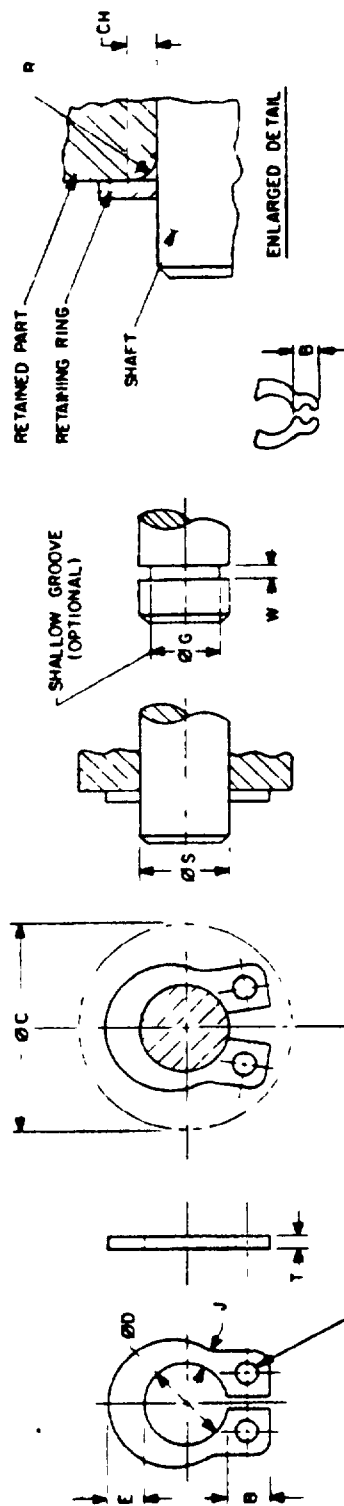


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AMSC N/A

REVIEWER ACT  
ARMY - AV GL  
AIR FORCE - 82  
DLA - IS

USER ACTIVITIES  
ARMY - AT, ER, ME  
NAVY - AS, MC, SH,  
DLA - IS



ALTERNATIVE LUG CONFIGURATION  
(MANUFACTURER'S OPTION)

③ ENTIRE STANDARD REVISED

TABLE 1. DIMENSIONS

Ø S SHAFT (REF)	INCH	MM	Ø D FREE		B LUG HEIGHT		E LARGE SECTION HEIGHT		J SHALL SECTION HEIGHT		T THICKNESS		Ø C CLEAR		R <sup>1</sup> / <sub>2</sub> CH OF RETAINED PART (REF)		Ø G SHALLOW GROOVE (OPTIONAL)		W WIDTH	
			BASIC	TOL	BASIC	TOL	BASIC	TOL	BASIC	TOL	BASIC	TOL	BASIC	TOL	MAX	MIN	BASIC	TOL	BASIC	TOL
.094		2.4	.069	+.002	.078	+.008	.045	+.004	.028	+.004	.025	+.002	.26		.042	.025	240	+.0005	.041	+.003
.125		3.2	.120	-.003	.078	+.003	.070	+.004	.048	+.004	.025	+.002	.33		.054	.032	303	-.0015	.048	-.000
.156		4.0	.150	+.002	.078	+.003	.079	+.004	.051	+.004	.025	+.002	.36		.059	.035	361		.048	
.187		4.8	.181	+.002	.097	+.004	.086	+.004	.052	+.004	.035	+.002	.44		.063	.038	419	+.001	.056	+.004
.250		6.3	.238	+.004	.097	+.004	.101	+.004	.057	+.004	.035	+.002	.49		.072	.043	478	-.002	.059	-.000
.313		7.9	.298	+.003	.141	+.005	.114	+.005	.073	+.005	.042	+.003	.68		.080	.048	599	+.002	.069	+.003
.376		9.5	.354	+.005	.141	+.005	.125	+.005	.075	+.005	.042	+.003	.74		.086	.051	718	-.003	.069	-.000
.437		11.1	.412	+.003	.151	+.004	.138	+.004	.083	+.004	.050	+.002	.81		.093	.056				
.500		12.7	.470	+.004	.158	+.004	.140	+.006	.082	+.006	.050	+.002	.90		.100	.060				
.625		15.9	.593	+.004	.180	+.006	.175	+.006	.100	+.006	.062	+.004	1.06		.120	.072				
.750		19.0	.706	+.005	.233	+.006	.176	+.006	.104	+.006	.062	+.004	1.32		.125	.075				

1/ T = THICKNESS "T" APPLIES TO UNPLATED RINGS. FOR CORROSION RESISTANT STEEL AND PLATED RINGS, T + .001 SHOULD BE ADDED TO THE MAXIMUM TOLERANCE, I.E., +.002 SHOULD BE +.004/- .001.

2/ C = ACTUAL CLEARANCE DIMETER WHEN THE RING IS SPRING OVER THE SHAFT (DESIGN REFERENCE DIMENSION).

3/ R AND CH = RADII OR CENTERS ALLOWABLE ON PARTS TO BE RETAINED BY THE RINGS. THRUST LOADS FOR RINGS, RETAINING PARTS WITH CORNER RADIII OR CENTERS, ARE TABULATED ON PAGE 4.

NAVY - OS Other List ARMY - AR AIR FORCE - 99	INTERNATIONAL INTEREST	TITLE  RING, RETAINING, EXTERNAL GRIP
PROCUREMENT SPECIFICATION MIL - R - 21248	SUPERSEDES	

**MILITARY STANDARD**  
**MS90707**

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

REVIEWER ACTIVITIES  
ARMY - AV, GL, MI  
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# REQUIREMENTS.

1. CLASSIFICATION RETAINING RINGS FURNISHED UNDER THIS STANDARD SHALL BE TYPE 1, CLASS 7 OF THE PROCUREMENT SPECIFICATION
2. MATERIAL
  - (a) CARBON SPRING STEEL, GRADE 1060 THRU 1095 (UNS G10600 THRU G10950) IN ACCORDANCE WITH ASTM A500 OR ASTM A602
  - (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
.094 TO .125	83-86HR15N	82-85-86HR15N	77-82HR15N
.127 TO .500	85-89.5HR30N	83-89.5HR30N	74-82HR30N
.025 TO .750	40-51HRC	44-51HRC	34-45HRC

# 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-410, TYPE II, CLASS 3 OR ASTM B690, TYPE II, CLASS 5.
  - (2) ZINC COAT IN ACCORDANCE WITH ASTM B633, TYPE II, CLASS Fe/40, OR ASTM B693, TYPE II, CLASS 5.
  - (3) PHOSPHATE COAT IN ACCORDANCE WITH DOD-P-10232, 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 MS PART NUMBER IS FOLLOWED BY A DASH NUMBER TAKEN FROM TABLE III OR IV.

EXAMPLE: MS90707-1025 IS THE PART NUMBER FOR A CARBON STEEL CADMIUM PLATE, EXTERNAL GRIP, RETAINING RING FOR USE ON A .250 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

TABLE III. DASH NUMBERS FOR MS90707

ØS SHAFT (REF)	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.
.094	-1009	-2009	-3009	-4009	-5009
.125	-1012	-2012	-3012	-4012	-5012
.156	-1015	-2015	-3015	-4015	-5015
.187	-1018	-2018	-3018	-4018	-5018
.250	-1025	-2025	-3025	-4025	-5025
.313	-1031	-2031	-3031	-4031	-5031
.376	-1037	-2037	-3037	-4037	-5037
.437	-1043	-2043	-3043	-4043	-5043
.500	-1050	-2050	-3050	-4050	-5050
.025	-1002	-2002	-3002	-4002	-5002
.750	-1075	-2075	-3075	-4075	-5075

- 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).

P.A. NAVY-OS Other Cost ARMY-AR AIR FORCE-99	INTERNATIONAL INTEREST	TITLE  RING, RETAINING, EXTERNAL GRIP	MILITARY STANDARD	
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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 CADMIUM PLATE 1/	CARBON STEEL ZINC COAT 1/	CARBON STEEL PHOSPHATE COAT 1/
	MS90707	MS90707	MS90707	MS90707
.094	-9	-1009	-2009	-3009
.125	-12	-1012	-2012	-3012
.156	-15	-1015	-2015	-3015
.187	-18	-1018	-2018	-3018
.250	-25	-1025	-2025	-3025
.312	-31	-1031	-2031	-3031
.375	-37	-1037	-2037	-3037
.437	-43	-1043	-2043	-3043
.500	-50	-1050	-2050	-3050
.625	-62	-1062	-2062	-3062
.750	-75	-1075	-2075	-3075

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).

RECOMMENDED DESIGN LIMITATIONS AND USAGE

- (a) INTENDED USE - TO PROVIDE SHOULDERS FOR POSITIONING AND RETAINING MACHINE COMPONENTS ON UNGROOVED SHAFTS, TUBES, BOSSES, STUDS, ETC. FRICTION FORCE CAUSED BY HEAVY SPRING PRESSURE OF RING ON SHAFT MAKES FASTENER SECURE AGAINST AXIAL DISPLACEMENT FROM EITHER DIRECTION UNDER MODERATE THRUST OR VIBRATION. THE RINGS ARE ADJUSTABLE ON THE SHAFT AND ARE RE-USABLE FOLLOWING DISASSEMBLY (SEE WARNING NOTE BELOW). THE RINGS WILL WITHSTAND HIGH ROTATIONAL SPEEDS.

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 ASSEMBLY OR DISASSEMBLY SINCE THIS WILL LEAD TO RING FAILURE. RINGS SHOULD ONLY BE EXPANDED TO GLIDE SMOOTHLY OVER THE SHAFT.

FOR APPROXIMATE SAFETY RPM LIMITS, SEE TABLE V.

TABLE V. APPROXIMATE SAFETY RPM LIMITS

Ø SHAFT (INCHES)		.125	.250	.312	.375	.437	.500	.625	.750
CARBON STEEL AND CORROSION RESISTANT STEEL	RPM LIMIT	80,000	77,000	58,000	51,000	44,000	40,000	32,000	25,000
	RPM LIMIT	51,000	49,000	37,000	32,000	28,000	25,000	20,000	16,000

- (a) APPROXIMATE ALLOWABLE THRUST LOAD CAPACITY OF THE RINGS ARE LISTED IN TABLE VII.
- (c) THE RINGS ARE BASICALLY DESIGNED TO BE USED WITHOUT GROOVES. THE THRUST LOAD CAPACITY OF A GRIP RING ASSEMBLY MAY BE INCREASED SUBSTANTIALLY BY INSTALLING THE RING IN A SHALLOW GROOVE (ONLY FOR SIZES .250 AND OVER). THE STRENGTH OF THE GROOVE WALL THEN BECOMES THE LIMITING FACTOR IN THE ASSEMBLY.

ALLOWABLE LOAD CAPACITY OF GROOVE WALL: (RETAINED PARTS HAVING SHARP CORNERS, OR RADII, OR CHAMFERS UP TO SPECIFIED LIMITS).

$$P = \frac{C_p \pi S d Y}{F}$$

WHERE

P = ALLOWABLE COMPRESSION LOAD (POUNDS)  
 S = SHAFT DIAMETER (INCHES)  
 d = GROOVE DEPTH (INCHES)  
 Y = YIELD STRENGTH IN COMPRESSION OF THE GROOVE MATERIAL  
 F = FACTOR OF SAFETY, F = 2, IS RECOMMENDED TO INSURE A SAFE WORKING LOAD.  
 C<sub>p</sub> = CORRECTION FACTOR. C<sub>p</sub> = 1, IS RECOMMENDED SINCE CONTACT AREA IN THE GROOVE WALL IS AROUND ENTIRE CIRCUMFERENCE.

- (d) WHEN RINGS ARE USED IN GROOVES, THE MINIMUM DISTANCE BETWEEN OUTER GROOVE WALL & SHALL BE -

TABLE VI. OUTER GROOVE WALLS

NOMINAL RING SIZE	z (MIN)
.250 TO .437	.030
.500	.040
.625	.045
.750	.050

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USER ACTIVITIES  
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REVIEWER ACTI  
ARMY-AV, CL  
AIR FORCE-BZ  
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## (e) DIFFERENTIAL ROTATION \*

DIFFERENTIAL ROTATION OF RING AND ADJACENT PART CREATES NO ELEMENT OF RISK IN THE APPLICATION OF THE RING

## (f) IMPACT CAPACITY OF RING ON SHAFTS WITHOUT GROOVES IS MODERATE. IF RINGS ARE USED IN GROOVES, THE IMPACT CAPACITY INCREASES AND THE GROOVE WALL IS THE LIMITING FACTOR IN THE ASSEMBLY.

IMPACT CAPACITY OF GROOVE WALL \*

$$I_G = \frac{Pd}{L}$$

WHERE:

P = ALLOWABLE THRUST LOAD (POUNDS)

d = GROOVE DEPTH (INCHES)

I<sub>G</sub> = IMPACT CAPACITY OF GROOVE WALL (INCH POUNDS)

## (g) LOAD CAPACITY WITH THE RETAINED PART RADIUSED OR CHAMFERED IS THE SAME AS THE LOAD CAPACITY OF RINGS ABUTTING COMPONENTS WITH SHARP CORNERS AND IS SPECIFIED IN TABLE VII BELOW

TABLE VII LIMIT LOADS <sup>1/</sup>

NOMINAL RING SIZE	ALLOWABLE THRUST LOAD FOR RING ASSEMBLIES WITHOUT GROOVE RETAINED PART SHARP CORNERED RADIUSED OR CHAMFERED	
	CARBON STEEL OR CORROSION RESISTANT STEEL	BERYLLIUM COPPER
0.75	8 LB	6 LB
1.25	10 LB	8 LB
1.50	12 LB	9 LB
1.87	20 LB	15 LB
2.50	23 LB	17 LB
3.13	25 LB	19 LB
3.75	30 LB	23 LB
4.37	40 LB	30 LB
5.00	45 LB	32 LB
6.25	60 LB	45 LB
7.50	65 LB	47 LB

<sup>1/</sup> LOAD VALUES ARE BASED UPON THE RING BEING INSTALLED ON A SOFT LOW CARBON STEEL SHAFT FOR HARDENED SHAFTS (50 HRC MIN) THE ALLOWABLE LOAD SHOULD BE REDUCED BY 50 PERCENT.

USER ACTIVITIES  
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P.A. NAVY-OS Other Code ARMY-AR AIR FORCE-99	INTERNATIONAL INTEREST	TITLE RING, RETAINING, EXTERNAL GRIP	MILITARY STANDARD MS90707 PAGE 4 OF 4
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