

## Non-Contact Seal

### GMN Labyrinth Seal CF 60 and CF 619 for Spindle Bearings

The challenge of global competition forces the Machine Tool Industry to improve its productivity and quality levels continuously. In addition environmental consciousness encourages all manufacturers to optimize their energy efficiency and ecological aspects of all production steps become more and more important.

From these business conditions concrete demands and requirement could be derived to modern machine tools. Improved performance e.g. requires higher machining forces or increased engine speed and this again results in ambitious demands to components like bearings and seals.

Though high quality spindle bearings must be protected reliably against splashing liquids and any kind of contamination from the machine's area of operations there is still no sealing standard established. Sealed – or covered – spindle bearings are offering a simple and complete solution but in many cases their reduced load capacities are not satisfying and the range of applications for standard contact seals is also limited. For this reason in spite of serious efforts in design and tests most manufactures prefer self-made labyrinth seals, often supported with sealing air.



GMN Labyrinth Seal  
Series CF

Now, GMN has looked into this subject intensively throughout the last two years. In due consideration of design guidelines published from the Institute of Machine Components (IMA), University Stuttgart in Germany, a capable prototype was developed in the first step, followed and optimized from a *design-to-standards* process. As a result now GMN could present the new CF Labyrinth Seal.

Basically the profile of the CF design creates an efficient barrier against splashing liquids and dust with a series of radial and horizontal gaps. When the shaft is rotating back transport is provided with centrifugal forces and finally a specific catching groove results in 100% sealing efficiency - even when the shaft is not rotating.

#### Info:

GMN, manufacturer of machining spindles, high-precision spindle bearings and freewheel clutches, produces non-contact seals for high speed applications for more than 4 decades now. This portfolio is unique and provides a maximum of experience in important aspects of the Machine Tool Industry.

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The performance of the new CF-design was tested with outstanding results. In the test bench the seal's gap is penetrated in a heavy splashing situation directly from a short distance with an oil-in-water emulsion under 6 bar pressure (see also video via QR-code). No leakage could be detected in rotation and also when the shaft is standing still – without any sealing air.

*Test bench CF Seal (movie)*

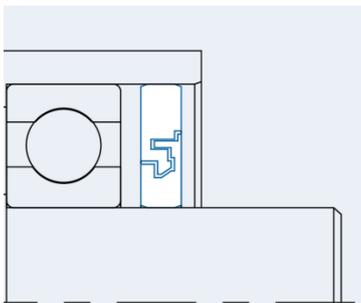


Besides the seals' efficiency the development was also focused on all design aspects of spindle bearings. CF Labyrinth Seals are made from nitriding steel, hardened and face-ground, and so the seal could be positioned directly in contact with the spindle bearing. The spindle bearings' preload could be applied directly through the seals' inner ring. In addition the seals' width is fixed to 6 mm only for all sizes. These specific advantages allow an extremely compact design. The benefit is a maximum distance of the spindle bearings and an improved performance of the spindle.

All sizes and tolerances of the new CF Labyrinth Seal are similar to the spindle bearings they are designed for. Available sizes are 6004 to 6020 according to ball bearing row 60 (respectively row 70) and 61908 to 61916 according to ball bearing row 619 (respectively row 719)

Assembly and adjustment of the seal is quite easy: The seals' inner- and outer ring are pressed in together against the bearing. With this process both rings are axially aligned in the middle position without any internal contact. The axial clearance allows a movement of 0.5 mm in each direction – the total axial clearance is 1 mm.

### CF 62 for Standard Ball Bearings



*GMN Labyrinth Seal  
Series CF 62*

In addition the new CF Labyrinth Seal is also offered in a different design for standard ball bearings made from aluminum. This design is not face-ground. The aluminum seal is offered in all sizes according to ball bearing row 62.

Of course the CF Labyrinth Seal also provides all general advantages of a non-contact seal as offered with our established standard products: As a result of absolutely no friction inside the seal there is no power loss and no generation of heat and so an optimum of energy efficiency is achieved. As a result of absolutely no wear the seals' lifetime is unlimited. These are strong benefits of all non-contact seals at all.

With its technical characteristics the CF Labyrinth Seal offers a new solution for the protection of spindle bearings and so an interesting alternative to sealed spindle bearings and self-made solutions. And last but not least the options of saving sealing air or increased maintenance intervals are also offering a considerable commercial progress.