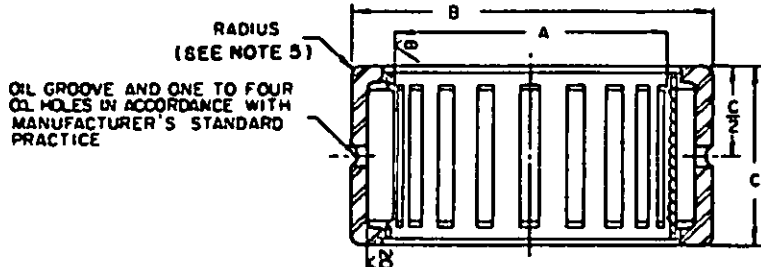


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REVIEW ACTIVITIES: ARMY-AV, NA, NJ, AF-99; DLA-13; NAVY-NC
USER ACTIVITIES: ARMY-CL, AF; NAVY-YD



- (P) MATERIAL:**
 A. RING STEEL, ALLOY OR CARBON, CARBURIZING GRADE, #670, #720, #820, #770 OR 1010-1020; SAE E51100 OR SAE 52100 PER FED-STD-66 OR SAE J-404.
 B. ROLLERS: STEEL, ALLOY, E50100, E51100 OR E57100 PER FED-STD-66 OR SAE J-404.
 C. CAGE: STEEL, BRASS, BRONZE OR ACCORDING TO CURRENT MANUFACTURER'S STANDARD.
HEAT TREATMENT:
 A. RINGS: STEEL, #670, #720, #820, #770 OR 1010-1020, CASE HARDENED TO RC58-65, CASE DEPTH .075 MIN. STEEL CAGE E51100, SAE 52100; THROUGH HARDENED TO RC58-65.
 B. ROLLERS: THROUGH HARDENED TO RC58-65.
SURFACE FINISH: SURFACES MARKED ∇ AND ∇ SHALL HAVE MAXIMUM SURFACE ROUGHNESS IN ACCORDANCE WITH ASTM D46.1.
PROTECTIVE COATING: UNLESS OTHERWISE SPECIFIED, PLAIN (NOT PLATED) BEARINGS TO BE COATED WITH RUST PREVENTIVE FILM BY MANUFACTURER.
LUBRICATION: BEARINGS SHALL BE FURNISHED WITHOUT LUBRICATION.

- (V) NOTES:**
- ALL DIMENSIONS ARE IN INCHES.
 - BEARINGS ARE INTENDED TO BE INSTALLED ON SHAFTS WHERE MAXIMUM TAPER DOES NOT EXCEED .0005 INCHES PER INCH OF BEARING WIDTH.
 - BEARINGS ARE INTENDED TO BE USED WITH HARDENED SHAFTS, RC58-65. FOR USE WITH UNHARDENED SHAFTS, BEARING SHOULD BE USED IN CONJUNCTION WITH RINGS, BEARINGS, INNER MS51962, SHOWN AS SPARING ASSEMBLIES ON MSS00072.
 - BEARING BORE SHOULD BE CHECKED USING A "GO" PLUG GAGE OF THE SIZE .0001 LESS THAN THE MINIMUM DIAMETER UNDER THE NEEDLE ROLLERS, AND A "NO GO" PLUG GAGE .0001 INCH LARGER THAN THE MAXIMUM DIAMETER UNDER THE NEEDLE ROLLERS. THE "NO GO" GAGE MAY ENTER 25 PERCENT OF ROLLER LENGTH.
 - ONE END OF BEARINGS MUST CLEAR THE MAX HOUSING FILLET RADIUS SHOWN IN "RAD" COLUMN. 1/32 MIN. CHAMFER ON OPPOSITE END MAY BE USED IN LIEU OF "RAD" CLEARANCE. WHEN ENDS ARE NOT IDENTICAL THE MARKING (NOTE 13) SHALL BE APPLIED TO THE END WITH THE LARGEST SURFACE.
 - THE "BASIC STATIC LOAD RATINGS" FOR A RADIAL ROLLER BEARING IS THAT STATIC RADIAL LOAD WHICH CORRESPONDS TO A COMBINED TOTAL PERMANENT DEFORMATION OF FOLLER PLUS RACEWAY, AT THE MOST HEAVILY STRESSED CONTACT, OF .0001 OF THE ROLLER DIAMETER.
 - THE "BASIC DYNAMIC LOAD RATINGS" FOR A RADIAL ROLLER BEARING IS THAT CALCULATED, CONSTANT, RADIAL LOAD WHICH A GROUP OF APPARENTLY IDENTICAL BEARINGS WITH STATIONARY OUTER RING CAN THEORETICALLY ENDURE FOR A RATING LIFE OF ONE MILLION REVOLUTIONS OF THE INNER RING. THE RATING LIFE IS DEFINED AS THE NUMBER OF REVOLUTIONS THAT 90% OF A GROUP OF BEARINGS WILL COMPLETE OR EXCEED BEFORE THE FIRST EVIDENCE OF FATIGUE DEVELOPS. SINCE APPLIED LOADING AS GREAT AS THE BASIC DYNAMIC LOAD RATING TENDS TO CAUSE LOCAL PLASTIC DEFORMATION OF THE ROLLING SURFACES, IT IS NOT ANTICIPATED THAT SUCH HEAVY LOADING WOULD NORMALLY BE APPLIED.
 - FOR RATING LIVES AT LOADS OTHER THAN THE BASIC DYNAMIC LOAD RATINGS, AT OPERATING CONDITIONS OF INNER RING ROTATING, OUTER RING STATIONARY, STEADY LOAD, UNIFORM RPM, THOROUGH LUBRICATION, 3000 F. MAXIMUM BEARING TEMPERATURE, SHAFT MISALIGNMENT NOT TO EXCEED .0005 INCHES PER INCH OF BEARING WIDTH; COEFFICIENT FOR LOAD-LIFE RELATIONSHIP:

$$L = \left(\frac{C_p}{P} \right)^{\frac{10}{3}}$$
 WHERE
 L = RATING LIFE, MILLIONS OF REVOLUTIONS.
 C_p = BASIC DYNAMIC LOAD RATINGS, LB.
 P = EQUIVALENT RADIAL LOAD TO WHICH BEARING IS SUBJECTED, LB.
 FOR AN APPLIED LOAD GREATER THAN ONE-HALF THE BASIC DYNAMIC LOAD RATING, THE ABOVE LOAD-LIFE RELATIONSHIP IS NOT VALID.
 - THE NEEDLE ROLLER DIAMETER VARIATION IN EACH BEARING AND THE RUN-OUT FOR EACH BEARING OUTSIDE DIAMETER AND RACEWAY INSIDE DIAMETER SHALL BE WITHIN THE LIMITATIONS PRESCRIBED IN CURRENT AFNMA STANDARDS FOR RDEC 1 TOLERANCES.
 - AVERAGE LIFE, THE LIFE WHICH 50% OF A GROUP OF BEARINGS WILL COMPLETE BEFORE EVIDENCE OF FATIGUE DEVELOPS, IS APPROXIMATELY FIVE (5) TIMES THE RATING LIFE.
 - FOR DESIGN FEATURE PURPOSES, THIS STANDARD TAKES PRECEDENCE OVER DOCUMENTS REFERENCED HEREIN.
 - REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON DATE OF INVITATION FOR BIDS, OR REQUEST FOR PROPOSAL, EXCEPT THAT REFERENCED ADOPTED INDUSTRY DOCUMENTS SHALL GIVE THE DATE OF THE ISSUE ADOPTED.
 - THE MS PART NUMBER SHALL CONSIST OF THE MS NUMBER PLUS THE DASH NUMBER. EXAMPLE: MS51961-1.
 - MARKING SHALL CONSIST OF THE MS PART NUMBER AND THE MANUFACTURER'S IDENTIFICATION IN ACCORDANCE WITH MIL-STD-130.
 - THE USE OF RECYCLED MATERIALS WHICH MEET THE REQUIREMENTS OF THE APPLICABLE MATERIAL SPECIFICATIONS WITHOUT JEOPARDIZING THE INTENDED USE OF THE ITEM SHALL BE ENCOURAGED.

(P) DENOTES CHANGES

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 26 DEC 1963 REVISED (A) 19 DECEMBER 1966 (B) 21 NOVEMBER 1967 (C) 20 MAY 1969 (D) 23 MAY 1975 (E) 25 JULY 1975 (F) 30 APRIL 1980

P.A. ARMY-AT Other Cost NAVY-03 AF-11	TITLE BEARING, ROLLER, NEEDLE: THICK OUTER RING W/ROLLERS AND CAGE	MILITARY STANDARD MS 51961
PROCUREMENT SPECIFICATION NONE	SUPERSEDES: MS17132	SHEET 1 OF 2

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(NOTE 3)

(NOTE 6)(NOTE 7)

MS DASH NO.	A BORE DIAMETER			B OUTSIDE DIAMETER			C WIDTH	RAD	BASIC STATIC LOAD RATING LBS	BASIC DYNAMIC LOAD RATING LBS	APPROX. LIMITING SPEED RPM
	NOM	MIN	MAX	NOM	MIN	MAX	+ .000 - .005				
- 1	5/8	.6258	.6267	1 1/8	1.1245	1.1250	.750	.025	2520	2980	30200
- 2	3/4	.7509	.7518	1 1/4	1.2495	1.2500	.750	.040	2540	3180	24600
- 3	3/4	.7509	.7518	1 1/4	1.2495	1.2500	1.000	.040	4120	4350	24600
- 4	13/16	.8134	.8143	1 5/16	1.3120	1.3125	.750	.040	2680	3210	22600
- 5	7/8	.8759	.8768	1 3/8	1.3745	1.3750	.750	.040	3210	3540	20700
- 6	7/8	.8759	.8768	1 3/8	1.3745	1.3750	1.000	.040	4810	4860	20700
- 7	15/16	.9384	.9393	1 7/16	1.4370	1.4375	.750	.040	3280	3590	20060
- 8	1	1.0009	1.0018	1 1/2	1.4995	1.5000	.750	.040	3670	3830	19200
- 9	1	1.0009	1.0018	1 1/2	1.4995	1.5000	1.000	.040	5500	5250	19200
- 10	1 1/16	1.0634	1.0643	1 9/16	1.5620	1.5625	1.000	.040	5280	5130	17800
- 11	1 1/8	1.1259	1.1268	1 5/8	1.6245	1.6250	1.000	.040	6190	5680	15700
- 12	1 1/8	1.1259	1.1268	1 5/8	1.6245	1.6250	1.250	.040	8270	7120	15700
- 13	1 3/16	1.1885	1.1894	1 11/16	1.6870	1.6875	1.000	.040	6150	5420	14800
- 14	1 1/4	1.2510	1.2519	1 3/4	1.7495	1.7500	1.000	.040	6530	5870	14000
- 15	1 1/4	1.2510	1.2519	1 3/4	1.7495	1.7500	1.250	.040	8730	7360	14000
- 16	1 5/16	1.3135	1.3144	1 13/16	1.8120	1.8125	1.000	.040	7650	6970	13300
- 17	1 5/16	1.3135	1.3144	1 13/16	1.8120	1.8125	1.250	.040	9300	7530	13300
- 18	1 3/8	1.3760	1.3769	1 7/8	1.8745	1.8750	1.000	.040	7220	6260	12600
- 19	1 3/8	1.3760	1.3769	1 7/8	1.8745	1.8750	1.250	.040	9650	7840	12600
- 20	1 7/16	1.4385	1.4394	1 15/16	1.9370	1.9375	1.000	.060	7480	6200	12100
- 21	1 1/2	1.5010	1.5019	2 1/16	2.0615	2.0625	1.000	.060	8130	7360	11700
- 22	1 1/2	1.5010	1.5019	2 1/16	2.0615	2.0625	1.250	.060	10900	9270	11700
- 23	1 9/16	1.5635	1.5644	2 1/8	2.1244	2.1250	1.250	.060	11000	8250	11200
- 24	1 5/8	1.6260	1.6269	2 3/16	2.1869	2.1875	1.000	.060	8530	7560	10700
- 25	1 5/8	1.6260	1.6269	2 3/16	2.1869	2.1875	1.250	.060	11500	9520	10700
- 26	1 11/16	1.6885	1.6895	2 1/4	2.2494	2.2500	1.250	.060	11600	9040	10000
- 27	1 3/4	1.7510	1.7520	2 5/16	2.3119	2.3125	1.000	.060	8940	7760	9650
- 28	1 3/4	1.7510	1.7520	2 5/16	2.3119	2.3125	1.250	.060	12000	9780	9650
- 29	1 3/4	1.7510	1.7520	2 5/16	2.3119	2.3125	1.250	.060	13100	10400	9150
- 30	2	2.0011	2.0021	2 9/16	2.5619	2.5625	1.250	.060	13700	10600	8550
- 31	2 1/4	2.2511	2.2521	3	2.9994	3.0000	1.500	.060	19100	14700	7600
- 32	1 1/2	2.2511	2.2521	3	2.9994	3.0000	1.750	.060	23200	17100	7600
- 33	1 1/2	2.5011	2.5021	3 1/4	3.2494	3.2500	1.500	.080	21600	15800	6800
- 34	1 1/2	2.5011	2.5021	3 1/4	3.2494	3.2500	1.750	.080	26200	18400	6800
- 35	3/4	2.7511	2.7521	3 1/2	3.4992	3.5000	1.500	.080	23300	16500	6150
- 36	2 3/4	2.7511	2.7521	3 1/2	3.4992	3.5000	1.750	.080	28200	15200	6150
- 37	3	3.0011	3.0023	3 3/4	3.7492	3.7500	1.500	.080	25800	17600	3500
- 38	3	3.0011	3.0023	3 3/4	3.7492	3.7500	1.750	.080	31200	20400	3500
- 39	3 1/4	3.2512	3.2524	4 1/4	4.2492	4.2500	1.750	.080	35700	26600	3250
- 40	3 1/4	3.2512	3.2524	4 1/4	4.2492	4.2500	2.000	.080	42100	30200	3250
- 41	3 1/2	3.5012	3.5024	4 1/2	4.4992	4.5000	1.750	.080	32200	21300	4250
- 42	3 1/2	3.5012	3.5024	4 1/2	4.4992	4.5000	2.000	.080	43800	30700	4850
- 43	3 3/4	3.7512	3.7524	4 3/4	4.7492	4.7500	2.000	.100	47000	32400	4500
- 44	4	4.0012	4.0024	5	4.9990	5.0000	1.750	.100	36900	22500	4200
- 45	4	4.0012	4.0024	5	4.9990	5.0000	2.000	.100	50400	33800	4200
- 46	4 1/4	4.2512	4.2526	5 1/4	5.2490	5.2500	2.000	.100	32200	34200	3950
- 47	4 1/2	4.5012	4.5026	5	5.9990	6.0000	2.000	.100	43600	30900	3850
- 48	4 1/2	4.5012	4.5026	5	5.9990	6.0000	2.250	.100	62800	47900	3850
- 49	4 1/2	4.5012	4.5026	5	5.9990	6.0000	2.500	.100	72700	53300	3850
- 50	5	5.0013	5.0027	6 1/2	6.4990	6.5000	2.000	.100	60800	46100	3400
- 51	5	5.0013	5.0027	6 1/2	6.4990	6.5000	2.500	.100	70900	52000	3400
- 52	5 1/2	5.5013	5.5027	7	6.9990	7.0000	2.500	.100	84200	58000	3100
- 53	5 1/2	5.5013	5.5027	7	6.9990	7.0000	3.000	.100	105000	69100	3100
- 54	5 3/4	5.7513	5.7527	7 1/4	7.2490	7.2500	3.000	.120	109000	70600	2950
- 55	5 3/4	5.7513	5.7527	7 1/4	7.2490	7.2500	2.500	.120	93200	61900	2800
- 56	6	6.0013	6.0027	7 1/2	7.4988	7.5000	3.000	.120	116000	73800	2800
- 57	6 1/2	6.5013	6.5029	8	7.9988	8.0000	2.500	.120	99000	63900	2600
- 58	6 1/2	6.5013	6.5029	8	7.9988	8.0000	3.000	.120	124000	75300	2600
- 59	7 1/4	7.2514	7.2530	9 1/8	9.1236	9.1250	3.000	.120	134000	85600	2300

APPROVED 26 DEC 1963 REVISED FOR CHANGES SEE SHEETS 1 AND 7

P.A. ARMY-AT Other Cust	TITLE	MILITARY STANDARD
	BEARING, ROLLER, NEEDLE: THICK OUTER RING W/ROLLERS AND CAGE	MS51961
PROCUREMENT SPECIFICATION NONE	SUPERSEDES: MS17132	SHEET 2 OF 2