FED. SUP CLASS
5365

TABLE I. DIMENSIONS

ØS SHAFT (REF)		ØD BORE		B LOC HEIGHT		E LARGE SECTION HEIGHT		J SMALL SECTION HEIGHT		T* THICKNESS		Y OVERALL RW HEIGHT		ØG RECOMMENDED GROOVE (REF)		W WIDTH		ØX *,	ØC *, CLEAR.	O *, FACE OF	R *, OF RETAINED PART (REF)	CH *,
INCH	MM	BASIC	TOL.	BASIC	TOL.	BASIC	TOL.	BASIC	TOL.	BASIC	TOL.	BASIC	TOL.	BASIC	TOL.	BASIC	TOL.	MAX		MAX	MAX	MAX
.188	4.8	.158	+.002 -.004	.050	±.002	.025	±.002	.016	±.002	.013	±.002	.036	±.006	.175	±.0013 .0015 FIX *,	.030	+.003 -.000	.218	.298	.015	.014	.008
.197	5.0	.170		.056		.028		.016		.013		.038		.185		.030		.228	.319	.015	.014	.009
.219	5.6	.196		.056		.030		.017		.015		.036		.205		.030		.252	.338	.015	.015	.009
.236	6.0	.213		.056		.035		.019		.015		.036		.222		.030		.272	.355	.015	.016	.010
.250	6.4	.225		.060		.035		.020		.015		.047		.230		.040		.290	.450	.015	.018	.011
.276	7.0	.250	+.002 -.005	.081	±.003	.035	±.003	.024	±.003	.025	±.002	.047	±.006	.255	±.002 .002 FIX *,	.040	+.005 -.000	.315	.490	.015	.017	.010
.281	7.1	.256		.080		.038		.025		.025		.047		.264		.040		.326	.490	.015	.020	.013
.312	7.9	.281		.087		.040		.026		.025		.047		.290		.040		.357	.540	.015	.021	.013
.344	8.7	.309		.087		.042		.026		.025		.047		.321		.040		.393	.570	.015	.023	.014
.354	9.0	.320		.087		.044		.028		.025		.047		.330		.040		.405	.590	.015	.025	.015
.375	9.5	.338	+.002 -.005	.088	±.003	.050	±.003	.030	±.003	.025	±.002	.047	±.006	.352	±.002 .002 FIX *,	.040	+.005 -.000	.433	.610	.015	.026	.015
.394	10.0	.354		.087		.052		.031		.025		.047		.363		.040		.452	.630	.015	.027	.016
.406	10.3	.366		.087		.054		.033		.025		.047		.383		.040		.468	.650	.015	.028	.017
.438	11.1	.395		.088		.055		.033		.025		.047		.413		.040		.501	.690	.015	.029	.017
.469	11.9	.428		.088		.060		.035		.025		.047		.443		.040		.540	.680	.015	.031	.018
.500	12.7	.461	+.005 -.010	.108	±.003	.063	±.004	.040	±.004	.035	±.003	.063	±.007	.468	±.002 .004 FIX *,	.055	+.005 -.000	.574	.770	.020	.034	.020
.531	14.0	.509		.108		.072		.043		.035		.063		.518		.055		.644	.830	.020	.037	.021
.562	14.3	.531		.108		.076		.043		.035		.063		.530		.055		.680	.860	.020	.039	.023
.594	15.1	.550		.109		.080		.045		.035		.063		.559		.055		.713	.900	.020	.041	.025
.625	15.9	.579		.110										.588	±.003 .004 FIX *,							

Ⓑ ENTIRE STANDARD REVISED

APPROVED 11 DEC 1958 REVISED Ⓑ 4 MAY 1990

USER ACTIVITIES:
ARMY – AT,ER,ME
NAVY – AS,MC,SH,YD

REVIEWER ACTIVITIES:
ARMY – AV,MI
AIR FORCE – 82
DLA – IS

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P.A.	INTERNATIONAL INTEREST	TITLE	MILITARY STANDARD
NAVY – OS Other Cust ARMY – AR AIR FORCE-99		RING, RETAINING, EXTERNAL, BOWED (TAPERED SECTION TYPE)	MS16628
PROCUREMENT SPECIFICATION MIL-R-21248	SUPERSEDES:		PAGE 1 OF 7

DD FORM 1 MAY 83 6721 (COORDINATED) PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE 5365-0130

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REVIEWER ACTIVITIES:
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DD FORM 1 MAY 72 **672-1** (CURRENTLY)

P.A. NAVY – OS
Other Govt ARMY – AR
AIR FORCE – 99

PROCUREMENT SPECIFICATION
MIL-R-21248

INTERNATIONAL INTEREST

SUPERSEDES:

TITLE
RING, RETAINING, EXTERNAL, BOWED (TAPERED SECTION TYPE)

MILITARY STANDARD
MS16628

PAGE 2 OF 7

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TABLE I. DIMENSIONS – CONTINUED

ØS SHAFT (REF)		ØD FREE		B LUG HEIGHT		E LARGE SECTION HEIGHT		J SMALL SECTION HEIGHT		T 1/ THICKNESS		Y OVERALL BOW HEIGHT		ØG RECOMMENDED GROOVE (REF)		W WIDTH		ØK 3/	ØC 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	MAX		MAX	MAX	MAX
.669	17.0	.621		.110	±.003	.082	±.004	.043	±.004	.035		.063	±.007	.629		.055		.756	.930	.020	.040	.024
.672	17.1	.621		.110		.082		.043		.035		.063		.631		.055		.758	.930	.020	.040	.024
.688	17.5	.635		.136		.084		.048		.042		.073		.646		.062		.779	1.010	.020	.042	.025
.750	19.0	.693		.136		.092		.051		.042		.073		.704		.062		.850	1.090	.020	.046	.027
.781	19.8	.722		.136		.094		.052		.042		.073		.733		.062		.883	1.120	.020	.047	.028
.812	20.6	.751	+.005	.136		.096	±.005	.054	±.005	.042		.073	±.008	.762	±.003	.062		.914	1.150	.020	.047	.028
.875	22.2	.810	-.010	.137		.104		.057		.042		.073		.822	.004 FIM 2/	.062		.987	1.210	.020	.051	.030
.938	23.8	.867		.166		.110		.063		.042		.073		.882		.062		1.054	1.340	.020	.055	.033
.984	25.0	.910		.167		.114		.064		.042	±.002	.073		.926		.062	+.005	1.106	1.390	.020	.056	.033
1.000	25.4	.925		.167		.116		.065		.042		.073		.940		.062	-.000	1.122	1.410	.020	.057	.034
1.021	26.0	.946		.168		.118		.066		.042		.073		.961		.062		1.147	1.430	.020	.058	.035
1.062	27.0	.982		.181	±.004	.122		.069		.050		.085		.998		.070		1.192	1.500	.020	.060	.036
1.125	28.6	1.041		.182		.128		.071		.050		.085		1.059		.070		1.261	1.550	.020	.063	.038
1.188	30.2	1.098		.182		.132		.072		.050		.085		1.118	±.004	.070		1.325	1.610	.020	.064	.038
1.250	31.7	1.156		.183		.140	±.006	.076	±.006	.050		.085	±.012	1.176	.005 FIM 2/	.070		1.396	1.690	.020	.068	.041
1.312	33.3	1.214		.183		.146		.076		.050		.085		1.232		.070		1.458	1.750	.020	.068	.041
1.375	34.9	1.272	+.010	.184		.152		.082		.050		.085		1.291		.070		1.529	1.800	.020	.072	.043
1.438	36.5	1.333	-.015	.184		.160		.086		.050		.085		1.350		.070		1.600	1.870	.020	.076	.045
1.500	38.1	1.387		.214		.168		.091		.050		.085		1.406		.070		1.668	1.990	.020	.079	.047

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 SHAFT.

3/ K = MAXIMUM DIAMETER WHEN THE RING IS PROPERLY SEATED IN THE GROOVE. (DESIGN REFERENCE DIMENSION).

4/ C = ACTUAL CLEARANCE DIAMETER WHEN THE RING IS SPRUNG OVER THE SHAFT PRIOR TO INSTALLATION IN THE GROOVE. (DESIGN REFERENCE DIMENSION).

5/ O = END PLAY TAKE UP (DESIGN REFERENCE DIMENSION).

6/ R AND CH = RADII OR CHAMFERS ALLOWABLE ON PARTS TO BE RETAINED BY THE RING. THRUST LOADS FOR RINGS, RETAINING PARTS WITH CORNER RADII OR CHAMFERS ARE TABULATED ON PAGE 7.

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FED. SUP CLASS 5365

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REQUIREMENTS:

1. CLASSIFICATION: RETAINING RINGS FURNISHED UNDER THIS STANDARD SHALL BE TYPE II, CLASS 2 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 SHAFT (REF)	CARBON STEEL	CORROSION RESISTANT STEEL	BERYLLIUM COPPER
.188 TO .236 INCL	-	-	77.9-82.0 HR15N 1/ (39-43 HRC EQUIV)
.250 TO .551 INCL	85.5-87.9 HR15N 1/ (50-55 HRC EQUIV)	83.5-85.9 HR15N 1/ (46-51 HRC EQUIV)	77.9-82.0 HR15N 1/ (39-43 HRC EQUIV)
.562 TO .669 INCL	68.5-73.0 HR30N 1/ (50-55 HRC EQUIV)	64.8-69.4 HR30N 1/ (46-51 HRC EQUIV)	58.6-62.2 HR30N 1/ (39-43 HRC EQUIV)
.688 TO 1.500 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/ 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: MS16628-1100 IS THE PART NUMBER FOR A CARBON STEEL CADMIUM PLATE, EXTERNAL, BOWED RETAINING RING FOR USE ON A 1.000 DIAMETER SHAFT.

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:
ARMY-AT,ER,ME
NAVY-AS,MC,SH,YD

REVIEWER ACTIVITIES:
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PROCUREMENT SPECIFICATION MIL-R-21248	SUPERSEDES:		PAGE 3 OF 7

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TABLE III. DASH NUMBERS FOR MS16628

ØS SHAFT (REF)	CARBON STEEL 1/ CADMIUM PLATE	CARBON STEEL 1/ ZINC COAT	CARBON STEEL 1/ PHOSPHATE COAT	STEEL, CORROSION RESISTANT	BERYLLIUM 1/ COPPER	BERYLLIUM COPPER 1/ CADMIUM PLATE
	DASH NO.	DASH NO.	DASH NO.	DASH NO.	DASH NO.	DASH NO.
.188					-5018	-5018-1
.197					-5019	-5019-1
.219					-5021	-5021-1
.236					-5023	-5023-1
.250	-1025	-2025	-3025	-4025	-5025	-5025-1
.276	-1027	-2027	-3027	-4027	-5027	-5027-1
.281	-1028	-2028	-3028	-4028	-5028	-5028-1
.312	-1031	-2031	-3031	-4031	-5031	-5031-1
.344	-1034	-2034	-3034	-4034	-5034	-5034-1
.354	-1035	-2035	-3035	-4035	-5035	-5035-1
.375	-1037	-2037	-3037	-4037	-5037	-5037-1
.394	-1039	-2039	-3039	-4039	-5039	-5039-1
.406	-1040	-2040	-3040	-4040	-5040	-5040-1
.438	-1043	-2043	-3043	-4043	-5043	-5043-1
.469	-1046	-2046	-3046	-4046	-5046	-5046-1
.500	-1050	-2050	-3050	-4050	-5050	-5050-1
.551	-1055	-2055	-3055	-4055	-5055	-5055-1
.562	-1056	-2056	-3056	-4056	-5056	-5056-1
.594	-1059	-2059	-3059	-4059	-5059	-5059-1
.625	-1062	-2062	-3062	-4062	-5062	-5062-1
.669	-1066	-2066	-3066	-4066	-5066	-5066-1
.672	-1067	-2067	-3067	-4067	-5067	-5067-1
.688	-1068	-2068	-3068	-4068	-5068	-5068-1
.750	-1075	-2075	-3075	-4075	-5075	-5075-1
.781	-1078	-2078	-3078	-4078	-5078	-5078-1
.812	-1081	-2081	-3081	-4081	-5081	-5081-1
.875	-1087	-2087	-3087	-4087	-5087	-5087-1
.938	-1093	-2093	-3093	-4093	-5093	-5093-1
.984	-1098	-2098	-3098	-4098	-5098	-5098-1
1.000	-1100	-2100	-3100	-4100	-5100	-5100-1
1.023	-1102	-2102	-3102	-4102	-5102	-5102-1
1.062	-1106	-2106	-3106	-4106	-5106	-5106-1
1.125	-1112	-2112	-3112	-4112	-5112	-5112-1
1.188	-1118	-2118	-3118	-4118	-5118	-5118-1
1.250	-1125	-2125	-3125	-4125	-5125	-5125-1
1.312	-1131	-2131	-3131	-4131	-5131	-5131-1
1.375	-1137	-2137	-3137	-4137	-5137	-5137-1
1.438	-1143	-2143	-3143	-4143	-5143	-5143-1
1.500	-1150	-2150	-3150	-4150	-5150	-5150-1

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).

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USER ACTIVITIES:
ARMY—AT,ER,ME
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REVIEWER ACTIVITIES:
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P.A. NAVY—OS; Other Cust ARMY—AR, AIR FORCE—99	INTERNATIONAL INTEREST	TITLE: RING, RETAINING, EXTERNAL, BOWED (TAPERED SECTION TYPE)	MILITARY STANDARD MS16628
PROCUREMENT SPECIFICATION: MIL-R-21248	SUPERSEDES:		PAGE 4 OF 7

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TABLE IV. SUBSTITUTION TABLE (CROSS REFERENCE OF PART NUMBERS)

Ø S SHAFT (REF)	INACTIVE	SUBSTITUTE	SUBSTITUTE	SUBSTITUTE
	CARBON STEEL	CARBON STEEL 1/ CADMIUM PLATE	CARBON STEEL 1/ ZINC COAT	CARBON STEEL 1/ PHOSPHATE COAT
	MS16628	MS16628	MS16628	MS16628
.250	-25	-1025	-2025	-3025
.276	-27	-1027	-2027	-3027
.281	-28	-1028	-2028	-3028
.312	-31	-1031	-2031	-3031
.344	-34	-1034	-2034	-3034
.354	-35	-1035	-2035	-3035
.375	-37	-1037	-2037	-3037
.394	-39	-1039	-2039	-3039
.406	-40	-1040	-2040	-3040
.438	-43	-1043	-2043	-3043
.469	-46	-1046	-2046	-3046
.500	-50	-1050	-2050	-3050
.551	-55	-1055	-2055	-3055
.562	-56	-1056	-2056	-3056
.594	-59	-1059	-2059	-3059
.625	-62	-1062	-2062	-3062
.669	-66	-1066	-2066	-3066
.672	-67	-1067	-2067	-3067
.688	-68	-1068	-2068	-3068
.750	-75	-1075	-2075	-3075
.781	-78	-1078	-2078	-3078
.812	-81	-1081	-2081	-3081
.875	-87	-1087	-2087	-3087
.938	-93	-1093	-2093	-3093
.984	-98	-1098	-2098	-3098
1.000	-100	-1100	-2100	-3100
1.023	-102	-1102	-2102	-3102
1.062	-106	-1106	-2106	-3106
1.125	-112	-1112	-2112	-3112
1.188	-118	-1118	-2118	-3118
1.250	-125	-1125	-2125	-3125
1.312	-131	-1131	-2131	-3131
1.375	-137	-1137	-2137	-3137
1.438	-143	-1143	-2143	-3143
1.500	-150	-1150	-2150	-3150

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).

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PROCUREMENT SPECIFICATION: MIL-R-21248	SUPERSEDES:		PAGE 5 OF 7

DD FORM 1 NOV 73 672-1 (COORDINATED)

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FED SUP CLASS 5365

RECOMMENDED DESIGN LIMITATIONS AND USAGE

(a) INTENDED USE - TO PROVIDE SHOULDERS FOR POSITIONING AND RETAINING MACHINE COMPONENTS ON SHAFTS. THE RINGS ARE BENT LIKE A BOW OUT OF PLANE. FREE ENDS AND OPPOSITE EDGE ABUT MACHINE PART, MID-SECTION OF RING ABUTS OUTER GROOVE WALL. RING WILL TAKE UP END PLAY RESILIENTLY. THE RING WILL COUNTERACT CONSIDERABLE CENTRIFUGAL FORCES. THE USE OF THE FOLLOWING FORMULAS ARE 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 EXPANDED DURING INSTALLATION SINCE THIS WILL LEAD TO RING FAILURE. IF THE RING HAS PLAY BETWEEN THE GROOVE DIAMETER AND THE INSIDE RING DIAMETER THIS INDICATES THAT THE RING HAS BEEN OVER EXPANDED, (PROVIDING GROOVE DIAMETER HAS BEEN MACHINED TO RECOMMENDED DIMENSIONS).

FOR APPROXIMATE SAFETY RPM LIMITS SEE TABLE V.

TABLE V. APPROXIMATE SAFETY RPM LIMITS

Ø SHAFT (INCHES)		.250	.500	1	1.500
CARBON STEEL AND CORROSION RESISTANT STEEL	RPM LIMIT	80,000	40,000	20,000	15,000
BERYLLIUM COPPER	RPM LIMIT	50,000	25,000	13,000	11,000

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

$$P = \frac{\pi STX}{F}$$

WHERE: P = ALLOWABLE THRUST LOAD (POUNDS)
S = SHAFT DIAMETER (INCHES)
T = RING THICKNESS (INCHES)
X = ULTIMATE SHEAR STRENGTH OF THE RING MATERIAL (PSI) 1/
F = FACTOR OF SAFETY

A SAFTEY FACTOR, 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 =

$$P = \frac{\pi SdY}{F}$$

WHERE: P = ALLOWABLE COMPRESSION LOAD (POUNDS)
S = SHAFT DIAMETER (INCHES)
d = GROOVE DEPTH (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 SHAFT =

$$Z = 3d$$

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

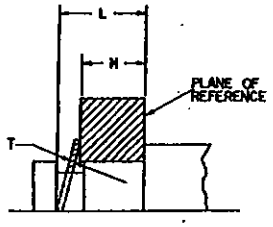
(e) LOCATION OF GROOVE =

$$L_{MAX} = H_{MIN} + T_{MIN} + \text{TAKE-UP (AS LISTED)}$$

$$L_{MIN} = H_{MAX} + T_{MAX} + .005\ 2/$$

$$\text{TAKE-UP} \geq \Delta_L + \Delta_H + \Delta_T + .005$$

WHERE: $\Delta_L = L_{MAX} - L_{MIN}$
$\Delta_H = H_{MAX} - H_{MIN}$
$\Delta_T = T_{MAX} - T_{MIN}$



1/ X = 120,000 PSI ULTIMATE SHEAR STRENGTH FOR RINGS UP TO AND INCLUDING .672 INCH SHAFT DIAMETER OF CARBON STEEL OR CORROSION RESISTANT STEEL.
X = 150,000 PSI ULTIMATE SHEAR STRENGTH FOR RINGS .688 INCH AND OVER SHAFT DIAMETER OF CARBON STEEL OR CORROSION RESISTANT STEEL.
X = 110,000 PSI ULTIMATE SHEAR STRENGTH FOR RINGS OF ALL SHAFT DIAMETERS AND OF BERYLLIUM COPPER.

2/ IT IS ADVISABLE FOR EASIER RING ASSEMBLY TO CALCULATE L_{MIN} WITH ADDITIONAL .005" IN ORDER THAT THE RING IS NOT FLATTENED OUT COMPLETELY IN ADVERSE TOLERANCE CASES.

APPROVED 11 DEC 1958 REVISED (B) FOR CHANGES SEE PAGES 1 THRU 7

USER ACTIVITIES: ARMY — AT, ER, ME NAVY — AS, MC, SH, YD

REVIEWER ACTIVITIES: ARMY — AV, MI AIR FORCE — 82 DLA — IS

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AMSC N/A

P.A. NAVY — OS Other Cust ARMY — AR AIR FORCE-99	INTERNATIONAL INTEREST	TITLE: RING, RETAINING, EXTERNAL, BOWED (TAPERED SECTION TYPE)	MILITARY STANDARD MS16628
PROCUREMENT SPECIFICATION: MIL-R-21248	SUPERSEDES:		PAGE 6 OF 7

DD FORM (MAY 73) 672-1 (COORDINATED) PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE 5365-0120

(f) 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 PART BEING REPEATEDLY ACCELERATED AGAINST THE RING.

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

$$XT\ 1.1\ \delta \geq \frac{W}{g} a$$

WHERE:
X = ULTIMATE SHEAR STRENGTH OF RING MATERIAL (PSI) 3/
T = RING THICKNESS (INCHES)
S = SHAFT DIAMETER (INCHES)
W = WEIGHT OF ABUTTING PARTS (POUNDS)
g = ACCELERATION DUE TO GRAVITY (IN/SEC^2)
δ = AMPLITUDE OF VIBRATION (INCHES)
w = ANGULAR SPEED (RAD/SEC)
a = ACCELERATION (IN/SEC^2)

OR FOR HARMONIC MOTION

$$a = \delta w^2$$

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

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

$$1.65Yds \geq \frac{W}{g} \delta w^2$$

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

(g) IMPACT CAPACITY OF RING OR GROOVE WALL =

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

$I_G = \frac{Pd}{2}$ - FOR THE GROOVE (INCH POUNDS)

WHERE:
P = ALLOWABLE THRUST LOAD OF RING OR GROOVE (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)

(h) 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 FORMULA ON PAGE 6 WILL APPLY. THE CORNER RADII AND CHAMFERS LISTED ON PAGES 1 AND 2 WERE CHOSEN AS LARGE AS POSSIBLE FOR THE RING SIZES INVOLVED AND ARE RELATED TO THE MAXIMUM THRUST LOADS LISTED IN TABLE VI. IF THE CORNER RADII OR CHAMFERS ARE SMALLER THAN THOSE LISTED, THEN THE THRUST LOADS INCREASE PROPORTIONALLY IN ACCORDANCE WITH THE FOLLOWING FORMULAS.

$$P^1 = \frac{P\ CH}{CH^1} \quad \text{OR} \quad P^1 = \frac{PR}{R^1}$$

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

LIMIT LOADS LISTED IN TABLE VI ARE BASED ON RINGS OF BERYLLIUM COPPER (WORKING STRESS 180,000 PSI) FOR ALL SIZES AND ON RINGS OF CARBON STEEL OR CORROSION RESISTANT STEEL (WORKING STRESS 250,000 PSI) FOR SIZES .250 AND LARGER. IF THE ALLOWABLE GROOVE CAPACITY LOADS AS CALCULATED BY USING THE FORMULA ON PAGE 6 ARE LESS, THEN THEY SHOULD BE USED.

TABLE VI. 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
.188	.236		105 LB
.250	.469	470 LB	340 LB
.500	.672	910 LB	650 LB
.688	1.023	1340 LB	950 LB
1.062	1.500	1950 LB	1400 LB

3/ X = 120,000 PSI ULTIMATE SHEAR STRENGTH FOR RINGS UP TO AND INCLUDING .672 INCH SHAFT DIAMETER OF CARBON STEEL OR CORROSION RESISTANT STEEL.
X = 150,000 PSI ULTIMATE SHEAR STRENGTH FOR RINGS .688 INCH AND OVER SHAFT DIAMETER OF CARBON STEEL OR CORROSION RESISTANT STEEL.
X = 110,000 PSI ULTIMATE SHEAR STRENGTH FOR RINGS OF ALL SHAFT DIAMETERS AND OF BERYLLIUM COPPER.

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P.A.
NAVY—OS
Other Govt
ARMY—AR
AIR FORCE—99

INTERNATIONAL INTEREST

TITLE
RING, RETAINING, EXTERNAL, BOWED (TAPERED SECTION TYPE)

MILITARY STANDARD
MS 16628

PROCUREMENT SPECIFICATION
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PAGE 7 OF 7

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