

Gap Seals



Design

The GMN Gap Seal is mounted from two plastic parts, which create a zig zag shaped gap based on a conic envelope, thus the diameter of the sealing gaps are increased step by step from e1 on the dry side to e2 on the side facing the contaminant. Peaks and valleys of the inner and outer rings profiles (turned by the same tool) merge with each other so that they may be snapped together during the mounting process at GMN but are shipped as an inseparable unit.

Chemical Resistance

The acetalresin our seals are made of is resistant against a large variety of chemicals as: the most of the common organic solvents, alcohols, esters, ketones, aliphatic and aromatic hydrocarbonates, greases and oils. Alkaloid water and base even at higher temperature do not harm the material.

On the other hand this material may not be used to seal against oxidators and organic and anorganic acids (pH < 4). Another advantage of this material is the very low value of water pickup (max. 0.8%). Detailed information about the resistance against certain chemicals could be found in the internet in the section seals/gap seals/technology: www.gmn.de

Sealing principle

The basic principle of a labyrinth seal is based on the geometric shape of the labyrinth which causes some turns of the contaminant on its way to penetrate the seal. With the GMN Gap Seal the efficiency of the centrifugal force to accelerate the contaminant radially to throw it away from the sealing gap is increased by the conic envelope of the labyrinth. To penetrate the seal the contaminant has to overcome the centrifugal force by creeping from the larger labyrinth diameter facing the contaminant to the smaller diameter on the "dry" side of the seal. Particles penetrating the first steps of the conic labyrinth are expelled by the centrifugal force and led back to the side of the seal facing the contaminant.

There is no chance for a Gap Seal to protect against higher liquid levels and a pressure gradient between inside and outside of a Non-Contact Seal. Pressure gradients may be reduced or throttled but not sealed.

The correct mounting direction:

Care should be taken to install the Gap Seal the right way – the larger labyrinth diameter has to point to the contaminant.

Axial and radial clearance

The axial end play refers to the total axial movement of the seal's inner and outer ring in relation to each other; from one end position to the other. Axial and radial clearance of the seal are almost the same – approximately 0.5 mm. Both interfere each other. Normally the seal should be installed in flush position – thus the axial allowance would be half the value in either direction.

Protection against dust

For this type of requirement the Gap Seal may be filled with grease before the mounting to increase the sealing efficiency against dusty environment. Please mark your order "pre-greased". A certain amount of the grease may be moved out

Heavy splashing liquids

There should be enough free space in front of the seal to allow free dropping or flowing of the splashing liquid. – In addition the "Sa Type" for rotating shafts or the "Si Type" for rotating housings could be used.

Speed Limit

GMN Labyrinth seals are pressed onto the shaft with a certain press fit. Due to centrifugal forces the inner ring could lift off of the shaft. The diagram below shows the speed limit depending on the size.

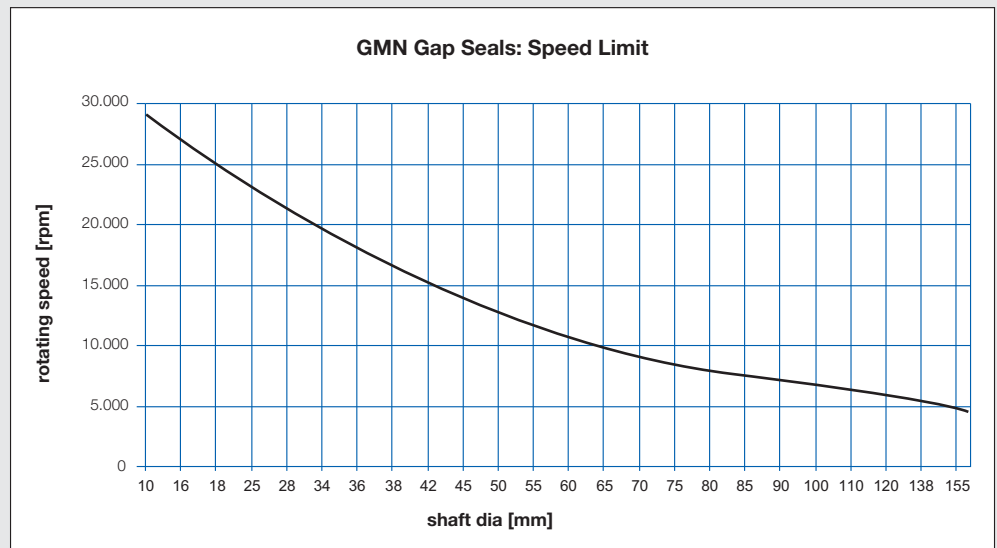




Figure 4

Type S

This is the basic design which can be used against light splashing of liquids and/or fine or coarse granular contamination. For either inner ring rotation or outer ring rotation.

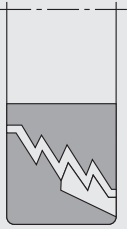


Figure 5

Type Sa

This design with a drain at the outer ring can be used against heavy splashing of liquids and/or fine or coarse granular contaminants.

For inner ring rotation only!



Figure 6

Type Si

This design with a drain at the inner ring can be used against heavy splashing of liquids and/or fine or coarse granular contaminants.

For outer ring rotation only!

The three drawings shown above are guides for the best choice of GMN Gap Seals. The most efficient design depends on whether the shaft of the housing rotates.

Mounting instructions

One of the prerequisites for the best performance of the seal is the correct mounting of the seal. Below we list some guidelines.

Mounting Position

It is very important that the GMN Gap Seal is mounted correctly. The bigger labyrinth diameter must be pointing to the contaminant. If the seal is used for two sealing functions to prevent infiltration of contaminants into a unit and to retain the lubricant inside the unit, two GMN Gap Seals should be used in opposite directions. A drain hole and a spacing ring between the two inner rings would be necessary. Minimum width of spacing ring is 5 mm. See page 20, figure 21.

With the Sa Type and the Si Type care should be taken that the built in drain is at the lowest point of the stationary part of the GMN Gap Seal.

Radial Clearance

Loose radial clearance must be avoided by accurate bearing support. Out of roundness of shafts and housings have a large influence on the sealing function – they must be kept to a minimum.

Axial Clearance

GMN Gap Seals allow an axial clearance of .5 mm (.020 inch) in total that means .25 mm (.010 inch) in each direction from the flush position of the inner and outer rings of the seal.

Axial Wobbling

To prevent axial wobbling of the rotating ring it should be mounted against a shoulder. The shoulder should be square to the shaft and be within a close tolerance.

Material

The high quality plastic material used for the standard model of GMN Gap Seals is well known for its stability and chemical resistance in a large number of applications in the capital goods and consumer goods industries. Due to its resistance to bacteria and fungi this material can be used in Food Processing and Food Conveying Industries.

The temperature range for using this material covers -40 °C (-40°F) and +60 °C (140 °F).

Material: Polyacetal resin TK – AD;
Delrin 100
Temperature limits:
-40° C to 60 °C
-40° F to 140 °F.

Special – customer oriented seals

On request we will be pleased to suggest and produce special seals for special applications, e.g. special dimensions. For slightly higher temperatures than the limit of 60 °C up to 80 °C (140 °F/174 °F) we offer a special design with “O”-rings at the inner and/or outer ring to increase the reliability of the press fit. Please contact our technical staff at no obligation.



Figure 7

For some applications the efficiency of GMN Gap Seal S Type is increased when filled with grease. This greasing can be done at the GMN plant. Please mark your order “pregreased”.

Also state the brand name if a special grease is needed depending on your contaminant.

Pregreasing is possible for GMN Gap Seal S Type only.

Mating Parts

The dimensions of GMN Non-Contact Seals are close to antifriction bearing or contact seal standards. On request we will produce seals with special dimensions. If in doubt please contact our technical staff.

Contact seals, especially at higher speeds require hardening of the shaft as well as a high surface finish at the sealing location. With the use of GMN Non-Contact Seals, hardening and grinding of the mating parts is not necessary. Tolerances of the seal have been designed so that mounting fits usual for antifriction bearings can be accepted.

Mounting fits

For GMN Labyrinth Seals:

Housing K7
Shaft h6

In any event the necessary press fit will be obtained. Additional bonding elements normally will not be necessary.

If it's necessary to decrease the press fit due to the design of the whole assembly, fits H7, G7 respectively g6 and f7 can be used. With these fits industrial glues for additional bonding of the GMN Labyrinth Seal onto the shaft and into the housing should be used. Surface finish $R_z \leq 6,3 \mu\text{m}$. The outer ring might be 0,1 mm wider than the inner ring.

For GMN Gap Seals the following mounting fits are required:

Housing	H7
Shaft	h7
Surface finish	$R_z \leq 6.3 \mu\text{m}$

The length "l" of the chamfered edge of shaft or housing depends on the width "b" of the seal. $L = 0,1 \times b$.

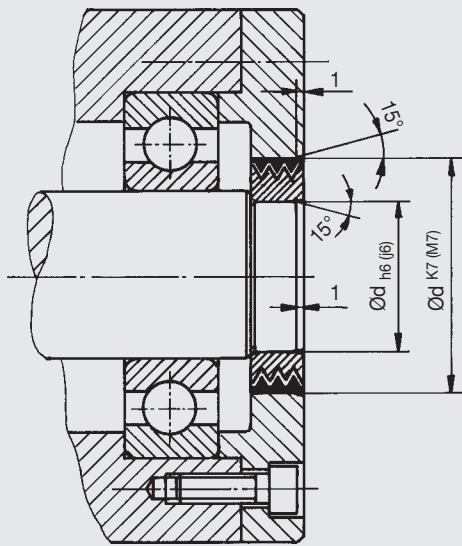


Fig. 8

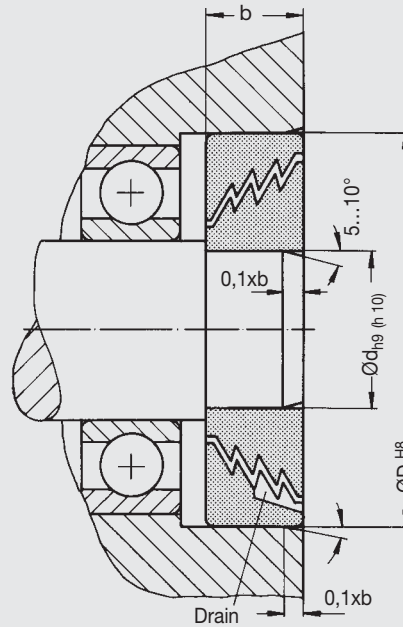


Fig. 9

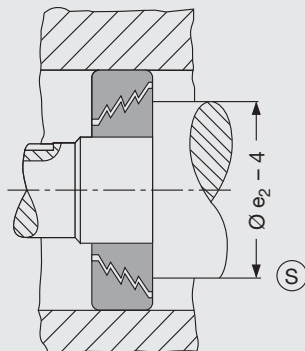


Fig. 10a

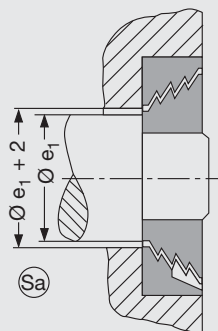


Fig. 10b

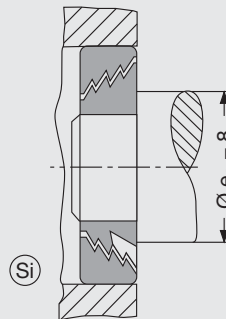


Fig. 10c

Mounting Dimensions

The drawings left are a guide for the design of mating parts. To achieve the best function of GMN Gap Seals the connecting diameters should not exceed minimum or maximum sizes.

Mounting Instructions

One of the most important requirements for the mounting of GMN Labyrinth Seals is to guarantee wobble free running of the inner ring. Therefore we recommend that the inner ring should be pressed against a solid shoulder of the shaft as shown in the section "Typical Applications" see page 18, figure 14. The shoulder and the shaft must be square and within a close tolerance. Three different methods which are commonly used for mounting are shown below.

Method I

(Face mounting position)

For these applications we recommend mounting by a mounting bushing, which covers the inner and outer ring, see figure 4. Due to the fact that both rings are almost of the same width they will be located in the working position after mounting. The difference of width, 0.1 mm in total, does not matter for normal applications. The outer ring will be, at maximum, 0.1 mm wider than the inner ring.

For high precision units or when axial clearance has to be used totally a recess could be machined on the mounting bushing and thus put the two rings into the position required.

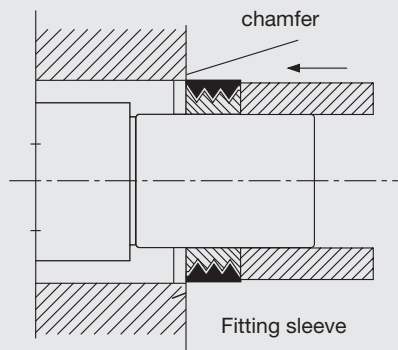


Fig. 11

With the GMN Gap-Seals basically the same mounting instructions are applicable. The only difference would be the fact that both – inner and outer ring – are of the same width.

Method II

(Mounting position inside the unit)

For assemblies where face mounting is not possible due to the design, GMN- Labyrinth Seals may be installed the following way, see figures 12a, 12b, 12c.

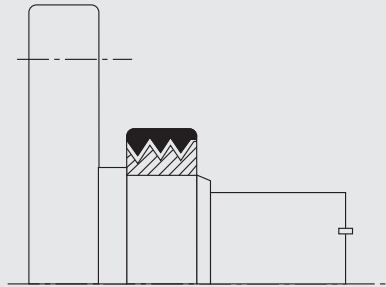


Fig. 12a

GMN Labyrinth Seal preassembled on the shaft.

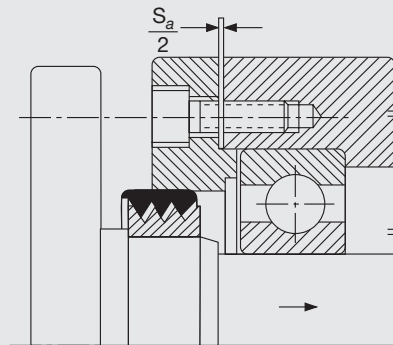


Fig. 12b

The shaft is slowly pushed into the bearing housing. The bearing flange is held in the correct position by a split shim of width $S_a/2$.

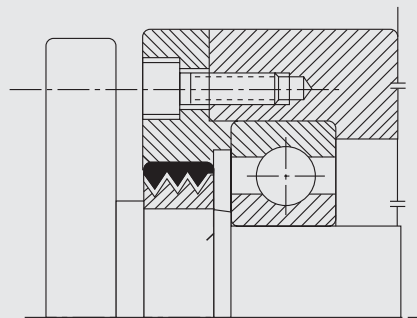


Fig. 12c

The shim is removed and the flange is fixed by screws. Now the labyrinth ring is installed in the correct position for operation.

Method III

This method can be used when neither face mounting nor preassembly on the shaft is possible, see figures 13a and 13b.

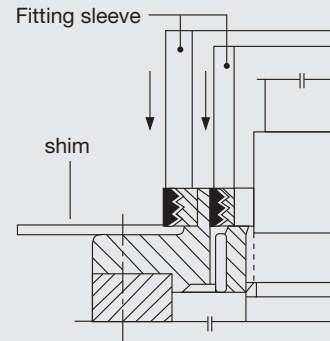


Fig. 13a

GMN Labyrinth Seal preassembled inside the housing flange.

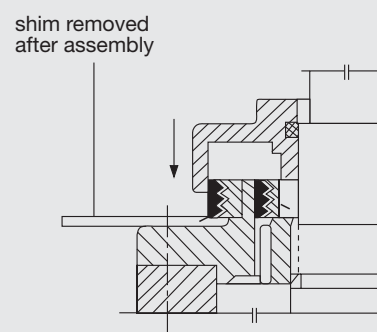


Fig. 13b

The shaft is slowly pushed into the bearing's housing while the outer ring of the labyrinth seal is held in the right position by a split shim of high accuracy. After mounting the shim is removed and both rings of the seal are in the correct position.