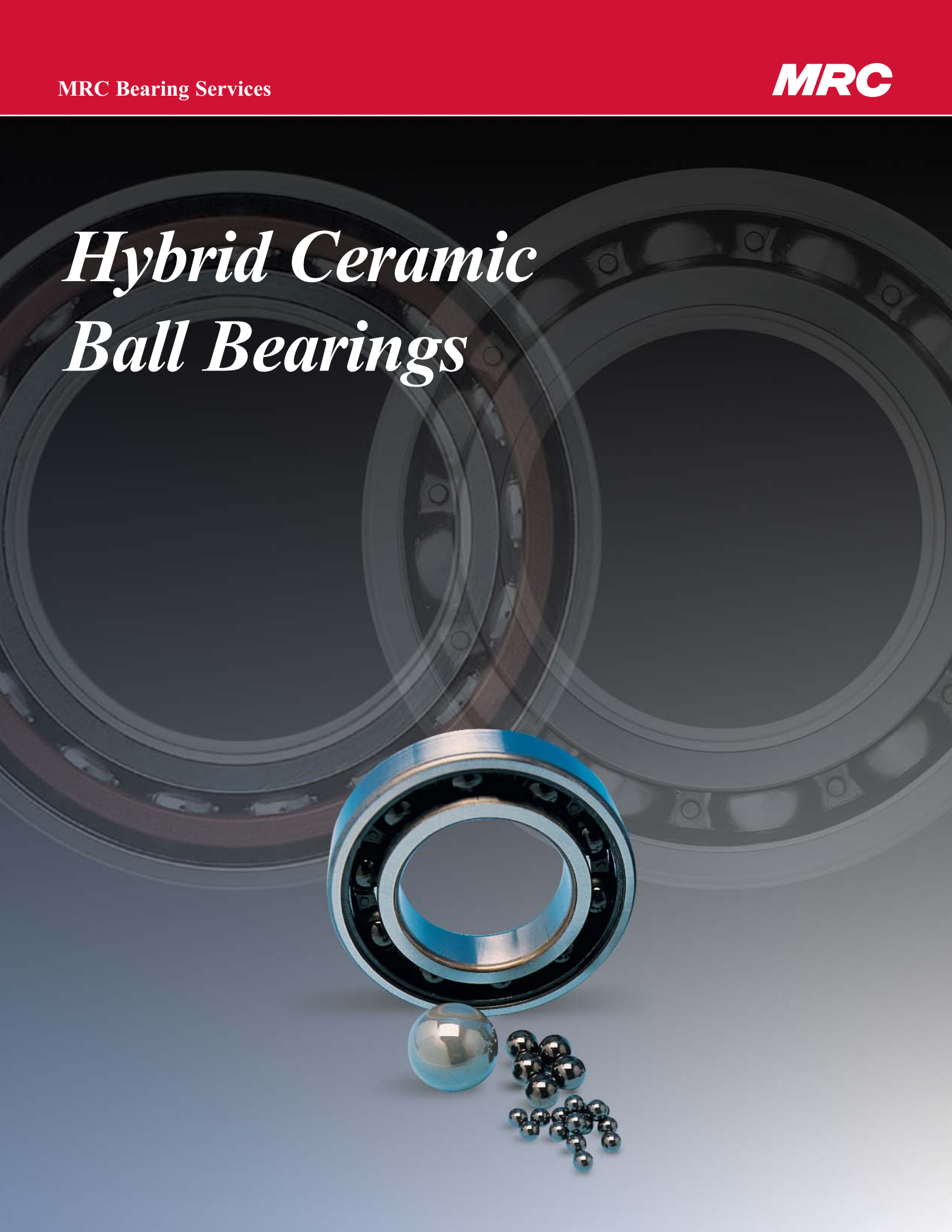
MRC

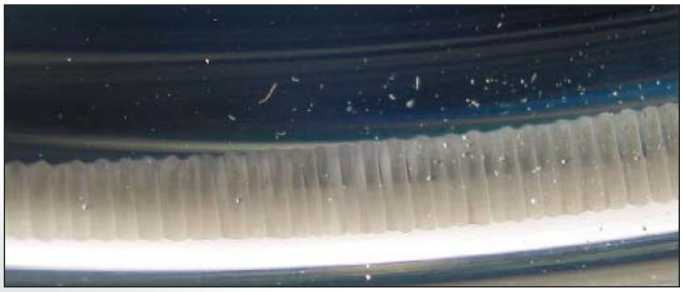
Hybrid Ceramic Ball Bearings



Hybrid Ceramic Ball Bearings . . . a combination of traditional

Prevents Electrical Arcing

When electrical current passes across bearings, a wash-board or fluting pattern appears on the raceways, in addition to a darkened grey appearance. This damage usually results in excessive noise which requires that the bearing be removed. Besides the surface damage, pre-mature aging of the lubricant also occurs. The natural insulating properties of ceramic material eliminates this type of damage.



Fluting created by electrical arcing

Lower Maintenance Costs

Maintenance costs can quickly add up if a bearing must be changed frequently. Anything that extends the service life of a bearing without increasing maintenance costs will reduce the operating cost of the equipment. Though the initial cost of a hybrid bearing is higher than a standard steel bearing, the difference is quickly recovered in maintenance savings. Less friction also results in lower energy costs.

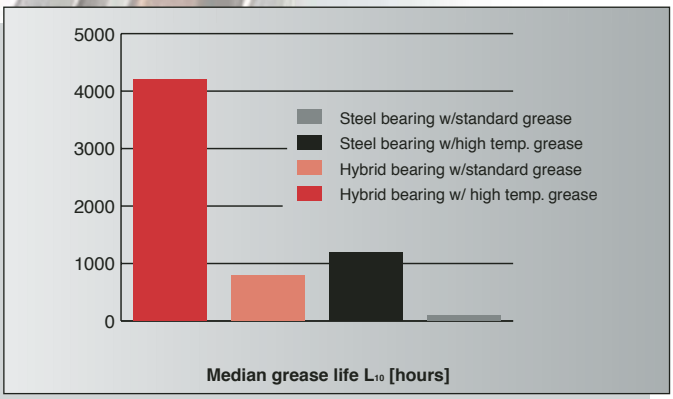
Material Properties	Bearing Steel	Bearing Silic Nitride
Mechanical properties		
Density [g/cm^3]	7.9	3.2
Hardness, HV10 [kg/mm^2]	700	1600
Modulus of elasticity, E [GPa]	210	310
Coefficient of thermal expansion [/°C]	12 x 10^{-6}	3 x 10^{-6}
Electrical properties		
Electrical resistivity [Wm]	0.4 x 10^{-6} (conductor)	10^{12} (insulato
Relative dielectric constant	N/A	4.2 to 6.1
Magnetic field influence	Yes	No
Chemical resistance	Reactive	Inert

Extended Service Life

Most bearings are designed into applications based on loading conditions and do not take into account factors such as lubrication, contamination and maintenance. Without proper attention to these external factors, a steel bearing rarely reaches its design L_{10} life and therefore has a shortened service life. Because of the properties of ceramics, the service life of a hybrid bearing is up to 10 times that of a standard steel bearing. And longer service life reduces the need for maintenance on your machine as well as the costly interruptions in production.

Extended Grease Life

In environments that place high demands on the bearing lubricant, standard bearings experience surface wear because of insufficient lubricant film. Bearings can fail if the initial grease charge is not replenished within an acceptable period of time. Hybrid bearings run cooler and can operate with thinner lubricant films, so there is less aging of the grease and the required relubrication interval will be longer. The result is increased service life compared to standard bearings in the same operating conditions.



Extended grease life

52100 steel rings precision matched with silicon nitride (ceramic) balls

Wear caused by static vibration

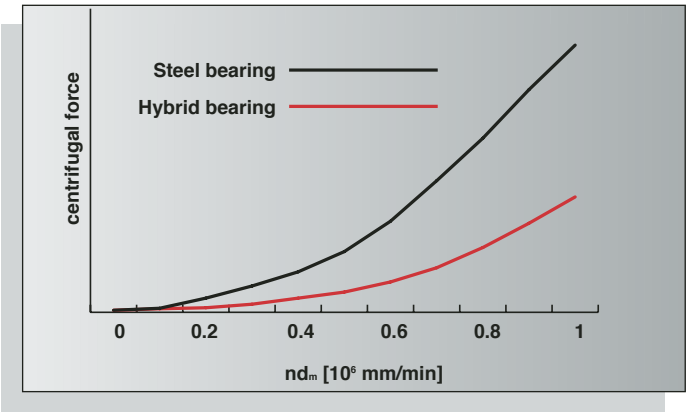
Reduced Wear from Vibration

In equipment exposed to static vibration, there is an inherent risk of false brinelling, (the wearing away of the surfaces within the ball and raceway contacts) which can eventually lead to spalling and premature failure. Because of the lighter weight ceramic balls and dissimilar materials, the risk of false brinelling damage is much less.

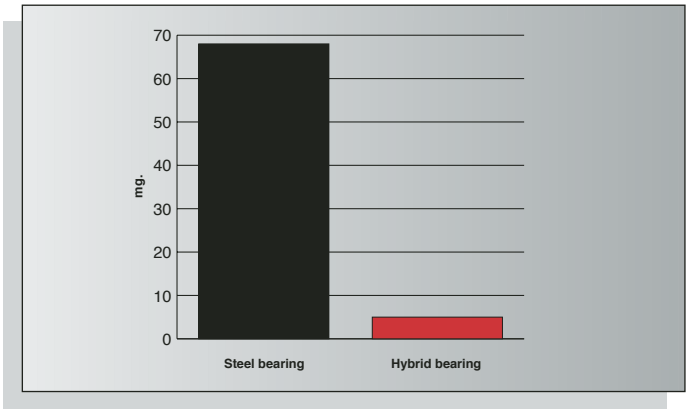
con	Benefit
	Lower density reduces the centrifugal force and thereby reduces bearing friction
	Higher hardness promotes wear resistance against hard particles and lower plastic deformation
	Higher modulus of elasticity increases the bearing stiffness. Hybrid bearings deflect less under load, providing more predictable performance
	Lower coefficient of expansion reduces the effects of ring temperature difference resulting in more stable clearance or preload
or)	The ceramic balls break the electrical current (DC) path and act as an insulator
	The ceramic balls break the electrical current (AC) path and act as a large impedance
	Ceramic balls do not respond to magnetic forces
	Ceramic to steel contacts show no micro-welding and do not seize during poor lubrication

Lower Operating Temperatures

The heat generated in bearings is attributable to viscous friction from lubrication and load dependent friction between the balls and raceways. The source of the loading is external as well as internal. There is little that can be done to reduce the external loads. However, since ceramic balls have only 40% of the density of steel balls, the centrifugal load generated by the balls is less and the internal friction is lower. This provides cooler running for the same operating conditions or, if applicable, a higher rotational speed while maintaining the same temperature.



Operating temperature



Wear reduction

Reduced Wear from Contamination

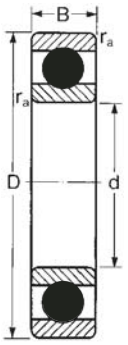
In contaminated environments, solid particles create dents in the rolling surfaces and raised edges around those dents. This condition causes noise and premature wear as the steel balls roll over those surfaces. The harder ceramic ball material smooths the surface roughness with no material removal. Also, there is little evidence of adhesive wear as seen in steel bearings. This reduces the noise and wear, which extends the bearing service life.

Part Numbering System

Basic Conrad Series
100KS
200S
300S

Sealing Options
ZZ- Two contact seals
FF- Two shields
FFP- Two low friction seals

Other suffixes
HYB- Ceramic balls
#1- ABEC 1



MRC hybrid ball bearings are stocked in an open version in the sizes listed. In most cases, hybrid bearings can also be supplied with seals, shields, or low friction seals through the MRC Made-to-Order (MTO) program. In addition to those listed, other sizes of the 200S and 300S series as well as the 100KS series can be supplied through the MTO program. Most series of angular contact ball bearings can also be supplied through MTO. Contact MRC at 1-800-MRC-7000 for price, lead time and other information for non-stocked variants.

MRC Bearing Services
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www.mrcbearingservices.com

Designation	Principal Dimensions				Mass	
	d	D	B	$r_{1,2}$ min		
	mm	mm	mm	mm	kg	lbs
306S-HYB#1	30	72	19	1.00	0.328	0.72
207S-HYB#1	35	72	17	1.10	0.265	0.58
307S-HYB#1	35	80	21	1.50	0.422	0.93
208S-HYB#1	40	80	18	1.10	0.334	0.74
308S-HYB#1	40	90	23	1.50	0.580	1.28
209S-HYB#1	45	85	19	1.10	0.384	0.85
309S-HYB#1	45	100	25	1.50	0.769	1.70
210S-HYB#1	50	90	20	1.10	0.427	0.94
310S-HYB#1	50	110	27	2.00	0.997	2.20
211S-HYB#1	55	100	21	1.50	0.564	1.24
311S-HYB#1	55	120	29	2.00	1.282	2.83
212S-HYB#1	60	110	22	1.50	0.737	1.62
312S-HYB#1	60	130	31	2.00	1.606	3.54
213S-HYB#1	65	120	23	1.50	0.946	2.09
313S-HYB#1	65	140	33	2.00	1.957	4.31
214S-HYB#1	70	125	24	1.50	1.017	2.24
314S-HYB#1	70	150	35	2.00	2.181	4.81
215S-HYB#1	75	130	25	1.50	1.106	2.44
315S-HYB#1 *	75	160	37	2.00	2.884	6.36
216S-HYB#1	80	140	26	2.00	1.358	2.99
316S-HYB#1 *	80	170	39	2.10	3.415	7.53
217S-HYB#1	85	150	28	2.00	1.712	3.77
317S-HYB#1	85	180	41	2.50	4.012	8.85
218S-HYB#1	90	160	30	2.00	2.082	4.59
318S-HYB#1 *	90	190	43	2.50	4.657	10.27
220S-HYB#1	100	180	34	2.00	3.006	6.63
222S-HYB#1	110	200	38	2.00	4.169	9.19
224S-HYB#1*	120	215	40	2.00	4.935	10.88
226S-HYB#1*	130	230	40	3.00	5.471	12.06
228S-HYB#1*	140	250	42	3.00	7.260	16.01
230S-HYB#1*	150	270	45	3.00	10.855	23.94
232S-HYB#1*	160	290	48	3.00	13.583	29.95
236S-HYB#1*	180	320	52	4.00	17.319	38.19

* Scheduled to be put into stock 4th qtr. 2002.

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