KÜNEMUND
GROUP

HIGH TEMPERATURE ROLLING BEARINGS

SOLID-LUBRICATED ROLLING BEARINGS
FOR EXTREME CONDITIONS

COMPOUND
HIGH TEMPERATURE ROLLING BEARINGS

KÜNEMUND – ALWAYS THE RIGHT SOLUTION

Friedrich Künemund founded his company as a commercial agent in Stuttgart in 1919, selling electric tools and electric motors made by reputable manufacturers to engineering companies, mainly in the Baden-Württemberg region in south west Germany. Today we are a strong group of companies with 150 experienced employees, 10 sites and 150,000 products, and a leading supplier of rolling bearings, seals and linear motion engineering to customers in Austria, Germany and Switzerland. Our businesses and divisions are fully integrated, with a pool of interdisciplinary expertise waiting to take on your engineering challenges.

We aspire to meet any need, which is why we not only supply products from almost every major manufacturer, but also have our own production facilities for tailored solutions, working in trusted partnership with our customers and suppliers. We provide end-to-end customer care from a designated contact – from consultancy for co-development using your design specifications, to volume production – so that you can focus on what you do best: business.

150,000
products

AVAILABILITY
Thanks to our integrated operations and warehousing system, we can supply over 150,000 different items at any time.

E-COMMERCE/EDI
Direct or indirect links to our ERP system make order processing easy, reliable and fast.

150

EMPLOYEES
Our 150 experienced employees make customer satisfaction and high quality their top priorities.

100
years' experience

EXPERTISE
Working with us gives you the reassurance that comes with 100 years of experience and cutting-edge expertise in assembly development and manufacture.

A SINGLE POINT OF CONTACT
We provide everything under one roof: parts, delivery and service.

DIN EN ISO 9001

CERTIFICATION
All our operations have been DIN EN ISO 9001 certified since 2001.

PRODUCTS
SOLID-LUBRICATED ROLLING BEARINGS
HIGH TEMPERATURE ROLLING BEARINGS UP TO 300°C
SPECIALLY GREASED DEEP GROOVE BALL BEARINGS
ROLLING BEARING COATINGS

WE ARE BOTH A TRADING COMPANY AND A MANUFACTURER

TRADE, CONSULTANCY AND SALES

We've got you covered: our five trading companies give you access to the full Künemund Group portfolio including engineering consultancy – everything from standardised branded products to custom manufacture. Our experts are ready and waiting to answer your questions and discuss your requirements.

BRANDS

As a full-range provider, we offer proven and innovative products from our partner companies. We supply rolling bearings from premium brands such as Schaeffler, Timken, GRW and GMN, seals and machining spindles from leading suppliers such as GMN and IMT, and linear motion engineering from Schaeffler, Ewellix and Thomson.

TAILORED SOLUTIONS MANUFACTURED IN-HOUSE

Künemund Group's manufacturing operations are designed to focus on your individual needs and requirements. We produce special-purpose ball bearings, high temperature rolling bearings, linear motion engineering and seals, all in-house.

COMPOUND High Temperature Rolling Bearings
Compound GmbH manufactures high temperature systems and rolling bearings with special-purpose dry lubricants for a long, maintenance-free service life even in extreme conditions.

KÜNEMUND Sealing Technology
Künemund Dichtungstechnik GmbH specialises in manufacturing sealing elements in PTFE and PTFE compound. We supply custom manufactured seals and sealing elements tailored to your specific application and requirements.

KÜNEMUND Linear Motion Engineering
Linear motion engineering production and preassembly. Künemund Lineartechnik not only manufactures high-grade ball screw drives and precision guide shafts to your drawings, but also supplies complete modular linear systems.

ADITEC Sealing Technology
Our Aditec Sealing Technology division is responsible for the production of high-grade mechanical seals, in some cases based on Goetze technology, and provides engineering consultancy on static and dynamic seals.

ZWICKER Precision Bearings
Zwicker Präzisionslager produces special-purpose ball bearings, precision-manufactured for your requirements and applications. We specialise in deep groove ball bearings with a variety of seals, cages, greases and oils. Alongside standard sizes, we supply custom dimensions, bearing pairs and complete units.

COMPOUND BEARINGS – MANUFACTURED IN-HOUSE

Compound GmbH in Kehl am Rhein is a company belonging to the Künemund Group. Our COMPOUND Bearings division develops and produces solid-lubricated systems and rolling bearings with special grease, which ensure rolling bearings retain their functionality under extreme operating conditions. These bearings are typically used in a wide variety of applications from steelworks to high-vacuum plants.

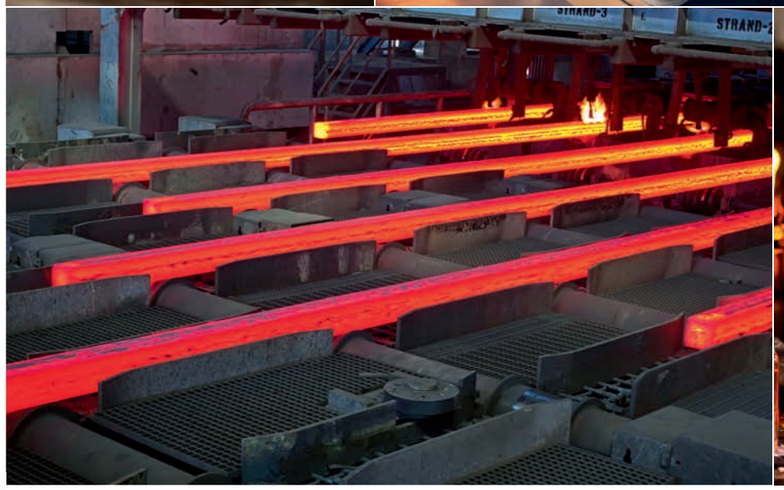
High temperatures in the steel, ceramics and glass industries and low pressure in vacuum applications expose rolling bearings to very particular conditions. We develop and produce solid-lubricated systems and rolling bearings with special grease, which ensure rolling bearings retain their functionality under extreme operating conditions.

PRODUCTS

- Solid-lubricated rolling bearings of steel and stainless steel
- Deep groove, angular contact and spherical ball bearings
- Spherical, cylindrical and tapered roller bearings
- COMPOUND bearings up to 300°C
- Special-purpose bearings for the glass, steel and ceramics industries
- Specially greased deep groove ball bearings
- Rolling bearing coatings

ADVANTAGES

- Rolling bearings with solid lubrication (no re-lubrication required)
- Suitable for extreme conditions
- Withstand extreme temperatures (-80°C to +300°C)
- Long, maintenance-free service life guaranteed
- Standard DIN sizes
- Ultra-low friction
- Environmentally friendly and maintenance-free



COMPOUND INDUSTRIES

- Steel industry
- Ceramics industry
- Glass industry
- Aluminium industry
- Industrial furnace construction
- Vacuum applications

COMPOUND APPLICATIONS

- Roller conveyors
- Cooling racks
- Hearth kiln trucks
- Tunnel kiln trucks
- Hot material transport containers/belts
- Commercial bakery ovens
- (Powder) coating plants

COMPOUND SERVICES

- Finishing (coatings)
- Special greases
- Custom solutions even for small batches
- Comprehensive advice

SOLID-LUBRICATED ROLLING BEARINGS

In normal conditions, rolling bearings are usually lubricated with grease or oil. However, lubrication with grease or oil fails in application areas where the lubricating effect of the lubricant is lost or its service life curtailed due to the chemical and/or physical influences acting on the lubrication point.

Solid lubrication using various compounds or coatings can ensure that rolling bearings retain their functionality under the extreme conditions mentioned above.

APPLICATIONS

- Very high and very low temperatures
- Ingress of aggressive media
- Very low pressure (vacuum)
- Air flowing through the bearing
- Bearing use after very long periods out of operation
- Ingress of hard or soft particles
- Stress acting on the bearing (e.g. centrifugal, gravitational)

APPLICATION AREAS

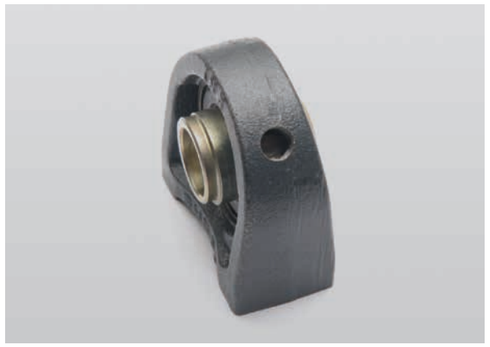
High temperatures, T > 180°C:
- Steel industry (e.g. continuous casting plants, roller gears, rocker bar furnaces, cooling racks)
- Ceramics industry (e.g. carriage bearings for tunnel kilns, conveyor chains)
- Glass industry
- Food industry (e.g. bakery ovens)
- Aluminium industry

Low pressure:
- Vacuum applications (e.g. coating plants)

Exposure to aggressive media:
- Presence of solvents and cleaning agents
- Lubrication with other fluids (e.g. diesel, petrol, water)

TYPES AND PROPERTIES OF THE MOST IMPORTANT SOLID LUBRICANTS

Property	Graphite C	Molybdenum disulfide MoS_2	Polytetrafluoroethylene PTFE
Colour	black	grey	white
Density (g/cm³)	1.4 – 2.4	4.8 – 4.9	2.1 – 2.3
Metal adhesion	moderate	good	poor
Coefficient of friction	0.1 – 0.4	0.04 – 0.1	0.04 – 0.09
Melting point (°C)	3,500	1,180	327
Operating temperature (°C)	-20 to +430	-180 to +350	-250 to +270
Lubricating behaviour at:			
Low | high load	good | good	good | very good	very good | poor
Suitability with:			
Inert gases	poor	good	very good
High humidity	good	moderate	good
Vacuum	poor	very good	good
Corrosion	good	poor	good
Chemicals	very good	moderate	very good
Vibrational friction	good	poor	very good
Stick-slip effect	yes	no	no
Decomposition products	CO, CO_2	MoO_3, SO_2	C_2F_4



APPLICATION AREAS OF THE DIFFERENT COMPOUND TYPES

COMPOUND 1 (COMP1)

From -30 to +280°C (and higher for brief periods), in damp environments or lubrication with other fluids (diesel, petrol, water, etc.) COMP1 should never be used in a vacuum, in a dry atmosphere or under inert gases such as nitrogen.

COMPOUND 2 (COMP2)

From -80°C to +300°C, in dry to slightly humid or inert atmospheres (e.g. nitrogen). Thanks to its special mix of solid lubricants, COMP2 covers numerous application areas. We therefore recommend it for situations in which the exact environmental influences are not known. However, COMP2 is of limited suitability for oscillating movements.

COMPOUND 4 (COMP4)

This COMPOUND has been specially developed for vacuum applications. Temperature-resistant up to 300°C, and up to 350°C for brief periods. It is important to note that the COMPOUND starts to outgas at temperatures above 300°C.

SPECIAL VERSION P.MoS_2

At very high temperatures (above 300°C), the outgassing of COMP4 can adversely affect the surrounding vacuum so much that use of this particular COMPOUND is out of the question. That's why we offer a manganese phosphate-coated rolling bearing, which has had various solid lubricants (in this case, MoS_2) drummed or rolled into its surfaces.

LUBRICATION CONCEPT:

As the lubricant is consumed during solid lubrication, long service lives can only be achieved if the consumed solid lubricant is constantly replenished (transfer lubrication). For this reason, the space between the bearing races and the rollers is filled with a mixture of different solid lubricants and a binding agent (COMP1, COMP2 or COMP4) which, once it has stabilised, circulates with the cage. With each rotation, the roller picks up some solid lubricant and transfers it to the gliding surfaces, ensuring continuous re-lubrication and a long, maintenance-free service life.

COMPOUND types				
	Temperature	**Highly suitable for:**	**Not suitable for:**	**Special features**
COMP1	-30°C to +280°C	Damp environment, lubrication with other fluids (diesel, water, petrol)	Vacuum, dry atmosphere, under inert gases such as nitrogen	
COMP2	-80°C to +300°C	Dry environment, slightly humid environment, inert atmosphere (e.g. nitrogen)	Limited suitability for oscillating movements	Highly suitable for all applications in which the exact environmental influences are not known
COMP4	Up to +300°C, up to 350°C for brief periods	Vacuum applications	Limited suitability for temperatures above 300°C as the compound starts to outgas	Specially designed for vacuum applications
P.MoS_2	Over 300°C	Vacuum applications	High speeds	Manganese phosphate-coated rolling bearing, which has had various solid lubricants (in this case, MoX_2) drummed or rolled into its surfaces
Rolling bearing oils and pastes				
	Temperature	**Highly suitable for:**	**Not suitable for:**	**Special features**
G05	Up to 300°C	Corrosion protection during long-term storage, run-in protection	High speeds	
L15	-10 °C to +200°C	High speeds and temperatures up to 200°C	Not suitable for temperatures below -10°C	No protection against steam or water
L25	-65 °C to +100°C	Very low temperatures down to -65°C	Temperatures above 100°C	Low-temperature oil
L30	Up to 280°C	Higher speeds and temperatures above 200°C		This can improve the load-bearing capacity of COMPOUND bearings

ROLLING BEARING OILS AND PASTES FOR COMPOUND BEARINGS:

Oils and pastes are used to improve corrosion protection and the run-in phase, and also to achieve higher speeds and greater load-bearing capacity as compared to dry lubrication alone (COMP1, COMP2, COMP4).

G05: Graphite/MoS_2-based paste, not much base oil (evaporates without residue at 200°C and above). Recommended as corrosion protection for longer periods of storage and for safety during running in. Not suitable for applications exposed to water or steam, and this paste does not increase speeds.

L15: MoS_2-based oil evaporates without residue at 200°C and above. Recommended at higher speeds and temperatures below 200°C. Also does not provide protection against steam or water. Not suitable for low-temperature applications (below -10°C).

L25: Low-temperature oil down to -65°C (max. +100°C).

L30: Ultra high-temperature oil up to 280°C for higher speeds combined with high temperatures of > 200°C. This can improve the load-bearing capacity of COMPOUND bearings.

GENERAL BEARING DATA

DIMENSIONS

As COMPOUND bearings are produced from standard rolling bearings from reputable manufacturers, the main dimensions of all COMPOUND bearings conform to German industrial standards (DIN 625, 626, 628, 635, 730 or DIN 616).

TOLERANCES

As COMPOUND bearings undergo a hardening process, there may be slight deviations from the tolerances defined in the standards (DIN 620). On manganese phosphate-coated surfaces, it must be borne in mind that the diameter of the outer ring may increase or that of the inner ring may decrease by approx. 10 – 15 µm.

BEARING CLEARANCE

Solid lubrication fundamentally requires increased radial clearance, regardless of the operating temperature. This compensates for kinematic imbalances arising from coating processes and unavoidable particles that cause wear. That's why COMPOUND bearings are only manufactured from rolling bearings with increased bearing clearances (C3, C4, C5 or higher). COMPOUND bearings should have C3 clearance as a minimum in operating conditions.

CAGES

Depending on the type of bearing, COMPOUND bearings are supplied with sheet steel or solid brass cages (as with spherical roller bearings, for example).

HEAT STABILISATION

Since materials undergo structural changes at temperatures over 120°C, causing them to change in shape or dimension or lose their hardness and stability, the dimensions of our rolling bearings are stabilised at different stages (depending on the operating temperature, S0 to S4).

However, we only manufacture COMPOUND bearings from stabilised rolling bearings to order, for two reasons:

- High costs
- Very long delivery times

Bearing tests have proven that stabilised rolling bearings do not achieve greater endurance at higher temperatures than non-stabilised versions. Therefore, changes in the dimensions of the steel at higher temperatures are compensated by selecting a suitable bearing clearance (C3, C4, C5 or higher).

SPEEDS

As the lubricant is consumed during solid lubrication, the user only has a limited number of speeds available. However, this total number of speeds depends to a considerable extent on the type of bearing, the solid lubricant used and the ambient conditions. Lower speeds are therefore where COMPOUND bearings really come into their own.

BEARING LOAD, DIMENSIONING

For maximum endurance, the load on the COMPOUND bearings should not exceed 25 % of the original bearing's static load-bearing capacity. This must be borne in mind when determining the bearing dimensions.

FITS

Due to the need for increased radial clearance, the selected fits should be relatively loose (e.g. H7, h7). Strong press fits lead to a reduction in clearance, which can severely impair the function of the COMPOUND bearings. This is a particular factor to remember if using the manganese phosphate-coated version.

CORROSION PROTECTION

Unlike greased rolling bearings, COMPOUND bearings do not offer any protection against corrosion. In cases where there is a risk of corrosion, we offer two options for protection:

- Phosphated surfaces
- Rolling bearings of corrosion-resistant steel

PHOSPHATING

We generally recommend phosphating the rolling bearings, to improve the gliding properties (solid lubricants adhere better to the gliding surfaces).

There are two options to choose from:

- Iron-phosphating: very thin (1 – 3 µm), low protection against corrosion
- Manganese-phosphating: relatively thick (approx. 10 – 15 µm), low protection against corrosion

When determining the bearing fits, bear in mind the dimensional changes due to the manganese phosphate coating.

ENQUIRIES

As various solid lubricants and combinations are available, when enquiring about a type of bearing, please always provide details about the installation location and its operating and ambient conditions, e.g.

- operating temperature
- speed
- bearing load
- water ingress
- cleaning agents
- lubrication with other fluids
- special atmospheric ambient conditions such as dust accumulation, dry or humid air, nitrogen atmosphere, vacuum (x mbar), etc.

GENERAL INFORMATION

SERVICE LIFE OF COMPOUND BEARINGS

In general, the service life, or duration of lubricating effect, of a dry lubricating film depends on the type of dry lubricant, its ability to adhere to the contact surfaces, and the film thickness.

As dry lubrication also has a wearing effect, it fails as soon as the film of dry lubricant has worn down. At present, there is therefore still no generally accepted basis for calculating the service life of solid-lubricated rolling bearings. Consequently, the user must rely on his or her own experience or trial results.

INSTRUCTIONS FOR THE USE OF COMPOUND BEARINGS

- Do not oil or grease COMPOUND bearings
- Install COMPOUND bearings with care so as not to damage the compound.
- The sealing effect of COMPOUND bearings is not equivalent to that of a rolling bearing with abrasive seal, such as the 2RS.
- The non-phosphated versions of COMPOUND bearings have no protection against corrosion.

INSTALLATION INSTRUCTIONS FOR BEARINGS WITH COMPOUND FILLING

- Ensure maximum cleanliness at the installation site.
- Only remove bearings from the packaging immediately before installation.
- Never expose rolling elements to installation stresses during installation.
- Make sure that bearing seats on the shaft or in the housing are clean and in perfect mechanical condition.
- If possible, use presses or mechanical installation aids.
- Use soft sleeves – never use impact tools directly on bearings.
- Never heat bearings directly with a naked flame.

PAY ATTENTION TO THESE ADDITIONAL POINTS FOR BEARINGS WITH COMPOUND FILLING

- Do not wash bearings or clean them in any other way.
- Do not wet bearings with grease from other manufacturers or with oil.
- Never allow assembly tools to come into contact with the compound filling or any bearing covers used, as mechanical stress can cause the lubricant depot to break and prevent the bearing from functioning properly.
- Bearings with a tapered bore:
  Do not use adjustment tables from bearing manufacturers! COMPOUND bearings with a tapered bore are designed in such a way that when the bearing is firmly seated on the assembly sleeve, no further adjustment is necessary.

ADVANTAGES OF COMPOUND BEARINGS

- Lubrication of rolling bearings over a large temperature range from -80°C to +300°C
- Maintenance-free
- No more need for expensive, ecologically questionable special greases
- A cost-intensive central lubrication system is no longer required
- No contamination of the bearing's surroundings due to surplus grease, which is expensive to dispose of
- Low starting torque regardless of temperature
- Environmentally friendly, as no ecologically questionable special greases are used

SPECIAL GREASES FOR ROLLING BEARINGS

- Deep groove ball bearings
- Spherical ball bearings
- Cylindrical roller bearings
- Needle bearings
- Spherical plain bearings
- Housed bearings
- Support rollers
- Cam followers, etc.
- A wide range of greases and oils from all leading manufacturers
- Defined quantity of grease
- Deep groove ball bearings shielded (2Z, 2RS, NBR and Viton, etc.) or open
- Not dependent on quantity (including tiny quantities)

ADVANTAGES THAT CAN BE ACHIEVED BY USING SPECIAL GREASES

- Use in extreme temperatures
- Pivoting movements
- Food-safe
- Smooth running
- Water-resistant
- Low noise

SUITABLE ROLLING BEARING TYPES

WHICH TYPES OF ROLLING BEARING ARE SUITABLE AS COMPOUND BEARINGS?

- Deep groove ball bearings
- Thin-ring bearings and miniature ball bearings
- Angular contact ball bearings
- Spherical ball bearings
- Spherical roller bearings
- Cylindrical roller bearings
- Tapered roller bearings
- Track rollers
- Housed bearings

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If you have a question about our products, services or company, please get in touch with one of our locations below.

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