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AURORA

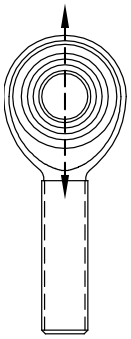
The *Motion-Transfer* Specialists

ROD END & SPHERICAL BEARING
CATALOG & RESOURCE GUIDE

Effective August 21st, 2023, the Naval Air Warfare Center Aircraft Division (NAWCAD) has disapproved Timken Aurora's qualification status for SAE-AS81820 and SAE-AS81935 specifications. Timken Aurora is working diligently to get requalified.

COMMERCIAL | MILITARY | AIRCRAFT

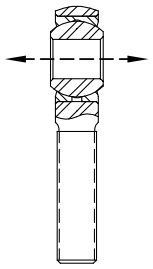
ULTIMATE RADIAL STATIC LOAD CAPACITY ROD ENDS



The ultimate radial static load capacity is based upon the minimum mechanical properties of the design configuration in the stressed area. The ultimate radial static load capacity called out in the rod end specification charts is defined as a single cycle, unidirectional applied load to cause ultimate failure. Operating loads should be based on the static load ratings, incorporating appropriate safety factors to suit the application. When a rod end or spherical bearing is to be applied in full rotation, the surface speed of the ball should be kept below 20 feet per minute or the rotational speed should be below 100 RPM, whichever is lower, with the operating loads not to exceed 10% of the ultimate radial static load.

Load ratings listed in the standard detail pages are applicable to rod ends supplied without grease fittings. Load ratings for units employing fittings may be affected due to lighter cross section in the stressed area. For information on the rod end radial static load ratings with fittings and other specific load rating information, consult the Timken Aurora Bearing engineering department.

AXIAL STATIC LOAD CAPACITY ROD ENDS



Axial static load capacity is the force that is applied through the bore of the ball. For Aurora two-piece rod ends, maximum axial static load capacity is recommended to be 15 percent of the ultimate radial static load capacity. For three-piece rod ends, maximum axial static load capacity is generally recommended as 10 percent of ultimate radial static load capacity. It should be noted, however, that on three-piece units factors such as race material, body material and dimensions may affect axial static load capacity. For further information, consult the Timken Aurora Bearing engineering department.

RADIAL STATIC LIMIT LOAD CAPACITY SPHERICAL BEARINGS

Unless otherwise noted, radial static loads are maximum static based on the maximum permanent set in the bearing race of 0.2% of the ball diameter. If greater permanent set can be allowed or if alternate race materials are used consult our engineering department for change factors. Operating loads are based on the radial static load rating and appropriate safety factors should be utilized to suit the application.

Max axial load is recommended at 20 percent of the radial static load. Extreme care should be used on selecting a sufficiently strong housing to accept this type of bearing.

BEARING MISALIGNMENT

A rod end or spherical bearing's ability to misalign is measured by the degree of angle the ball can accommodate without interference.

The angle of misalignment in a rod end is limited by the ball width and head diameter as shown in figure 1. This arrangement is called a clevis mount, and is the type represented in the standard rod end detail pages. If added misalignment is necessary, this can be accomplished by utilizing spacers between the clevis mounting and ball face, or by using special rod ends designed to meet specific requirements.

Misalignment angle in a spherical bearing is limited by the ball and race width with respect to the ball diameter, illustrated in figure 3. This is the mounting type represented in the standard detail pages for spherical bearings.

Mounting arrangements for spherical bearings such as shown in figures 2 through 4 are also used with rod ends. The misalignment angle is then calculated by selecting the proper formula.

ANGLE OF MISALIGNMENT

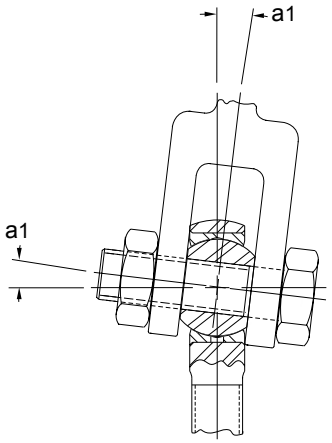


FIGURE 1

$a1 = \sin^{-1}\frac{W}{D} - \sin^{-1}\frac{H}{D}$

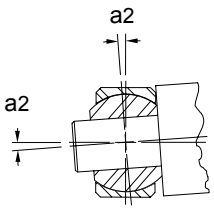


FIGURE 2

$a2 = \sin^{-1}\frac{W}{A} - \sin^{-1}\frac{H}{A}$

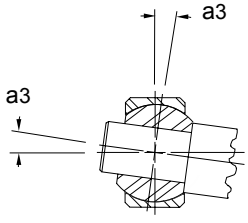


FIGURE 3

$a3 = \sin^{-1}\frac{W}{R} - \sin^{-1}\frac{H}{R}$

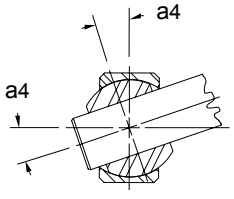


FIGURE 4

$a4 = \cos^{-1}\frac{B}{R} - \sin^{-1}\frac{H}{R}$

Reference Letters
B - Ball Bore
M - Outer Race Chamfer
D - Head Diameter of Outer Race Diameter
R - Ball Diameter
H - Housing Width
W - Ball Width

$A = \sqrt{(D-2M)^2 + H^2}$

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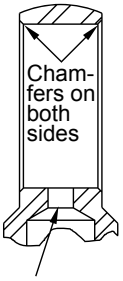
3-Piece Unit

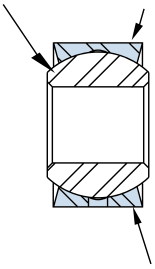
HOUSING



NOTE - Re-Lube hole for lubrication through shank of housing.

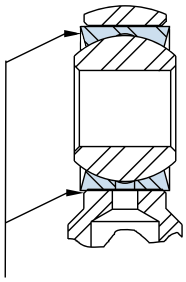
INSERT

Consists of BALL and RACE



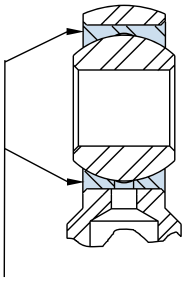
Single piece race, steel, heat-treated (optional), features swaged construction for maximum performance. Alternate race materials available to suit your application.

ASSEMBLED HOUSING AND INSERT IN PRE-STAKING POSITION



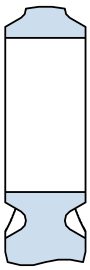
Note extension of race beyond width of housing in the pre-staking position.

ASSEMBLED HOUSING AND INSERT IN STAKED POSITION

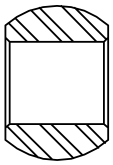


After staking, the sides of race have been upset into chamfers. Ball is subsequently loosened holding close tolerance fits between ball and race.

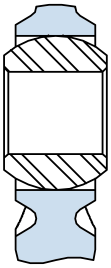
2-Piece Unit



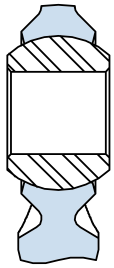
Housing ready for swaging



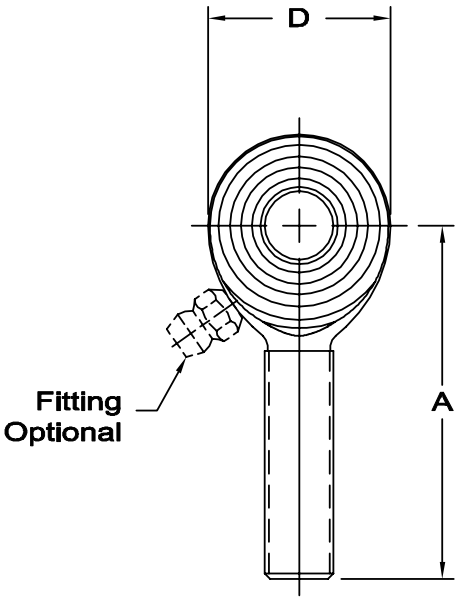
Precision ground ball - (available in alternate materials) - for close tolerance fits.

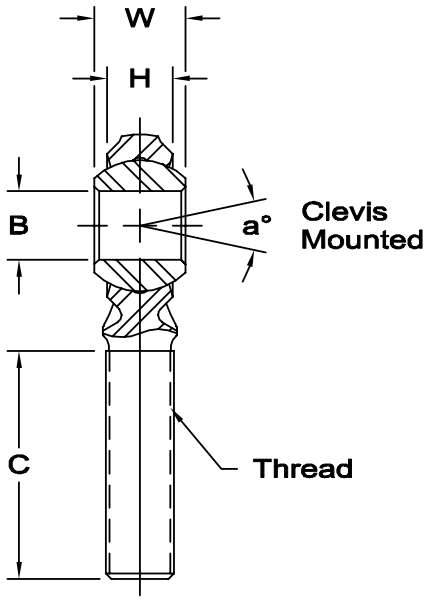


Housing and Ball in pre-swaging position.



Sides of housing are closed around ball for maximum strength unit.





Body - Low carbon steel, protective coated for corrosion resistance.

Ball - Alloy steel, heat treated, hard chrome plated.

Notes - All sizes available with studs upon request.

Load ratings apply only to rod ends without grease fittings. For load ratings with fittings, please consult our engineering department.

* Grease fittings not available on these sizes. Units are supplied without grease fittings. When a grease fitting is required, specify by adding suffix as designated.

Z Zerk type fitting Ex: CM-6Z

F Flush type fitting Ex: CM-6F

ROD END NO.		DIMENSIONS IN INCHES								a° Misalign. Angle	Ultimate Radial Static Load Capacity Lbs.	Approx. Brg. Wt. Lbs.
Right Hand	Left Hand	B +.0025 -.0005	W ±.005	H Ref.	A ±.015	D Ref.	Ball Dia. Ref.	C +.062 -.031	Thread UNF-3A			
CM-3*	CB-3*	.1900	.312	.234	1.250	.625	.437	.750	10-32	20	1,204	.03
CM-4*	CB-4*	.2500	.375	.250	1.562	.750	.500	1.000	1/4-28	27	2,212	.04
CM-5*	CB-5*	.3125	.437	.312	1.875	.875	.625	1.250	5/16-24	22	3,577	.07
CM-6	CB-6	.3750	.500	.359	1.938	1.000	.719	1.250	3/8-24	22	5,068	.11
CM-7	CB-7	.4375	.562	.406	2.125	1.125	.812	1.375	7/16-20	21	6,345	.15
CM-8	CB-8	.5000	.625	.453	2.438	1.312	.937	1.500	1/2-20	20	8,338	.24
CM-10	CB-10	.6250	.750	.484	2.625	1.500	1.125	1.625	5/8-18	26	9,713	.36
CM-12	CB-12	.7500	.875	.593	2.875	1.750	1.312	1.750	3/4-16	24	14,207	.57

ROD END NO.		DIMENSIONS IN MILLIMETERS								a° Misalign. Angle	Ultimate Radial Static Load Capacity Newtons	Approx. Brg. Wt. Grams
Right Hand	Left Hand	B +.064 -.013	W ±.13	H Ref.	A ±.38	D Ref.	Ball Dia. Ref.	C +1.57 -.79	Thread UNF-3A			
CM-3*	CB-3*	4.826	7.92	5.94	31.75	15.88	11.10	19.05	10-32	20	5,355	14
CM-4*	CB-4*	6.350	9.53	6.35	39.67	19.05	12.70	25.40	1/4-28	27	9,839	18
CM-5*	CB-5*	7.938	11.10	7.92	47.63	22.23	15.88	31.75	5/16-24	22	15,910	32
CM-6	CB-6	9.525	12.70	9.12	49.23	25.40	18.26	31.75	3/8-24	22	22,542	50
CM-7	CB-7	11.113	14.27	10.31	53.98	28.58	20.62	34.93	7/16-20	21	28,223	68
CM-8	CB-8	12.700	15.88	11.50	61.93	33.32	23.80	38.10	1/2-20	20	37,087	109
CM-10	CB-10	15.875	19.05	12.29	66.68	38.10	28.58	41.28	5/8-18	26	43,203	163
CM-12	CB-12	19.050	22.23	15.06	73.03	44.45	33.32	44.45	3/4-16	24	63,193	259

Studs available per notes and comments, page 76

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CW & CG SERIES FEMALE ROD ENDS

General Purpose - Economy

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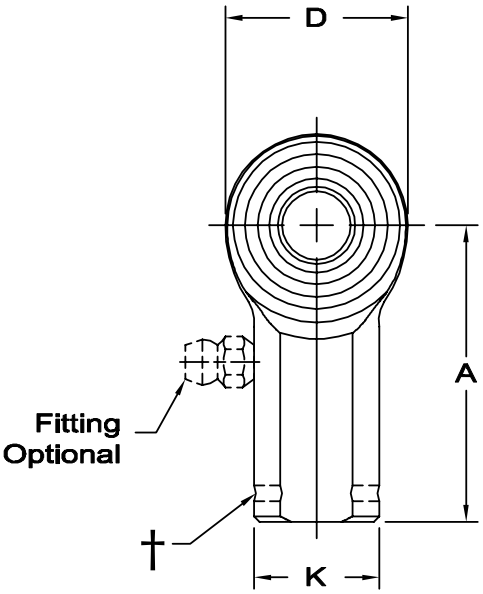

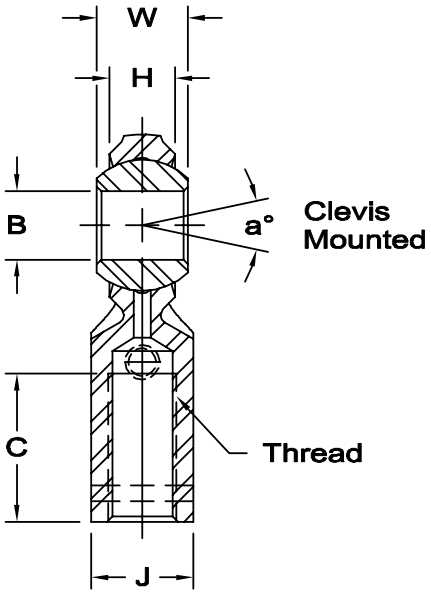

Body - Low carbon steel, protective coated for corrosion resistance.

Ball - Alloy steel, heat treated, hard chrome plated.

Notes - All sizes available with studs upon request.

†Left hand units have identification groove near end of shank.

* Grease fittings not available on these sizes. Units are supplied without grease fittings. When a grease fitting is required, specify by adding suffix as designated.

Z Zerk type fitting Ex: CW-6Z

F Flush type fitting Ex: CW-6F

ROD END NO.		DIMENSIONS IN INCHES												
Right Hand	Left Hand†	B +.0025 -.0005	W ±.005	H Ref.	A ±.015	D Ref.	K ±.010	J ±.010	Ball Dia. Ref.	C +.062 -.031	Thread UNF-2B	a° Misalign. Angle	Ultimate Radial Static Load Capacity Lbs.	Approx. Brg. Wt. Lbs.
CW-3*	CG-3*	.1900	.312	.234	1.062	.625	.406	.312	.437	.500	10-32	20	2,079	.04
CW-4	CG-4	.2500	.375	.250	1.312	.750	.469	.375	.500	.687	1/4-28	27	3,208	.05
CW-5	CG-5	.3125	.437	.312	1.375	.875	.500	.437	.625	.687	5/16-24	22	3,824	.08
CW-6	CG-6	.3750	.500	.359	1.625	1.000	.687	.562	.719	.812	3/8-24	22	5,087	.13
CW-7	CG-7	.4375	.562	.406	1.812	1.125	.750	.625	.812	.937	7/16-20	21	6,385	.18
CW-8	CG-8	.5000	.625	.453	2.125	1.312	.875	.750	.937	1.062	1/2-20	20	9,096	.29
CW-10	CG-10	.6250	.750	.484	2.500	1.500	1.000	.875	1.125	1.375	5/8-18	26	9,713	.43
CW-12	CG-12	.7500	.875	.593	2.875	1.750	1.125	1.000	1.312	1.562	3/4-16	24	14,207	.65

ROD END NO.		DIMENSIONS IN MILLIMETERS												
Right Hand	Left Hand†	B +.064 -.013	W ±.13	H Ref.	A ±.38	D Ref.	K ±.25	J ±.25	Ball Dia. Ref.	C +1.57 -.79	Thread UNF-2B	a° Misalign. Angle	Ultimate Radial Static Load Capacity Newtons	Approx. Brg. Wt. Grams
CW-3*	CG-3*	4.826	7.92	5.94	26.97	15.88	10.31	7.92	11.10	12.70	10-32	20	9,247	18
CW-4	CG-4	6.350	9.53	6.35	33.32	19.05	11.91	9.53	12.70	17.45	1/4-28	27	14,269	23
CW-5	CG-5	7.938	11.10	7.92	34.93	22.23	12.70	11.10	15.88	17.45	5/16-24	22	17,009	36
CW-6	CG-6	9.525	12.70	9.12	41.28	25.40	17.45	14.27	18.26	20.62	3/8-24	22	22,627	59
CW-7	CG-7	11.113	14.27	10.31	46.02	28.58	19.05	15.88	20.62	23.80	7/16-20	21	28,400	82
CW-8	CG-8	12.700	15.88	11.50	53.98	33.32	22.23	19.05	23.80	26.97	1/2-20	20	40,459	132
CW-10	CG-10	15.875	19.05	12.29	63.50	38.10	25.40	22.23	28.58	34.93	5/8-18	26	43,203	195
CW-12	CG-12	19.050	22.23	15.06	73.03	44.45	28.58	25.40	33.32	39.67	3/4-16	24	63,193	295

Studs available per notes and comments, page 76