCK, SPANNER NUT
APPLICABLE DOCUMENT MS9952

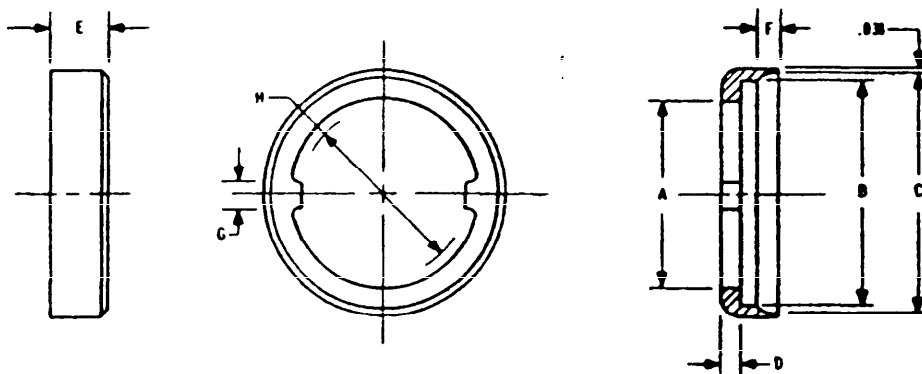


TABLE I. Part numbers.

Material								CRES
Protective finish								None
Hardness (BHN)								140-220
A Min	B Min	C	D	E	F	G Max	H Min	MS9952 - Dash no.
.378	.600	.615	.125	.425	.200	.120	.2756	-02
.441	.750	.775	.125	.425	.200	.120	.3346	-03
.503	.900	.925	.125	.425	.200	.120	.3906	-04
.628	.925	.950	.125	.425	.200	.120	.5156	-06
.753	1.075	1.100	.125	.425	.200	.120	.6406	-08
.878	1.200	1.225	.125	.425	.200	.150	.7656	-10
1.003	1.350	1.375	.125	.425	.200	.150	.8906	-12
1.128	1.475	1.500	.150	.475	.225	.150	1.0156	-14
1.253	1.625	1.650	.150	.475	.225	.180	1.130	-16
1.378	1.750	1.775	.150	.475	.225	.180	1.250	-18
1.503	1.900	1.925	.150	.475	.225	.180	1.375	-20
1.753	2.175	2.200	.150	.475	.225	.245	1.630	-24
2.003	2.450	2.475	.150	.475	.225	.245	1.865	-28
2.253	2.700	2.750	.150	.525	.275	.245	2.115	-32
2.503	2.975	3.025	.150	.525	.275	.245	2.365	-36
2.753	3.250	3.300	.150	.525	.275	.245	2.590	-39
3.003	3.525	3.575	.150	.525	.275	.245	2.835	-41

SECTION 404
WASHER, KEY, DRIVE (SYNCHRO)
APPLICABLE DOCUMENT: MS17186

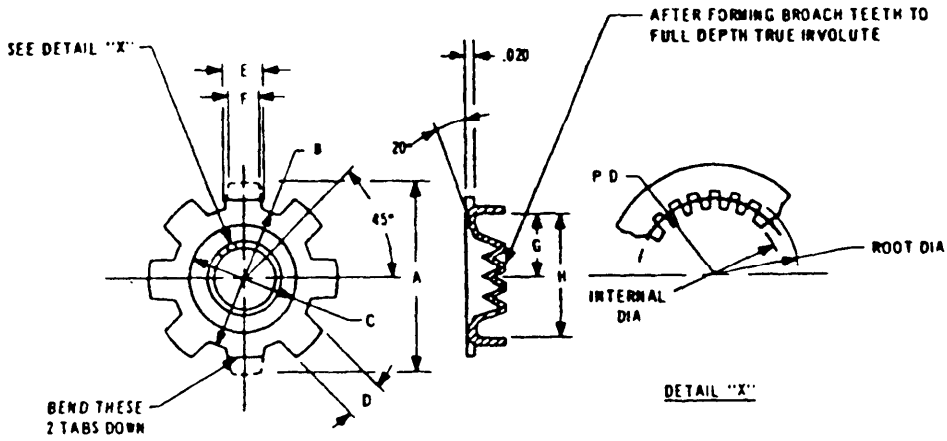


TABLE I. Part numbers.

Material														Aluminum alloy	Brass
Protective finish														Dichromate	Black nickel plating
C Min	A	B	D Min	E	F	G	H	Gear data						MS17186 - Dash no.	
								Press angle	Number of teeth	D. P.	P. D. Min	Root Min	Internal Min		
.215	.432	.287	.09	.093	.078	.146	.292	20°	13	120	.108	.125	.091	-1	-5
.291	.516	.350	.09	.125	.093	.177	.355	20°	15	96	.156	.177	.135	-3	-7
									21	120	.175	.192	.158	-2	-6
.350	.625	.437	.12	.125	.093	.208	.417	20°	22	96	.229	.250	.208	-4	-8

SECTION 405
WASHER, KEY, FLAT, GENERAL PURPOSE
APPLICABLE DOCUMENT MSZ7111

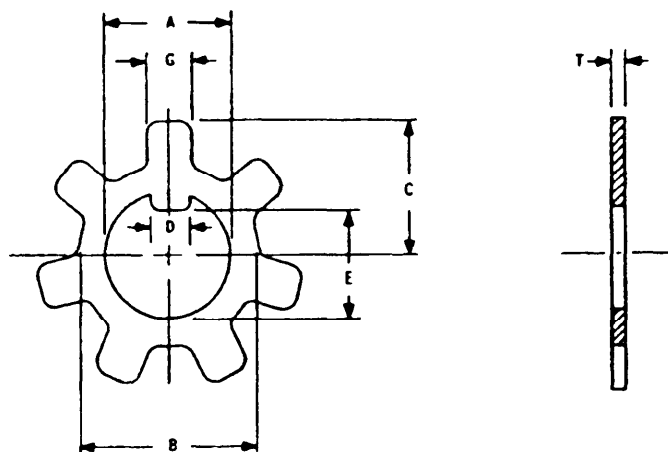


TABLE I. Part numbers.

Material							Carbon steel
Protective finish							Cadmium plate
A	B	C	D	E	G	T Max	MSZ7111 + Dash no.
.256	.374	.317	.055	.223	.094	.033	-1
.319	.436	.364	.055	.286	.116	.033	-2
.381	.499	.411	.086	.333	.140	.033	-3
.444	.560	.458	.086	.386	.164	.033	-4
.506	.624	.546	.117	.442	.188	.033	-5
.631	.896	.705	.148	.551	.234	.052	-7
.756	1.019	.798	.180	.661	.280	.052	-8
.881	1.206	.934	.180	.786	.328	.052	-9
1.006	1.367	1.057	.242	.880	.374	.065	-10
1.131	1.517	1.211	.242	1.005	.422	.065	-11
1.256	1.698	1.361	.305	1.097	.468	.065	-12
1.381	1.880	1.487	.305	1.222	.516	.065	-13
1.506	2.029	1.623	.367	1.316	.562	.081	-14
1.756	2.392	1.875	.430	1.534	.656	.081	-15
2.006	2.754	2.127	.492	1.753	.750	.081	-16

SECTION 406
WASHER, KEY, LOCKING
APPLICABLE DOCUMENTS W39276, W39581, W39582

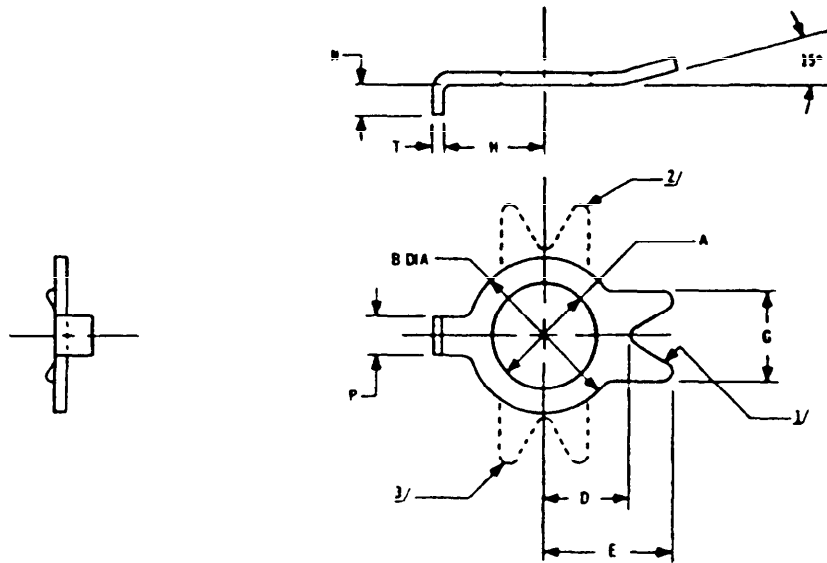


TABLE I. Part numbers.

Material										GRES		
Protective finish										Not specified	Not specified	Not specified
Configuration										1/	2/	3/
Angle										180°	90°	270°
A Min	B Max	D Min	E Min	G Max	H Max	N Min	P Max	T Max		W39276 - Dash no.	W39581 - Dash no.	W39582 - Dash no.
.170	.320	.160	.275	.185	.191	.080	.085	.075		-08	-08	-04
.195	.380	.190	.295	.210	.231	.095	.115	.025		-09	-09	-09
.255	.450	.220	.350	.260	.275	.100	.115	.036		-10	-10	-10
.320	.505	.250	.410	.290	.335	.100	.145	.036		-11	-11	-11
.390	.570	.280	.450	.330	.375	.140	.145	.036		-12	-12	-12
.450	.695	.345	.525	.400	.425	.150	.175	.040		-13	-13	-13
.515	.755	.375	.590	.435	.475	.150	.205	.040		-14	-14	-14
.640	.940	.470	.680	.540	.575	.150	.205	.040		-16	-16	-16
.765	1.065	.530	.730	.560	.675	.150	.235	.040		-17	-17	-17
.890	1.255	.625	.860	.610	.800	.150	.265	.040		-18	-18	-18
1.015	1.440	.715	.950	.660	.875	.150	.295	.040		-19	-19	-19

SECTION 407
WASHER, KEY, LOCKING, SPECIAL DESIGN
APPLICABLE DOCUMENT: MS15820

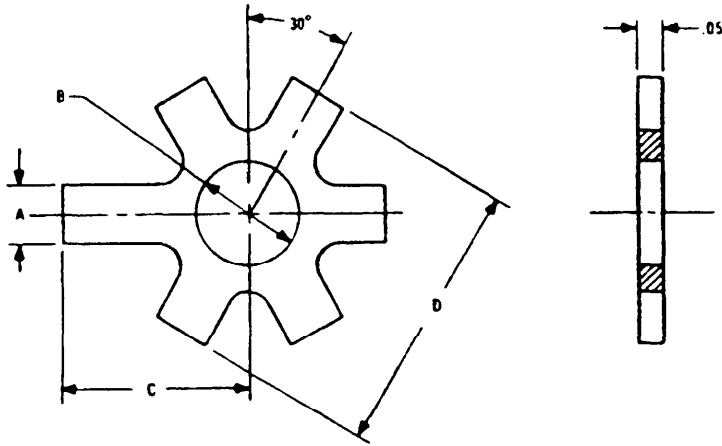


TABLE I. Part numbers.

Material				Steel
Protective finish				Galvanized
B	A	C	D	MS15820 - Dash no.
13/32	1/4	1	1-1/4	-1
17/32	5/16	1-1/8	1-1/2	-2
21/32	3/8	1-1/4	1-3/4	-3
25/32	3/8	1-3/8	2	-4
29/32	5/16	1-1/2	2-1/4	-5
1-1/16	1/2	1-3/4	2-1/2	-6
1-3/16	1/2	1-3/4	2-1/2	-7
1-5/16	1/2	1-7/8	2-5/8	-8

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SECTION 406
WASHER, KEY, RETAINING, WHEEL BEARING
APPLICABLE DOCUMENT MS21258

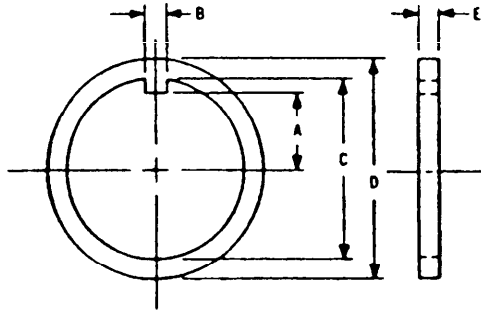


TABLE I. Part numbers.

Material					Steel	
Protective finish					Cadmium plate	Zinc plate
A Min	B Max	C Min	D Max	E Max	MS21258 - Dash no.	
.388	.125	.944	1.405	.098	C15	Z15
.419	.166	1.005	1.530	.130	C16	Z16
.541	.166	1.255	1.780	.130	C20	Z20
.630	.166	1.440	1.905	.130	C23	Z23
.665	.166	1.510	1.905	.130	C24	Z24
.750	.166	1.755	2.280	.130	C28	Z28
.845	.229	1.945	2.405	.130	C31	Z31
.875	.229	2.005	2.655	.130	C32	Z32
1.100	.229	2.445	3.092	.130	C39	Z39
1.302	.291	2.943	3.718	.130	C47	Z47
1.552	.291	3.443	4.780	.130	C55	Z55
2.052	.291	4.445	5.405	.192	C71	Z71

SECTION 409
WASHER, KEY, TAB
APPLICABLE DOCUMENTS MS25081, NAS1636

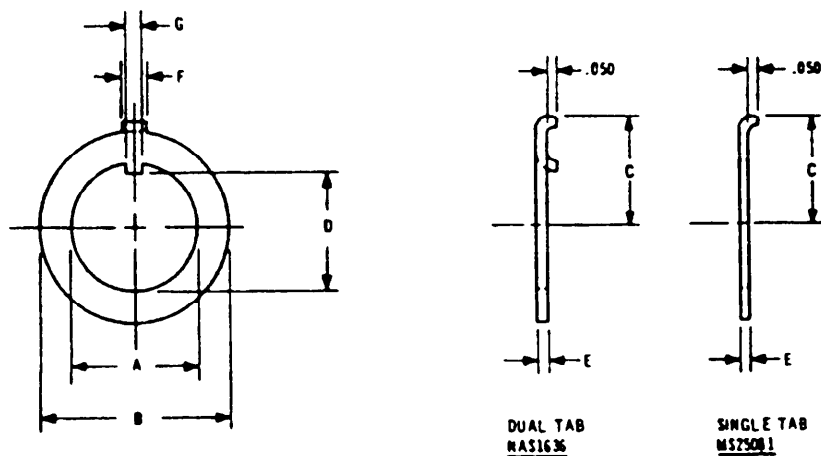
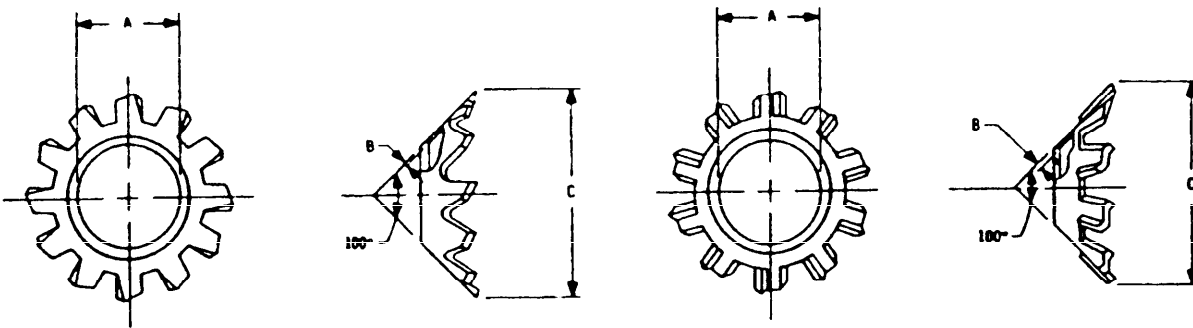


TABLE I. Part numbers.

Material							Carbon steel	CRES		
Protective Finish							Cadmium plate	Passivate		
A Min	B Max	C Max	D Min	E Max	F Max	G Max	MS25081 - Dash no.		NAS1636 - Dash no.	
.250	.414	.250	.220	.035	.067	.051	-0	CO	-	
.377	.642	.370	.340	.035	.115	.065	-	CI	-3	
.470	.735	.397	.433	.045	.115	.067	-4	CI	-	
.470	.735	.417	.433	.055	.115	.065	-	-	-1	
.625	.891	.522	.589	.045	.115	.067	-5	CS	-	
.625	.891	.494	.589	.035	.115	.065	-	-	-2	
.647	.891	.475	.591	.045	.115	.067	-6	CS	-	
.747	1.000	.533	.633	.045	.115	.067	-7	CS	-	
1.005	1.264	.710	.951	.045	.115	.067	-8	CS	-	

SECTION 501
WASHER LOCK EXTERNAL TOOTH, COUNTERSUNK
APPLICABLE DOCUMENT MS35790

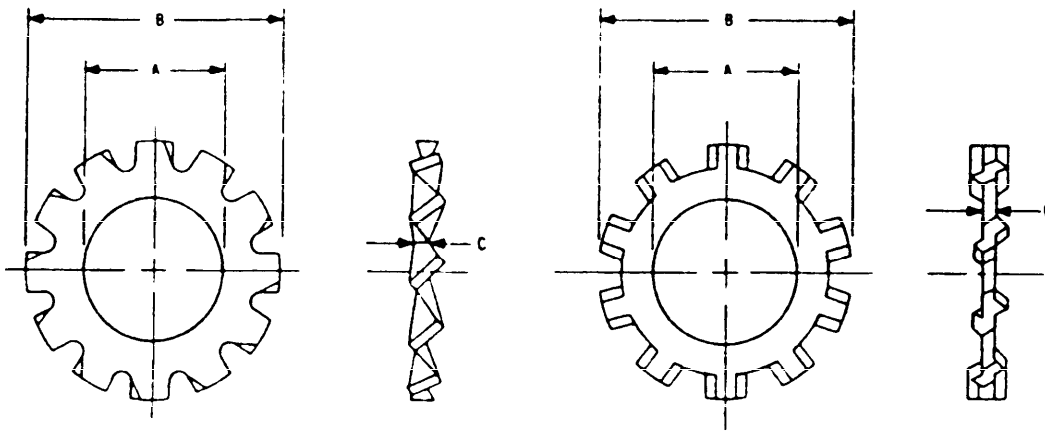


OPTIONAL DESIGNS

TABLE I. Part numbers.

Material			Carbon steel	Tin brass or phosphor bronze
Protective finish			Cadmium plate	None
A Min	B Max	C Max	MS35790 - Dash no.	
.089	.010	.193	-101	-117
.113	.019	.280	-109	-119
.140	.021	.319	-1	-121
.167	.021	.360	-9	-123
.195	.025	.394	-17	-125
.255	.025	.493	-25	-127
.318	.028	.653	-33	-129
.383	.034	.850	-41	-131

SECTION 502
WASHER LOCK, EXTERNAL TOOTH, FLAT
APPLICABLE DOCUMENT MS35335

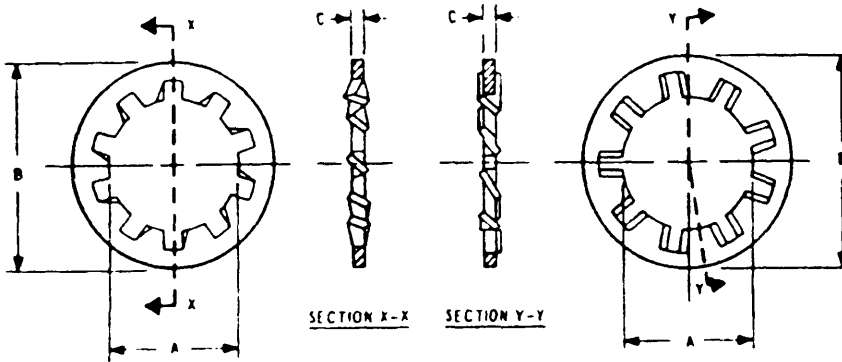


OPTIONAL DESIGNS

TABLE I Part numbers.

Material			Carbon steel	CRES	Tin, brass or phosphor bronze
Protective finish			Cadmium plate	Passivate	Uncoated
A Min	B Max	C Max	MS35335 - Dash no.		
.115	.250	.019	-29	-57	-85
.141	.320	.022	-30	-58	-86
.168	.381	.023	-31	-59	-87
.195	.410	.025	-32	-60	-88
.256	.510	.028	-33	-61	-89
.320	.610	.034	-34	-62	-90
.384	.694	.040	-35	-63	-91
.448	.760	.040	-36	-64	-92
.513	.900	.045	-37	-65	-93
.576	.985	.045	-38	-66	-94
.641	1.070	.050	-39	-67	-95
.768	1.260	.055	-40	-68	-96
.897	1.410	.060	-41	-69	-97
1.025	1.620	.067	-42	-70	-98

SECTION 503
WASHER, LOCK, INTERNAL TOOTH, FLAT
APPLICABLE DOCUMENTS MS35333, MS35334

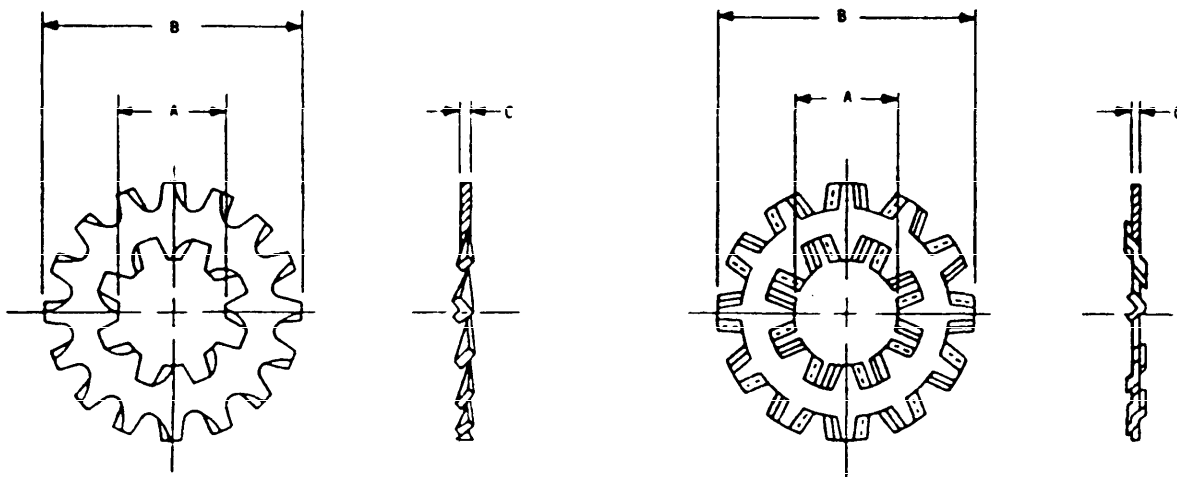


OPTIONAL DESIGNS

TABLE I Part numbers

Material			Carbon steel		CRES	Tin brass or phosphor bronze
Protective finish			Cadmium plate		Passivate	None
A Min	B Max	C Max	MS35333 - Dash no.	MS35334 - Dash no.	MS35333 - Dash no.	
.089	.200	.015	-35	---	-69	-103
.115	.270	.019	-36	---	-70	-104
.141	.295	.021	-37	---	-71	-105
.168	.340	.023	-38	---	-72	-106
.195	.381	.025	-39	---	-73	-107
.256	.410	.020	-125	---	-135	-145
	.478	.028	-40	---	-74	-108
	.536	.045	---	-19	---	---
.320	.607	.050	---	-20	---	---
	.610	.034	-41	---	-75	-109
.384	.692	.040	-42	---	-76	-110
	.748	.050	---	-21	---	---
.440	.592	.020	-131	---	-141	-151
.448	.789	.040	-43	---	-77	-111
.512	.900	.045	-44	---	-78	-113
	.924	.067	---	-23	---	---
.630	.800	.027	-128	---	-138	-148
.640	1.071	.050	-46	---	-80	-115
	1.135	.067	---	-25	---	---
.768	1.265	.084	---	-26	---	---
.769	1.245	.055	-47	---	-81	-116
.775	1.077	.027	129	---	-139	-149
.894	1.410	.060	-48	---	-82	-117
	1.447	.084	---	-27	---	---
1.010	1.390	.028	-130	---	-140	-150
1.019	1.637	.067	-49	---	-83	-118
1.225	1.975	.067	-51	---	-85	-120

SECTION 504
WASHER LOCK INTERNAL AND EXTERNAL TOOTH, FLAT
APPLICABLE DOCUMENT MS45904

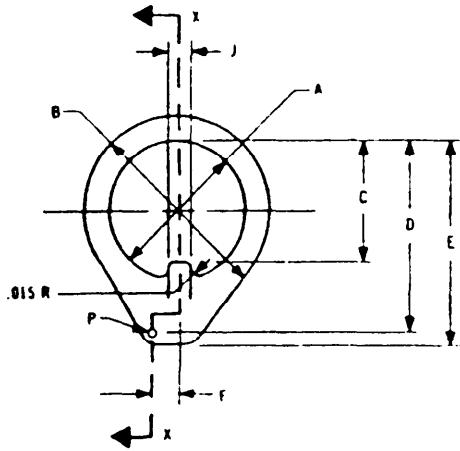


OPTIONAL DESIGNS

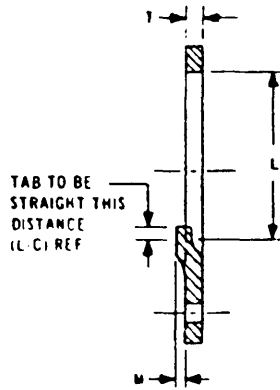
TABLE I. Part numbers.

Material			Carbon steel
Protective finish.			Cadmium plate
A Min	B Max	C Max	MS45904, Dash no.
.115	.475	.021	-51
.141	.510	.028	-54
.168	.610	.034	-57
	.690	.034	-58
	.760	.034	-59
.195	.610	.034	-60
	.690	.040	-61
	.760	.040	-62
	.900	.040	-63
.256	.760	.040	-68
	.900	.040	-69
	.985	.045	-70
	1.070	.045	-71
.320	.900	.040	-72
	.985	.045	-73
	1.070	.050	-74
.384	.985	.045	-76
	1.070	.050	-77
	1.155	.050	-78
	1.260	.050	-79
.512	1.260	.055	-84
	1.410	.060	-86
	1.620	.067	-87
.640	1.410	.060	-92
	1.620	.067	-93

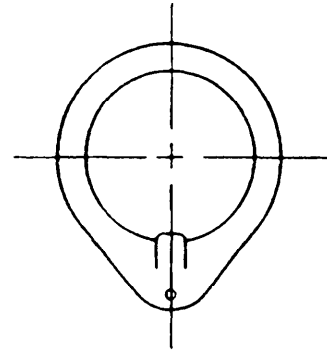
SECTION 505
WASHER LOCK ROD END
APPLICABLE DOCUMENT WASS13



-4 THRU -20



SECTION X-X



-22 THRU -36

TABLE I. Part numbers.

Material											Spring steel
Protective finish											Cadmium plate
Hardness (Rockwell)											C 40-45
A	B	C	D	E	F	J	L	M	T	P	WASS13 Dash no.
.272	.44	.214	.406	.500	.125	.052	.293	.036	.050	.062	-4
.334	.50	.273	.484	.578	.125	.052	.355	.036	.050	.062	-5
.396	.56	.327	.562	.656	.125	.082	.418	.036	.050	.062	-6
.459	.63	.366	.625	.719	.125	.082	.463	.049	.063	.062	-7
.520	.75	.450	.719	.813	.156	.082	.542	.049	.063	.062	-8
.647	1.00	.559	.937	1.031	.188	.114	.675	.057	.071	.071	-10
.772	1.12	.681	1.062	1.156	.188	.114	.800	.057	.071	.071	-12
.897	1.31	.795	1.250	1.344	.188	.142	.944	.066	.080	.080	-14
1.022	1.50	.918	1.422	1.516	.188	.142	1.088	.074	.090	.090	-16
1.147	1.62	1.028	1.547	1.656	.219	.174	1.213	.074	.090	.090	-18
1.272	1.75	1.154	1.687	1.796	.219	.174	1.280	.096	.112	.112	-20
1.387	1.88	1.254	1.859	1.969	--	.236	1.405	.096	.112	.112	-22
1.518	2.00	1.379	1.969	2.078	--	.236	1.530	.096	.112	.112	-24
1.643	2.12	1.495	2.109	2.219	--	.236	1.638	.109	.125	.125	-26
1.766	2.25	1.607	2.260	2.375	--	.298	1.763	.109	.125	.125	-28
1.891	2.38	1.732	2.375	2.484	--	.298	1.888	.109	.125	.125	-30
2.016	2.63	1.857	2.594	2.703	--	.298	2.076	.109	.125	.125	-32
2.141	2.75	1.973	2.750	2.860	--	.298	2.201	.109	.125	.125	-34
2.266	2.88	2.098	2.875	2.984	--	.298	2.326	.109	.125	.125	-36

SECTION 506
WASHER LOCK SPRING HELICAL
APPLICABLE DOCUMENTS MS35338, MS35340, MSS1848

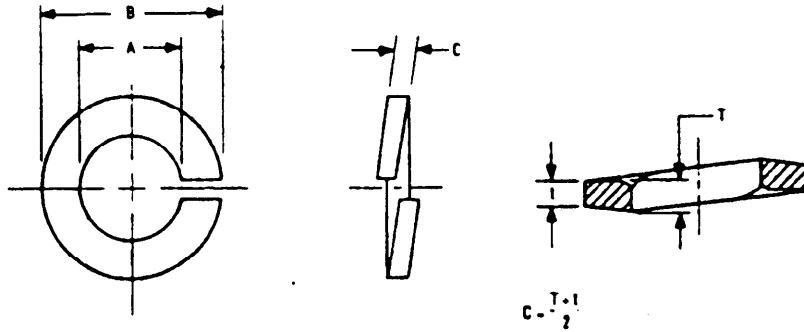


TABLE I. Part numbers.

Material			Carbon steel					CRES					Ph brz or tin brs	Nickel copper alloy
								Series						
Protective finish			Cadmium plate		Phosphate		Passivate			Black oxide		Cadmium plate	None	
Hardness (Rockwell)			C45-43	C45-53	C45-53	Not specified		C35-43	C35-43	C45-53	C35-43	C45-53	None	
A Min	B Max	C Min	MSS1848 - Dash no.	MS35338 - Dash no.	MS35340 - Dash no.	MS35338 - Dash no.	MSS1848 - Dash no.	MSS1848 - Dash no.	MS35338 - Dash no.					
.062	.092	.016	-1	--	--	--	-21	-41	--	--	--	--	--	--
.088	.135 .172 .208	.020 .020 .027	-3 -- --	-- -39 --	-- -- -39	-- -- --	-23 -- --	-43 -- --	-- -134 --	-- -153 --	-- -134B --	-- -153B --	-- -96 --	-- -115 --
.114	.173 .115	.022 .034	-5 --	-- --	-- -40	-- --	-25 --	-45 --	-- --	-- --	-- --	-- --	-- --	-- --
.115	.209	.025	--	-40	--	-59	--	--	-135	-154	-135B	-154B	-97	-116
.141	.216 .250 .314	.030 .031 .045	-7 -- --	-- -41 --	-- -- -41	-- -60 --	-27 -- --	-47 -- --	-- -136 --	-- -155 --	-- -136B --	-- -155B --	-- -98 --	-- -117 --
.167	.267 .168	.047 .057	-8 --	-- --	-- -42	-- --	-28 --	-48 --	-- --	-- --	-- --	-- --	-- --	-- --
.168	.293	.040	--	-42	--	-61	--	--	-137	-156	-137B	-156B	-99	-118
.193	.294 .194	.047 .068	-9 --	-- --	-- -43	-- --	-29 --	-49 --	-- --	-- --	-- --	-- --	-- --	-- --
.194	.334	.047	--	-43	--	-62	--	--	-138	-157	-138B	-157B	-100	-119
.254	.365 .255	.078 .084	-10 --	-- --	-- -44	-- --	-30 --	-50 --	-- --	-- --	-- --	-- --	-- --	-- --
.255	.489	.062	--	-44	--	-63	--	--	-139	-158	-139B	-158B	-101	-120
.317	.460 .318	.093 .108	-11 --	-- --	-- -45	-- --	-31 --	-51 --	-- --	-- --	-- --	-- --	-- --	-- --

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TABLE I Part numbers - Continued

Material			Carbon steel					CRES					Ph brz or tin brs	Nickel copper alloy
								Series						
Protective finish			Cadmium plate			Phosphate		Passivate			Black oxide		Cadmium plate	None
Hardness (Rockwell)			C45-S3	C45-S3	C45-S3	C45-S3		C35-43	C35-43	C45-S3	C35-43	C45-S3	None	
A Min	B Max	C Min	MSS1848 - Dash no.	MSS2538 - Dash no.	MSS2540 - Dash no.	MSS2538 - Dash no.	MSS1848 - Dash no.	MSS1848 - Dash no.	MSS2538 - Dash no.					
.318	.586	.078	--	-45	--	-64	--	--	-140	-159	-140B	-159B	-102	-121
.387	.553 .741	.125 .123	-12 --	-- -46	--	--	-32 --	-52 --	-- --	-- --	-- --	-- --	-- --	-- --
.387	.683	.094	--	-46	--	-65	--	--	-141	-160	-141B	-160B	-103	-122
.443	.647	.140	-13	--	--	--	-33	-53	--	--	--	--	--	--
.446	.779	.109	--	-47	--	-66	--	--	-142	-161	-142B	-161B	-104	-123
.509	.737 .939	.172 .162	-14 --	-- -48	--	--	-34 --	-54 --	-- --	-- --	-- --	-- --	-- --	-- --
.509	.873	.125	--	-48	--	-67	--	--	-143	-162	-143B	-162B	-105	-124
.572	.971	.141	--	-49	--	-68	--	--	-144	-163	-144B	-163B	-106	-125
.636	.923 1.157	.203 .202	-15 --	-- -50	--	--	--	-55 --	-- --	-- --	-- --	-- --	-- --	-- --
.636	1.079	.156	--	-50	--	-69	--	--	-145	-164	-145B	-164B	-107	-126
.763	1.111 1.361	.218 .241	-16 --	-- -51	--	--	--	--	--	--	--	--	--	--
.763	1.271	.188	--	-51	--	-70	--	--	-146	-165	-146B	-165B	-108	-127
.887	1.296	.234	-17	--	--	--	--	--	--	--	--	--	--	--
.890	1.464	.219	--	-52	--	-71	--	--	-147	-166	-147B	-166B	-109	-128
1.017	1.483 1.661 1.799	.250 .250 .330	-18 -- --	-- -53 -53	-- -- --	-- -- --	-- -72 --	-- -- --	-- -148 --	-- -167 --	-- -148B --	-- -167B --	-- -110 --	-- -129 --
1.144	1.853	.281	--	-54	--	--	--	--	-149	-168	-149B	-168B	-111	-130
1.271	2.045 2.231	.312 .417	-- --	-55 -55	-- --	-- --	-- --	-- --	-150 --	-169 --	-150B --	-169B --	-112 --	-131 --
1.388	2.239	.344	--	-56	--	--	--	--	-151	-170	-151B	-170B	-113	-132
1.525	2.430 2.638	.375 .496	-- --	-57 -57	-- --	-- --	-- --	-- --	-152 --	-171 --	-152B --	-171B --	-114 --	-133 --

SECTION 601
WASHER, RECESSED, COUNTERSUNK, ONE SURFACE
APPLICABLE DOCUMENTS NAS1587, MS20002, MS21206

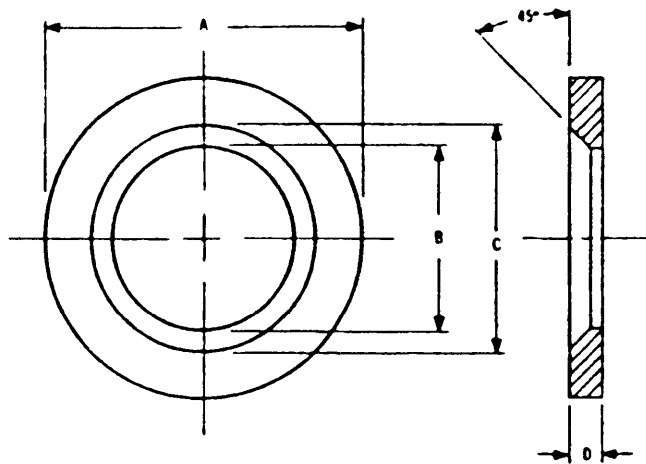


TABLE I. Part numbers.

Material				CRES Type 321 or 347	Alloy steel		
Protective finish				Passivate	Cadmium plate		
Tensile strength (psi)				75,000 Min	125,000 to 145,000	Not specified	
Hardness (Rockwell)				Not specified	Not specified	C38-45	
B Min	C Min	A Max	D Max	NAS1587 + Dash no.	MS20002 + Dash no.	MS21206 + Dash no.	
.191	.280	.372	.069	—	—	C3	
.192	.222	.479	.072	-3C	—	—	
.251	.340	.470	.069	—	—	C4	
.252	.334	.541	.088	-4C	C4	—	
.314	.402	.573	.069	—	—	C5	
.315	.396	.593	.078	-5C	C5	—	
.376	.497	.679	.085	—	—	C6	
.378	.483	.697	.088	-6C	C6	—	
.439	.559	.783	.085	—	—	C7	
.441	.543	.791	.088	-7C	C7	—	
.501	.622	.898	.085	—	—	C8	
.504	.604	.085	.088	-8C	C8	—	
.627	.778	1.125	.085	—	—	C10	
.631	.765	1.072	.088	-10C	C10	—	
.752	.903	1.350	.085	—	—	C12	
.757	.890	1.260	.088	-12C	C12	—	
.877	1.028	1.572	.085	—	—	C14	
.884	1.015	1.447	.088	-14C	C14	—	
1.002	1.153	1.798	.119	—	—	C16	
1.010	1.140	1.635	.088	-16C	C16	—	
1.127	1.278	2.188	.119	—	—	C18	
1.135	1.265	1.885	.088	-18C	C18	—	
1.252	1.435	2.260	.119	—	—	C20	
1.260	1.427	2.135	.104	-20C	C20	—	
1.377	1.560	2.490	.119	—	—	C22	
1.385	1.552	2.323	.104	—	C22	—	
1.502	1.685	2.723	.119	—	—	C24	
1.510	1.677	2.510	.104	—	C24	—	

SECTION 602
WASHER, RECESSED, COUNTERSUNK, TWO SURFACES
APPLICABLE DOCUMENTS: MS9482, MS9768, MS14155, MS14177

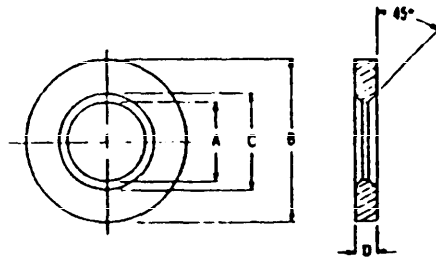


TABLE I. Part numbers.

Material				Steel	CRES	Alloy steel	
Protective finish				Diffused nickel-cadmium plate	None	Cadmium plate	
Hardness (Rockwell)				C50-56	C29-39	C39-43	
A Min	B Max	C Min	D Max	MS9482 - Dash no.	MS9768 - Dash no.	MS14155 - Dash no.	MS14177 - Dash no.
.140	.340	.176	.076	—	-07	—	—
.143	.315	.178	.070	-07	—	—	—
.166	.385	.202	.076	—	-08	—	—
.169	.375	.214	.085	-08	—	—	—
.192	.448	.236	.085	—	-08	—	—
.195	.435	.250	.095	-09	—	—	—
.251	.505	.337	.124	—	—	-4	—
	.532	.337	.133	—	—	—	-4
.252	.635	.296	.085	—	-10	—	—
.255	.570	.332	.135	-10	—	—	—
.314	.620	.399	.124	—	—	-5	—
	.651	.399	.133	—	—	—	-5
.315	.760	.359	.105	—	-11	—	—
.317	.700	.394	.160	-11	—	—	—
.376	.766	.494	.158	—	—	-6	—
	.795	.494	.167	—	—	—	-6
.378	.885	.422	.117	—	-12	—	—
.380	.855	.489	.195	-12	—	—	—
.439	.878	.556	.158	—	—	-7	—
	.912	.556	.167	—	—	—	-7
.441	1.010	.495	.130	—	-13	—	—
.443	.980	.552	.215	-13	—	—	—
.501	1.004	.619	.163	—	—	-8	—
	1.038	.619	.167	—	—	—	-8
.504	1.198	.558	.165	—	-14	—	—
.505	1.170	.614	.260	-14	—	—	—
.627	1.266	.775	.226	—	—	-10	—
	1.302	.775	.198	—	—	—	-10
.630	1.405	.771	.315	-16	—	—	—
.752	1.507	.900	.278	—	—	-12	—
	1.546	.900	.198	—	—	—	-12
.755	1.670	.896	.375	-17	—	—	—
.877	1.747	1.025	.320	—	—	-14	—
	1.791	1.025	.198	—	—	—	-14
.880	1.935	1.021	.430	-18	—	—	—
1.002	1.978	1.150	.368	—	—	-16	—
1.005	2.195	1.146	.480	-19	—	—	—

MIL-STD-1764
31 January 1980

SECTION 603
WASHER, RECESSED, TAPER PIN
APPLICABLE DOCUMENT AN975

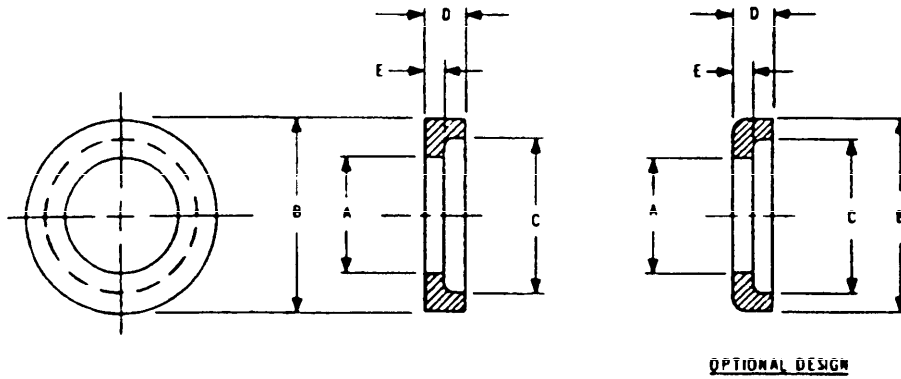


TABLE I. Part numbers

Material					Steel
Protective finish					Cadmium plate
A	B	C	D	E	AN975 - Dash no.
13/64	15/32	11/32	3/16	1/16	-3
17/64	9/16	13/32	13/64	5/64	-4
21/64	11/16	17/32	13/64	5/64	-5
25/64	25/32	19/32	13/64	5/64	-6
29/64	27/32	21/32	13/64	5/64	-7
33/64	15/16	23/32	7/32	3/32	-8
49/64	1- 9/32	1	15/64	7/64	-12
57/64	1- 15/32	1- 3/16	15/64	7/64	-14

SECTION 701
WASHER SHOULDERED AND RECESSED DIMPLED 100
APPLICABLE DOCUMENT NAS1169

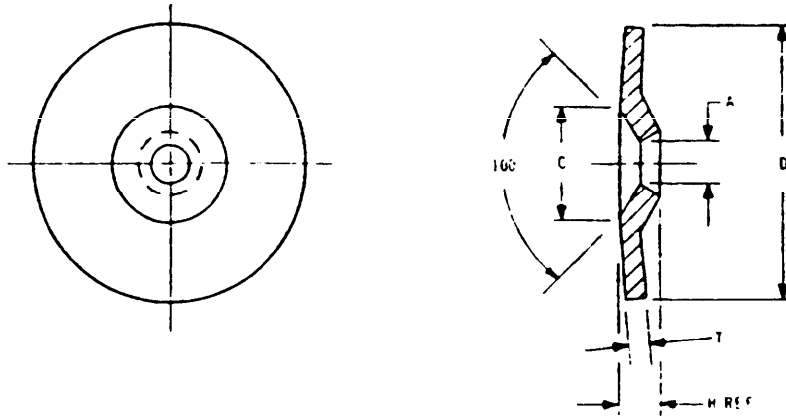


TABLE I Part numbers

Material					Carbon steel	Aluminum alloy		CRES	Titanium
Protective finish					Cadmium plate	5052	2024	Passivate	Not specified
Hardness or tensile strength (ksi)					Rockwell C42-47	Not specified		160 tensile	None
A Min	D Max	C Min	H Ref	T	NAS1169 - Dash no.				
.140	.495	.279	.068	.008	--	D6E	--	--	--
			.076	.016	-6L	--	DD6L	C6L	T6L
			.082	.025	-6	--	DD6	C6	T6
.166	.582	.332	.079	.008	--	D8E	--	--	--
			.087	.016	-8L	--	DD8L	C8L	T8L
			.094	.025	-8	--	DD8	C8	T8
.192	.645	.385	.091	.008	--	D10E	--	--	--
			.099	.016	-10L	--	DD10L	C10L	T10L
			.101	.025	-10	--	DD10	C10	T10
.252	.770	.507	.117	.008	--	D416E	--	--	--
			.125	.016	-416L	--	DD416L	C416L	T416L
			.132	.025	-416	--	DD416	C416	T416
.314	.958	.635	.145	.008	--	D516E	--	--	--
			.153	.016	-516L	--	DD516L	C516L	T516L
			.160	.025	-516	--	DD516	C516	T516
.377	1.020	.762	.172	.008	--	D616E	--	--	--
			.180	.016	-616L	--	DD616L	C616L	T616L
			.188	.025	-616	--	DD616	C616	T616
.440	1.208	.890	.200	.008	--	D716E	--	--	--
			.206	.016	-716L	--	DD716L	C716L	T716L
			.215	.025	-716	--	DD716	C716	T716
.502	1.332	1.017	.225	.008	--	D816E	--	--	--
			.237	.016	-816L	--	DD816L	C816L	T816L
			.245	.025	-816	--	DD816	C816	T816

SECTION 801
WASHER, SPRING TENSION
APPLICABLE DOCUMENT MIL-W-12133/1

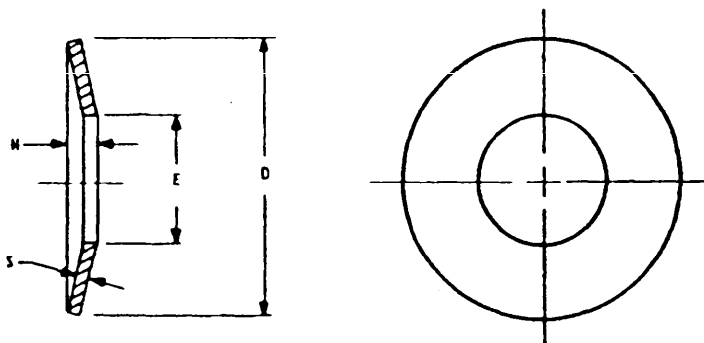


TABLE I. Part numbers.

Material				Spring steel	
Protective finish				Plain	Cadmium plate
E Min	D Max	S Nom	H Nom	M 12133/1 - Dash no.	
.125	.250	.013	.020	-1	-1P
.156	.312	.017	.025	-2	-2P
.195	.375	.015	.027	-3	-3P
.254	.500	.020	.035	-4	-4P
.317	.625	.032	.051	-5	-5P
.382	.750	.032	.054	-6	-6P
.445	1.000	.035	.067	-7	-7P
.512	1.000	.039	.075	-8	-8P
	1.102	.049	.083	-9	-9P
.637	1.375	.059	.102	-10	-10P
.761	1.500	.059	.114	-11	-11P
		.070	.121	-12	-12P
.880	1.750	.085	.128	-13	-13P
1.016	2.000	.079	.138	-14	-14P
	2.375	.098	.177	-15	-15P

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