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8060 0923 ENG

GMN

Non-Contact Seals

8060 0923 ENG

Index:

GMN Non-Contact Seals

The machine tool industry and its end users are continuously demanding the most in quality in every aspect of their machine. Highly specialized components are resulting in shorter process time, higher rotating speed, flexible material characteristics and a huge range of operating conditions. Simultaneously, new energy-saving solutions and maintenance-free characteristics are increasing economic efficiency of modern machine systems.

Based on decades of experience, GMN has specialized in producing extremely high quality machine tool components. Through this strategy, GMN manufactures a wide range of standard non-contact seals and customized solutions.

The frictionless, no-wear characteristics of GMN Non-Contact Seals offer effective, economical and ecological solutions for modern applications in and outside of the machine tool industry.

Seals Classification

Classification

Varying industrial processes and demands require specialized sealing systems which could be classified into several product groups.

GMN Non-Contact Seals

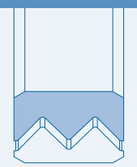
GMN provides efficient, economical, quality sealing components made of metal or plastic for concentric rotating parts.

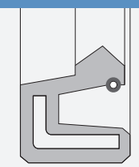
Seals (Classification)					
Dynamic seals				Static seals	
Linear movement		Rotary movement			
Rod, piston, linear guided seals		Shaft seals			
Non-Contact	Contact	Non-Contact	Contact	Non-Contact	Contact
Gap Special solutions Sealing air	Grooved ring Wiper ring Edge sealing ring Compact seal	**GMN** **Labyrinth Seal** **- Metal** **- Plastic** **Special solutions**	Felt ring Compression gland Slide ring seal Radial shaft seal	Ventilation	O-Ring Sealing mass Bellow-type seal Profile seal Flat seal Membrane seal High pressure seal Cutting ring seal

Non-Contact Seals vs. Contact Seals

The design of GMN Non-Contact Seals offers – compared to conventional contact seals – operation without any friction, an essential advantage for many seal applications.

Comparisons of Non-Contact Seals vs. Contact Seals





Characteristic	**GMN Non-Contact Seals**	**Contact Seals**
Seal wear	**Absolutely no wear of any component** Minimal maintenance	Rubbing wear due to relative movement (rotation) at the sealing lip
Power loss	**No power loss** Increases the possibility for smaller drives	Power loss due to friction
Speed limit	At high speed rotation only, the inner-ring can lift-off from the shaft due to its weight combating centrifugal forces	Limited applications for high speed rotation due to the increased wear
Contamination / abrasion	**Absolute no contamination** A key factor for food, electro-technical and electronic industries	**Micro-wear due to friction** Wear may turn into contaminant
Lifetime	**Unlimited lifetime**	Lifetime/function is limited due to wear
Lubrication of the seal	**Not necessary**	Often recommended
Mating components - Hardening and grinding	**No hardening or grinding of the mating parts** Simple turning quality (IT6) is sufficient	Shaft must be hardened and ground in most applications
Increase of temperature	**No increase of temperature**	Increase of temperature due to friction
Temperature range	**High operating range** Due to the steel and aluminium construction; 392° F [200° C] Plastic (POM) is rated to 140° F [60° C]	**Narrow operating range** Because of materials such as various rubbers and elastomeres.

Non-Contact Seals Basics

In correlation with the application's design, non-contact seals also:

- **Protect/shield inner workings of the application**
- **Throttling/switching**
- **Back transport of application medium(s)**
- **Optional draining within the seal design**

The seal itself as well as the specific design encompassing the seal satisfies only parts of the sealing requirement.

The maximum efficiency of a GMN labyrinth seal is achieved with an optimised interaction of the seal-component and the surrounding construction/design.

Sealing function at machine standstill

The functions of protecting, shielding, throttling and switching are effective even when the shaft stands still. The seal functions of back transport and draining require the shaft to be rotating.

Functions of the seal and the surrounding construction in an application

Components encompassing the seal

Protecting/ Shielding

The sealing gap is protected against direct contamination with a customized housing/shaft design. Specifically, the design in front of the seal's entrance area is important to the seal's efficiency.
The architecture of the GMN series CF shows excellent repelling and shielding characteristics.

GMN seal component

Throttling/ Switching

The tight sealing gap throttles (reduces) the flow and minimizes possible penetration by any contamination.
The labyrinth geometry creates an efficient barrier against liquids and dust.

GMN seal component

Back transport of application medium(s)

If heavy splashing liquids are penetrating the gap, drain grooves in the outer ring and a ring groove inside the housing can provide back transport when the shaft is rotating.
This is commonly used for heavy coolant or oil splashing where saving the medium is key to the application (Type SA and M).

Surrounding components to the seal

Draining

Grooves in the housing will effectively drain the medium. GMN engineers are available to help with waste gate design.
Particularly, the GMN CF-labyrinth seals ensure absorbing and draining characteristics in case of heavy splashing liquids.

Function

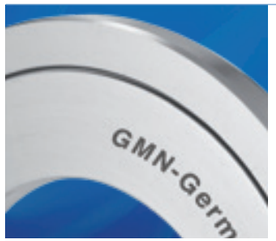
Gap height

The theory of non-contact seals is based on the gap height between inner and outer rings.
The tighter the gap height, the smaller the area (annular gap) where liquid could penetrate the seal.
Depending on amount, direction and speed (intensity) of the contamination, an additional protection against direct splashing liquids is recommended.
As an additional supporting effect inherent in a non-contact seal, tight gaps create an air cushion inside the gap. This air cushion increases in correlation to rotational speed.
With the constant gap height of only 0.2 to 0.5 mm. The complete product line of GMN Labyrinth Metal Seals achieves the highest efficiency.

Labyrinth

The labyrinth geometry acts as a barrier against any liquids or dust. Particles entering the Labyrinth seal bump against the labyrinth, therefore any media is slowed. The shifts in direction inside the labyrinth make passing the seal almost impossible.

Metal seals provide 2 to 4 labyrinth steps (depending on size) in a mini-mized space. GMN's proprietary manufacturing process guarantees 100% conformity of inner- and outer ring's labyrinth geometry to each other.
The M-type are enable to drain the penetrated liquids through the grooves at the outerring out of the annular groove at the mating parts.



In the S10 version, the GMN CF seals are made of hardened and ground steel in high precision and are particularly used for sealing of spindle bearings.
The aluminum version A0 also has the highly effective CF profile and is specially designed for standard bearings.
The CF seal profile is a combination of radial and axial gaps.
Radial gaps create a reverse flow effect due to centrifugal force when the shaft rotates.
Axial gaps impede the flow of using capillary forces.
A catching groove at the end of the profile ensures a high level of leak-tightness even when the shaft is at a standstill.

Plastic seals are providing 3 to 4 labyrinths steps depending on size. With this type, the conical gap design increases sealing efficiency due to centrifugal forces of rotation.
Penetrated media is transported back to the larger gap diameter when the shaft is rotating. The larger gap diameter always faces the contamination.
In case of heavy splashing liquids, type M and SA with drain grooves are preferred.

GMN Non-Contact Seals
Benefits and applications

Benefits

The specific design of GMN Labyrinth Seals allows operation without any friction. Many different applications are taking advantage of this major benefit:

Technical benefits
- No wear
- Rated for high rotating speeds
- Sealing efficiency is independent from direction of rotation
- No abrasion, no contamination

Thermal benefits
- No frictional heat increase
- No thermal effects to the surrounding application

Functional benefits
- Maintenance free
- Constant sealing efficiency during operation
- No adjustment required
- No lubrication required (approved for dry operation)

Economic benefits
- No hardening or grinding of mating parts
- Unlimited lifetime – no replacement due to the Non-Contact design
- Cost saving component instead of expensive self made labyrinth
- Less maintenance results in higher machine yield
- No frictional loss results in reduced demand to engine output

Ecological benefits
- Operation without friction saves energy

Applications

- High-speed
  (no-wear operation)
- Sealing against dust
  (Pre-greased GMN Labyrinth Seal made of plastic)
- High cleanliness
  (Freedom from any wear)
- Positioning without resistance
  (No opposing forces during operation)
- Protection for lip seals
  (Guarding against wear from chips and abrasive particles)

Practical examples

Textile / paper industry

Sealing against dust

The sealing of fine textile fibres is a challenge for any sealing system. Fibres and micro-fibres have the tendency to cling to the sealing gap of a lip seal. As a result, friction and wear are increasing with use. With time, the fibres are making their way to the bearings. In applications like this, pre-greased GMN Labyrinth Seals made of plastic are providing an established, proven alternative.

Examples in the textile industry are; carding engines, spinning machines, coiling machines, mechanical looms, knitting machines, cutting machines, etc..
Similar applications can be found in the paper industry. Pre-greased GMN Labyrinth Seals made of plastic are providing high efficiency sealing alternatives against fine paper dust.

Machine tool industry, spindle heads

High-speed applications

The maximum speed of contact seals is limited because of temperature, wear and resultant life expectancy.

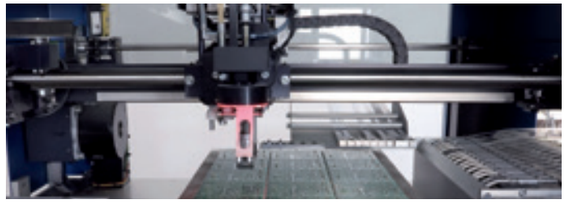
GMN Non-Contact Seals protect spindle bearings against cooling fluid and metal/wood chips. They are operating free from wear and any frictional contact. Unlimited life, no temperature increase from operation, freedom from maintenance and no loss of power provide a perfect economic solution.

Food / chemical / electronic industries

High cleanliness

Cleanliness and freedom from wear is essential in the food industry. Every contact seal is operating with some kind of relative movement between two different components being in contact continuously. With this friction, small amounts of wear (i.e. rubber material) have to be accepted, it could never be fully excluded. In the worst case, this wear could contaminate food.

A Non-Contact Seal is absolutely free from any friction contact and free from any wear. There is no risk for any kind of contamination.
An additional advantage of our GMN Labyrinth Plastic Seals is the resistance against many acids (i.e. lactic acid), chemicals (cleaning processes) and fungi; the material (POM) is already FDA-approved.

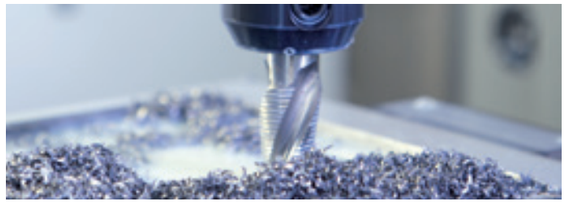


Highly accurate positioning

Positioning without resistance

Sophisticated optical or magnetic systems have to be reliably protected against any external contamination.

Encoders are exposed to high dynamic accelerations at an already high speed. With GMN Non-Contact Seals encoders could be positioned without resistance to the highest accuracy.
This is a requirement of many high-tech performance applications.



Sealing against chips and abrasive contaminations

Protection for a lip seal

Lip Seal life is extremely limited with contact of chips and abrasive particles. This contact greatly accelerates the wear of the rubber material.

An optimal solution is the combination of both seal systems: In a first step the GMN Non-Contact Seal keeps chips and abrasive particles away from the lip seal. In this scenario the contact seal is protected and the lifetime of the complete sealing system increases greatly.

The additional investment for the GMN Non-Contact Seal is minimal compared to the lost time to repair and/or replace worn seals.

Characteristics of sealing systems

The performance of any seal in various machines is extremely important to the life and efficiency of the complete system.

Because of this, GMN prefers to help customers early in the design phase to ensure that everything will perform as planned and the correct design choices are made.

Different applications require specialized and individual solutions; there is a large variety of products on the market.

The table below includes some general information to help find the best seal for your application.

In many cases the combination of different sealing systems provides the perfect solution. An additional GMN Non-Contact Seal could protect a standard contact seal against chips to increase the life-time of the complete sealing system.

	GMN Metall	GMN CF	GMN Plastic	Shield	Radial shaft seal	Sliding shield	Felt ring	Packed gland	Face seal
Suitable for high rotational speed	++	++	++	++	+-	+	--	-	++
Suitable against splashing liquids	++	++	++	-	++	++	++	+-	+-
Suitable against dust	+	+	++	-	-	+	+	+-	+-
Suitable against water	+--	++	++	+-	+	+-	++	++	++
Suitable against chemicals	--	++	++	-	+-	+-	+-	+	++
Suitable for food industry	----	++	++	-	+-	+-	-	+-	+
Suitable against liquid levels	----	-----	----	--	+	+-	+-	+	++
Suitable against pressure differentials	----	-----	----	--	+-	-	-	+	++
Suitable in high temperature applications	++	++	--	+-	+	+	-	+	++
Power efficiency	++	++	++	++	+-	+	-	--	--
Life time	++	++	++	++	+-	++	-	--	+-
Thermal effects to surrounding construction	keine	keine	keine	no	low	low	middle	high	high
Requirements to the mating parts	gering	gering	gering	middle	middle	low	middle	high	high
Maintenance	keine	keine	keine	no	middle	low	low	high	middle

Limits of use

GMN Non-Contact Seals are providing solutions for a wide field of applications. However, in certain cases the use of GMN seals is also limited.

Liquid levels and pressure differentials

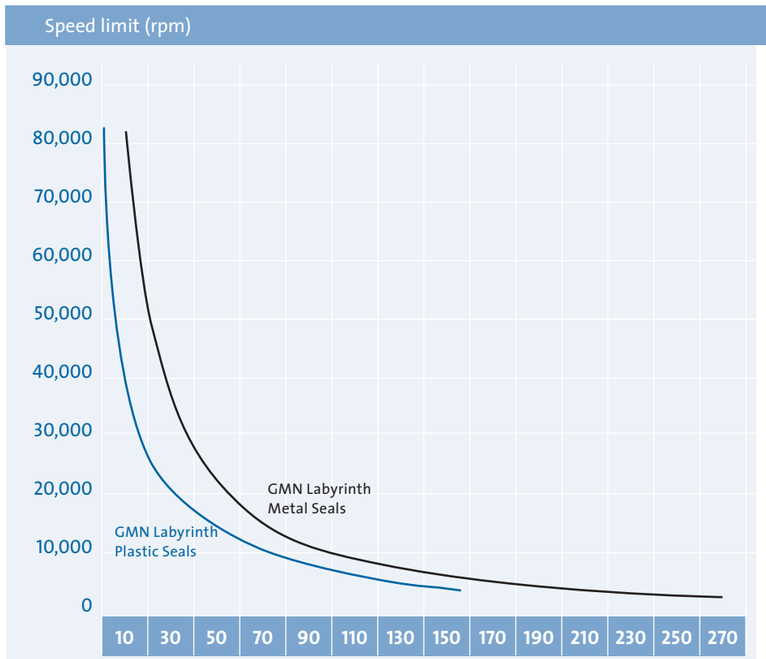
The design of a GMN Non-Contact Seal requires a gap between the outer and the inner ring. With this gap liquid levels and any difference of pressure could be reduced, but not sealed.

Speed limit

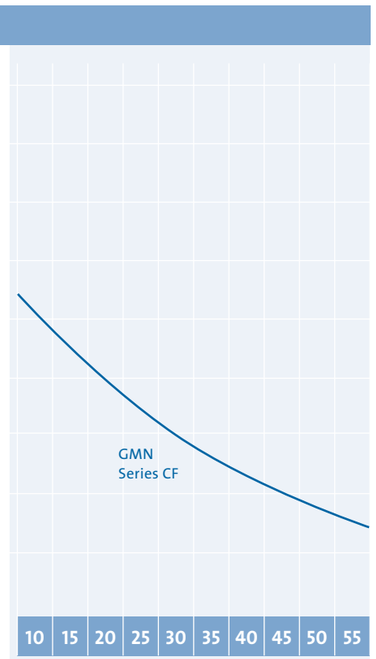
With increasing rotational speed the press-fit inner ring on the shaft has the tendency to lift-off due to centrifugal forces (lift-off speed). Most applications are far below this speed limit.

In certain cases the speed limit could be increased with increased press fit. We recommend contacting a GMN engineer when you feel that this may happen in your application.

Speed limit of GMN Non-Contact Seals

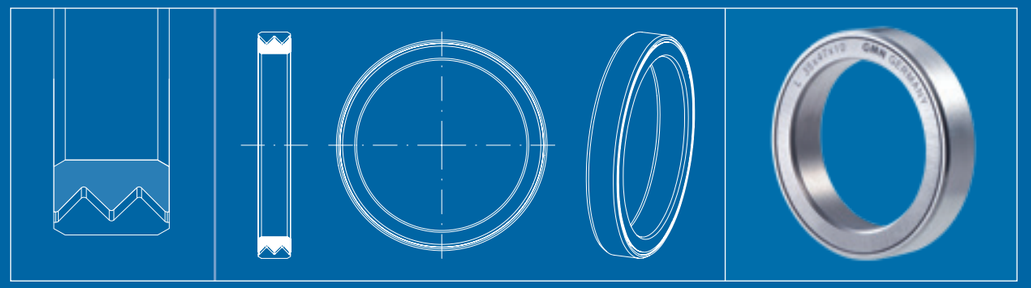


The maximum circumferential speed is (depending on the size) v = 35–60 m/s for GMN Labyrinth Plastic Seals and v = 45–70 m/s for GMN Labyrinth Metal Seals.

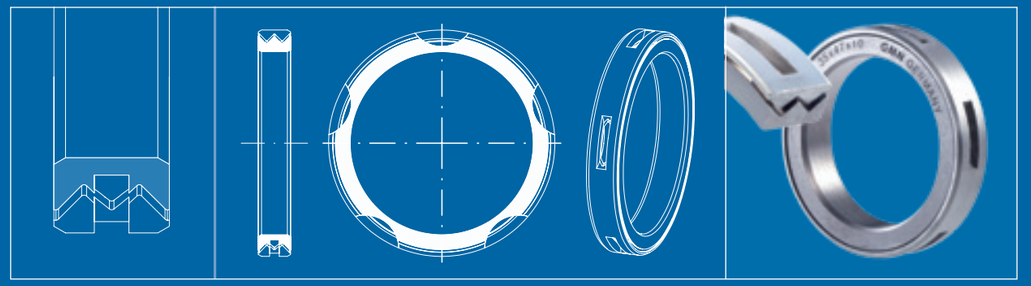


Speed limit of CF series A0
(The series CF 60/619...S10 shows no speed limit in the axial interference fit)

GMN Labyrinth Metal Seals
Type L and M



Type L
Against splashing liquids for rotating shafts and housings



Type M with drain grooves
Against heavy splashing liquids (optimized back transport) for rotating shafts only

Mounting tolerances (mating parts)

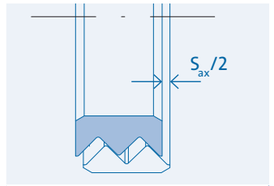
Technical data

Material

Outer ring:	Aluminium (GD AlSi 12)
Inner ring:	Non-alloy steel
Range of temperature:	-40°–390°F (-40°–200°C)

Design

Shaft diameter:	15–210mm
Width:	10, 14, 15, 20, 22 mm (depending on size)
Gap height:	Constantly 0.2–0.5mm (depending on size)
Sealing gap:	Horizontal
Axial clearance:	S_{ax} (see table of dimensions) = total axial movement of the seal's inner and outer ring in relation to each other; from one end position to the other.
Increased axial clearance:	On request all types are also available with increased axial clearance: S_{ax} = 1.5x S_{ax} (order example: L d x D x B with increased axial clearance)
Radial clearance:	$S_{rad} = S_{ax}$ /tan (42.5°)
Type M	Heavy and direct splashing liquids could be drained through a certain number of grooves in the outer ring into a circular groove inside the housing;



Axial clearance

Type M

The interlocked labyrinth design keeps inner- and outer ring together as an inseparable unit.

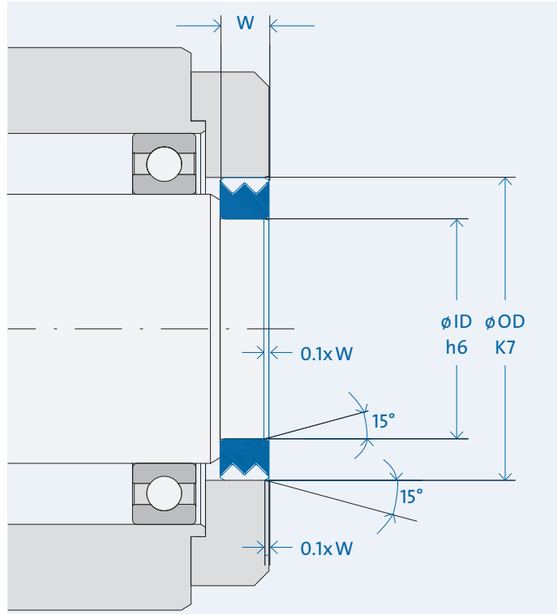
Characteristics

Material

- Robust
  Metallic materials of GMN seal components guarantee highest resistance against coarse and fine contamination.
- Well suited for high temperature applications
  Metallic materials are suitable for temperatures up to 200°C (392°F).

Design

- No friction
  GMN-Seals guarantee operation without any frictional contact.
- No wear
  GMN-Seals operate without any kind of wear, unlimited life possibilities.
- No abrasion
  The Non-Contact design of GMN-L-Seals guarantees operation without any metallic abrasion. The L-Seal is suitable for the highest demands of cleanliness.
- Effective
  The small distance between outer and inner ring of approx. 0.2-0.5 mm offers high sealing efficiency and effective protection against contamination.
- No increased temperatures
  No friction means no thermal effects to the surrounding parts and/or the lubricant.
- Power saving performance
  The specific design of the GMN Labyrinth Seal allows operating conditions without any power loss. The result is the highest efficiency and power saving performance in high speed applications.
- Compact design
  GMN Labyrinth Seals are offering 2 to 4 labyrinth steps within a tight space.
- Efficiency
  The small gap height creates an air cushion inside the gap at high rotating speeds which helps increase efficiency.
- Back transporting
  Drain grooves on the outer ring are draining liquids with great effectiveness (Type M).



Tolerances

Surrounding constructions (mating component)

Fits
Housing: K7
Shaft: h6
Surface: Rz ≤ 16µm; Ra ≤ 3.2µm

Assembly
"l" Length (chamfer of housing and shaft) depending on the width "W": l = 0.1 x W

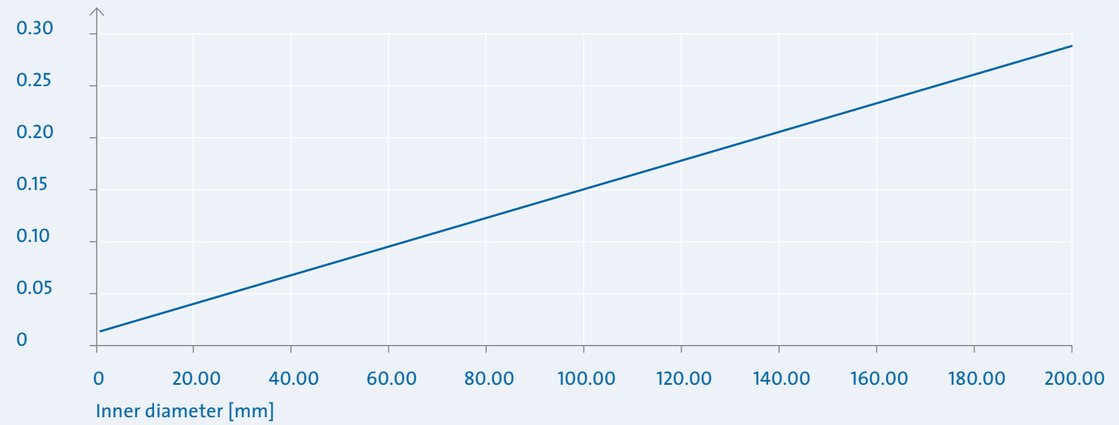
Aluminium outer ring
The softer aluminium outer ring may be deformed during transport and arrive out of roundness. When the seal is then pressed into the housing, the outer ring easily re-forms to the circular housing.

The outer ring could also be wider by max. 0.1mm than the inner ring.

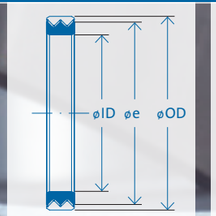
GMN Metal Seals are pressed through a round steel ring to calibrate the outer ring. After this process the outer ring widens again a little bit due to its elasticity.

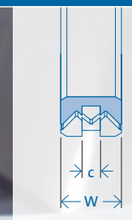
Outer ring after calibrating

Plus-tolerance OR (mm)



Labyrinth Metal Seals

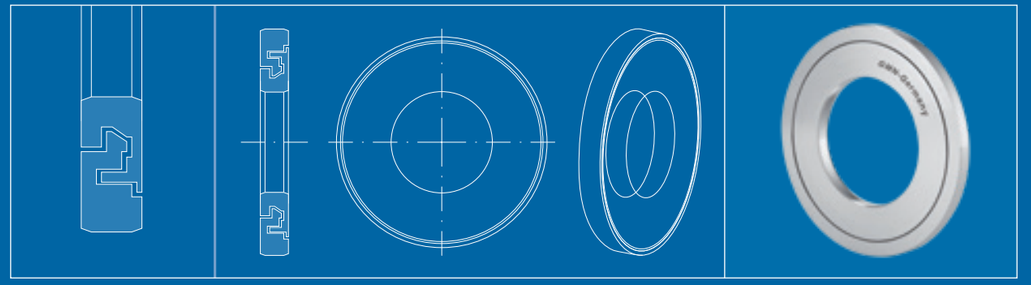




ID	OD	W	c	e	S_{ax}	max. speed	Weight	Type L			Type M (with groove)		
								Type	Part no.	Part name	Type	Part no.	Part name
15	26	8	2.5	24	0.35	63,500	0.020	L	301171	L 15 x 26 x 8	M	301337	M 15 x 26 x 8
18	28	10	3	26	0.38	56,800	0.020	L	301176	L 18 x 28 x 10	M	301341	M 18 x 28 x 10
20	28	10	3	26	0.38	81,000	0.010	L	301178	L 20 x 28 x 10	M	301343	M 20 x 28 x 10
	30	10	3	28	0.38	70,700	0.010	L	301180	L 20 x 30 x 10	M	301345	M 20 x 30 x 10
22	30	10	3	28	0.38	71,400	0.010	L	301182	L 22 x 30 x 10	M	301347	M 22 x 30 x 10
25	37	10	3	34	0.38	50,600	0.030	L	301185	L 25 x 37 x 10	M	301349	M 25 x 37 x 10
28	39	10	3	36	0.38	45,700	0.030	L	301187	L 28 x 39 x 10	M	301351	M 28 x 39 x 10
30	42	10	3	39	0.38	48,900	0.030	L	301189	L 30 x 42 x 10	M	301353	M 30 x 42 x 10
32	45	10	3	42	0.40	43,300	0.040	L	301192	L 32 x 45 x 10	M	301355	M 32 x 45 x 10
35	47	10	3	44	0.40	39,800	0.040	L	301194	L 35 x 47 x 10	M	301357	M 35 x 47 x 10
40	52	10	3	49	0.40	33,300	0.040	L	301199	L 40 x 52 x 10	M	301360	M 40 x 52 x 10
42	55	10	3	52	0.40	30,100	0.050	L	301204	L 42 x 55 x 10	M	301364	M 42 x 55 x 10
45	55	10	3	52	0.40	30,700	0.030	L	301206	L 45 x 55 x 10	M	301366	M 45 x 55 x 10
	62	10	3	59	0.40	24,800	0.080	L	301210	L 45 x 62 x 10	M	301369	M 45 x 62 x 10
48	62	10	3	59	0.40	24,500	0.060	L	301215	L 48 x 62 x 10	M	301371	M 48 x 62 x 10
50	62	10	3	59	0.40	28,300	0.050	L	301217	L 50 x 62 x 10	M	301373	M 50 x 62 x 10
52	68	10	3	65	0.40	24,200	0.090	L	301220	L 52 x 68 x 10	M	301376	M 52 x 68 x 10
55	68	10	3	65	0.40	24,100	0.070	L	301222	L 55 x 68 x 10	M	301378	M 55 x 68 x 10
58	72	10	3	68.5	0.40	22,100	0.070	L	301226	L 58 x 72 x 10	M	301384	M 58 x 72 x 10
60	72	10	3	68.5	0.40	22,300	0.060	L	301228	L 60 x 72 x 10	M	301387	M 60 x 72 x 10
	80	10	3	76	0.40	18,900	0.130	L	301230	L 60 x 80 x 10	M	301389	M 60 x 80 x 10
63	80	10	3	76	0.40	18,700	0.100	L	301234	L 63 x 80 x 10	M	301392	M 63 x 80 x 10
65	80	10	3	76	0.40	18,600	0.090	L	301237	L 65 x 80 x 10	M	301394	M 65 x 80 x 10
	85	10	3	81	0.42	17,000	0.140	L	301240	L 65 x 85 x 10	M	301396	M 65 x 85 x 10
68	85	10	3	81	0.42	16,800	0.110	L	301243	L 68 x 85 x 10	M	301400	M 68 x 85 x 10
70	85	10	3	81	0.42	16,700	0.140	L	301247	L 70 x 85 x 10	M	301404	M 70 x 85 x 10
	90	10	3	86	0.42	15,300	0.150	L	301250	L 70 x 90 x 10	M	301406	M 70 x 90 x 10
72	90	10	3	86	0.42	15,200	0.130	L	301254	L 72 x 90 x 10	M	301409	M 72 x 90 x 10
75	90	10	3	86	0.42	15,100	0.100	L	301257	L 75 x 90 x 10	M	301411	M 75 x 90 x 10
80	100	10	3	95	0.42	14,500	0.160	L	301266	L 80 x 100 x 10	M	301420	M 80 x 100 x 10
85	100	10	3	95	0.42	14,500	0.110	L	301270	L 85 x 100 x 10	M	301426	M 85 x 100 x 10
90	110	10	3	105	0.42	12,300	0.180	L	301272	L 90 x 110 x 10	M	301428	M 90 x 110 x 10
100	120	10	3	115	0.42	10,600	0.190	L	301278	L 100 x 120 x 10	M	301433	M 100 x 120 x 10
	120	14	4	115	0.70	11,100	0.250	L	301282	L 100 x 120 x 14	M	301437	M 100 x 120 x 14
110	130	15	5	125	0.70	11,700	0.290	L	301285	L 110 x 130 x 15	M	301439	M 110 x 130 x 15
120	140	15	5	135	0.70	10,400	0.310	L	301293	L 120 x 140 x 15	M	301445	M 120 x 140 x 15
130	150	15	5	145	0.70	9,200	0.330	L	301297	L 130 x 150 x 15	M	301449	M 130 x 150 x 15
140	170	15	5	165	0.70	7,500	0.650	L	301301	L 140 x 170 x 15	M	301453	M 140 x 170 x 15
150	180	15	5	175	0.70	6,800	0.700	L	301304	L 150 x 180 x 15	M	301455	M 150 x 180 x 15
160	190	20	5	184.5	0.80	6,200	0.950	L	301306	L 160 x 190 x 20	M	301457	M 160 x 190 x 20
170	210	20	5	204.5	0.80	5,400	1.500	L	301309	L 170 x 210 x 20	M	301460	M 170 x 210 x 20
180	210	20	5	204.5	0.80	5,300	1.070	L	301312	L 180 x 210 x 20	M	301463	M 180 x 210 x 20
190	230	20	5	224.5	0.80	4,700	1.660	L	301316	L 190 x 230 x 20	M	301468	M 190 x 230 x 20
200	230	20	5	224.5	0.80	4,600	1.180	L	301318	L 200 x 230 x 20	M	301470	M 200 x 230 x 20
210	250	22	5	244.5	1.00	4,000	1.960	L	301321	L 210 x 250 x 22	M	301473	M 210 x 250 x 22

ID = Inner diameter [mm]
OD = Outer diameter [mm]
W = Width [mm]
e = Gap diameter [mm]
c = Groove width [mm]
Max. speed [rpm]
S_{ax} = Axial clearance [mm]
Weight [kg]

GMN Labyrinth Metal Seals
Series CF



Series CF 60/619...S10
Steel
Series CF 62...A0
Aluminium

Labyrinth Metal Seals Series CF 60/619...S10

GMN series CF 60/619...S10 for spindle bearings

GMN Labyrinth Seals of type CF 60 and CF 619 are manufactured in the dimensions of the ball bearing series 60 and 619 and are made of nitrided steel, hardened and face-ground. The spindle bearing could be directly preloaded through the inner ring of the seal.

Technical data

Material

Outer- and inner ring: Steel
Hardness: ≥ 45 HRC
Plan parallelism: ≤ 5 µm
Range of temperature: -40°–170°C

Design

Shaft diameter: CF 60: 20–100 mm
CF 619: 40–80 mm
Width: 6 mm (0/-20 µm)

Sealing Gap

Axial clearance:* S_{ax} =1 mm
Radial clearance:* S_{rad}=0,5 mm

*total axial respectively radial movement.

Tolerances of the seal

Bore inner ring d [mm]				
above	18	30	50	80
to	30	50	80	120
max. tolerance [µm]	20	22	24	26
min. tolerance [µm]	0	0	0	0
Outer diameter outer ring D [mm]				
above	30	50	80	120
to	50	80	120	150
max. tolerance [µm]	0	0	0	0
min. tolerance [µm]	-22	-24	-26	-28

CF 60/619...S10 Characteristics

· Insensitive to temperature
For operating temperatures up to 170‘C.

· Resilient
The hardened material is extremely resistant to abrasive particles and chips.

· No friction
Non-contact design of inner and outer ring

· No wear
Unlimited lifetime

· No abrasion
meets the highest purity requirements

· Unlimited speed
No axial movement between the spindle bearing and shaft nut

· No increased temperature
No thermal strain to the seal and to the surrounded components

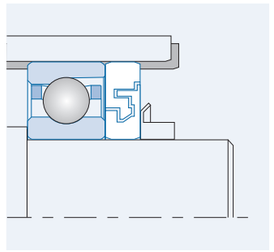
· Power efficient
Frictionless operation without loss of performance meets the highest ecological and economical requirements

· Compact design
Narrow width of 6 mm for all shaft diameters enables space-saving solutions

· Effectively
High sealing efficiency against heavy splashing liquids over a wide speed range – even when the shaft stands still

· Easy to assemble
Could be mounted directly next to the spindle bearing in an axial interference fit assembly

Installation



Series CF...S10 seals are positioned between the spindle bearing and the shaft nut without any axial mobility. For this reason there is no speed limit in this specific adjustment.

The seal is designed to be assembled directly in contact to the spindle bearing.Inner- and outer ring must be secured axially. The spindle bearing could be preloaded directly through the seal.

Orientation

The bigger gap diameter (e2) of the CF-Seal always faces the splashing liquids/contaminations.
The groove in the outer ring must be positioned downwards.

Series CF 62...A0

GMN series CF 62...A0 for deep groove ball bearings

Effective sealing of standard deep groove ball bearings with the GMN labyrinth seals of type CF 62 made of aluminum with unground plane surfaces in the dimensions of the bearing series 62.

Technical data

Material

Outer- and inner ring: Aluminium
Range of temperature: -40°–200°C

Design

Shaft diameter: 10–50 mm
Width: 6 mm

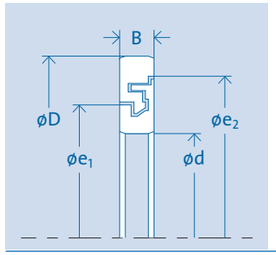
Sealing Gap

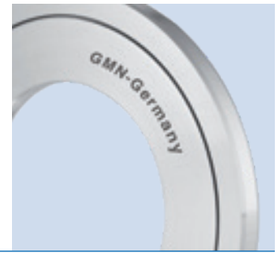
Axial clearance:* S_{ax} =1 mm
Radial clearance:* S_{rad}=0,5 mm

*total axial respectively radial movement.

Tolerances

Seal Width: 6 mm (-50/+50 µm)
Connecting parts: Shaft k5; Housing J6





CF 62...A0 Characteristics

· Insensitive to temperature
For operating temperatures up to 200‘C.

· Suitable for high speed
Low mass of the inner ring at rotating shaft

· No friction
Non-contact design of inner and outer ring

· No wear
Unlimited lifetime

· No abrasion
Meets the highest purity requirements

· No increased temperature
No thermal strain to the seal and to the surrounded components

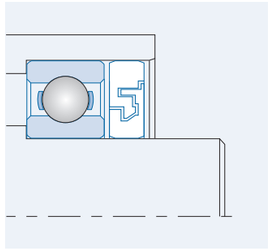
· Power efficient
Frictionless operation without loss of performance meets the highest ecological and economical requirements

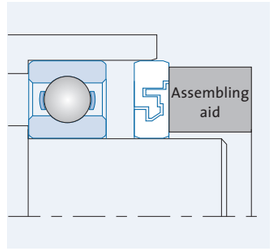
· Compact design
Narrow width of 6 mm for all shaft diameters enables space-saving solutions

· Effectively
High sealing efficiency against heavy splashing liquids over a wide speed range - even when the shaft stands still

· Easy to assemble
No adjustment of the connecting parts is required (like different diameters tolerances, hardness, shaft collar, etc ...).

Installation



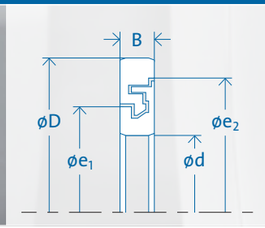


Chamfer of min. 0.8 x 15° is requested.

Orientation

The bigger gap diameter (e2) of the CF-Seal always faces the splashing liquids/contaminations.
The groove in the outer ring must be positioned downwards.

Labyrinth Metal Seals
Series CF 60/619...S10



Series CF 60...S10

Type	d [mm]	D [mm]	B [mm]	e_1 [mm]	e_2 [mm]	$n_{max.}$ [min^{-1}]	Weight [kg]	Art. No.
CF 6004 S10	20	42	6	28	38	-	0,051	307082
CF 6005 S10	25	47	6	33	43	-	0,059	307085
CF 6006 S10	30	55	6	39	49	-	0,079	307089
CF 6007 S10	35	62	6	45	55	-	0,097	307093
CF 6008 S10	40	68	6	50	60	-	0,113	307097
CF 6009 S10	45	75	6	55	65	-	0,134	307101
CF 6010 S10	50	80	6	60	70	-	0,145	307105
CF 6011 S10	55	90	6	67	77	-	0,189	307109
CF 6012 S10	60	95	6	72	82	-	0,202	307113
CF 6013 S10	65	100	6	77	87	-	0,215	307117
CF 6014 S10	70	110	6	83	93	-	0,268	307121
CF 6015 S10	75	115	6	89	99	-	0,283	307125
CF 6016 S10	80	125	6	94	104	-	0,343	307129
CF 6017 S10	85	130	6	100	110	-	0,360	307133
CF 6018 S10	90	140	6	107	117	-	0,428	307137
CF 6019 S10	95	145	6	112	122	-	0,447	307141
CF 6020 S10	100	150	6	117	127	-	0,465	307145

Series CF 619...S10

CF 61908 S10	40	62	6	48	58	-	0,084	307149
CF 61909 S10	45	68	6	53	63	-	0,097	307153
CF 61910 S10	50	72	6	58	68	-	0,100	307157
CF 61911 S10	55	80	6	63	73	-	0,126	307161
CF 61912 S10	60	85	6	68	78	-	0,135	307165
CF 61913 S10	65	90	6	73	83	-	0,144	307169
CF 61914 S10	70	100	6	80	90	-	0,190	307173
CF 61915 S10	75	105	6	85	95	-	0,201	307177
CF 61916 S10	80	110	6	90	100	-	0,212	307181

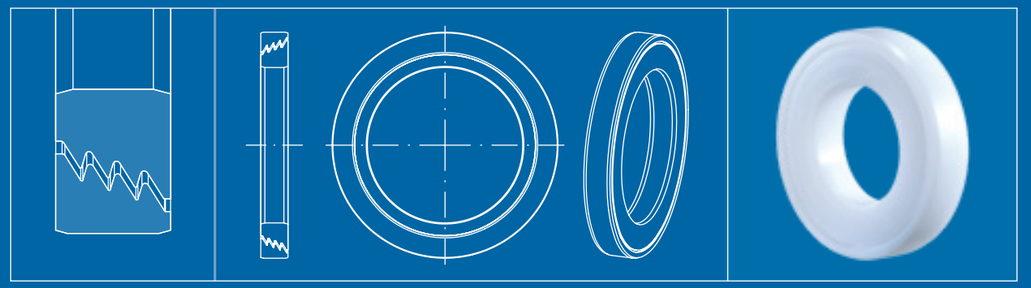
Series CF 62...A0

Sries CF 62...A0

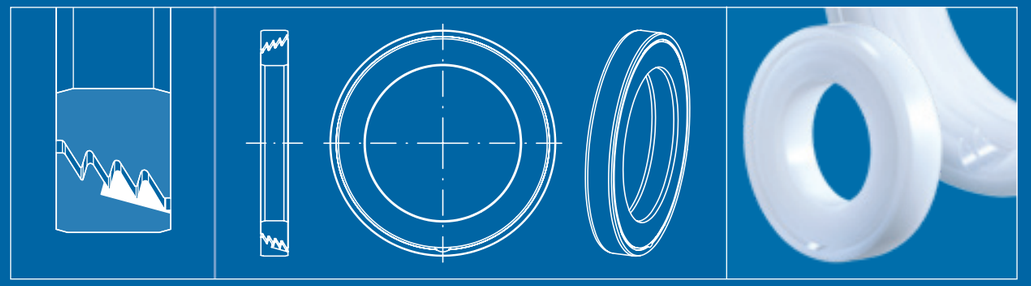
Type	d [mm]	D [mm]	B [mm]	e_1 [mm]	e_2 [mm]	$n_{max.}$ [min^{-1}]	Weight [kg]	Art. No.
CF 6200 A0	10	30	6	17	27	66.420	0,010	306787
CF 6201 A0	12	32	6	19	29	54.330	0,011	306791
CF 6202 A0	15	35	6	22	32	46.100	0,013	306795
CF 6203 A0	17	40	6	25	35	50.200	0,017	306799
CF 6204 A0	20	47	6	29	39	45.580	0,023	306803
CF 6205 A0	25	52	6	34	44	36.570	0,026	306807
CF 6206 A0	30	62	6	42	52	32.270	0,037	306811
CF 6207 A0	35	72	6	48	58	28.090	0,050	306815
CF 6208 A0	40	80	6	54	64	24.810	0,061	306819
CF 6209 A0	45	85	6	58	68	21.980	0,066	306823
CF 6210 A0	50	90	6	63	73	19.810	0,071	306827

d = Inner diameter [mm]
D = Outer diameter [mm]
B = Width [mm]
e_1 = Gap diameter [mm]
e_2 = Gap diameter [mm]
n_{max} = Max. speed [rpm]
Weight [kg]

GMN Labyrinth Plastic Seals
Type S and SA



Type S
Against normal splashing liquids
For rotating shafts and housings



Type SA with drain groove
Against heavy splashing liquids
For rotating shafts only (increased back transport)

Labyrinth Plastic Seals Type S and SA

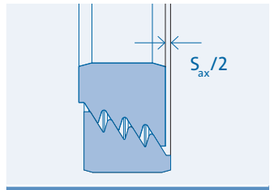
Technical Data

Material

Outer- and inner ring:	high quality Polyoxymethylene plastic (POM)
Temperature range:	-40°–140°F (-40°–60°C) special design with O-ring up to 170°C (80°C)

Design

Shaft diameter:	10–160 mm (customized solutions available upon request)
Width:	10, 12, 15 mm (depending on size)
Sealing gap:	Conical
Axial clearance:	S_{ax} = 0.8 mm Total axial movement of the seals inner and outer ring in relation to each other from one end position to the other.
Type SA	Heavy and direct splashing liquids could be drained through an additional groove in the outer ring – for rotating shafts only.
Greased seals:	Pre-greased Seals Type S – available in all sizes – provide improved protection against dust.



Axial clearance


Drain groove Type SA

The labyrinth peaks are overlapping each other. With the assembly the rings are simply clicked together.

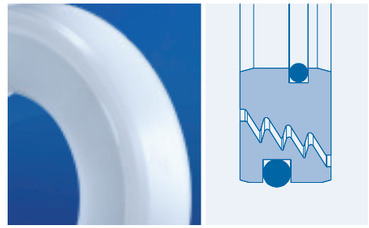
Characteristics

Material

- Non corrosive
  GMN Plastic Seals are made from non corrosive material and are particularly suitable against watery liquids.
- Chemical resistant
  Polyoxymethylene (POM) guarantees high resistance against a lot of acids (i.e. lactic acid), chemicals and fungi. **GMN Non-Contact Plastic Seals are approved for the food Industry.**

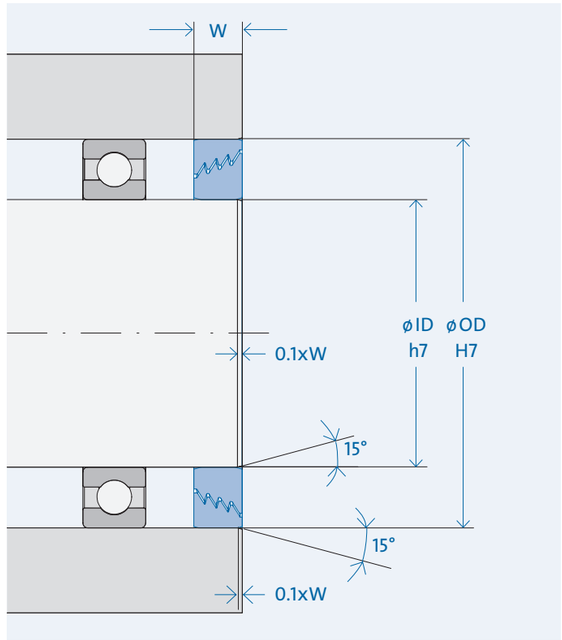
Design

- No friction
  GMN-Seals operate without any frictional contact.
- No wear
  GMN-Seals operate without any kind of wear, unlimited life possibilities.
- No abrasion
  The Non-Contact design of GMN Labyrinth Seals guarantee operation without any abrasion. (GMN Plastic Non-Contact Seals are suitable for the highest demands of cleanliness.)
- Effective
  The small distance between outer and inner ring offers high sealing efficiency and effective protection against contamination.
- No increased temperatures
  No friction means no thermal effects to the surrounding parts and/or the lubricant.
- Power saving performance
  The specific design of the GMN Labyrinth Seal allows operating conditions without any power loss. The result is the highest efficiency and power saving performance in high speed applications.
- Compact design
  GMN Labyrinth Plastic Seals are offering 3 to 4 labyrinth steps within a small space.
- Efficient
  GMN Labyrinth Seal Type S and SA take advantage of the centrifugal force to improve the sealing efficiency. Entering liquids are trans ported back to the bigger gap diameter with the rotation of the inner ring. Because of this effect, the bigger gap diameter (e_2) of the Labyrinth seal must always face the splashing liquids/ contamination.
- Dust-free
  The gap of pre-greased seals is filled with a specific grease type and improves protection against dust and fine particles.



Special design with O-ring for higher temperatures up to 176°F [80°C]

In applications with high temperatures, an additional O-ring at the outer ring (also available at the inner ring) saves the press fit and keeps the seal in position.



Mounting

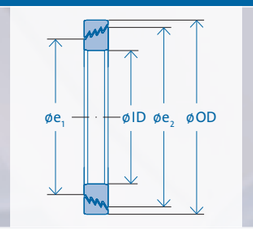
Tolerances

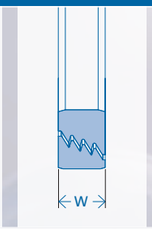
Surrounding constructions (mating component)

Fits
Housing: H7
Shaft: h7
Surface: Rz ≤ 16µm; Ra ≤ 3.2µm

Assembly
“l” Length (chamfer of housing and shaft) depending on the width “W”: l = 0.1 x W

Labyrinth Plastic Seals





ID	OD	W	e_1	e_2	S_{ax}	Max. speed	Weight	Type S			Type SA (with groove)		
								Type	Part no.	Part name	Type	Part no.	Part name
10	30	10	14	24	0.8	82,000	0.010	S	301491	S 10 X 30 X 10	SA	301753	SA 10 X 30 X 10
12	32	10	14	24	0.8	75,000	0.010	S	301494	S 12 X 32 X 10	SA	301756	SA 12 X 32 X 10
	37	10	19	29	0.8	59,500	0.010	S	301496	S 12 X 37 X 10	SA	301758	SA 12 X 37 X 10
15	35	10	19	29	0.8	53,400	0.010	S	301498	S 15 X 35 X 10	SA	301759	SA 15 X 35 X 10
	42	10	24	34	0.8	44,300	0.010	S	301501	S 15 X 42 X 10	SA	301762	SA 15 X 42 X 10
17	35	10	19	29	0.8	67,900	0.010	S	301506	S 17 X 35 X 10	SA	301767	SA 17 X 35 X 10
	40	10	24	34	0.8	56,900	0.010	S	301509	S 17 X 40 X 10	SA	301771	SA 17 X 40 X 10
	47	10	31	41	0.8	45,600	0.020	S	301511	S 17 X 47 X 10	SA	301773	SA 17 X 47 X 10
20	40	10	24	34	0.8	51,300	0.010	S	301515	S 20 X 40 X 10	SA	301777	SA 20 X 40 X 10
	42	10	24	34	0.8	51,300	0.010	S	301516	S 20 X 42 X 10	SA	301779	SA 20 X 42 X 10
	47	10	31	41	0.8	45,600	0.020	S	301517	S 20 X 47 X 10	SA	301781	SA 20 X 47 X 10
22	42	10	24	34	0.8	48,500	0.010	S	301520	S 22 X 42 X 10	SA	301786	SA 22 X 42 X 10
25	47	10	31	41	0.8	40,500	0.010	S	301523	S 25 X 47 X 10	SA	301789	SA 25 X 47 X 10
	52	10	31	41	0.8	40,500	0.020	S	301524	S 25 X 52 X 10	SA	301791	SA 25 X 52 X 10
28	47	10	31	41	0.8	37,800	0.010	S	301533	S 28 X 47 X 10	SA	301802	SA 28 X 47 X 10
	52	10	31	41	0.8	37,800	0.020	S	301534	S 28 X 52 X 10	SA	301803	SA 28 X 52 X 10
30	62	10	46	56	0.8	25,900	0.030	S	301537	S 30 X 62 X 10	SA	301807	SA 30 X 62 X 10
	72	10	47	61	0.8	24,500	0.040	S	301541	S 30 X 72 X 10	SA	301812	SA 30 X 72 X 10
35	62	10	46	56	0.8	23,900	0.020	S	301547	S 35 X 62 X 10	SA	301819	SA 35 X 62 X 10
	72	10	47	61	0.8	22,600	0.030	S	301550	S 35 X 72 X 10	SA	301824	SA 35 X 72 X 10
36	62	10	46	56	0.8	23,500	0.020	S	301555	S 36 X 62 X 10	SA	301829	SA 36 X 62 X 10
40	62	10	46	56	0.8	22,000	0.020	S	301567	S 40 X 62 X 10	SA	301842	SA 40 X 62 X 10
	68	10	47	61	0.8	21,000	0.030	S	301570	S 40 X 68 X 10	SA	301845	SA 40 X 68 X 10
	90	10	60	74	0.8	17,300	0.060	S	301576	S 40 X 90 X 10	SA	301851	SA 40 X 90 X 10
42	65	10	46	56	0.8	25,300	0.020	S	301578	S 42 X 65 X 10	SA	301854	SA 42 X 65 X 10
	72	10	47	61	0.8	24,100	0.030	S	301580	S 42 X 72 X 10	SA	301857	SA 42 X 72 X 10
45	80	10	60	74	0.8	19,200	0.040	S	301584	S 45 X 80 X 10	SA	301862	SA 45 X 80 X 10
	85	10	60	74	0.8	19,200	0.050	S	301585	S 45 X 85 X 10	SA	301864	SA 45 X 85 X 10
50	80	10	60	74	0.8	17,800	0.030	S	301593	S 50 X 80 X 10	SA	301873	SA 50 X 80 X 10
	90	10	60	74	0.8	17,800	0.050	S	301596	S 50 X 90 X 10	SA	301876	SA 50 X 90 X 10
55	80	10	60	74	0.8	19,100	0.030	S	301606	S 55 X 80 X 10	SA	301886	SA 55 X 80 X 10
	85	10	60	74	0.8	19,100	0.040	S	301608	S 55 X 85 X 10	SA	301888	SA 55 X 85 X 10
60	95	12	72	87	0.8	15,400	0.060	S	301618	S 60 X 95 X 12	SA	301899	SA 60 X 95 X 12
	110	12	87	102	0.8	13,200	0.090	S	301622	S 60 X 110 X 12	SA	301901	SA 60 X 110 X 12
65	100	12	72	87	0.8	16,300	0.060	S	301631	S 65 X 100 X 12	SA	301910	SA 65 X 100 X 12
68	95	12	72	87	0.8	15,800	0.050	S	301639	S 68 X 95 X 12	SA	301918	SA 68 X 95 X 12
70	110	12	87	102	0.8	13,400	0.080	S	301643	S 70 X 110 X 12	SA	301920	SA 70 X 110 X 12
	125	15	96	112	0.8	12,300	0.170	S	301646	S 70 X 125 X 15	SA	301923	SA 70 X 125 X 15
75	130	15	96	112	0.8	12,900	0.160	S	301659	S 75 X 130 X 15	SA	301936	SA 75 X 130 X 15
80	110	12	87	102	0.8	13,300	0.060	S	301666	S 80 X 110 X 12	SA	301944	SA 80 X 110 X 12
	140	15	116	132	0.8	9,600	0.180	S	301671	S 80 X 140 X 15	SA	301950	SA 80 X 140 X 15
82	110	12	87	102	0.8	13,100	0.060	S	301675	S 82 X 110 X 12	SA	301954	SA 82 X 110 X 12
85	120	15	96	112	0.8	10,800	0.100	S	301678	S 85 X 120 X 15	SA	301956	SA 85 X 120 X 15
90	120	15	96	112	0.8	10,400	0.090	S	301687	S 90 X 120 X 15	SA	301963	SA 90 X 120 X 15
	145	15	116	132	0.8	9,800	0.200	S	301691	S 90 X 145 X 15	SA	301968	SA 90 X 145 X 15
95	140	15	116	132	0.8	9,500	0.150	S	301697	S 95 X 140 X 15	SA	301973	SA 95 X 140 X 15
100	140	15	116	132	0.8	9,100	0.130	S	301704	S 100 X 140 X 15	SA	301981	SA 100 X 140 X 15
110	140	15	116	132	0.8	7,900	0.100	S	301715	S 110 X 140 X 15	SA	301992	SA 110 X 140 X 15
120	150	15	126	142	0.8	6,200	0.110	S	301725	S 120 X 150 X 15	SA	302002	SA 120 X 150 X 15
125	170	15	146	162	0.8	5,400	0.210	S	301729	S 125 X 170 X 15	SA	302008	SA 125 X 170 X 15
130	170	15	146	162	0.8	5,200	0.190	S	301731	S 130 X 170 X 15	SA	302011	SA 130 X 170 X 15
140	170	15	146	162	0.8	5,000	0.140	S	301739	S 140 X 170 X 15	SA	302019	SA 140 X 170 X 15
150	190	15	166	182	0.8	4,300	0.190	S	301746	S 150 X 190 X 15	SA	302025	SA 150 X 190 X 15
160	190	15	166	182	0.8	4,100	0.140	S	301750	S 160 X 190 X 15	SA	302029	SA 160 X 190 X 15

ID = Inner diameter [mm]
OD = Outer diameter [mm]
W = Width [mm]
e_1 = Gap diameter [mm]
e_2 = Gap diameter [mm]
Max. speed [rpm]
S_{ax} = Axial clearance [mm]
Weight [kg]

Installation

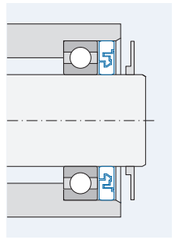
Installation

General information

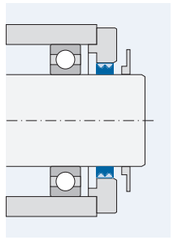
When installing a GMN Non-Contact Seal, one must be certain that both the inner and outer races are axially aligned. Furthermore, the races need to be unrestricted by any shoulder, nut(s), and/or other restrictions from axial movement.

Surrounding construction

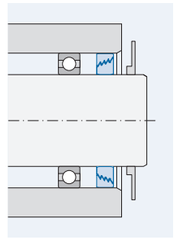
An additional disc in front of the seal protects the gap against strong and direct splashing liquids.
The disc should be assembled in front of the seal with sufficient distance (capillary forces should be considered).



Non-Contact Seal (metal) Type CF...A0 with disc



Non-Contact Seal (metal) Type L with disc



Non-Contact Seal (plastic) Type S with disc

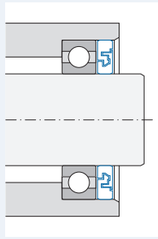
Any kind of high liquid level in front of the seal's gap needs to be avoided. (Attention: High liquid levels may cause leakage).

In a non-horizontal working application, GMN can offer specific advice to optimize your individual design in order to protect the sealing gap effectively.

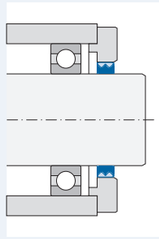
When using Type SA, care should be taken that the drain groove in the stationary part is always positioned at the lowest point.

Standard assembly

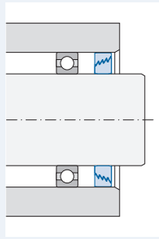
Non-Contact Seal (metal) Type CF...A0

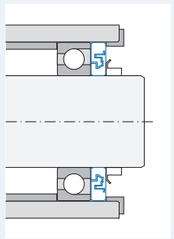


Non-Contact Seal (metal) Type L



Non-Contact Seal (plastic) Type S



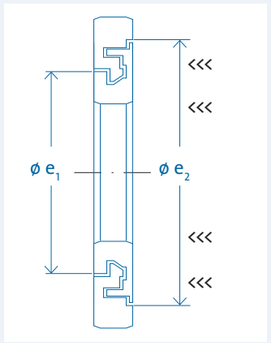


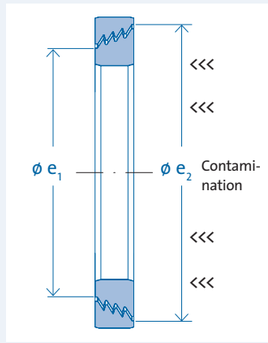
Non-Contact Seal (metal) Type CF...S10

The type CF...S10 is designed to be installed in direct contact to the spindle bearing. Inner ring and outer ring of the seal have to be fixed axially.
The spindle bearing could be preloaded directly through the seal. The preloaded force is to apply over the inner ring only. (The retaining ring is force free.)

Orientation

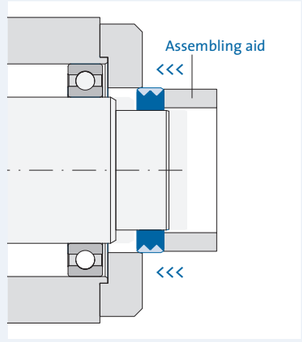
The bigger gap diameter (e_2) of the GMN Labyrinth Plastic Seals must always face the splashing liquids/contamination.





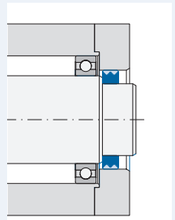
Face-mounting with pre-assembled bearing

Both rings of the seal are pressed-in with an assembling aid (i.e. tube) together at the same time. If pressure would be applied on one ring only the labyrinth could be destroyed.



(The outer ring could be wider by maximum 0.1 mm than the inner ring.)

Shaft shoulder

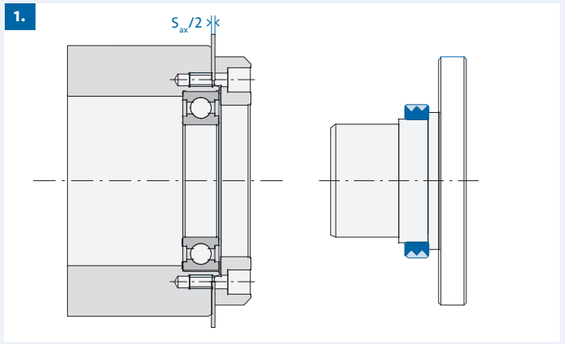


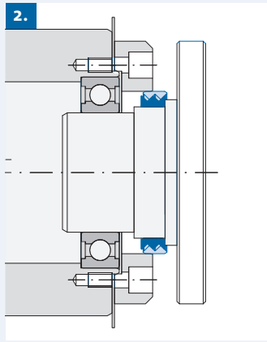
A precise positioning of the seal is provided with a shaft shoulder for the inner ring.

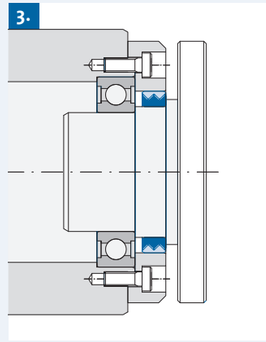
The outer ring of GMN Labyrinth Metal Seals should be positioned freely without any shoulder.

Assembly inside the unit

1. The GMN seal is pre-assembled onto the shaft. A thin metal sheet mounting aid (Thickness $S_{ax}/2$, half the amount of the seal's axial clearance) should be inserted between the housing and an additional ring.







2. Shaft (with the seal) and housing (with the bearing) are fitted into each other carefully. Now the outer ring stands in the right end position of the seal.

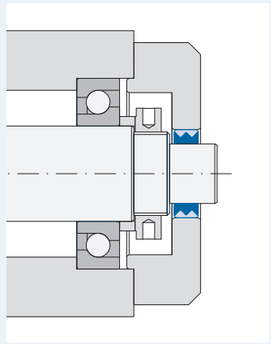
3. Finally the mounting aid is removed and the screws are tightened. With this process the seal's outer ring moves to the left by $S_{ax}/2$ and finds itself in the final, correct non-contact position.

Installation

Specific Assembly Situations

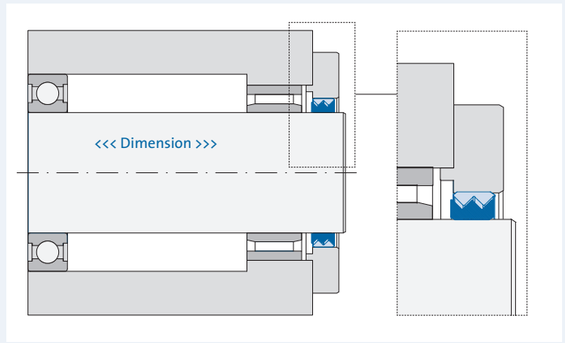
Assembly with pre-loaded spindle bearings

The seal's outer and inner ring must not be affected when the bearing is pre-loaded.
The assembly into the cover keeps the seal independent from any bearing displacement.



Shaft Expansion with Temperature

To avoid any increase of the maximum axial clearance, GMN recommends a seal with an increased axial clearance or an asymmetrical seal adjustment in the extension direction. (The excess of maximum axial clearance could destroy the seal.)

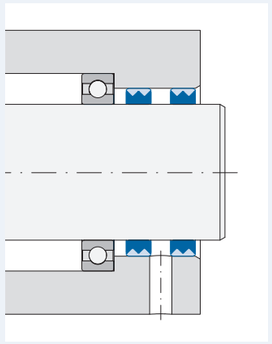


Seals with drainage

Tandem arrangement

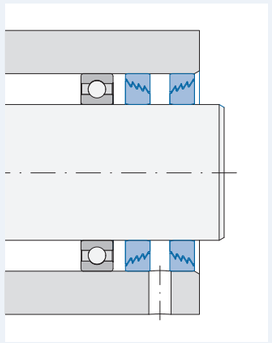
Metal Seal (Type L)

100% sealing efficiency is guaranteed with two seals in a row (minimum distance 5mm) with a drain hole in between. With this design any liquid between the seals could be drained reliably.



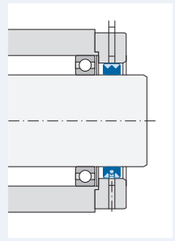
Plastic Seal (Type S)

The tandem arrangement of the plastic seals with a drain hole in between require opposite orientation with the assembly. One seal is operating specifically against possible contamination from outside while the other seal keeps the bearing's lubrication inside.
The bigger gap-diameter always faces the contamination.
(Space between the seals: min. 5mm)



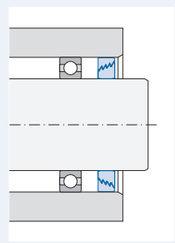
Seals with drain groove

Metal Seal (Type M)



In case of limited construction space Type M offers a compromise of the tandem arrangement in a tight package.
Passing liquid is centrifugally forced through the outer ring's grooves into a drain groove inside the housing.
Width of the drain groove in housing:
R = c + 1mm (c = drain groove width)

Plastic Seal (Type SA)



When using the Type SA, care should be taken that the drain
groove in the stationary part is always positioned at the lowest point.

Sealing air

Sealing air improves the efficiency of the seal, but please note the reasonable amount of air consumption. If sealing air should be applied through the grooves of the M Type the air releases in both directions of the seal; paying special attention with the bearing.

Additional aspects to consider

Correct choice of the seal as well as customized design of the mating parts is the most important aspects for a successful application, but there is more. If a milling machine is stopped suddenly within a very short time, a temporary oil level could be created in front of the sealing gap. The following questions should help to analyze your application from different points of view:

Is the level of the sealing gap fixed?

Would another size of the seal move the sealing gap into a more protected area?

Could the viscosity of the cooling/oil etc. be influenced in a positive way?

Are there any existing components (i.e. shield) which could be included into a complete design?

Are all drain holes and drain grooves big enough?
Could any possibility of backwater be excluded?

What is the size of any particles to be sealed? What is their speed and direction?

Could any negative aspects be changed in a positive way with the control system?

...

On request, GMN would be pleased to give advice based on our decades of experience in order to optimize your individual solution.

Product overview

Type	GMN Non-Contact Seal (metal)				GMN Non-Contact Seal (plastic)				GMN Non-Contact Seal (plastic)						
	L		M w groove		S		SA w groove		CF 62 A0		CF 60 S10		CF 619		Bearing size*
Ø d	D	B	D	B	D	B	D	B	D	B	D	B	D	B	DIN
10					30	10	30	10	30	6					6200
12					32	10	32	10							6201
					37	10	37	10	32	6					6301
15	26	8	26	8											
					35	10	35	10	35	6					6202
					42	10	42	10							6302
17					35	10	35	10							6003
					40	10	40	10	40	6					6203
					47	10	47	10							6303
18	28	10	28	10											
20	28	10	28	10											
	30	10	30	10											
					40	10	40	10							
					42	10	42	10			42	6			6004
					47	10	47	10	47	6					6204
22	30	10	30	10											
					42	10	42	10							
25	37	10	37	10											61805
					47	10	47	10			47	6			6005
					52	10	52	10	52	6					6205
28	39	10	39	10											
					47	10	47	10							
					52	10	52	10							
30	42	10	42	10											61806
											55	6			6006
					62	10	62	10	62	6					6206
					72	10	72	10							6306
32	45	10	45	10											
35	47	10	47	10											61807
					62	10	62	10			62	6			6007
					72	10	72	10	72	6					6207
36					62	10	62	10							
40	52	10	52	10											61808
					62	10	62	10					62	6	61908
					68	10	68	10			68	6			6008
									80	6					6208
					90	10	90	10							6308
42	55	10	55	10											
					65	10	65	10							
					42	10	72	10							
45	55	10	55	10											
	62	10	62	10											
					80	10	80	10							
													68	6	61909
											75	6			6009
					85	10	85	10	85	6					6209
48	62	10	62	10											
50	62	10	62	10											
					90	10	90	10							
													72	6	61910
					80	10	80	10			80	6			6010
									90	6					6210
52	68	10	68	10											
55	68	10	68	10											
					80	10	80	10							
					85	10	85	10					80	6	61911
											90	6			6011
58	72	10	72	10											

Special Sizes on request

Ø d	GMN Non-Contact Seal (metal)				GMN Non-Contact Seal (plastic)				GMN Non-Contact Seal (plastic)						
	L		M w groove		S		SA w groove		CF 62 A0		CF 60 S10		CF 619		Bearing size*
	D	B	D	B	D	B	D	B	D	B	D	B	D	B	DIN
60	72	10	72	10											
	80	10	80	10											
													85	6	61912
					95	12	95	12			95	6			6012
					110	12	110	12							6212
63	80	10	80	10											
65	80	10	80	10											
	85	10	85	10											61813
													90	6	61913
					100	12	100	12			100	6			6013
68	85	10	85	10											
					95	12	95	12							
70	85	10	85	10											
	90	10	90	10											61814
													100	6	61914
					110	12	110	12			110	6			6014
					125	15	125	15							6214
72	90	10	90	10											
75	90	10	90	10											
													105	6	61915
					130	15	130	15			115	6			6015
															6215
80	100	10	100	10											61816
					110	12	110	12					110	6	61916
											125	6			6016
					140	15	140	15							6216
82					110	12	110	12							
85	100	10	100	10											
					120	15	120	15							61917
											130	6			6017
90	110	10	110	10											
					120	15	120	15							
					145	15	145	15							
											140	6			6018
95					140	15	140	15							
											145	6			6019
100	120	10	120	10											
	120	14	120	14											
					140	15	140	15							61920
											150	6			6020
110	130	15	130	15											61822
					140	15	140	15							
120	140	15	140	15											
					150	15	150	15							61824
125					170	15	170	15							
130	150	15	150	15											
					170	15	170	15							
140	170	15	170	15	170	15	170	15							
150	180	15	180	15											
					190	15	190	15							61830
160	190	20	190	20	190	15	190	15							
170	210	20	210	20											
180	210	20	210	20											
190	230	20	230	20											
200	230	20	230	20											
210	250	22	250	22											

ID = Inner diameter [mm]
OD = Outer diameter [mm]
W = Width [mm]
*ID and OD according to bearing sizes
Width W off-size

Tolerance table

GMN Labyrinth Seals series CF...S10

CF Outer diameter outer ring D [mm] above / to			30 / 50	50 / 80	80 / 120	120 / 150	
max. tolerance [µm]			0	0	0	0	
min. tolerance [µm]			-22	-24	-26	-28	

CF Bore inner ring d [mm] above / to		18 / 30	30 / 50	50 / 80	80 / 120		
max. tolerance [µm]		20	22	24	26		
min. tolerance [µm]		0	0	0	0		

Tolerances

Housing Extract of ISO 286-2

Bore diameter D Nominal size [mm] above / to	10 / 18	18 / 30	30 / 50	50 / 80	80 / 120	120 / 180	180 / 250
H7	+18 / 0	+21 / 0	+25 / 0	+30 / 0	+35 / 0	+40 / 0	+46 / 0
J6	+6 / -5	+8 / -5	+10 / -6	+13 / -6	+16 / -6	+18 / -7	+22 / -7
K7	+6 / -12	+6 / -15	+7 / -18	+9 / -21	+10 / -25	+12 / -28	+13 / -33

Shaft Extract of ISO 286-2

Shaft diameter d Nominal size [mm] above / to	10 / 18	18 / 30	30 / 50	50 / 80	80 / 120	120 / 180	180 / 250
h6	0 / -11	0 / -13	0 / -16	0 / -19	0 / -22	0 / -25	0 / -29
h7	0 / -18	0 / -21	0 / -25	0 / -30	0 / -35	0 / -40	0 / -46
k5	+9 / +1	+11 / +2	+13 / +2	+15 / +2	+18 / +3	+21 / +3	+24 / +4

Tolerances [µm]

Index

Internet

On our website www.gmn.de we provide comprehensive product information for download.

GMN

GMN Paul Müller Industrie GmbH & Co. KG manufactures ball-bearings, machine spindles, freewheel clutches and seals for many areas of application.

On the basis of long experience in the development and production of machine components, GMN has specialized in manufacturing high quality products in the area of non-contact seals and beyond a comprehensive standard product range also offers customer-oriented special solutions.
A worldwide GMN service network provides competent customer advice as well as individual solutions.

GMN Quality management – tested and certified.

GMN guarantees maximum quality of products and services on the basis of high reliability over the long term. Highly modern development and production methods safeguard products that always correspond to the state of the art. Transparency in the structure of all GMN corporate divisions as well as comprehensible organizational procedures ensure customer-oriented services and economic safety.

All GMN corporate divisions are certified according to DIN ISO 9001.

GMN – safeguarding the future.

Progress means for GMN best possible customer support and performance-oriented optimization of technical products.
This aspiration is realized by GMN especially under strict observance of national and international environmental standards with regard to efficient and sustainable utilization of ecological resources.

Reference

Parts of chapter “Non-Contact Seals” are based on publications of the Institute of Machine Components (IMA), University of Stuttgart.

This catalogue corresponds to the state of art at the time of printing.
Technical changes, factual errors, printing errors are reserved.

Design: LMmedia, Nuremberg

GMN

High Precision Ball Bearings
Spindle Technology
Sprag Type Freewheel Clutches
Non Contact Seals