AMSC N/A

This military standard is established for use by all Departments and Agencies of the Department of Defense. Suggestions for new or revised standards, data item descriptions, and design applications and for repetitive use shall be made from this document when applicable.

REVIEWER ACTIVITIES
ARMY - AV,
AIRFORCE - 82
DLA - IS

USER ACTIVITIES
NAVY - MC
ARMY - AT, AV, ME

DD 672-1

NAVY - OS
ARMY - AR
AIR FORCE - 99

PROCUREMENT SPECIFICATION
MIL - R - 21248

INTERNATIONAL INTEREST

SUPERSEDES

(D) ENTIRE STANDARD REVISED

TITLE
RING, RETAINING, INTERNAL, BEVELED (TAPERED SECTION TYPE)

MILITARY STANDARD
MS16631

PAGE 1 OF 2

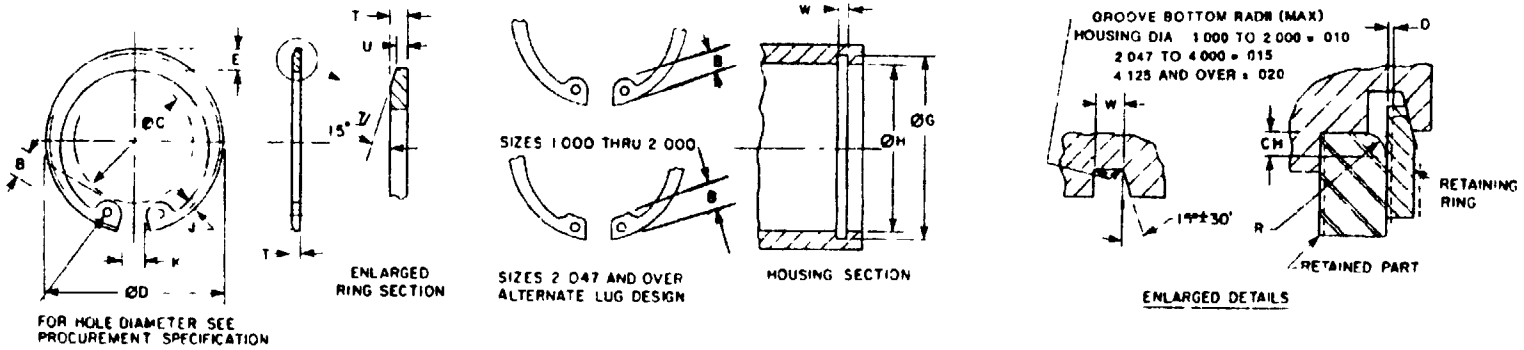


TABLE I DIMENSIONS

Ø I HOUSING (REF)		Ø E REF		B LUG HEIGHT		E LARGE SECTION HEIGHT		J SMALL SECTION HEIGHT		J 7/ THICKNESS AT BEVELED EDGE		T 1/ THICKNESS		Ø G RECOMMENDED GROOVE (REF)		W WIDTH		V 3/ GAP WIDTH	Ø C 4/ CLEAR	O 5/ PAD UP	R 6/	H 6/ OF RETAINED PART (REF)
INCH	MM	BASIC	TOL	BASIC	TOL	BASIC	TOL	BASIC	TOL	BASIC	TOL	BASIC	TOL	BASIC	TOL	BASIC	TOL	MIN		MAX	MAX	MAX
1 000	25 4	1 1 1	+ 015	155		104	± 005	052	± 005	033		042		1 076	+ 005	036		145	665	005	042	034
1 023	26 0	1 136	- 010	155		106		054		033		042		1 101	- 000	036		150	69	005	042	034
															004 FIM 2/							
1 062	27 0	1 180		180		110		055		041		050		1 138		044		143	685	005	044	035
1 125	28.6	1 243		180		116		057		040		050		1 205		043		157	745	005	047	036
1.181	30 0	1 319		.180		120		058		040		050		1 265		043		150	79	0055	047	036
1 188	30.2	1 319		180		120		058		040		050	± 002	1 272		043		169	80	0055	047	036
1 250	31.7	1 386	+ 025	180		124		062		039		050		1 342	+ 006	042		184	875	006	048	038
1 259	32 0	1 388	- 020	180		124	± 006	062	± 006	039		050		1 351	- 000	042		209	885	006	048	038
1 312	33 3	1 457		180		130		062		039		050		1 408	005	042		198	93	006	048	038
1 375	34 9	1 526		180		130		063		038		050		1 475	FIM 2/	041		211	99	0065	048	038
1 378	35 0	1 542		.180		130		063		038		050		1 478		041		219	99	0065	048	038
1 438	36 5	1 595		180		133		065		037	± 001	050		1 542		040	+ 005	221	1 06	007	048	038
1 456	37.0	1 616		180		133		065		037		050		1 562		040	- 000	226	1 08	007	048	038
1 500	38.1	1 660		180		133		066		037		050		1 604		040		238	1 12	007	048	038
1 562	39 7	1 734		220		157		078		048		062		1 674		052		238	1 10	0075	064	050
1.575	40.0	1 734		220		157		078		048		062		1 687		052		275	1 12	0075	064	050
1 625	41 3	1 804		220		164		082		047		062		1 743		051		242	1 15	008	064	0 0
1 653	42 0	1 835		221		.167		083		047		062		1 773		051		248	1 17	008	064	0'0
1 688	42 9	1 874		220		170		085		046		062		1 810	+ 007	050		255	1 21	008	064	0 0
															- 000							
1 750	44 4	1 942	+ 035	240		171		083		046		062		1 878	005 FIM 2/	.050		267	1.26	0085	064	050
1 812	46 0	2 017	- 025	240	+ 005	170		084		046		062		1 944		050		250	1 32	009	064	050
1 850	47 0	2 054		240		170		085		046		062		1 984		050		284	1 36	009	064	050
1 875	47 6	2 054		240		170		085		046		062		2 011		050		320	39	009	064	0 0
1 938	49 2	2 14		240		170		085		045		062		2 082		049		328	1 45	0095	064	0'0
2 000	50 8	2 211		240		170		085		044		062		2 144		048		332	1 50	0095	064	050
2 047	52 0	2 280		250		186		091		060		078		2 195		065		341	1 52	0095	076	061
2 062	52 4	2 280		250		186		091		060		078		2 210	+ 007	065		349	1 54	0095	078	062
2 125	54 0	2 350	+ 040	260		195		096		060		078		2 279	- 000	065	+ 007	345	1 58	010	078	062
2 165	55 0	2 41	- 030	264		199	± 007	098	± 007	059		078		2 327	006	064	- 000	323	1 61	010	078	062
2 188	55 6	2 41		264		199		098		059		078	± 003	2 350	FIM 2/	064		373	1 64	010	078	062
2 250	57 1	2 49		270		203		099		059	± 0015	078		2 420		064		368	1 69	0105	078	062

APPROVED 11 DEC 1958 REVISED (D) 7 MAY 1990

FED SUP CLASS 5365

5365 - 0128

This military standard is approved for use by all Departments and Agencies of the Department of Defense. Selection for all new engineering and design applications and for repetitive use shall be made from this document when applicable.

REVIEWER ACTIVITIES
ARMY - AV, MI
AIRFORCE - 82
DLA - IS

USER ACTIVITIES
NAVY - MC
ARMY - AT, AV, ME

TABLE I DIMENSIONS - CONTINUED

Ø H HOUSING (REF)		Ø D FREE		B LARGE SECTION HEIGHT		E LARGE SECTION HEIGHT		J SMALL SECTION HEIGHT		J 7/ THICKNESS AT BEVELED EDGE		T 1/ THICKNESS		Ø G RECOMMENDED GROOVE (REF)		W WIDTH		K 3/ GAP WIDTH	Ø C 4/ CLEAR	C 5/ TAIL UP	R 6/ OF RETAINED PART (REF)	CH 6/
INCH	MM	BASIC	TOL	BASIC	TOL	BASIC	TOL	BASIC	TOL	BASIC	TOL	BASIC	TOL	BASIC	TOL	BASIC	TOL	MIN		MAX	MAX	MAX
2.312	58.7	2.535		.70		.206		.109		.058		.078		2.484	+.007	.063		.415	1.75	.011	.078	.062
2.375	60.3	2.630		.70		.207		.102		.058		.078		2.552	-.000	.063		.374	1.81	.015	.078	.062
2.440	62.0	2.702		.80		.209		.103		.057	±.0015	.078		2.618	.006	.062		.386	1.86	.012	.078	.062
2.500	63.5	2.775		.80		.210		.103		.057		.078		2.684	FIM 2/	.062		.398	1.91	.012	.078	.062
2.531	64.3	2.775	+.040	.80		.210		.103		.057		.078		2.717		.062	+.007	.460	1.94	.0125	.078	.062
2.562	65.1	2.844	-.0.0	.90		.222		.109		.074		.093		2.750		.076	-.000	.400	1.95	.0125	.088	.070
2.625	66.7	2.910		.90		.226		[illegible]		.071		.093		2.820		.077		.418	2.02	.013	.088	.070
2.677	68.0	2.980		.00	±.005	.230	±.007	.113	±.007	.071		.093		2.876		.077		.393	2.05	.013	.090	.072
2.688	68.3	2.980		.00		.230		[illegible]		.071		.093		2.887		.077		.423	2.06	.013	.090	.072
[illegible]	69.8	3.050		.00		.234		.115		.070		.093		2.955		.076		.442	2.12	.014	.092	.074
2.812	71.4	3.121		.00		.230		.115		.070	±.002	.093		3.020		.076		.459	2.18	.014	.088	.070
2.875	72.0	3.121		.00		.230		[illegible]		.070		.093		3.043		.076		.512	2.21	.014	.088	.070
2.875	73.0	3.191		.10		.240		.120		.070		.093		3.085		.076		.451	2.22	.014	.092	.074
2.953	75.0	3.325		.0		.250		.124		.068		.093		3.178		.074		.449	2.30	.015	.092	.074
3.000	76.2	3.325		.0		.250		.124		.068		.093		3.225		.074		.568	2.35	.015	.092	.074
3.062	77.8	3.418		.1		.254		.126		.082		.109		3.290		.089		.473	2.41	.015	.097	.078
3.125	79.4	3.488		.10		.259		.129		.082		.09		3.355		.089		.469	2.47	.0155	.099	.079
3.149	80.0	3.523		.3		.262		.129		.082		.109		3.381		.089		.462	2.49	.0155	.100	.080
3.156	80.2	3.523		.30		.262		.129		.082		.109		3.388		.089		.481	2.50	.0155	.100	.080
[illegible]	82.5	3.623		.32		.269		.135		.082		.109		3.469		.089		.509	2.54	.016	.104	.083
.346	85.0	3.734	+.09	.32		.276		.140		.082		.09		3.591		.089		.514	2.63	.0165	.108	.086
3.469	88.1	3.857		[illegible]		.286		.144		.082		.109		3.726		.089		.571	2.76	.017	.108	.086
3.500	88.9	3.890		.32		.289	±.008	.14	±.008	.082		.109		3.760		.089		.574	2.79	.017	.110	.088
3.543	90.0	3.936		.32		.292		.14		.082		.109		3.806		.089		.586	2.83	.0175	.110	.088
[illegible]	90.5	3.936		.32		.293		.142		.082		.109		3.830		.089		.643	2.85	.018	.110	.088
3.625	92.1	4.024		.33		.299		.150		.082		.109		3.900	+.010	.089		.639	2.91	.018	.116	.093
.750	95.0	4.157		.32		.309		.155		.082		.109		4.030	-.000	.089		.647	3.02	.0195	.120	.096
3.750	95.2	4.157	+.008	.32		.309		.15		.082	±.0025	.109	+.003	4.040	.006	.089	+.008	.674	3.03	.0195	.120	.096
[illegible]	98.4	4.291		.3		.319		.160		.082		.09		4.171	FIM 2/	.089	-.000	.680	3.11	.020	.123	.098
[illegible]	100.0	4.358		.3		.324		.162		.082		.109		4.236		.089		.687	3.17	.020	.124	.099
4.000	101.6	4.424		.3		.330		.166		.082		.109		4.302		.089		.694	3.23	.020	.128	.102
4.125	104.8	4.558		.3		.330		.171		.082		.109		4.433		.089		.718	3.36	.021	.130	.104
4.250	108.0	4.691		.3		.335		.180		.082		.109		4.562		.089		.743	3.48	.021	.138	.110
4.375	110.0	4.756		.4		.343		.180		.082		.109		4.647		.089		.803	3.50	.021	.142	.114
4.500	114.3	4.940		.4		.354		.181		.084		.109		4.824		.089		.787	3.66	.022	.146	.117
4.625	117.5	5.076	±.06	.		.360		.183		.082		.109		4.955		.089		.822	3.79	.022	.151	.121
4.724	120.0	5.213		.4		.370		.183		.082		.09		5.060		.089		.773	3.88	.023	.154	.123
4.750	120.6	5.213		.4		.370		.183		.082		.109		5.086		.089		.843	3.90	.023	.154	.123
5.000	127.0	5.485		.4		.390	+.009	.186	+.009	.082		.109		5.346		.089		.753	4.08	.023	.158	.126
[illegible]	133.3	5.770		.4		.408		.198		.095		.125		5.612		.102		.886	4.31	.024	.168	.134
5.375	136.5	5.910		.4	+.010	.408		.198		.095		.125	±.004	5.739	+.012	.102	+.010	.893	4.41	.024	.168	.134
5.500	139.7	6.066		.45		.408		.198		.095	±.003	.125		5.864	-.000	.102	-.000	.879	4.53	.024	.168	.134
5.750	146.0	6.336		.45		.408		.198		.095		.125		6.120	.006	.102		.905	4.78	.025	.168	.134
6.000	152.4	6.620		.45		.408		.196		.095		.125		6.374	FIM 2/	.102		.929	5.03	.025	.168	.134

APPROVED 11 DEC 1958 REVISED (D) FOR CHANGES SEE PAGES 1 THROUGH 8

NAVY - OS
ARMY - AR
AIRFORCE - 99

INTERNATIONAL INTEREST

PROCUREMENT SPECIFICATION
MIL - R - 21248

TITLE
RING, RETAINING, INTERNAL, BEVELED (TAPERED SECTION TYPE)

MILITARY STANDARD
MS16631

PAGE 2 OF 8

FSC 5365

DD 672-1

AMSC N/A

REVIEWER ACTIV
ARMY - AV, MI
AIRFORCE - 82
DLA - IS

USER ACTIVITIES
NAVY - MC
ARMY - AT, AV, ME

TABLE I DIMENSIONS - CONTINUED

Ø F HOUSING (REF)		Ø U FACE		B LUG HEIGHT		L LARGE SECTION HEIGHT		J SMALL SECTION HEIGHT		U 2/ THICKNESS AT BEVELED EDGE		T 2/ THICKNESS		Ø G RECOMMENDED GROOVE (REF)		W WIDTH		K 3/ GAP WIDTH	Ø C 4/ CLEAR	O 5/ TAKE UP	R 6/	CH 6/ OF RETAINED PART (REF)
INCH	MM	BASIC	TOL	BASIC	TOL	BASIC	TOL	BASIC	TOL	BASIC	TOL	BASIC	TOL	BASIC	TOL	BASIC	TOL	MIN		MAX	MAX	MAX
6 250	158 7	6 895		495		423		211		121		156		6 642		.129		956	5 24	026	177	142
6 500	165 1	7 170		485		438		219		121		156		6 908		129		1 040	5.49	.027	.181	145
6 625	168 3	7 308	030	485		447	± 009	221	± 009	121		156		7 042		129		1 063	5 60	028	183	.146
6 750	171 4	7 445		530		456		224		120		156		7 174		.128		985	5 65	028	188	150
7 000	177 8	7 720		530		474		232		120		156		7 441		128		1 037	5 88	029	196	157
7 250	184 1	7 995		560		489		238		150		.167		7 708		.159		1 085	6 00	.031	202	162
.00	190 5	6 270		560		507		247		150		187	± 005	7 974		159		1 138	6 33	032	208	166
7 750	196 8	8 545		560	± 010	523		255		150	± 003	187		8 240	+ 015	159	+ 010	1 178	6 50	033	214	171
8 000	203 2	8 820		600		540		262		146		187		8 507	- 000	155	- 000	1 238	6 75	034	220	176
8 250	209 [illegible]	9 095		600		.558		270		146		187		8 773	.006 FIM 2/	155		1 269	7 00	035	229	183
8 500	2 5 9	9 285	+ 090	660		573	± 010	277	± 010	142		187		9 040		151		1 444	7 13	036	235	188
8 750	222 2	9 558		660		591		286		142		187		9 307		151		1 481	7 38	037	241	193
9 000	228 6	9 830		660		609		294		142		187		9 573		151		1 539	7.63	038	249	199
9 250	235 0	10 102		660		625		299		142		187		9 838		151		1 559	7 88	039	253	202
9 500	241 3	10 375		735		642		304		.138		187		10 106		147		1 596	7 96	041	258	206
9 750	247 7	10 648		735		658		309		138		187		10 372		147		1 680	8 21	042	263	210
10 000	254 0	10 920		735		675		315		38		.187		10 639		147		1 687	8 48	043	270	216

1/ THICKNESS "T" APPLIES TO UNPLATED RINGS. FOR CORROSION RESISTANT STEEL AND PLATED RINGS, + .002 SHOULD BE ADDED TO THE MAXIMUM TOLERANCE. i.e., ± .002 SHOULD BE + .004 - .002

2/ FIM = (FULL INDICATOR MOVEMENT) IS THE MAXIMUM ALLOWABLE DEVIATION OF CONCENTRICITY BETWEEN THE GROOVE AND THE BODY.

3/ K = MINIMUM GAP WIDTH WHEN THE RING IS PROPERLY SEATED IN THE GROOVE (DESIGN REFERENCE DIMENSION)

4/ C = ACTUAL CLEARANCE DIAMETER WHEN THE RING IS SPRUNG INTO THE HOUSING, PRIOR TO INSTALLATION INTO THE GROOVE (DESIGN REFERENCE DIMENSION)

5/ O = END PLAY TAKE UP

6/ R AND CH = RADII OR CHAMFERS ALLOWABLE ON PARTS TO BE RETAINED BY THE RINGS. THRUST LOADS FOR RINGS, RETAINING PARTS WITH CORNER RADII OR CHAMFERS ARE TABULATED ON PAGE 8

7/ J AND U = THESE DIMENSIONS ARE FOR GROOVE LOCATION CALCULATIONS ONLY (SEE (f) ON PAGE 7) AND NOT FOR INSPECTION PURPOSES

P.A. NAVY - OS
Other Cust. ARMY - AR
AIRFORCE - 99

INTERNATIONAL INTEREST

TITLE RING, RETAINING, INTERNAL, BEVELED (TAPERED SECTION TYPE)

MILITARY STANDARD

MS16631

PAGE 3 OF 8

DD 672-1

MIL - R - 21248

SUPERSEDES

APPROVED 11 DEC 1958

REVISED (D) FOR CHANGES SEE PAGES 1 THROUGH 8

FED SUP CLASS 5365

5365 0128

REQUIREMENTS:

1. CLASSIFICATION RETAINING RINGS FURNISHED UNDER THIS STANDARD SHALL BE TYPE III, CLASS 1 OF THE PROCUREMENT SPECIFICATION

2 MATERIAL

(a) CARBON SPRING STEEL, GRADE 1060 THRU 1095 (UNS G10600 THRU G10950) IN ACCORDANCE WITH ASTM A568 OR ASTM A682

(b) CORROSION RESISTANT STEEL IN ACCORDANCE WITH AMS 5520 (UNS S15700)

(c) BERYLLIUM COPPER ALLOY NUMBER 170 (UNS C17000) OR ALLOY NUMBER 172 (UNS C17200) IN ACCORDANCE WITH ASTM B194

3 HARDNESS

TABLE II HARDNESS

Ø HOUSING (REF)	CARBON STEEL	CORROSION RESISTANT STEEL	BERYLLIUM COPPER
.000 TO .500 INCL	52.5-58.6 HR45N 1/ (48-53 HRC EQUIV)	50.3-56.1 HR45N 1/ (46-51 HRC EQUIV)	41.9-46.7 HR45N 1/ (39-43 HRC EQUIV)
1.562 TO 2.000 INCL	46-51 HRC	46-51 HRC	39-43 HRC
2.047 TO 3.000 INCL	46-51 HRC	46-51 HRC	-
3.062 & OVER	44-49 HRC	46-51 HRC	-

1/ USE HIGHEST SCALE TO PROVIDE SECTION WIDTH EQUAL TO OR GREATER THAN 5 TIMES THE BRALE IMPRESSION DIAMETER

4 PROTECTIVE FINISH OR SURFACE TREATMENT

(a) CARBON STEEL - SHALL BE AS SPECIFIED (SEE TABLE III OR IV)

(1) CADMIUM PLATE IN ACCORDANCE WITH QQ-P-416, TYPE II, CLASS 3 OR ASTM B696, TYPE II, CLASS 5

(2) ZINC COAT IN ACCORDANCE WITH ASTM B633, TYPE II, CLASS Fe/Zn5, OR ASTM B695, TYPE II, CLASS 5.

(3) PHOSPHATE COAT IN ACCORDANCE WITH DOD-P-16232, TYPE Z, CLASS 2

(b) CORROSION RESISTANT STEEL - SHALL BE CLEANED, DESCALED AND PASSIVATED IN ACCORDANCE WITH QQ-P-35

5 PART NUMBER. THE BASIC MS PART NUMBER IS FOLLOWED BY A DASH NUMBER TAKEN FROM TABLE III OR IV

EXAMPLE. MS16631-1100 IS THE PART NUMBER FOR A CARBON STEEL CADMIUM PLATE, INTERNAL, BEVELED RETAINING RING FOR USE ON A 1.000 DIAMETER HOUSING.

NOTES

1 UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES

2 IN THE EVENT OF A CONFLICT BETWEEN THE TEXT OF THIS STANDARD AND THE REFERENCES CITED HEREIN, THE TEXT OF THIS STANDARD SHALL TAKE PRECEDENCE.

3 REFERENCED GOVERNMENT (OR NON-GOVERNMENT) DOCUMENTS OF THE ISSUE LISTED IN THAT ISSUE OF THE DEPARTMENT OF DEFENSE INDEX OF SPECIFICATIONS AND STANDARDS (DODISS) SPECIFIED IN THE SOLICITATION FORM A PART OF THIS STANDARD TO THE EXTENT SPECIFIED HEREIN

USER ACTIVITIES
NAVY - MC
ARMY - AT, AV, ME

REVIEWER ACTIVITIES
ARMY - AV, MI
AIRFORCE - 82
DLA - IS

AMSC N/A

REVISED (D) FOR CHANGES SEE PAGES 1 THROUGH 8

APPROVED 11 DEC 1958

PA	INTERNATIONAL INTEREST	TITLE	
NAVY - OS Other Cust ARMY - AR AIRFORCE - 99		RING, RETAINING, INTERNAL BEVELED (TAPERED SECTION TYPE)	MILITARY STANDARD MS16631
PROCUREMENT SPECIFICATION MIL - R - 21248	SUPERSEDES		PAGE 4 OF 8

DD 672-1 COORDINATED 5365 - 0128

FSC N/A

REVIEWER ACTIVITIES
ARMY - AV,
AIRFORCE - 82
DLA - IS

USER ACTIVITIES
NAVY - MC
ARMY - AT, AV, ME

DD 672-1

NAVY - OS
Ord. Gu
ARMY - AR
AIRFORCE - 99
PROCUREMENT SPECIFICATION
MIL - R - 21246

RING, RETAINING, INTERNAL, BEVELED
(TAPERED SECTION TYPE)

MILITARY STANDARD

MS16631

TABLE III DASH NUMBERS FOR MS16631

Ø H HOUSING (BORE)	CARBON STEEL 1/ CADMIUM PLATE	CARBON STEEL 1/ ZINC COAT	CARBON STEEL 1/ PHOSPHATE COAT	STEEL CORROSION RESISTANT	BERYLLIUM 1/ COPPER
	DASH NO	DASH NO	DASH NO	DASH NO	DASH NO
1.000	[illegible]	-2100	-3100	-4100	-5100
1.023	-11[illegible]	2102	-3102	-4102	-5102
.062	-2106	-2106	3106	-4106	-5106
1.125	-	-2112	-3112	-4112	-5112
1.181	-1118	-2118 2/	-3118 2/	4118 2/	-5118 2/
1.188	-11[illegible]	-2118 2/	-3118 2/	-4118 2/	-5118 2/
1.250	-11 5	-2125 2/	-3125 2/	-4125 2/	-5125 2/
1.[illegible]	-11	2125 2	3125 2	-4.25 2/	-5125 2/
1.3.2	-11 1	-2131	-3131	-4131	-5131
1.[illegible]	1 7	-2137 2	-3137 2	-4137 2/	-5137 2
1.1 8	-11 7	-2137 2	-3137 2/	-4137 2/	-5137 2
1.438	11	2143	3143	-4.43	-5143
1.4.6	-1145	-2145	-3145	-4145	-5145
1.500	-11[illegible]	-2150	-3150	-4150	-5150
1.562	-11	-2156 2	-3156 2/	-4.56 2/	-5156 2/
1.575	-11	-2156 2/	-3156 2/	-4156 2/	-5156 2/
1.625	-116	-2162	-3162	-4162	-5162
1.6 3	-116	-2165	-3165	-4165	-5165
1.668	-116	-2168	-3168	-4168	-5168
700	-117	-2175	-3175	-4175	-5175
8.2	-118	-2181	-3181	-4181	-5181
1.8 0	1.8 2	-2185 2/	-3185	-4185 2/	-5.85 2/
1.87	-118	-2185 2/	-3185 2/	-4185 2/	-5185 2/
1.938	-119	-2193	-3193	-4193	-5193
2.000	-1 2	-2200	-3200	-4200	-5200
2.04	-1 0	-2206 2/	-3 06	-4206 2/	
2.06	1.6	-2206 2/	-3206	-4200 2/	
2.1	-121	-2212	-3212	-4212	
2.165	1	-2218 2/	-3218	4218 2/	
2.188	-1218	-2218 2/	-3218	-4218 2/	
2.250	-122	-2225	-322	-4225	
2.312	-12	-2231	-3231	-4231	
2.3	-123	-2237	-3237	-4237	
2.44	-1244	-2244	-3244	-4244	
2.500	-	-2250 2/	-3250 2/	-4250 2/	
2.53	-1250	-2250 2	-3250 2	-4.50 2	
2.562	-125	2.56	-3256	-4.56	
2.6	-1267	-2 62	-3262	-4.62	
2.675	1	-2268 2/	-3268	-4.68 2/	
2.688	-1268	-2268 2/	-3268 2	-4.68 2/	
750	-1	-2.75	-3	4 75	
2.81	-1281	-2281 2	-3281 2	-4281 2/	
2.834	8	2.81 2/	3281 2	-4281 2/	
831	-1287	-2287	-3287	-4287	
2.95	-1300 2	-2300 2/	-3300 2	-4300 2/	
3.000	-1300	-2300 2/	-3300 2/	-4300 2/	

Ø H HOUSING (BORE)	CARBON STEEL 1/ CADMIUM PLATE	CARBON STEEL 1/ ZINC COAT	CARBON STEEL 1/ PHOSPHATE COAT	STEEL CORROSION RESISTANT
	DASH NO	DASH NO	DASH NO	DASH NO.
3.062	-1306	-2306	-3306	-4306
3.125	-1312	-2312	-3312	4312
3.149	-1315 2/	-2315 2/	-3315 2/	-4315 2/
3.156	-1315 2/	-2315 2/	3315 2/	-4315 2/
3.250	-132[illegible]	-2325	-3325	-4325
3.346	-1334	-2334	-3334	4334
3.469	-1346	-2346	-3346	-4346
3.500	-1350	-2350	-3350	-4350
3.543	-1354 2/	2 54 2/	-3354 2/	-4354 2/
3.562	-1354 2/	-2354 2/	3354 2/	-4354 2/
3.625	-1362	-2362	-3362	-4362
3.740	1375 2/	-2375 2/	-3375 2/	-4375 2/
3.750	-1375 2/	2375 2/	-3375 2/	-4375 2/
3.875	-1387	-2387	3387	-4387
3.938	-1393	-2393	3393	-4391
4.000	-1400	-2400	3400	-4400
4.125	-1412	-2412	-3412	-4412
4.250	-1425	-2425	-3425	-4425
4.330	-1433	-2433	3433	-4433
4.500	-1450	-2450	-3450	-4450
4.625	-1462 2/	2462	3462	-4462
4.724	-1475 2/	-2475	-3475	-4475
4.750	-1475	-2475	-3475	4475
5.000	-1500	-2500	-3500	-4500
5.250	-1525	-2525	-3525	-4525
5.375	-1537	-2537	-3537	-4537
5.500	-1550	-2553	-3550	4 50
5.750	-1575	-2575	-3575	-4575
6.000	-1600	-2600	-3600	-4600
6.250	-1625	-2625	-3625	-4625
6.500	-1650	-2650	-3650	4650
6.625	-1662	-2662	-3662	-4662
6.750	-1675	-2675	-3675	-4675
7.000	-1700	2700	-3700	-4 00
7.250	-1725	-2725	-3725	-47.5
7.500	-1750	-2750	-3 50	-4750
7.750	-1775	-2775	-3 75	-4775
8.000	-1800	-2800	-3 00	-4800
8.250	-1825	-2825	-3825	-48
8.500	-1850	-2850	-3 50	48
8.750	-1875	-2875	-3875	-4875
9.000	-1900	2900	-3900	-4900
9.250	-1925	-2925	-3925	-4925
9.500	-1950	-2950	-3950	4950
9.750	-1975	4975	-3975	-4975
10.000	-2000	-3000	-4000	-5000

1/ [illegible] COPPER [illegible] STAINLESS STEEL WHEN USED IN FOOD PROCESSING MACHINERY, OR IN FUEL OR LUBRICATION SYSTEMS [illegible] WHEN USED AT TEMPERATURES OVER 450°F (233°C)

2/ SAME DASH NUMBERS [illegible] FOR FRACTIONAL HOUSING DIAMETER (INCHES OR MM)

APPROVED 11 DEC 1958

REVISED (D) FOR CHANGES SEE PAGES 1 THROUGH 8

5365-0.28

REVIEWER ACTIVITIES
ARMY - AV, MI
AIRFORCE - 82
DLA - IS

USER ACTIVITIES
NAVY - MC
ARMY - AT, AV, ME

DD 672-1

NAVY - OS
ARMY - AR
AIRFORCE - 99

PROCUREMENT SPECIFICATION
MIL - R - 21248

RING, RETAINING, INTERNAL, BEVELLED (TAPERED SECTION TYPE)

MILITARY STANDARD

MS16631

PAGE 6 8

FED SUPP CLASS 5365

5365F - 0128

TABLE IV SUBSTITUTION TABLE (CROSS REFERENCE OF PART NUMBERS)

Ø H HOLE IN (REF)	INACTIVE CARBON STEEL MS16631	SUBSTITUTE CARBON STEEL 1/ CADMIUM PLATE MS16631	SUBSTITUTE CARBON STEEL 1/ ZINC COAT MS16631	SUBSTITUTE CARBON STEEL 1/ PHOSPHATE COAT MS16631	Ø H HOUSING (REF)	INACTIVE CARBON STEEL MS16631	SUBSTITUTE CARBON STEEL 1/ CADMIUM PLATE MS16631	SUBSTITUTE CARBON STEEL 1/ ZINC COAT MS16631	SUBSTITUTE CARBON STEEL 1/ PHOSPHATE COAT MS16631
1.000	-1100	-1100	-2100	-3100	3.062	-306	-1306	-2306	-3306
1.025	-1102	-1102	-2102	-3102	3.125	-312	-1312	-2312	-3312
1.06	[illegible]	1.06	-2106	-3106	3.149	-315	-1315	-2315	-3315
1.12	-1112	-1112	-2112	-3112	3.156	-315	-1315	-2315	-3315
1.18	-1118	1.18	-2118	-3118	250	-325	-1325	-2325	-3325
1.185	-1118	-1118	-2118	-3118	3.346	-334	-1334	-2334	-3334
1.25	-1125	-1125	-2125	-3125	3.469	-346	-1346	-2346	-3346
1.25	-1125	-1125	-2125	-3125	3.500	-350	-1350	-2350	-3350
1.31	-1131	-1131	-2131	-3131	3.543	-354	-1354	-2354	-3354
1.37	-1137	-1137	-2137	-3137	3.562	354	-1354	-2354	-3354
1.37	-1137	-1137	-2137	-3137	3.625	-362	-1362	-2362	-3362
1.436	-1143	-1143	-2143	-3143	3.740	-375	-1375	-2375	-3375
1.45	-1145	-1145	-2145	-3145	3.750	-375	-1375	-2375	-3375
1.500	-1150	-1150	-2150	-3150	3.875	-387	-1387	-2387	-3387
1.56	-1156	-1156	-2156	-3156	3.938	-393	-1393	-2393	-3393
1.57	[illegible]	-1156	-2156	-3156	4.000	400	-1400	-2400	-3400
1.625	-1162	-1162	-2162	-3162	4.125	-412	-1412	-2412	-3412
1.65	-1165	-1165	-2165	-3165	4.250	-425	-1425	-2425	-3425
1.68	[illegible]	-1168	-2168	-3168	4.330	-433	-1433	-2433	-3433
1.750	-1175	-1175	-2175	-3175	4.500	-450	-1450	-2450	-3450
1.81	181	-1181	-2181	-3181	4.625	-462	-1462	-2462	-3462
1.850	-1185	-1185	-2185	-3185	4.724	-475	-1475	-2475	-3475
1.875	-1187	-1185	-2185	-3185	4.750	-475	-1475	-2475	-3475
1.938	-1193	-1193	-2193	-3193	5.000	-500	-1500	-2500	-3500
2.000	-1200	-1200	-2200	-3200	5.250	-525	-1525	-2525	-3525
2.047	-1206	-1206	-2206	-3206	[illegible]	[illegible]	-1537	-2537	-3537
2.062	[illegible]	-1206	-2206	-3206	5.500	-550	-1550	-2550	-3550
2.125	[illegible]	-1212	-2212	-3212	5.750	-575	-1575	-2575	-3575
2.16	-1218	-1218	-2218	-3218	6.000	-600	-1600	-2600	-3600
2.188	[illegible]	-1218	-2218	-3218	6.250	-625	-1625	-2625	-3625
2.250	-1225	-1225	-2225	-3225	6.500	-650	-1650	-2650	-3650
2.312	[illegible]	-1231	-2231	-3231	6.625	-662	-1662	-2662	-3662
2.375	-1237	-1237	-2237	-3237	6.750	-675	-1675	-2675	-3675
2.400	1244	-1244	-2244	-3244	7.000	-700	-1700	-2700	-3700
2.500	[illegible]	-1250	-2250	-3250	7.250	-725	-1725	-2725	-3725
2.531	[illegible]	-1250	-2250	-3250	7.500	-750	-1750	-2750	-3750
2.562	-1256	-1256	-2256	-3256	7.750	-775	-1775	-2775	-3775
2.625	[illegible]	-1262	-2262	-3262	8.000	-800	-1800	-2800	-3800
2.677	-1268	-1268	-2268	-3268	8.250	-825	-1825	-2825	-3825
2.688	-1268	-1268	-2268	-3268	8.500	-850	-1850	-2850	-3850
2.750	[illegible]	-1275	-2275	-3275	8.750	-875	-1875	-2875	-3875
2.813	281	-1281	-2281	-3281	9.000	-900	-1900	-2900	-3900
2.834	281	-1281	-2281	-3281	9.250	-925	-1925	-2925	-3925
2.875	287	-1287	-2287	-3287	9.500	-950	-1950	-2950	-3950
2.953	300	-1300	-2300	-3300	9.750	-975	-1975	-2975	-3975
3.000	300	-1300	-2300	-3300	10.000	-1000	-2000	-3000	-4000

1/ SUBSTITUTE CORROSION RESISTANT STEEL WHEN USED IN FOOD PROCESSING MACHINERY, OR IN FUEL OR LUBRICATION SYSTEMS, OR WHEN USED AT TEMPERATURES OVER 450°F (233°C)

APPROVED 11 DEC 1958

REVISED (D) FOR CHANGES SEE PAGES 1 THROUGH 8

USER ACTIVITIES
NAVY - MC
ARMY - AT, AV, ME

REVIEWER ACTIVITIES
ARMY - AV, I
AIRFORCE - 84
DLA - IS

RECOMMENDED DESIGN LIMITATIONS FOR USAGE

(a) INTENDED USE - TO PROVIDE SHOULDERS FOR POSITIONING AND RETAINING MACHINE COMPONENTS IN HOUSINGS. TAPERED DESIGN PRINCIPLE PERMITS RINGS TO MAINTAIN PRACTICALLY CONSTANT CIRCULARITY THE RINGS WITH BEVEL ON OUTER CIRCUMFERENCE WHEN SPRUNG INTO GROOVE WITH TAPERED OUTER WALL CORRESPONDING TO RING BEVEL WILL SELF ADJUST AND PROVIDE SECURE PRESSURE FIT AXIALLY TO TAKE UP END PLAY. THE USE OF THE FOLLOWING FORMULAS IS BASED ON THE FACT THAT THE RING MATERIAL WILL NOT FAIL IN COMPRESSION.

LIMITATION ON USE - THE FOLLOWING FORMULAS ARE NOT TO BE USED FOR BRITTLE MATERIALS SUCH AS CAST IRON, ETC

WARNING - RINGS SHOULD NOT BE OVER CONTRACTED DURING INSTALLATION SINCE THIS WILL LEAD TO RING FAILURE

(b) ALLOWABLE THRUST LOAD CAPACITY OF THE RING = (ABUTTING COMPONENTS TO HAVE SHARP CORNERS)

$$P = \frac{\pi H T X}{F}$$

WHERE

P = ALLOWABLE THRUST LOAD (POUNDS)
H = HOUSING DIAMETER (INCHES)
T = RING THICKNESS (INCHES)
X = ULTIMATE SHEAR STRENGTH OF THE RING MATERIAL (PSI) 1/
F = FACTOR OF SAFETY, F = 4 IS RECOMMENDED SINCE THE RING UNDER LOAD IS SUBJECTED NOT ONLY TO PURE SHEAR STRESSES BUT ALSO TO BENDING STRESSES

(c) ALLOWABLE LOAD CAPACITY OF GROOVE WALL =

$$P = \frac{\frac{d}{2}\,\pi H Z Y}{F}$$ 2/

WHERE

P = ALLOWABLE COMPRESSION LOAD (POUNDS)
H = HOUSING DIAMETER (INCHES)
d = BASIC GROOVE DEPTH OF BEVELED GROOVE (INCHES)
Y = YIELD STRENGTH IN COMPRESSION OF THE GROOVE MATERIAL (PSI)
F = FACTOR OF SAFETY, TO INSURE A SAFE WORKING LOAD, A SAFETY FACTOR, F = 2, IS RECOMMENDED

(d) MINIMUM DISTANCE BETWEEN OUTER GROOVE WALL AND END OF HOUSING =

$$Z = 1.5d$$

WHERE

Z = MINIMUM DISTANCE BETWEEN OUTER GROOVE WALL AND END OF HOUSING (INCHES)
d = GROOVE DEPTH (INCHES)

(e) DEFLECTION (UNDER LOAD) =

$$\Delta_L = \frac{L}{\frac{Ed}{2}}$$

WHERE.

d = GROOVE DEPTH (INCHES)
E = YOUNG'S MODULUS OF ELASTICITY OF GROOVE MATERIAL
L = APPLIED LOAD (POUNDS)
Δ_L = DEFLECTION, AT LOAD "L" (INCHES)

(f) LOCATION OF GROOVE =

(1) MINIMUM INSERTION OF RING IN GROOVE =

$$L_{MIN} \geq M_{MAX} + U_{MAX} + \text{TAKE-UP (AS LISTED)}$$

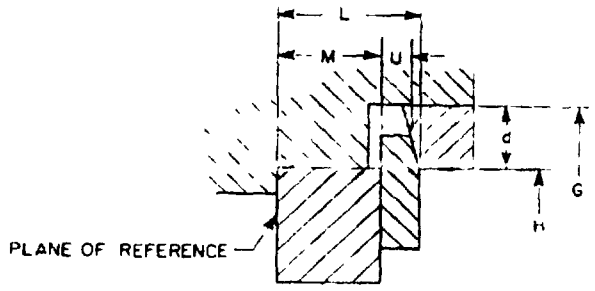
(2) MAXIMUM INSERTION OF RING IN GROOVE =

$$L_{MAX} \leq M_{MIN} + U_{MIN} + 2 \text{ TIMES TAKE-UP (AS LISTED)}$$

(3) TAKE-UP = IN ORDER TO FUNCTION PROPERLY THE RING TAKE-UP SHOULD EXCEED THE SUM TOTAL OF THE TOLERANCES

$$\text{TAKE-UP} > \Delta_L + \Delta_M + \Delta_U$$

WHERE $\Delta_L = L_{MAX} - L_{MIN}$
$\Delta_M = M_{MAX} - M_{MIN}$
$\Delta_U = U_{MAX} - U_{MIN}$



1/ X = 150,000 PSI ULTIMATE SHEAR STRENGTH FOR RINGS OF CARBON STEEL AND CRES
X = 110,000 PSI ULTIMATE SHEAR STRENGTH FOR RINGS OF BERYLLIUM COPPER.
2/ $\frac{d}{2}$ = HALF OF THE GROOVE DEPTH OF THE BEVELED GROOVE WILL MAINTAIN THE MINIMUM CONTACT AREA OF RING IN GROOVE ALLOWABLE LOAD CALCULATION SHOULD BE BASED ON $\frac{d}{2}$

REVISED (D) FOR CHANGES SEE PAGES 1 THROUGH 8

APPROVED 11 DEC 1958

SC N/A

PA	INTERNATIONAL INTEREST	TITLE	MILITARY STANDARD
NAVY - OS Other Cust ARMY - AR AIRFORCE - 99		RING, RETAINING, INTERNAL, BEVELED (TAPERED SECTION TYPE)	MS16631
PROCUREMENT SPECIFICATION MIL - R - 21248	SUPERSEDES		PAGE 7 OF 8

g) VIBRATION = A RETAINING RING WILL BE SECURE AGAINST VIBRATION IF ITS SHEAR FATIGUE STRENGTH EQUALS OR EXCEEDS THE FORCE CREATED BY THE MASS OF THE PARTS REPEATEDLY ACCELERATED AGAINST THE RING

(1) SHEAR STRENGTH OF RING (CRITICAL) ABUTTING COMPONENTS TO HAVE SHARP CORNERS

$XT\ 1.1H \geq \frac{W}{g} a$ OR FOR HARMONIC MOTION $a = \delta\omega^2$

$$XT\ 1.1H \geq \frac{W}{g} \delta\omega^2$$

WHERE
- H = HOUSING DIAMETER (INCHES)
- X = ULTIMATE SHEAR STRENGTH OF RING MATERIAL (PSI) 3/
- T = RING THICKNESS (INCHES)
- W = WEIGHT OF ABUTTING PARTS (POUNDS)
- g = ACCELERATION DUE TO GRAVITY (IN/SEC²)
- δ = AMPLITUDE OF VIBRATIONS (INCHES)
- ω = ANGULAR SPEED (RAD/SEC)
- a = ACCELERATION (IN/SEC²)

(2) COMPRESSION STRENGTH OF GROOVE MATERIAL (CRITICAL) =

$$Y \frac{d}{2} 1.05H \geq \frac{W}{g} \delta\omega^2$$

WHERE.
- Y = YIELD STRENGTH IN COMPRESSION OF THE GROOVE MATERIAL (PSI)
- d = GROOVE DEPTH (INCHES).
- OTHER SYMBOLS AS SHOWN IN (1) ABOVE

(h) IMPACT CAPACITY OF RING OR GROOVE WALL =

$I_R = \frac{PT}{2}$ - FOR THE RING (INCH POUNDS) ABUTTING COMPONENTS TO HAVE SHARP CORNERS

$I_G = \frac{Pd}{4}$ - FOR THE GROOVE (INCH POUNDS)

WHERE
- P = ALLOWABLE THRUST OF RINGS OR GROOVES (POUNDS)
- T = RING THICKNESS (INCHES)
- I_G = IMPACT CAPACITY OF GROOVE WALL (INCH POUNDS)
- d = GROOVE DEPTH (INCHES)
- I_R = IMPACT CAPACITY OF RING (INCH POUNDS)

(i) LOAD CAPACITY=(WITH THE RETAINED PART RADIUSED OR CHAMFERED).
WHEN THE RADIUS OR CHAMFER OF THE RETAINED PART DOES NOT EXCEED THE MAXIMUM RADIUS ALLOWED FOR THE BOTTOM OF THE RING GROOVE, THE LESSER LOAD CAPACITY COMPUTED FROM THE FORMULAS ON PAGES 7 AND 8 WILL APPLY THE CORNER RADII AND CHAMFERS LISTED ON PAGES 1, 2, AND 3 WERE CHOSEN AS LARGE AS POSSIBLE FOR THE RING SIZES INVOLVED, AND ARE RELATED TO THE MAXIMUM THRUST LOADS LISTED IN THE FOLLOWING TABLE IF THE CORNER RADII OR CHAMFERS ARE SMALLER THAN THOSE LISTED, THEN THE THRUST LOADS INCREASE PROPORTIONALLY IN ACCORDANCE WITH THE FOLLOWING FORMULAS

$P^1 = \frac{P\ CH}{CH^1}$ OR

$= \frac{P\ R}{R^1}$

WHERE
- P^1 = NEW ALLOWABLE THRUST LOAD
- P = LISTED ALLOWABLE THRUST LOAD
- CH^1 = NEW (SMALLER) CHAMFER
- CH = LISTED CHAMFERS
- R^1 = NEW (SMALLER) CORNER RADIUS
- R = LISTED CORNER RADIUS

LIMIT LOADS LISTED BELOW ARE BASED ON RINGS OF STEEL (WORKING STRESS = 250,000 PSI) AND OF BERYLLIUM COPPER (WORKING STRESS = 180,000 PSI). IF THE ALLOWABLE GROOVE CAPACITY LOADS AS CALCULATED BY USING THE FORMULAS ON PAGES 7 AND 8 ARE LESS, THEN THEY SHOULD BE USED

TABLE V LIMIT LOADS

NOMINAL RING SIZE		ALLOWABLE THRUST LOAD, FOR RING ASSEMBLIES WITH PARTS HAVING MAXIMUM CORNER RADII OR CHAMFERS	
FROM	TO	CARBON STEEL OR CORROSION RESISTANT STEEL	BERYLLIUM COPPER
1.000	1.500	2400 LB	1700 LB
1.562	2.000	3900 LB	2800 LB
2.062	2.531	6200 LB	
2.562	3.000	9000 LB	
3.062	5.000	12000 LB	
5.250	6.000	15000 LB	
6.250	7.000	23000 LB	
7.250	10.000	34000 LB	

3/ X = 150,000 PSI ULTIMATE SHEAR STRENGTH FOR RING OF CARBON STEEL AND CRES
X = 110,000 PSI ULTIMATE SHEAR STRENGTH FOR RINGS OF BERYLLIUM COPPER.

USER ACTIVITIES
NAVY - MC
ARMY - AT, AV, ME

REVIEWER ACTIVITIES
ARMY - AV, MI
AIRFORCE - 82
DLA - IS

DISTRIBUTION STATEMENT A Approved for public release; distribution is unlimited

This military standard is approved for use by all Departments and Agencies of the Department of Defense. Selection for all new engineering and design applications and for repetitive use shall be made from this document when applicable

APPROVED 11 DEC 1958 REVISED (D) FOR CHANGES SEE PAGES 1 THROUGH 8

PA	INTERNATIONAL INTERES	TITLE	MILITARY STANDARD
NAVY - OS Other Cust ARMY - AR AIRFORCE - 99		RING, RETAINING, INTERNAL, BEVELED (TAPERED SECTION TYPE)	MS16631
PROCUREMENT SPECIFICATION MIL - R - 21248	SUPERSEDES		PAGE 8 OF 8