

# Axial excluder seal HRC1

Extends service life by protecting wind turbine main shaft bearings from contaminants



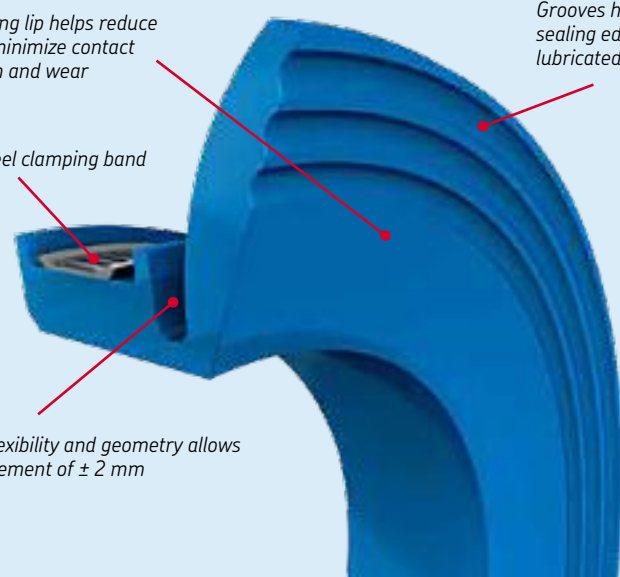
## The HRC1 high-performance profile

Robust sealing lip helps reduce bending to minimize contact area, friction and wear

Grooves help keep the sealing edge properly lubricated

Stainless steel clamping band

Optimized flexibility and geometry allows axial displacement of  $\pm 2$  mm



## An alternative to rubber excluder seals

During the many months between maintenance visits, an excluder seal must protect the turbine main shaft bearing from whatever debris or contaminants the wind may carry. Until recently, the industry has had to rely on rubber excluder seals to provide this first line of defense.

Unable to handle the rough counterface surfaces and limited lubrication conditions common to turbine main shafts, rubber excluder seals can wear out quickly. If they fail, they leave main shaft bearings more exposed to contaminants that can cause bearing failures, unplanned downtime, and higher costs per kW hour. In many cases, replacing rubber excluder seals up-tower is very difficult or next to impossible.

The HRC1 axial excluder seal from SKF is designed to overcome these challenges. This seal is made of a special H-ECOPUR, an SKF-developed polyurethane material with excellent abrasion resistance and wear strength. Available in solid and split executions, this seal also features a steel band clamp with a fast-lock mechanism for easy up-tower installations. The result is an axial excluder seal that delivers significantly extended service life and contaminant protection for increased wind turbine reliability and reduced maintenance costs.

## Extended up-tower service life

Working closely with a prominent wind turbine manufacturer, SKF subjected the HRC1 axial excluder seal to an extended field trial. Following installation on 40 separate 2,5 MW turbines, the seal operated continuously under real-world conditions. After three months, an initial inspection revealed some normal running-in wear of the seal. Six months later, only minimal additional wear could be detected.

This field trial helped confirm that the axial excluder seal from SKF can provide drastically extended service life compared to conventional rubber excluder seals. With this exceptional service life extension, the HRC1 seal can meet standard wind farm maintenance inspection schedules – a tremendous advantage in terms of more cost-effective maintenance scheduling.

Ultimately, this seal can help wind farm operators significantly reduce the risks of contaminant-related bearing failures – and the high unplanned downtime, repair and lost productivity costs that follow.



## Benefits

- Extends service life
- Reduces maintenance costs
- Reduces contaminant-related bearing failures
- Increases wind turbine reliability
- Facilitates up-tower retrofits

## Application

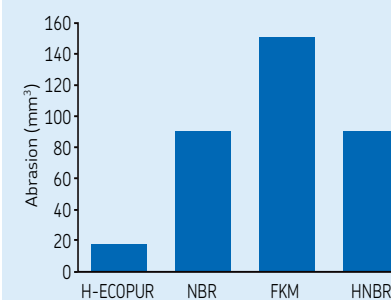
- Wind turbine main shafts

## Part of the proven SKF wind turbine solutions portfolio

The HRC1 axial excluder seal from SKF is part of a comprehensive, integrated range of SKF products for the wind turbine drive train. As a market leader in bearing and units for wind turbines, SKF is unique in combining bearing, sealing and lubrication technologies, supporting manufacturers, wind farm operators and service providers with integrated design solutions.

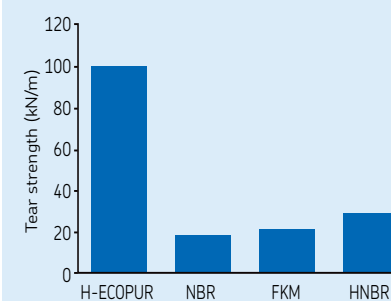
## The H-ECOPUR difference

Abrasion wear of various elastomers



H-ECOPUR is 5 times more abrasion-resistant than the next best-performing elastomer material.

Tear strength of various elastomers



H-ECOPUR offers almost 3,5 times greater tear strength than the next best-performing elastomer material.

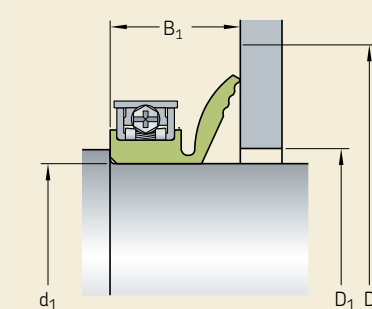
## Advanced seal engineering and materials

Developed to handle applications with a rough counterface and poor lubrication, the axial excluder seal from SKF combine important design features, contributing to a robust, high-performing solution.

The HRC1 seal features an engineered geometry that allows axial displacement of  $\pm 2$  mm. The design also supports the lubrication of the sealing lip edge while reducing seal contact area, friction and wear.

The seal is made of a special H-ECOPUR, a polyurethane material developed by SKF for specific application requirements. It is hydrolysis resistant and provides high resistance to wear, abrasion, UV radiation and ozone, making it an excellent material for up-tower applications.

Seal system dimensions



Shaft diameter ( $d_1$ ) = 1 000 – 3 000 mm  
 Seal fitted width ( $B_1$ ) =  $35 \pm 2$  mm  
 Counterface ( $D$ ) =  $d_1 + \text{min } 60$  mm  
 Clearance ( $D_1$ ) =  $d_1 + \text{max } 24$  mm

## Design flexibility

The HRC1 axial excluder seal from SKF is available in three different executions:

- Solid (HRC11)
- Split (HRC12)
- Split for welding installation (HRC13)

All executions of this seal, made of a special H-ECOPUR material, have the same cross sectional dimensions and are available for shaft diameters ranging from 1 to 3 metres.

Additionally, special sizes, compounds and designs are available on request. Please contact your SKF sales representative for solutions outside the standard range.



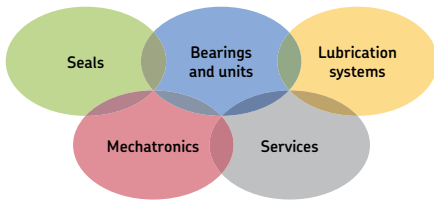
Fast-lock mechanism

## Easy to install, solid or split

Available in standard solid and split executions for shaft sizes from 1 to 3 metres\*, HRC1 seal from SKF feature a steel band clamp with a fast-lock mechanism that enables easy installation and fixation on the shaft.

For split seal retrofits, SKF provides installation services, including the recommended up-tower seal welding. In new turbine assemblies, the axial excluder seal should preferably be installed in solid execution.

\* For shaft sizes outside of this range, please contact your local SKF seal specialist.



### The Power of Knowledge Engineering

Combining products, people, and application-specific knowledge, SKF delivers innovative solutions to equipment manufacturers and production facilities in every major industry worldwide. Having expertise in multiple competence areas supports SKF Life Cycle Management, a proven approach to improving equipment reliability, optimizing operational and energy efficiency and reducing total cost of ownership.

These competence areas include bearings and units, seals, lubrication systems, mechatronics, and a wide range of services, from 3-D computer modelling to cloud-based condition monitoring and asset management services.

SKF's global footprint provides SKF customers with uniform quality standards and worldwide product availability. Our local presence provides direct access to the experience, knowledge and ingenuity of SKF people.



SKF BeyondZero is more than our climate strategy for a sustainable environment: it is our mantra; a way of thinking, innovating and acting.

For us, SKF BeyondZero means that we will reduce the negative environmental impact from our own operations and at the same time, increase the positive environmental contribution by offering

our customers the SKF BeyondZero portfolio of products and services with enhanced environmental performance characteristics.

For inclusion in the SKF BeyondZero portfolio, a product, service or solution must deliver significant environmental benefits without serious environmental trade-offs.

All our solutions for the renewable energy sector have been selected for inclusion in the SKF BeyondZero portfolio, which includes products and solutions with significant environmental benefits, such as improved energy efficiency and the enabling of increased renewable energy generation.

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