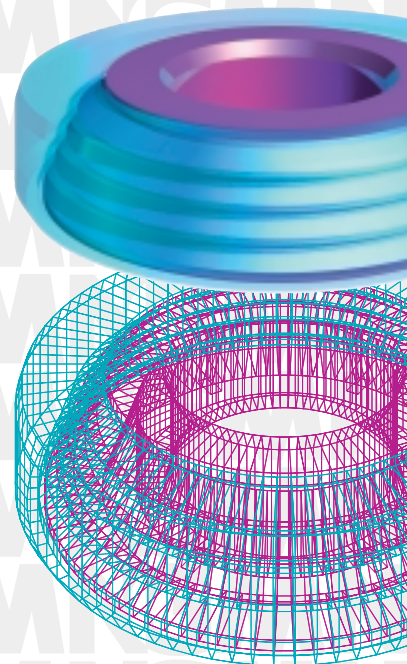
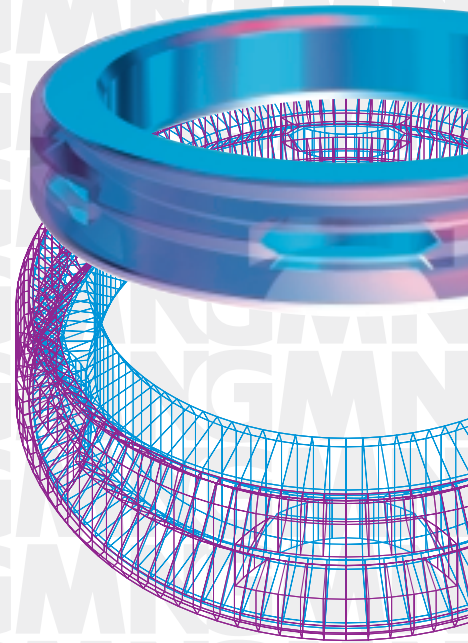


NON-CONTACT SEALS



GMN

GMN Non-Contact Seals. Typical Applications

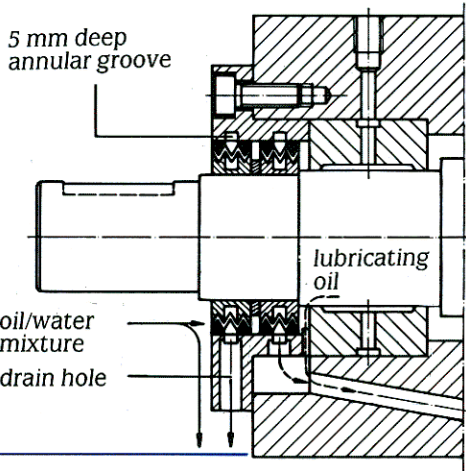


Figure 15

Double sealing of a spindle

The application shown in figure 15 requires two sealing functions against two different heavy splashing liquids. The solution is to use two GMN Labyrinth Seals "M" Type.

One seal is used to prevent penetration of the cutting oil from the outside.

Liquid splashed into the first gap is centrifuged by the peripheral grooves of the "M" Type seal into a circular groove of at least 5 mm depth.

The cutting oil can flow back to the outside via a drain hole. Using the same system oil lubricant will be led back to the reservoir by the second seal.

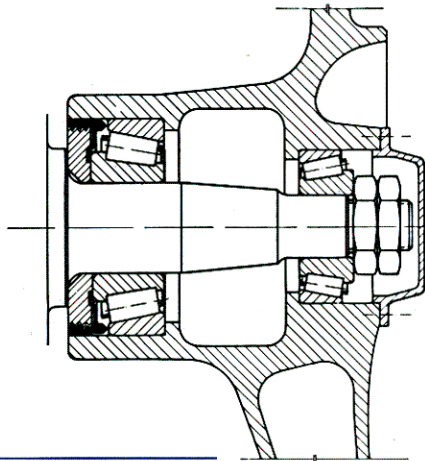


Figure 16

Sealing the axle of a special vehicle

The combined seal shown in figure 16 is just a proposal, not an economic product. If there is more space a stock item lip seal and a non-contact seal can be used.

The GMN Labyrinth Seal "L" Type protects the lip seal against coarse and fine granular contamination as well as against heavy splashing water.

If some water penetrates the seal when the axle is immersed into water for a short time the grease lubricated bearings are protected by the lip seal.

This combination of contact and non-contact seals increases the life of the entire unit.

Sealing an electric motor

Two GMN Labyrinth Seals, "L" Type, of special design prevent entry of dust and loss of grease.

The spacing ring usually placed between the ball bearing and the fan wheel is integrated in the seal inner ring.

Thus an economical solution for high volume production quantities is achieved.

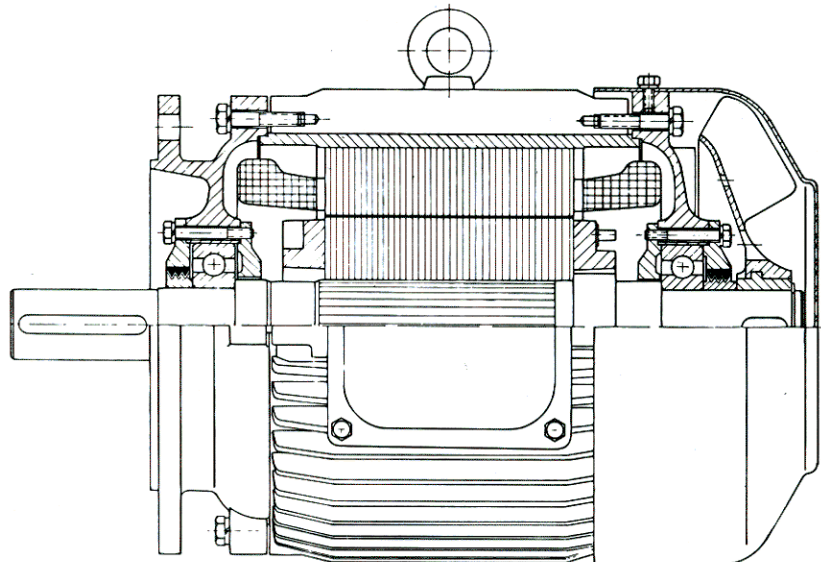


Figure 17

GMN Non-Contact Seals. Design and Performance of the Labyrinth Seals

Design

GMN Labyrinth Seals are complete units of two rings of metallic material with built in labyrinth, and are ready for mounting but inseparable. They are manufactured by a patented production process; the inner ring of steel and the outer ring of aluminum. The profiles show at least three labyrinth peaks. Standard models are supplied with widths of 10, 15 or 20 mm depending on seal diameter. For a wide range of applications GMN offer two different designs:

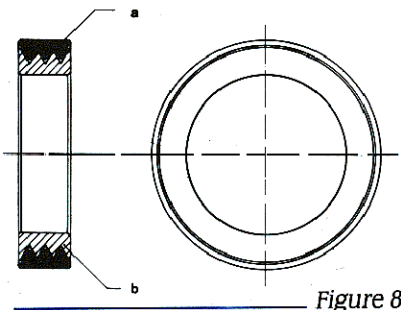


Figure 8

The "L" Type for coarse and fine granular contamination and light splashing liquids.

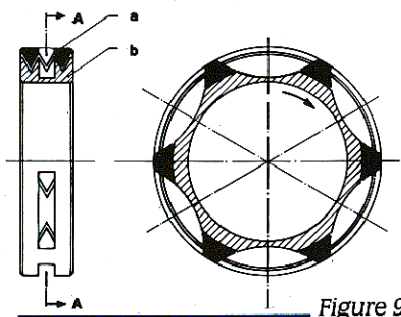


Figure 9

The "M" Type for coarse and fine granular contamination and heavy splashing liquids.

The "L" Type is the basic model, from which the "M" Type was developed.

The "M" Type seal is designed with peripheral grooves which allow liquids splashed into the first labyrinth gap to be centrifuged into a circular groove of customers mating part. The liquid may flow back via a drain hole to the reservoir or to the outside – depending on the application. The correct dimensioning of the cross section of the circular

groove and the drain hole is a necessary requirement for high sealing efficiency. An increase of sealing efficiency of GMN Labyrinth Seals may be achieved by using an additional pressure of at least 50 hPa – i.e. 20 inches water – depending on the application.

For special applications e.g. if a certain pressure has to be reduced it will be useful to use two or more seals beside each other. If two or more seals are used, spacing rings should be used between the inner rings of every pair of seals, with a minimum width of 0.5 mm.

The maximum efficiency of a non-contact seal is achieved during rotation. For some applications, if heavy splashing liquids are expected while machine parts are stationary, care should be taken that splashing directly onto the seal does not occur. This can be achieved easily by a disc or a shield, which should be mounted on the shaft.

Labyrinth-gap

The precision of the rings and the accuracy of the gap are essential to the efficiency of the seal.

Due to the special production process and special design GMN Labyrinth Seals fulfill this requirement.

Care has to be taken that the end play of the seal is larger than the expansion of the mating parts or clearance of the bearing.

The axial clearance is shown in the table of dimensions, see page 8. Axial and radial clearances of GMN Labyrinth Seals are approximately the same. They do affect each other.

The labyrinth gap of the GMN Labyrinth Seal is designed, so that a good compromise between high sealing efficiency and sufficient axial and radial clearance is achieved. For many antifriction bearings applied to the same assembly where a GMN non-contact seal is used the clearance of the seal will be

larger than the bearing clearance. You will have to check if axial end play is sufficient.

Special design for

high requirements of axial

movement

For very high axial clearance requirements we show a possible solution, see figure 10.

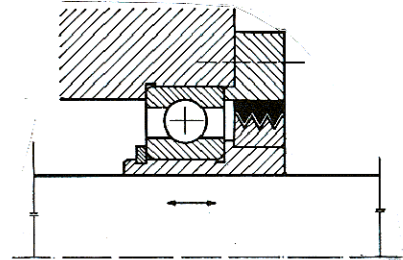


Figure 10

The design shows a ball bearing working as a loose mounted bearing. The shaft may slide inside the hub in axial direction, so there will be no relative motion between the seal's inner and outer ring. If necessary the design could be changed to a hub sliding inside the housing.

An additional solution for high requirements of axial clearance can be offered by especially produced seals with increased end play inside the seal. Please send detailed information about your requirements to our technical staff and we will check the possibilities from a production point of view. If we find a compromise we will contact you again.

Please bear in mind, that special production will take excess time and will cause additional cost. Therefore we ask you to contact our technical staff at the earliest stage of your design project to prevent delays.

If aggressive or corrosive mediums are to be sealed, GMN Labyrinth Seals can be made from different materials. Please contact our technical staff at the earliest stage of your design to discuss solutions. Special material will need special tools and therefore a longer time of delivery.

Requirements for increased end play – please contact our technical staff.

You have to seal against aggressive or corrosive contamination and need special material – please consult with our technical staff for the best solution.

GMN Non-Contact Seals. Design and Performance of the Gap Seals

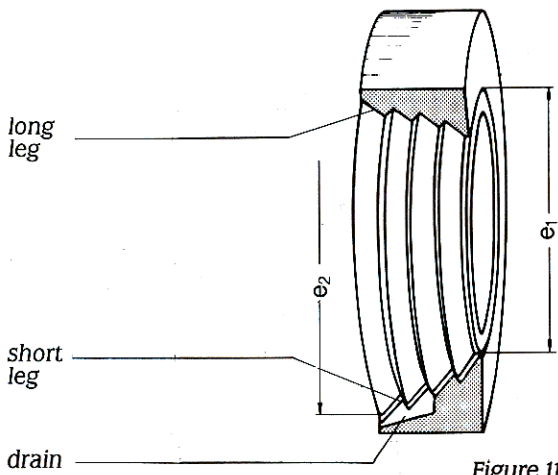


Figure 11

The peaks of the profile are produced in a conical form, thus the diameters of the sealing gaps are increased step by step from e_1 on the dry side to e_2 on the side facing the contaminant.

The sealing gap is of high accuracy and close tolerance, this is achieved by turning both rings with the same tool.

Due to the design of the conical form the length of the gap is increased. This is a prerequisite for the laminar boundary layer aligned to the direction of rotation to get in contact with the opposite wall of the gap. Thus a first barrier against contaminants (especially gaseous contaminants) is built, even at low speeds.

Based on the conical design the sealing gap has a short leg pointing at the dry side and a long leg pointing at the contaminant side, which guarantees that contaminants penetrating the first step will be centrifuged back by centrifugal force.

A small static head between the side facing the contaminant and the dry side of the seal may destroy the equilibrium.

A small amount of the contaminant may infiltrate into the sealing gap against decreasing centrifugal force to a point where a new equilibrium is achieved.

Thus the situation will be stabilized and penetration of contaminants will be prevented. Non-contact seals are able to seal only against a small pressure gradient. For higher values a contact- or lip seal will be necessary.

For applications with abrasive contaminants, a non-contact seal may protect the lip seal against the coarse contaminant to increase the life of the whole sealing system. See page 16 figure 21.

For some applications it is possible to reduce the pressure gradient to a level which can be accepted, by using two or more non-contact seals side by side. A spacing ring between the two inner rings would be necessary – minimum width 2 mm. It is not possible to give guidelines for the relationship between static head and number of seals, without actual tests.

When GMN Gap Seals start to turn after having been stationary, liquids remaining in the larger diameter peripheral groove will be centrifuged in the direction of the larger diameter – step by step, finally to e_2 . Movement of liquids in the direction of e_1 will not occur.

To seal against heavy splashing liquids we suggest using a GMN Gap Seal (Sa) Type for inner ring rotation or (Si) Type for outer ring rotation. These seals have an axial drain milled or molded into the stationary ring. The drain is located at the seals lowest point, even located lower than maximum sealing diameter. This drain fulfills two functions:

1. liquids which have penetrated the first sealing gap with a certain pressure are relieved at the discharge port.
2. liquids which have penetrated the seal while being stationary are guided by the single steps of the labyrinth profile to drain back.

GMN Non-Contact Seals. The Best Choice / Mounting Instructions / Material of the Gap Seals

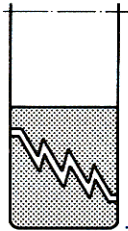


Figure 12

Ⓢ Type

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 13

Ⓢa Type

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!

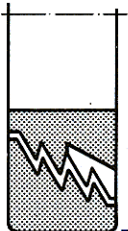


Figure 14

Ⓢi Type

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 or 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 spacing ring between the two inner rings would be necessary – minimum width of spacing ring is 2 mm. See fig.22, page 16.

With the Ⓢa Type and the Ⓢi 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.

Mounting

The best method of mounting, to achieve a non-contact and wobblefree rotation of the GMN Gap Seal, is to push both rings together into the mating parts by means of a mounting bushing. If this is not possible one should try to mount inner and outer rings fixed to each other by a split distance ring, which can be removed after mounting.

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).

The chemical resistance includes for example:

alcohols, aldehydes, esters, ethers, hydrocarbons (motor oils, gasoline), agricultural chemicals, weak acids and bases.

The peripheral speed of shafts that GMN Gap Seals are mounted on is limited at 80 m/sec. At higher speeds the pressfit is decreased by centrifugal force and exact location and connection of the inner ring and the shaft cannot be guaranteed. If speeds and/or temperatures are in the upper tolerance range one can use some industrial adhesive to fix the inner ring on the shaft, such as Loctite No. 675. For extremely high temperatures and/or speeds the inner ring can be made from a different material (plastic or metallic).

Dusty Environment

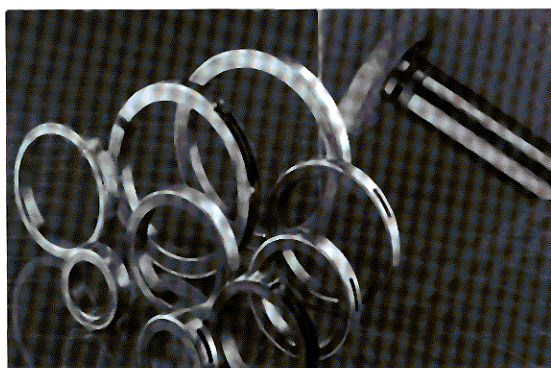
Pregreased Seal

For some applications the efficiency of GMN Gap Seal Ⓢ Type is increased when filled with grease. This greasing can be done at the GMN plant. If you feel a pregreased seal is necessary, please mark your order "grease needed". Also state the brand name if a special grease is needed depending on your contaminant.

Pregreasing is possible for GMN Gap Seal Ⓢ Type only.

GMN Non-Contact Seals. Contents – Both Systems

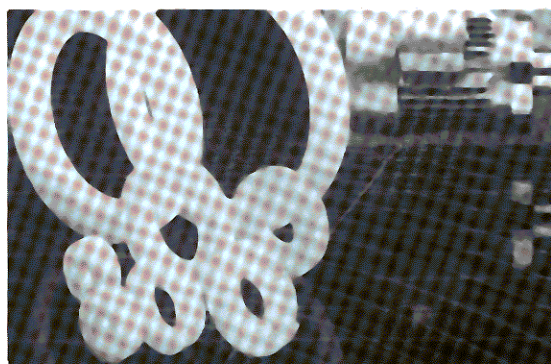
Contents – Both Systems	2
Introduction – Main Benefits – Group of Customers	3
Mating Parts	4
Mounting Instructions for Both Systems	5
General Information about the Labyrinth Seals	6
Design and Performance of the Labyrinth Seals	7
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The GMN Labyrinth Seal.

This seal is manufactured from steel and aluminum. The high accuracy of inner and outer rings labyrinth profile is achieved by a special production process.

By this process, the non-separable connection of the steel inner ring and the aluminum outer ring is achieved.



The GMN Gap Seal.

It is produced of high quality plastic material, which provides remarkable resistance to a wide variety of chemicals. The material is bacteriostatic and fungistatic and therefore utilized frequently in the Food Processing Industry.

GMN Non-Contact Seals. Introduction – Benefits

Modern design, with respect to minimum loss of energy, requires long life and lowest power loss due to friction of all components. One of GMN's answers to this challenge is a wide range of high quality and high precision ball bearings. Another answer is producing non-contact seals of two different types: GMN have designed complete units ready for mounting. They give economic solutions for many sealing problems, which allow non-contact sealing of rotating machine parts.

GMN Labyrinth Seals are produced from metallic material, inner ring – steel; outer ring – aluminum, by a special and patented production process, which guarantees the total identity of inner rings and outer rings labyrinth profile. Thus a highly efficient seal against splashing liquids and/or coarse and fine granular contaminants is achieved.

GMN Seals can be used for many applications under extreme conditions, high speeds and high temperatures. The standard model can be used up to temperatures of 170°C (340°F) at the aluminum outer ring. Temperature of the shaft and seal's inner ring may be higher. If a non-contact seal is needed for higher temperatures please contact our technical staff.

The GMN Gap Seal.

For the standard model a high quality plastic material is used which provides remarkable resistance to a wide variety of chemicals. This material enables the seal to be used in a broad range of applications. It is often used in the Food Processing Industries. The plastic material which is of a high strength can be used for temperatures of -40°C to 60°C (-40°F to 140°F).

A very high accuracy of the labyrinth gap is achieved by turning the molded inner and outer ring of the seal with the same tool. The very smooth surface achieved by this turning process is a prerequisite for the high efficiency of the GMN Gap Seal.

Main benefits

Compact design	Dimension equal or similar to those of antifriction bearings or contact seals.
No contact	No wear and no heat caused by the seal. No friction power loss.
Almost unlimited life	No costs for maintenance and replacement.
Low cost for mating parts and mounting fits	Large tolerances allowed for shaft and housing. Hardening and grinding is not necessary for customers parts.
Metallic material	No speed limit – applicable at temperatures up to 170°C (340°F).
Plastic material up to 200 mm outer diameter of the seal	Resistance against many types of chemicals, bacteria and fungi. Therefore GMN Gap Seals are ideal for the Food Processing Industry at temperatures up to 60°C (140°F).
Independent from sense of rotation	Not influenced by reversal of rotation.
High standard sealing efficiency at reasonable cost	Design of labyrinth gap and the above mentioned benefits allow the use of GMN Non-Contact Seals even for applications which have been solved with contact seals or with home designed, expensive, labyrinth profiles.
GMN Non-Contact Seals can be used for inner ring and/or outer ring rotation	

Applications

GMN Non-Contact Seals are supplied to the manufacturers of the following types of machines and equipment:

Machine Tool Industry
Testing Equipment
Packaging Machines
Textile Machines
Food Processing Machines
Driving Units
Mechanical Conveying Equipment

GMN Non-Contact Seals allow for a certain axial end play which is listed in the different tables of dimensions. If installed in flush position one can use half the value in either direction.

GMN Non-Contact Seals. Mating Parts

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

Mounting fits

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 anti-friction bearings can be accepted.

For GMN Labyrinth Seals:

Housing K7, M7 or N7
Shaft h6, j6 or k6

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.

GMN Gap Seals are produced with tolerances on the inner and outer diameters which allow for a tight pressfit with customers mating parts as marked below.

Housing	H8
Shaft (diameter up to Ø 80 mm)	h10
Shaft (diameter above Ø 80 mm)	h9
Fits usual for antifriction bearings may also be selected.	

Surface finish $R_t \leq 14 \mu\text{m}$
(3.6 micro inches)

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

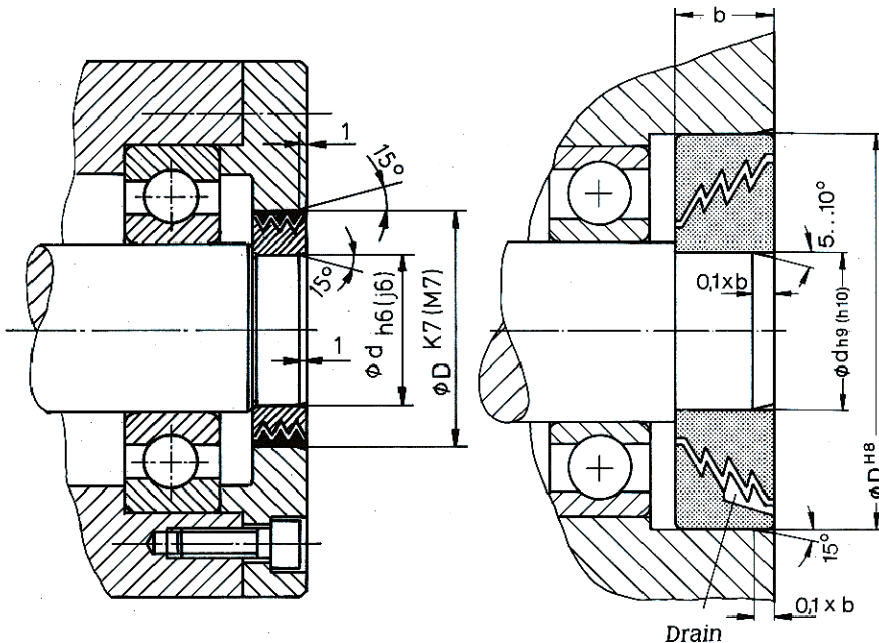


Figure 1

Figure 2

Mounting Dimensions

The drawings right 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 marked right.

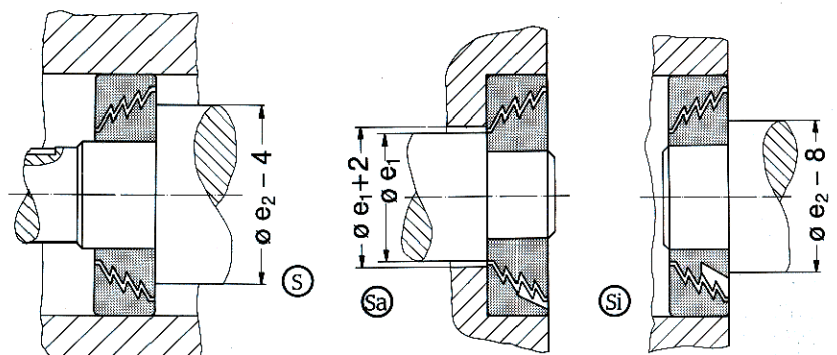


Figure 3a

Figure 3b

Figure 3c

GMN Non-Contact Seals. Mounting Instructions for Both Systems

Method I (Face mounting position)

For these applications we recommend mounting by a mounting bushing, which covers the inner and outer rings, see figure 4a. 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 one can machine a recess on the mounting bushing and thus put the two rings into the position required.

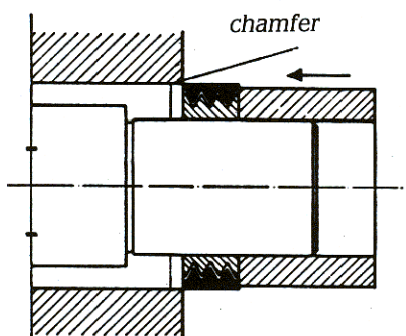


Figure 4a

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.

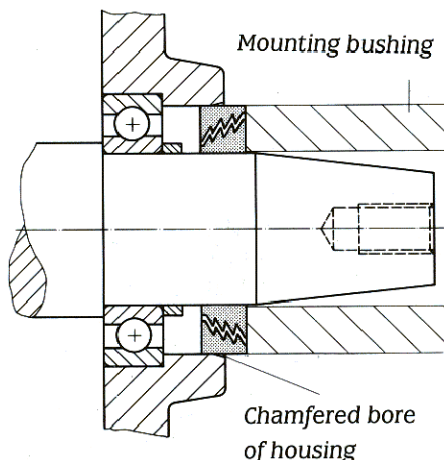


Figure 4b

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 5 a, 5 b, 5 c.

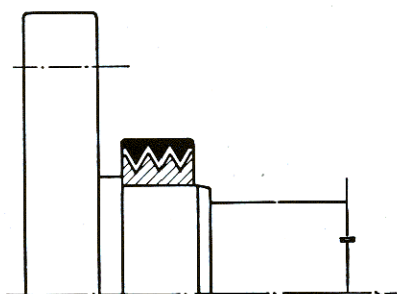


Figure 5 a

GMN Labyrinth Seal pre-assembled on the shaft

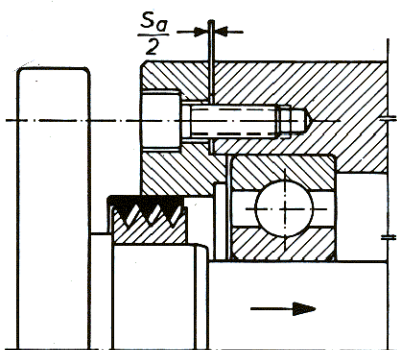


Figure 5 b

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

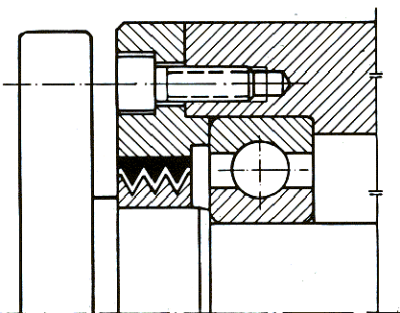


Figure 5 c

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 6 a and 6 b

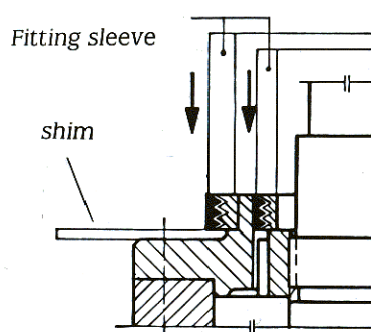


Figure 6 a

GMN Labyrinth Seal pre-assembled inside the housing flange.

shim removed after assembly

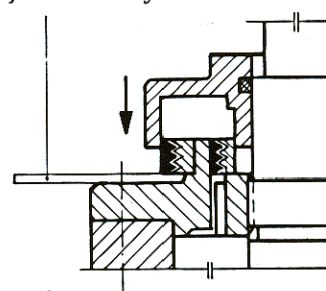


Figure 6 b

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.

One of the most important requirements for the mounting of GMN Labyrinth Seals is to guarantee wobblefree 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 14, figure 15. The shoulder and the shaft must be square and within a close tolerance. Three different methods which are commonly used for mounting are shown beside.

GMN Non-Contact Seals. General Information about Labyrinth Seals

Comparison of contact seals and non-contact seals

Contact Seal – Lip Seal	Non-Contact Seal – Labyrinth Seal
Sliding causes wear	No sliding – no wear
Power loss	No power loss – savings of energy, smaller driving units
Heat caused by the seal	No heat caused by the seal
Speed limit caused by the seal	No speed limit
Life depending on wear	No limit for the life
Lubricant necessary at sealing location	No lubricant necessary
Hardening and grinding necessary for shafts due to wear (especially at high speeds)	No hardening and grinding necessary for the mating parts
Temperature limit – low – caused by material used: rubber or plastic	Temperature limit – high – material: steel and aluminum 170°C (340°F)
Ease of mounting	Ease of mounting
Space requirements – small	Space requirements: previously: large (custom made labyrinths) today: small (GMN Labyrinth Seal)
To be applied with: grease lubrication oil lubrication	To be applied with: grease lubrication oil lubrication (oil level has to be under sealing diameter). Water – if corrosion proof material is used and water level is under the sealing diameter – will cause no problem
Water may cause problems because water lubrication at the sealing location will increase wear	Fine or coarse granular contaminants – will increase wear.
Fine or coarse granular contaminants – will increase wear.	Fine or coarse granular contaminants can be sealed reliably.

Due to the technical progress nowadays it is necessary to find the best solution for every component used on newly designed machinery, to save costs on energy and maintenance.

One important machine element is the sealing system to be used. Many different requirements have to be fulfilled by a seal.

For a large number of applications one can use non-contact seals. Very often it is too expensive to build a special labyrinth seal. It is necessary to manufacture 14 fits to get a seal with only 3 labyrinth steps.

Furthermore the mounting space required by custom made labyrinth seals is very large. Based on these disadvantages the use of non-contact seals was very low in the past. Since 1975 GMN have offered non-contact seals, ready for mounting:

The GMN Labyrinth Seal. This seal has become famous for its compact design. The advantages in comparison with contact seals or custom made non-contact seals are shown beside. The GMN Labyrinth Seal fulfills the following requirements for non-contact seals:

- Low cost
- small mounting space
- ease of mounting
- reliable sealing against splashing liquids and granular contaminants.

Sometimes a combination of contact seal and non-contact seal may solve very difficult sealing problems. For example if a gear box is lubricated with large amounts of oil – oil level higher than the sealing diameter – and bearings are to be protected against very coarse contamination. For this type of application a GMN Labyrinth Seal can be used to protect the contact seal and increase the life of the whole system this way.

Test results

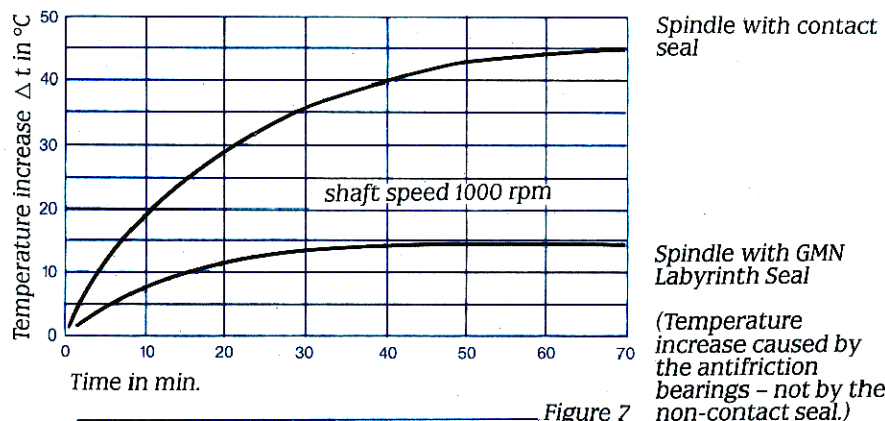


Figure 7

GMN Non-Contact Seals. Typical Applications

Sealing a high frequency grinding spindle

The GMN Labyrinth Seal "L" Type has to protect the high precision bearings against grinding chips and lightly splashing liquids.

The excess pressure caused by the oil mist lubrication increases the sealing efficiency. To protect the seal against splashing liquids when the spindle is stationary an additional front plate should be used.

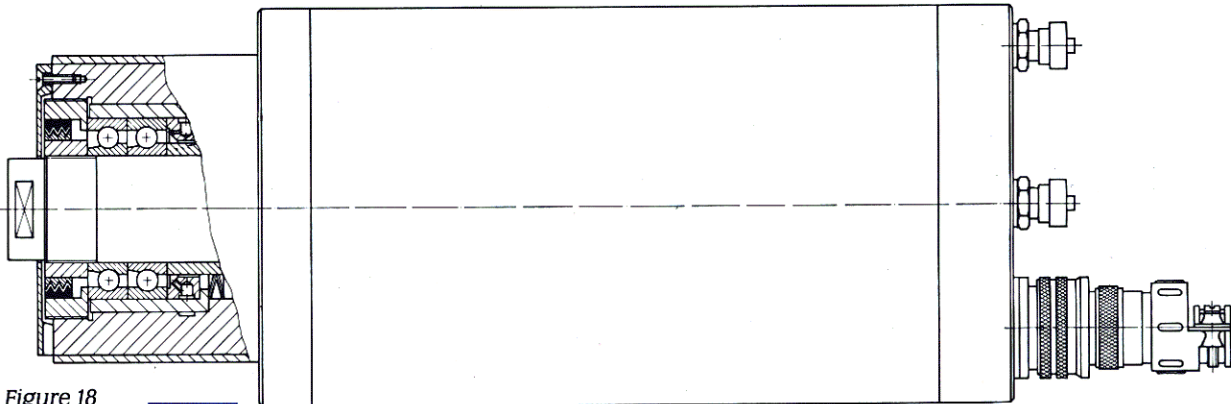


Figure 18

Sealing a drilling sleeve

The grease lubricated bearings have to be protected against cutting oil and chips. Due to the vertical mounting position the flange must be designed correctly because it is not possible to protect the inside against vertical splashing liquids by an uncovered non-contact seal.

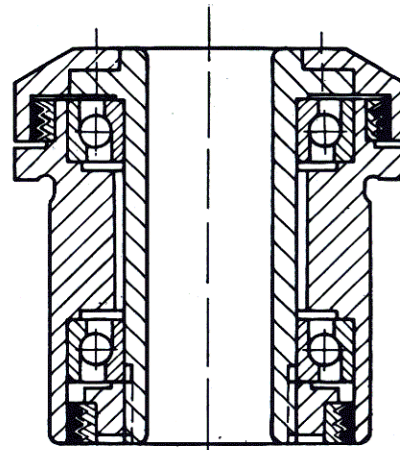


Figure 19

Sealing a conveyer roller

The grease lubricated ball bearing of the roller has to be protected against dust and coarse granular contamination from the outside.

Mounting

For mounting a bushing is used to push the seal onto the shaft and into the housing in one operation. To reach wobblefree running make sure that the inner ring is square against the shoulder of the shaft.

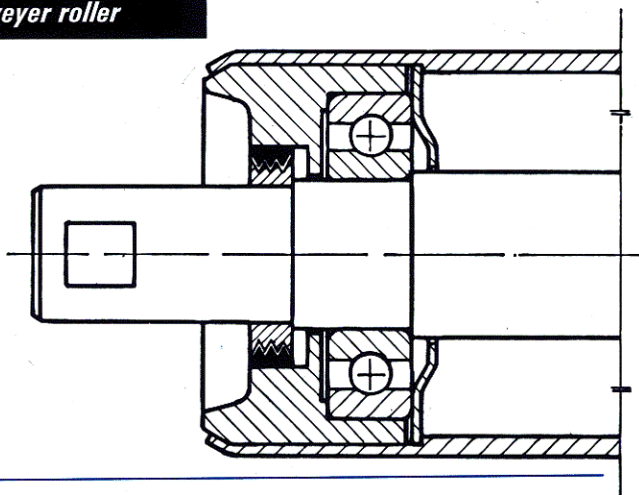


Figure 20

GMN Non-Contact Seals. Typical Applications

Sealing a gearbox with oil-level up to the middle of the shaft

With this application it is absolutely necessary to use a contact seal to keep the lubricant inside the gearbox. It is impossible to use a non-contact seal if the level of the lubricant is higher than the sealing diameter.

A GMN Gap Seal is used to protect the lip seal against rough contamination and to increase the life of the whole sealing system.

Mounting:

There is no axial limitation for the mounting depth of the GMN Gap Seal. Therefore it is necessary to true the face of the seal to the face of the housing.

The face of the housing has to be square to the housing bore.

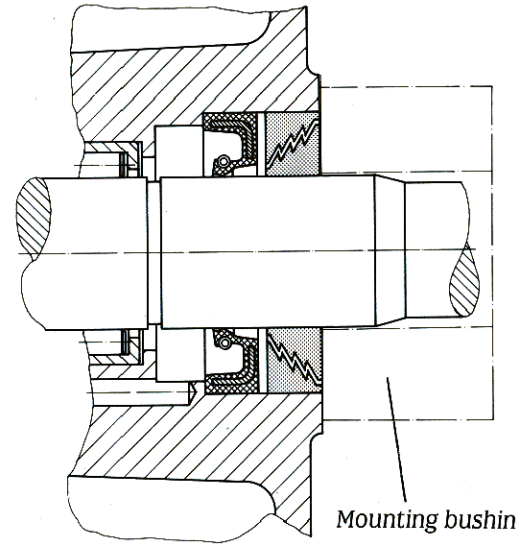


Figure 21

Sealing a grease lubricated antifriction bearing

To keep the grease inside the unit and to prevent penetration of dust, coarse granular contamination and light splashing liquids, two GMN Gap Seals in opposite sealing directions can be used. One facing the lubricant, the other facing the contaminant. To get the best sealing function a spacing ring is placed between the two inner rings.

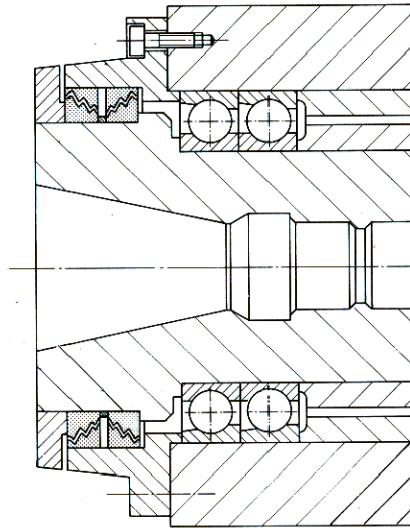


Figure 22

Sealing a spindle bearing (machine tool)

This figure shows an application, where two GMN Gap Seals are used with opposite sealing directions. One is protecting the bearing against penetration of coolant and dust. The other one is used to keep the grease inside the spindle. To obtain the best sealing function a spacing ring on the shaft with at least 2 mm width should be used.

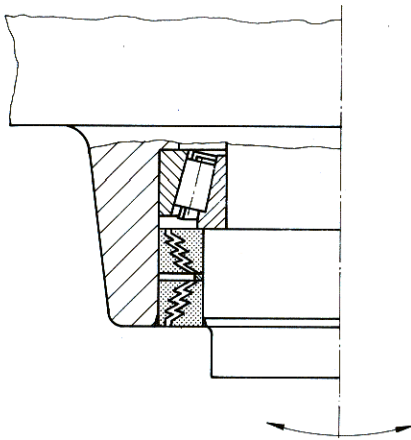


Figure 23

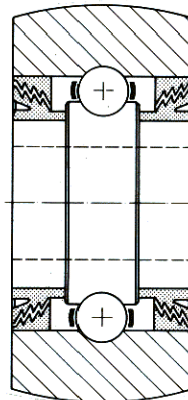


Figure 24

Sealing a conveyer roller

Conveyer rollers have to fulfill the same requirements as transport cylinders.

Figure 24 shows a specially designed GMN Gap Seal (S) Type protecting grease lubricated antifriction bearings against splashing fluids, dirt or dust.

GMN Non-Contact Seals. Typical Applications

Sealing an automotive wheel bearing

For this application we recommend a GMN Gap Seal (S) Type filled with grease as additional sealing to prevent the penetration by splashing liquids, dirt and dust. Ease of mounting for car repair purposes is achieved by this design.

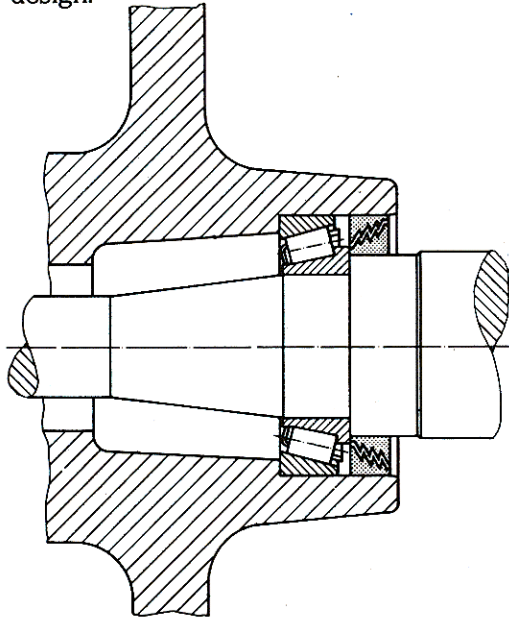


Figure 26

Sealing a work spindle

(two different working positions)

A work spindle should be used for two applications with minimum change of parts (only the cover plate and the seal housing are to change).

Figure 27 a shows an application with the sealing location on the bottom. The cover plate is designed with drain holes for centrifuging out penetrating liquids.

Figure 27 b shows the design of the cover plate without drain holes if heavy splashing liquids are applied to a seal on top of the assembly.

Sealing a spindle bearing (machine tool)

Against heavy splashing coolant the spindle bearing of a machine tool is protected by a GMN Gap Seal (S) Type with drain. To protect the seal against splashing coolant while the spindle is stationary a cover plate can be placed in front of the seal. Please allow for a drain hole in the housing.

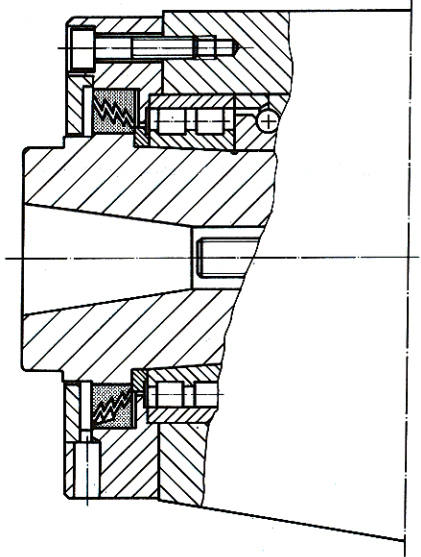


Figure 25

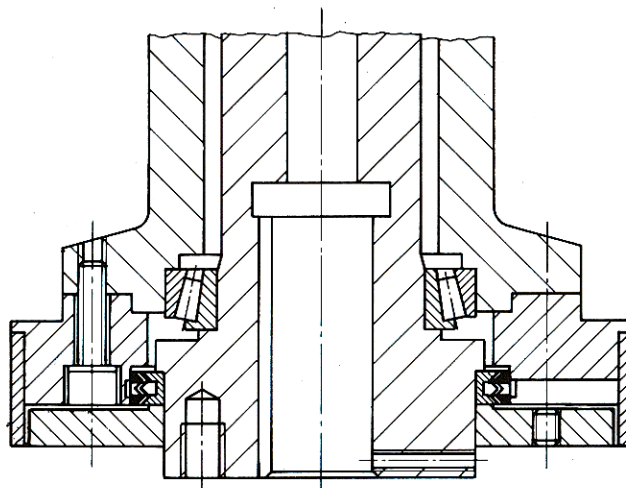


Figure 27a

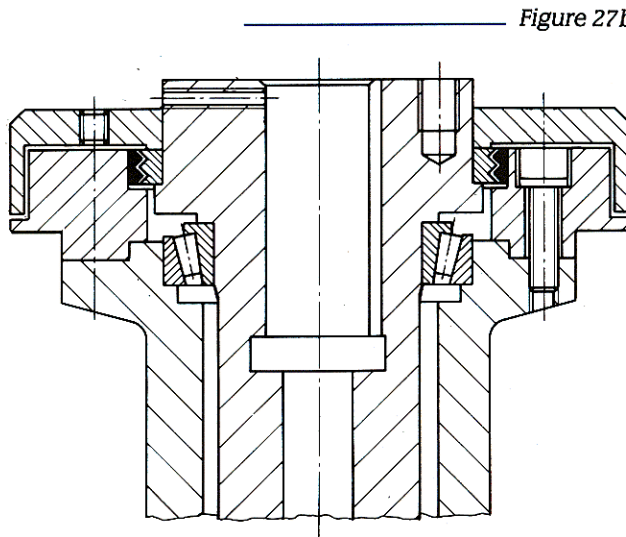


Figure 27b

GMN Non-Contact Seal. Tolerance Table

Housing

Housing		Extract of DIN 7161						
Normal size in mm	above to	Housing tolerance in 0.0001 inches (0.001 mm)						
		10 18	18 30	30 50	50 80	80 120	120 180	180 250
K7		+ 2 (6) - 5 (12)	+ 2 (6) - 6 (15)	+ 3 (7) - 7 (18)	+ 4 (9) - 8 (21)	+ 4 (10) - 10 (25)	+ 5 (12) - 11 (28)	+ 5 (13) - 13 (33)
M7		0 - 7 (18)	0 - 8 (21)	0 - 10 (25)	0 - 12 (30)	0 - 14 (35)	0 - 16 (40)	0 - 18 (46)
N7		- 2 (5) - 9 (23)	- 3 (7) - 11 (28)	- 3 (8) - 13 (33)	- 4 (9) - 15 (39)	- 4 (10) - 18 (45)	- 5 (12) - 20 (52)	- 6 (14) - 24 (60)
H7	additional glueing of the aluminum outer ring necessary	+ 7 (18) 0	+ 8 (21) 0	+ 10 (25) 0	+ 12 (30) 0	+ 14 (35) 0	+ 16 (40) 0	+ 18 (46) 0
H8	additional glueing of the aluminum outer ring necessary	+ 11 (27) 0	+ 13 (33) 0	+ 18 (39) 0	+ 18 (46) 0	+ 21 (54) 0	+ 25 (63) 0	+ 28 (72) 0
G7	additional glueing of the aluminum outer ring necessary	+ 9 (24) + 2 (6)	+ 11 (28) + 3 (7)	+ 13 (34) + 4 (9)	+ 16 (40) + 4 (10)	+ 18 (47) + 5 (12)	+ 21 (54) + 6 (14)	+ 24 (61) + 6 (15)

Shaft

Shaft		Extract of DIN 7160						
Normal size in mm	above to	Shaft tolerance in 0.0001 inches (0.001 mm)						
		10 18	18 30	30 50	50 80	80 120	120 180	180 250
h6		0 - 4 (11)	0 - 5 (13)	0 - 6 (16)	0 - 7 (19)	0 - 9 (22)	0 - 10 (25)	0 - 11 (29)
h9						0 - 34 (87)	0 - 39 (100)	0 - 45 (115)
h10		0 - 28 (70)	0 - 33 (84)	0 - 39 (100)	0 - 47 (120)			
j6		+ 3 (8) - 1 (3)	+ 4 (9) - 2 (4)	+ 4 (11) - 2 (5)	+ 5 (12) - 3 (7)	+ 5 (13) - 4 (9)	+ 6 (14) - 4 (11)	+ 6 (16) - 5 (13)
k6		+ 5 (12) + 0 (1)	+ 6 (15) + 1 (2)	+ 7 (18) + 1 (2)	+ 8 (21) + 1 (2)	+ 10 (25) + 1 (3)	+ 11 (28) + 1 (3)	+ 13 (33) + 2 (4)
g6	additional glueing of the steel inner ring necessary	- 2 (6) - 7 (17)	- 3 (7) - 8 (20)	- 4 (9) - 10 (25)	- 4 (10) - 11 (29)	- 5 (12) - 13 (34)	- 6 (14) - 15 (39)	- 5 (15) - 17 (44)
f7	additional glueing of the steel inner ring necessary	- 6 (16) - 13 (34)	- 8 (20) - 16 (41)	- 10 (25) - 20 (50)	- 12 (30) - 24 (60)	- 14 (36) - 28 (71)	- 17 (43) - 33 (83)	- 20 (50) - 38 (96)

GMN Non-Contact Seals. Technical Advice

This catalog shows on its pages 14 - 17 a wide variety of applications in which GMN Non-Contact Seals are already used and have proven their reliability. The examples are a guide as to the right choice of seals for your sealing problem and the correct way of mounting.

Should you require more detailed design, our technical department will be pleased to advise with no obligation.

We will submit the most convenient seal based on the following information about your design project.

We will need:
a drawing or sketch describing the exact function of the unit, including the following data:

- medium to be sealed,
- temperature at the seal location,
- speed at the seal location,
- axial movement of the shaft.

If you have more information regarding mating parts and any special working conditions of your unit please include this.

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