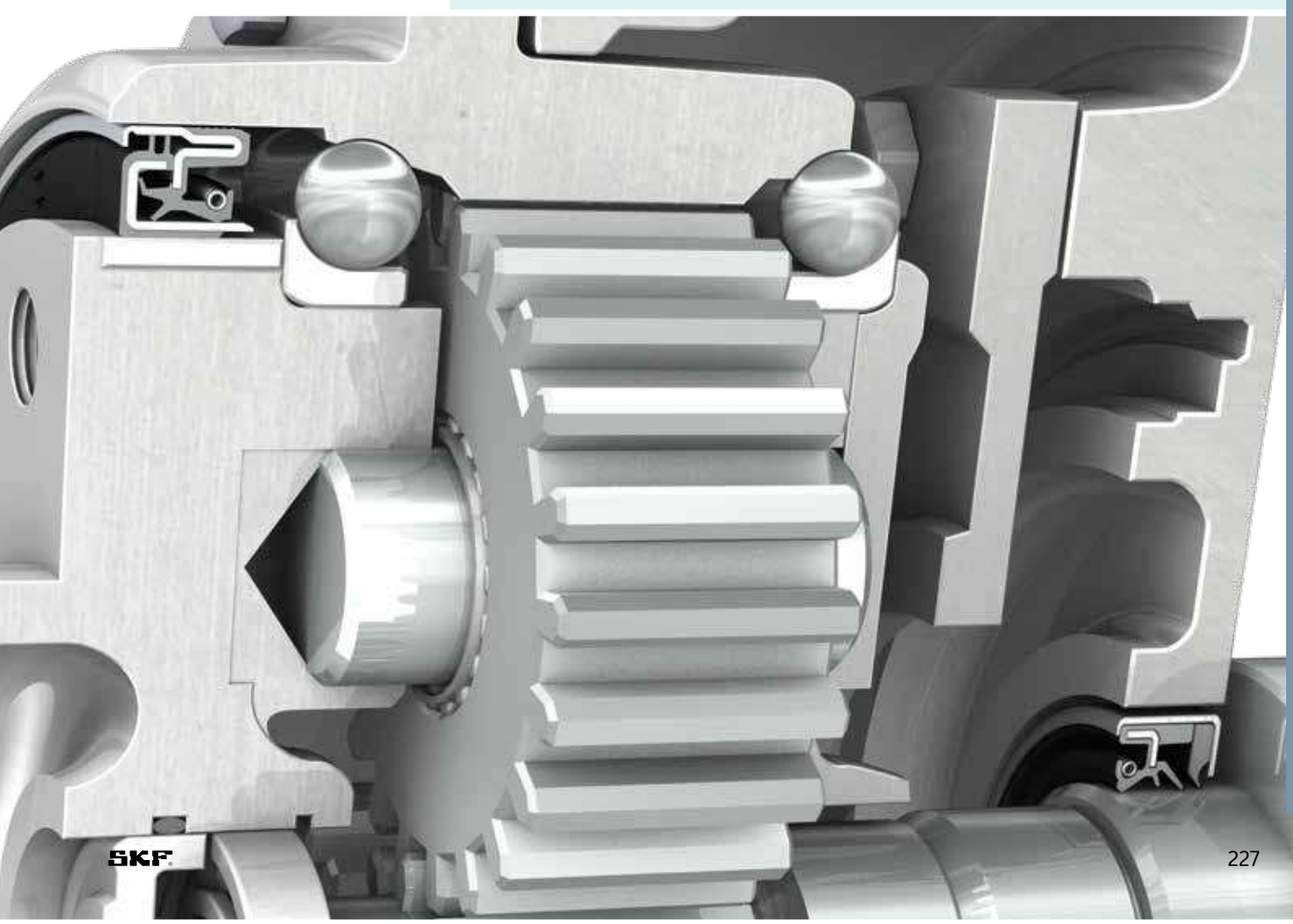
A.3 Cassette seals

20%
LESS FRICTION

SKF Cassette seals

- Maximum protection against liquid or solid contamination
- Extended wheel-end service life
- Reduced friction

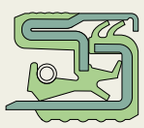


Cassette seals – general

Featuring a utilized, multilip seal design, coupled with a high performance elastomer, SKF Mudblock seals are the latest generation radial shaft sealing units. These seals have their own integrated lip running surface delivering a very high performance in contaminated environment. The design of SKF Mudblock cassette seals has been optimized to provide excellent retention of either grease or oil and maximum protection against liquid or solid contaminants (→ **fig. 1**). The seal designs are selected based on specific application criteria.

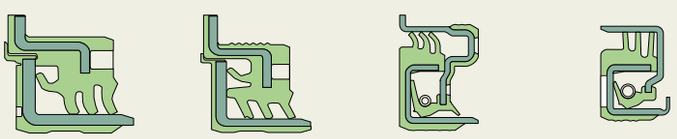
Fig. 1

SKF Mudblock designs for oil lubricated applications



MUD11

SKF Mudblock designs for grease lubricated applications



MUD3 MUD6 MUD7 MUD8

SKF Mudblock seals are widely used in low speed wheel-end applications such as the front and rear axles of, for example:

- Tractors
- Agricultural machinery
- Construction equipment
- Forestry equipment
- Off-highway trucks

Design features

All SKF Mudblock seals are designed with an integrated wear sleeve and a rubber inside diameter, but can have any one of a number of sealing lip and auxiliary lip configurations. The sealing lip material normally is nitrile rubber, but the seals are also available in other compounds including fluoro rubber, hydrogenated nitrile rubber or polyacrylate to meet the demands of different operating conditions. For more information, please refer to paragraph *Sealing materials*, starting on **page 31**.

Interchangeable and easy to handle and install

Fully interchangeable with alternative seal designs available in the market, the SKF Mudblock seals offer OEMs a range of extensively tested, pre-validated sealing retrofit options. The seals feature an integrated sleeve as the main lip counterface, which eliminates the need for costly shaft machining operations like grinding and hardening. The seal and sleeve are also unitized with a curled design feature that helps prevent damage during transportation, handling and installation. Additionally, SKF Mudblock seals do not require specific assembly tools.

Testing

SKF conducts mud shary tests of the SKF Mudblock seals at global testing facilities in USA, Europe and Asia. The tests include both our own tests and tests according to customer specifications (→ **diagram1, 2** and **3** on **page 230** and **231**). SKF Mudblock seals are engineered using Finite Element Analysis (FEA) to obtain optimum design solutions.

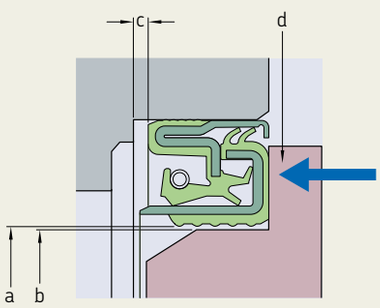
FEA evaluates to optimise the design:

- Stress / strain behavior of the sealing lip in deformed condition
- Lip contact forces
- Lip opening pressure
- Displacement of the lips
- Assembly simulation of seal and sleeve

To see how the new generation SKF Mudblock seals for oil-lubricated applications compare to conventional cassette seal designs, SKF conducted a punishing series of performance tests. The results speak for themselves: SKF Mudblock new generation seals lasted up to 50% longer and operated with up to 20% less friction than the competitor's seal. Yet SKF Mudblock seals also offered superior oil retention and contamination exclusion in the harshest, most contaminated conditions.

Fig. 2

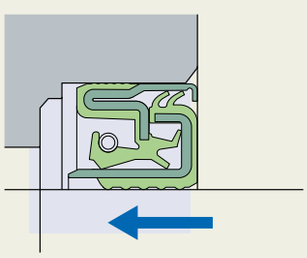
Seal is installed in the housing bore



a) Seal inside diameter
b) Installation tool inside diameter
c) Bore depth clearance
d) Installation tool arrest

Fig. 3

Shaft is introduced



Recommended surface roughness values:
Shaft: h8; Ra = 1,6 to 3,2 µm
Housing bore: H8; Ra = 1,6 to 3,2 µm

SKF Mudblock seal designs MUD11 and MUD7

SKF Mudblock seal design MUD11 is a new generation of radial shaft sealing units, specifically developed for heavy-duty applications in harsh environments and tough operating conditions.

SKF MUD11 seals (→ **fig. 4**) are designed for oil lubricated applications and provide features including:

- **Half-metal / half-rubber outside diameter:** Improves static sealing, heat dissipation and retention in housing.
- **Bumper:** The bumper positions the sleeve relative to the seal to balance the right interference for the axial lips. It also acts as a line of defence against contaminants.
- **SKF developed nitrile rubber:** Represented by all of the light-green areas in the illustration, this standard SKF Mudblock sealing lip material is a unique nitrile rubber compound. Specially formulated by SKF to help reduce wear and ageing, this advanced material is compatible with most synthetic oils.
- **Curl:** Curled feature closes the unitized design, promotes easier installation and dismounting and also prevents seal disassembly during transport and handling.
- **Main lip:** The spring-loaded main sealing lip keep the sealing lips lubricated and promote sealing ability regardless of rotation direction. This results in less friction and wear for extended service life.
- **Integrated counterface:** Wear sleeve and seal form a single, unitized seal unit that eliminates shaft machining requirements.
- **Multiple sealing lips:** Pre-greased auxiliary radial and axial lips support the main lip for maximum protection against liquid or solid contaminant ingress.
- **Full rubber inside diameter:** Contributes to effective static sealing and helps reduce the assembly force required for installation.

Fig. 4

MUD11

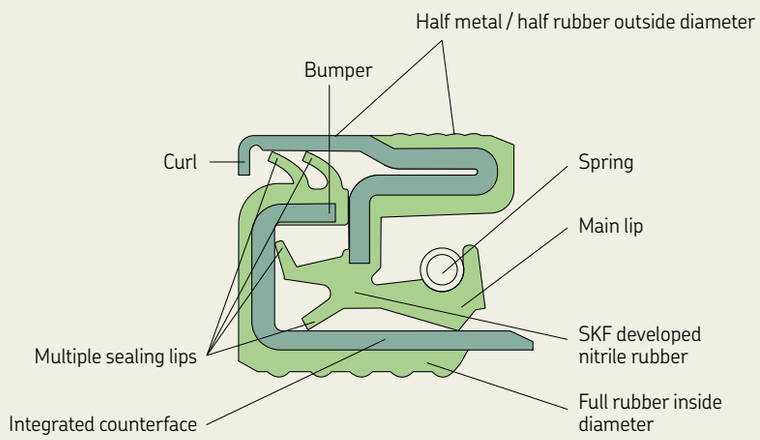
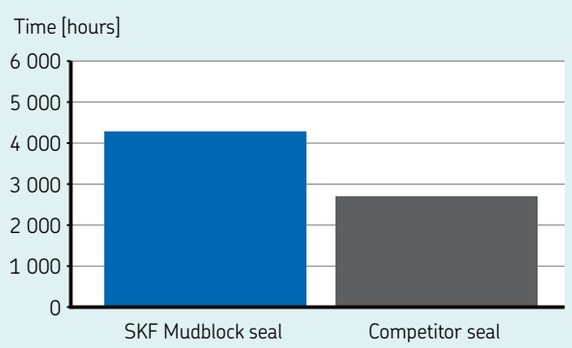


Diagram 1

MUD11 – Mud slurry test results to seal failure
Mud slurry tests simulate many thousands of hours of exposure to the most punishing liquid and solid contaminants. As this graph indicates, SKF Mudblock seals can outlast the competitor's seals by up to 1 700 hours.



SKF Mudblock seals MUD7 (→ **fig. 5**) are designed for use in grease lubricated applications and provide features including:

- **Half metal / half rubber outside diameter:** for reliable seal retention in the bore as well as improved sealing performance
- **Rubber covered inside diameter:** for improved sealing performance and easy installation
- **Integrated wear sleeve**
- **SKF patented lip design:** for extended bearing service life
- **Bumper:** maintaining the relative position between the seal and the sleeve as well as acting as a barrier against contaminants
- **Auxiliary radial lips:** for contaminant exclusion

The SKF patented lip design has a special geometry combining both a spring-loaded radial lip and an axial lip. This design enables excess pressure inside the bearing chamber to pass the lip. Thus, the bearing can run cooler, resulting in extended service life.

Fig. 5

MUD7

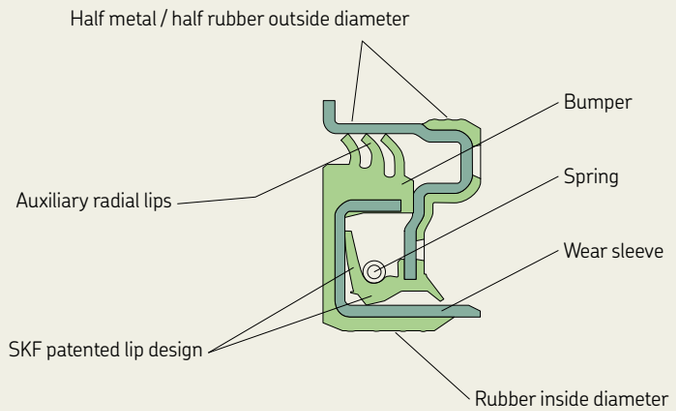


Diagram 2

MUD11 – Hot oil durability test results to seal failure
Deteriorating oil condition indicates the effectiveness of a seal's main oil retention lip. Featuring the seal profile, SKF Mudblock seals help extend oil durability, thereby reducing wear and contributing to significantly longer service life vs. the competitor's seals.

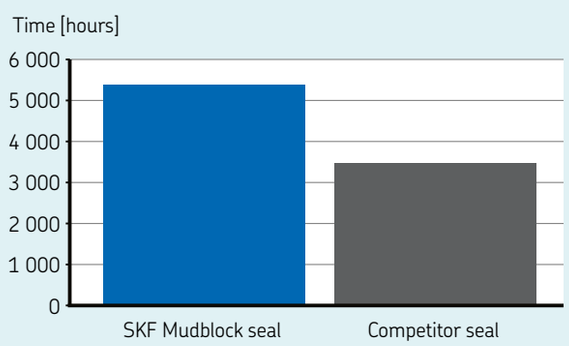


Diagram 3

MUD11 – Friction torque tests
Seal friction depends on several factors, including design geometry, rubber material composition and speed. Thanks to their optimized geometry and high-performance nitrile rubber material, SKF Mudblock seals operate with up to 20% less friction than the competitor's seals.