



# CEROBEAR ROLLING BEARINGS FOR PROCESS TECHNOLOGY APPLICATIONS

# CEROBEAR ROLLING BEARINGS

CEROBEAR is the renowned world leader in the design and manufacturing of innovative bearings that feature highly advanced ceramic technology.

Our bearings are applied where standard steel bearings do no longer fulfill the special requirements or where *cost of ownership* and *equipment availability* are the key issues.

CEROBEAR designs and produces innovative bearing solutions for the process technology in the chemical-, biochemical-, and pharmaceutical industry in close collaboration with the customer.

Beside process technology, CEROBEAR also provides bearing solutions to other core markets: The aerospace industry, machine tool industry, vacuum- and semiconductor industry, food- and beverage industry and for the international motorsport.

With a team of highly skilled employees, state-of-the-art manufacturing technology and highly precision measuring technology, CEROBEAR rolling bearings are manufactured in Herzogenrath, near Aachen. Quality made in Germany!



CEROBEAR ceramic bearings are customized according to the specific requirements of the application.



CEROBEAR rolling bearings for process technology applications



Diverse CEROBEAR ceramic bearings in different specifications. The bearings are individually aligned to the special requirements of the process technology.

## FIELDS OF APPLICATION

Bearings are often exposed to a variety of different, highly demanding operating conditions in chemical, biochemical and pharmaceutical processes. Thereby a superposition of different problem areas might occur according to the application.

The most frequently recurring requirements for the bearings are:

- **Superb corrosion resistance**
- **Suitability for media lubrication and dry running**
- **Aseptic qualification**
- **Low particle emission**
- **High temperature resistance**
- **Resistance against abrasive wear**
- **Extreme speeds**
- **Superior lifetime**

Increasing demands regarding sterile, germfree and ultrapure processes and products, whether in the pharmaceutical- or in the biotechnology, are often only feasible by using aggressive and corrosive purifier, like acetic acid or hydrogen peroxide in combination with superheated steam sterilization.

Standard bearings with rings made of 100 Cr6 and even stainless steel bearings made of AISI 440 reach its limits of corrosion resistance under these circumstances.

CEROBEAR hybrid bearings with tough hardened rings made of high nitrogen steels 1.4108 (Cronidur 30) or 1.4123 (X.D.15 N.W) and full ceramic bearings made of silicon nitride (Si<sub>3</sub>N<sub>4</sub>) or zirconia (ZrO<sub>2</sub>) already demonstrate their superb corrosion resistance in a variety of different applications as superior alternative to standard bearings for years. They are often used in autoclaves and fermenters for the biotechnology, in agitators and pumps for the chemical industry and in packaging processes for the pharmaceutical industry, only to mention a couple of applications where CEROBEAR bearings are applied. Rings made of nickel-based alloys, like Inconel or Hastelloy, are also applicable if the load capacity of the bearings is not paramount.



CEROBEAR bearing steels are highly corrosion resistant, also against aggressive media.



bio-m® magnetic agitators equipped with CEROBEAR ceramic bearings.

(Kindly supported by Zeta Biopharma GmbH)

One more key benefit of hybrid and full ceramic bearings in the aseptic beverage filling industry and in agitators or pumps, is the ability of media lubrication.

Due to the atomic structure of the ceramic that is comparable with the one of inert gas, a material flow between the raceways and the rolling elements, also known as “fretting” in standard steel bearings, is not possible. A separating lubrication film in the rolling contact is no longer mandatory. This enables the use of even extreme corrosive media as “lubrication”. Thereby cost and design intensive sealing against the environmental products may be avoided. Even dry running is possible. The elimination of sealing and therefore open bearing arrangements also facilitates the purifying processes which results in a better cleanliness and sterility of the equipment.

Particle polluted media lead to increased abrasive wear and in consequence to low bearing lifetime for steel bearings used in media lubricated pumps. Full ceramic bearings with an enhanced hardness of more than 75 HRC reach a superior lifetime compared to conventional bearings in such applications and contribute to improved equipment availability.



CEROBEAR bearings, made from diverse high technology materials

Apart from standard bearing sizes according to DIN/ISO, CEROBEAR also designs and manufactures customized bearing solutions. It is possible to integrate anti-rotation slots for a better adaption to the mating parts or to optimize the bearing internal geometry with respect to existing cross sections, for example.

Even such individual bearing solutions are available in small batches.

## ADVANTAGES

CEROBEAR's all ceramic and hybrid bearings feature key advantages over conventional steel bearings:

- Effects like smearing, cold welding or fretting, known from standard steel bearings under starved lubrication conditions, do not occur. That enables CEROBEAR bearings to be used in media lubrication or even without any lubricant.
- The highly corrosion resistant materials of CEROBEAR bearings make it possible to use the bearings in contact with aggressive media. It even makes the media applicable as a lubricant.
- CEROBEAR rolling bearings can be used under extreme temperature (-253 up to 1000°C) as well as pressure (UHV up to high pressures) conditions.
- The extremely low friction coefficient of the highly sophisticated ceramic material causes a reduction of friction and thus wear in the bearing.
- CEROBEAR rolling bearings are electrically insulating due to the very high breakdown voltage of silicon nitride.
- As a result of the superior non-magnetic properties, full ceramic bearings perform well in strong magnetic fields without eddy current losses and influencing measurements.



CEROBEAR rolling bearings are used in bio-m<sup>®</sup> magnetic agitators of the sterile process engineering  
(Kindly supported by Zeta Biopharma GmbH)



CEROBEAR deep groove ball bearings are made from high technology materials.



CEROBEAR ceramic bearings  
Media lubricated operation in hermetically sealed  
magnetic agitators.

## PRODUCTS

CEROBEAR manufactures two different product lines:

- **Hybrid bearings**, consisting of races made of premium high nitrogen steels and ceramic rolling elements that are made of  $\text{Si}_3\text{N}_4$ .
- **Full ceramic bearings**, consisting of races and rolling elements that are made of  $\text{Si}_3\text{N}_4$ . Alternatively the rings can be made of  $\text{ZrO}_2$ .

Besides any standard dimensions according to DIN/ISO, CEROBEAR also designs and produces customized solutions for any specific application in close collaboration with technical designers and developers. This service is already available for low quantities.

## MATERIALS

- **Siliciumnitrid ( $\text{Si}_3\text{N}_4$ )** is a highly sophisticated material for the rolling elements of hybrid bearings as well as the rings of full ceramic bearings. The superb properties, like over rolling resistance, high hardness and chemical resistance, of this ceramic are ideal requirements for a reliable bearing material.
- **Zirconia ( $\text{ZrO}_2$ )** is the choice for high quality roller bearing races. By its mechanical and thermal characteristics this material is equivalent to standard bearing steel. The corrosion resistance of  $\text{ZrO}_2$  is even better than stainless bearing steel.
- **High nitrogen steels** are standard for our hybrid bearings. The steels X30 CrMoV 15 1 and X40 CrMoVN 16 2 offer the highest corrosion and wear resistance available for bearing steels.
- **PEEK** is an advanced thermoplastic polymer that is utilized as standard material for CEROBEAR bearings. The proven reliability and its superior mechanical properties such as low friction and resistance against high temperatures, perfects the superior CEROBEAR bearing quality. PEEK is already used in a variety of applications in the process engineering due to its FDA approval.
- **Further materials** such as Inconel 718 or S 6-5-2 are additional ring and cage materials that can be used according to the application requirements. CEROBEARs application engineers would appreciate consulting you regarding the best material choice.



CEROBEAR hybrid deep groove ball bearing



We welcome your enquiries from around the world and look forward to hearing from you.

For more information on CEROBEAR and our unique technology and products, please contact us:

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