

ALINABAL

MOTION TRANSFER DEVICES

- Rod Ends
- Spherical Bearings
- Connecting Linkages



www.alinabal.com

Alinabal, Inc. Motion Transfer Device Division



Diversified Assembly Area



Statistical Process Control

Injection Molding



Computer Aided Design (CAD)



Computer Aided Manufacturing (CAM)



In-House Laboratory Testing











Specialty Machining

Non-Contact Video Inspection System



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		 = High Performance Products	

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Such information is subject to change without notice.

Nomenclature

Rod End Nomenclature (Inch)

Alinabal Rod End Catalog numbers consist of six positions (for ISO-LINK and Alumilite refer to catalog page #):

(1) Series	(2) Type	(3) *Stud	(4) Thread	(5) Size	(6) Ball
A	M (Male)	Add	Add	bore	A - Sintered Bronze Oil Filled
K	F (Female)	"S"	"L" for	size	B2 - Hardened Sintered Steel Oil Filled
KP		for	left	in	G - Mild Steel Case Hardened Plated
P & PRO		stud	hand	1/16"	GP - Mild Steel Case Hardened Hard Plated
V & VX		(see page	thread		X5 - Chrome Moly Steel Hardened Plated
ARM		15)			
RM					
S					

*High Tensile Steel Studs are available with all rod ends, standard with sintered balls, and optional with steel balls. Use basic rod end catalog number, insert "S" after Male or Female designation, and add "R" after a "G" Ball designation if a High Tensile Stud is desired.

Integral ball stud is standard for all rod ends assembled with steel (G) balls. Insert "S" after Male or Female designation. Add -8 to include grease fitting on V & A series.

Typical Rod End Callouts:

PM-3-A	P Series , Male, R.H. thread, 3/16" bore, bronze ball.
VF-8-G	V Series , Female, R.H. thread, 1/2" bore, (G-ball standard).
VMS-6-GR	V Series , Male, R.H. thread, 3/8" bore, G-ball with High Tensile steel stud.
AFSL-6-G-8	A Series , Female with stud, L.H. thread, 3/8" bore, single piece ball stud with lube fitting.

Rod End Nomenclature (Metric)

Alinabal Metric Rod End Catalog numbers consist of four positions:

(1) Series	(2) Type	(3) Thread	(4) *Size
MP	M (Male)	Add	bore
MV	F (Female)	"L" for	&
		left hand	thread
		thread	

*For Metric Rod Ends the size is always followed by an "M" to indicate Metric Dimensioning.

Typical Rod End Callouts:

MPM-6M	P Series , Male, R.H. thread, 6mm bore & thread.
MVFL-10M	V Series , Female, L.H. thread, 10mm bore & thread.

Spherical Bearing Nomenclature

Alinabal Spherical Bearing Catalog numbers consist of four positions:

(1) Series	(2) Bore Tolerance	(3) Size	(4) Ball
CBA, CBB, COM, PBL, PLS, NBA, VBC	No Code-Precision (.0000/- .0005) C-Commercial (.0025/- .0005)	bore size in 1/16"	A - Sintered Bronze Oil Filled B2 - Hardened Sintered Steel Oil Filled E - Hardened High Carbon/Chromium Steel Plated G - Mild Steel Case Hardened Plated

Typical Spherical Bearing Callouts:

CBA-6-B2	CBA Series , Precision bore tolerance, 3/8" bore, sintered steel ball.
VBC-8-G	VBC Series , Commercial bore tolerance, 1/2" bore, plated steel ball.



Rod Ends A-Series



A SERIES • HIGHER CAPACITY • PLATED STEEL HOUSING • HARDENED PLATED STEEL BALL • LUBRICATOR OPTION • STUD OPTIONAL (SEE PAGE 15)

Alinabal's A Series rod ends combine a plated, hardened steel ball with a plated mild steel housing. The raceless method of construction provides a greater housing mass and increased static load capacity. This construction is recommended for cost sensitive applications requiring a higher static capacity.

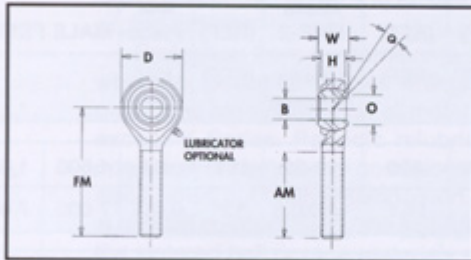
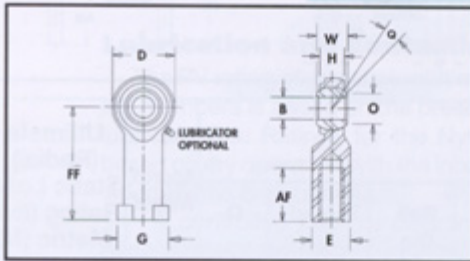
Materials:

- Housing: Low carbon steel - plated for corrosion resistance
- Race: Integral with machined housing
- Ball: Low carbon steel - case hardened - plated for corrosion resistance and wear

Notes:

1. Add letter "L" to prefix to indicate left hand thread (example: AML-6-GP)
2. For ZERK type grease fitting add "-8" after part number (example: AM-6-GP-8)
3. For Teflon liner add letter "T" to part number (example: AMT-6-GP). Available as a special.

Other variations can be supplied as specials.
For additional information and ordering instructions, contact
ALINABAL CUSTOMER SERVICE



Rod End Catalog Numbers		Dimensions in Inches													Approx Weight	Ultimate (Radial) Static Load Rating (lbs)		
		B	W	H	AM	FM	AF	FF	D	G	E	O	Ball Dia	Thread		Q	MALE	FEMALE
MALE	FEMALE	+0.0025 -0.0005	±.005	(REF)	±.060	±.030	±.060	±.030	±.010	(REF)	(REF)	(REF)	(REF)	Class UNF-2	(REF)	lbs/ Piece	MALE	FEMALE
*AM-3-GP	*AF-3-GP	.1900	.312	.250	.750	1.250	.562	1.062	.625	.406	.312	.296	.430	10-32	±12°	.03	1,500	2,000
AM-4-GP	AF-4-GP	.2500	.375	.281	1.000	1.562	.750	1.312	.750	.468	.375	.346	.510	1/4-28	±14°	.05	2,100	3,300
AM-5-GP	AF-5-GP	.3125	.437	.344	1.250	1.875	.750	1.375	.875	.500	.437	.438	.618	5/16-24	±12°	.08	3,300	4,000
AM-6-GP	AF-6-GP	.3750	.500	.406	1.250	1.938	.937	1.625	1.000	.687	.562	.508	.713	3/8-24	±10°	.12	6,600	6,700
AM-7-GP	AF-7-GP	.4375	.562	.437	1.375	2.125	1.062	1.812	1.125	.750	.625	.578	.806	7/16-20	±12°	.17	6,800	6,900
AM-8-GP	AF-8-GP	.5000	.625	.500	1.500	2.438	1.187	2.125	1.312	.875	.750	.690	.931	1/2-20	±10°	.26	10,000	10,000
AM-10-GP	AF-10-GP	.6250	.750	.562	1.625	2.625	1.500	2.500	1.500	1.000	.875	.801	1.098	5/8-18	±13°	.40	11,000	11,000
AM-12-GP	AF-12-GP	.7500	.875	.687	1.750	2.875	1.750	2.875	1.750	1.125	1.000	1.010	1.336	3/4-16	±10°	.61	15,000	15,000

*Grease fittings not available on these units

V-Series Rod Ends

V SERIES • MAINTENANCE-FREE CONSTRUCTION • SELF LUBRICATING • PLATED STEEL HOUSING • PHOSPHOR BRONZE RACE • HARDENED PLATED STEEL BALL • GREASE FITTING OPTIONAL • STUD OPTIONAL (SEE PAGE 15)

Alinabal's V Series rod ends combine a plated case hardened steel ball with self lubricated sintered phosphor bronze race secured permanently in a mild steel, plated housing. This combination assures reduced frictional wear for longer life and superior resistance to corrosion. V Series rod ends have been found to fulfill the widest range of applications and are an excellent general purpose rod end.

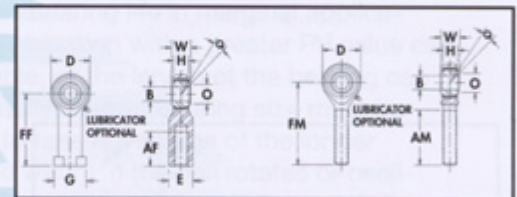
Metric V Series are manufactured in accordance with DIN 648 standard.

Materials:

Housing: Low carbon steel - plated for corrosion resistance
 Race: Sintered bronze - oil impregnated
 Ball: Low carbon steel - case hardened - plated for corrosion resistance and wear

Notes:

1. Add letter "L" to prefix to indicate left hand thread (example: VML-6-G/MVML-6M)
2. For ZERK type grease fitting add "-8" after part number (example: VM-6-G-8)



Rod End Catalog Numbers		Dimensions in Inches											Metric in Millimeters		Approx Weight	Ultimate (Radial) Static Load Rating (lbs) Metric (N)	
		B	W	H	AM	FM	AF	FF	D	G	E	O	Ball Dia	Thread		Q	MALE
MALE	FEMALE	+0.0025 -0.0005	±0.005 (REF)	±0.060	±0.030	±0.060	±0.030	±0.10	(REF)	(REF)	(REF)	(REF)	(REF)	Class UNF-2 (REF)	lbs/ Piece	MALE	FEMALE
		+0.0635 -0.0127	±0.13 (REF)	±1.5	±0.75	±1.5	±0.75	±0.25	(REF)	(REF)	(REF)	(REF)	Male 6g Female 6H	Kg/ Piece			
*VM-3-G	*VF-3-G	.1900	.312	.250	.750	1.250	.562	1.062	.750	.406	.312	.296	.430	10-32 ±11°	.04	1,600	1,800
MVM-5M	MVF-5M	5	8	6	20	33	10	27	18	11	9	7,7	11,1	M5X0,8 13°	0,017	7 000	7 000
VM-4-G	VF-4-G	.2500	.375	.281	1.000	1.562	.750	1.312	.750	.468	.375	.346	.510	1/4-28 ±13°	.05	2,250	2,300
MVM-6M	MVF-6M	6	9	6,75	22	36	12	30	20	13	11	9	12,7	M6X1,0 13°	0,025	8 500	8 500
VM-5-G	VF-5-G	.3125	.437	.344	1.250	1.875	.750	1.375	.875	.500	.437	.438	.618	5/16-24 ±11°	.08	2,850	2,900
MVM-8M	MVF-8M	8	12	9	25	42	16	36	24	16	14	10,4	15,9	M8X1,25 13°	0,043	12 000	12 000
VM-6-G	VF-6-G	.3750	.500	.406	1.250	1.938	.937	1.625	1.000	.687	.562	.508	.713	3/8-24 ±10°	.12	3,900	4,300
MVM-10M	MVF-10M	10	14	10,5	29	48	20	43	28	19	17	13	19,1	M10X1,5 13°	0,073	18 500	18 500
VM-7-G	VF-7-G	.4375	.562	.437	1.375	2.125	1.062	1.812	1.125	.750	.625	.578	.806	7/16-20 ±12°	.17	5,300	5,350
MVM-12M	MVF-12M	12	16	12	33	54	22	50	32	22	19	15,4	22,2	M12x1,75 13°	0,11	20 500	20 500
VM-8-G	VF-8-G	.5000	.625	.500	1.500	2.438	1.187	2.125	1.312	.875	.750	.690	.931	1/2-20 ±10°	.27	7,400	8,400
MVM-14M	MVF-14M	14	19	13,5	36	60	25	57	36	25	22	16,9	25,4	M14X2,0 15°	0,16	22 500	22 500
VM-10-G	VF-10-G	.6250	.750	.562	1.625	2.625	1.500	2.500	1.500	1.000	.875	.801	1.098	5/8-18 ±12°	.40	9,350	9,550
MVM-16M	MVF-16M	16	21	15	40	66	28	64	42	28	22	19,4	28,6	M16X2,0 15°	0,21	30 000	30 000
VM-12-G	VF-12-G	.7500	.875	.687	1.750	2.875	1.750	2.875	1.750	1.125	1.000	1.010	1.336	3/4-16 ±10°	.62	10,450	10,500
MVM-20M	MVF-20M	20	25	18	47	78	33	77	50	33	32	24,4	34,9	M20X1,5 15°	0,38	40 000	40 000

*Grease fittings not available on these units or metric units.

Rod Ends Precision VX-Series



VX SERIES • MAINTENANCE-FREE CONSTRUCTION • SELF LUBRICATING • PLATED STEEL HOUSING • PHOSPHOR BRONZE RACE • HARDENED PLATED STEEL BALL • GREASE FITTING OPTIONAL • STUD OPTIONAL (SEE PAGE 15)

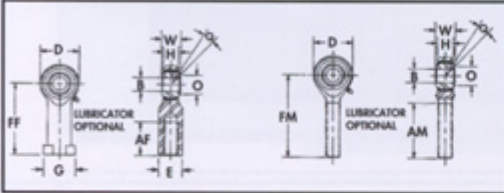
Alinabal's VX Precision Series rod ends combine a plated case hardened steel ball with self lubricated sintered phosphor bronze race secured permanently in a mild steel, plated housing. This combination assures reduced frictional wear for longer life and superior resistance to corrosion. VX Series rod ends have been found to fulfill the widest range of applications and are an excellent general purpose precision rod end. The VX Precision Series rod ends are produced to closer tolerances than the commercial grade V Series.

Materials:

Housing: Low carbon steel - plated for corrosion resistance
 Race: Sintered bronze - oil impregnated
 Ball: Low carbon steel - case hardened - plated for corrosion resistance and wear

Notes:

1. Add letter "L" to prefix to indicate left hand thread (example: VXML-6-G)
2. For ZERK type grease fitting add "-8" after part number (example: VXM-6-G-8)



Rod End Catalog Numbers	Dimensions in Inches													Approx Weight	Ultimate (Radial) Static Load Rating (lbs)			
	B	W	H	AM	FM	AF	FF	D	G	E	O	Ball Dia	Thread		Q	MALE	FEMALE	
MALE FEMALE		^{+0.0015} -0.0005	±0.005	(REF)	±0.060	±0.030	±0.060	±0.030	±0.010	(REF)	(REF)	(REF)	(REF)	UNF Threads	(REF)	lbs/ Piece	MALE	FEMALE
*VXM-3-G *VXF-3-G	.1900	.312	.250	.750	1.250	.562	1.062	.750	.406	.312	.296	.430	10-32	±11°	.04	1,600	1,800	
VXM-4-G VXF-4-G	.2500	.375	.281	1.000	1.562	.750	1.312	.750	.468	.375	.346	.510	1/4-28	±13°	.05	2,250	2,300	
VXM-5-G VXF-5-G	.3125	.437	.344	1.250	1.875	.750	1.375	.875	.500	.437	.438	.618	5/16-24	±11°	.08	2,850	2,900	
VXM-6-G VXF-6-G	.3750	.500	.406	1.250	1.938	.937	1.625	1.000	.687	.562	.508	.713	3/8-24	±10°	.12	3,900	4,300	
VXM-7-G VXF-7-G	.4375	.562	.437	1.375	2.125	1.062	1.812	1.125	.750	.625	.578	.806	7/16-20	±12°	.17	5,300	5,350	
VXM-8-G VXF-8-G	.5000	.625	.500	1.500	2.438	1.187	2.125	1.312	.875	.750	.690	.931	1/2-20	±10°	.27	7,400	8,400	
VXM-10-G VXF-10-G	.6250	.750	.562	1.625	2.625	1.500	2.500	1.500	1.000	.875	.801	1.098	5/8-18	±12°	.40	9,350	9,550	
VXM-12-G VXF-12-G	.7500	.875	.687	1.750	2.875	1.750	2.875	1.750	1.125	1.000	1.010	1.336	3/4-16	±10°	.62	10,450	10,500	

*Grease fittings not available on these units or metric units.

K-Series Rod Ends

K SERIES • PLATED STAMPED METAL HOUSING • HARDENED, PLATED STEEL BALL • LOWEST COST • STUD OPTIONAL (SEE PAGE 15)

The K Series combines Alinabal's bearing and metal stamping expertise to produce a high strength rod end at low cost. This series is an economical alternative to higher priced rod ends.

Materials:

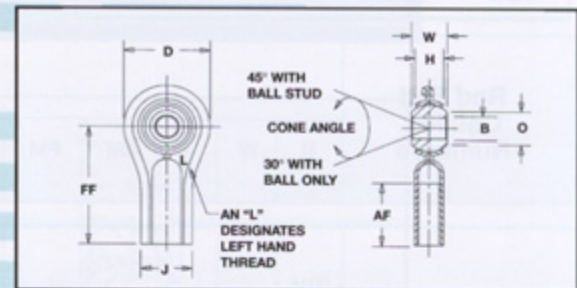
Housing: Low carbon steel stamping - plated for corrosion resistance
 Ball: Low carbon steel - case hardened - plated for corrosion resistance

Notes:

1. Add letter "L" to prefix to indicate left hand thread (example: KML-6-G/MKML-5M)



Other variations can be supplied as specials.
 For additional information and ordering instructions, contact
ALINABAL CUSTOMER SERVICE



Rod End Catalog Numbers	Dimensions in Inches Metric in Millimeters												Approx Weight	Ultimate (Radial) Static Load Rating (lbs) Metric (N)	
	B	W	H	AM	FM	AF	FF	D	J	P	O	Ball Dia			Thread
FEMALE	+0.0025 -.0005	±.005	(REF)	±.060	±.030	±.060	±.030	±.030	(REF)	(REF)	(REF)	(REF)	Class UNF-2	lbs/ Piece	FEMALE
	+0,0635 -0,0127	±0,13	(REF)	±1,5	±0,75	±1,59	±0,75	±0,75	(REF)	(REF)	(REF)	(REF)	Male 6g Female 6H	Kg/ Piece	
KF-3-G	.1900	.312	.250	.750	.750	.500	1.062	.750	.450	.250	.296	.430	10-32	.02	1,000
MKF-5M	5	7,92	6,35	19,05	19,05	12,7	26,97	12,7	11,43	6,35	7,5	10,92	M5x0,8	0,01	4 440
KF-4-G	.2500	.375	.287	1.000	.862	.687	1.312	.850	.515	.300	.346	.510	1/4-28	.04	1,900
MKF-6M	6	9,53	7,3	25,4	21,9	17,45	33,3	21,6	13	7,6	8,8	12,95	M6x1,0	0,02	8 450
KF-5-G	.3125	.437	.305	1.250	1.000	.687	1.375	1.015	.590	.375	.438	.618	5/16-24	.07	2,300
MKF-8M	8	11,10	7,75	31,75	25,4	17,45	35	25,8	15	9,5	11,1	15,7	M8x1,25	0,03	10 200
KF-6-G	.3750	.500	.400	1.250	1.138	.875	1.625	1.125	.725	.450	.508	.713	3/8-24	.11	3,000
MKF-10M	10	12,70	10,1	31,75	28,9	20,41	41	28,6	18,4	11,45	12,9	18,1	M10x1,5	0,05	13 300
KF-8-G	.5000	.625	.500	1.500	1.538	1.125	2.125	1.470	1.010	.600	.690	.931	1/2-20	.23	6,100
MKF-12M	12	15,88	12,7	38,10	39	28,6	54	37,3	25,6	15,25	17,5	23,65	M12x1,75	0,10	27 100

Rod Ends **KP-Series**



KP SERIES • ECONOMICAL • HIGH PERFORMANCE • MOLDED NYLOY® RACE • HARDENED PLATED STEEL BALL • PLATED STAMPED METAL HOUSING • STUD OPTIONAL (SEE PAGE 15)

Alinabal's KP Series combines the economy of the K Series with the performance of the P Series. This series features our patented high strength molded NYLOY® race with a hardened steel ball and a two-piece stamped metal housing.

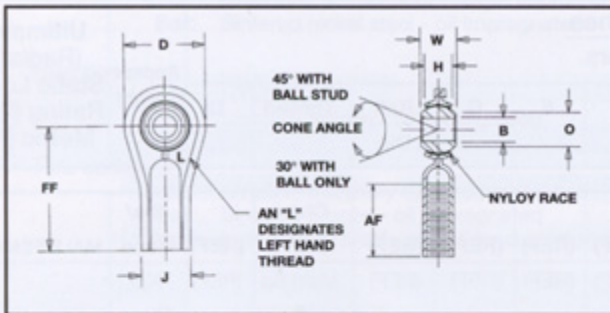
Materials:

- Housing Halves: Low carbon steel stamping - plated for corrosion resistance
- Ball: Low carbon steel - case hardened - plated for corrosion resistance and wear
- Race: NYLOY® integrally molded around ball

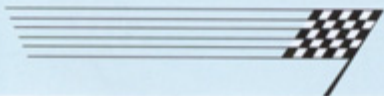
Notes:

1. Add letter "L" to indicate left hand thread (example: KPFL-6-G/MKPFL-5M)

Other variations can be supplied as specials. For additional information and ordering instructions, contact **ALINABAL CUSTOMER SERVICE**



Rod End Catalog Numbers	Dimensions in Inches Metric in Millimeters										Approx Weight	Ultimate (Radial) Static Load Ratings (lbs) Metric (N)
	B	W	H	AF	FF	D	J	O	Ball Dia	Thread		
Female Only	+0.0025									Class	lbs/	Pounds
	-.0005	±.005	(REF)	±.060	±.030	±.030	(REF)	(REF)	(REF)	UNF-2	Piece	
	+0,0635	±0,13	(REF)	±1,5	±0,75	±0,75	(REF)	(REF)	(REF)	Class	Kg/	Newtons
	-0,0127									6H	Piece	
KPF-5-G	.3125	.437	.305	.687	1.375	1.015	.590	.378	.578	5/16-24	.08	2,300
MKPF-8M	8	11,10	7,75	17,40	35	25,8	15	9,6	14,7	M8x1,25	0,03	10 200
KPF-6-G	.3750	.500	.400	.875	1.625	1.125	.725	.451	.673	3/8-24	.12	3,000
MKPF-10M	10	12,70	10,10	22,20	41	28,6	18,4	11,5	17,1	M10x1,5	0,05	13 300
KPF-8-G	.5000	.625	.500	1.125	2.125	1.470	1.010	.635	.891	1/2-20	.24	6,100
MKPF-12M	12	15,88	12,70	28,60	54	37,3	25,6	16,1	22,6	M12x1,75	0,11	27 100



Forged Rod Ends **Alumi-Lite**

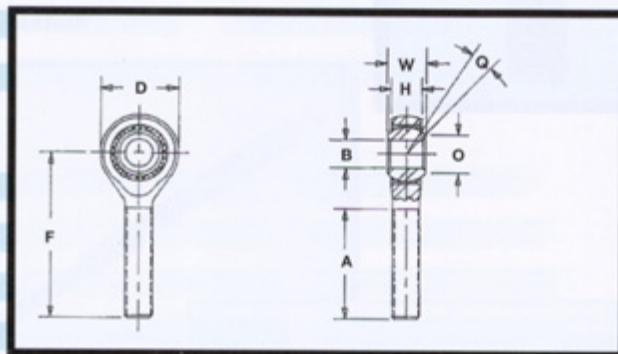
ALUMI-LITE SERIES • SHOCK ABSORBING FORGED ALUMINUM CONSTRUCTION • CARBON STEEL BALL • COMPOSITE RACE • PLATED FOR CORROSION RESISTANCE

Materials:

- Housing: Forged Aluminum - anodized for corrosion resistance
- Ball: Heat treated chrome moly steel - plated for corrosion resistance and wear
- Liner: Self lubricating composite race
- Race:

Note:

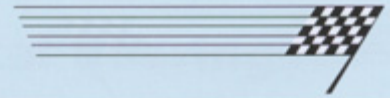
3A1212X - Special .007 over size ball bore for steering shaft applications



Other variations can be supplied as specials.
For additional information and ordering instructions, contact
ALINABAL CUSTOMER SERVICE

Rod End Catalog Numbers	Dimensions in Inches										Bore x Thd. Size	Ultimate (Radial) Static Load Rating (lbs)
	B	W	H	A	F	D	O	Ball Dia	Thread	Q		
	+0.0025 -0.0005	±0.005	(REF)	±0.060	±0.030	±0.010	(REF)	(REF)	Class UNF-2A	(REF)		
3A0808	.500	.625	.515	1.562	2.625	1.500	.612	.875	1/2-20	9°	1/2x1/2-20	12,000
3A0808L	.500	.625	.515	1.562	2.625	1.500	.612	.875	1/2-20LH	9°	1/2x1/2-20LH	12,000
3A0810	.500	.625	.515	1.562	2.625	1.500	.612	.875	5/8-18	9°	1/2x5/8-18	13,100
3A0810L	.500	.625	.515	1.562	2.625	1.500	.612	.875	5/8-18LH	9°	1/2x5/8-18LH	13,100
3A0810HD	.500	.750	.577	1.625	2.750	1.625	.752	.062	5/8-18	12°	1/2x5/8-18	16,900
3A0810HDL	.500	.750	.577	1.625	2.750	1.625	.752	.062	5/8-18LH	12°	1/2x5/8-18LH	16,900
3A1010	.625	.750	.577	1.625	2.750	1.625	.752	.062	5/8-18	12°	5/8x5/8-18	16,900
3A1010L	.625	.750	.577	1.625	2.750	1.625	.752	.062	5/8-18LH	12°	5/8x5/8-18LH	16,900
3A1212	.750	.875	.593	1.750	2.875	1.875	.892	1.250	3/4-16	13°	3/4x3/4-16	17,100
3A1212L	.750	.875	.593	1.750	2.875	1.875	.892	1.250	3/4-16LH	13°	3/4x3/4-16LH	17,100
3A1212X	.757	.875	.593	1.750	2.875	1.875	.892	1.250	3/4-16	13°	3/4x3/4-16	17,100

Steel Pro-Line Rod Ends



**PRO-LINE • AIRCRAFT QUALITY/PERFORMANCE • STRONGEST HOUSING DESIGN
• COMPLETE BALL CONTAINMENT • HIGH PERFORMANCE CARBON FIBER REIN-
FORCED RACE • COST EFFECTIVE DESIGN • HIGH STRENGTH/WEARABILITY
• STUDS OPTIONAL (SEE PAGE 15)**

The Pro-Line Series is Alinabal's high performance economy rod end. Features and benefits include complete ball containment, maintenance free, self lubricating and self-wiping action to prohibit contaminants. Studs optional see page 15.

Materials:

Ball: Low carbon hardened-plated for corrosion resistance

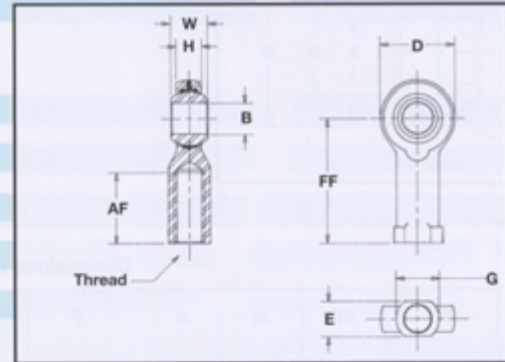
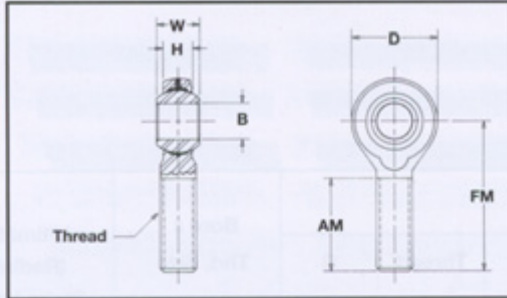
Race: Carbon fiber integrally molded around ball

Housing: Low carbon steel-plated for corrosion resistance

Notes:

1. Add letter "L" to prefix to indicate left hand thread (example: PROL-6M-G).

Other variations can be supplied as specials.
For additional information and ordering
instructions, contact
ALINABAL CUSTOMER SERVICE



Rod End Catalog Numbers		Dimensions in Inches											Ultimate Radial Static Load Rating (lbs)		
		Thread	B	W	H	AM	AF	FM	FF	D	G	E	Ball Dia	MALE	FEMALE
MALE	FEMALE	Class	+.0025												
		UNF-2A	-.0005 (REF)	±.010	±.060	±.060	±.030	±.030	±.010	(REF)	(REF)	(REF)			
PRO-5M-G	PRO-5F-G	5/16-24	.3125	.437	.304	1.250	.750	1.875	1.375	.875	.500	.437	.618	2700	2800
PRO-6M-G	PRO-6F-G	3/8-24	.3750	.500	.365	1.250	.937	1.938	1.625	1.000	.687	.562	.713	3200	3250
PRO-7M-G	PRO-7F-G	7/16-20	.4375	.562	.390	1.375	1.062	2.125	1.812	1.125	.750	.625	.806	3750	3800
PRO-8M-G	PRO-8F-G	1/2-20	.5000	.625	.462	1.500	1.187	2.438	2.125	1.312	.875	.750	.931	5800	6400
PRO-10M-G	PRO-10F-G	5/8-18	.6250	.750	.520	1.625	1.500	2.625	2.500	1.500	1.000	.875	1.098	7050	7100
PRO-12M-G	PRO-12F-G	3/4-16	.7500	.875	.635	1.750	1.750	2.875	2.875	1.750	1.125	1.000	1.336	8800	9000

Call for Specific Rating



Rod Ends Aluminum Pro-Line



- ALPRO-LINE SERIES • AIRCRAFT QUALITY/PERFORMANCE**
• COMPLETE BALL CONTAINMENT • HIGH PERFORMANCE CARBON FIBER REINFORCED RACE • COST EFFECTIVE DESIGN • HIGH STRENGTH/WEARABILITY
• STUDS OPTIONAL (SEE PAGE 15)

The Pro-Line Series is Alinabal's high performance economy rod end. Features and benefits include complete ball containment, maintenance free, self lubricating and self-wiping action to prohibit contaminants. Studs optional see page 15.

Materials:

Ball: Low carbon hardened-plated for corrosion resistance

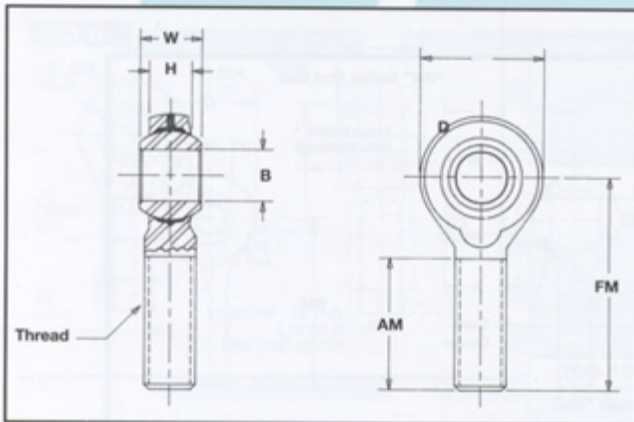
Race: Carbon fiber integrally molded around ball

Housing: Aluminum

Notes:

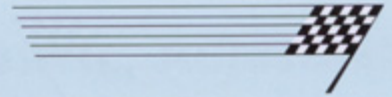
1. Add letter "L" to prefix to indicate left hand thread (example: ALPROL-6M-G).

Other variations can be supplied as specials.
 For additional information and ordering instructions, contact
ALINABAL CUSTOMER SERVICE



Rod End Catalog Numbers	Dimensions in Inches								Ultimate Static Load Rating (lbs)
	Thread	B	W	H	AM	FM	D	Ball Dia	
MALE	Class UNF-2A	+0.025 -0.0005	(REF)	±0.10	±0.060	±0.030	±0.010	(REF)	
ALPRO-5M-G	5/16-24	.3125	.437	.304	1.250	1.875	.875	.618	
ALPRO-6M-G	3/8-24	.3750	.500	.365	1.250	1.938	1.000	.713	
ALPRO-7M-G	7/16-20	.4375	.562	.390	1.375	2.125	1.125	.806	
ALPRO-8M-G	1/2-20	.5000	.625	.462	1.500	2.438	1.312	.931	6,000
ALPRO-10M-G	5/8-18	.6250	.750	.520	1.625	2.625	1.500	1.098	7,200
ALPRO-12M-G	3/4-16	.7500	.875	.635	1.750	2.875	1.750	1.336	9,100
ALPRO-10/8 M-G	5/8-18	.5000	.6250	.462	1.625	2.625	1.500	.750	9,500
ALPRO-12/10M-G	3/4-16	.6250	.7500	.520	1.750	2.875	1.750	1.098	11,500

"S" Series Rod Ends



Alinabal's S Series features the economical load carrying design of the two piece A Series with a solid backface and a Neoprene dust cover. Lube fitting optional. Composite race optional.

Materials:

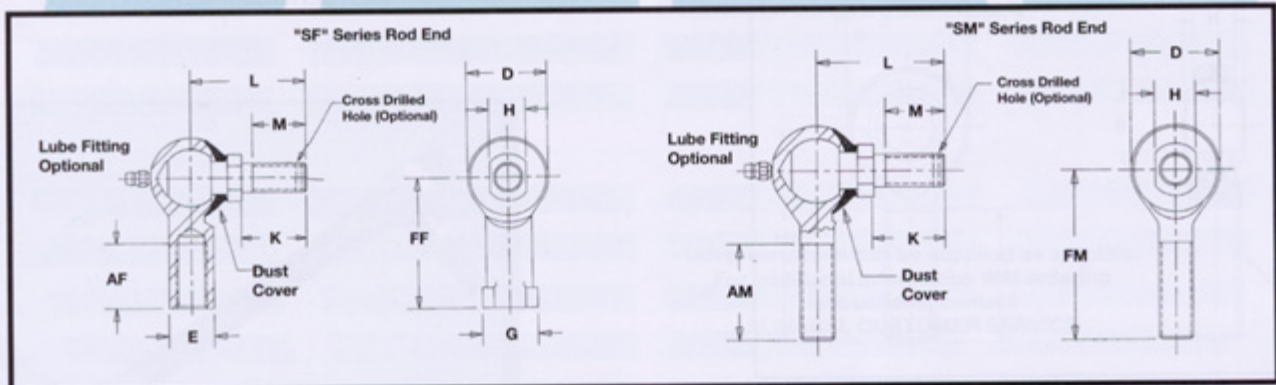
- Housing: Low carbon steel - plated for corrosion resistance
- Ballstud: Low carbon steel - case hardened - plated for corrosion resistance (Optional: Hardened alloy steel - hard chrome plated)
- Dust Cover: Neoprene

Notes:

Ballstud has right hand thread on all types. Add the letter "L" before size number to indicate left hand thread (example: SML-8-G).
 "X5" indicates optional ballstud material (example: SM-8-X5).
 "-8" indicates optional lube fitting (example: SM-8-G-8)



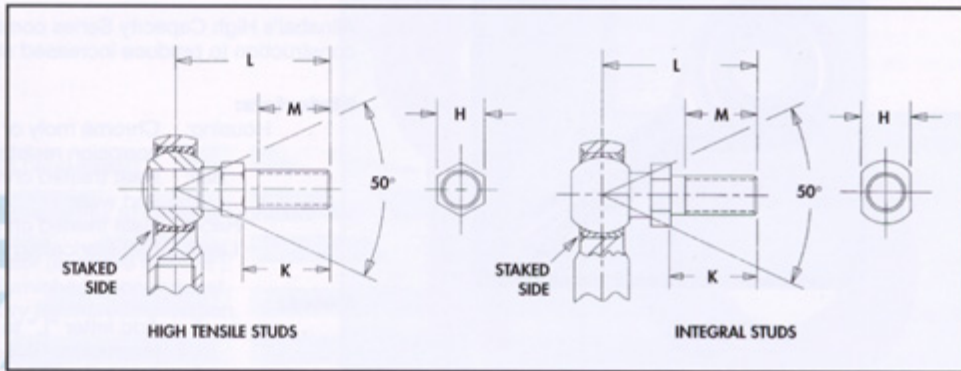
Other variations can be supplied as specials. For additional information and ordering instructions, contact ALINABAL CUSTOMER SERVICE



Rod End Catalog Numbers		Dimension in Inches											SPHER DIA	THREAD
		K	L	M	H	AF	FF	AM	FM	D	G	E		
MALE	FEMALE	±.010	±.015	MIN	±.005	±.060	±.030	±.060	±.030	±.010	(REF)	(REF)	(REF)	Class UNF-2
SM-4-G	SF-4-G	.562	1.047	.412	.375	.750	1.312	1.000	1.562	.750	.468	.375	.510	1/4-28
SM-5-G	SF-5-G	.687	1.234	.509	.438	.750	1.375	1.250	1.875	.875	.500	.437	.618	5/16-24
SM-6-G	SF-6-G	.906	1.570	.728	.500	.937	1.625	1.250	1.938	1.000	.687	.562	.713	3/8-24
SM-7-G	SF-7-G	1.125	1.968	.916	.625	1.062	1.812	1.375	2.125	1.125	.750	.625	8.06	7/16-20
SM-8-G	SF-8-G	1.125	2.000	.916	.625	1.187	2.125	1.500	2.438	1.312	.875	.750	.931	1/2-20
SM-10-G	SF-10-G	1.500	2.500	1.250	.750	1.500	2.500	1.625	2.625	1.500	1.000	.875	1.098	5/8-18

Studded Rod Ends

STUDED ROD ENDS ARE AVAILABLE IN • A • P • PRO-LINE • V • VX • K AND KP SERIES



Steel studs are available to facilitate right angle connections. Standard misalignment is 50 degrees in all sizes. Threads are right hand only. There are two types of Alinabal studs available:

High Tensile Steel Studs are standard for all rod ends assembled with sintered balls and optional for steel balls. These studs are machined for exact fit-up within the ball bore, for smooth operation and high performance. The studs are assembled to maintain the internal clearances inherent in the Alinabal units. They are permanently secured in the bore of the ball, threaded for easy mounting and have a hex section to facilitate tightening. The stud is designed to accommodate 50° misalignment in any direction, and provides maximum load capacity.

Integral Studs. The ball and stud are combined into a single unit of case hardened machined plated steel. Wrench flats are provided for tightening. These studs are standard for all rod end assemblies with steel balls, offering the same operational features as the high tensile studs, with slightly reduced load capacity.

NUMBERING SYSTEM.

High Tensile Steel Studs are available for all Alinabal rod ends, standard for assemblies with sintered balls, optional for assemblies with steel balls. To specify studs, use basic rod end catalog number inserting "S" immediately after Male (M) or Female (F) designation. Add "R" after "G" ball designation if the high tensile stud is desired.

Examples: PMS-3-A (standard)
VFS-6-GR (optional with steel ball and add "R")

Integral Ball Stud is standard for all rod ends assembled with steel (G) balls. To specify, use basic rod end and catalog number inserting "S" immediately after Male (M) or Female (F) designation.

Examples: PFS-7-G VMS-8-G

Materials:

Rod End: Refer to basic Rod End specification page
Stud: High tensile steel - plated for corrosion resistance
Ball Stud: Low carbon steel - case hardened - plated for corrosion resistance

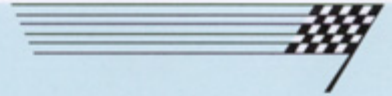
STUDED ROD ENDS ARE AVAILABLE IN • A • P • PRO-LINE • V • VX • K AND KP SERIES

Contact Factory for Special Stud Offerings

Other variations can be supplied as specials. For additional information and ordering instructions, contact ALINABAL CUSTOMER SERVICE

To Fit Rod End Size	Stud Thread UNF-2	Dimensions in Inches				Static Load Rating (lbs)	
		H	K	L	M	Hi-Tensile Stud	Ball Stud
		±.005	±.010	±.015	MIN		
3	10-32	.312	.500	1.016	.350	350	250
4	1/4-28	.375	.562	1.047	.412	850	550
5	5/16-24	.438	.687	1.234	.509	1600	1050
6	3/8-24	.500	.906	1.570	.728	2400	1500
7	7/16-20	.625	1.125	1.968	.916	2700	1800
8	1/2-20	.625	1.125	2.000	.916	3100	2200
10	5/8-18	.750	1.500	2.500	1.250	4500	N/A
12	3/4-16	1.000	1.812	3.000	1.625	6000	N/A

High Capacity Rod Ends



RM SERIES • CHROME MOLY STEEL HOUSING, BALL AND RACE • PLATED FOR CORROSION RESISTANCE

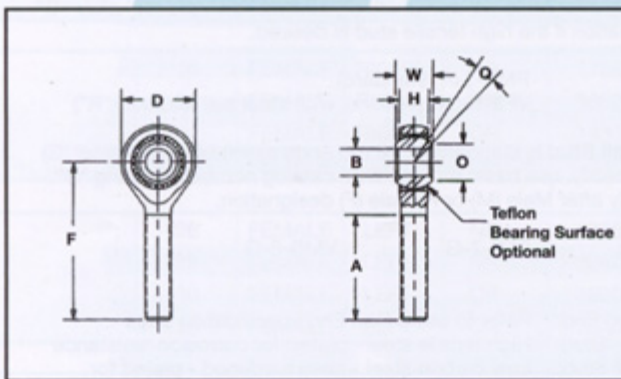
Alinabal's High Capacity Series combines high strength material with three piece construction to produce increased static load ratings.

Materials:

- Housing: Chrome moly or low carbon steel - heat treated - plated for corrosion resistance
- Ball: Heat treated chrome moly steel - plated for corrosion resistance and wear
- Race: Heat treated chrome moly steel - plated for corrosion resistance
- Liner: Self lubricating woven Teflon fabric (optional)

Notes:

1. Add letter "L" to prefix to indicate left hand thread (examples: RML-6-X5)
2. Add letter "T" to prefix to indicate permanently bonded Teflon material to the race I.D. (examples: RMLT-6-X5)



Other variations can be supplied as specials.
For additional information and ordering instructions, contact
ALINABAL CUSTOMER SERVICE

Rod End Numbers High Capacity (Chrome Moly Steel)	Dimension in Inches										Approx Weight lbs/ Piece	Ultimate (Radial) Static Load Rating (lbs) High Strength
	B	W	H	A	F	D	O	Ball Dia	Thread	Q		
	+0.0025 -0.0005	±.005	(REF)	±.060	±.030	±.010	(REF)	(REF)	Class UNF-2	(REF)		
RM-5-X5	.3125	.437	.344	1.250	1.875	.875	.438	.618	5/16-24	±14°	.07	3,940
RM-6-X5	.3750	.500	.406	1.250	1.938	1.000	.508	.713	3/8-24	±15°	.12	6,800
RM-7-X5	.4375	.562	.437	1.375	2.125	1.125	.578	.806	7/16-20	±16°	.16	8,830
RM-8-X5	.5000	.625	.500	1.500	2.438	1.312	.690	.931	1/2-20	±16°	.24	13,990
RM-8/6-X5	.3750	.500	.406	1.500	2.438	1.312	.508	.713	1/2-20	±15°	.24	20,850
RM-10-X5	.6250	.750	.562	1.625	2.625	1.500	.801	1.098	5/8-18	±15°	.38	16,110
RM-10/8-X5	.5000	.625	.500	1.625	2.625	1.500	.690	.931	5/8-18	±16°	.38	26,280
RM-12-X5	.7500	.875	.687	1.750	2.875	1.750	1.010	1.336	3/4-16	±12°	.65	21,950
RM-12/10-X5	.6250	.750	.562	1.750	2.875	1.750	.801	1.098	3/4-16	±12°	.65	35,900

Large Bore Bearings

Materials:

RM/RF Ball: Steel, heat treated, chrome plated
 Race: Low carbon steel-plated
 Body: Low carbon steel-plated

CRS Ball: Steel, heat treated & chrome plated
 Race: Low carbon steel, oil coated

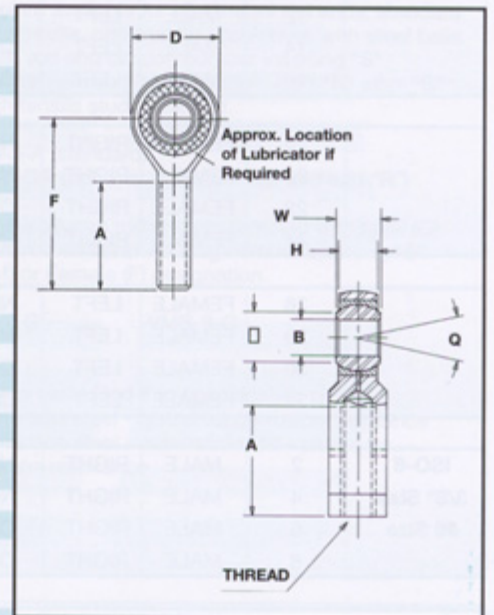
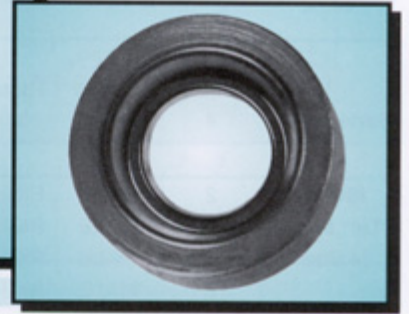
Notes: RM/RF Rod Ends

1. Add letter "L" to prefix to indicate left hand thread (example: RML-16).
2. Optional lubricators available. Add "Z" to suffix to indicate lubricator (example: RM-16Z). Add "F" to indicate flush type lubricator (example RM-16F).
3. Special sizes and materials can be furnished upon request.
4. Teflon* liners are available. Call factory for more information.

Notes: CRS Spherical Bearings

1. Teflon* liners are available. Add suffix "T" (example CRS-16T).

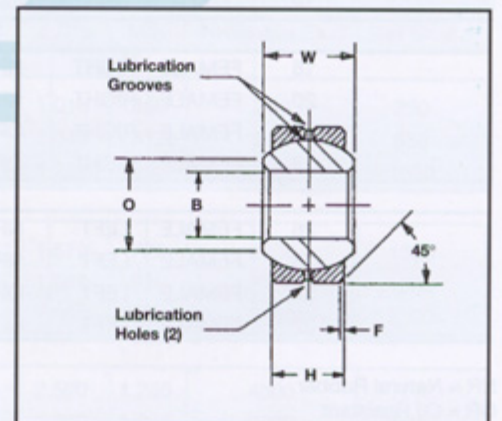
* A trade name of E.I. DuPont de Nemours & CO., Inc.



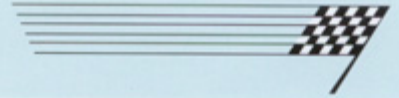
Rod End Catalog Numbers		Dimensions in Inches										
		B	W	H	A	F	D	J	O	Ball Dia	Thread	Q
Male	Female	+0.015	+0.000	+0.010	+1/16	+0.020	+0.030	Wrench				Class
		-0.005	-0.005	-0.010	-1/32	-0.020	-0.010	Flats	(REF)	(REF)	UNF-3	
RM-16	RF-16	1.000	1.375	1.000	2.125	4.125	2.750	1-1/2	1.269	1.875	1-1/4-12	14°
RM-16-2	RF-16-2	1.000	1.375	1.000	2.125	4.125	2.750	1-1/2	1.269	1.875	1-14	14°
RM-16-3	RF-16-3	1.000	1.375	1.000	2.125	4.125	2.750	1-1/2	1.269	1.875	1-12	14°

Other variations can be supplied as specials.
 For additional information and ordering instructions, contact
ALINABAL CUSTOMER SERVICE

Spherical Catalog Numbers	Dimensions in Inches									
	B	O	D	F	H	W	Ball Dia	Housing Bore	Max. Static Radial Load (lbs)	Approx Weight
CRS-12	.7500	.920	1.4375	.044	.593	.750	1.187	1.4373	30,000	.0204
CRS-14	.8750	.980	1.5625	.044	.703	.875	1.312	1.4368	41,100	.0263
								1.5618		
CRS-16	1.0000	1.118	1.7500	.044	.797	1.000	1.500	1.7498	54,700	.0386
								1.7493		

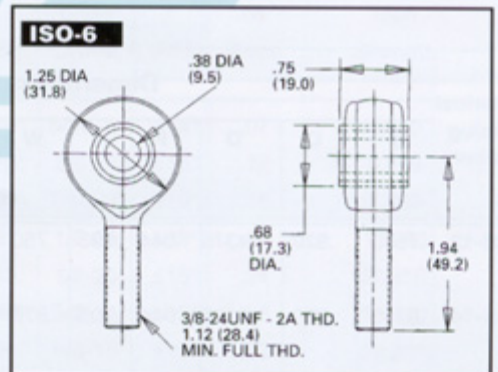
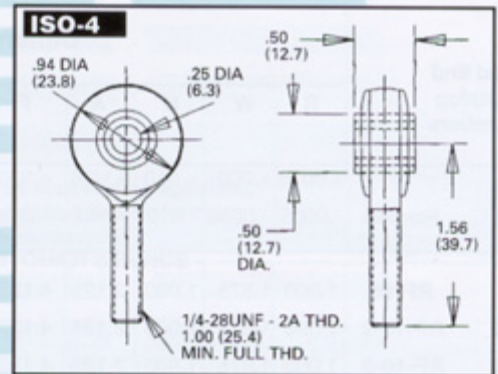


ISO-LINK[®] Rod Ends



ISO-LINK™ Elastomeric rod ends deliver effective suppression of noise and vibration in vehicle suspensions and linkages. In addition, they combine the vibration isolation capabilities of elastomeric mounts with the installation ease of rod ends. The design of these products brings the rod end expertise of Alinabal, Inc. together with the most sophisticated noise and vibration expertise available in the industry.

Series P/N	Dash #	Thread Type	Thread Hand	Rubber Type	TYP		Load Rating		
					DYN Stiffness lb/in	(N/mm)	lb	(N)	
ISO-4 1/4" Size	2	MALE	RIGHT	NR	1725	(302)	30	(133)	
	4	MALE	RIGHT	NR	3660	(641)	60	(267)	
	#4 Size	6	MALE	RIGHT	OR	1830	(320)	30	(133)
	8	MALE	RIGHT	OR	3840	(673)	60	(267)	
	10	MALE	LEFT	NR	1725	(302)	30	(133)	
	12	MALE	LEFT	NR	3660	(641)	60	(267)	
	14	MALE	LEFT	OR	1830	(320)	30	(133)	
	16	MALE	LEFT	OR	3840	(673)	60	(267)	
	18	FEMALE	RIGHT	NR	1725	(302)	30	(133)	
	20	FEMALE	RIGHT	NR	3660	(641)	60	(267)	
	22	FEMALE	RIGHT	OR	1830	(320)	30	(133)	
	24	FEMALE	RIGHT	OR	3840	(673)	60	(267)	
	26	FEMALE	LEFT	NR	1725	(302)	30	(133)	
	28	FEMALE	LEFT	NR	3660	(641)	60	(267)	
	30	FEMALE	LEFT	OR	1830	(320)	30	(133)	
	32	FEMALE	LEFT	OR	3840	(673)	60	(267)	
ISO-6 3/8" Size	2	MALE	RIGHT	NR	3450	(604)	60	(267)	
	4	MALE	RIGHT	NR	8540	(1496)	140	(623)	
	#6 Size	6	MALE	RIGHT	OR	3660	(641)	60	(267)
	8	MALE	RIGHT	OR	8960	(1569)	140	(623)	
	10	MALE	LEFT	NR	3450	(604)	60	(267)	
	12	MALE	LEFT	NR	8540	(1496)	140	(623)	
	14	MALE	LEFT	OR	3660	(641)	60	(267)	
	16	MALE	LEFT	OR	8960	(1569)	140	(623)	
	18	FEMALE	RIGHT	NR	3450	(604)	60	(267)	
	20	FEMALE	RIGHT	NR	8540	(1496)	140	(623)	
	22	FEMALE	RIGHT	OR	3660	(641)	60	(267)	
	24	FEMALE	RIGHT	OR	8960	(1569)	140	(623)	
	26	FEMALE	LEFT	NR	3450	(604)	60	(267)	
	28	FEMALE	LEFT	NR	8540	(1496)	140	(623)	
	30	FEMALE	LEFT	OR	3660	(641)	60	(267)	
	32	FEMALE	LEFT	OR	8960	(1569)	140	(623)	



NR = Natural Rubber
OR = Oil Resistant

Metric and #12,3/4" sizes are also available. Please call for information.

Rod Ends **ISO-LINK®**



Series P/N	Dash #	Thread Type	Thread Hand	Rubber Type	TYP		Load Rating lb (N)
					DYN Stiffness lb/in	(N/mm)	
ISO-8 1/2" Size #8 Size	2	MALE	RIGHT	NR	7930	(1389)	130 (578)
	4	MALE	RIGHT	NR	19300	(3380)	270 (1201)
	6	MALE	RIGHT	OR	8320	(1457)	130 (578)
	8	MALE	RIGHT	OR	16875	(2955)	270 (1201)

	10	MALE	LEFT	NR	7930	(1389)	130 (578)
	12	MALE	LEFT	NR	19300	(3380)	270 (1201)
	14	MALE	LEFT	OR	8320	(1457)	130 (578)
	16	MALE	LEFT	OR	16875	(2955)	270 (1201)

	18	FEMALE	RIGHT	NR	7930	(1389)	130 (578)
	20	FEMALE	RIGHT	NR	19300	(3380)	270 (1201)
	22	FEMALE	RIGHT	OR	8320	(1457)	130 (578)
	24	FEMALE	RIGHT	OR	16875	(2955)	270 (1201)

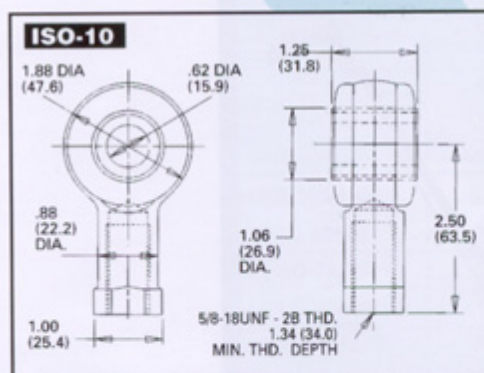
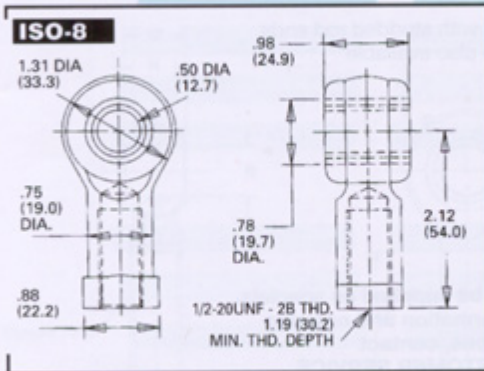
	26	FEMALE	LEFT	NR	7930	(1389)	130 (578)
	28	FEMALE	LEFT	NR	19300	(3380)	270 (1201)
	30	FEMALE	LEFT	OR	8320	(1457)	130 (578)
	32	FEMALE	LEFT	OR	16875	(2955)	270 (1201)

ISO-10 5/8" Size #10 Size	2	MALE	RIGHT	NR	10350	(1813)	180 (801)
	4	MALE	RIGHT	NR	19520	(3419)	320 (1423)
	6	MALE	RIGHT	OR	10980	(1923)	180 (801)
	8	MALE	RIGHT	OR	20480	(3587)	320 (1423)

	10	MALE	LEFT	NR	10350	(1813)	180 (801)
	12	MALE	LEFT	NR	19520	(3419)	320 (1423)
	14	MALE	LEFT	OR	10980	(1923)	180 (801)
	16	MALE	LEFT	OR	20480	(3587)	320 (1423)

	18	FEMALE	RIGHT	NR	10350	(1813)	180 (801)
	20	FEMALE	RIGHT	NR	19520	(3419)	320 (1423)
	22	FEMALE	RIGHT	OR	10980	(1923)	180 (801)
	24	FEMALE	RIGHT	OR	20480	(3587)	320 (1423)

	26	FEMALE	LEFT	NR	10350	(1813)	180 (801)
	28	FEMALE	LEFT	NR	19520	(3419)	320 (1423)
	30	FEMALE	LEFT	OR	10980	(1923)	180 (801)
	32	FEMALE	LEFT	OR	20480	(3587)	320 (1423)



NR = Natural Rubber
OR = Oil Resistant

Metric and #12,3/4" sizes are also available. Please call for information.

Rod End Linkages Single, Double, Adjustable



ROD END LINKAGES (SPECIAL ORDER)

Whether you require a fixed length or adjustable linkage, straight or with bends, Alinabal can fill your need. The linkages shown illustrate some of Alinabal's unique capabilities.

SINGLE END LINKAGE (SPECIAL ORDER)

Alinabal's single end connecting rod assemblies are available with V Series (bronze race), P Series (molded race), or K/KP Series (staked version only) construction. A housing ring or rod end is welded or staked to a steel rod which has been threaded at one end. All external surfaces are plated for corrosion resistance. Available with right or left hand thread. This construction method is ideal where the length is greater than the standard.

DOUBLE END FIXED LINKAGE (SPECIAL ORDER)

Alinabal's double end connecting rod assemblies are available with V Series (bronze race), P Series (molded race), or K/KP Series (staked version only) construction. Two housing rings or rod ends are welded or staked to a steel rod. All external surfaces are plated for corrosion resistance. These units provide a simple design for applications requiring a double link with a fixed center distance.

ADJUSTABLE LINKAGE (SPECIAL ORDER)

Connecting rod assemblies with variable length adjustment are available in all series of rod ends. Jam nuts are normally provided to secure the final adjustment. All external surfaces are plated for corrosion resistance.

Notes:

1. Linkages are available with studded rod ends
2. Lubrication fittings are also available



Other variations can be supplied as specials.
For additional information and ordering
instructions, contact
ALINABAL CUSTOMER SERVICE

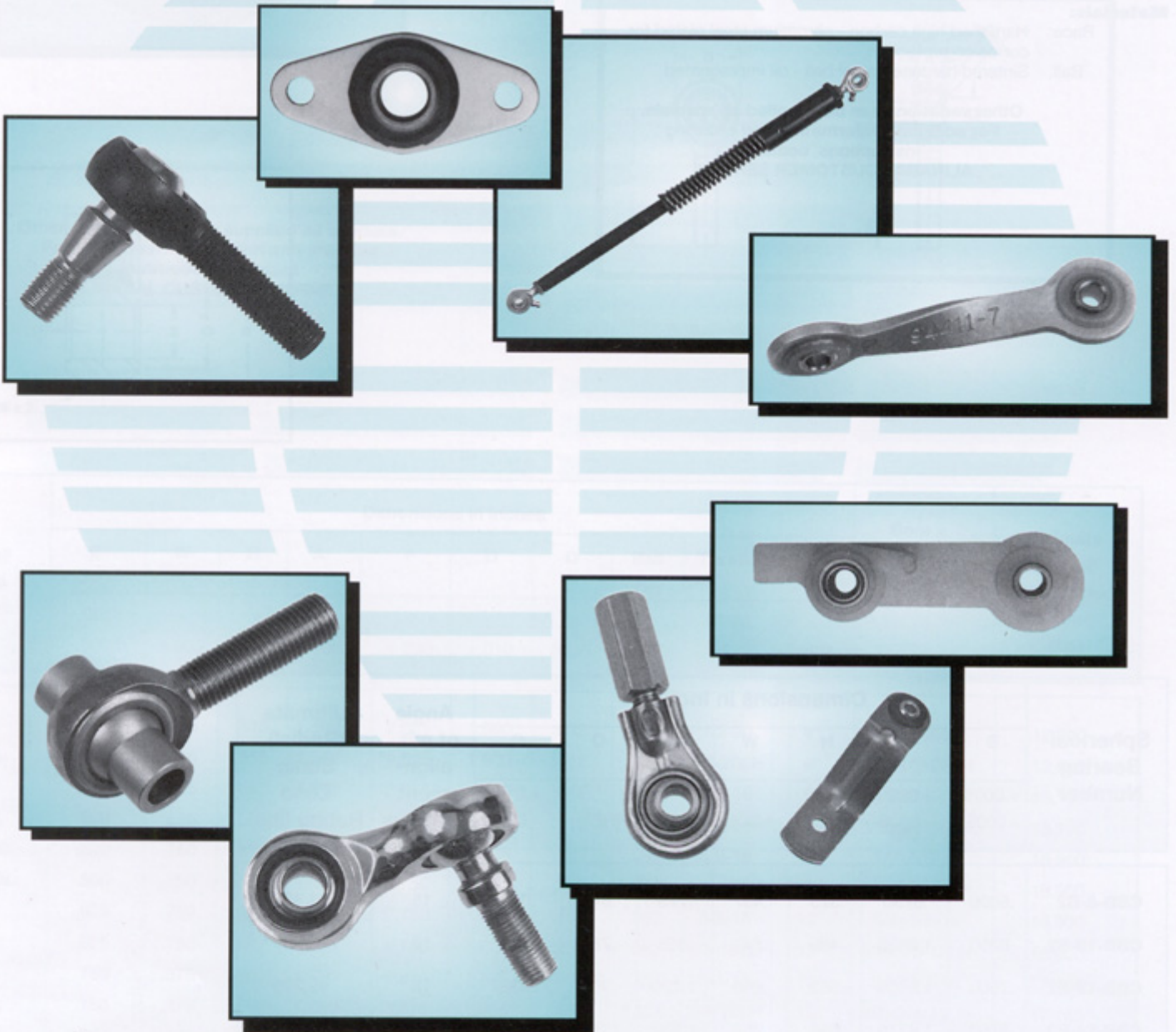


Custom Applications

Alinabal's expertise in metal stamping, metal removal, and injection molding offers the widest range of custom products in the industry.

The many variations in basic construction and the unique design features available in Alinabal products provide the tools with which to solve unusual requirements for self-aligning bearing products. Our application engineers will assist you in developing unique solutions or we can work strictly to your specifications. Alinabal features may be incorporated in completed assemblies or can be installed in customer provided units.

Other variations can be supplied as specials.
For additional information and ordering
instructions, contact
ALINABAL CUSTOMER SERVICE

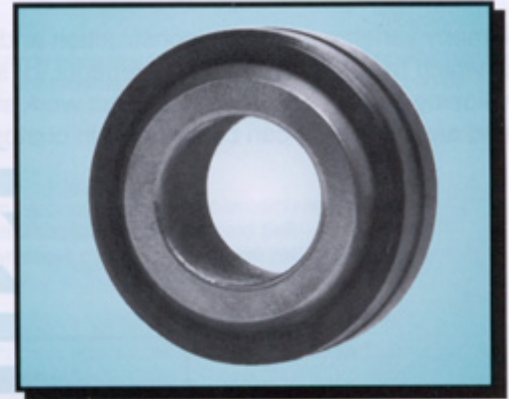


Extra Light Section Spherical Bearings

CBB SERIES • THROUGH HARDENED STEEL RACE PLATED FOR CORROSION RESISTANCE • HARDENED SINTERED STEEL OIL IMPREGNATED BALL

Alinabal's CBB Series spherical bearings have construction features identical with CBA bearings but have reduced dimensions, resulting in a maximum capacity two-piece spherical bearing, with the minimum envelope cross section related to bore size.

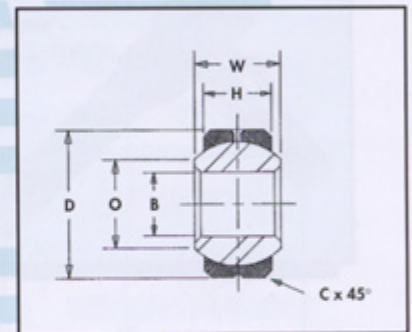
A single fractured through hardened steel race, plated for corrosion resistance, is coupled with the high capacity, oil impregnated sintered steel ball. Both are precision ground to assure maximum bearing surface in the load zone. A lubrication groove or access hole facilitates periodic supplemental lubrication. The fractured outer race may be slightly out of round in the free state.



Materials:

- Race: Hardened high carbon - chromium steel plated for corrosion protection
- Ball: Sintered hardened steel ball - oil impregnated

Other variations can be supplied as specials.
For additional information and ordering instructions, contact
ALINABAL CUSTOMER SERVICE



Spherical Bearing Number	Dimensions in Inches							Angle of misalignment Degrees	Ultimate (Radial) Static Load Rating (lbs)
	B	D	H	W	Ball Dia	O	C		
	+0.0005 -0.0005	+0.0000 -0.0005	+0.000 -0.005	±0.005	(REF)	(REF)	+0.010 -0.000		
CBB-8-B2	.5000	.8750	.375	.437	.775	.640	.032	15	21,850
CBB-10-B2	.6250	1.0625	.469	.547	.958	.787	.032	15	34,200
CBB-12-B2	.7500	1.2500	.562	.656	1.120	.908	.032	15	49,200
CBB-14-B2	.8750	1.4375	.656	.765	1.280	1.026	.032	15	67,000

Spherical Bearings Light Section

CBA SERIES • THROUGH HARDENED STEEL RACE PLATED FOR CORROSION RESISTANCE • HARDENED STEEL OIL IMPREGNATED BALL

This series features a single-fractured through hardened steel race and the self lubricating ball. The ball and race are precision ground to assure maximum bearing surface in the load zone. A lubricating groove and access hole facilitate periodic relubrication. The fractured outer race may be slightly out of round in the free state.

NBA SERIES • NYLOY® RACE • SINTERED BRONZE OIL IMPREGNATED BALL

This series features a single-fractured NYLOY® race, assembled with controlled clearance around a sintered bronze ball. This combination provides reliable performance in a wet atmosphere and is completely non-magnetic.

PBL SERIES • LOW CARBON STEEL HOUSING RING PLATED FOR CORROSION RESISTANCE • SINTERED BRONZE OIL IMPREGNATED

This series features an injection molded NYLOY® race, sintered bronze ball, and steel housing. The NYLOY® race provides a slight preload for smooth operation, increased performance and acts as a wiping seal to keep dirt and foreign material away from the bearing surface.

Materials:

CBA Series:

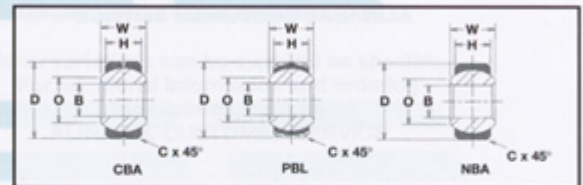
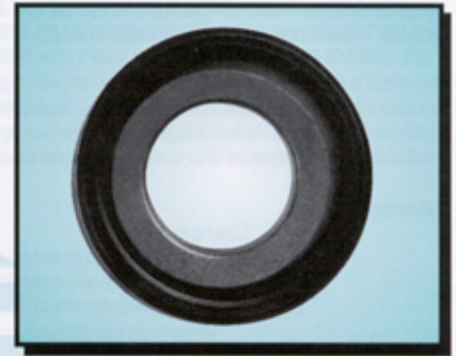
Race: Hardened 52100 steel - single fractured
Ball: Sintered nickel steel - oil impregnated

NBA Series:

Race: NYLOY®
Ball: Sintered bronze - oil impregnated

PBL Series:

Race: NYLOY® integrally molded around ball
Ball: Sintered bronze - oil impregnated
Housing: Low carbon steel - plated for corrosion resistance



Other variations can be supplied as specials.
For additional information and ordering instructions, contact
ALINABAL CUSTOMER SERVICE

Spherical Bearing Number		Dimensions in Inches											Ultimate (Radial) Static Load Ratings (lbs)			
		"B" Tolerance +.0005 -.0005	Sintered Nickel Steel Ball Sintered Bronze Ball	B	D	H	W	C	CBA			PBL/NBA			CBA Series	PBL/NBA Series
Ball Dia	O								Angle of misalignment Degrees	Ball Dia	O	Angle of misalignment Degrees				
CBA-3-B2	NBA-3-A PBL-3-A			.1900	.5625	.218	.281	.010	.500	.415	17	.400	.285	23	4,800	530
CBA-4-B2	NBA-4-A PBL-4-A			.2500	.6562	.250	.343	.010	.594	.485	21	.496	.358	26	7,720	600
CBA-5-B2	NBA-5-A PBL-5-A			.3125	.7500	.281	.375	.020	.670	.556	18.5	.558	.414	24	10,550	1,170
CBA-6-B2	NBA-6-A PBL-6-A			.3750	.8125	.312	.406	.020	.718	.592	17.5	.621	.470	23	13,700	1,520
CBA-7-B2	NBA-7-A PBL-7-A			.4375	.9062	.343	.437	.020	.797	.665	15	.683	.526	19	17,200	1,910
CBA-8-B2	NBA-8-A PBL-8-A			.5000	1.0000	.390	.500	.020	.880	.725	16.5	.777	.595	20	22,500	2,500
CBA-10-B2	NBA-10-A PBL-10-A			.6250	1.1875	.500	.625	.020	1.057	.855	21	.965	.735	18	35,200	3,900
CBA-12-B2	NBA-12-A PBL-12-A			.7500	1.4375	.593	.750	.020	1.2875	1.045	17.5	1.183	.916	17	50,600	5,620

PLS SERIES Spherical Bearings

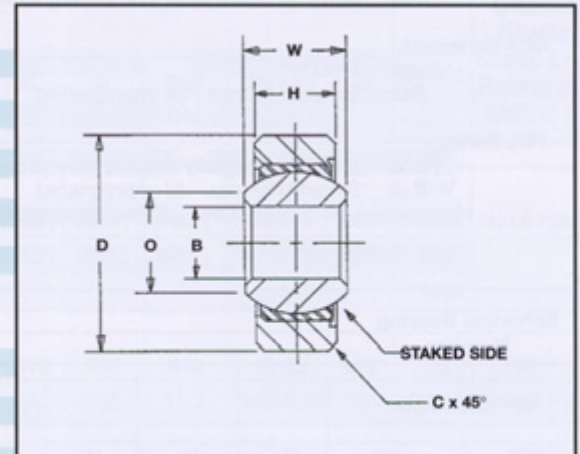
PLS SERIES • LOW CARBON STEEL • REINFORCED NYLOY® RACE • HARDENED PLATED BALL

Alinabal's PLS Series features its patented, high strength injection molded NYLOY® race, fully contained between spherical housing material and ball. This configuration yields superior wear resistance, zero radial and axial play, and a steel-entrapped ball.

Materials:

- Housing: Low carbon steel
- Race: Reinforced nylon molded around ball
- Ball: Low carbon steel - case hardened - plated for corrosion resistance and extended wear

Other variations can be supplied as specials.
For additional information and ordering instructions, contact
ALINABAL CUSTOMER SERVICE



Spherical Bearing Number	Dimensions in Inches							Angle of mis-alignment Degrees	Approx Weight (lbs)
	B	D	W	H	O	Ball Dia	C		
	+0.0025 -0.0005	+0.0000 -0.0007	±.005	±.005	(REF)	(REF)	(REF)		
PLS-3-G	.1900	.5625	.281	.218	.293	.406	.015	22	.014
PLS-4-G	.2500	.6562	.343	.250	.364	.500	.022	27	.022
PLS-5-G	.3125	.7500	.375	.281	.419	.562	.032	24	.030
PLS-6-G	.3750	.8125	.406	.312	.516	.565	.032	20	.038
PLS-7-G	.4375	.9062	.437	.343	.530	.687	.032	19	.047
PLS-8-G	.5000	1.000	.500	.390	.600	.781	.032	19	.065
PLS-10-G	.6250	1.1875	.625	.500	.739	.968	.032	17	.110
PLS-12-G	.7500	1.4675	.750	.593	.920	1.187	.044	18	.204

Spherical Bearings Commercial Series



COM SPHERICAL BEARING SERIES • LOW CARBON STEEL OIL COATED RACE • HARDENED HIGH CARBON CHROMIUM STEEL PLATED BALL

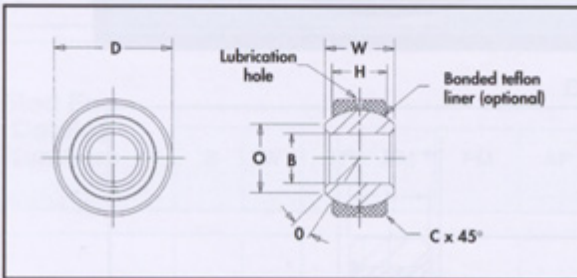
Alinabal's COM Series is dimensionally the same as the CBA Series, but features a solid outer race. This series is also available with a Teflon-lined race, resulting in a bearing with minimal clearance and extended wear.

Materials:

- Race: Low carbon steel - oil coated
 Ball: Hardened high carbon - chromium steel ball - plated for corrosion resistance and extended wear

Notes:

1. Lubrication groove in I.D. and O.D. of race. Lubrication hole through race only.
2. For Teflon liner add "T" to part number (example: COMT-3). Units with Teflon liners have no lubrication holes or groove in race.



Other variations can be supplied as specials. For additional information and ordering instructions, contact ALINABAL CUSTOMER SERVICE

Dimensions in Inches										
Spherical Bearing Number	B	D	W	H	O	Ball Dia	C	Angle of misalignment Degrees	Ultimate (Radial) Static Load Rating (lbs)	Approx Weight (lbs)
	+0.0015 -0.0005	+0.0000 -0.0007	±0.005	±0.005	(REF)	(REF)	(REF)			
COM-3-E	.1900	.5625	.281	.218	.293	.406	.015	11	3,250	.014
COM-4-E	.2500	.6562	.343	.250	.364	.500	.022	13.5	4,950	.022
COM-5-E	.3125	.7500	.375	.281	.419	.562	.032	12	6,475	.030
COM-6-E	.3750	.8125	.406	.312	.516	.656	.032	10	8,400	.038
COM-7-E	.4375	.9062	.437	.343	.530	.687	.032	9.5	9,453	.047
COM-8-E	.5000	1.0000	.500	.390	.600	.781	.032	9.5	13,250	.065
COM-10-E	.6250	1.1875	.625	.500	.739	.968	.032	8.5	21,280	.110
COM-12-E	.7500	1.4375	.750	.593	.920	1.187	.044	9	31,920	.204

Heavy Section Spherical Bearings

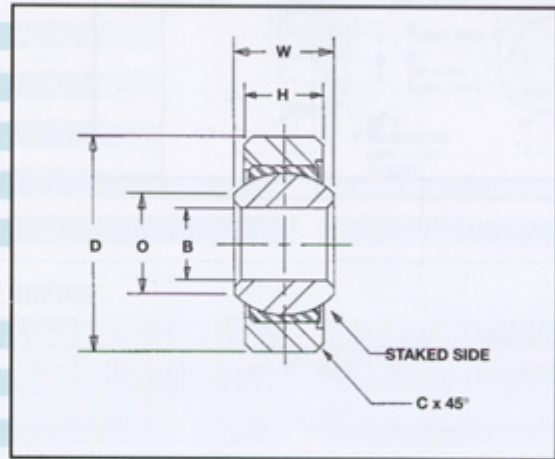
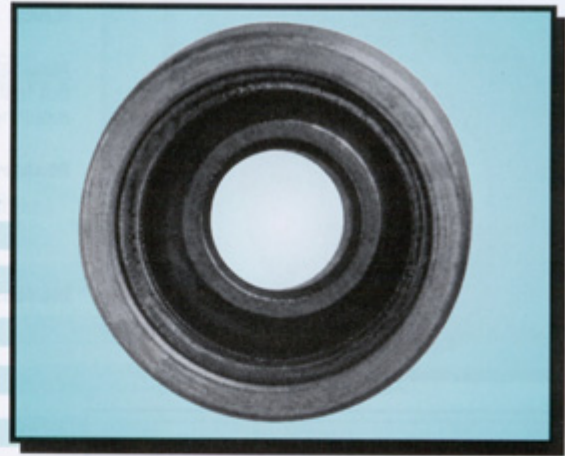
VBC SERIES • MAINTENANCE FREE CONSTRUCTION • SELF LUBRICATING • PLATED STEEL HOUSING • PHOSPHOR BRONZE RACE • HARDENED PLATED STEEL BALL

Alinabal's VBC Series spherical bearings combine a plated case hardened steel ball with a self lubricating sintered phosphor bronze race secured permanently in low carbon steel, plated housing. This combination assures reduced frictional wear for longer life and a superior resistance to corrosion. VBC Series spherical bearings have been found to fulfill the widest range of applications, and are an excellent general purpose spherical bearing.

Materials:

- Housing: Low carbon steel - all exposed surfaces plated for corrosion resistance
- Race: Sintered phosphor bronze - oil impregnated
- Ball: Low carbon steel - case hardened - plated for corrosion resistance and wear

Other variations can be supplied as specials.
For additional information and ordering instructions, contact
ALINABAL CUSTOMER SERVICE



Spherical Bearing Number	Dimensions in Inches							Angle of mis-alignment Degrees	Ultimate (Radial) Static Load Rating (lbs)
	B	D	H	W	Ball Dia	O	C		
	+0.025 -0.005	+0.000 -0.005	±.005	±.005	(REF)	(REF)	+0.015 -0.000		
VBC-3-G	.1900	.6250	.187	.281	.400	.285	.016	42	1,520
VBC-4-G	.2500	.7500	.281	.375	.510	.346	.016	34	2,900
VBC-5-G	.3125	.8750	.313	.437	.618	.438	.016	34	3,900
VBC-6-G	.3750	1.0000	.375	.500	.713	.508	.016	28	5,400
VBC-7-G	.4375	1.1875	.437	.562	.806	.578	.032	30	7,100
VBC-8R-G	.5000	1.3125	.500	.625	.931	.690	.044	32	9,300
VBC-8-G	.5000	1.3125	.531	.687	.931	.627	.044	25	9,900
VBC-10R-G	.6250	1.5000	.562	.750	1.097	.801	.044	30	12,400
VBC-10-G	.6250	1.5625	.687	.875	1.178	.789	.044	42	16,300
VBC-12R-G	.7500	1.8750	.687	.875	1.336	1.010	.044	25	18,480

Engineering Data

Environment and Mounting

Corrosive Environments

All Alinabal components are protected by plating or corrosion inhibiting oil. The bronze ball is recommended for applications involving normal exposure to water and is standard in the NBA Series, PBL Series and optional in the P Series. A case hardened, plated steel ball operating in sintered phosphor bronze races is recommended for use in a salt spray environment. There is virtually no galvanic action set up between ball and bronze race (V Series).

Lubrication and Contaminants

The PV rating of all series with metal-on-metal bearing members is based on the presence of an adequate lubricant film. Ratings for the Nyloy® race series are based on dry operation with the inherent lubrication provided by the bronze ball.

A controlled internal clearance is present in all Alinabal metal-on-metal bearings. The Nyloy® race series are molded with a positive interference fit-up which excludes contaminants and results in an excellent self-wiping action.

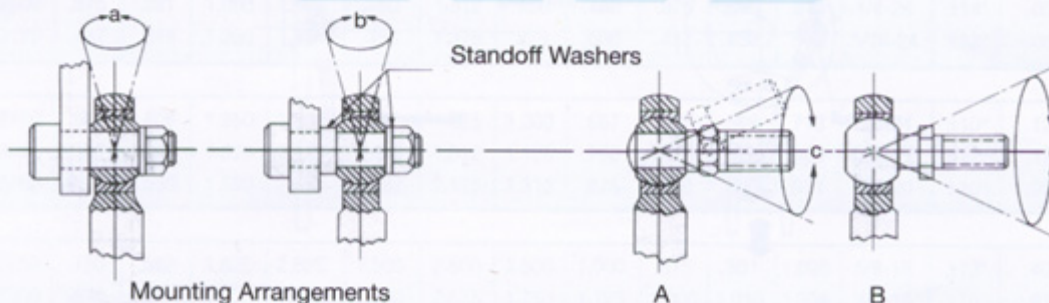
Protection from contaminants should be provided wherever possible. Grease fittings or lubricant entry provisions are available for all metal-on-metal bearings, except K Series. Periodic relubrication will improve operation under severe conditions. Contaminants are also flushed out during relubrication. Where relubrication is difficult or impractical, the self-lubricating features of the sintered ball or race materials and the Nyloy® race provide built-in protection.

Caution:

The lubricator mounting hole in housings reduces the strength of housings by varying amounts depending on size and location.

Mounting

Sintered bronze balls may be distorted by excessive clamping pressure. Care should be used in tightening a nut against the ball to prevent distortion or binding. Caution: certain ANSI bolt series with fillets under the head will interfere with proper assembly. Use of a countersunk washer is suggested.



Temperature and Water Immersion

Alinabal metallic bearings may be operated between -30°F and +300°F, with wider ranges obtained by the use of special lubricants. Nyloy® race bearings may be operated between -30°F and +150°F. Prolonged immersion of Nyloy® races in water can cause an increase of torque.

Mounting and Misalignment Factors

The single biggest reason rod end bearings are used is their ability to absorb gross misalignment and still transmit motion in the preferred direction. To overcome misalignment, the ball or housing rotates as far as necessary or until it strikes an obstruction. The amount of misalignment a bearing can absorb is limited by the mounting arrangement. Shown below are common mounting arrangements, along with an indication of the misalignment absorbing capabilities of each. The table lists the maximum angular displacement in each mounting mode.

A, P, V, VX, ARM, PRO, RM Series

Misalignment Cone Angles	Rod End Size							
	3	4	5	6	7	8	10	12
a	10	14	12	10	14	10	14	14
b	18	24	20	20	22	22	22	20
c	50	50	50	50	50	50	50	50

Rod Ends offer the least misalignment absorbing capability when fitted closely between the legs of a clevis or when the ball is bolted against the face of a lever. The limit is reached when the housing head strikes the mounting member.

Adding a standoff washer with the same diameter as the ball face increases misalignment absorbing capability. The limit is reached when the washer strikes the race.

The greatest misalignment compensation results when the ball is fitted with a stud, the shank diameter of which equals the ball bore chamfer, (see A). One piece ball studs (see B) of similar proportions also allow similar misalignment. Exceeding these dimensional limits may deform the race, so care should be taken to choose the proper mounting arrangement.

Engineering Data

Load Capacity — Catalog Static Load Ratings

Ultimate Static Load — gradually applied radial static load values beyond which structural failure or fracture will occur in the ball, race, housing, or stud.

Dynamic Load Capacity — The maximum radial load which can be applied, at a given rate of continuous rotation or oscillation, for 1000 hours prior to significant deterioration of the bearing surfaces. The Dynamic Load Capacity rating is usually limited in low speed, high load applications by the strength of the lubricant film (approx. 3500 PSI). With ultra high speed, low load applications (approx. 830 SFPM), the whirl out and loss of lubricant is the limiting factor. In the intermediate load/speed ranges, the Dynamic Capacity of sliding contact bearings can be predicted by the use of the PV Formula, (load in PSI on the projected surface area multiplied by the surface speed in FPM), once the PV value or ratings of the actual bearing elements is known.

Use of the PV Formula

Where P = pressure in PSI W = load in lbs
 V = velocity in FPM at interface N = RPM
 D = bearing diameter, (in.) L = bearing length, (in.)

$$PV = P \times V = \frac{W}{L \times D} \times \frac{\pi DN}{12} = \frac{\pi WN}{12L}$$

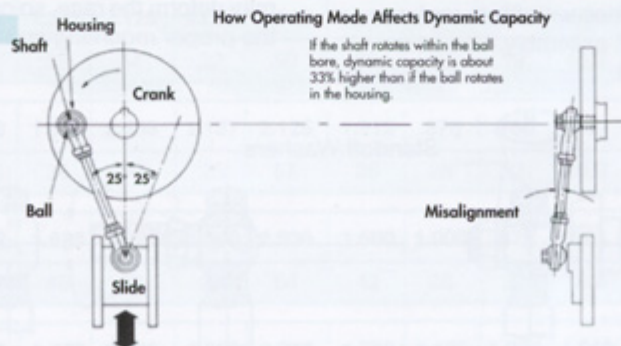
It should be noted that "D" cancels out in the computation, indicating that small diameter bearings can carry the same load as large diameter bearings. Within certain limits this is true, since doubling the diameter halves the pressure in PSI, but unfortunately doubles the speed in FPM. These relationships counteract each other.

Importance of considering shaft rotation in the ball bore.

Since $PV = \frac{\pi WN}{12L}$, it is important to note that with a given load and speed, there are only two variables available to increase bearing life in marginal applications. A bearing combination with a greater PV value can be chosen, if possible, or the length of the bearing can be increased. Normally a larger bearing size must be employed in order to take advantage of the longer bearing length (race width), if the ball rotates or oscillates in the race. A more cost-effective alternative, in many cases, involves the use of a shoulder bolt through the bore of a sintered bronze ball for mounting a rod end. The maximum PV of 50,000 is available, and the bearing length through the ball bore, which averages $\frac{4}{3}$ x the race width, will result in $\frac{3}{4}$ x the PV compared with ball rotation in the mating race. Many reliable applications have been successful only because the designer took advantage of this inherent extra provided by sintered bronze balls supporting a rotating shaft or shouldered bolt. Misalignment is accommodated between ball and race in that case.

Dynamic Capacity — Oscillating Applications

If less than a full revolution is made with each cycle of oscillation, the average velocity at the interface will be proportionately less than with continuous rotation. Each cycle will consist of two stops and starts and a peak velocity at midpoint which will be 1.57 times the average velocity. The average velocity of a bearing oscillating plus and minus 25° from a midpoint will be $100^\circ/360^\circ$ x the velocity achieved in continuous rotation. The peak (or critical) velocity will be $100^\circ/360^\circ \times 1.57 = .44$ that of continuous rotation. See illustration below.



Engineering Data

Rod Ends

Use of the load-speed ball rotation chart — bearings with a PV rating of 50,000 or less & dimensional proportions common to rod ends & spherical bearings.

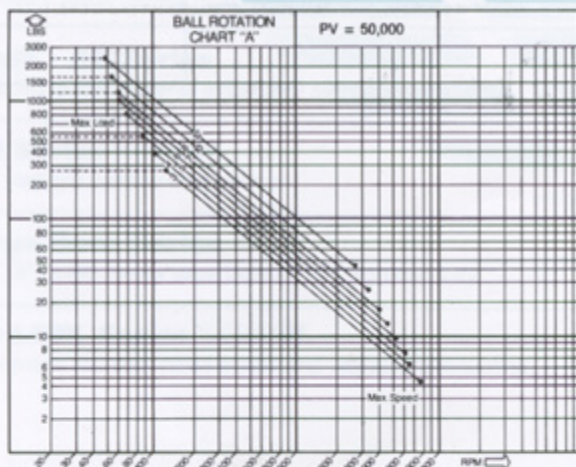
Series	Ball	Ball Matl. Code	Race	PV Rating	Max. Load	Interm. Speeds	Max. Speed
A	HARDENED STEEL, PLATED	GP	MILD STEEL MACHINED HOUSING	5,000	34% OF RATING	10% OF RATING	10% OF RATING
K	HARDENED STEEL, PLATED	G	MILD STEEL STAMPED HOUSING	5,000	20% OF RATING	10% OF RATING	10% OF RATING
KP	HARDENED STEEL, PLATED	G	INTEGRALLY MOLDED NYLOY® RACE	20,000	AS RATED	40% OF RATING	34% OF RATING
P	HARDENED STEEL, PLATED	G	INTEGRALLY MOLDED NYLOY® RACE	20,000	AS RATED	40% OF RATING	34% OF RATING
V	HARDENED STEEL, PLATED	G	SINTERED PHOSPHOR BRONZE	50,000	AS RATED	AS RATED	AS RATED
VX	HARDENED STEEL, PLATED	G	SINTERED PHOSPHOR BRONZE	50,000	AS RATED	AS RATED	AS RATED
S	HARDENED STEEL PLATED, STUD ONLY	GP	MILD STEEL MACHINED HOUSING	5,000	34% OF RATING	10% OF RATING	10% OF RATING
ALUMI-LITE	HARDENED STEEL, PLATED	G	INTEGRALLY MOLDED NYLOY® RACE	20,000	AS RATED	40% OF RATING	34% OF RATING

Spherical Bearings

COM	HARDENED HIGH CARBON-CHROMIUM STEEL, PLATED	E	MILD STEEL OILED	20,000	34% OF RATING	10% OF RATING	10% OF RATING
CBA CBB	SINTERED STEEL HARDENED, OIL FILLED	B2	HARDENED HIGH CARBON-CHROMIUM STEEL, PLATED	20,000	75% OF RATING	40% OF RATING	40% OF RATING
PLS	HARDENED STEEL, PLATED	G	INTEGRALLY MOLDED NYLOY® RACE	20,000	AS RATED	40% OF RATING	34% OF RATING
VBC	HARDENED STEEL, PLATED	G	SINTERED PHOSPHOR BRONZE	50,000	AS RATED	AS RATED	AS RATED

Use of the load-speed chart for shafts rotating in bore of sintered bronze oil-filled balls.

PBL	SINTERED BRONZE, OIL FILLED	A	INTEGRALLY MOLDED NYLOY® RACE	50,000	133% OF RATING	133% OF RATING	
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For corresponding series of light & extra light spherical bearings, reduce the ratings proportional to the length of their bearing surfaces.

Good design practice requires doubling the application load prior to selecting a bearing size appropriate for continuous ball or shaft rotation. Compensation for loss of the lubricant under oscillating conditions requires tripling the application load.

EXAMPLES OF RATINGS FROM CHART

VM-6-G 800 lb load up to 70 RPM — 260 lbs at 200 RPM.

PM-6-G 800 lb load up to 40% x 70 RPM = 28 RPM.
40% x 260 = 104 lbs at 200 RPM.

Rod End Interchange Chart

MALE ROD ENDS

ALINABAL	AURORA	FK	HEIM	MORSE/SEAL MASTER	NATIONAL	SUPERIOR
VM		MB/MSB	HM-C	TM	BM	BSM
VXM	MM/MB	M	HM	TRE	MBM	
RM ¹	MW/MG		HM	TRE		
RM ²	XAM/XAB	RSMX			RMX	
AM	CM/CB	CM	M	CFM	SM	SSM
PM			CMHD	CTMD	NM	SPM
KM						
KPM						
LCRM	MM/MB/XM/XB	JM/RSM		TRE	MTSM/RM	
PRO-LINE ³						
ISO-LINK ⁴						

FEMALE ROD ENDS

ALINABAL	AURORA	FK	HEIM	MORSE/SEAL MASTER	NATIONAL	SUPERIOR
VF		FB/FSB	HF-C	TF	BF	BSF
VXF	MW/MG	F	HF	TR	MBF	
RF ¹	MW/MG		HF	TR		
AF	CW/CG	CF	F	CCF	SF	SSF
PF			CFHD	CTFD	NF	SPF
KF						
KPF						
PRO-LINE ³						
ISO-LINK ⁴						

¹ General purpose, low carbon steel, size 16 (1 inch size) male/female.

² High capacity, chrome moly, 3 pc., male only.

³ Fully staked, carbon fiber race, rod ends.

⁴ Noise and vibration isolating rod end - elastomeric insert.

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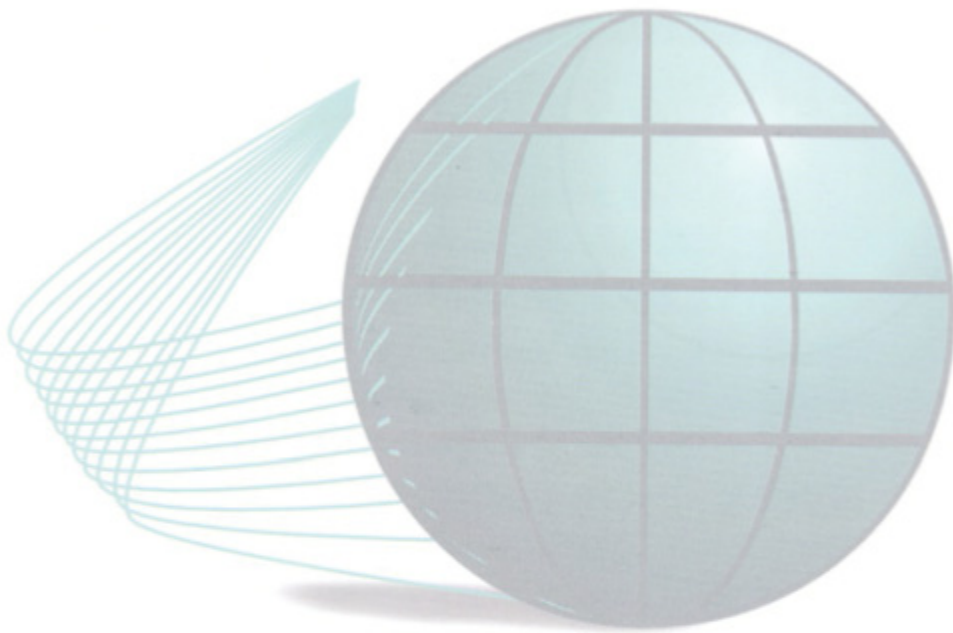
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