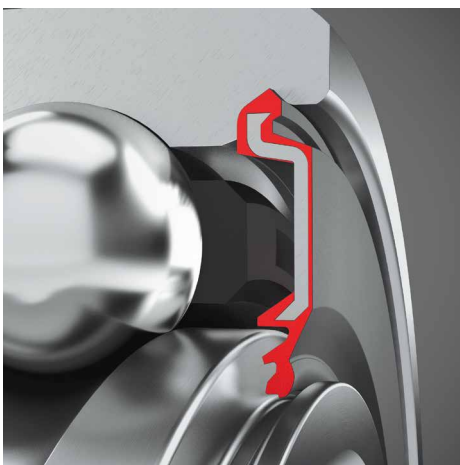


Bearings Seals

Bearing seals can prevent lubricants from escaping and stop dust, water and other harmful substances such as metal particles from getting into the bearing. By doing so, they help to ensure that bearings last as long as possible. Seals must not cause excessive friction and should only allow a small amount of seal wear. External seals should also be easy to fit and remove.

The NSK DG Seal is an extensive knowledge design seal able to match efficiency, sealing & performance. The triple seals with a special inner ring design and manufacturing capabilities make this seal the best performer on ball bearing in the market. Thanks to long experience in automotive alternator business with severe temperature, load, speed, vibration & harsh environment testing type. This seal make no compromise on performance making it available for all type of industries.



After several decades used in Automotive industry such as alternator and idler pulley, the DG seal design is now entering in the industrial field strongly. Machine tool was the first to use DG seal on ball screw support as standard, now agriculture, handling conveyor & electric motor could access to the best seal in the market.

Application:

- › Agriculture
- › Alternator
- › Conveyor
- › Electric motor
- › Food industry

Benefits:

- › Low starting torque
- › Low running torque
- › High water resistance
- › High dust resistance
- › High grease retention

Comparison of the DU standard seal with the optimised DG seal for deep-groove ball bearings

| | |
|--|---|
| | <p>DU standard seal</p> <ul style="list-style-type: none"> › Dust resistance Good › Water resistance Good › Grease retention Good |
| | <p>Optimised DG seal</p> <ul style="list-style-type: none"> › Dust resistance Excellent › Water resistance Excellent › Grease retention Excellent |

Inner ring rotation test

Reference bearings for the comparative test: 6303DDU/6303DDG

Dust test

Test conditions: Speed: 4,500 min⁻¹
 Temperature: 80 °C
 Dust composition: JIS 3kind test*, 400 g

Result: The bearings with the DDG seal last more than twice as long as the bearings with DDU seals.

Average running time (in hours until temperature suddenly rises)

| Seal Type | Average running time (hours) |
|-----------|------------------------------|
| DDU | 58 |
| DDG | 133 |

Water jet test

Test conditions: Speed: 2,000 min⁻¹
 Amount of water: 1 l/min
 Duration of test: 2 hours

Result: There was no indication of water ingress in the bearing with the DDG seal

Increase in weight (mg)

| Seal Type | Increase in weight (mg) |
|-----------|-------------------------|
| DDU | 112 |
| DDG | 0 |

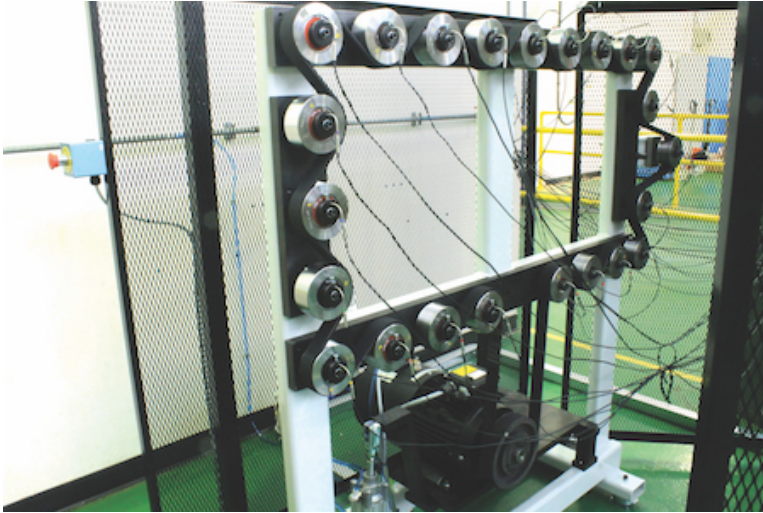
Outer ring rotation test

Comparison between

- > DU seal,
- > Competitor seal
- > NSK DG seal on outer ring rotation test

Test condition:

- > Phase 1 : Bearing 6206, 5000rpm, 900N, 500h
- > Phase 2: washing 100 bar(high pressure cleaner), 90°, 200h
- > Phase 3: 5000rpm 900N, 500h

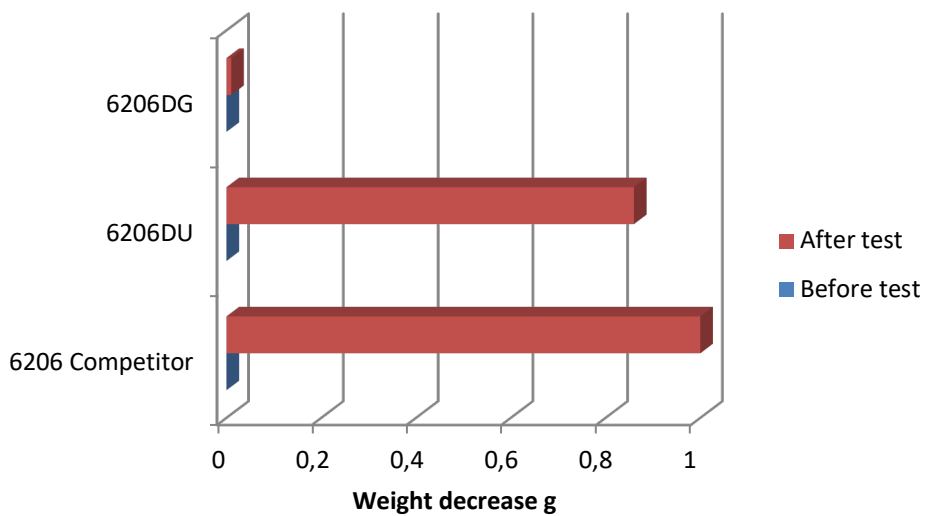


Test rig outer ring rotation



Test rig washing pressure 110Bar

Test results



Results: No water ingress or leakage with DG seal, superior performance on outer ring rotation & washing conditions

The test rigs, which have been replicated at the European Technology Centre in the UK, accurately simulate extreme agricultural conditions over a two-year period of use. Once testing is complete, the bearings are weighed to within 1µg precision to detect any grease loss. They are then inspected visually, and seal efficiency and wear are recorded.

The deep groove ball bearings featuring DG/DDG seals were subjected to intensive comparative testing. At the end of the tests, they were found to have significantly better sealing capability in comparison with both NSK deep groove ball bearings featuring existing DU seals, as well competitor products.

The bearings completely satisfy the stringent requirements of agricultural users in terms of seal tightness/performance and low-friction torque. As a result, demand from the industry is currently high and NSK has already commenced full production of deep groove ball bearings featuring the new DG and DDG seals (single-sided/double-sided sealing).

Example of nomenclature

6 2 3 DDG C3 E EA7 S 5

| | |
|-----|---|
| 6 | Bearing Type |
| 2 | Bearing Series |
| 3 | Bore Diameter |
| DDG | Seals both sides |
| C3 | Internal clearance (CM or C3 as standard) |
| E | Noise reduction |
| EA7 | Grease type |
| S | Grease Quantity |
| 5 | Packaging |

NSK Range of product available

| Bearing series currently available with an optimised DDG seal | | | | | | | | | | |
|---|----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| Serie | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 |
| 60 | | | | DDG | DDG | DDG | DDG | | | |
| 62 | | DDG | DDG | DDG | DDG | DDG | DDG | DDG | DDG | |
| 63 | | | DDG | DDG | DDG | DDG | DDG | DDG | | |