

# Sealing systems for NORD gear units and NORD electric motors

Output shaft seals and shaft seals



# NORD DRIVESYSTEMS Group



Industrial gear units



Geared motors



Frequency inverters and motor starters

- ▶ Headquarters and technology centre in Bargteheide near Hamburg.
- ▶ Innovative drive solutions for more than 100 branches of industry.
- ▶ 7 production locations with cutting edge technology produce gear units, motors and drive electronics for complete drive systems from a single source.
- ▶ NORD has 51 subsidiaries in 36 countries and further sales partners in more than 50 countries, providing local stocks, assembly centres, technical support and customer service.
- ▶ More than 4,000 employees throughout the world create customised solutions.



Headquarters in Bargteheide



Gear unit production



Inverter production



Motor production



Production and assembly



Motor mounting



NORD DRIVESYSTEMS places a high priority on the topic of sealing gear units and geared motors. Reliable and durable sealing against the entry of foreign materials and the escape of lubricants is an essential factor for product life cycle costs, as leaks in gear units and geared motors are a significant cause of malfunctions.

With the launch of the UNICASE housing concept almost 40 years ago, NORD DRIVESYSTEMS introduced a housing design which does not involve any forces in the housing joints. This sustainably reduces the risk of leaks from housing joints, so that shaft seals are now the focus of attention. Although with geared motors the gear unit seal on the input side is optimally protected against environmental influences by the motor, the output shaft seal is highly exposed to such influences.

NORD DRIVESYSTEMS has developed various sealing systems for gear unit output shafts, which are recommended according to various environmental influences and applications. The sealing systems for gear unit output shafts are described below.

# Sealing systems for NORD gear units and NORD electric motors

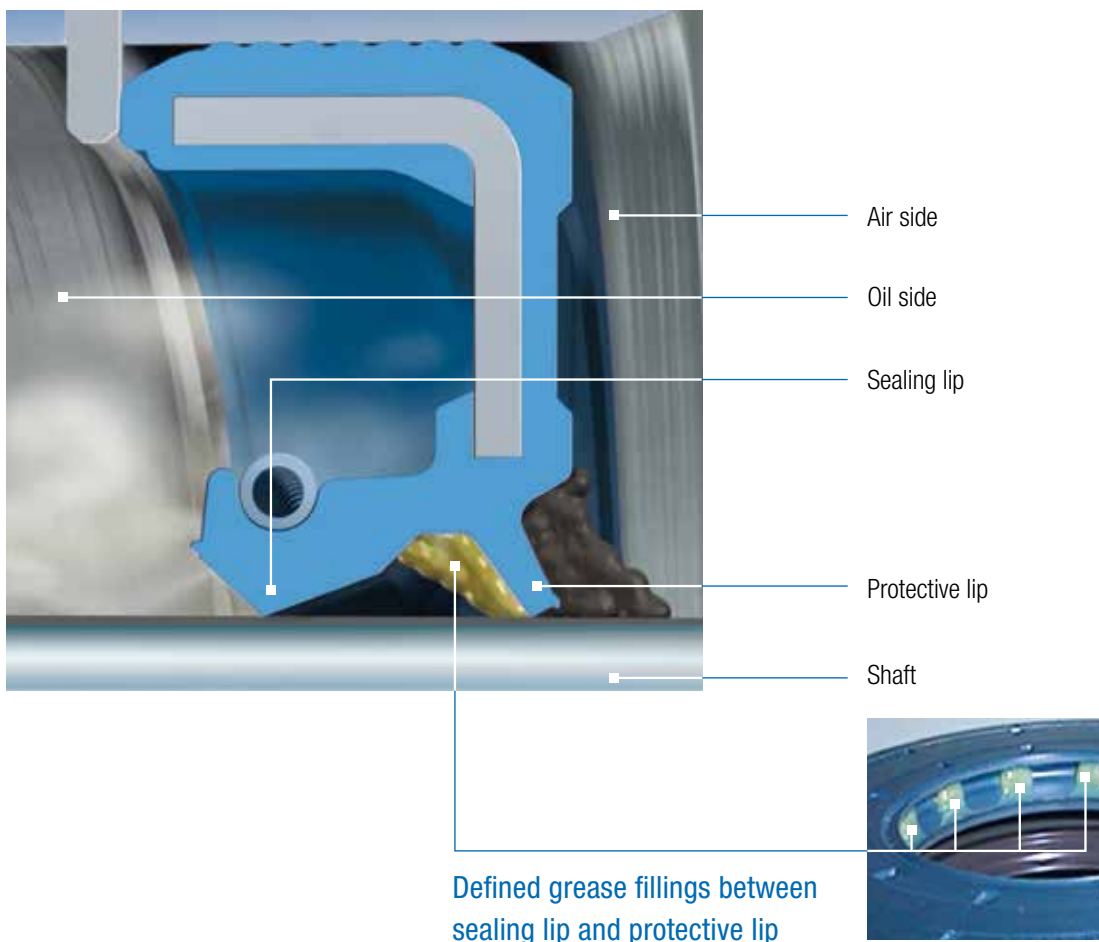
## 1. Catalogue versions

### 1.1 Standard versions for normal conditions

As standard, gear unit output shafts are sealed with radial shaft sealing rings made from nitrile-butadiene elastomer (NBR) and use radial spring-loaded sealing lips to seal in the lubricant, as well as an additional protective lip to provide extra protection against the entry of dirt. The space between the sealing lip and the protective lip is filled with a defined amount of special grease which reduces wear of the lips and provides an extra barrier, that further protects the sealing lip from dirt from the outside.

NORD DRIVESYSTEMS only uses branded shaft sealing rings from selected, well-known suppliers. The shafts are manufactured with precisely specified degrees of surfaces roughness in the contact area of the sealing rings.

### Radial shaft sealing ring with sealing lip and protective lip



## 1.2 Double shaft seal with two shaft sealing rings and grease lubricated roller bearings

Increased safety is provided by the double shaft seal on the output side. This consists of two shaft sealing rings. Substances which affect the seal from the outside must overcome additional barriers before they reach the inner sealing ring of the oil chamber and can cause leakage. In case of external damage, the second sealing ring provides additional protection against leaks.

The double shaft seal has an inner shaft sealing ring with (form A without protective lip) and an outer shaft sealing ring with (form AS with protective lip).

If the use of two shaft sealing rings is not possible due to the available space, a Type MSS1 shaft sealing ring with integrated double shaft sealing can be specified as an alternative.

As standard, double output shaft seals are used for the following NORD gear units:

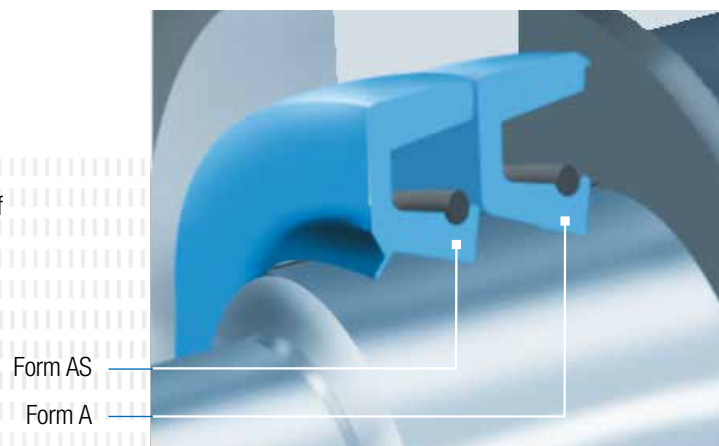
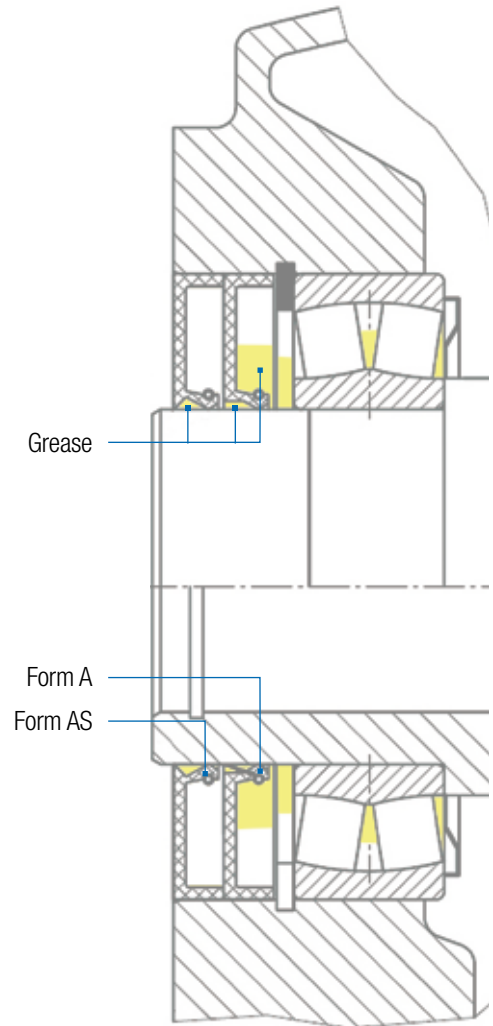
- ▶ Industrial gear units (SK 5207 up to 15507)
- ▶ 3- and 4-stage bevel gear units with hollow shafts (SK 9012.1 up to 9096.1) and with solid shafts for types SK 9072.1 and 9096.1
- ▶ Helical worm gear units with hollow shafts (SK 02040.1 up to 43125)
- ▶ Parallel shaft gear units with hollow shafts from SK 1282.1 up to 11382.1\*
- ▶ Parallel shaft gear units with solid shafts from SK 1282.1 up to 11382.1
- ▶ NORDBLOC.1® helical gear units from SK 772.1 up to 973.1

In addition, double shaft sealing is available as an option for:

- ▶ 2-stage bevel gear units (SK 92072.1 up to 92772.1)
- ▶ Parallel shaft gear units SK 0182.1 and 0282.1
- ▶ 3- and 4-stage bevel gear units with solid shafts (SK 9012.1 up to 9096.1)
- ▶ Parallel shaft gear units with solid shafts from SK 1282.1 up to 9382\*
- ▶ Helical gear units from SK 32 up to 103

*\*Note: For space reasons, parallel shaft gear units SK 2282, 4282 only have double shaft sealing on the A side*

For other types of gear units, double output shaft sealing is possible by means of special measures. Please contact us.

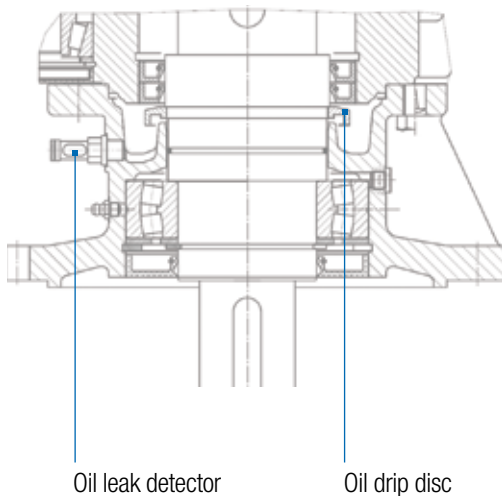


# Sealing systems for NORD gear units and NORD electric motors

## 1.3 Option: „FKM“ for high temperatures and high resistance to chemicals

As an option, NORD DRIVESYSTEMS can supply output shaft sealing rings made from fluor-rubber elastomer (FKM) for almost all types of gear units. FKM is also known under the trade name Viton.

FKM fulfils higher requirements for resistance to heat and chemicals. The operating temperature range of FKM is from -25 to 150° C. For temperatures in the area of the seal in excess of 85° C for mineral oil lubrication and 80° C for synthetic lubricants, NORD DRIVESYSTEMS recommends the optional use of the usually brown FKM material in place of the standard NBR shaft sealing rings. For applications in which the shaft sealing ring comes into contact with chemicals from the outside, e.g. when cleaning the plant, the compatibility of the shaft sealing ring material must be checked, both for NBR and for FKM. Please contact us (see section 2).



## 1.4 Option: VL3 „Drywell“ bearings for vertical output shafts

Especially for agitators, NORD DRIVESYSTEMS supplies reinforced output shaft bearings with larger bearing spacing and especially robust bearings, which are also suitable for handling large radial and axial forces. To greatly reduce the probability of lubricant leakage and possible contamination of the material being mixed, a VL3 Drywell version is available as an option for vertical output shafts.

The VL3 option offers the following safety function: In case of leakage at the double shaft sealing rings of the output shaft, the oil passes from the oil drip disc to a collecting space in the flange and is detected by an oil leak detector or an oil sensor. This prevents leakage into the agitator area.

The VL3 option is available for:

- ▶ All industrial gear units with vertical output shafts (SK 5207 up to 15507)
- ▶ M4 version parallel shaft gear units with solid and hollow shafts from SK 1282.1 up to 11382.1
- ▶ M5 and M6 version 3- and 4-stage bevel gear units with solid and hollow shafts (SK 9012.1 up to 9096.1)

## 1.5 Option: „True Drywell“ for vertical shafts

Some applications have extremely stringent requirements for security against leaks, for which the contact seals on the vertical, downward output shaft of the gear unit are not considered to be adequately safe to prevent leaks in case of wear or contamination. For these applications, NORD DRIVESYSTEMS offers the option True Drywell.

The NORD True Drywell version completely excludes the risk of leaks due to contact seals, as with True Drywell, there are no contact seals which are below the oil level and which could cause leaks during operation. A fixed protective tube protrudes far above the oil level. This provides an additional non-contact and wear-free seal based on the principle that, due to gravity, liquids cannot flow upwards.

This option is available for:

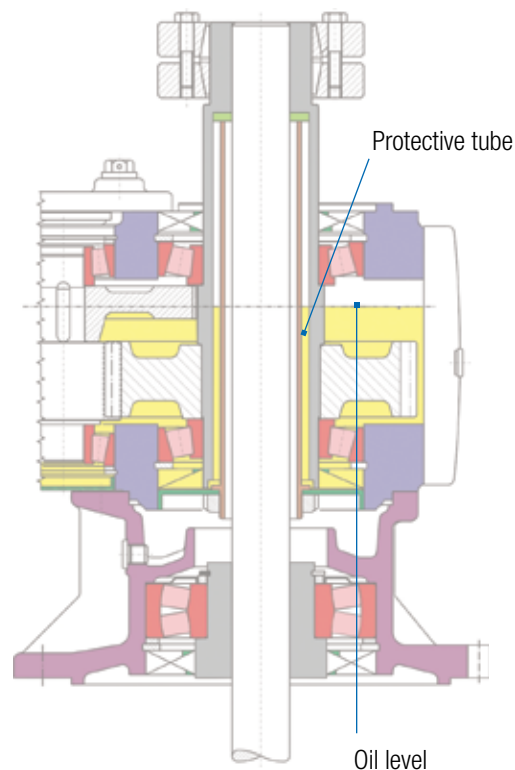
- ▶ All industrial gear units with vertical output shafts (SK 5207 up to 15507)

This option is available as a special version for parallel shaft and bevel gear units. Please contact us.

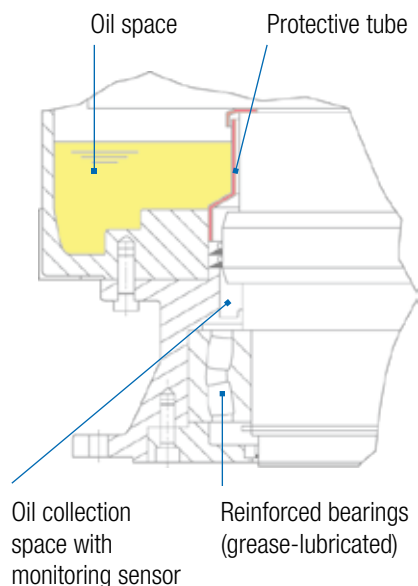
NORD True Drywell parallel shaft gear units feature a hollow shaft with shrink disc and reduced hollow shaft diameter, agitator version VLII, as well as standard gear unit venting (pressure venting is not permissible). The NORD range of modular gear units also enables the True Drywell version for M5 and M6 bevel gear units. Here however, the sealing of the output side is below the oil level.

For True Drywell versions of industrial gear units, a low-level protective tube is used in combination with a reduced oil level, which requires circulation lubrication. In this case, the True Drywell version is also combined with reinforced output bearings.

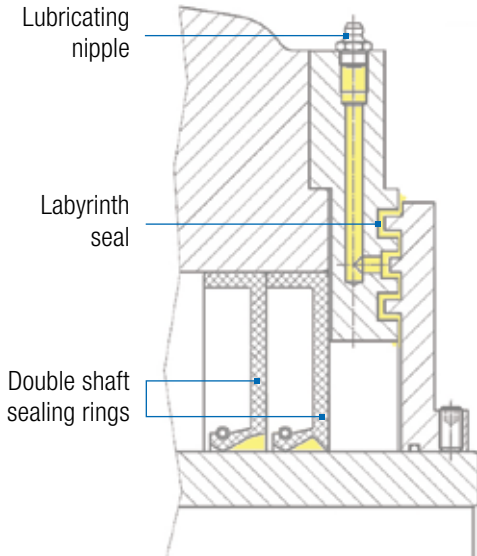
## „True Drywell“ for geared motors



## „True Drywell“ for industrial gear units



# Sealing systems for NORD gear units and NORD electric motors



## 1.6 Taconite sealing system for aggressive rock and ore dust

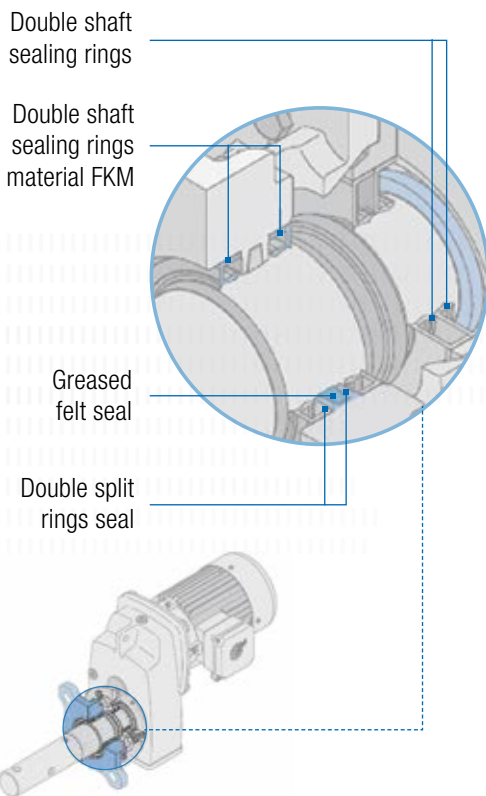
The Taconite\* sealing system was specially developed for operation with aggressive stone and ore dust. The Taconite sealing system consists of two shaft sealing rings and a radial labyrinth seal, which is filled with grease. This grease forms a barrier against the entry of stone dust. Due to regular relubrication via the grease nipple, the grease carries dust particles out of the labyrinth seal. Because of this, aggressive dust cannot penetrate as far as the shaft sealing rings. Contaminated grease which escapes from the sealing gap must be removed.

\*Named after taconite, an iron ore which is mined in Minnesota/USA.

The Taconite option is available for:

- ▶ All industrial gear units (SK 5207 up to 15507)

The Taconite option is available as a special version for geared motors. Please contact us.



## 1.7 Option: SCP for Screw Conveyors

In screw conveyors, the output shaft of the gear unit often comes into contact with the materials which are being conveyed. Here, the conveyed material is literally forced against the seal of the output shaft. To cater for these special requirements, the option SCP Screw Conveyor was specially developed for the US American market.

The option SCP Screw Conveyor is available for:

- ▶ Parallel shaft gear units in the sizes SK 1282.1 up to 6382
- ▶ Bevel gear units in the sizes SK 9012.1 up to 9053.1

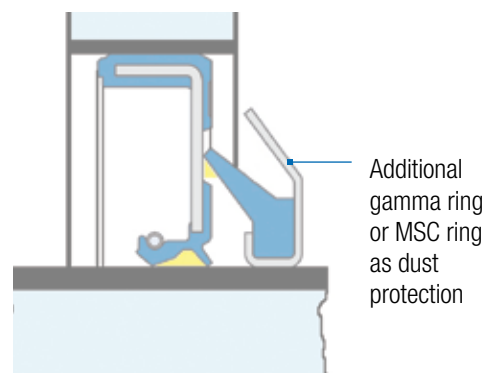
The characteristic feature of the parallel shaft gear unit for screw conveyors is an output flange in which several different seals are integrated to protect the actual oil seal of the gear unit. If the conveyed material overcomes the two outer FKM shaft sealing rings, the felt ring and the two gap seals, it is still unlikely that it will reach the double oil sealing rings of the output shaft, as the material can fall downwards out of the flange. Result: The shaft seal is securely protected against the conveyed material.



## 2. Special versions

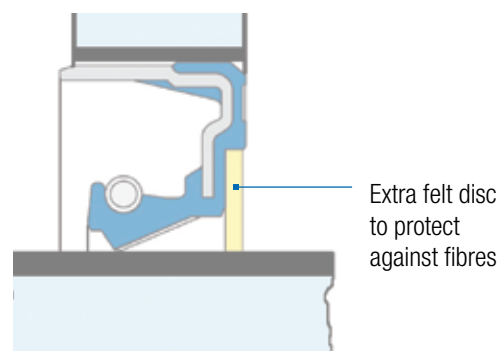
### 2.1 Additional axial gamma ring for moderately dusty conditions

Additional protection against dust is provided by a gamma ring or MSC ring with an extra sealing lip that rubs axially against the outer face of the shaft sealing ring. The gamma ring or MSC ring is an addition to the sealing system and rotates together with the shaft. For this, the length of the output shaft is slightly increased. This special version is possible for many types of gear unit. Please contact us.



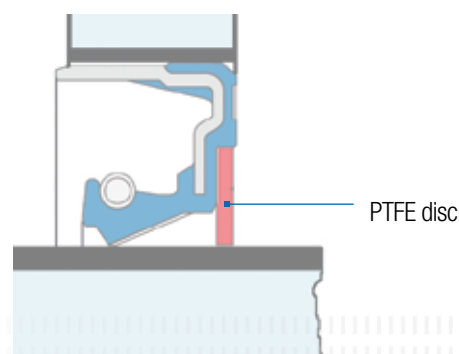
### 2.2 Extra felt disc for especial protection against textile fibres

Fibres, in particular textile fibres and fluff, can disturb a sealing system. If for example a fibre becomes trapped in the sealing ring, it may cause a temporary leak. A fixed felt disc which is glued to the outside of the shaft sealing ring has proved to be a particularly effective protection against fibres. This special version is possible for many types of gear unit. Please contact us.

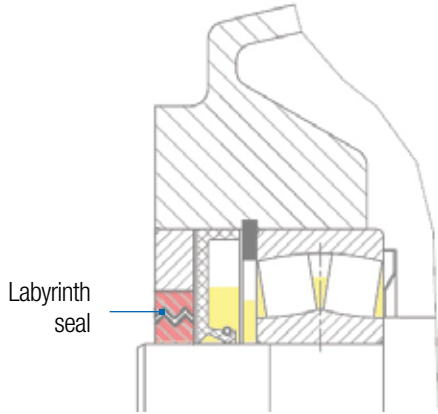


### 2.3 Additional PTFE disc for chemicals

PTFE discs are used if the output shaft comes into temporary contact with aggressive chemicals (e.g. during cleaning). For output shafts on which two shaft sealing rings are possible, the outer shaft sealing ring can be replaced with a PTFE ring. This special version is possible for many types of gear units. Please contact us.

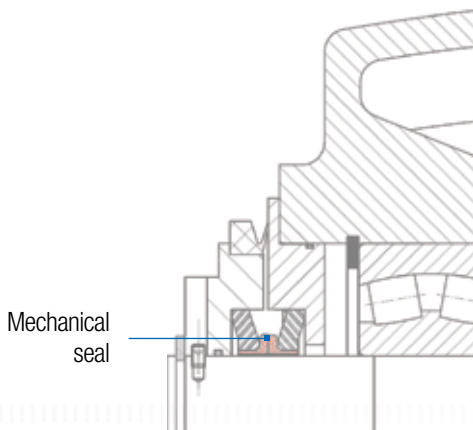


# Sealing systems for NORD gear units and NORD electric motors



## 2.4 Labyrinth seals for moderate dust and splashed water

A non-lubricated labyrinth seal may be a good solution in cases where the amount of dust is not sufficient to justify the greater expense of a Taconite sealing system. These maintenance-free labyrinth seals can often be installed without dimension changes, in place of the outer shaft sealing ring for gear units which enable a double shaft sealing ring. Please contact us.



## 2.5 Mechanical seals for aggressive ambient media

Mechanical seals are used if the sealing area of the output shaft often comes into contact with aggressive and dirty liquids. Mechanical seals have proved to be very effective in the field of waste water. It should be noted that due to their function, mechanical seals have a slight leakage of oil in normal operation and are therefore not completely leak-proof. Mechanical seals can even be used below an outer liquid surface. In this case, care must be taken that the hydrostatic pressure in the gear unit is always greater than the outside pressure, so that no foreign materials can penetrate into the gear unit. This special version is possible for many types of gear unit. Please contact us.

### 3. Shaft sealings for NORD electric motors

#### 3.1 NBR or FKM shaft sealing rings

All NORD electric motors are equipped with protection class IP55 as standard. This means, for instance, that the shaft has shaft sealing rings on both sides. The conversion to IP66 is an option for all series. For HM series smooth-surface motors and for the unventilated IE5+ motors, protection class IP69K is possible if the motor is directly mounted onto a NORD gear unit (direct mounting).

The radial shaft sealing rings of ISO F series motors are made from a nitrile butadiene elastomer (NBR). For motors that are directly mounted onto the gear unit, the gear unit's expected oil temperatures must be observed. The same recommendations apply as in chapter 1.3.

- ▶ For oil temperatures > 85° C in case of mineral oils
- ▶ For oil temperatures > 80° C in case of synthetic oils

NORD DRIVESYSTEMS recommends the use of FKM shaft sealing rings.

In addition to the oil temperatures, excessively high motor speeds also play a decisive role and can also be a reason for switching from NBR to FKM shaft sealing rings. While no critical speeds are achieved with standard 50 Hz/60 Hz, critical motor speeds may however occur with some motor sizes, when they are designed according to the 87 Hz characteristic curve.

The switch from NBR to FKM applies to the A- and to the B-side of the motor.

Motors with insulation material class H (185° C) and explosionprotected motors are already equipped with FKM shaft sealing rings as standard. With these motors, the independent selection of shaft sealing ring materials is not possible.

#### 3.2 B-side protection measures

Depending on the application case, the shaft sealing may also be modified at the B-side. In addition to simple possibilities for minimising direct entry of dirt or moisture – rain cover (RD) or double fan cover (RDD) – there is also the possibility with ribbed motors to cut short the B-side shaft end and to close the opening in the bearing cover (OL/H option). With this modification, a motor fan is not required and the nominal power or operating mode must be reduced accordingly.



The table\* provides an overview of the critical speeds

Type	Maximum speed (U/min)
63	2,500
71	2,500
80	2,860
90	3,400
100	3,500
112	3,500
132	3,300
160	3,200
180	3,100
225	2,800
250	2,800

\*Extract from the motor catalogue M7000

**EN**

Headquarters:  
Getriebebau NORD GmbH & Co. KG  
Getriebebau-Nord-Str. 1  
22941 Bargteheide, Deutschland  
T: +49 45 32 / 289 0  
F: +49 45 32 / 289 22 53  
info@nord.com