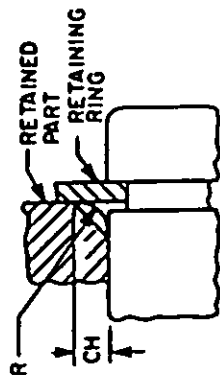
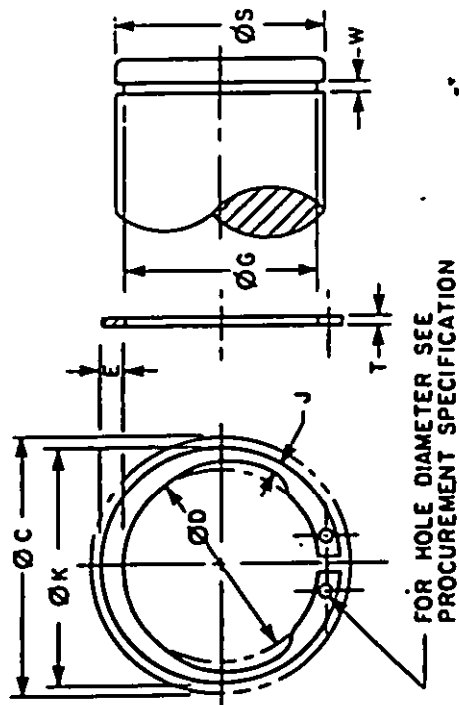


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DLA - ISUSER ACTIVITIES:  
ARMY - AT, ER, ME  
NAVY - AS, MC, SH, YDGROOVE BOTTOM RADII (MAX)  
SHAFT DIAS.: .500 TO 1.000 = .005  
1.062 TO 2.000 = .010  
2.062 AND OVER = .015

ENLARGED DETAILS

TABLE 1. DIMENSIONS

| ØS<br>SHAFT<br>(REF) | ØD<br>PITCH | E<br>LARGE<br>SECTION<br>HEIGHT |       | J<br>SMALL<br>SECTION<br>HEIGHT |       | T<br>THICKNESS |       | ØG<br>RECOMMENDED GROOVE (REF) |       | ØK<br>Ø | R<br>Ø<br>OF<br>RETAINED<br>PART (REF) | CH<br>Ø |
|----------------------|-------------|---------------------------------|-------|---------------------------------|-------|----------------|-------|--------------------------------|-------|---------|--|---------|
|                      |             | BASIC                           | TOL   | BASIC                           | TOL   | BASIC          | TOL   | BASIC                          | TOL   |         |  |         |
| .500                 | 12.7        | .461                            |       | .041                            |       | .035           |       | .460                           | ±.002 | .640    | .051                                   | .032    |
| .562                 | 14.3        | .521                            |       | .043                            | ±.004 | .035           |       | .530                           | ±.002 | .715    | .057                                   | .036    |
| .594                 | 15.1        | .550                            |       | .046                            |       | .035           |       | .559                           | ±.002 | .790    | .059                                   | .037    |
| .625                 | 15.9        | .579                            |       | .048                            |       | .035           |       | .588                           | ±.002 | .830    | .062                                   | .039    |
| .672                 | 17.1        | .621                            |       | .051                            |       | .035           |       | .631                           | ±.002 | .890    | .065                                   | .041    |
| .688                 | 17.5        | .635                            |       | .052                            |       | .042           |       | .646                           | ±.002 | .910    | .066                                   | .042    |
| .750                 | 19.0        | .693                            | ±.005 | .056                            |       | .042           |       | .704                           | ±.002 | .990    | .071                                   | .045    |
| .781                 | 19.8        | .722                            | ±.010 | .057                            |       | .042           |       | .733                           | ±.002 | 1.040   | .073                                   | .046    |
| .812                 | 20.6        | .751                            |       | .060                            | ±.005 | .042           | ±.002 | .762                           | ±.002 | 1.080   | .076                                   | .048    |
| .875                 | 22.2        | .810                            |       | .064                            |       | .042           |       | .821                           | ±.002 | 1.130   | .080                                   | .051    |
| .938                 | 23.8        | .867                            |       | .068                            |       | .042           |       | .882                           | ±.002 | 1.170   | .086                                   | .054    |
| .984                 | 25.0        | .925                            |       | .072                            |       | .042           |       | .936                           | ±.002 | 1.240   | .091                                   | .057    |
| 1.000                | 25.4        | .925                            |       | .072                            |       | .042           |       | .940                           | ±.002 | 1.250   | .091                                   | .057    |
| 1.062                | 27.0        | .982                            |       | .073                            |       | .050           |       | .998                           | ±.002 | 1.310   | .092                                   | .058    |
| 1.125                | 28.6        | 1.041                           |       | .075                            |       | .050           |       | 1.059                          | ±.002 | 1.380   | .093                                   | .059    |
| 1.188                | 30.2        | 1.098                           |       | .076                            |       | .050           |       | 1.118                          | ±.002 | 1.450   | .094                                   | .059    |
| 1.250                | 31.7        | 1.156                           |       | .079                            |       | .050           |       | 1.176                          | ±.002 | 1.520   | .096                                   | .060    |
| 1.312                | 33.3        | 1.214                           | ±.010 | .080                            |       | .050           |       | 1.232                          | ±.002 | 1.580   | .097                                   | .061    |
| 1.375                | 34.9        | 1.272                           | ±.015 | .082                            | ±.006 | .050           |       | 1.291                          | ±.002 | 1.650   | .098                                   | .061    |
| 1.438                | 36.5        | 1.331                           |       | .085                            |       | .050           |       | 1.350                          | ±.002 | 1.715   | .100                                   | .063    |
| 1.500                | 38.1        | 1.387                           |       | .086                            |       | .050           |       | 1.406                          | ±.002 | 1.775   | .100                                   | .063    |

Ⓑ ENTIRE STANDARD REVISED

F.A.  
NAVY-OS  
Other Code  
ARMY-AR  
AIR FORCE-99INTERNATIONAL  
INTEREST

TITLE

RING, RETAINING, EXTERNAL, INVERTED  
(TAPERED SECTION TYPE)PROCUREMENT SPECIFICATION  
MIL-R-21248

SUPERSEDES:

MILITARY STANDARD

MS16626

PAGE 1 OF 1

APPROVED 11 DEC 1958

REVISED 23 APRIL 1969

26 JAN 1990

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NAVY - AS, MC, SH, YD

TABLE 1. DIMENSIONS - CONTINUED

| $\phi$ S<br>SHAFT<br>(REF) | INCH  | $\phi$ P<br>PIES |            | E<br>LARGE<br>SECTION<br>HEIGHT |            | J<br>SMALL<br>SECTION<br>HEIGHT |            | T<br>THICKNESS |            | $\phi$ C<br>RECOMMENDED GROOVE (REF) |     | $\phi$ R<br>MAX |     | R 2/<br>OF<br>RETAINED<br>PART (REF) |     | CH 2/<br>(REF) |
|----------------------------|-------|------------------|------------|---------------------------------|------------|---------------------------------|------------|----------------|------------|--------------------------------------|-----|-----------------|-----|--------------------------------------|-----|----------------|
|                            |       | BASIC            | TOL        | BASIC                           | TOL        | BASIC                           | TOL        | BASIC          | TOL        | BASIC                                | TOL | MAX             | MAX | MAX                                  | MAX |                |
| 1.562                      | 39.7  | 1.446            |            | .178                            | $\pm .006$ | .089                            | $\pm .006$ | .062           |            | 1.468                                |     | 1.850           |     | 1.950                                |     | .066           |
| 1.750                      | 44.4  | 1.637            | $\pm .013$ | .196                            |            | .098                            |            | .062           |            | 1.650                                |     | 2.070           |     | 2.180                                |     | .073           |
| 1.772                      | 45.0  | 1.637            | $-.020$    | .196                            |            | .098                            |            | .062           |            | 1.650                                |     | 2.090           |     | 2.200                                |     | .073           |
| 1.812                      | 46.0  | 1.675            |            | .199                            |            | .100                            |            | .062           |            | 1.708                                |     | 2.130           |     | 2.240                                |     | .074           |
| 1.969                      | 50.0  | 1.819            |            | .212                            |            | .106                            |            | .062           |            | 1.857                                |     | 2.310           |     | 2.430                                |     | .078           |
| 2.000                      | 50.8  | 1.850            |            | .216                            |            | .108                            |            | .062           |            | 1.886                                |     | 2.350           |     | 2.470                                |     | .080           |
| 2.125                      | 54.0  | 1.993            |            | .229                            |            | .117                            |            | .078           |            | 2.003                                |     | 2.490           |     | 2.620                                |     | .084           |
| 2.156                      | 54.8  | 1.993            | $\pm .013$ | .229                            |            | .117                            |            | .078           | $\pm .003$ | 2.032                                |     | 2.520           |     | 2.650                                |     | .084           |
| 2.500                      | 63.5  | 2.313            | $-.025$    | .259                            | $\pm .007$ | .130                            | $\pm .007$ | .078           |            | 2.360                                |     | 2.910           |     | 3.050                                |     | .095           |
| 2.875                      | 73.0  | 2.659            |            | .290                            |            | .145                            |            | .093           |            | 2.721                                |     | 3.330           |     | 3.490                                |     | .107           |
| 3.156                      | 80.1  | 2.920            | $\pm .020$ | .316                            |            | .159                            |            | .093           |            | 2.986                                |     | 3.650           |     | 3.820                                |     | .116           |
| 3.500                      | 88.8  | 3.237            | $-.030$    | .345                            | $\pm .008$ | .173                            | $\pm .008$ | .109           |            | 3.316                                |     | 4.030           |     | 4.220                                |     | .127           |
| 3.938                      | 100.0 | 3.642            |            | .368                            |            | .183                            |            | .109           |            | 3.734                                |     | 4.500           |     | 4.710                                |     | .133           |

1/ T = THICKNESS "T" APPLIES TO UNPLATED RINGS. FOR CORROSION RESISTANT STEEL AND PLATED RINGS,  $\pm .002$  SHOULD BE ADDED TO THE MAXIMUM TOLERANCE. I.E.,  $\pm .002$  SHOULD BE  $\pm .004/- .002$ .

2/ P/N - FULL INDICATOR MOVEMENT IS THE MAXIMUM ALLOWABLE DEVIATION OF CONCENTRICITY BETWEEN THE GROOVE AND THE SHAFT.

3/ R - 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 INTO THE GROOVE. (DESIGN REFERENCE DIMENSION).

5/ R AND CH - RADIUS OR CORNER RADIUS OF PARTS TO BE RETAINED BY THE RINGS. THIRST LOADS FOR RINGS, RETAINING PARTS WITH CORNER RADIUS OR CHAMFERS ARE TABULATED ON PAGE 6.

APPROVED 11 DEC 1958

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FOR CHANGES SEE PAGES 1 THRU 6

FED SUP CLASS  
5365P.A.  
NAVY-OS  
ARMY-AR  
AIR FORCE-99INTERNATIONAL  
INTEREST

TITLE

RING, RETAINING, EXTERNAL, INVERTED  
(TAPERED SECTION TYPE)

MILITARY STANDARD

MS16626

PROCUREMENT SPECIFICATION  
MIL-R-21248

SUPERSEDES:

PAGE 2 OF 6

FIELD SUP CLASS  
5365**REQUIREMENTS:**

1. **CLASSIFICATION:** RETAINING RINGS FURNISHED UNDER THIS STANDARD SHALL BE TYPE I, CLASS 4 OF THE PROCUREMENT SPECIFICATION.
2. **MATERIAL:**
  - (a) CARBON SPRING STEEL, GRADE 1060 TIRU 1095 (UNS G10600 TIRU 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 B 194.
3. **HARDNESS:**

TABLE II. HARDNESS

| SHAFT<br>(REF) | CARBON<br>STEEL | CORROSION<br>RESISTANT<br>STEEL | BERYLLIUM<br>COPPER |
|----------------|-----------------|---------------------------------|---------------------|
| .500 TO .672   | 50-55 HRC       | 63-69.5 HR30N                   | 56.5-62 HR30N       |
| .688 TO .812   | 48-53 HRC       | 63-69.5 HR30N                   | 56.5-62 HR30N       |
| .875 TO 1.500  | 48-53 HRC       | 44-51 HRC                       | 37-43 HRC           |
| 1.562 TO 3.437 | 46-51 HRC       | 44-51 HRC                       | 37-43 HRC           |
| 3.500 & OVER   | 44-49 HRC       | 44-51 HRC                       | 37-43 HRC           |

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 2, CLASS 2.
  - b. **CORROSION RESISTANT STEEL** - SHALL BE CLEANED, DESCALED AND PASSIVATED IN ACCORDANCE WITH QQ-P-35.
5. **PART NUMBER:** THE BASIC NG PART NUMBER IS FOLLOWED BY A DASH NUMBER TAKEN FROM TABLE III OR IV.  
 EXAMPLE: NG16626-1100 IS THE PART NUMBER FOR A CARBON STEEL CADMIUM PLATE, EXTERNAL, INVERTED RETAINING RING FOR USE ON A 1.000 SHAFT DIAMETER.

**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 (DOOISS) SPECIFIED IN THE SOLICITATION FORM A PART OF THIS STANDARD TO THE EXTENT SPECIFIED HEREIN.

|  |                           |  |                              |
|--|---------------------------|--|------------------------------|
| P.A.<br>NAVY-OS<br>Other Code<br>ARMY-AR<br>AIR FORCE-99 | INTERNATIONAL<br>INTEREST | TITLE<br>RING, RETAINING, EXTERNAL, INVERTED<br>(TAPERED SECTION TYPE) | MILITARY STANDARD<br>MS16626 |
| PROCUREMENT SPECIFICATION<br>MIL-R-21248                 | SUPERSEDES:               | PAGE<br>3  | OF<br>6                      |

5365-0132

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REVIEWER ACTIVITIES:  
ARMY - AV, GL, MI  
AIR FORCE - B2  
DLA - IS

TABLE IV. SUBSTITUTION TABLE (GROSS REFERENCES OF PART NUMBERS)

| ØS<br>SHAFT<br>(REF) | INACTIVE        | SUBSTITUTE                          | SUBSTITUTE                      | SUBSTITUTE                            |
|----------------------|-----------------|-------------------------------------|---------------------------------|---------------------------------------|
|                      |                 |                                     |                                 |                                       |
|                      | CARBON<br>STEEL | CARBON<br>STEEL<br>CUMULUS<br>PLATE | CARBON<br>STEEL<br>LINE<br>COAT | CARBON<br>STEEL<br>PROSPERITY<br>COAT |
|                      | MS16626         | MS16626                             | MS16626                         | MS16626                               |
| .500                 | -50             | -1050                               | -2050                           | -3050                                 |
| .562                 | -56             | -1056                               | -2056                           | -3056                                 |
| .594                 | -59             | -1059                               | -2059                           | -3059                                 |
| .625                 | -62             | -1062                               | -2062                           | -3062                                 |
| .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                                 |
| .935                 | -93             | -1093                               | -2093                           | -3093                                 |
| .984                 | -98             | -1098                               | -2098                           | -3098                                 |
| 1.000                | -100            | -1100                               | -2100                           | -3100                                 |
| 1.062                | -106            | -1106                               | -2106                           | -3106                                 |
| 1.175                | -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                                 |
| 1.562                | -156            | -1156                               | -2156                           | -3156                                 |
| 1.750                | -175            | -1175                               | -2175                           | -3175                                 |
| 1.772                | -177            | -1177                               | -2177                           | -3177                                 |
| 1.812                | -181            | -1181                               | -2181                           | -3181                                 |
| 1.969                | -196            | -1196                               | -2196                           | -3196                                 |
| 2.000                | -200            | -1200                               | -2200                           | -3200                                 |
| 2.125                | -212            | -1212                               | -2212                           | -3212                                 |
| 2.156                | -215            | -1215                               | -2215                           | -3215                                 |
| 2.500                | -250            | -1250                               | -2250                           | -3250                                 |
| 2.875                | -287            | -1287                               | -2287                           | -3287                                 |
| 3.156                | -315            | -1315                               | -2315                           | -3315                                 |
| 3.500                | -350            | -1350                               | -2350                           | -3350                                 |
| 3.938                | -393            | -1393                               | -2393                           | -3393                                 |

110 SUP CLASS  
5365

TABLE III. DASH NUMBERS FOR MS16626

| ØS<br>SHAFT<br>(REF) | CARBON<br>STEEL<br>CUMULUS<br>PLATE | CARBON<br>STEEL<br>LINE<br>COAT | CARBON<br>STEEL<br>PROSPERITY<br>COAT | STEEL<br>CORROSION<br>RESISTANT | BERYLLIUM<br>COPPER |
|----------------------|-------------------------------------|---------------------------------|---------------------------------------|---------------------------------|---------------------|
|                      |                                     |                                 |                                       |                                 |                     |
|                      | DASH NO.                            | DASH NO.                        | DASH NO.                              | DASH NO.                        | DASH NO.            |
| .500                 | -1050                               | -2050                           | -3050                                 | -4050                           | -5050               |
| .562                 | -1056                               | -2056                           | -3056                                 | -4056                           | -5056               |
| .594                 | -1059                               | -2059                           | -3059                                 | -4059                           | -5059               |
| .625                 | -1062                               | -2062                           | -3062                                 | -4062                           | -5062               |
| .672                 | -1067                               | -2067                           | -3067                                 | -4067                           | -5067               |
| .688                 | -1068                               | -2068                           | -3068                                 | -4068                           | -5068               |
| .750                 | -1075                               | -2075                           | -3075                                 | -4075                           | -5075               |
| .781                 | -1078                               | -2078                           | -3078                                 | -4078                           | -5078               |
| .812                 | -1081                               | -2081                           | -3081                                 | -4081                           | -5081               |
| .875                 | -1087                               | -2087                           | -3087                                 | -4087                           | -5087               |
| .935                 | -1093                               | -2093                           | -3093                                 | -4093                           | -5093               |
| .984                 | -1098                               | -2098                           | -3098                                 | -4098                           | -5098               |
| 1.000                | -1100                               | -2100                           | -3100                                 | -4100                           | -5100               |
| 1.062                | -1106                               | -2106                           | -3106                                 | -4106                           | -5106               |
| 1.125                | -1112                               | -2112                           | -3112                                 | -4112                           | -5112               |
| 1.188                | -1118                               | -2118                           | -3118                                 | -4118                           | -5118               |
| 1.250                | -1125                               | -2125                           | -3125                                 | -4125                           | -5125               |
| 1.312                | -1131                               | -2131                           | -3131                                 | -4131                           | -5131               |
| 1.375                | -1137                               | -2137                           | -3137                                 | -4137                           | -5137               |
| 1.438                | -1143                               | -2143                           | -3143                                 | -4143                           | -5143               |
| 1.500                | -1150                               | -2150                           | -3150                                 | -4150                           | -5150               |
| 1.562                | -1156                               | -2156                           | -3156                                 | -4156                           | -5156               |
| 1.750                | -1175                               | -2175                           | -3175                                 | -4175                           | -5175               |
| 1.772                | -1177                               | -2177                           | -3177                                 | -4177                           | -5177               |
| 1.812                | -1181                               | -2181                           | -3181                                 | -4181                           | -5181               |
| 1.969                | -1196                               | -2196                           | -3196                                 | -4196                           | -5196               |
| 2.000                | -1200                               | -2200                           | -3200                                 | -4200                           | -5200               |
| 2.125                | -1212                               | -2212                           | -3212                                 | -4212                           | -5212               |
| 2.156                | -1215                               | -2215                           | -3215                                 | -4215                           | -5215               |
| 2.500                | -1250                               | -2250                           | -3250                                 | -4250                           | -5250               |
| 2.875                | -1287                               | -2287                           | -3287                                 | -4287                           | -5287               |
| 3.156                | -1315                               | -2315                           | -3315                                 | -4315                           | -5315               |
| 3.500                | -1350                               | -2350                           | -3350                                 | -4350                           | -5350               |
| 3.938                | -1393                               | -2393                           | -3393                                 | -4393                           | -5393               |

✓ SUBSTITUTE CORROSION RESISTANT STEEL WHEN USED IN FOOD PROCESSING MACHINERY, OR IN FUEL OR LUBRICATION SYSTEMS, OR WHEN USED AT TEMPERATURES OVER 450°F (235°C).

NAVY-OS  
ARMY-AR  
AIR FORCE-99

INTERNATIONAL  
INTEREST

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MILITARY STANDARD  
MS16626

PROCUREMENT SPECIFICATION  
MIL-R-21248

SUPERSEDES:

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APPROVED 11 DEC 1958 REVISED ⑧ FOR CHANGES SEE PAGES 1 THRU 6

FED SUP CLASS  
5365RECOMMENDED DESIGN LIMITATIONS AND USAGE:

- (a) INTENDED USE - TO PROVIDE UNIFORM PROTRUDING SHOULDERS FOR POSITIONING AND RETAINING MACHINE COMPONENTS ON SHAFTS. TAPERED DESIGN PRINCIPLE PERMITS RINGS TO MAINTAIN PRACTICALLY CONSTANT CIRCULARITY, AND FIT SECURELY AGAINST BOTTOM OF GROOVE, COUNTERACTING CONSIDERABLE CENTRIFUGAL FORCE (SEE CHART BELOW). ESPECIALLY SUITED FOR LOCKING AND RETAINING MACHINE PARTS HAVING CURVED ADJUTING SURFACES. 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 RING HAS PLAY BETWEEN THE GROOVE DIAMETER AND THE INSIDE RING DIAMETER THIS INDICATES THAT THE RING HAS BEEN OVER EXPANDED, (PROVIDING GROOVE HAS BEEN MACHINED TO RECOMMENDED DIMENSIONS).

FOR APPROXIMATE SAFETY RPM LIMITS SEE TABLE V.

TABLE V. APPROXIMATE SAFETY RPM LIMITS

| Ø SHAFT (INCHES)                           |           | .500   | 1      | 2      | 3     | 4     |
|--|-----------|--------|--------|--------|-------|-------|
| CARBON STEEL AND CORROSION RESISTANT STEEL | RPM LIMIT | 40,000 | 20,000 | 10,000 | 6,700 | 5,000 |
| BERYLLIUM COPPER                           | RPM LIMIT | 25,000 | 13,000 | 6,400  |       |       |

- (b) ALLOWABLE THRUST LOAD CAPACITY OF THE RING. ADJUTING COMPONENTS TO HAVE SHARP CORNERS -

$$P = \frac{2}{3} \frac{USTX}{F}$$

WHERE:

P = ALLOWABLE THRUST LOAD (POUNDS)

S = SHAFT DIAMETER (INCHES)

T = RING THICKNESS (INCHES)

U = ULTIMATE SHEAR STRENGTH OF THE RING MATERIAL (PSI)  $\sqrt{}$ 

F = FACTOR OF SAFETY

A SAFETY 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 -

$$P = \frac{1}{2} \frac{USGY}{F}$$

WHERE:

P = ALLOWABLE COMPRESSION LOAD (POUNDS)

S = SHAFT DIAMETER (INCHES)

G = 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) DIFFERENTIAL ROTATION -

THE CONDITIONS UNDER WHICH A RETAINING RING MAY BE USED WHEN ADJACENT PARTS ROTATE RELATIVE TO IT, FALL INTO TWO CATEGORIES -

- WHERE NO THRUST IS EXERTED BY ADJACENT PART: IN THIS CASE, DIFFERENTIAL ROTATION OF RING AND ADJACENT PART CREATES NO ELEMENT OF RISK IN THE APPLICATION OF THE RING BECAUSE NO FRICTIONAL TORQUE IS EXERCISED BY THE MACHINE PART ON THE RING.
- CONSIDERATION MUST BE GIVEN TO THE MAGNITUDE OF THE THRUST INVOLVED. THE FRICTION MOMENT MAY NOT EXCEED THE BENDING MOMENT WHICH THE RING CAN TOLERATE WITHOUT RELEASING ITS PRESSURE AGAINST THE BOTTOM OF THE GROOVE, FORMULATED AS FOLLOWS:

$$CPH \leq \frac{STE^2}{18}$$

OR

$$P \leq \frac{STE^2}{18EN}$$

WHERE:

P = ALLOWABLE THRUST LOAD EXERTED BY ADJACENT PART (POUNDS)

C = COEFFICIENT OF FRICTION

S = WORKING STRESS OF RING UNDER MAXIMUM EXPANSION (PSI)  $\sqrt{}$ 

T = RING THICKNESS (INCHES)

E = GREATEST WIDTH SECTION OF RING (INCHES)

N = NEUTRAL RING DIAMETER (INCHES) = FREE DIAMETER PLUS 1/4 E DIMENSION

IN SUCH CASES WHERE DIFFERENTIAL ROTATION OCCURS, THE CALCULATION SHOULD BE BASED ON THE MAXIMUM POSSIBLE VALUE OF THE COEFFICIENT OF FRICTION.

- $\sqrt{}$  X = 150,000 PSI ULTIMATE SHEAR STRENGTH FOR RINGS OF CARBON STEEL OR CORROSION RESISTANT STEEL.
- X = 110,000 PSI ULTIMATE SHEAR STRENGTH FOR RINGS OF BERYLLIUM COPPER.
- $\sqrt{}$  X = 250,000 PSI WORKING STRESS FOR RINGS OF CARBON STEEL OR CORROSION RESISTANT STEEL.
- X = 180,000 PSI WORKING STRESS FOR RINGS OF BERYLLIUM COPPER.

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

REVIEWER ACTIVITIES:  
ARMY - AV, GL, MI  
AIR FORCE - B2  
DLA - IS

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|  |                           |  |                              |
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| P.A.<br>NAVY-OS<br>Other Code<br>ARMY-AR<br>AIR FORCE-99 | INTERNATIONAL<br>INTEREST | TITLE<br>RING, RETAINING, EXTERNAL, INVERTED<br>(TAPERED SECTION TYPE) | MILITARY STANDARD<br>MS16626 |
| PROCUREMENT SPECIFICATION<br>MIL-R-21248                 | SUPERSEDES:               | PAGE 5 OF 6  |                              |

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## (f) IMPACT CAPACITY OF RING OR GROOVE WALL -

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

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

WHERE:  
 $P$  = ALLOWABLE THRUST LOAD 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)

## (g) 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 PAGE 5 WILL APPLY. THE CORNER RADIUS 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 RADIUS OR CHAMFERS ARE SMALLER THAN THOSE LISTED, THEN THE THRUST LOADS INCREASE PROPORTIONALLY, IN ACCORDANCE WITH THE FOLLOWING FORMULAS.

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

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

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

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 FORMULA ON PAGE 5 ARE LESS, THEN THEY SHOULD BE USED.

TABLE VI. LOADS

| NOMINAL RING SIZE |       | ALLOWABLE THRUST LOAD FOR RING ASSEMBLIES WITH PARTS HAVING MAXIMUM CORNER RADIUS OR CHAMFERS. |                  |
|-------------------|-------|--|------------------|
| FROM              | TO    | CARBON STEEL OR CORROSION RESISTANT STEEL  | BERYLLIUM COPPER |
| .500              | .672  | 680 LB   | 500 LB           |
| .688              | 1.000 | 1000 LB  | 700 LB           |
| 1.062             | 1.500 | 1460 LB  | 1050 LB          |
| 1.563             | 2.000 | 2250 LB  | 1600 LB          |
| 2.125             | 2.500 | 3750 LB  |                  |
| 2.875             | 3.156 | 5500 LB  |                  |
| 3.500             | 3.938 | 7850 LB  |                  |

APPROVED 11 DEC 1958 REVISED 11 DEC 1958 (B) FOR CHANGES SEE PAGES 1 THRU 6

|  |                        |  |                              |
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