Mechanical Seals
From our Production Range:

For more than four decades NIDEC GPM has been developing and manufacturing precision mechanical seals to seal rotating partial systems with liquid and gaseous media in the mechanical engineering industry. NIDEC GPM provides competent solutions wherever sealing problems arise and operational reliability is required. The quality of our products was proved in various fields of application under extreme conditions. We are certified according to ISO / TS 16949:2002 and DIN EN ISO 14001:1996.

NIDEC GPM sees its strength in particular in fields where specific innovative solutions for sealing with mechanical seal systems are required. We regard our customers’ problems as our tasks. It goes without saying therefore that close cooperation is our basis for finding solutions quickly, even for the most difficult sealing problems.

The mechanical seals we describe in the following overview of types are our basic types. We can, of course offer adapted or customised constructions in special cases. Moreover, our manufacturing programme also includes accessory equipment needed for the operation of single or multiple mechanical seals.

To make it easier for you to work with this overview brochure, we have broken down the seals as follows:
- Standard mechanical seals according to EN 12756 (DIN 24960)
- Serial mechanical seals
- Special seals

We also present a table with shaft diameters, application limits, design features and recommendations on the use of the various types of mechanical seals. In addition, we provide technical information on the use of mechanical seals and the NIDEC GPM material code, which is based on EN 12756.

To ensure that your inquiries will be processed properly, please fill in the questionnaire provided with this overview brochure as accurately as possible.

### Standard Mechanical Seals

**acc. to EN 12756 (DIN 24960)**

<table>
<thead>
<tr>
<th>Application</th>
<th>Design</th>
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<th>Shaft diameters dia. (mm)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Water and sewage pumps Heating circulation pumps Chemical pumps Compressors Mixers</td>
<td>single directional unbalanced single spring length l₁k</td>
<td>p=10(16) bar T= -40°C...-200°C vᵣ=15m/s</td>
<td>10...48</td>
<td>GLRD 91-U</td>
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<tr>
<td>Refinery pumps Chemical pumps Water and sewage pumps Compressors Mixers</td>
<td>dual directional unbalanced multiple springs length l₁k combination with pumping scroll</td>
<td>p=16(25) bar T= -50°C...-280°C vᵣ=20m/s</td>
<td>28...100</td>
<td>GLRD 92-U 93-U</td>
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<td>dual directional unbalanced multiple springs length l₁k F- with pumping scroll</td>
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<td>p=16(25) bar T= -50°C...-280°C vᵣ=20m/s</td>
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<td>dual directional unbalanced multiple springs length l₁k</td>
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<td>p=25 bar T= -40°C...-200°C vᵣ=20m/s</td>
<td>24...95</td>
<td>GLRD 925-B</td>
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**acc. to EN 12756 (DIN 24960)**

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<tr>
<td>95-U</td>
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<td>14...70</td>
<td>p=10(16) bar T= -40°C...+230°C v =20m/s</td>
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<td>Compressors for refrigeration plants Water and sewage pumps</td>
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<td>26...100</td>
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### Serial Mechanical Seals

<table>
<thead>
<tr>
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<tr>
<td>Cooling water pumps Household appliances Heating circulation pumps</td>
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<td>p=3.5 bar T= -30°C...+110°C v =20m/s</td>
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<tr>
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<td>Application limits</td>
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<tr>
<td>GN 71</td>
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<td>20...50</td>
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<td>Chemical pumps</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>T=-50°C…+230°C</td>
<td>multiple springs</td>
<td>Foodstuff pumps</td>
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<tr>
<td>GN 75.1A</td>
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<td></td>
<td>T=-50°C…+230°C</td>
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<td>Compressors for</td>
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<td>Mixers</td>
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<td>GN 75.1B</td>
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<td>40...95</td>
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<td>T=-50°C…+230°C</td>
<td>balanced</td>
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<td></td>
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<td>GN 75.2</td>
<td></td>
<td>80 66 125</td>
<td>p=55 bar</td>
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<td>Pipeline pumps</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>T=-40°C…+180°C</td>
<td>balanced</td>
<td>Seward pumps</td>
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<td>GN 75.5</td>
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<td>25</td>
<td>p=3.5 bar</td>
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<td></td>
<td></td>
<td>T=-30°C…+120°C</td>
<td>balanced</td>
<td>Household appliances</td>
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<tr>
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<tr>
<td>GN 77</td>
<td></td>
<td>14...100</td>
<td>p=25 bar</td>
<td>dual directional</td>
<td>Chemical pumps</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>T=-40°C…+220°C</td>
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<td>Mixers</td>
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<tr>
<td>Cartridge E 100</td>
<td></td>
<td>38...105</td>
<td>p=25 bar</td>
<td>Cartridge unit with</td>
<td>Chemical pumps</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>T=-40°C…+130°C</td>
<td>balanced mechanical seal</td>
<td>Process pumps</td>
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<td></td>
<td>seal face</td>
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</tr>
</tbody>
</table>

**Application**
- Chemical pumps
- Process pumps
- Compressors for refrigeration plants
- Mixers
- Pipeline pumps
- Seward pumps
- Coolant pumps
- Household appliances
- Refinery pumps
- Paper industry
- Sugar industry
- Sewage technology
- Refinery pumps
- Petrochemical pumps
- Tank mixers

**Design**
- Cartridge unit with balanced single mechanical seal stationary seal face
- Cartridge unit with balanced double mechanical seal stationary seal faces
- Cartridge unit with balanced single mechanical seal stationary seal face
- Cartridge unit with balanced double mechanical seal stationary seal faces

**Application limits**
- p=25 bar
- T=-40°C…+280°C
- vg=25m/s
- p=25 bar
- T=-40°C…+260°C
- vg=30m/s
- p=16(25) bar
- T=-20°C…+80°C
- vg=20m/s
- p=16(25) bar
- T=-75°C…+430°C
- vg=25m/s
- p=16(25) bar
- T=-75°C…+430°C
- vg=50m/s
- p=25 bar
- T=-40°C…+200°C
- vg=2m/s
- p=vacuum up to 16(25) bar
- T=-40°C…+200°C
- vg=2m/s

**Shaft diameters dia. (mm)**
- 38...105
- 40...155
- 56 75 110
- 34
- 40...190
- 40...155
- 106
- 108
- 40...63.5
- 42...135
- 42...80

**Illustration**
- Cartridge D 100
- Cartridge E 100
- 96 97 98
- 64.9
- 84-45
- 98
- 51
- 8

**Type**
- Cartridge D 100
- Cartridge E 100
- 96 97 98
- 64.9
- 84-45
## Special Mechanical Seals

<table>
<thead>
<tr>
<th>Type</th>
<th>Illustration</th>
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<tbody>
<tr>
<td>GN 74 K</td>
<td>![Image]</td>
<td>40...220 **</td>
<td>p = vacuum up to 6 bar T = -10°C...+200°C</td>
<td>(GN 74 KL) single mechanical seal dual directional</td>
<td>Mixers for VA vessels acc. to DIN 28136 Fitting flange acc. to DIN 28141 End of shaft acc. to DIN 28154</td>
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<tr>
<td>GN 74 KL</td>
<td>![Image]</td>
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<td>p = vacuum up to 6 bar T = -10°C...+200°C</td>
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</tr>
<tr>
<td>GN 76</td>
<td>![Image]</td>
<td>40...160 **</td>
<td>p = vacuum up to 16 bar T = -25°C...+200°C</td>
<td>(GN 75 KL) double mechanical seal dual directional</td>
<td>Mixers for enamelled vessels acc. to DIN 28136 Fitting flange acc. to DIN 28137 T2 End of shaft acc. to DIN 28159</td>
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<tr>
<td>GN 76 L</td>
<td>![Image]</td>
<td>40...160 **</td>
<td>p = vacuum up to 16 bar T = -10°C...+200°C</td>
<td>(GN 76 L) double mechanical seal dual directional</td>
<td>Mixers for enamelled vessels acc. to DIN 28136 Fitting flange acc. to DIN 28137 T2 End of shaft acc. to DIN 28159</td>
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<tr>
<td>GN 77 L</td>
<td>![Image]</td>
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<td>Mixers for enamelled vessels acc. to DIN 28136 Fitting flange acc. to DIN 28137 T2 End of shaft acc. to DIN 28159</td>
</tr>
<tr>
<td>GN 78</td>
<td>![Image]</td>
<td>25...160 **</td>
<td>p = vacuum up to 10 bar T = -40°C...+200°C</td>
<td>(GN 78) single mechanical seal balanced dual directional</td>
<td>Mixers for VA vessels acc. to DIN 28136 Fitting flange acc. to DIN 28141 End of shaft acc. to DIN 28154</td>
</tr>
</tbody>
</table>

** Special versions on request

### Circulation

The circulation serves to cool and flush the mechanical seal. In the case of single seals, a circulation line is laid from the pressure connection into the seal housing. Depending on the quality of the medium, cyclone separators, filters or coolers must be integrated. To restrict the quantity circulated, a throttle passage is provided between the pump and the sealing area.

### Flushing

Flushing is necessary when media that are very dirty or tend to crystallize require single-acting sealing. The flushing causes an external medium to be fed through a flow restrictor into the sealing area. The circulation systems are specified in accordance with API 610.

### Quenching

Quenching is a product applied to the atmospheric side of a single mechanical seal with a pressureless feeder. The quenching area is sealed by radial sealing or by through-brushing in the case of gaseous or vaporous media. The quenching liquid fulfills the following functions: cooling on heating, exclusion of air, dissolving and draining, leakage monitoring and the formation of a lubricating film during vacuum operation. The vapour quenching serves the purpose of heating and leakage draining.

Gas quenching serves as an icing inhibitor by blowing in dry air.

### Leakage

Leakage depends on the - choice of material, - evenness and surface roughness of slide surfaces, - condition of the secondary sealing and the - smooth running of the unit

### Loading ratios

The hydraulic load factor \( k \) is defined as the ratio of the hydraulically loaded area to the sliding face. In mechanical seals according to EN 12756:

- Form U: unbalanced load factor \( k > 1 \) (smooth shaft), Form B: balanced \( k < 1 \) (stepped shaft)

### Arrangement of sealing

When arranging the sealing, consideration must be given to the properties of the medium to be sealed, such as viscosity, temperature, pressure, vapour pressure, solids content, density, pH value and suchlike as well as the specific properties of the unit to be sealed. Single mechanical seals can be arranged internally and externally and with or without quenching.

Multiple sealings are inserted back-to-back, face-to-face or in tandem. If the media are very dirty, seals with springs outside the product are used.

### Deviations in shape and position in the sealing area

- Bearing clearance: axial 0.05 mm, radial 0.05 mm
- Concentricity of the shaft to the sealing area: 0.25 mm
- Face runout deviation of the stationary seal to the shaft: 0.025 mm or 0.01 mm per 25 mm shaft dia.
- Face runout deviation of the seal seat to the shaft: 0.2 mm
- Straightness of the shaft: 0.01 mm

### Surface quality in the area of the secondary seals

- Elastomers: stat. \( R_a = 2.5 \mu m \) dyn. \( R_a = 1.0 \mu m \)
- PTFE: stat. \( R_a = 1.6 \mu m \) dyn. \( R_a = 0.25 \mu m \)
- Graphite: stat. \( R_a = 1.0 \mu m \)

### Fitting Instructions

Clean the sealing area thoroughly. Apply a thin film of anti-seize compound to the secondary sealings. Do not use oil or fat on EP synthetic rubber.

Press in the stationary sealings using evenly distributed pressure and adhering to minimum face runout deviation. Heat the PTFE secondary sealings with stationary seal to 90°C before fitting. Be sure that the seal faces are dry and dust-free before fitting. Push the rotating components of the mechanical seal onto the shaft one after the other and fix in place. The flange must be tightened evenly and at right angles. Mount clamping rings without grease.
# Mechanical Seal – Standard Materials

## Material of seal face
- Digit 1
- Digit 2
- Digit 3
- Digit 4
- Digit 5

## Material of stationary seal
- Digit 1
- Digit 2
- Digit 3
- Digit 4
- Digit 5

## Material of secondary seals
- Digit 1
- Digit 2
- Digit 3
- Digit 4
- Digit 5

## Material of the spring(s)
- Digit 1
- Digit 2
- Digit 3
- Digit 4
- Digit 5

## Material of other construction parts (apart from housing parts and shaft sleeves)
- Digit 1
- Digit 2
- Digit 3
- Digit 4
- Digit 5

For double mechanical seals, add digits 6, 7 and 8 for digits 1, 2 and 3 for the atmospheric-side mechanical seals in the code of materials for single seals.

## Synthetic Carbons
- A = carbon, antimon impregnated
- B = carbon, resin impregnated
- C = carbon, unimpregnated

## Metals
- D = C steel
- E = Cr steel
- K = hard layer
- K1 = hard layer, metallic
- K2 = hard layer, non-metallic
- K3 = hard layer, multi-layer
- M = high-nickel-alloy
- R = grey cast, alloy (0.6655)
- S = chrome cast (1.4138)
- T = other metals

## Carbide
- U = tungsten carbide
- U1 = TC, Co-combined
- U11 = TC, Co-combined, shrunk
- U12 = TC, Co-combined, solidified
- U2 = TC, Ni-combined
- Q = silicon carbide
- Q1 = SiC
- Q11 = SiC, shrunk
- Q2 = SiC-Si
- Q21 = SiC-Si, shrunk
- Q3 = CSSi
- Q4 = SiC-C-Si
- Y1 = PTFE/glass
- Y2 = PTFE/Sealed

## Metal oxide
- V = Al oxide
- W = Cr oxide

## Elastomers, not coated
- D = C steel (1.0535, 1.0711)
- E = Cr steel (1.4034, 1.4057)
- F = Cr/Ni steel (1.4301)
- G = Cr/NiMo steel (1.4571)
- M = high-nickel-alloy
- M1 = Hastelloy B-2 (2.4617)
- M2 = Hastelloy C-4 (2.4610)
- M3 = Hastelloy C-276 (2.4819)
- M4 = Ni 431 (1.3811)
- M5 = LucenoX750 (2.4669)
- M6 = Hastelloy 312 (4.060)
- T = PTFE
- T1 = PTFE glass-fibre reinforced
- T2 = Cr/Ni steel/PTFE covered
- T3 = CuZn alloy

## Elastomers, coated
- M = elastomers/PTFE coated
- M1 = fluorcarbon-rubber/PTFE-coated
- M2 = EPDM-rubber/PTFE-coated
- M3 = silicon-rubber/PTFE-coated

## Elastomers, seamlessly covered
- H = elastomers, FEP-covered
- H1 = fluorcarbon-rubber/FEP-covered
- H2 = silicon rubber/FEP-covered

## Non elastomers
- G = Graphite
- T = PTFE
- T1 = PTFE, glass-fibre reinforced
- Y = other non elastomers

## Different materials
- U = different materials for secondary seals
- U1 = K, T
- U2 = V, T
- U3 = H, T
- U4 = H2, T
- U5 = E, T
- U6 = H, P1
- U7 = H, K

## Questionnaire

**Company:**
- Type of unit to be sealed:
- Pressure in the sealing area p1 (bar):
  - suction side:
  - pressure side:
- Rotational direction of the shaft (rpm):
  - Must be calculated with crystallisation and suchlike?
- Shaft diameter (mm):
- Shaft sleeve diameter (mm):
- Hazard classification:
- Medium to be sealed:
- Downtime
- Assembly:
- Switching frequency
- Solids content (%):
- Boiling temperature (°C):
- Solidifying point (°C):
- Operating temperature (°C):
- Mode of operation:
- Continuous duty:
- Intermittent operation:
- Is dry operation possible?
- Is liquid cooling or jacket cooling possible?

Please enclose a sectional drawing of the unit or the sealing area with this questionnaire.

If double-acting mechanical seals are to be used, which sealants are product-compatible?

Please give binding dimensions for the installation area for the mechanical seal.