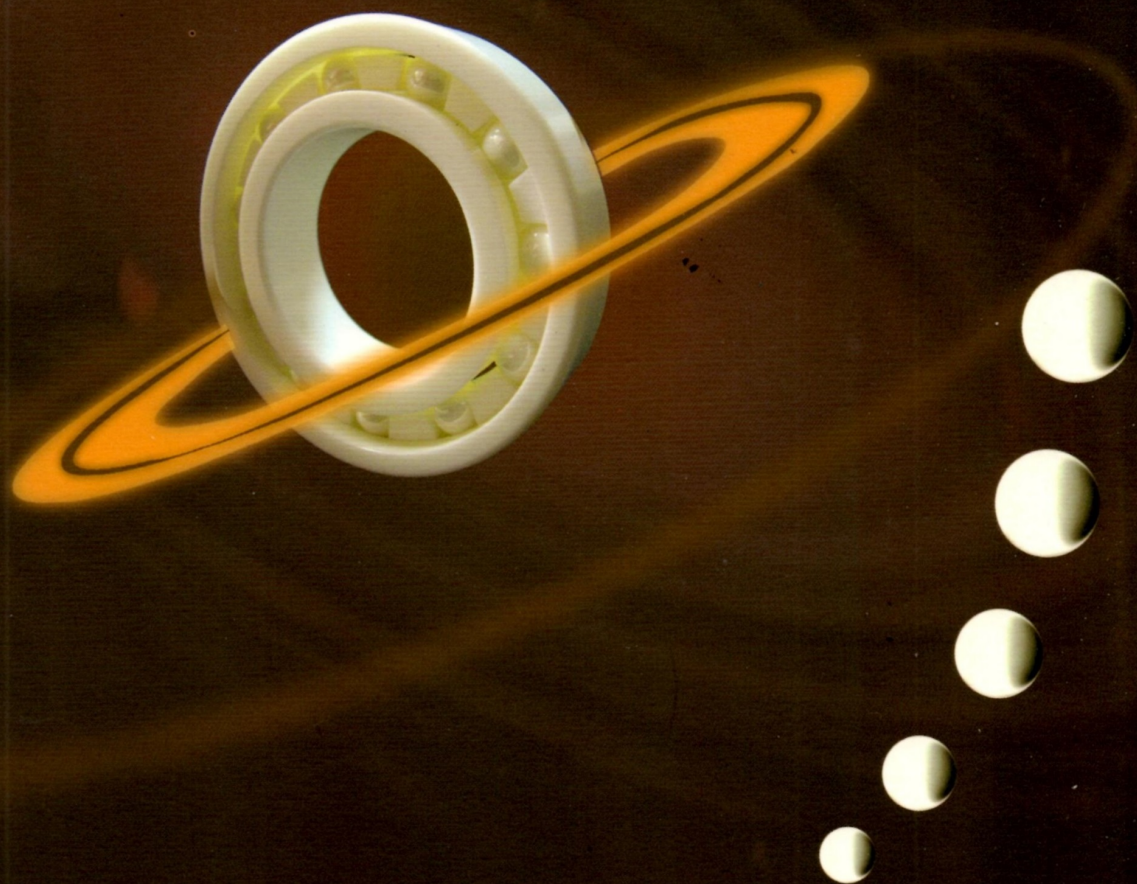


# CERAMIC



LCB





# CERAMIC

## 陶瓷軸承

CERAMIC (陶瓷) 給人很強烈的第一印象就是一衛浴、建材、居家用品與藝術。今隨著時代的演進，科技的提升，已廣泛的運用於高精密、特殊環境的機台上。陶瓷軸承也就因應而生。

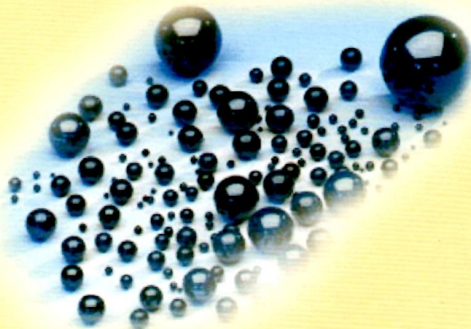
The first thought that people have about ceramics is usually concerned with bathroom equipment, building materials, home accessories, or possibly art. But thanks to technical advancements, ceramic is now enjoying widespread use on highly precise and specialized-environment equipment. The ceramic bearing has been transformed for accordance with our lives.

LCB陶瓷軸承，從原料挑選→混合研磨→CIP成型→高溫高壓燒結(GPS)→熱等靜壓(HIP)→研磨→超精→組合→檢驗→成品；各個環節小心翼翼，精益求精，為的就是把最好的產品呈現出來。

The LCB ceramic bearing is made by being diligent at each and every step: Selection of materials → Hybrid grinding → CIP molding → High temperature, high pressure sinter (GPS) → Hot Isostatic Pressing (HIP) → Grinding → Ultra precision → Assembly → Examination → Final product. With careful attention and care throughout the process, we constantly strive for a better and better product. We extend our promise of never leaving a customer unsatisfied and only present our best products.

陶瓷軸承具有耐寒、耐高溫、耐磨、耐腐蝕、抗磁、電絕緣、高轉速和無油自潤滑等特性。在極惡劣的環境及特殊狀況下，更是不可或缺；應用範圍遍及各領域，有航空、航海、石油、化工、汽車、半導體、電子設備、冶金、電力、紡織、醫療器材、儀器、玩具，以及超高真空環境...等。其屬一種新材料應用之高科技產品。

It possesses several notable characteristics such as being cold resistant, high temperature refractory, wear-resistant, corrosion-resistant, anti-magnetic insulating, high rotational in speed, and is oilless self-lubricating. It is more indispensable in extremely bad environments than other bearings, and can withstand in a variety of special conditions. The use of ceramic bearings can be applied in a wide range of industries including: aviation, navigation, petroleum, chemical, automobile, tech/electronic, metallurgy, electric power, spinning and weaving, medical supply, measurement instrument, toy, as well as ultra-high vacuum environments. Today, more and more high tech products include ceramic bearings as part of their design.





## ADVANTAGES

### 使用陶瓷軸承之優點

- 組合：
  - 降低熱擴散
  - 更輕的重量
  - 更高的堅硬
  - 更佳的耐腐蝕性
  - 更高的剛度
  - 更高的電子抵抗
- 為軸承用戶增加表現和減少總營業成本。
- 減少潤滑油的剝蝕和較少的磨損以增加軸承之壽命。
- 更快的操作速度以增加的生產力。
- 減少維修與保養以縮短停工時間，給予更高的可靠性。
- 膨脹的設計可能性幫助您解決您的軸承問題。



- The combination of:
  - lower thermal expansion
  - lighter weight
  - higher hardness
  - increased corrosion resistance
  - higher stiffness
  - higher electrical resistance
- Increases performance and decreases total operating for the user.
- Decreased lube degradation & less wear yield longer bearing life.
- Higher Operating Speeds mean increased productivity.
- Reduced Downtime with less maintenance gives higher reliability.
- Expanded Design possibilities help you solve your bearing problems.

## 主要類型 TYPES

▣ 依據工作環境的需求，目前陶瓷軸承大概已研發出四大類型：

According to the demand of working conditions, ceramic bearings have developed into four major types:

1. 氧化鋯 – 主要原料為 $ZrO_2$ 。保持架材質有“PTFE”或“PEEK”。  
Zirconia – The main material is  $ZrO_2$ . The cage material is "PTFE" or "PEEK".
2. 氮化硅 – 主要原料為 $Si_3N_4$ 。保持架材質有“PTFE”或“PEEK”。  
Silicon Nitride – The main material is  $Si_3N_4$ . The cage material is "PTFE" or "PEEK".
3. 碳化硅 – 主要原料為 $SiC$ 。保持架材質有“PTFE”或“PEEK”。  
Silicon Carbides – The main material is  $SiC$ . The cage material is "PTFE" or "PEEK".
4. 氧化鋁 – 主要原料為 $Al_2O_3$ 。保持架材質有“PTFE”、“PEEK”或“不銹鋼”。  
Alumina – The main material is  $Al_2O_3$ . The cage material is "PTFE" or "PEEK".

◎ 同時本公司亦有能力在各領域中，如：非標準軸承、滑動元件…等，以陶瓷為材料者，提供圖面接受訂製組具。交貨迅速、品質保證。

In addition to these, our company also provides custom-made ceramic bearing components, such as a special bearing sliding mechanism, and more. We deliver rapidly, and the quality is always 100% guaranteed.



## APPLICATIONS OF CERAMIC BEARINGS

### 陶瓷軸承應用說明

#### I. 高速陶瓷軸承 HIGH-SPEED CERAMIC BEARINGS

具有耐寒性、受壓彈性小、抗壓力大、導熱性能差、自重輕、及摩擦係數小等優點。

They resist cold, have slight elasticity, high resistance of pressure, low thermal conductivity, are lightly self-possessed, and the friction coefficient is small.

#### II. 耐高溫陶瓷軸承 HIGH-TEMPERATURE CERAMIC BEARINGS

使用溫度在 $100^{\circ}\text{C} \sim 800^{\circ}\text{C}$  間，不會產生因溫差而造成的膨脹現象，並可應用在密爐、制塑、煉銅等高溫設備中。

The application temperature is between  $100^{\circ}\text{C} \sim 800^{\circ}\text{C}$ , and does not cause an inflation phenomenon at different temperatures. It may be applied in a dense stove, plastic manufacturing, copper smelting, or other high temperature equipment.

#### III. 耐腐蝕陶瓷軸承 CORROSION RESISTANT CERAMIC BEARINGS

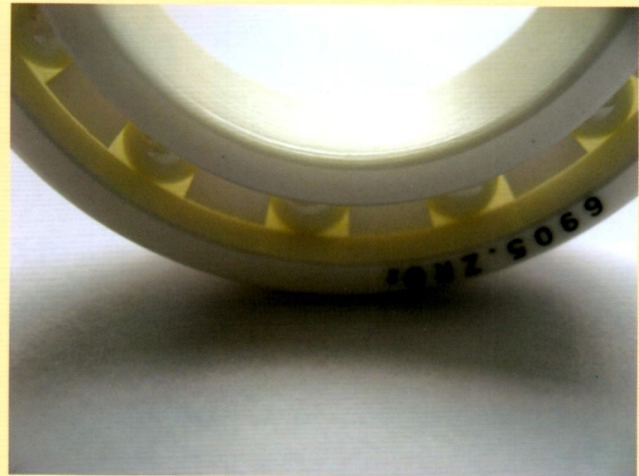
材料本身具有耐腐蝕的特性，可應用在強酸、強鹼、無機、有機鹽海水等領域。

例如：電鍍設備、電子設備、化工機械、船舶製造、醫療設備等。The material itself has an anti-corrosive characteristic, may be applied in strong acid, strong alkali, inorganic domain, organic seawater, and more.

Example applications include:

galvanized equipment, electronic installation, chemical machinery, shipping manufacturing, and medical equipment.





#### IV. 防磁陶瓷軸承 MAGNETICALLY-SHIELDED CERAMIC BEARINGS

因無磁故不吸粉塵，可減少軸承表面提前剝落、噪音大等問題。可運用在退磁設備、精密儀器等設備當中。

Because of the absence of magnetism, they don't attract dust. As a result, they may reduce problems such as rapid exfoliation of the bearing surface, loud noise, etc. These bearings may be utilized in degausses equipment, precision instruments, and more.

#### V. 電絕緣陶瓷軸承 ELECTRIC INSULATION CERAMIC BEARINGS

因電阻力高，可避免電弧損傷軸承，故可運用在各種要求絕緣的電力設備中。

Because the electricity resistance is high, it may avoid electric arc damage to the bearings. Therefore, it can be utilized in each kind of power equipment that requires insulation.

#### VI. 真空陶瓷軸承 VACUUM CERAMIC BEARINGS

因陶瓷材料獨具的無油自潤滑特性，故在超高真空環境中，可克服普通軸承無法實現潤滑的難題。

Because of the oilless self-lubrication characteristic in ceramic, the bearing may overcome lubrication problems in an ultra-high vacuum environment.

- ◎ 本公司提供以上六種類別之陶瓷軸承，同一軸承可應用在高溫、高速、強酸、強鹼、磁場、非絕緣、高真空中。但因材料屬性不同，故在選擇產品時，請先告知本公司所應用之場合及環境，以便為您挑選最適用、耐久的陶瓷軸承。

Our company provides the six types of ceramic bearings above and the same bearing could be applied in a high temperature, high speed, strong acidic, strong alkali, magnetic field, non-insulation and high vacuum environment. But, because the material attribution is different, when you are choosing a product please inform us of the application situation and the environment. This will enable us to choose the most suitable ceramic bearings for you.



## CERAMIC

### 陶瓷軸承

#### 壹、氧化鋯( $ZrO_2$ )陶瓷軸承 — Zirconia ( $ZrO_2$ ) ceramic bearing

##### 應用領域

化工機械、食品機械、海洋、水域等機械設備。

##### 特性

配置PTFE(聚四氟乙稀)保持架，更具有高耐腐蝕的作用。

使用環境溫度在 $150^{\circ}\sim 450^{\circ}C$ 之間，建議用滿球型軸承。



##### Application domain

Chemical industry machinery, food machinery, the sea, other water, etc.

##### The general domain

Contains a PTFE (Polytetrafluoroethylene) cage which has a higher anti-corrosive function.

The environmental temperature in this usage is between  $150^{\circ}\sim 450^{\circ}C$ ; groove ball bearings are suggested.

#### 貳、氮化硅( $Si_3N_4$ ) 陶瓷軸承 — Silicon Nitride ( $Si_3N_4$ ) ceramic bearing:

##### 應用領域

此型陶瓷軸承，在材料應用上有更廣泛的突破。其具有更強的硬度，幾達HRC80度，耐極限高溫也達 $800^{\circ}C$ 左右。因此其表面光滑、堅硬，同時也具備自潤滑的能力。

##### 通用領域有

高真空環境、高速主軸機床、研磨機、牙鑽機、儀表機、航空模型、溜冰鞋...等。

##### Application domain

This kind of ceramic bearing has a more widespread breakthrough in the material application. It has a stronger degree of hardness - almost up to HRC80, and the tolerance of high temperature also reaches to about  $800^{\circ}C$ . Therefore, its surface is smooth and adamantine, and also has the self-lubricating ability.

##### The general domain

High vacuum environments, high-speed spindle machines, grinding machines, dental drill machines, measuring appliance machines, model airplanes, ice skates, etc.





## CERAMIC

### 陶瓷軸承

#### 參、碳化硅(SiC) 陶瓷軸承 — Silicon Carbides (SiC) ceramic bearing

##### 應用領域

在極惡劣的環境及特殊場所，例如：超高溫環境(建議用滿球型)，其幾可承受到1300℃。又如在高腐蝕化學藥劑中(建議使用PTFE保持架)有較久的使用壽命，因其之硬度高達HRC90度。

##### Application domain

In extremely bad environments and special places. For example, in an extremely high temperature environment (suggestion: groove ball bearings) it can withstand up to 1300 °C. Also, in a high corrosion chemical agent (suggest using a PTFE cage) to have a longer usage life, because its hardness reaches up to HRC90.



#### 肆、陶瓷軸承鋼、不銹鋼混合型軸承— The ceramic and steel mixed bearing

##### 應用領域

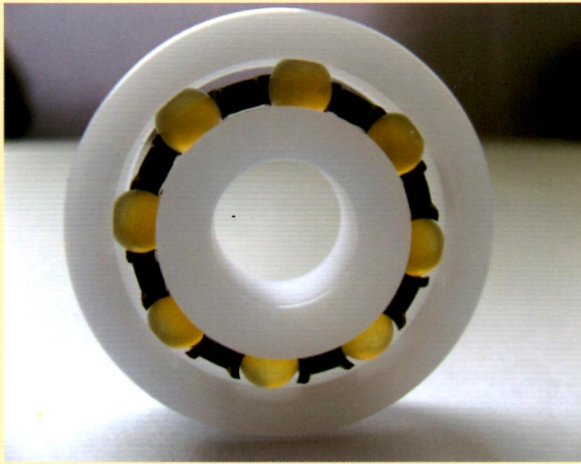
- 由於陶瓷的特性及屬性，使其在加工過程中受到諸多限制，以及製造有一定的難度，以致價格也隨之高昂，故有了混合型軸承，其中又以球為陶瓷，內、外圈為軸承鋼的混合型軸承，在高速高精度領域應用最多。
- 陶球，內、外圈不銹鋼(SUS440)既可防蝕，又具備高潤滑、耐磨損的效果。
- 氧化鋯(ZrO<sub>2</sub>)內、外圈，球氮化硅Si<sub>3</sub>N<sub>4</sub>)，混合型陶瓷軸承。

◎以上混合型軸承，可適用於溜冰鞋、航模、電動玩具...等。

##### Application domain

- Because of the characteristics and attributes of ceramic, there are many limits in the processing process, as well as the difficulty of manufacturing; therefore the price is higher. Thus, the mixed bearing was created, especially the type where the ball is ceramic and the inner and outer ring are bearing steel. They are used mostly in high speed and high accuracy required domains.
- Ceramic ball and the inner-outer ring stainless steel (SUS440) can prevent corrosion, has a high lubrication and wear-resistant effect.
- The inner-outer ring Zirconia, and the Silicon Carbides ball mixed bearing.

◎The mixed type bearings above are suitable for ice skates, model airplanes, electrically operated toys, etc.



## PLASTIC BEARING

### 塑料軸承

#### ▼ 常用工程塑料軸承負荷、極限轉速、耐腐蝕性、最高使用溫度使用成本對照表

軸承材料	最高使用溫度	負荷能力	極限轉速	耐腐蝕性	使用成本對照表
ZRO2	450°C	*****	*****	*****	*****
SI3N4	950°C	*****	*****	*****	*****
PEEK	260°C	****	*****	*****	*****
PVDF	150°C	***	***	****	****
UPE	80°C	**	**	****	***
PVC	60°C	***	***	***	**
HDPE	80°C	**	**	****	*
POM	90°C	***	***	**	*
PA	90°C	***	***	**	**
PP	85°C	**	**	****	*
PTFE	180°C	*	*	*****	****





<p>PEEK聚醚醚酮 深溝球微型軸承</p>		
<p>POM聚甲鈐 雙列角接觸軸承</p>		
<p>PVDF聚偏氟乙烯 深溝球微型軸承</p>		
<p>POM聚甲鈐 深溝球軸承</p>		

本公司有常規產品，深溝球 68、69、60、62、63系列，以及非標尺寸，皆可接受訂做。交貨迅速、物美價廉，歡迎來電洽詢。

本公司將為您提供詳實的資訊，在不同的環境，選擇適用的材料，以降低成本，並維持品質之保證，以發揮異曲同工之妙。



# LCB 陶瓷與軸承鋼材料、性能、數據比較表

項目 Item	單位 Unit	軸承鋼 SUJ2	氧化鋯 ZrO <sub>2</sub>	氮化硅 Si <sub>3</sub> N <sub>4</sub>	碳化硅 SiC	氧化鋁 Al <sub>2</sub> O <sub>3</sub>
密度	g/CM <sup>3</sup>	7.7	6	3.2 ~ 3.3	3.1	4
熱膨脹係數 a	10 <sup>-6</sup> /k	10	10.5	3.2	4.5	8.5
硬度	HV	700	1100~1300	1400~1700	2000~2500	1800
	HRC	62	70~75	75~80	85~90	80
最高耐溫	°C	120	450	800	1300	1000
彈性模量 E	GPa	208	210	300~320	350	380
泊松比		0.3	0.3	0.26	0.2	0.22
抗灣強度 RT	MPa	2400	600~900	600~1000	450	300~500
斷裂韌性 K <sub>ic</sub>	MPam <sup>1/2</sup>	25	6~8	5~7	3~5	3~4
熱導率	W/mK	30~40	2~3	35	150	30
比電阻	Ωmm <sup>2</sup> /m	0.1~1	10 <sup>5</sup> ~10 <sup>15</sup>	10 <sup>8</sup> ~10 <sup>18</sup>	10~10 <sup>3</sup>	10 <sup>8</sup> ~10 <sup>18</sup>
耐酸鹼腐蝕		弱	強	強	更強	強
應力循環次數 (50%破壞機率)	次	10 <sup>7</sup>	10 <sup>5</sup>	10 <sup>7</sup> ~10 <sup>9</sup>		
無潤滑摩擦係數		大	小	更小	小	
磁性		有	無	無	無	無
運轉離心力		大	稍小	小	小	中
運轉溫升		高	低	低	低	低
尺寸穩定性		隨溫度變化較大	稍大	好	好	稍大
絕緣性		不絕緣	絕緣	絕緣	絕緣	絕緣
滾動接觸疲		剝落	碎裂	剝落	碎裂	碎裂



# LCB 陶瓷軸承 塑料軸承規格表

型號	主要尺寸(mm)														
	6000			6200			6300			6800			6900		
	d	D	B	d	D	B	d	D	B	d	D	B	d	D	B
0	10	26	8	10	30	9	10	35	11	10	19	5	10	22	6
1	12	28	8	12	32	10	12	37	12	12	21	5	12	24	6
2	15	32	9	15	35	11	15	42	13	15	24	5	15	28	7
3	17	35	10	17	40	12	17	47	14	17	26	5	17	30	7
4	20	42	12	20	47	14	20	52	15	20	32	7	20	37	9
5	25	47	12	25	52	15	25	62	17	25	37	7	25	42	9
6	30	55	13	30	62	16	30	72	19	30	42	7	30	47	9
7	35	62	14	35	72	17	35	80	21	35	47	7	35	55	10
8	40	68	15	40	80	18	40	90	23	40	52	7	40	62	12
9	45	75	16	45	85	19	45	100	25	45	58	7	45	68	12
10	50	80	16	50	90	20	50	110	27	50	65	7	50	72	12
11	55	90	18	55	100	21	55	120	29	55	72	9	55	80	13
12	60	95	18	60	110	22	60	130	31	60	78	10	60	85	13
13	65	100	18	65	120	23	65	140	33	65	85	10	65	90	13
14	70	110	20	70	125	24	70	150	35	70	90	10	70	100	16
15	75	115	20	75	130	25	75	160	37	75	95	10	75	105	16

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## 聯誠軸承有限公司

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地址:台北市新生北路三段十九巷十五號一樓

電話:(02) 2585-5281

傳真: (02) 2585-5324

<http://www.lcbearing.com.tw>

e-mail : [service@lcbearing.com.tw](mailto:service@lcbearing.com.tw) / [lcb707@yahoo.com.tw](mailto:lcb707@yahoo.com.tw)

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## LIEN CHENG BEARINGS COMPANY

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Add : No.15, Lane 19, Sec ,3, Sinsheng N, Rd., Taipei City 104, Taiwan (R.O.C )

Tel : 886-2-2585-5281

Fax : 886-2-2585-5324

<http://www.lcbearing.com.tw>

e-mail : [service@lcbearing.com.tw](mailto:service@lcbearing.com.tw) / [lcb707@yahoo.com.tw](mailto:lcb707@yahoo.com.tw)

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