SiC (Silicon Carbide)

Key properties	Application
◇ Low density	◇ Fixed and moving turbine components
◇ High strength	◇ Suction box covers
◇ Low thermal expansion	◇ Seals,bearings
◇ High thermal conductivity	◇ Ball valve parts
◇ High hardness	◇ Hot gas flow liners
◇ High elastic modulus	◇ Heat exchangers
◇ Excellent thermal shock resistance	◇ Semiconductor process equipment
◇ Superior chemical inertness	

Si_3N_4(Silicon Nitride)

Key properties	Application
◇ High strength over a wide temp. range	◇ Rotating bearing balls and rollers
◇ High fracture toughness	◇ Cutting tools
◇ High hardness	◇ Engine moving parts-valves, turbocharger rotors
◇ Outstanding wear resistance	◇ Engine wear parts-cam followers, tappet shims
◇ Impingement and Frictional modes	◇ Turbine blades, vanes, buckets
◇ Good thermal shock resistance	◇ Metal tube forming rolls and dies
◇ Good chemical resistance	◇ Precision shafts and axles in high wear environments
	◇ Weld positioners

ZrO2 (Zirconium Oxide)

Key properties	Application
◇ Use temperature up to 2400^{o}C	◇ Precision ball valve balls and seats
◇ High density	◇ High density ball and pebble mill grinding media
◇ Chemical inertness	◇ Rollers and guides for metal tube forming
◇ Resistance to molten netals	◇ Thread and guides
◇ Ionic electrical conduction	◇ Hot metal extrusion dies
◇ Wear resistance	◇ Deep weel down-hole valves and seats
◇ High fracture toughness	◇ Power compacting dies
◇ High hardness	◇ Marine pump seals and shaft guides
	◇ Oxygen sensors
	◇ High temperature induction furnace susceptors
	◇ Fuel cell membranes
	◇ Electrical furnace heater over 2000^{o}C in oxidizing atmospheres

Al2O3 (9 99.5% Aluminum Oxide)

Key properties	Application
◇ High wear resistance	◇ Gas laser tubes
◇Excellent dielectric property from DC to GHz frequencies	◇ Wear pads
◇ Resists strong acid and alkali attack at elevated temp.	◇ Seal rings
◇ Good thermal conductivity	◇ High temperature electrical insulators
◇ Excellent size and shape capability	◇ High voltage insulators
◇ High strength and stiffness	◇ Furnace liner tubes
◇ Available in purity ranges from 94% , an easily	◇ Thread and guides
metallizable composition, to 99.5% for the most	◇ Electronic substrates
demanding high temperature applications	◇ Ballistic arrmor
	◇ Abrasion resistant tube and elbow liners
	◇ Thermmometry sensors
	◇ Laboratory instument tubes and sample holders
	◇ Instrumentation parts for thermal property test machines
	◇ Griding media

PEEK

Properties

◇ Heat resistance of PEEk is more excellent than other plastic of resistant to high temperature, and PEEk has high intensity high modulus, high fracture toughness

◇ large rigidness, good dimensional stability, small linear expansion coefficient

◇ Excellent resistance to chemicals goods. in usual chemicals goods, only strong sulfuric acid can dissolve or destroy it it's corrosion resistance is nearly same as nickel steel,at the same time,it has fire resistance and strong resistance to radiation.

◇ Good toughness, well resistance to fatigue ;

◇ outstanding performance of resistance to Sliding wear and fretting wear, especially below 250 ℃, to maintain high resistance to wear and low friction coefficient;

◇ Easy to extrusion and injection molding,outstanding processing performance, high efficiency molding;

◇ well self-lubricating, insulation stability and resistance to hydrolysis

Typical uses

◇ In the aerospace and aircraft field, used for manufacturing various aircraft components.

◇ Use for manufacturing of bearing, gasket, seal, clutch toothed ring, etc. Various kinds of spare parts in the car transmission brake and widely used in air conditioning system;

◇ manufacturing pipelines valves and pumps of conveying the super pure water ;

◇ In the semiconductor industry, PEEk is used to manufacture wafer carrying device, electronic insulation diaphragm anc various connecting device.

◇ Make compressor valves, piston rings, seals and all kinds of chemical pump body, valve components;

◇ Produce high sterilization demand and repeated using surgery and dental equipment.

Chemical Durability Comparison Chart

（UNITS：WEIGHT LOSS：mg/㎡/day）

MEDIA	TEMP	99.5% Al2O3	99.9% Al2O3	ZrO2	SSiC	Si3N4	SS304	SS316	HC	STFLLITE #6	STFLLITE #12
20% HCL	60℃	A	A	A	A	B	C	C	B	C	C
20% HCL	95℃	A	A	A	A	C	-	-	C	C	C
90% H2SO4	60℃	A	A	A	A	A	C	C	B	B	C
90% H2SO4	95℃	A	A	A	A	B	C	C	C	-	-
60% H3PO4	60℃	A	A	A	A	C	C	C	A	B	A
60% H3PO4	95℃	A	A	A	A	C	C	C	A	C	C
10% HF	60℃	B	B	C	A	A	C	C	B	C	C
46% HF	95℃	C	C	C	A	C	-	-	C	-	-
60% HNO3	60℃	A	A	A	A	C	A	A	C	A	A
60% HNO3	95℃	B	A	A	A	C	B	B	C	B	C
30% NaOH	60℃	B	A	A	A	B	A	A	A	C	A
30% NaOH	95℃	B	A	A	A	C	A	B	A	-	B

A=<0.1mmg/㎡/day Negligible or no corrosion and recommended for this service

B=0.1~0.3 mmg/㎡/day Little or slight corrosion; Use with annual inspection

C=>0.3 mmg/㎡/day Significant corrosion,and not recommended for valve use

— = Test not completed due to violent corrosion

Engineering Properties of Ceramic materials

Mechanical properties

Items	99.5% Alumina Al_2O_3	99.5% Alumina Al_2O_3	Silicon Carbide S-SiC	Silicon Nitride HP-Si_3N_4	Silicon Nitride GPS-Si_3N_4	Zircnia ZrO_2
Color	white	Ivory	Black	Charcoal	Charcoal	Lightgray
Bulk Density (g/cc)	3.8	3.97	3.1~3.17	3.23~3.25	3.23~3.25	6~6.01
Flexural strength (Mpa)	379	352	552	906	689	620
Elastic modulus (GPa)	372	386	400	311	311	200
Poisson's ratio	0.22	0.22	0.14	0.27	0.24	0.3
Compressive strengh (Mpa)	2620	3792	3900			
Fracture toughness K_{IC} (Mpa*m1/2) -notched beam test	4~5	4~5	3.0～5.0	6.1	5.7	11
Max working temperature (℃)	1750	1900	1650	1200	1000	1500
Hardness(kg/mm^2)	1440	1440	2800	1580	1450	1300

Thermal properties

Thermal shock resistance(℃) (immersion test,quenchina in 20℃ water)	50	50	75	87	85	200
Thermal Coefficient (W/M^o K)	35		120	30	29	2~3
Coefficient of thermal expansion (10^{-6}/C)	8.5	8.5	4	3.3	3.3	10.3
Specific Heat (J/Kg C^O K)	880		750			

Electrical properties

Special electrical resistance (Ωmm^2/m)	10^8-10^{18}		10-10^3	10^8—10^{18}		10^5-10^{15}
Dielectric Strength (ac-kv/mm)	16.9		semi-conductor			
Dielectric Constant (f/m)	9.8					

Other properties

Corrosion resistance	good		good	good		good
Stress cycles (50% failed) turn	-		-	10^7 ～ 10^9		105
No lubrication friction	-		little	little		little
Magnetism			non-magnetic			
Centrifugal force	middle		little	little		large
Operating temperature Increasing	-		low	low		-
Size stability	unstable		stable	stable		unstable
Conductivity	insulator		conductor	insulator		insulator
Rolling contact failure form				flaking		crushing

Application of Ceramic Bearings

The ceramic bearings and products are mainly used for high speed shaft, dental drill instument computer hard diskdriver, electronic cooling fan, anti-magnetic, anti-corrosion and high temperature encironment and so on.

◇ High temperature field

Such as for feeding roller of high temperature furnaces. Si_3N_4 ceramic retains strength and hardness nearly up to 800^{o}C, and Aluminum Oxide, Silicon Carbide can stand nearly up to 1000^{o}C~ 1400^{o}C, but bearing steel hardness will drop when the temperature is over 120^{o}C

◇ High-speed rotation field

The specific gravity of Si3N4 is 3.20g/cm3 and that of bearing steel is 7.85g/cm3, therefore the ceramic rolling elements can effectively restrain the centrifugal force with better performance in high speed rotation, which can reduce the load of rolling elements raceway corresponding.

◇ Aviation and Airspace fields

The coefficient of thermal expiation of Si3N4 is 3.2×10^{-6}/K but that of bearing steel is 10×10^{-6}/K, so the ratio to each other is nearly 1 to 4 . Therefore Si3N4 ceramic bearings are more stable and reliable in a temperature diviation condition.

◇ Main shaft of machine tools

The Si3N4 ceramic has nearly double hardness of bearing steel, and 1/3 modulus of elasticity larger than bearing steel. We can found that the elastic deformation of Si3N4 is quiet small and under an identical loading.

◇ Chemical machinery, Food industry and Marine industry

The ceramic bearings can solve corrosion problems (acid, alkali, salt and so on)

◇ High vacuum field

In high vacuum environment, the advantage is the self-lubrication.Ceramic bearings are the best choice in order to prevent vacuum pollution from lubrication contamination.

◇ Strong magnetic environment

In a strong magnetic environment the metal powder which is produced from wear of steel bearing will be adhered to the surfaces of rolling element and raceway, it will causes flanking in advance and increasing noise. The solution is also to use ceramic bearing.

◇ Toys, Roller Skates, Model Navigation and Motor-Driven Toys

The high price of ceramic bearing limits its wide use in the world. So up to now most application of ceramic bearing are merely in high speed, high precision mechanism. Not like full ceramic bearings the hybrid ceramic ball bearing that combines ceramic balls and steel inner ring and outer ring, is most adopted by the market. Owing to adopting near net shaping technology, so the performance is better than steel bearings.

Ceramic materials are noted for their characters of high strength in high teperature , high rigidity corrosion resistance, high temperature resistance, electrical insulatioin, non-magnetic, with these characters, ceramic bearings is the best product to replace steel bearing to satify the requirements in severe conditions where a steel bearings can't achieve.

Rolling element model	Material	Anti-Corrosion	Speed Limited	Max working temp	load capacity
 Hot pressure Si_3N_4 balls	Si_3N_4	☆★★★★	★★★★★	1100℃	☆★★★★
	◇Usage	high precision bearing balls, high speed, vaccum, fixed anode X-ray tube high temp, low temp, electric insulation, high precision ball screw set valve ball for acid, alkali, salt, measure pump, flowmeter			
	◇Characteristic	resistance to strong acid, strong alkali, salt and gas of deleterious, long contact fatigue life, high hardness, resistance to wear			
 Pressureless sintered SiC balls	SiC	★★★★★	☆☆★★★	1400℃	☆☆★★★
	◇Usage	high precision bearing balls, high speed, vaccum, fixed anode X-ray ltube, high temp, low temp, electric insulation, high precision ball screw set, valve ball for acid, alkali, salt, measure pump, flowmeter			
	◇Characteristic	resistance to strong acid e alkali, salt and gas of deleterious, especially resistance to hydrofluoric, long life, high hardness, resistance to wear			
 ZrO_2 balls	ZrO_2	☆★★★★	☆★★★★	600℃	★★★★★
	◇Usage	high precision bearing balls, high speed, vaccum, fixed anode X-ray ltube, high temp, low temp, electric insulation, high precision ball screw set, valve ball for acid, alkali, salt, measure pump, flowmeter and valves ball plunger for deep pump ,deep well pump			
	◇Characteristic	resistance to strong acid e alkali, salt and gas of deleterious, long life high hardness, especially resistance to wear, high modulus of elasticity			
 99.5% Al_2O_3	Al_2O_3	☆★★★★	☆★★★★	1400℃	☆☆☆★★
	◇Usage	high precision bearing balls, high speed, vaccum, fixed anode X-ray ltube, high temp, low temp, electric insulation, high precision ball screw set, valve ball for acid, alkali, salt, measure pump, flowmeter			
	◇Characteristic	resistance to strong acid e alkali, salt and gas of deleterious, especially resistance to hydrofluoric, long life, high hardness, resistance to wear			
 Ceramic Tapered and Cylindrical Rollers	SiC Si_3N_4 ZrO_2	★★★★★ ☆★★★★ ☆★★★★	☆☆★★★ ★★★★★ ☆★★★★	1400℃ 1100℃ 600℃	☆☆★★★ ☆★★★★ ★★★★★
	◇Type	tapered rollers and cylindrical rollers			
	◇Usage	high precision, high speed, vacuum, high temp, low temp electric insulation, nonmagnetic			
	◇Characteristic	resistance to strong acid e alkali, salt and gas of deleterious long life, high hardness, resistance to wear			

Ceramic Balls Standard

Grade	Tolerance	Lot Diameter Variation	Ball Diameter Variation	Deviation from Spherical form	Surface Roughness
	NOT EXCEED（μm）				
3	±5	0.13	0.08	0.08	0.012
5	±7	0.25	0.13	0.13	0.02
10	±10	0.5	0.25	0.25	0.025
16	±12	0.7	0.4	0.4	0.032
20	±14	0.8	0.5	0.5	0.04
28	±14	1.2	0.7	0.7	0.05

Standard for the finished steel balls	**Standard for the finished ceramic balls**
◇ Hardness on Spherical: 60~66HRC	◇ Hardness on Spherical: Si_3N_4/Sialon/SSiC 2300~2700HV
◇ Hardness Variation of a Ball: ≤0.5HRC	◇ ZrO_2: 1200~1500HV
◇ Hardness Variation of One Lot: ≤1.0HRC	◇ Hardness Variation of a Ball: ≤ 2 HRC
◇ Decarburized layer: ≤0.02mm	◇ Hardness Variation of One Lot: ≤ 3 HRC
◇ Micro-structure:1~3 class, no troostite on	◇ Density: Si_3N_4/SSiC 3.15~3.26g/cm^3
the surface	◇ ZrO_2: 6.01~6.04g/cm^3
	◇ Sialon: 2.93~3.2g/cm^3
	◇ Micro-structure: micro-fine structure having well distraction
	Gas hole ratio: ＜1%

High Precision Ceramic Balls

Dimension List

Grade: G5~G28

Material: Si_3N_4, SSiC, Al_2O_3, ZrO_2

(hot pressed Silicon Nitride, Pressureless sintered Silicon Carbide, Aluminum Oxide, Zirconium Oxid)

The largest ceramic ball diameter which we are able to manufacture and process is 80mm, and the precision grade and material will be in accordance with customers' requirements

Ball Dia.	Balls Qty/Kg			
（mm）	SSiC	Si3N4	ZrO2	Al2O3
1.2	349761	345389	183291	283396
1.5	179077	176839	93845	145099
1.5785	151068	149180	79167	122404
2	75548	74604	39519	61213
2.3812	44764	44204	23458	36270
2.5	38681	38197	20270	31341
3	22385	22105	11731	18137
3.175	18884	18647	9896	15301
3.5	14096	13920	7387	11422
3.9688	9668	9547	5066	7834
4	9444	9325	4949	7652
4.5	6632	6550	3476	5374
4.7625	5595	5525	2932	4533
5	4835	4775	2534	3918
5.5	3633	3587	1904	2943
5.5562	3524	3480	1847	2855
5.9531	2865	2829	1501	2321
6	2798	2763	1466	2267
6.35	2360	2331	1237	1913
6.5	2201	2173	1153	1783
6.7469	1968	1943	1031	1594
7	1762	1740	923	1428
7.1438	1658	1637	869	1343
7.5	1433	1415	751	1161
7.9375	1209	1193	633	979
8	1180	1166	619	956
8.5	984	972	516	797
8.7312	908	897	476	736
9	829	819	434	672
9.5	705	696	369	571
9.525	699	691	367	567
10	604	597	317	490
10.319	550	543	288	446
11	454	448	238	368
11.113	440	435	231	357
11.5	397	392	208	322
11.509	396	392	208	321

Ball Dia.	Balls Qty/Kg			
（mm）	SSiC	Si3N4	ZrO2	Al2O3
11.906	358	354	188	290
12	350	345	183	283
12.303	325	320	170	263
12.7	295	291	155	239
13	275	272	144	223
13.494	246	243	129	199
14	220	218	115	178
14.288	207	205	109	168
15	179	177	94	145
15.0812	176	174	92	143
15.875	151	149	79	122
16	148	146	77	120
16.6688	130	129	68	106
17	123	121	64	100
17.4625	113	112	59	92
18	104	102	54	84
18.2562	99	98	52	80
19	88	87	46	71
19.05	87	86	46	71
19.8438	77	76	41	63
20	76	75	40	61
20.6375	69	68	36	56
21	65	64	34	53
22	57	56	30	46
22.225	55	54	29	45
23	50	49	26	40
23.0188	50	49	26	40
23.8125	45	44	23	36
24	44	43	23	35
25	39	38	20	31
25.4	37	36	19	30
26	34	34	18	28
26.9875	31	30	16	25
28	28	27	14	22
28.575	26	26	14	21
30	22	22	12	18

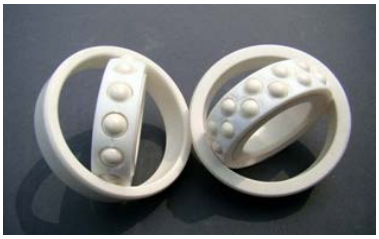
Product Introduction -Ceramic Ball Bearings

Brief Introduction

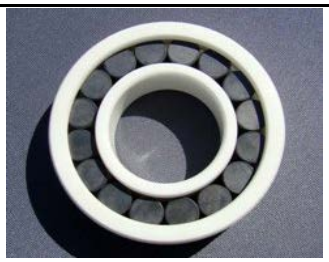
Bearig Type	Bearing material			Bearing Sereis	Anti-Corrosion	Limit Speed	Max working temp	Load capacity
	Rings	Balls	Cage types					
	Si_3N_4	Si_3N_4	PEEK PTFE PFA graphite reinforcing PTFE	6000 6200 6300	☆★★★★	★★★★★	260℃	☆★★★★
	ZrO_2	Si_3N_4			☆★★★★	☆★★★★	260℃	☆★★★★
	ZrO_2	ZrO_2			☆★★★★	☆★★★★	260℃	★★★★★
	ZrO_2	SSiC			☆★★★★	☆★★★★	260℃	☆☆★★★
Ceramic Deep Groove Ball Bearings	SSiC	SSiC			★★★★★	☆☆★★★	260℃	☆☆★★★
	Si_3N_4	Si_3N_4	PEEK PTFE PFA graphite reinforcing PTFE	61800 61900 71800 71900	☆★★★★	★★★★★	260℃	☆★★★★
	ZrO_2	Si_3N_4			☆★★★★	☆★★★★	260℃	☆★★★★
	ZrO_2	ZrO_2			☆★★★★	☆★★★★	260℃	★★★★★
	ZrO_2	SSiC			☆★★★★	☆★★★★	260℃	☆☆★★★
Thin wall Deep Groove Ball Bearings Thin wall Angular Contact Ball Bearings	SSiC	SSiC			★★★★★	☆☆★★★	260℃	☆☆★★★
	Si_3N_4	Si_3N_4	PEEK PTFE PFA graphite reinforcing PTFE	683~689 693~699 603~609 623~629 633~639	☆★★★★	★★★★★	260℃	☆★★★★
	ZrO_2	Si_3N_4			☆★★★★	☆★★★★	260℃	☆★★★★
	ZrO_2	ZrO_2			☆★★★★	☆★★★★	260℃	★★★★★
	ZrO_2	SSiC			☆★★★★	☆★★★★	260℃	☆☆★★★
Ceramic Miniature Deep Groove Ball Bearings	SSiC	SSiC			★★★★★	☆☆★★★	260℃	☆☆★★★
	Si_3N_4	Si_3N_4	PEEK PTFE PFA graphite reinforcing PTFE	7000 7200 7300	☆★★★★	★★★★★	260℃	☆★★★★
	ZrO_2	Si_3N_4			☆★★★★	☆★★★★	260℃	☆★★★★
	ZrO_2	ZrO_2			☆★★★★	☆★★★★	260℃	★★★★★
	ZrO_2	SSiC			☆★★★★	☆★★★★	260℃	☆☆★★★
Ceramic Angular Contact Ball Bearings	SSiC	SSiC			★★★★★	☆☆★★★	260℃	☆☆★★★
	Si_3N_4	Si_3N_4	PEEK PTFE PFA graphite reinforcing PTFE	5200 5300	☆★★★★	★★★★★	260℃	☆★★★★
	ZrO_2	Si_3N_4			☆★★★★	☆★★★★	260℃	☆★★★★
	ZrO_2	ZrO_2			☆★★★★	☆★★★★	260℃	★★★★★
	ZrO_2	SSiC			☆★★★★	☆★★★★	260℃	☆☆★★★
Ceramic Double Angular Contact Ball Bearings	SSiC	SSiC			★★★★★	☆☆★★★	260℃	☆☆★★★

Product Introduction -Ceramic Ball Bearings

Brief Introduction

Bearig Type	Bearing material			Bearing Sereis	Anti-Corrosion	Limit Speed	Max working temp	Load capacity
	Rings	Balls	Cage types					
 Ceramic Self-aligning Ball Bearings	Si_3N_4	Si_3N_4	PEEK PTFE PFA graphite reinforcing PTFE	1200 1300 2200 2300	☆★★★★	★★★★★	260℃	☆★★★★
	ZrO_2	Si_3N_4			☆★★★★	☆★★★★	260℃	☆★★★★
	ZrO_2	ZrO_2			☆★★★★	☆★★★★	260℃	★★★★★
	ZrO_2	SSiC			☆★★★★	☆★★★★	260℃	☆☆★★★
	SSiC	SSiC			★★★★★	☆☆★★★	260℃	☆☆★★★
 Ceramic Spherical surface Ball Bearings (Ceramic Insert Ball Bearigns)	Si_3N_4	Si_3N_4	PEEK PTFE PFA graphite reinforcing PTFE	UC200	☆★★★★	★★★★★	260℃	☆★★★★
	ZrO_2	Si_3N_4			☆★★★★	☆★★★★	260℃	☆★★★★
	ZrO_2	ZrO_2			☆★★★★	☆★★★★	260℃	★★★★★
	ZrO_2	SSiC			☆★★★★	☆★★★★	260℃	☆☆★★★
	SSiC	SSiC			★★★★★	☆☆★★★	260℃	☆☆★★★
 Ceramic Thrust Ball Bearings	Si_3N_4	Si_3N_4	PEEK PTFE PFA graphite reinforcing PTFE	51100 51200	☆★★★★	★★★★★	260℃	☆★★★★
	ZrO_2	Si_3N_4			☆★★★★	☆★★★★	260℃	☆★★★★
	ZrO_2	ZrO_2			☆★★★★	☆★★★★	260℃	★★★★★
	ZrO_2	SSiC			☆★★★★	☆★★★★	260℃	☆☆★★★
	SSiC	SSiC			★★★★★	☆☆★★★	260℃	☆☆★★★
 Ceramic Cylindrical Roller Bearings	Si_3N_4	Si_3N_4	PEEK PTFE PFA graphite reinforcing PTFE	NU200 NU300	☆★★★★	★★★★★	260℃	☆★★★★
	ZrO_2	Si_3N_4			☆★★★★	☆★★★★	260℃	☆★★★★
	ZrO_2	ZrO_2			☆★★★★	☆★★★★	260℃	★★★★★
	ZrO_2	SSiC			☆★★★★	☆★★★★	260℃	☆☆★★★
	SSiC	SSiC			★★★★★	☆☆★★★	260℃	☆☆★★★
 Ceramic Double Row Cylindrical Roller Bearings	Si_3N_4	Si_3N_4	PEEK PTFE PFA graphite reinforcing PTFE	NN3000	☆★★★★	★★★★★	260℃	☆★★★★
	ZrO_2	Si_3N_4			☆★★★★	☆★★★★	260℃	☆★★★★
	ZrO_2	ZrO_2			☆★★★★	☆★★★★	260℃	★★★★★
	ZrO_2	SSiC			☆★★★★	☆★★★★	260℃	☆☆★★★
	SSiC	SSiC			★★★★★	☆☆★★★	260℃	☆☆★★★

Brief Introduction

Bearig Type	Bearing material			Bearing Sereis	Anti-Corrosion	Limit Speed	Max working temp	Load capacity
	Rings	Balls	Cage types					
 Ceramic full Ball Bearings	Si_3N_4	Si_3N_4	no cage	71800 71900 7000 7200 7300	☆★★★★	★★★★★	260℃~1100℃	☆★★★★
	ZrO_2	Si_3N_4			☆★★★★	☆★★★★	260℃~600℃	☆★★★★
	ZrO_2	ZrO_2			☆★★★★	☆★★★★	260℃~600℃	★★★★★
	ZrO_2	SSiC			☆★★★★	☆★★★★	260℃~600℃	☆☆★★★
	SSiC	SSiC			★★★★★	☆☆★★★	260℃~1400℃	☆☆★★★
 Ceramic full Cylindrical Roller Bearings	Si_3N_4	Si_3N_4	no cage	NJ2304V NCF2204V NCF3004V	☆★★★★	★★★★★	260℃~1100℃	☆★★★★
	ZrO_2	Si_3N_4			☆★★★★	☆★★★★	260℃~600℃	☆★★★★
	ZrO_2	ZrO_2			☆★★★★	☆★★★★	260℃~600℃	★★★★★
	ZrO_2	SSiC			☆★★★★	☆★★★★	260℃~600℃	☆☆★★★
	SSiC	SSiC			★★★★★	☆☆★★★	260℃~1400℃	☆☆★★★
 Ceramic Tapered Roller Bearings	Si_3N_4	Si_3N_4	PEEK PTFE PFA graphite reinforcing PTFE	30200 30300	☆★★★★	★★★★★	260℃	☆★★★★
	ZrO_2	Si_3N_4			☆★★★★	☆★★★★	260℃	☆★★★★
	ZrO_2	ZrO_2			☆★★★★	☆★★★★	260℃	★★★★★
	ZrO_2	SSiC			☆★★★★	☆★★★★	260℃	☆☆★★★
	SSiC	SSiC			★★★★★	☆☆★★★	260℃	☆☆★★★
 Ceramic Double Row Tapered Roller Bearings	Si_3N_4	Si_3N_4	PEEK PTFE PFA graphite reinforcing PTFE		☆★★★★	★★★★★	260℃	☆★★★★
	ZrO_2	Si_3N_4			☆★★★★	☆★★★★	260℃	☆★★★★
	ZrO_2	ZrO_2			☆★★★★	☆★★★★	260℃	★★★★★
	ZrO_2	SSiC			☆★★★★	☆★★★★	260℃	☆☆★★★
	SSiC	SSiC			★★★★★	☆☆★★★	260℃	☆☆★★★
 Hybrid Super High Speed Ball Bearings	GCr15	Si_3N_4	PEEK PTFE PFA Phenolic resin tube no cage	61800 61900 6000 6200 7000 7200 NN3000	☆☆☆☆☆	★★★★★	260℃	★★★★★
	M50	Si_3N_4			☆☆☆☆☆	☆★★★★	260℃ ~520℃	☆★★★★
	W18Cr4V	Si_3N_4			☆☆☆☆★	☆★★★★	260℃ ~520℃	★★★★★
	M50	SSiC			☆☆☆☆☆	☆★★★★	260℃ ~520℃	☆★★★★
	W18Cr4V	SSiC			☆☆☆☆★	☆★★★★	260℃ ~520℃	☆★★★★

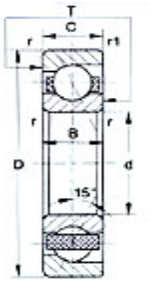
Product Introduction -Ceramic Ball Bearings

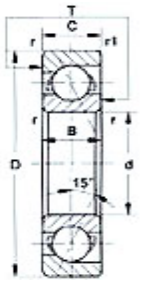
Brief Introduction

Bearig Type	Bearing material			Bearing Sereis	Anti-Corrosion	Limit Speed	Max working temp	Load capacity
	Rings	Balls	Cages					
 Hybrid Deep Groove Ball Bearings	PEEK	Si_3N_4	PEEK PTFE PFA	6000 6200 6300	☆★★★★	★★★★★	260℃	☆★★★★
	PEEK	ZrO2			☆★★★★	☆★★★★	260℃	☆★★★★
	PEEK	SSiC			☆★★★★	☆☆★★★	260℃	☆☆★★★
	PEEK	Si_3N_4	no cage		☆★★★★	☆☆★★★	260℃	☆☆★★★
	PEEK	ZrO2	no cage		☆★★★★	☆☆★★★	260℃	☆☆★★★
	PEEK	SSiC	no cage		☆★★★★	☆☆★★★	260℃	☆☆★★★
 Hybrid ceramic ball bearings	GCr15	Si_3N_4	PEEK 08F H62	6012~6018 6212~6224 6312~6328	☆☆☆☆☆	★★★★★	200℃	★★★★★
	GCr15	Si_3N_4			☆☆☆☆☆	★★★★★	200℃	★★★★★
	GCr15	ZrO_2			☆☆☆☆☆	★★★★★	200℃	★★★★★
	GCr15	SSiC			☆☆☆☆☆	★★★★★	200℃	★★★★★
	GCr15	SSiC			☆☆☆☆☆	★★★★★	200℃	★★★★★
 Hybrid high precision ceramic cylindrical roller bearings	M50	Si_3N_4	PEEK 08F H62	NN3000 NU200 NU300 NU1013~ NU1021	☆☆☆☆☆	★★★★★	200℃	★★★★★
	W18Cr4V	Si_3N_4			☆☆☆☆☆	★★★★★	200℃	★★★★★
	GCr15	ZrO_2			☆☆☆☆☆	☆★★★★	200℃	★★★★★
	GCr15	Si_3N_4			☆☆☆☆☆	★★★★★	200℃	★★★★★
	GCr15	SSiC			☆☆☆☆☆	☆☆★★★	200℃	☆★★★★

Bearig Type	Material	Anti-Corrosion	Limit Speed	Max working temp	Load capacity
 Ceramic Linear (Motion) Bearings	Si_3N_4	☆★★★★	☆★★★★	1100℃	☆★★★★
	ZrO_2	☆★★★★	☆★★★★	600℃	★★★★★
	SSiC	★★★★★	☆☆★★★	1400℃	☆☆★★★
	◇Usage: ceramic joint bearings are widely used in engineering hydraulic cylinder, metal forming machine, construction machinery, automation equipment, automotive shock absorbers, hydraulic machinery and other industries				
	◇Characteristic: anti-corrosion, resistant to wear, self-aligning, good lubrication or self-lubrication with no lubrication dirt pollution, even can work under missalignment, widely used in lower-speed swing, tilt and rotation movement.				
 Ceramic Spherical Plain Bearings	SSiC	★★★★★	☆☆★★★	260℃	☆☆★★★
	Si_3N_4	☆★★★★	★★★★★	260℃	☆★★★★
	ZrO_2	☆★★★★	☆★★★★	260℃	★★★★★
	◇Usage: widely used in electronic equipment, tensile testing machine and the digital three-dimansional coordinate measuring equipment, and multi-axis machine tools, presses tool grinders, automatic gas cutting machine, printer, card sorting machine, food packaging machines as sliding parts.				
	◇Characteristic: a linear motion systems, in conjunction with the cylinder axis.As the balls point contact with the shaft, so the load is small.Ceramic balls rotate with minimal friction, which can get a smooth precision movement				

Entity Cage





Pressed Brass Cage

Designation		Principal Dimensions (mm)					Load Ratings		Limited Speed	
		d	D	B,C,T	rmin	r1min	Cr	Cor	Grease	Oil
EN10	E10	10	28	8	0.3	0.15	4.3	0.8	22000	28000
EN11	E11	11	32	7	0.3	0.15	4	0.8	20000	24000
EN12	E12	12	32	7	0.3	0.15	4	0.8	20000	24000
EN13	E13	13	30	7	0.3	0.15	4	0.8	20000	24000
EN14	-	14	35	8	0.3	0.15	5.5	1.1	16500	20000
EN15	E15	15	35	8	0.3	0.15	5.5	1.1	16500	20000
-	BO15	15	40	10	0.6	0.3	7.4	1.4	15000	18000
EN16	-	16	38	10	0.6	0.2	6.7	1.25	15000	18000
-	L17	17	40	10	0.6	0.3	7.4	1.4	15000	18000
EN17	-	17	44	11	0.6	0.3	7.4	1.4	14500	17000
-	BO17	17	44	11	0.6	0.3	7.4	1.4	14500	17000
EN18	-	18	40	9	0.6	0.2	5	1	15000	18000
EN19	E19	19	40	9	0.6	0.2	5	1	15000	18000
EN20	E20	20	47	12	1	0.6	10.8	2.4	12000	15000
-	L20	20	47	14	1	0.6	10.8	2.4	12000	15000

Ceramic Blast Nozzle

Description	Material	Anti-Corrosion	Speed Limited	Max working temp	load capacity
 Pressureless sintered SiC blast nozzle	SSiC	★★★★★	☆☆★★★	1400℃	☆☆★★★
	◇Usage	various of sand blaster nozzles, including: wet sandblasting, compressed air sandblasting tumtable sandblasting, roller sandblasting, double sandblasting, wheel sandblasting pneumatic sandblasting, steam sandblasting, conveyor-blasting, impeller sandblasting nozzles			
	◇Characteristic	resistant to strong acid,strong alkali,salt and gas or deletetious, long life ,high hardness resistant to wear; especially resistant to hydrfluoric acid			
 ZrO_2 blast nozzle	ZrO_2	☆★★★★	☆★★★★	600℃	★★★★★
	◇Usage	various of sand blaster nozzles, including: wet sandblasting, compressed air sandblasting tumtable sandblasting, roller sandblasting, double sandblasting, wheel sandblasting pneumatic sandblasting, steam sandblasting, conveyor-blasting, impeller sandblasting nozzles			
	◇Characteristic	resistant to strong acid,strong alkali,salt and gas or deletetious,long life, high toughness resistant to wear			
 Si_3N_4 blast nozzle	Si_3N_4	☆★★★★	★★★★★	1100℃	☆★★★★
	◇Usage	various of sand blaster nozzles, including: wet sandblasting, compressed air sandblasting tumtable sandblasting, roller sandblasting, double sandblasting, wheel sandblasting pneumatic sandblasting, steam sandblasting, conveyor-blasting, impeller sandblasting nozzles			
	◇Characteristic	resistant to strong acid,strong alkali,salt and gas or deletetious, long life ,high toughness resistant to wear			
 WC blast nozzle	WC				
	◇Usage	various of sand blaster nozzles, including: wet sandblasting, compressed air sandblasting tumtable sandblasting, roller sandblasting, double sandblasting, wheel sandblasting pneumatic sandblasting, steam sandblasting, conveyor-blasting, impeller sandblasting nozzles			
	◇Characteristic	resistant to strong acid,strong alkali,salt and gas or deletetious, long life ,high toughness resistant to wear			
 B4C blast nozzle	B4C				
	◇Usage	various of sand blaster nozzles, including: wet sandblasting, compressed air sandblasting tumtable sandblasting, roller sandblasting, double sandblasting, wheel sandblasting pneumatic sandblasting, steam sandblasting, conveyor-blasting, impeller sandblasting nozzles			
	◇Characteristic	resistant to strong acid,strong alkali,salt and gas or deletetious, long life ,high toughness resistant to wear			

Ceramic Ball Valves

Description	Material	Anti-Corrosion	Speed Limited	Max working temp	load capacity
 SSiC ball valve-hard seal/soft seal	SSiC	★★★★★	☆☆★★★	1400℃	☆☆★★★
	◇Usage	various resistance to high temp and anti-corrosion ball valve,rotary valves,needle valve, bleed bleed valve,extraction valve,valve cone,seating valve.The valve fits in granule medium of high hardness ,or medium with erosive soft granule . it is also the only valve suitable for this type of medium .They are widely used in petroenemical industry,metallurgy,mining,power station medicine and papermaking and so on.			
	◇Characteristic	resistance to strong acid,alkali,salt and gas of deleterious; resistance to wear, high hardness SSiC valve especialy resistance to hydrofluoric acid.The valve has the exceeding high wear-proof capability, corrosion resisting,enduring capability ,good heat insulation ,small thermal expansion all parts that contact the media are made of structural ceramics with extremely high chemical stability and hardness (HRC90) only inferior to diamond.			
					
 ZrO_2 ball valve-hard seal/soft seal	ZrO_2	☆★★★★	☆★★★★	600℃	★★★★★
	◇Usage	various of resistant to high temp and anti-corrosion ball valve,rotary valve,needle valve,bleed valve,extraction valve,valve cone,seating vale.			
	◇Characteristic	resistant to strong acid,strong alkali,salt and gas or deletetious,ZrO2 valve has long life ,high toughness,resistant to wear			
 Si_3N_4 ball valve-hard seal/soft seal	Si_3N_4	☆★★★★	★★★★★	1100℃	☆★★★★
	◇Usage	various of resistant to high temp and anti-corrosion ball valve,rotary valve,needle valve,bleed valve,extraction valve,valve cone,seating vale.			
	◇Characteristic	resistant to strong acid,strong alkali,salt and gas or deletetious,ZrO2 valve has long life ,high toughness,resistant to wear			
 Al_2O_3 ball valve-hard seal/soft seal	Al_2O_3	☆★★★★	☆★★★★	1400℃	☆☆☆★★
	◇Usage	various of resistant to high temp and anti-corrosion ball valve,rotary valve,needle valve,bleed valve,extraction valve,valve cone,seating vale.			
	◇Characteristic	resistant to strong acid,strong alkali,salt and gas or deletetious,long life,high toughness resistant to wear			

Ceramic Plunger

Description	Material	Anti-Corrosion	Speed Limited	Max working temp	load capacity
 SSiC High Pressure pump plunger	SSiC	★★★★★	☆☆★★★	1400℃	☆☆★★★
	◇Usage	various of plunger barrel, plunger high-precision plunger for rotary plunger pumps, hydraulic pressure valve,super high pressure oil pumps			
	◇Characteristic	resistant to strong acid,strong alkali,salt and gas or deletetious SSiC plunger has long life ,high toughness,resistant to wear.			
 ZrO_2 High Pressure pump plunger	ZrO_2	☆★★★★	☆★★★★	600℃	★★★★★
	◇Usage	various of plunger barrel, plunger high-precision plunger for rotary plunger pumps, hydraulic pressure valve,super high pressure oil pumps			
	◇Characteristic	resistant to strong acid,strong alkali,salt and gas or deletetious ZrO_2 plunger has long life ,high toughness,resistant to wear			
 Si_3N_4 High Pressure pump plunger	Si_3N_4	☆★★★★	★★★★★	1100℃	☆★★★★
	◇Usage	various of plunger barrel, plunger high-precision plunger for rotary plunger pumps, hydraulic pressure valve,super high pressure oil pumps			
	◇Characteristic	resistant to strong acid,strong alkali,salt and gas or deletetious Si_3N_4 plunger has long life ,high toughness,resistant to wear			
 AL_2O_3 High Pressure pump plunger	Al_2O_3(99.5%)	☆★★★★	☆★★★★	1400℃	☆☆☆★★
	◇Usage	various of plunger barrel, plunger high-precision plunger for rotary plunger pumps, hydraulic pressure valve,super high pressure oil pumps			
	◇Characteristic	resistant to strong acid,strong alkali,salt and gas or deletetious AL_2O_3 plunger has long life ,high toughness,resistant to wear			

SiC Parts for Pumps

Description of Products	Material	Anti-Corrosion	Speed Limited	Max working temp	load capacity
 Pressureless Sintered SiC Bushing for Pump (sliding bearings)	SSiC	★★★★★	☆☆★★★	1400℃	☆☆★★★

◇Including: bushing, sleelve, thrust disk, shaft for pumps

◇Usage: bushing bearings for canner pump,magnetic drive pump,vacuum pump, fixed anode X-ray tube shaft; bushing bearings for strong acid,strong alkali,salt,measure pumps flowmeter and deep well pump; bushing bearings for nonmagnetic,electric insulation

◇Characteristic: resistance strong acid, strong alkali, salt, gas of deleterious, long life high hardness,resistance to wear especialy resistance to hydrofluric acid

Pressureless sintered SiC bushing bearings for pump

Pressureless sintered SiC bushing bearing for pump

Pressureless sintered SiC shaft for pump

Pressureless sintered SiC thrust disk for pump

SiC Sealing Rings

Description of Products	Material	Anti-Corrosion	Speed Limited	Max working temp	load capacity
 Pressureless sintered SiC sealing rings	SSiC	★★★★★	☆☆★★★	1400℃	☆☆★★★

◇Type: plain sealing rings, step sealing rings

◇Usage: sealing rings for vacuum pump, acid, alkali, salt, measure pump, flowmeter, deep well pump and various rotary sealing rings

◇Characteristic: resistance strong acid, strong alkali, salt, gas of deleterious, long life high hardness,resistance to wear especialy resistance to hydrofluric acid

Pressureless sintered SiC sealing ring

SiC plain sealing rings

SiC step sealing rings

SiC sealing rings