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MS16633 — external E retaining ring, reduced section

MS16633: external e retaining ring for .040 to 1.375 shafts.

Specification

Item	Value
Type	External E retaining ring
Material	Carbon spring steel, grade 1060 thru 1095 (ASTM A568/A568M or ASTM A684/A684M); corrosion-resistant steel, SAE AMS 5520 (UNS S15700); beryllium copper, alloy 170 (UNS C17000) or 172 (UNS C17200), ASTM B194
Finish	Carbon steel, by dash number: cadmium plate (SAE AMS-QQ-P-416, Type II, Class 3, or ASTM B696, Type II, Class 5), zinc coat (ASTM B633, Type II, Class Fe/Zn 5, or ASTM B695, Type II, Class 5) or phosphate coat (MIL-DTL-16232, Type Z, Class 2); corrosion-resistant steel: cleaned, descaled and passivated (SAE AMS2700)
Procurement	MIL-R-21248, Type I, Class 5
Status	Check the current issue before design use.

Dimensions by size (1 of 2)

Dimension, in	.040	.062	.094	.110	.125	.140	.156	.172	.188	.219	.250	.312	.375
D — D free dia, basic	.025	.051	.073	.076	.094	.102	.114	.125	.145	.185	.207	.243	.300
D tolerance	+.001/-.003	+.001/-.003	+.001/-.003	+.001/-.003	+.001/-.003	+.001/-.003	+.001/-.003	+.001/-.003	+.001/-.003	+.001/-.003	+.001/-.003	+.002/-.004	+.002/-.004
E — E large section height, ref	.027	.052	.057	.150	.068	.084	.084	.094	.095	.126	.160	.128	.180
T — T thickness, basic	.010	.010	.015	.015	.015	.025	.025	.025	.025	.025	.025	.025	.035
T tolerance	±.001	±.001	±.002	±.002	±.002	±.002	±.002	±.002	±.002	±.002	±.002	±.002	±.002
G — G groove dia, basic	.026	.052	.074	.079	.095	.105	.116	.127	.147	.188	.210	.250	.303
G tolerance	+.002/-.000	+.002/-.000	+.002/-.000	+.002/-.000	+.002/-.000	+.002/-.000	+.002/-.000	+.002/-.000	+.002/-.000	+.002/-.000	+.002/-.000	+.003/-.000	+.003/-.000
FIM — Groove concentricity, FIM	.0015	.0015	.0015	.0015	.0015	.002	.002	.002	.002	.002	.002	.004	.004
W — W groove width, basic	.012	.014	.020	.020	.020	.030	.030	.030	.030	.030	.030	.030	.040
W tolerance	+.002/-.000	+.002/-.000	+.002/-.000	+.002/-.000	+.002/-.000	+.003/-.000	+.003/-.000	+.003/-.000	+.003/-.000	+.003/-.000	+.003/-.000	+.003/-.000	+.003/-.000
R — R max, retained part	.015	.030	.040	.080	.040	.060	.060	.060	.060	.060	.060	.060	.065
CH — CH max, retained part	.010	.020	.030	.060	.030	.045	.045	.045	.045	.045	.045	.045	.050
E1 — E1 small section height, ref	.012	.022	.022	.060	.030	.038	.033	.040	.035	.045	.055	.047	.060

Dimensions by size (2 of 2)

Dimension, in	.438	.500	.625	.744	.750	.875	.984	1.188	1.375
D — D free dia, basic	.337	.392	.480	.616	.574	.688	.822	1.066	1.213
D tolerance	+.002/-.004	+.002/-.004	+.003/-.005	+.003/-.005	+.003/-.005	+.003/-.005	+.003/-.005	+.006/-.010	+.006/-.010
E — E large section height, ref	.175	.204	.230	.192	.273	.316	.339	.280	.331
T — T thickness, basic	.035	.042	.042	.050	.050	.050	.050	.062	.062
T tolerance	±.002	±.002	±.002	±.002	±.002	±.002	±.002	±.003	±.003
G — G groove dia, basic	.343	.396	.485	.625	.580	.675	.835	1.079	1.230
G tolerance	+.003/-.000	+.003/-.000	+.003/-.000	+.003/-.000	+.003/-.000	+.003/-.000	+.003/-.000	+.005/-.000	+.005/-.000
FIM — Groove concentricity, FIM	.004	.004	.004	.004	.004	.004	.004	.005	.005
W — W groove width, basic	.040	.047	.047	.056	.056	.056	.056	.068	.068
W tolerance	+.003/-.000	+.003/-.000	+.003/-.000	+.003/-.000	+.003/-.000	+.003/-.000	+.003/-.000	+.004/-.000	+.004/-.000
R — R max, retained part	.065	.080	.080	.080	.085	.085	.085	.090	.090
CH — CH max, retained part	.050	.060	.060	.045	.065	.065	.065	.070	.070
E1 — E1 small section height, ref	.062	.080	.090	.078	.110	.120	.130	.130	.140

Dimensions in inches, as tabulated in the standard (letters as on its drawing). Groove and retained-part figures are recommendations (ref).

Part numbers

.040 1 part number

Part no.	Material and finish
MS16633-5004	Beryllium copper

.062 5 part numbers

Part no.	Material and finish
MS16633-1006	Carbon steel, cadmium plate
MS16633-2006	Carbon steel, zinc coat
MS16633-3006	Carbon steel, phosphate coat
MS16633-4006	Corrosion-resistant steel
MS16633-5006	Beryllium copper

.094 5 part numbers

Part no.	Material and finish
MS16633-1009	Carbon steel, cadmium plate
MS16633-2009	Carbon steel, zinc coat
MS16633-3009	Carbon steel, phosphate coat
MS16633-4009	Corrosion-resistant steel
MS16633-5009	Beryllium copper

.110 5 part numbers

Part no.	Material and finish
MS16633-1011	Carbon steel, cadmium plate
MS16633-2011	Carbon steel, zinc coat
MS16633-3011	Carbon steel, phosphate coat
MS16633-4011	Corrosion-resistant steel
MS16633-5011	Beryllium copper

.125 5 part numbers

Part no.	Material and finish
MS16633-1012	Carbon steel, cadmium plate
MS16633-2012	Carbon steel, zinc coat
MS16633-3012	Carbon steel, phosphate coat
MS16633-4012	Corrosion-resistant steel
MS16633-5012	Beryllium copper

.140 5 part numbers

Part no.	Material and finish
MS16633-1014	Carbon steel, cadmium plate
MS16633-2014	Carbon steel, zinc coat
MS16633-3014	Carbon steel, phosphate coat
MS16633-4014	Corrosion-resistant steel
MS16633-5014	Beryllium copper

.156 5 part numbers

Part no.	Material and finish
MS16633-1015	Carbon steel, cadmium plate
MS16633-2015	Carbon steel, zinc coat
MS16633-3015	Carbon steel, phosphate coat
MS16633-4015	Corrosion-resistant steel
MS16633-5015	Beryllium copper

Reference data. The aircraft manufacturer's documentation (SRM / IPC) takes precedence.

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.172 5 part numbers

Part no.	Material and finish
MS16633-1017	Carbon steel, cadmium plate
MS16633-2017	Carbon steel, zinc coat
MS16633-3017	Carbon steel, phosphate coat
MS16633-4017	Corrosion-resistant steel
MS16633-5017	Beryllium copper

.188 5 part numbers

Part no.	Material and finish
MS16633-1018	Carbon steel, cadmium plate
MS16633-2018	Carbon steel, zinc coat
MS16633-3018	Carbon steel, phosphate coat
MS16633-4018	Corrosion-resistant steel
MS16633-5018	Beryllium copper

.219 5 part numbers

Part no.	Material and finish
MS16633-1021	Carbon steel, cadmium plate
MS16633-2021	Carbon steel, zinc coat
MS16633-3021	Carbon steel, phosphate coat
MS16633-4021	Corrosion-resistant steel
MS16633-5021	Beryllium copper

.250 5 part numbers

Part no.	Material and finish
MS16633-1025	Carbon steel, cadmium plate
MS16633-2025	Carbon steel, zinc coat
MS16633-3025	Carbon steel, phosphate coat
MS16633-4025	Corrosion-resistant steel
MS16633-5025	Beryllium copper

.312 5 part numbers

Part no.	Material and finish
MS16633-1031	Carbon steel, cadmium plate
MS16633-2031	Carbon steel, zinc coat
MS16633-3031	Carbon steel, phosphate coat
MS16633-4031	Corrosion-resistant steel
MS16633-5031	Beryllium copper

.375 5 part numbers

Part no.	Material and finish
MS16633-1037	Carbon steel, cadmium plate
MS16633-2037	Carbon steel, zinc coat
MS16633-3037	Carbon steel, phosphate coat
MS16633-4037	Corrosion-resistant steel
MS16633-5037	Beryllium copper

.438 5 part numbers

Part no.	Material and finish
MS16633-1043	Carbon steel, cadmium plate
MS16633-2043	Carbon steel, zinc coat
MS16633-3043	Carbon steel, phosphate coat
MS16633-4043	Corrosion-resistant steel
MS16633-5043	Beryllium copper

.500 5 part numbers

Part no.	Material and finish
MS16633-1050	Carbon steel, cadmium plate
MS16633-2050	Carbon steel, zinc coat
MS16633-3050	Carbon steel, phosphate coat
MS16633-4050	Corrosion-resistant steel
MS16633-5050	Beryllium copper

.625 5 part numbers

Part no.	Material and finish
MS16633-1062	Carbon steel, cadmium plate
MS16633-2062	Carbon steel, zinc coat
MS16633-3062	Carbon steel, phosphate coat
MS16633-4062	Corrosion-resistant steel
MS16633-5062	Beryllium copper

.744 5 part numbers

Part no.	Material and finish
MS16633-1074	Carbon steel, cadmium plate
MS16633-2074	Carbon steel, zinc coat
MS16633-3074	Carbon steel, phosphate coat
MS16633-4074	Corrosion-resistant steel
MS16633-5074	Beryllium copper

.750 5 part numbers

Part no.	Material and finish
MS16633-1075	Carbon steel, cadmium plate
MS16633-2075	Carbon steel, zinc coat
MS16633-3075	Carbon steel, phosphate coat
MS16633-4075	Corrosion-resistant steel
MS16633-5075	Beryllium copper

.875 5 part numbers

Part no.	Material and finish
MS16633-1087	Carbon steel, cadmium plate
MS16633-2087	Carbon steel, zinc coat
MS16633-3087	Carbon steel, phosphate coat
MS16633-4087	Corrosion-resistant steel
MS16633-5087	Beryllium copper

.984 5 part numbers

Part no.	Material and finish
MS16633-1098	Carbon steel, cadmium plate
MS16633-2098	Carbon steel, zinc coat
MS16633-3098	Carbon steel, phosphate coat
MS16633-4098	Corrosion-resistant steel
MS16633-5098	Beryllium copper

1.188 5 part numbers

Part no.	Material and finish
MS16633-1118	Carbon steel, cadmium plate
MS16633-2118	Carbon steel, zinc coat
MS16633-3118	Carbon steel, phosphate coat
MS16633-4118	Corrosion-resistant steel
MS16633-5118	Beryllium copper

1.375 5 part numbers

Part no.	Material and finish
MS16633-1137	Carbon steel, cadmium plate
MS16633-2137	Carbon steel, zinc coat
MS16633-3137	Carbon steel, phosphate coat
MS16633-4137	Corrosion-resistant steel
MS16633-5137	Beryllium copper

How to read the part number

Part	Meaning
Format	MS16633-<dash>
Example	MS16633-1025 — Carbon steel, cadmium plate, for a .250 shaft

Table II: hardness

Shaft dia (ref), in	Carbon steel	Corrosion-resistant steel	Beryllium copper
.040	—	—	79 - 82 HR15N
.062 to .125 incl.	84.5 - 87.0 HR15N	82.5 - 86 HR15N	79 - 82 HR15N
.140 to .312 incl.	66.5 - 71 HR30N	63 - 69.5 HR30N	56.5 - 68 HR30N
.375 to 1.375 incl.	47 - 52 HRC	44 - 51 HRC	37 - 43 HRC

As printed in MS16633D Table II; the .040 ring is listed for beryllium copper only.

Notes

- Thickness T applies to unplated rings; for corrosion-resistant steel and plated rings add .002 to the maximum tolerance (±.002 becomes +.004/-.002).
- FIM (full indicator movement): maximum allowable deviation of concentricity between the groove and the shaft.
- R and CH: radii or chamfers allowable on the parts retained by the ring.
- Use corrosion-resistant steel in food processing machinery, in fuel or lubrication systems, or above 450°F.
- The .040 ring is made in beryllium copper only: dash -5004 supersedes dash -4.
- Inactive carbon steel numbers are replaced by the cadmium plated, zinc coated or phosphate coated carbon steel ring of the same shaft (pairs below).
- Applied radially; intended to give large shoulders that withstand considerable thrust. Do not over-expand the ring at installation.
- Approximate safety RPM limits, shafts .250, .500 and 1.000: steel 25000, 14000 and 8500; beryllium copper 16000, 9000 and 4000.

SOURCES · MS16633 Rev. D, May 2012 — Ring, Retaining, External, "E"

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