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KRW Leipzig

Paper & Plastic Processing

Industry range

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From pulp products to newspapers and magazines to packaging of all kinds – paper and plastics are an integral part of modern society. The manufacturing methods and processing are diverse and define clear requirements for the machine parts used. KRW manufactures optimized bearing solutions for a wide range of operating conditions, and is a reliable partner for new developments in these industries.

Paper industry

For the paper industry, KRW offers an extensive product portfolio and services. The focus is on standard rolling bearings with an outside diameter greater than 320 mm. The dominant roller bearing types are spherical roller bearings, followed by cylindrical roller bearings and tapered roller bearings. Auxiliary units, such as motors, are usually equipped with deep groove or angular contact ball bearings, as well as cylindrical or tapered roller bearings. Self-aligning cylindrical roller bearings (ACB series), split spherical roller bearings, or triple ring bearings are available for more complex special solutions.

The typical applications for the various types of roller bearings are:

Type	Scope
Deep groove ball bearing	Motors, gearboxes, spreader rollers
Angular contact ball bearing	Winders, gearboxes, pumps
Tapered roller bearing	Breast rollers, pressurized screens, calender rolls
Cylindrical roller bearing	Guide rollers, dryer gears, corrugator rollers
Spherical roller bearing	Suction rollers, press rollers, calender rolls, dryer rolls, M.G, cylinders
Self-aligning roller bearings (ACB series)	Dryer rolls, Yankee Cylinder, M.G, cylinders
Split spherical roller bearings	Dryer rolls
Triple ring bearings	Driven anti-deflection roller in press section or calender roller

Requirements for roller bearings for paper machines

- High operational reliability
- Easy mounting
- Compensation of angular misalignments
- In the wet section: Corrosion prevention
- In dry section: high temperature suitability
- Suitable for high speeds
- High quality and precision

The continuous operation of machines in the paper industry makes the installed rolling bearings a key product for our customers' economic success.

Each paper machine is unique, with individual features and equipment. Large machineries can be several meters long or high, and are equipped with a large number of rollers. The production speed can be up to 1800m of paper per minute, which demands enormous reliability from the rolling bearings in use. The required bearing service life is usually more than 80,000 h, and thus exceeds that of general mechanical engineering.

Tis is basic structure of a large paper machine:

- Wet end section with the forming and press section
- Dryer section
- End section

Each section has special characteristics, which must be taken into account when choosing the right bearing solution.

Paper processing

Wet end section

The wet section is characterized by high humidity. Therefore, all components and roller bearings used must, above all, be protected against corrosion. Here, the use of seals is of decisive advantage. There are three different types of rollers in the wet end section.

The forming rollers give the paper web its shape, and at the same time, the water is drawn out of the pulp. As a result, there is a high level of humidity in the immediate vicinity of the roller bearings. KRW recommends the use of multi-stage labyrinth seals to prevent corrosion of the bearings.

Due to the low bearing load, a bearing with a low dynamic load rating must be selected in order to avoid slippage damage. Spherical roller bearings are advantageous when the rollers are misaligned.

In between are the suction wire rollers, which have the same bearing requirements as the forming rollers. In addition, they require high running accuracy, as well as a tapered inner ring bore, for the exact adjustment of the radial clearance.

Press rollers, which squeeze the largest amount of water from the paper web, are massive rollers and tend to deflect. Here, roller bearings are required that can compensate for this deflection / angular misalignment. Due to the high weight of the rollers, spherical roller bearings of series 231 and 232 are mostly used, which have a lower overall height.

Types

Type	Series
Spherical roller bearing	231, 232, 239
Cylindrical roller bearing	NUB 2

Dryer section

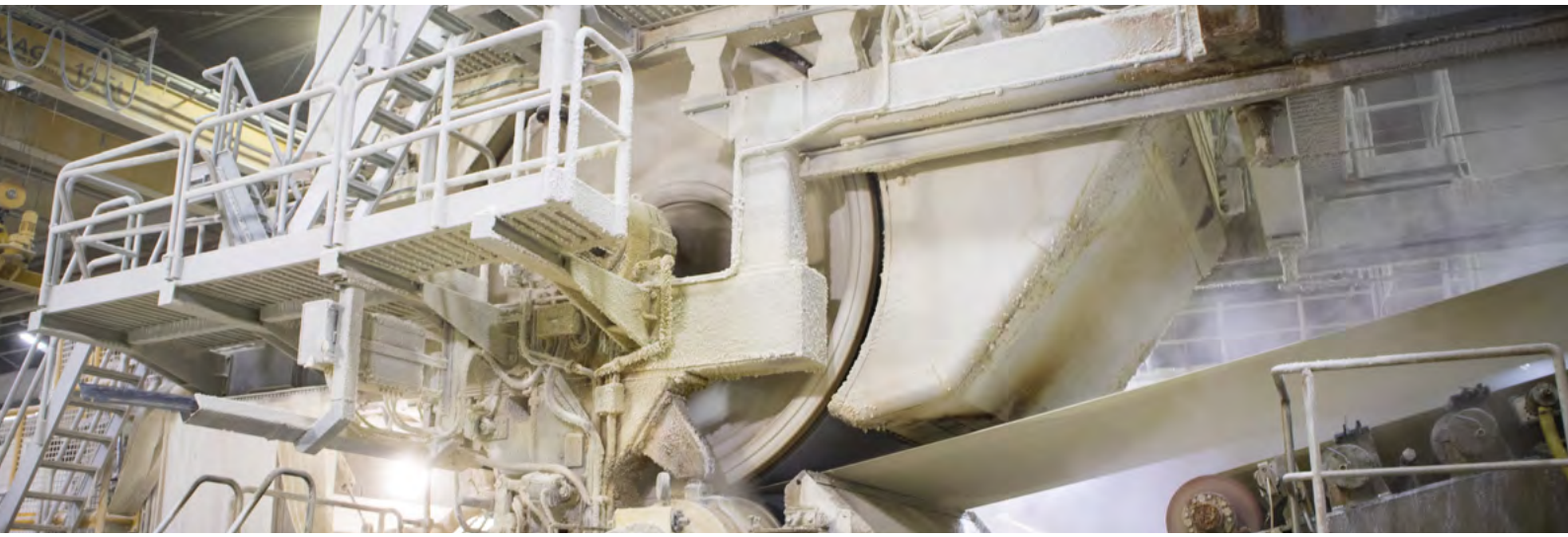
The dryer section consists of three different roll variants: guide rollers, forming rollers and drying cylinders.

The guide rollers, which are responsible for guiding the paper web, are equipped with deep groove ball bearings. While the ambient temperature can easily reach 95°C, temperatures of up to 115°C are possible in the roller bearing. This is a challenge for rolling bearing lubrication. The lubricant quantity is higher than in the wet end section because the roller bearing needs additional cooling. The further removal of the water causes the material to stiffen. This therefore requires a correspondingly higher rigidity of the roll and, thus, of the roller bearing.

The steam-heated drying cylinders dry the material at a high surface temperature. The heat transfer to the roller bearings makes higher heat stabilizations (e.g. S1, S2) necessary. In some cases, the roller bearings must also be insulated against the high temperature input. The high temperature differences of 50K between the inner and outer rings also require enlarged internal clearance classes (C4 for spherical roller bearings / C5 for cylindrical roller bearings). The lubrication of the roller bearings is realized with circulating oil lubrication, which should have a high volume flow and good cleanliness.

Types

Type	Series
Deep groove ball bearing	608, 618, 62
Spherical roller bearing	222, 223, 230, 231, 232
Cylindrical roller bearing	NUB 2



End section

The end section consists of various calender thermo rollers, anti-deflection rollers and expander rollers.

The expander rollers prevent the wrinkling of the paper webs. They are equipped with smooth-running bearings – mostly deep groove ball bearings. In this case, increased internal clearance (C3) is advantageous due to the web temperatures.

The calender thermo rollers improve (or finalize) the surface finish of the paper web. The predominant splitting force is adjusted depending on the type of product, which is why each calender thermo roller is individually stored. This prevents damage to the bearings or a risk to operational safety due to oversizing or undersizing. The high temperatures of the roller of up to 250°C result in thermal radiation on the bearing pins, allowing the rolling bearings to reach a temperature of 130°C. In addition, when the calender thermo roller starts heating temperature differences between the inner and outer ring can occur. A bearing clearance class of C4, therefore, is recommended. The required low construction height limits the use to rolling bearing types 231 / 232, which are also well suited to compensate for the deflection of calender thermal rollers. The oil circulation lubrication used should be selected in such a way that it also has a cooling function.

The anti-deflection roll compensates for the deflection of the calender thermo roll. In this process, the bearings are subjected to very high load pressure. In order to further improve the quality of the end product, the bearings used should also have increased concentricity.

Types

Type	Series
Spherical roller bearing	230, 231, 232, 241
Deep groove ball bearing	160, 619, 618

Plastics processing

For the design and operation of plastics processing machines, bearing properties such as load capacity, thermal stability, and above all, accuracy, are crucial. Through various parameters such as nip pressure, deflection of the roll, inclination of the roll, installation height and counterbending unit, each roll in a calender system is individually adjusted.

Requirements for roller bearings for plastics processing machines

- Reliable load capacity
- High-precision axial / radial guidance
- Compensation of angular misalignments due to high bending deformation
- Running accuracy
- Temperature suitability by means of heat stabilization
- High load capacity
- High quality and precision

A PVC calender roll has several bearing systems, which are divided into main bearing system, anti-deflection bearing system and preload bearing system

Main bearings support the main load, dead load, gap load and support load. Radial guidance is provided by cylindrical, tapered and spherical roller bearings. For axial guidance, cylindrical roller bearings normally use additional thrust bearings. The bearing types used must have a high load-bearing capacity and be able to compensate for any misalignment of the surrounding structure. The roller bearing seat has a temperature of about 140-160°C during operation, while the roller has an average temperature of 220°C.

An important aspect is the temperature difference between the bearing rings, which can be up to 80K. The roller bearing must not be radially distorted. Cylindrical roller bearings are a special feature. Here, the inner ring is grinding together with the roller at operating temperatures. This enables a more precise roundness, which has a significant effect on the quality of the end product.

The anti-deflection bearings (also called “roll-bending” bearings) are attached to the outside of the rollers. These bearings must be able to support high loads and compensate for angular misalignments. Spherical roller bearings are used here as standard.

Preload bearings are used to prevent the possible slippage of the rollers in the event of load fluctuations, as occurs, for example, when the roll vibrates, the material is exchanged or when the zero crossing. The bearing types used are mostly spherical roller bearings.

Special solutions, such as bearings of the ACB series, are possible for all roller systems. These can compensate for angular misalignments and, at the same time, have high load-bearing capacities. The roller bearings used must, therefore, have heat stabilization. A higher precision grade of P5 or better is also required for optimum quality.

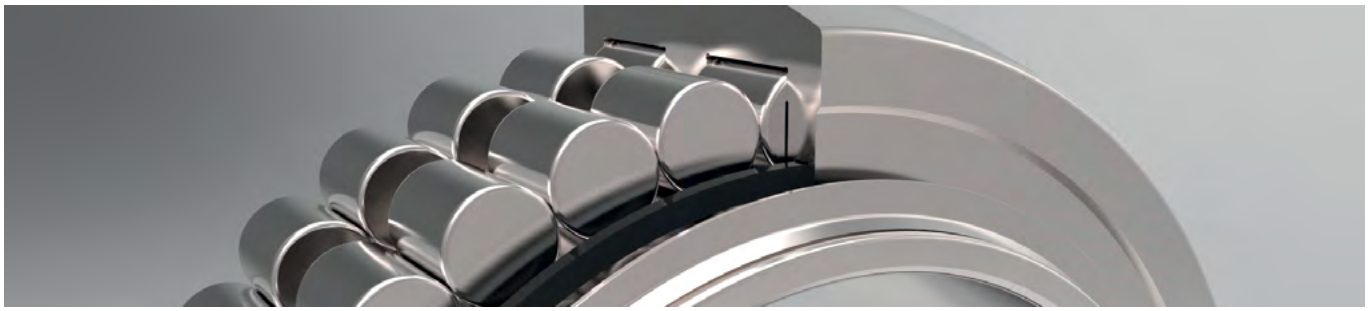
Types

Type	Series
Tapered roller bearing	Application-specific special solutions
Spherical roller bearing	231, 232
Cylindrical roller bearing	Application-specific special solutions
Deep groove ball bearing	619

* This list is to be considered exemplary. Each roller system is individual and may have different parameters.

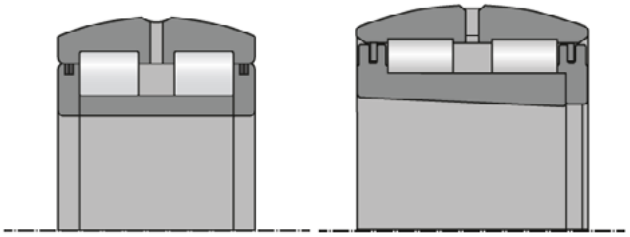
ACB series –
Self-aligning cylindrical roller bearings

ACB bearings are double row, full complement cylindrical roller bearings as locating and non-locating bearings with a cylindrical or alternatively tapered bore. All versions are equipped with non-contact seals on both sides and are thus reliably protected against contamination and grease leakage. The bearings of ACB series 05 to 08 have a spherical outer ring which, in conjunction with KRW plummer block housings of series SLG01, ensures compensation of misalignment.

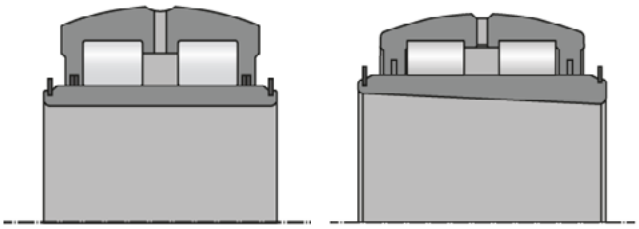


Locating bearing (ACB 05/ 07)

The locating bearing unit 05 has two self-centering flanges. The tapered version 07 has a fixed lip and a self-centering loose lip. The axial forces that can be supported correspond to those of conventional cylindrical roller bearings, but may be limited by the axial load bearing capacity of the housings if static dimensioning is used. In this case, please contact the KRW application engineering team.



Locating bearing - ACB 05 & ACB 07



Non-locating bearing ACB 06 & ACB 08

Non-locating bearing (ACB 06/ 08)

The non-locating bearing units 06 and 08 have two external locking rings which protect the inner ring against accidental extraction. The locating bearing units 05 and 07 have no corresponding lock.

Do you require more information about our storage solutions for paper and plastics processing?
Our sales and engineering team will be happy to help you.

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Service and engineering

In addition to the common standard roller bearing types, the KRW portfolio offers an extensive range of special bearings for individual bearing solutions. Our application engineers will support you from the selection and design of the best roller bearing solution through to assembly and disassembly on your site.

Diagnostics and Damage Analysis

Roller bearings are by far one of the most heavily loaded machine components. Thus, in the case of machine defects, the most obvious signs and massive damage can often be found on the bearings.

However, the roller bearing itself is only rarely the cause. We help you to find the cause of the bearing failure and to avoid damage in the future. Take advantage of our experience and our extensive capabilities:

The experienced KRW application technology team will be pleased to support you.

Close up of a material fatigue

Mounting Support

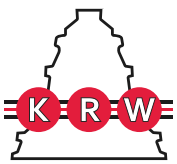
Pre-damage during assembly or handling of roller bearings is the second most common cause of premature bearing failure after lubrication. Heavy and large roller bearings in particular are not easy to assemble. They can be easily damaged by carelessness, incorrect transport or errors made during assembly.

Avoid such unnecessary problems and costs! Our engineers will advise you before the installation of the bearing and help you to avoid initial mistakes. We recommend the best assembly strategy and are also available to support you on site.

Materials Testing

In addition to material technology tests such as hardness testing, metallographic examinations to determine the chemical composition, determine the degree of purity and assess the respective microstructures have become standard for roller bearing applications.

Ultrasonic, magnetic particle, eddy current and grinding burn tests are also carried out in our in-house materials testing laboratory. Thus, we are able to ensure the quality of the materials before and after heat treatment.



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