THADIN ARM ATI Certificate 03 Profile 05 Products Mechanical Seals Definitions 13 Single Spring 17 O-ring 21 Elastomer Bellows 24 U-Cup 24 PTFE Bellows V-Packing 25 26 Wave Spring Multi Spring 27 29 O-ring V-Packing 31 Wedge 34 34 PTFE Bellows 35 Metal Bellows 37 Edge Welded Special Seal Cartridge Multi Spring 43 Dry Gas Seal 55 Flatness & Lapping Orings, Elastomers & Eng. Plastics 57 Packings & Gaskets 59 Seat & Hard Faces 61





NAHADIN ARMAN CO.



Nahadin Arman® is privately held company established in 1998. We would like to introduce ourselves as the first and biggest manufacturer of mechanical seals in Iran and the Middle East. We are a fully integrated seal manufacturer that conceptualizes, designs, manufactures, markets, sells, services and repairs our complete line of mechanical seals and related devices in the region. The combination of innovation, high safety standards, quality assurance and manufacturing skills has resulted in the continuous expansion and the phenomenal growth of the company.



Nahadin Arman has a manufacturing area of 6000 sq. meters. The site is located close to Tehran International Airport and truck roads for dispatch of goods to all parts of the world. Our goal is to exceed your expectations. All personnel are experienced and well trained in seal technology and have specialized knowledge of metallurgy, manufacturing methods and quality procedures. The manufacturing plant includes some of the most modern Computerized Numerically Controlled Machines currently used in industry.





Our vision is to be the primary choice of our customers for products and services to improve reliability, productivity and performance in the process industries.

Our technical and sales staff have over 15 years combined experience in the mechanical seal industry and are ready to handle all your sealing requirements. The company works with customers to provide the solutions that help industry run more reliably, efficiently and economically.

The optical flat is placed on the piece to be measured. The monochromatic light is aimed at the piece and this light reflects off of the piece back through the optical flat causing interference light bands. If the distance between the optical flat and the piece we are measuring is one half the wave length of helium, or an even multiple of the number, the band will show black. This is referred to as a helium light band and because it is one half the wave length of helium it measures 0.3 microns or 0.0000116 inches.

To understand this measurement we might mention that the smallest object that can be seen with the human eye is forty (40) microns.



This machine produces optically flat surfaces with high precision surface finish.

Our products are widely used by many industries such as Oil and Gas, Petrochemical, Refineries, Pipelines, Mineral and Mining, Pulp and Paper, Chemical, Pharmaceutical, Power plants, Water and Waste Water, and Food and Beverage industries.

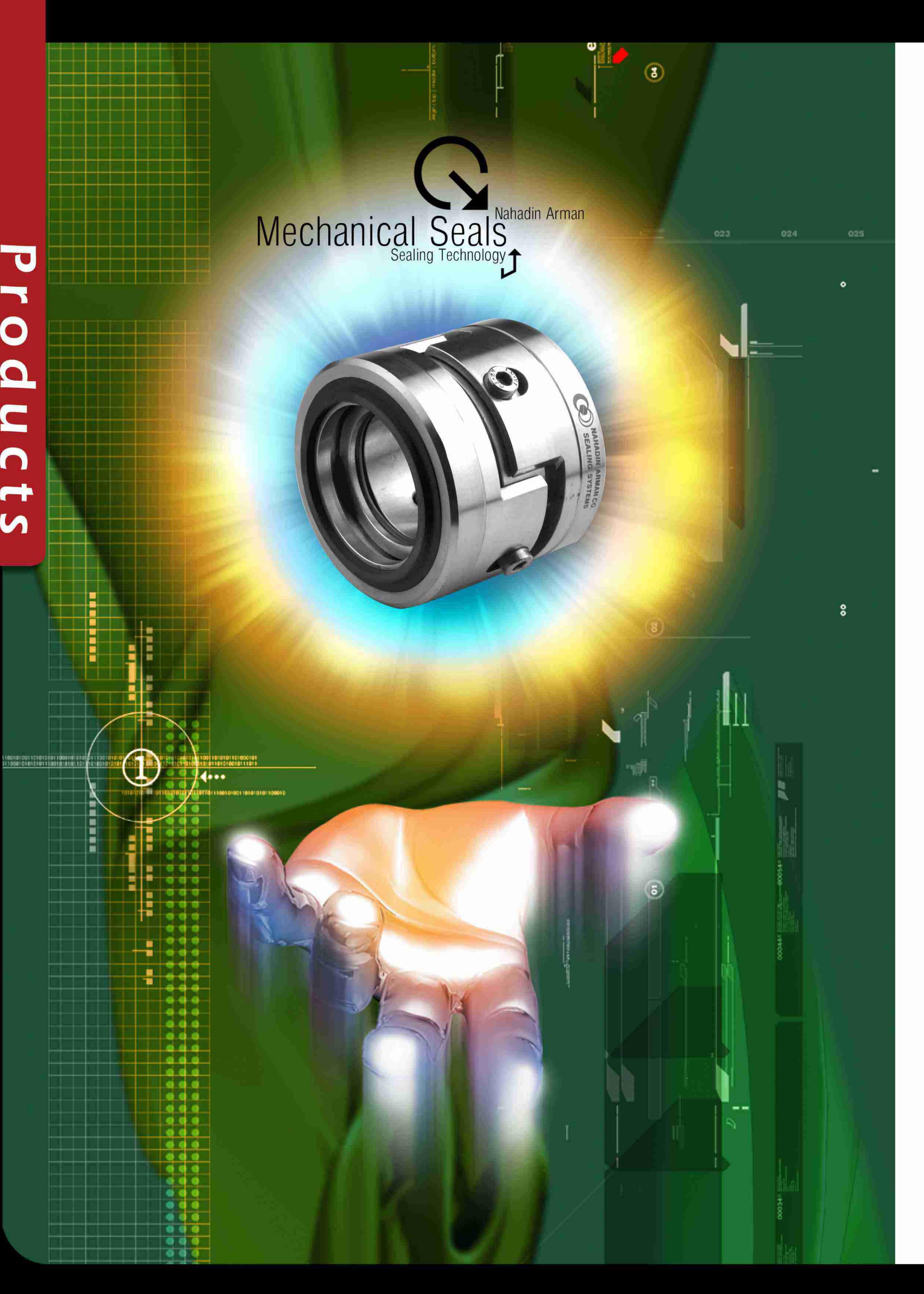
Being a well-organized and experienced manufacturer, ISO 9001: 2000 certified, we utilize the latest technology and strict quality control system in the manufacturing procedure. Therefore our products are sold with good reputation in the local market. In fact, when you buy your Oilfield Packer Elements, Seals, and O-Rings from Nahadin Arman, you will be buying one of the best technologies available in the local market.

The extent of our capabilities is demonstrated on the catalogue and includes Mechanical Seals, Packings, Gaskets, Carbides & Ceramic Parts, Engineering Plastics, and O-Rings & Elastomers. We have prepared this catalogue in an effort to distribute quality information about sealing products.

In addition to our regular products, we also manufacture mechanical seals for customer's special designs - any type and size. Just send us a sample or your drawings and we will meet your need.

Nahadin Arman so far have produced over thousands mechanical seal pieces for Petroleum Ministry of Iran and have acted as a manufacturer, stockist, and supplier for Petroleum Industry and contributing to cost reduction and preventing frequent shutdowns. Nahadin Arman uses the best quality raw materials from well-known international companies like Sandvik, HC-Starck, SGL, Dupont, and Special Metals for its mechanical seal products and is also the sole representative of Sandvik and Bayer in Iran.

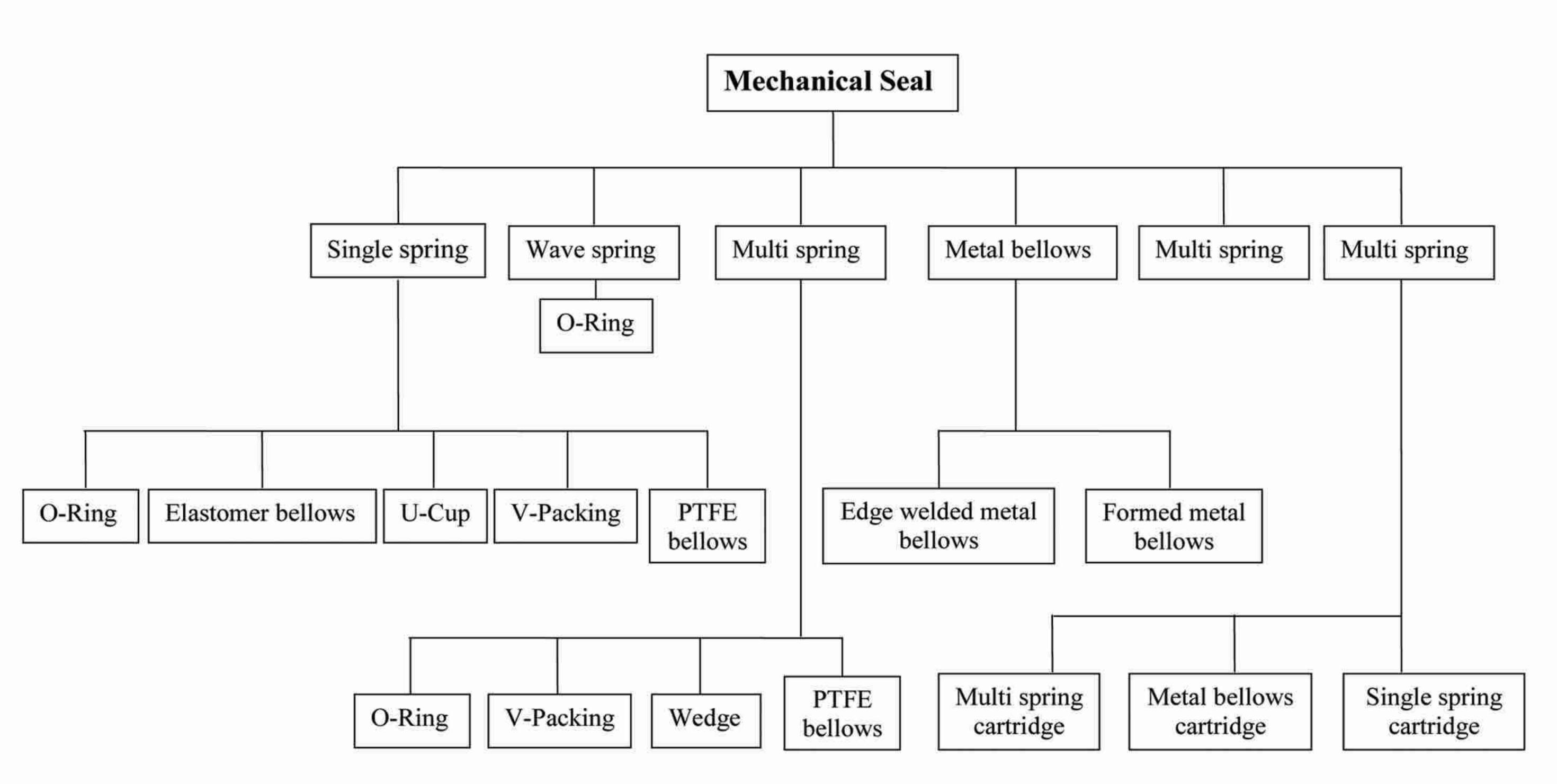




Mechanical Seals

Mechanical Seal rings are used to prevent the flow of liquids or gases between two machine elements, which are moving relative to one another. The mechanical seal assembly generally includes a rotating sealing ring fixed to the shaft, a non-rotating sealing ring adjacent to and in close contact with the rotating sealing ring for forming an annular seal about the shaft. The breadth of our mechanical seal products from small single spring mechanical seals used in millions of domestic water pumps to large, highly customized dry-running gas seals for high speed turbo compressors far exceeds any other seal manufacturer in the region.





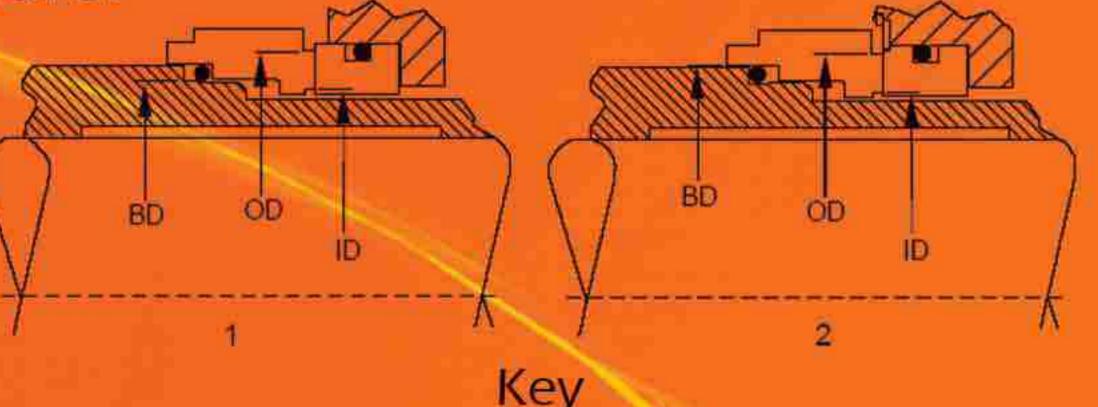
Mechanical Seals Sealing Technology

API 682 Definition

Seal Balance Ratio:

Ratio, sometimes expressed as a percentage, of seal face area exposed to closing force by hydraulic pressure in the seal chamber, to the total sealing face area.

The seal manufacturer shall design the seal faces and seal balance ratio to minimize seal face-generated heat consistent with optimum life expectations in 1.3 (Refer to API 682) and emissions limit requirements. The seal balance ratio measurement points shall be as shown in the following Figure.



1 Seal with higher pressure at outer diameter2 Seal with higher pressure at inner diameter

Balance Ratio Measurement Points

For seals pressurized at the outside diameter, the seal balance ratio is defined by the simplified equation: $(OD^2 - RD^2)$

Where

 $\frac{1}{(OD^2 - ID^2)}$

OD is the seal face outside diameter; ID is the seal face inner diameter; and BD is the balance diameter of the seal.

For seals pressurized at the inner diameter, the seal balance ratio is defined by the equation: $(BD^2 - ID^2)$

Where

 $(OD^2 - ID^2)$

OD is the seal face outside diameter; ID is the seal face inner diameter; and BD is the balance diameter of the seal.

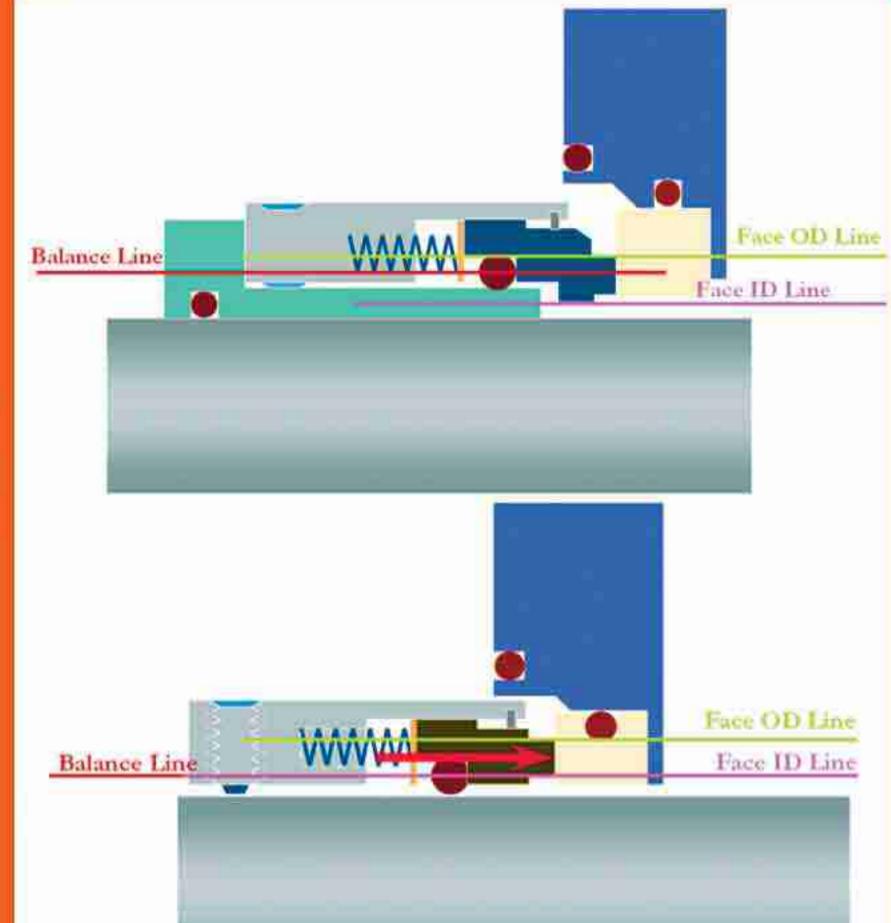
Balance diameter varies with seal design, but for spring pusher seals under outer diameter pressure, it is normally the diameter of the sliding contact surface of the inner diameter of the dynamic O-Ring; for spring pusher seals under inner diameter pressure, it is normally the diameter of the sliding contact surface of the outer diameter of the dynamic O-ring; for welded metal bellows type seals, the balance diameter is normally the mean diameter of the bellows, but this can vary with pressure.

Balanced Seal

Mechanical seal in which the seal balance ratio is less than 1

Unbalanced Seal

Mechanical seal in which the balance ratio is equal to or greater than 1



API 682 Definition

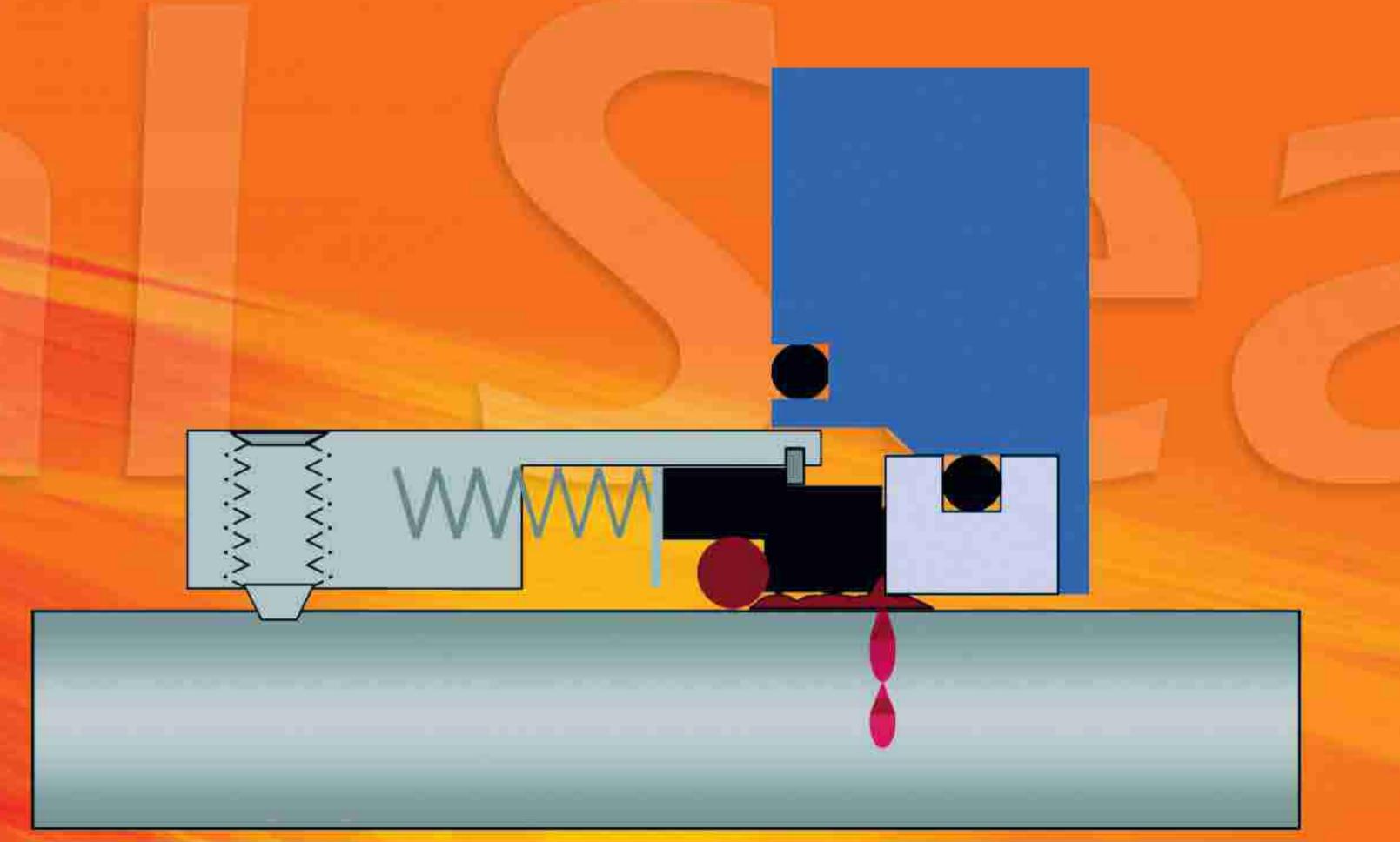
Pusher Type Seal:



(seal design in which the secondary seal is mounted between the seal ring on the flexible element and the sleeve or seal gland plate in which this secondary seal slides axially to compensate for wear and misalignment.)

- The basic difference between pusher and non-pusher types have to do with the dynamics of the shaft packing or O-Ring and whether or not it moves as the seal wears.
- As the seal faces wear down over time, they must be closed to compensate for lost face material. If the shaft O-Ring must move when this compensation takes place, it is pushed forward by the components of the seal and by stuffing box pressure. If the seal is configured with a "dynamic" O-Ring of this type, the seal is called a pusher type.

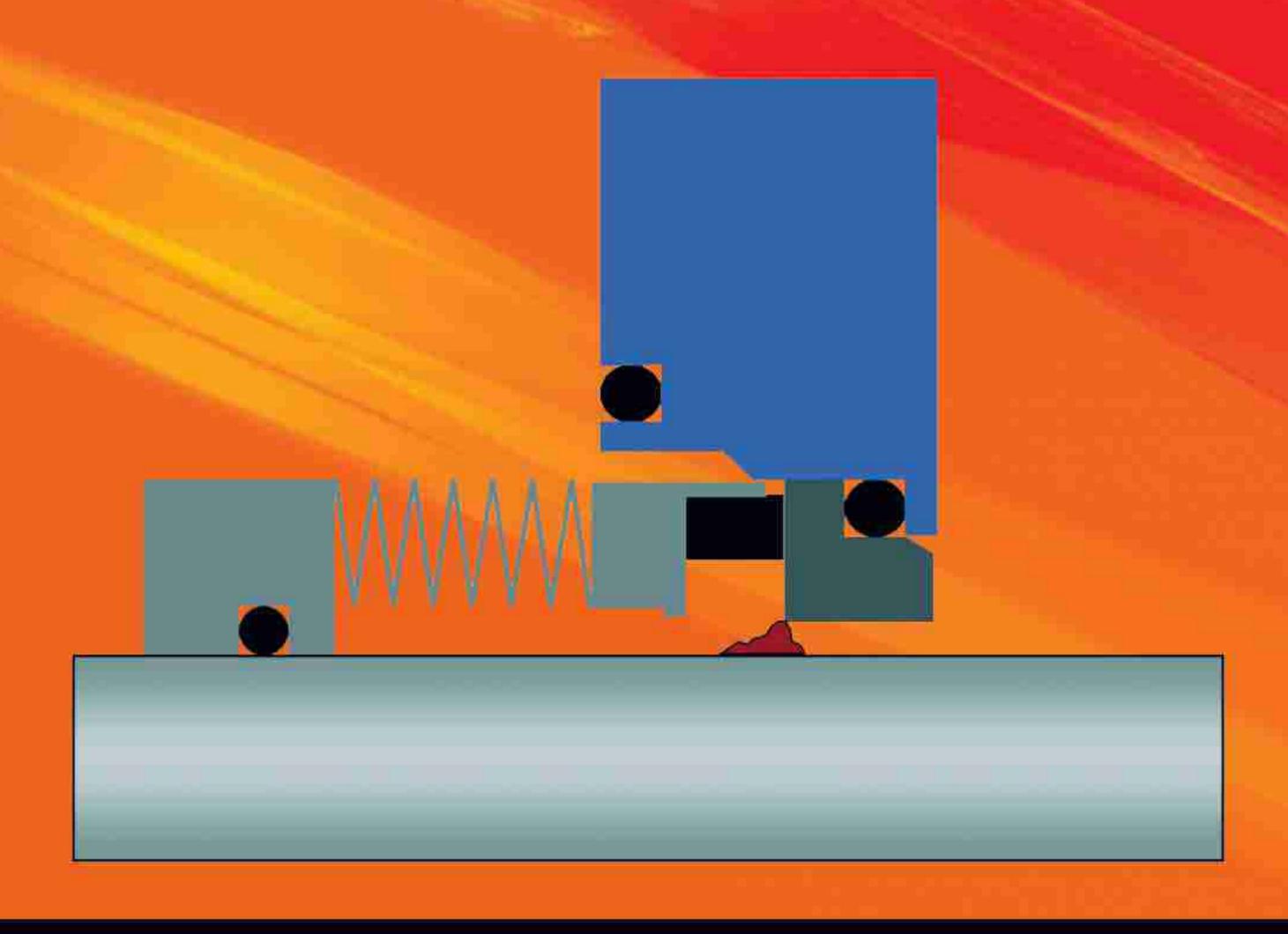
As the softer carbon face wears down, the rotating face must move to maintain face closure. Minute particles of carbon and solids from the process liquid that migrate across the seal faces build up on the shaft.



Non-Pusher:

Debris can build up without causing hang up.

This feature is probably the most notable selling point when comparing a bellows seal to a pusher type seal.

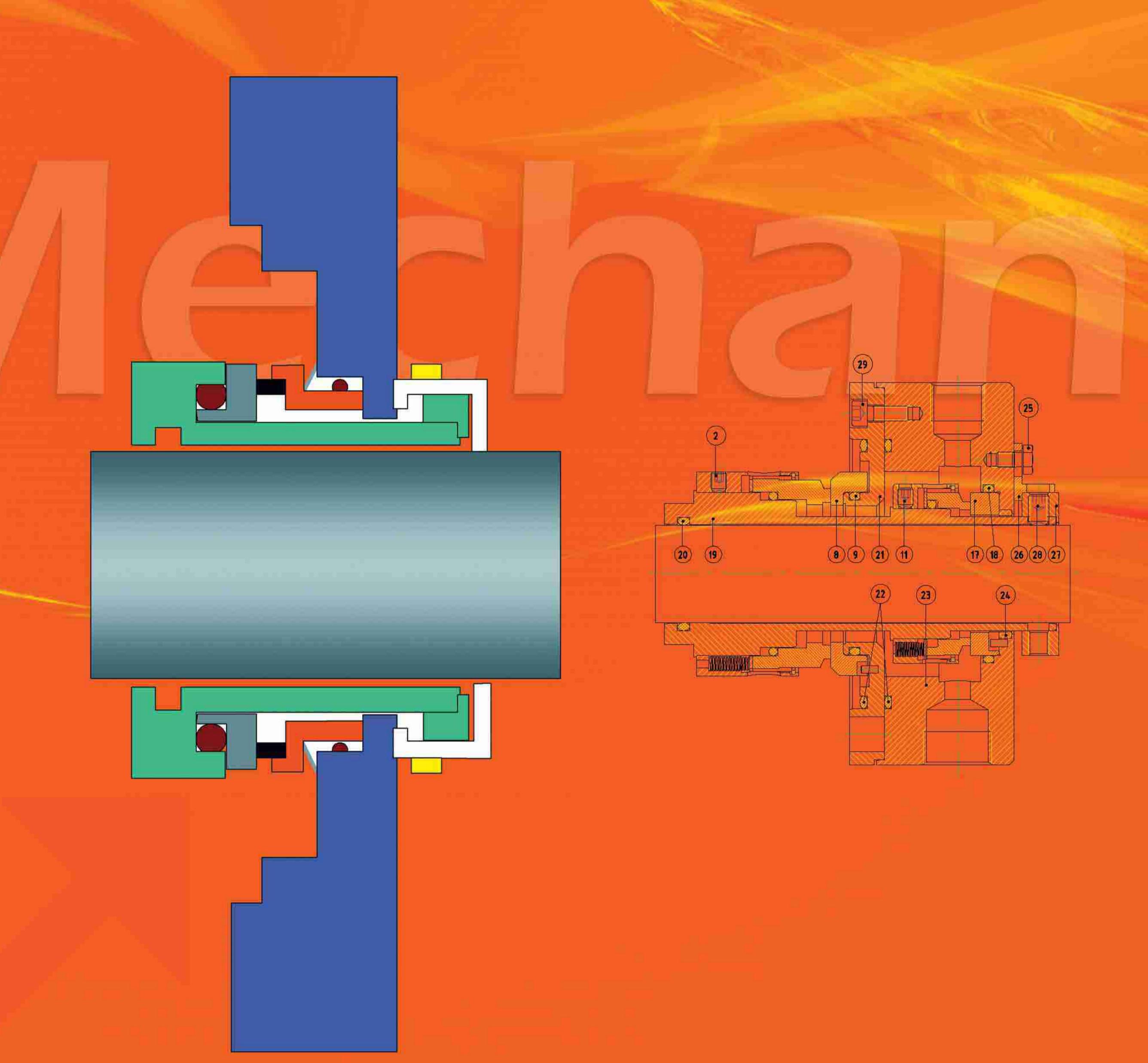




Cartridge Seal

Completely self-contained unit (including seal faces, flexible elements, seal gland plate, sleeve, and mating ring) which is pre-assembled and preset before installation.

- A cartridge type mechanical seal is a pre-assembled package of seal components making installation much easier with fewer points for potential installation errors to occur.
- The assembly is "pre-set" so that no installed length calculations must be performed for determining where to set the seal. This pre-set is achieved by the use of "setting holder" that are removed once the seal is installed and the pump assembled.



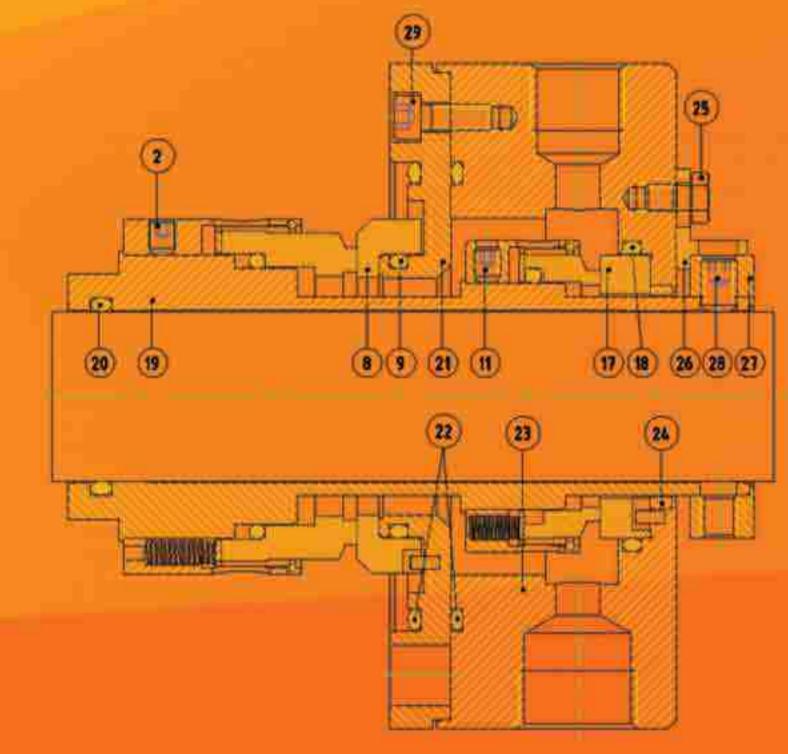
Double Seals



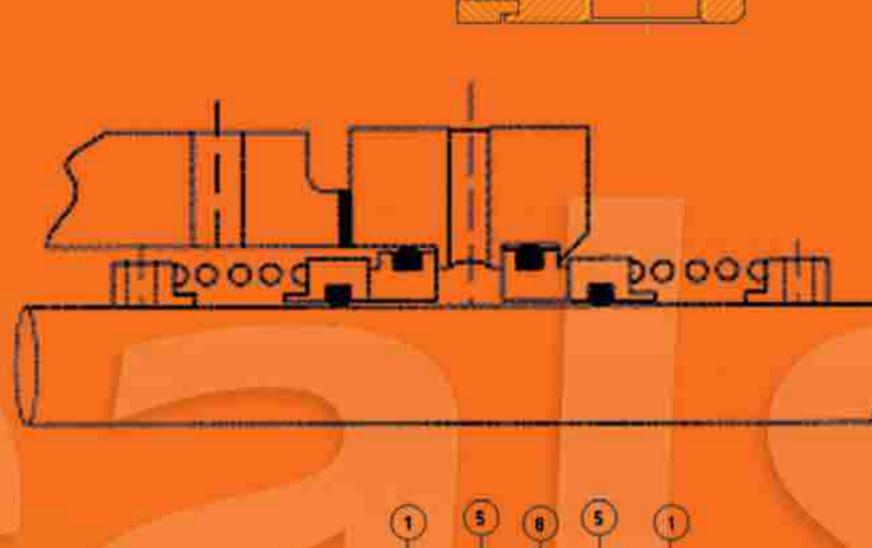
Nahadin Arman's mechanical seals mounted in pairs are used for sealing hazardous, toxic or abrasive fluids and are often provided with clean flushing fluid between the seals. Double seals also provide an additional degree of safety were the pressure differentials are likely to reverse and/or there is a high risk of the sealing failure.

There are a number of double seal assembly options as listed below:

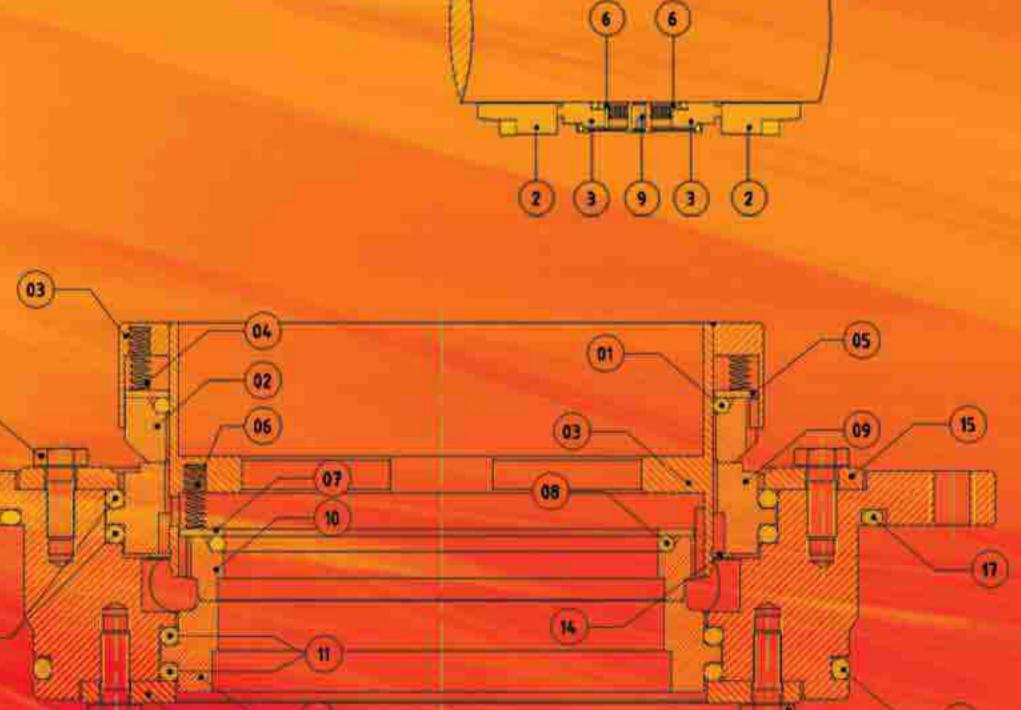
1. **In Series** - Used primarily to overcome the risk of failure of a single seal.



2. **Face to Face** - Used when a cooling fluid interface is required. One seal is used for the process fluid and the other seal is used for the coolant.



3. **Back to Back** - Used when an abrasive fluid is being contained and both seals are flushed with a clean buffer fluid. The flushing fluid is introduced at a higher pressure than process fluid.



4. Concentric or one inside the other.

Nahadin Arman's double seals are recommended for a variety of purposes that include:

- To prevent a costly product from leaking.
- To prevent a hazardous product from leaking to the atmosphere.
- To prevent a pollutant from leaking to the atmosphere.
- As a back up seal to prevent costly down time when the first seal wears out or fails.
 This is an important element in any predictive maintenance program.



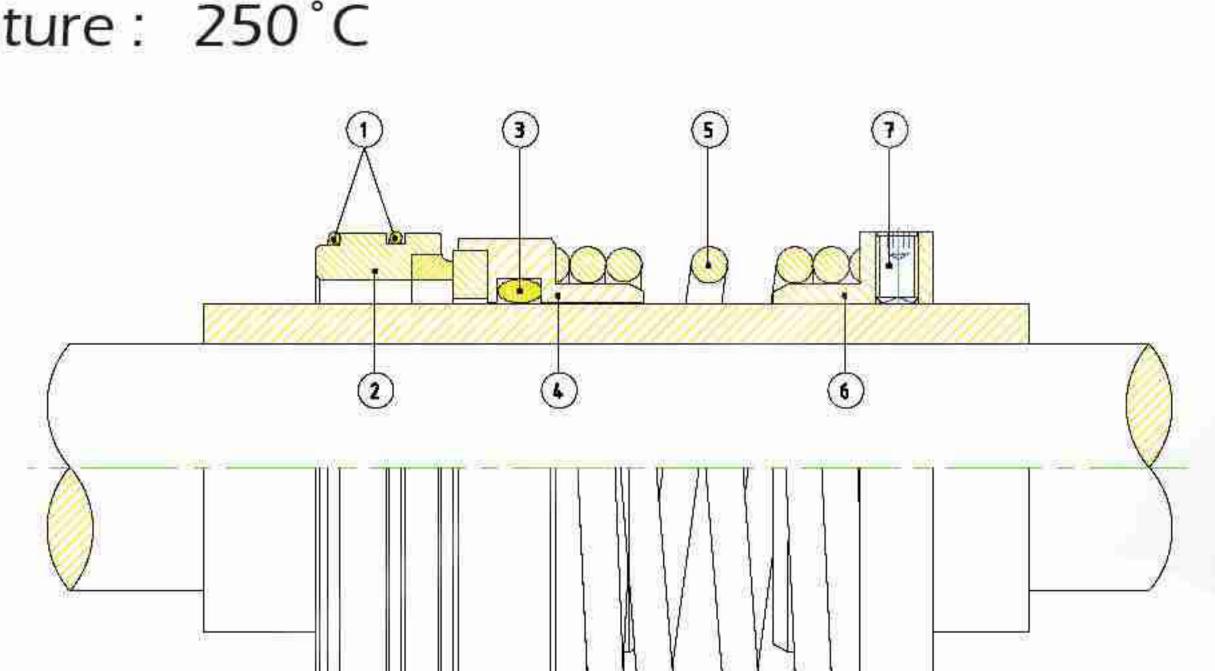
Unbalanced/ for low pressure

Application: Useful for fluids like various kind of acids, alkalis, water, oils. Industries such as petrochemical and oil refining. Depending on operating conditions, the seal ring

and mating ring must be cooled if fluid temperature exceeds 70

Specification: Unbalanced/ multi spring /
Pressure: less than 5 bar g 👸 Speed: 4000 RPM

Temperature: 250°C





USO2

This type is useful for fluids like fresh water, O Application:

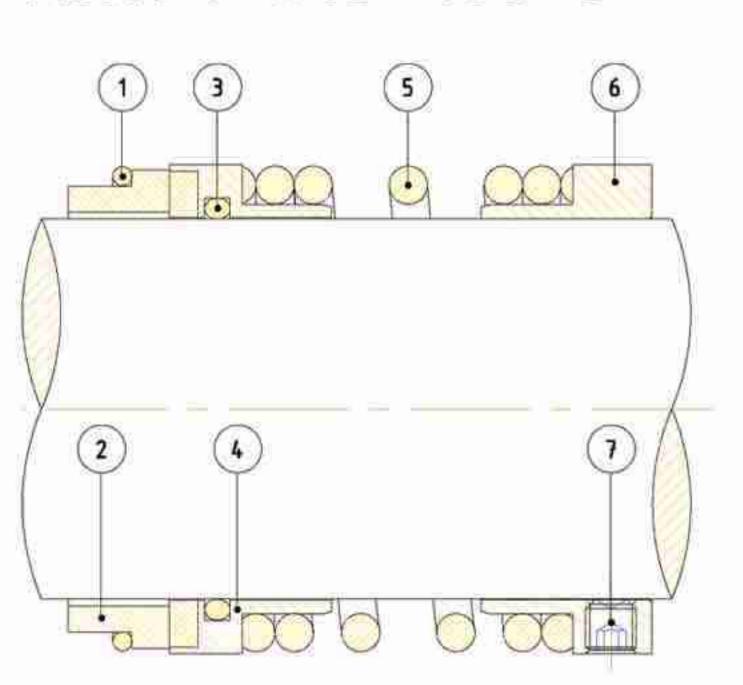
sea water, fuel and lubricating oil

* Specification: Unbalanced, single spring, o-ring packing

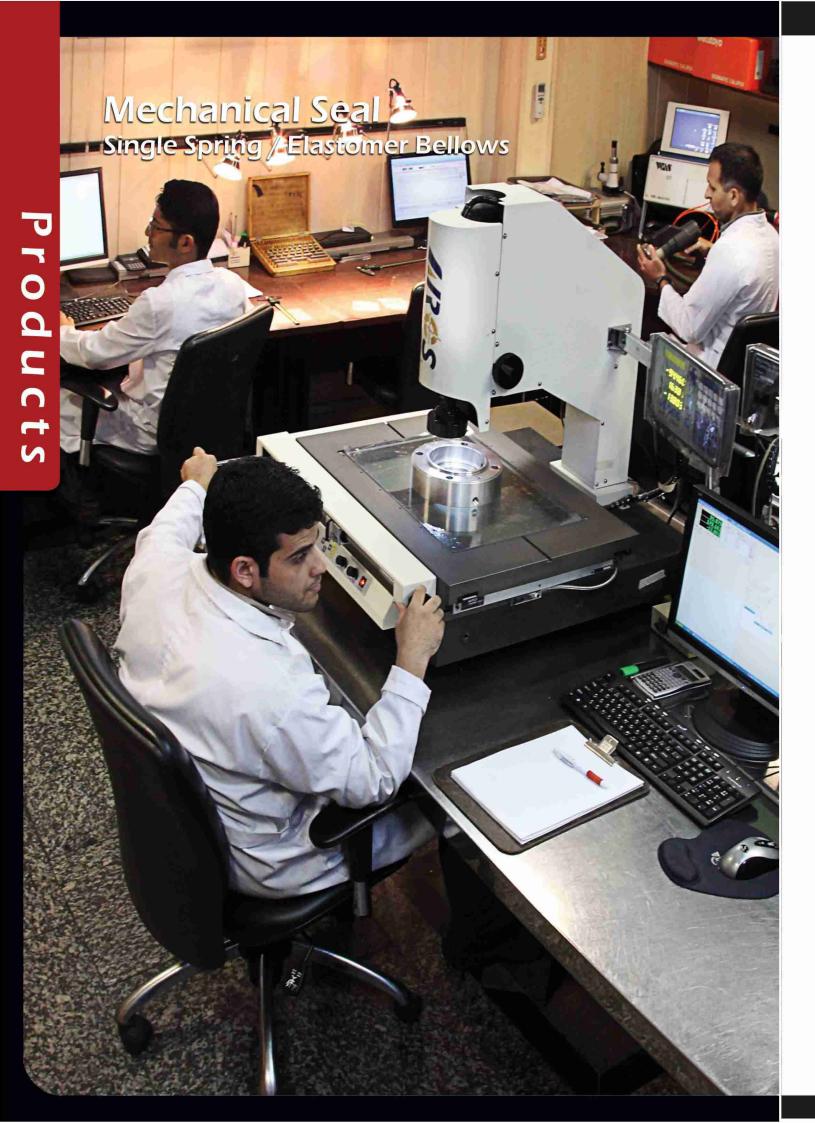
Pressure: 10 bar g 🕱 Speed: 20 m/s

■ Temperature: Nitrile -20°C to +80°C

Viton 0°C to +150°C







USE1

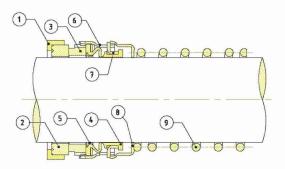
• Application: All types of rotary equipment, pumps, marine, mixers, agitators and compressors

in variety of service application

Pressure: Up to 30 bar g

Speed: Up to 25 m/s

Temperature: -40°C to +205°C





USE2

• Application: These types are suitable for a wide range of service conditions, including water,

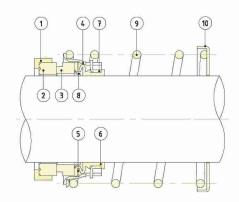
refrigeration, oils and chemicals.

Pressure: Up to 29 bar g

S p e e d: Up to 20 m/s

Temperature: -40°C to 205°C

(depending on materials used)



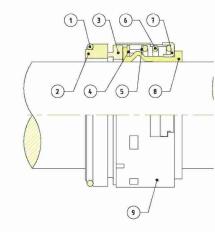


USE5

Pressure: Up to 40 bar g

Speed: Up to 25m/s

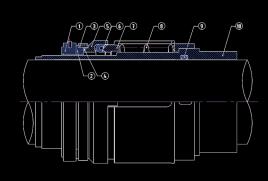
Temperature: -40°C to 205°C







Mechanical Seal Single Spring / U-CUP





For heavy duty and general services **Application**:

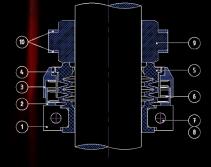
• Pressure : Up to 69 bar g 🔯 **S**peed: Up to 23 m/s

Temperature : water/ water solutions 0°C to 80°C

Other liquids -73°C to +232°C



Mechanical Seal Single Spring / PTFE Bellows





Application: It is used for corrosive fuilds like acids,

salts, organic compound and corrosive

or severe services

Pressure: Up to 10 bar q 👸 **S**peed: Up to 20 m/s



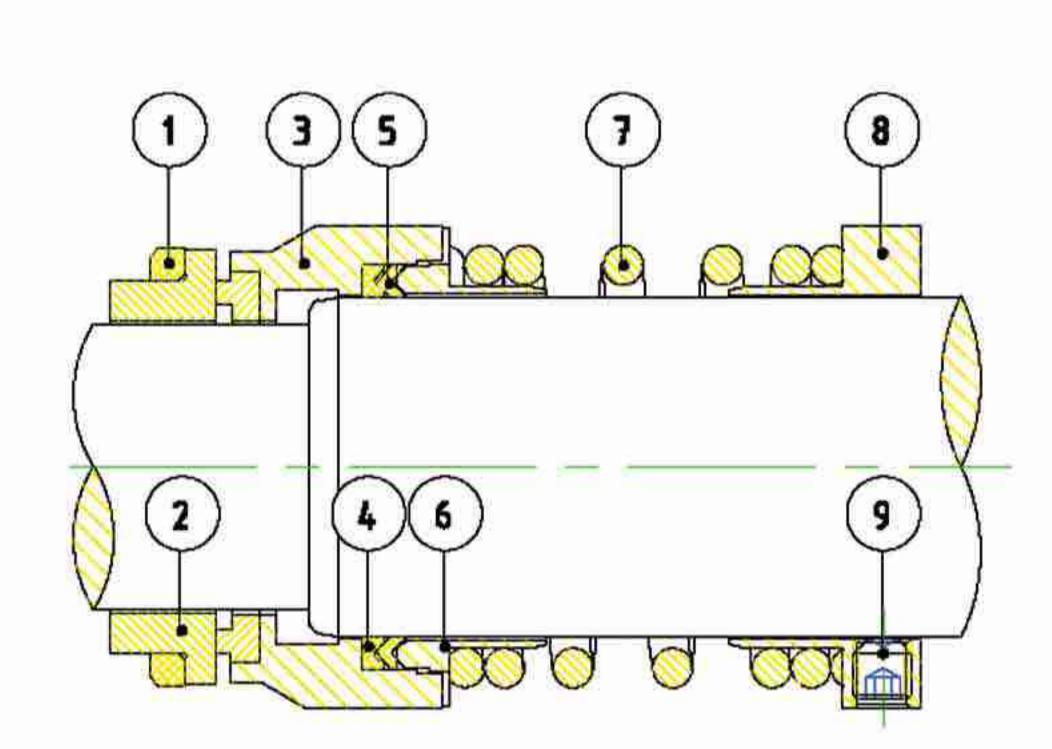




BSV26

Specification: single spring/balanced/v-packing

Pressure: Up to 20 bar g
S p e e d: 20 m/s
Temperature: Up to 200°C





UW07

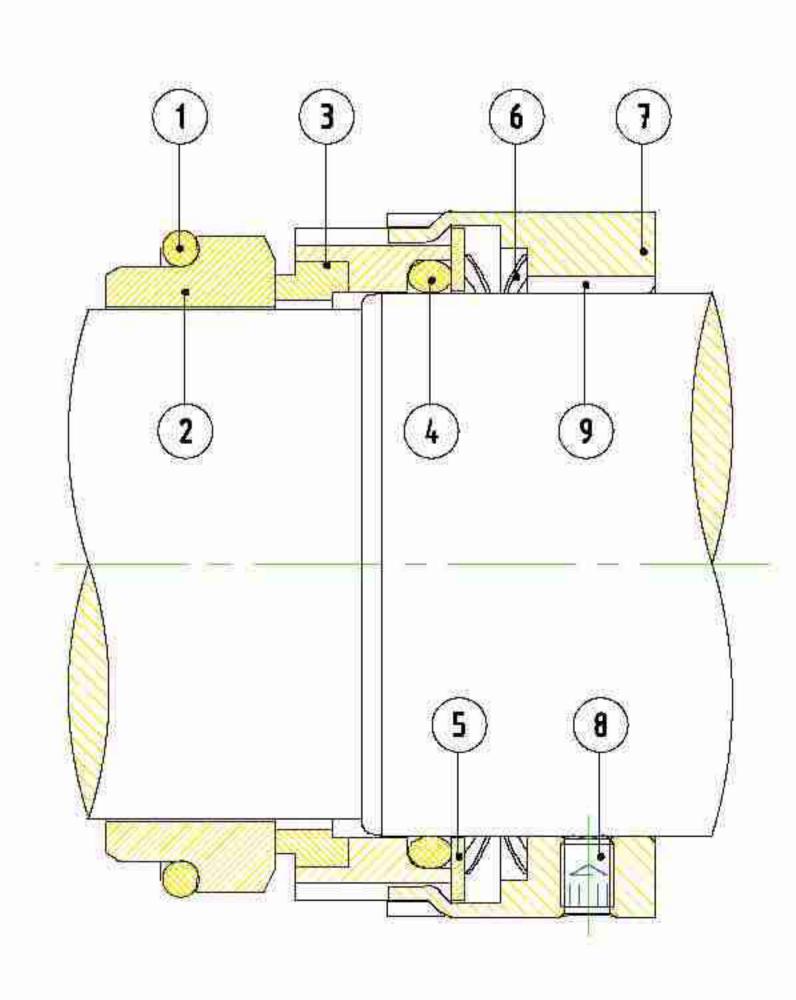
Specification: Wave spring/ unbalanced/

O-Ring constructed for secondary sealing

Pressure: 16 bar

S p e e d: 20 m/s

Temperature: -50°C to 220°C







Mechanical Seal Multi Spring / O-Ring BMO8 Pressure : Up to 30 bar g 25 m/s 👸 Speed: ■ Temperature: Up to 240°C NAHADIN ARMAN C SEALING SYSTEMS • BMO81 This type is useful for industrial fluid like chemicals, light hydrocarbons, Application: corrosives and low to high pressure fluids • Pressure: UP to 80 bar q 👸 Speed: UP to 25m/s **■ Temperature**: -40°C to +260°C

1 3 6 7 9

BMOL

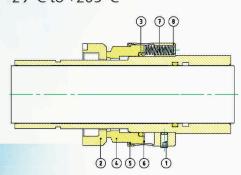
O Application: Useful for liquids such as volatile organic

compounds, hazardous materials, ubricating

I liquids, aqueous solutions, chemicals,

light hydrocarbons

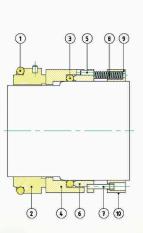
• Pressure: 34 bar g Speed: Up to 20 m/s Temperature: -29°C to +205°C



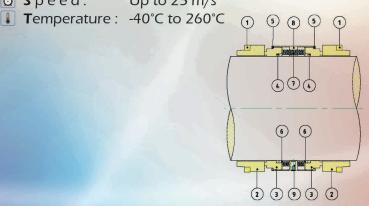
BMOP

20 bar g • Pressure: UP to 23 m/s Speed:

■ Temperature: 260°C

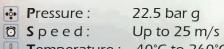














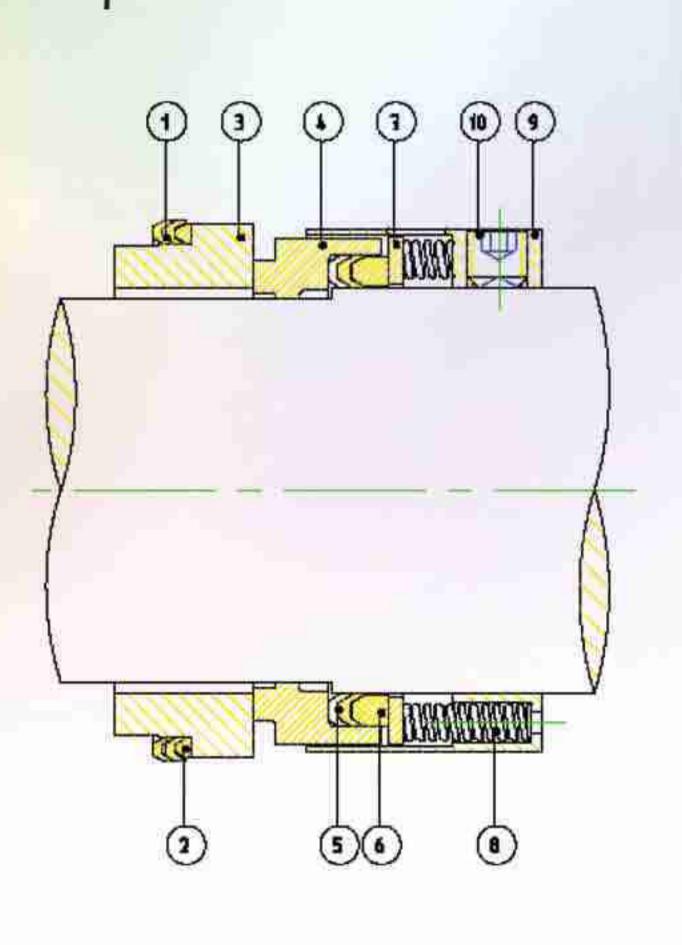
Mechanical Seal Multi Spring / V-Packing

• BMV8

Pressure: Up to 20 bar g

S p e e d: 20 m/s

Temperature: Up to 250°C





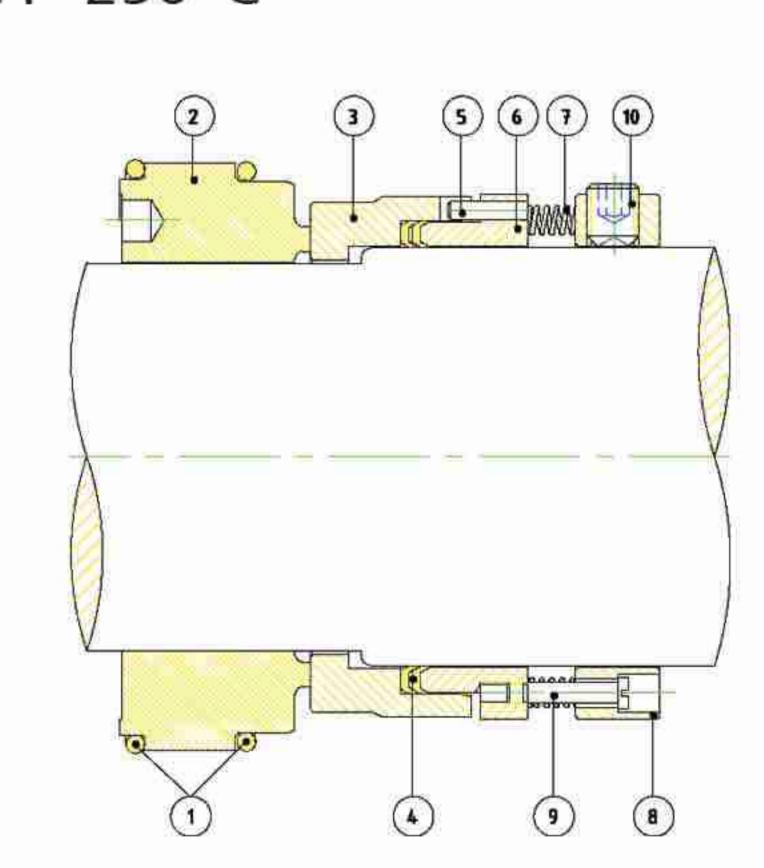
BMV10

Application: Useful for liquids like acids, alkalis, water, oils and petrochemical and oil refining

industries, high pressure fluids, is used in application where lubrication is a problem. Depending on operating conditions, the seal ring and mating ring must be cooled

if fluid temprature exceeds 70°C

Pressure: 30 kg/cm²
S p e e d: 4000 RPM
Temperature: 250°C





• BMV12

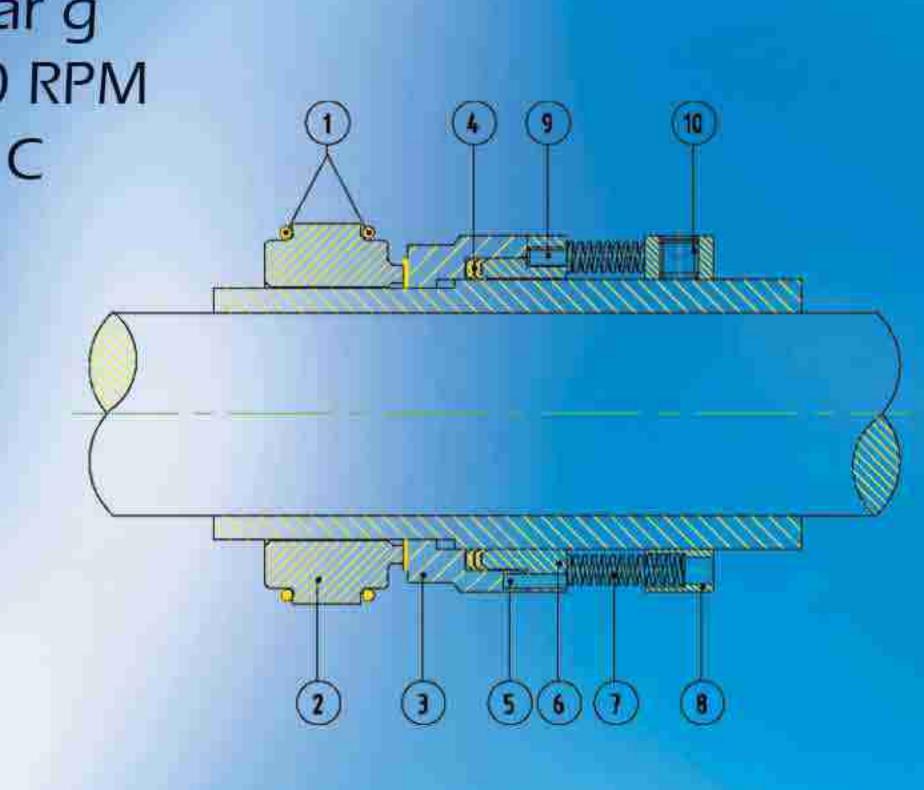
O Application: Useful for liquids like acids, alkalis, water, oils and petrochemical and oil refining industries, high pressure fluids, is used in application where lubrication is a problem.

Depending on operating conditions, the seal ring and mating ring must be cooled

if fluid temprature exceeds 70°C

Pressure: 30 bar g
 Speed: 4000 RPM

Temperature: 250°C



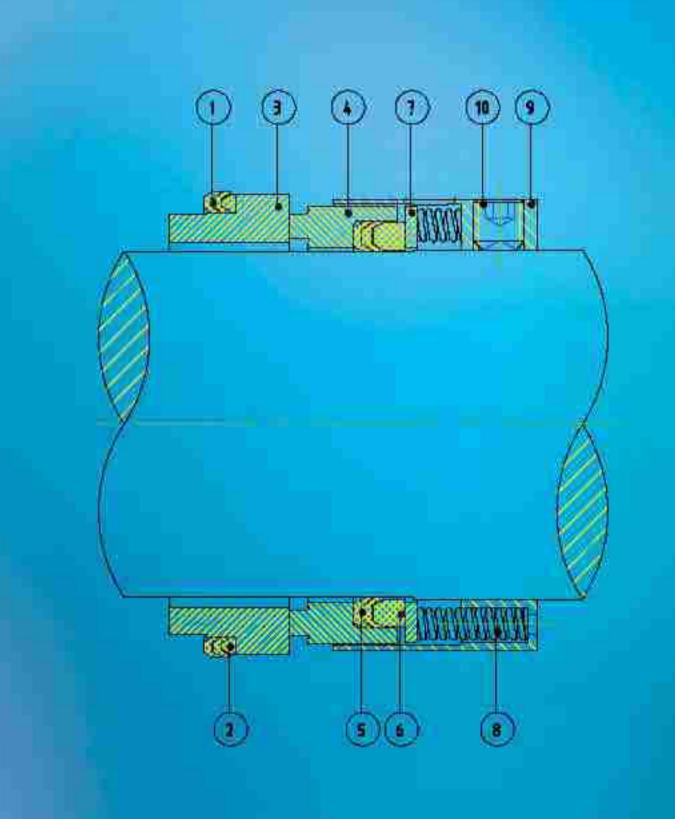


UMV3

Pressure: Up to 20 bar g

Speed: 20 m/s

Temperature: Up to 250°C





UMV11 Unbalanced/ for low pressure

O Application: Useful for fluids like various kind of acids, alkalis, water, oils. Industries such as

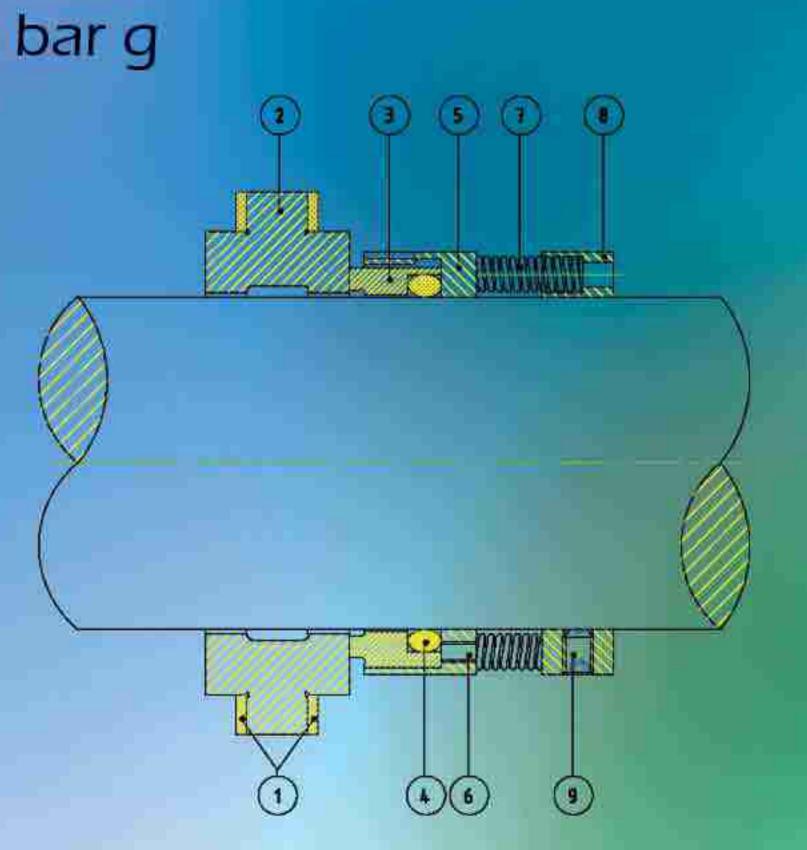
petrochemical and oil refining. Depending on operating conditions, the seal ring

and mating ring must be cooled if fluid temperature exceeds 70°C

Pressure: less than 5 bar g

Speed: 4000 RPM

▼ Temperature: 250°C





Multi Spring / Wedge Multi Spring / PTFE Bellows



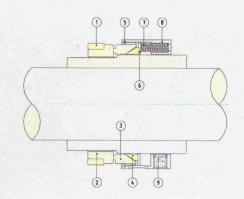
UMW10

O Application: Chemical, refinery, petrochemical and pharmaceutical

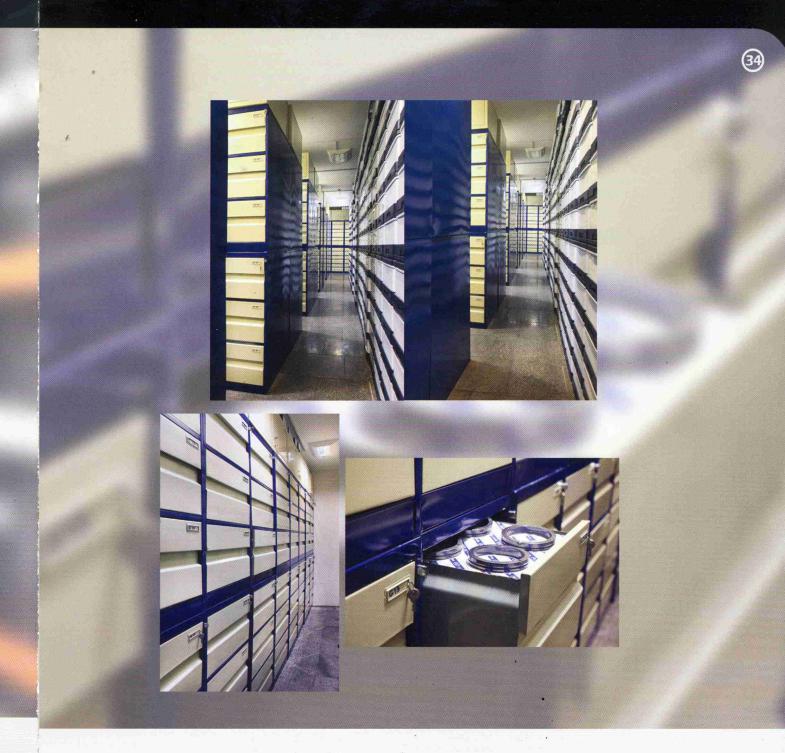
Pressure: Up to 24 bar g

S p e e d: Up to 25 m/s

Temperature: -215°C to +400°C







BMP6

All sort of corrosive fluids, reducing agent, strong acids, alkaline liquids, salts, corrosive concentrated acids

O Application: For various types of chemical pumps, agitators, mixer

Pressure: 5 bar g
S p e e d: 3600 RPM
Temperature: 90°C







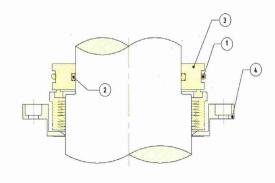
• BBE8

Application:Pressure: This type is used for high speed applications in turbines, compressors, centrifuges

Less than 5 bar g Speed:

40 m/s

Temperature: -180°C to +250°C

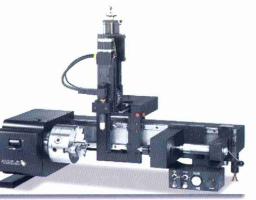






For the first time in the Middle East, Nahadin Arman started manufacturing of metal bellows mechanical seals with high-technology machines.







BBEC

This type is used in chemical industry

Application: This type is used to Pressure: Up to 20 bar grades of the property of the propert Up to 20 bar g



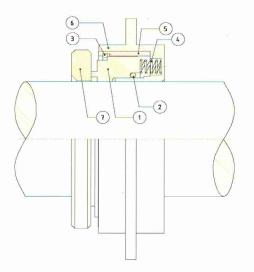




BXO6

Pressure: 50 bar g 15000 RPM © Speed: 15000 F

■ Temperature: 300°C

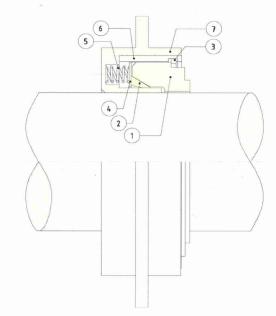




BXW5

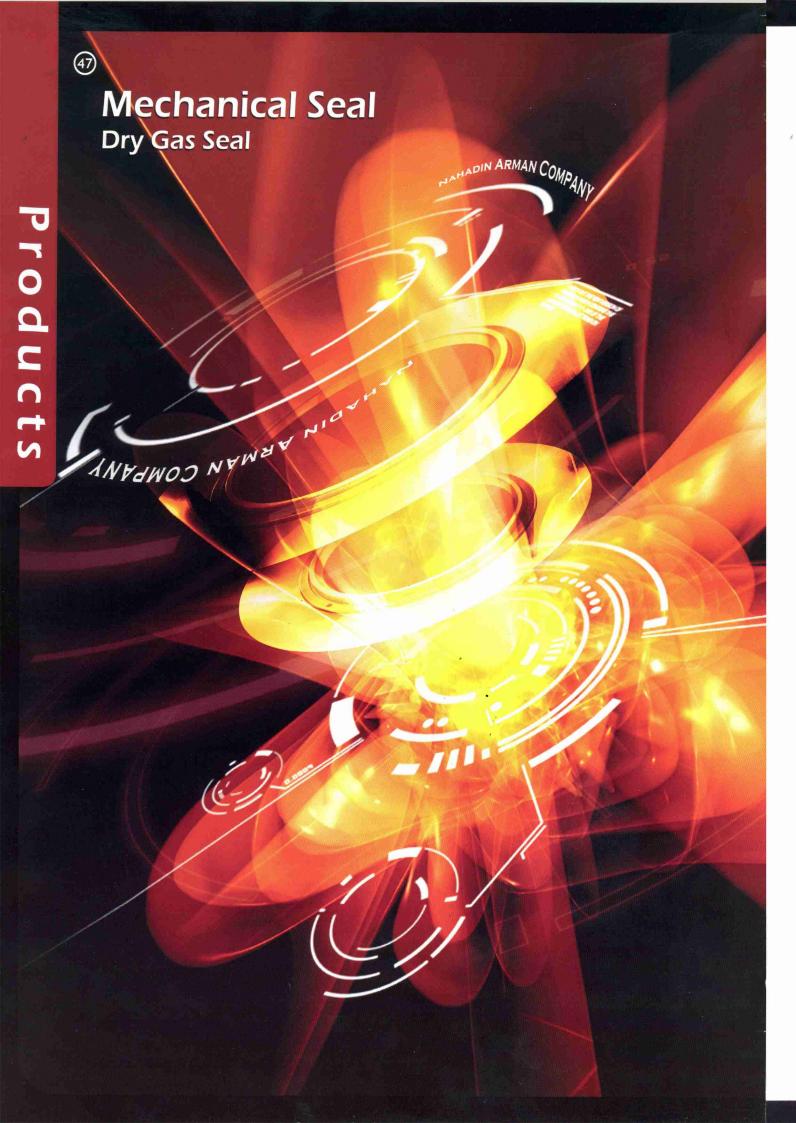
Pressure: 50 bar g

Speed: 15000 RPM
Temperature: 300°C







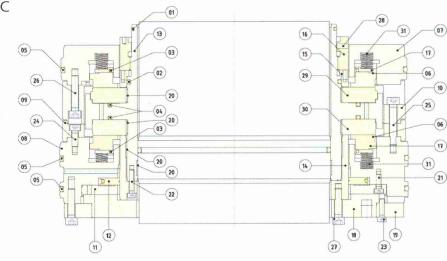


DGS2

Pressure: Up to 450 bar g

Speed: Up to 200 m/s

Temperature: -140°C to 315°C





Dry Running Gas Seals

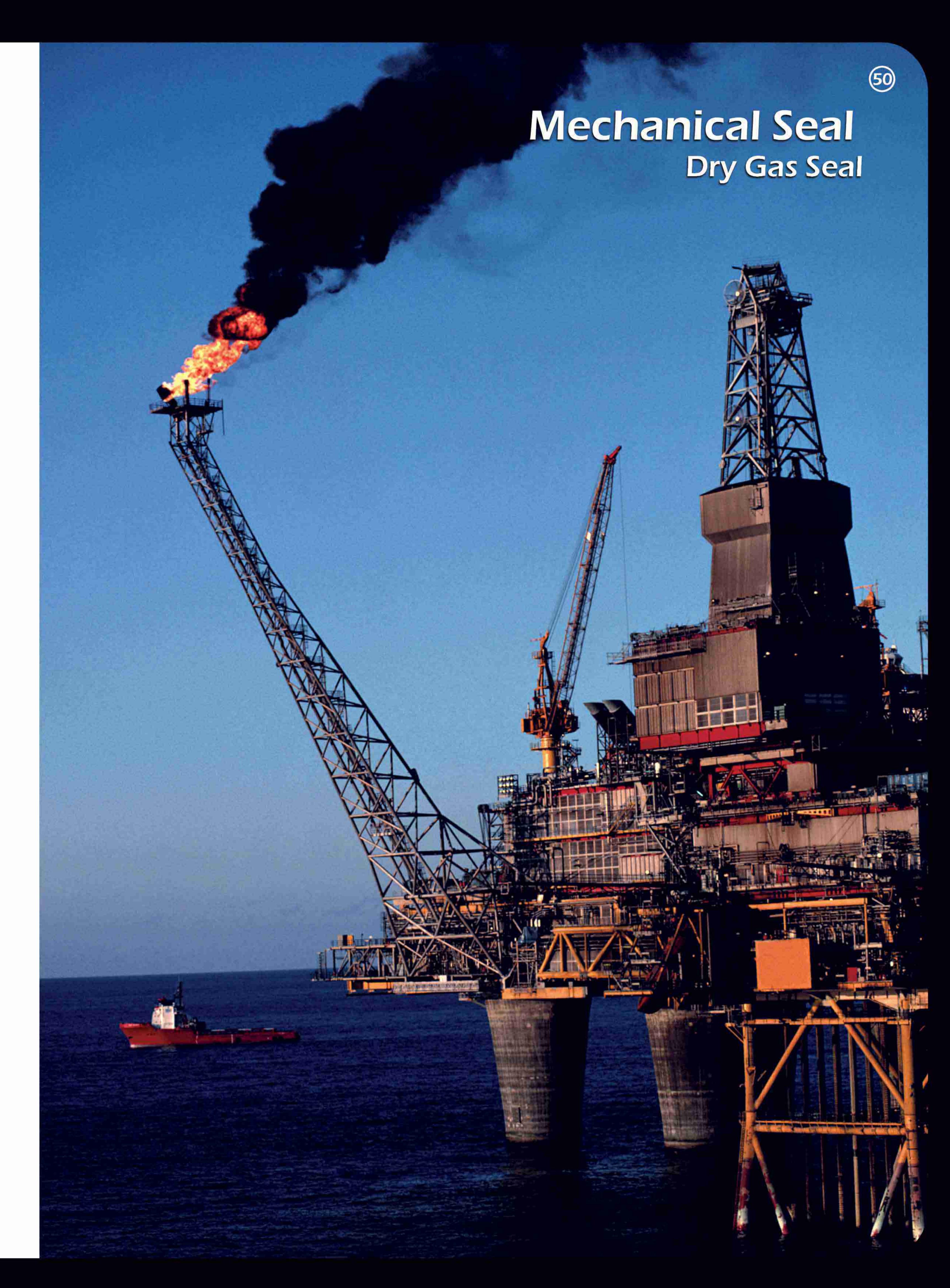
Traditionally , the sealing of rotating shafts on gas compressors has been achieved by the use of carbon ring seals, labyrinth seals and double contacting end face seals with a pressurized liquid barrier to provide lubrication and coating. These installations which need complicated. Space-consuming seal oil systems are expensive, inefficient and require continual maintenance. Ever increasing shaft sizes, shaft speeds, pressures generate considerable friction losses in sealing oil films which represents lost energy . The dry running, non-contacting gas seal, however, operates by establishing a very thin gas film between the rotating faces.

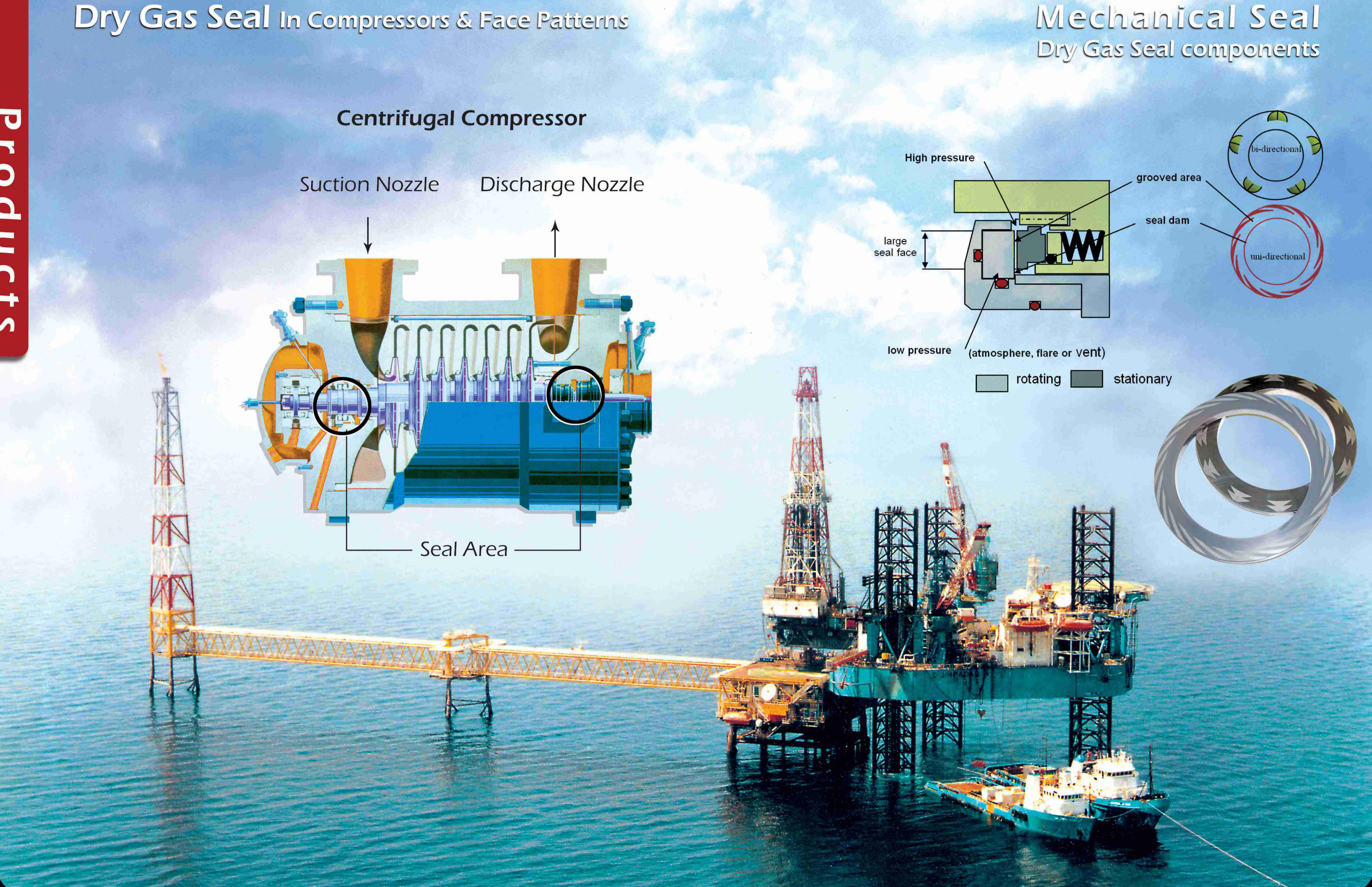
Thus requiring no auxiliary seal oil systems, absorbing very little power and reducing wear rates to near zero values.

A dry running gas seal resembles an ordinary stationary mechanical face seal having the same basic components: face ring, seat ring, retainer, coil sprigs, secondary seal, sleeve, etc. The main differences are: wider seal face, specially shaped face ring and a spiral groove, Raleigh pad or other pattern on one of the sealing faces .

The rotating seat ring, usually a very hard, stiff, wear-resistant material is axially fixed, whereas the stationary face ring, made from a relatively softer, more flexible self-lubricating material like carbon, is free to move in the axial direction to establish a dynamic equilibrium sealing gap between the two rings.



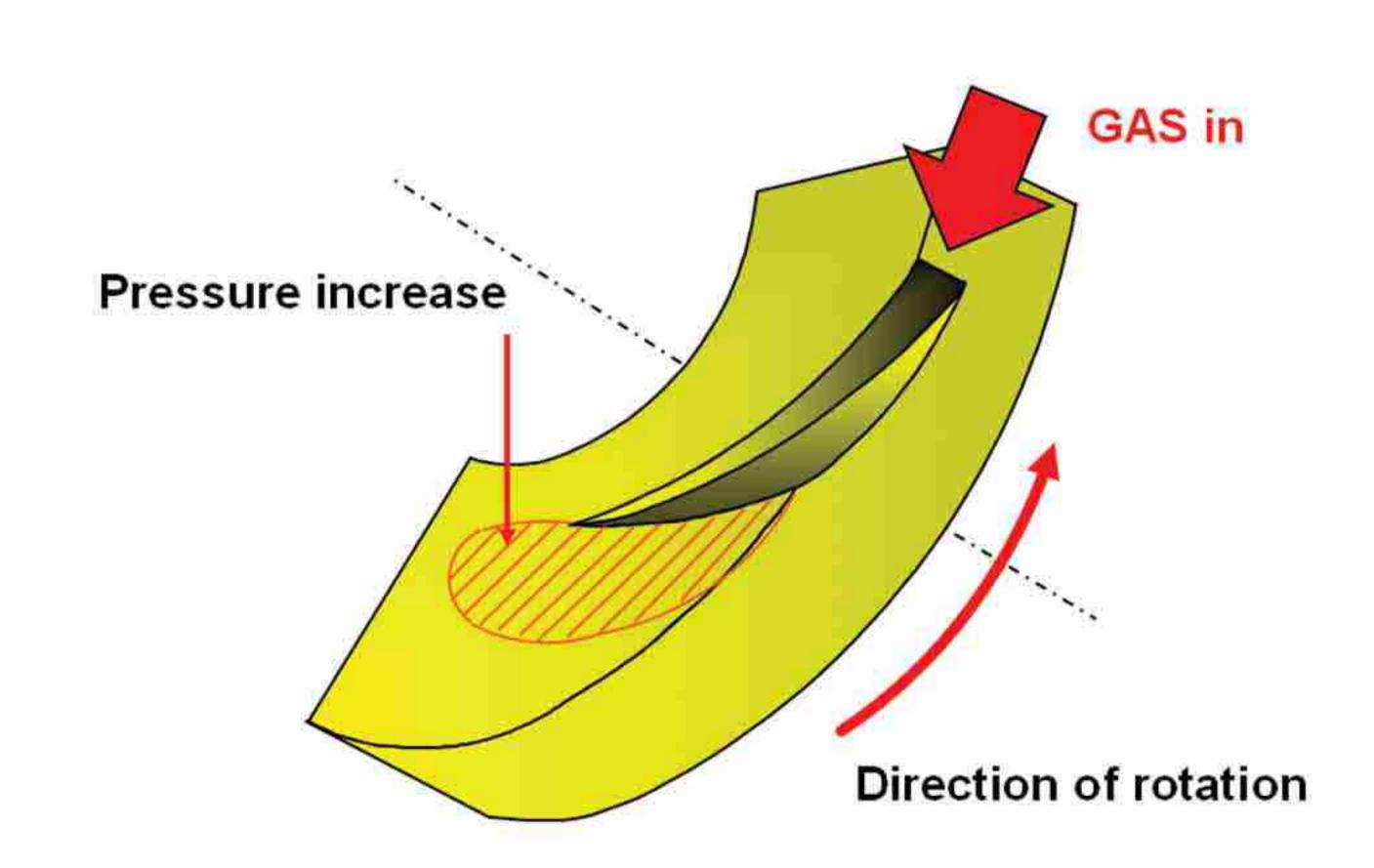




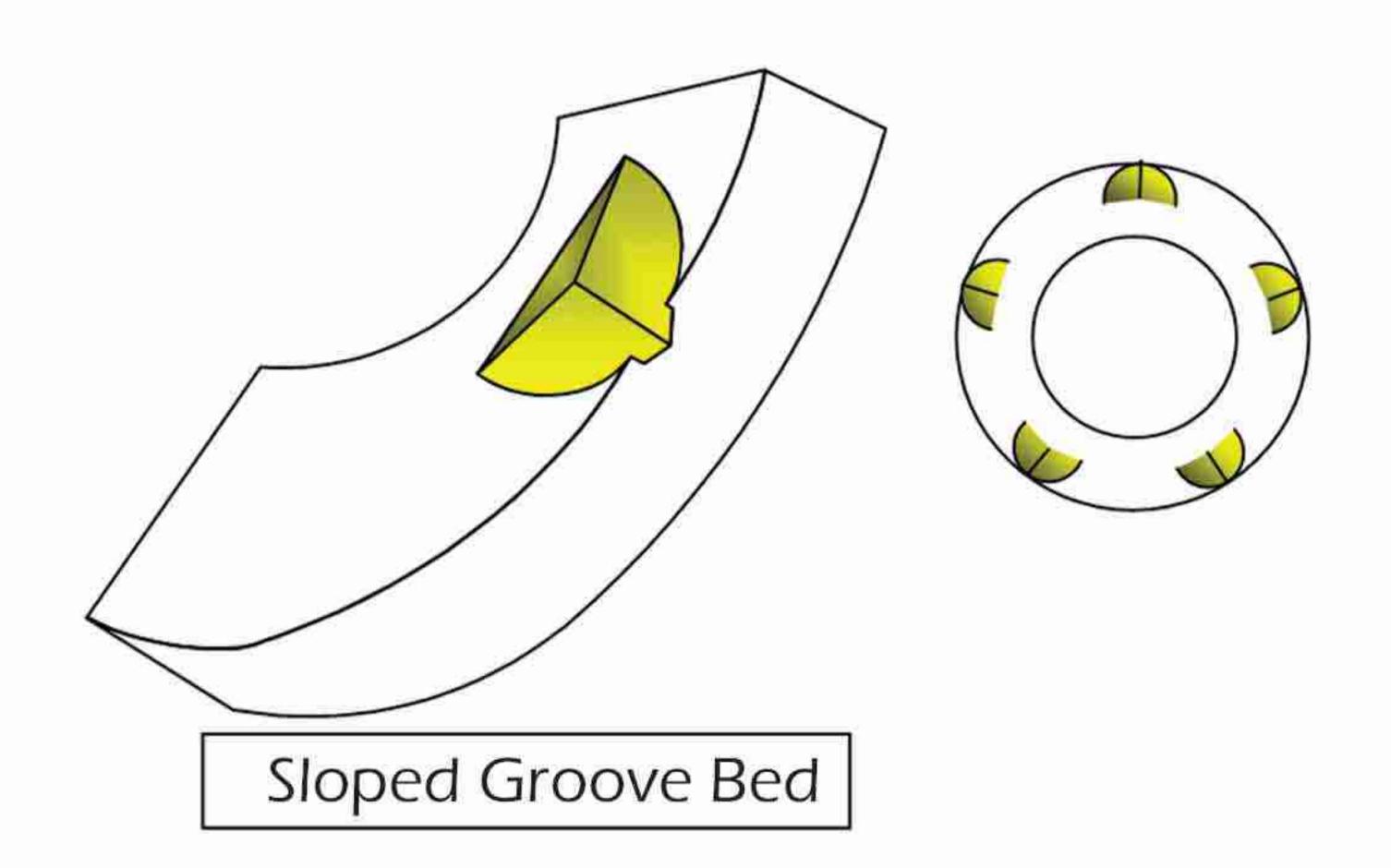
Uni - directional, V - Groove

Sloped Groove Bed

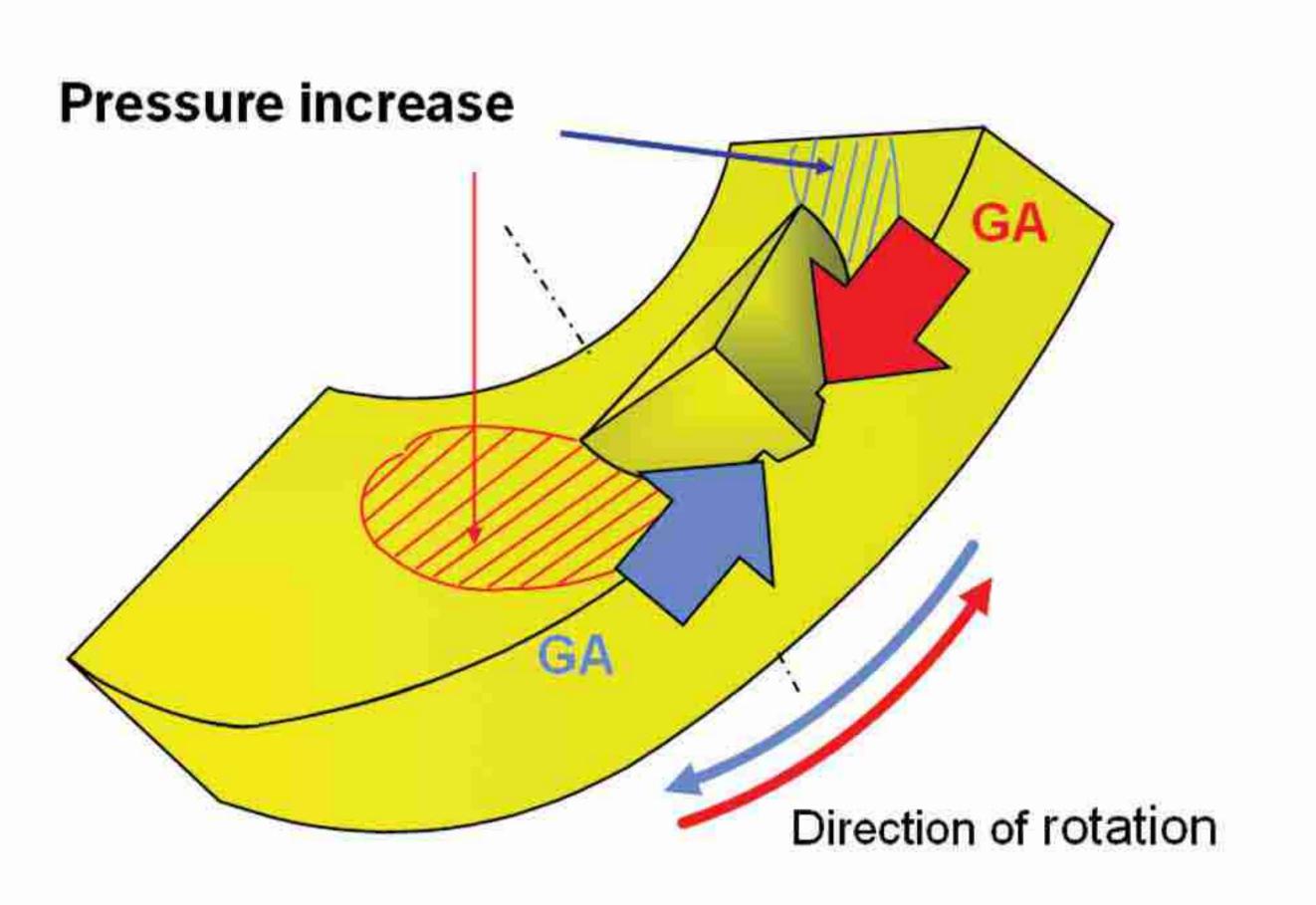
Dry Gas Seal Principle V-groove

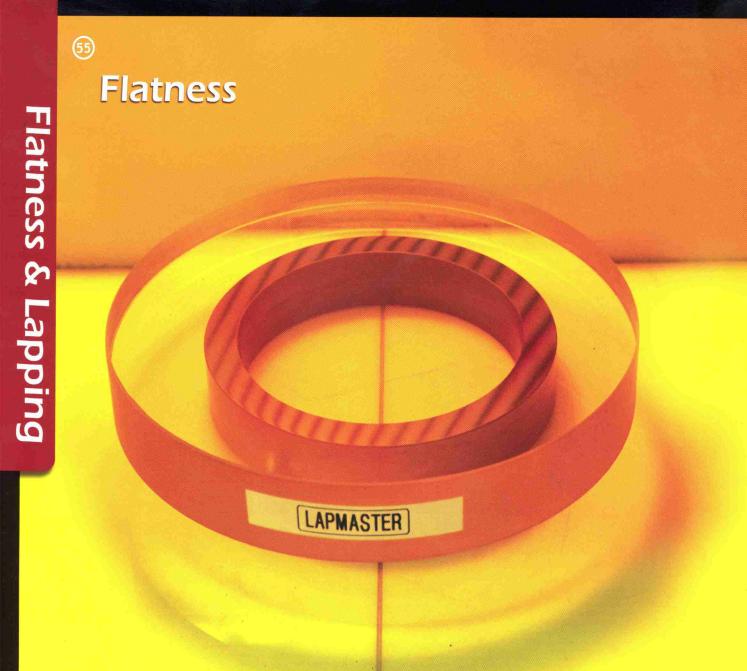


Bi - directional, U - Groove



Dry Gas Seal Principle U-groove







Flatness is a term that describes a level surface that has no elevations or depressions. We use terms like waviness, or concave and convex surfaces to describe the condition when we refer to mechanical seal faces. It is this flatness that is of the most concern to us because testing has shown that if the faces are separated by a space of about two microns or more, the seal faces will show visible leakage, and depending upon the separation, let solids penetrate that might score or in some way injure these lapped faces.

There are several ways you could measure flatness, for example:

You could read the flatness by using an optical flat and a monochromatic light source, and this is the method that is used by all of us in the sealing industry.

The optical flat is placed on the piece to be measured. The monochromatic light is aimed at the piece and this light reflects off of the piece back through the optical flat causing interference light bands. If the distance between the optical flat and the piece we are measuring is one half the wave length of helium, or an even multiple of the number, the band will show black. This is referred to as a helium light band and because it is one half the wave length of helium it measures 0.3 microns or 0.0000116 inches.

To understand this measurement we might mention that the smallest object that can be seen with the human eye is forty (40) microns.



This machine produces optically flat surfaces with high precision surface finish.



Elastomers O-Ring



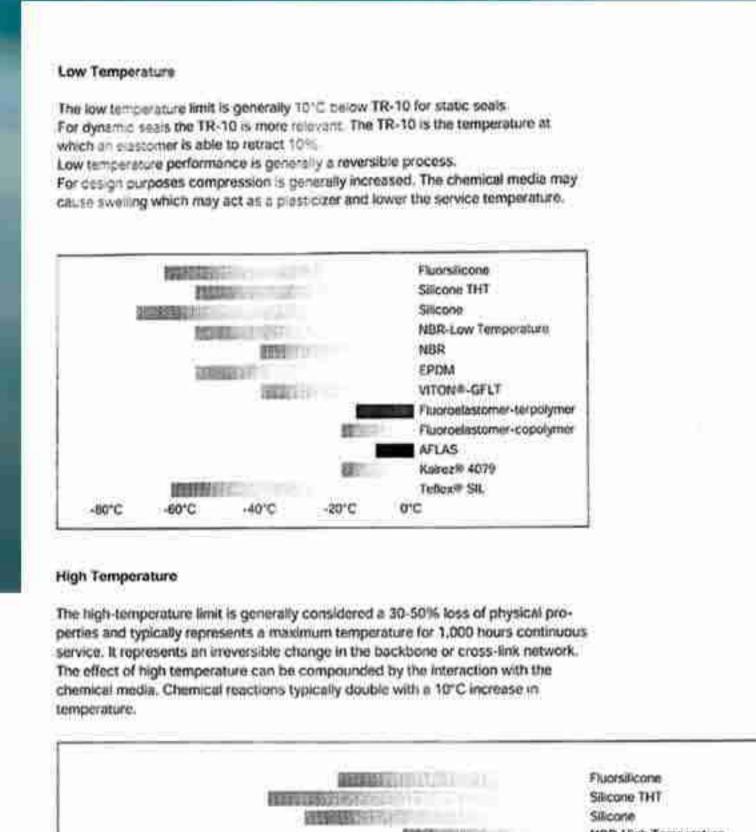
Elastomers, usually in the form of O-Rings are simple, ingenious and effective sealing device. Because of its simple construction, it is readily adaptable to limited-space applications. It provides a dependable dynamic and static seal through wide ranges of pressures and temperatures. Although O-Rings are manufactured primarily as hydraulic and pneumatic seals, they are also used as drive belts, friction devices, vibration dampers and retaining rings. Nahadin Arman also provides CAMLAST elastomer family of compounds, which allows reliable operation of oilfield equipment in the most severe oilfield environments, such as high temperatures, high H₂S levels, and amine corrosion inhibitors.

Storage And Age Control of Elastomers

Nahadin Arman recommends the following storage parameters:

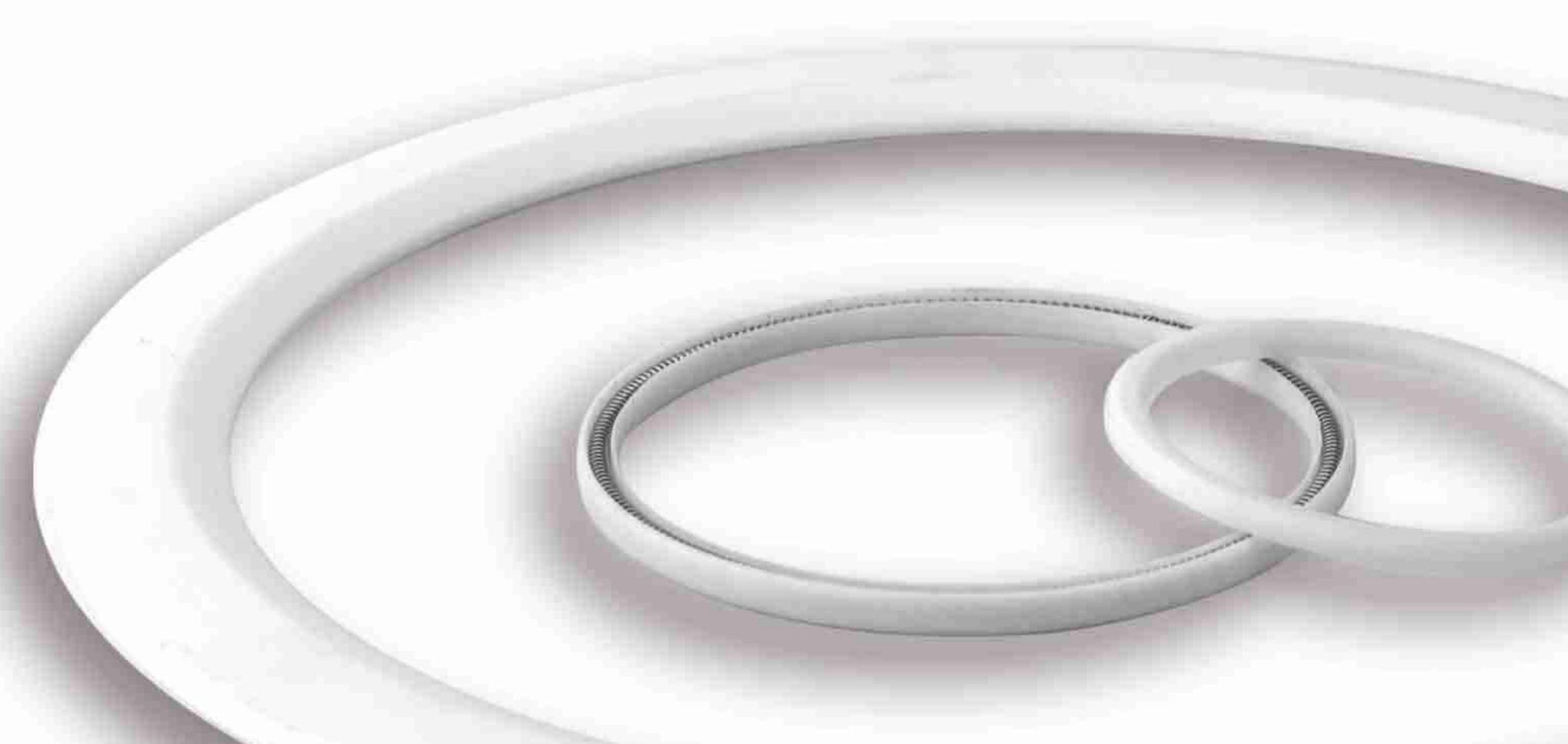
- Ambient temperature (preferably not higher than 50°C (120°F)).
- Dry environment and exclusion of contamination.
- Protect against direct sunlight.
- Protect against radiation.
- Protect against artificial light containing UV-radiation.
- protect from ozone generating electrical devices.
- Store parts without tension (never hang O-Ring).





| ies and typically represents a maximum temperature for 1,000 hours continuous ice. It represents an irreversible change in the backbone or cross-link network. effect of high temperature can be compounded by the interaction with the nicel media. Chemical reactions typically double with a 10°C increase in perature. | | | | |
|--|---|--|--|--|
| | Fluorsilicone Silicone NBR-High Temperature NBR EPDM PC VITON® Fluoroelastomer-terpolymer Viton® 8 Fluoroelastomer-copolymer ™ A AFLAS Kairiz® 4079 Kelrez® Spectrum 6375 | | | |
| 350°C 300°C 250°C 200°C 150°C 100°C 50°C | o.c | | | |

| Chemical Terms, Abbreviations, and Trade Names | | | | |
|--|------------------------------|--|--|--|
| Chemical Term | ASTM Designated Abbreviation | Polymer Trade Names Chemigum®, Nipol®, Krynac®, Paracril®, Perbunan N®, Buna N® | | |
| Acrylonitrile Butadiene | NBR | | | |
| Highly Saturated Nitrile | HNBR | Therban*, Zetpol* | | |
| Carboxylated Nitrile | XNBR | Nipol®, Krynac®, Chemigum® | | |
| Fluorocarbon | FKM, FEPM | Dyneon*, Viton*, Aflas*, Fluorel* | | |
| Ethylene Propylene | EP, EPDM, EPT, EPR | Nordel®, Royalene® Vistalon®, Buna EP®, Keltan® | | |
| Styrene Butadiene | SBR | Ameripol Synpol®, SBR®, Plioflex®, Stereon® | | |
| Polychloroprene | CR | Neoprene*, Baypren*, Butaclor* | | |
| Isobutylene Isoprene | IIR | Butyl® | | |
| Silicone | VMQ, PMQ, PVMQ | Silastic*, SILPLUS*, Elastosil, Wacker* | | |
| Fluorosilicone | FVMQ | FSE*, Silastic*, Sylon* | | |
| Polyacrylate | ACM | Cyanacryl®, HyTemp®, Thiacril® | | |
| Ethylene Acrylic | AEM | Vamac* | | |
| Chlorosulfonated Polyethylene | CSM | Hypalon* | | |
| Epichlorohydrin | ECO/CO | Gechron®, Hydrin® | | |
| Polyisoprene | | | | |
| Natural | NR | SMR®, Pale Crepe®, Smoked Sheet® | | |
| Synthetic | IR | Ameripol SN®, Natsyn® | | |
| Polyurethane (Polyester or Polyether) | AU or EU | Adiprene®, Millathane®, Vibrathane®, Vulkolan®, PUR | | |
| Perfluoroelastomer | FFPM | Kalrez®, Isolast®, Chemraz®, Simriz®, Parofluor® | | |



| Elastomer Type | ASTM Designation | Recommended Shelf Life |
|-------------------------------|---------------------|---------------------------|
| Nitrile | NBR | 3 to 5 years |
| Styrene Butadiene | SBR | 3 to 5 years |
| Polybutadiene | BR | 3 to 5 years |
| Polyisoprene | NR, IR | 3 to 5 years |
| Chlorosulfonated Polyethylene | e CSM | 5 to 10 years |
| Ethylene Propylene | EPDM | 5 to 10 years |
| Neoprene/Chloroprene | CR | 5 to 10 years |
| Polyurethane (Polyether) | EU | 5 to 10 years |
| Epichlorohydrin | ECO | 5 to 10 years |
| Fluorocarbon Elastomer | FKM | up to 20 years |
| Perfluoroelastomer | FFKM | up to 20 years |
| Silicone | VMQ | up to 20 years |
| Fluorosilicone | FVMQ | up to 20 years |
| Polyacrylate | ACM | up to 20 years |



Packings

Gaskets

Mechanical Packings are made from various compliant fibers and appropriate lubricants that are selected for their suitability in specific uses. These materials are usually braided on specialized machines designed to generate a square cross section. This 'square rope' is then cut into a number of rings that are 'fitted' to the equipment shaft and inserted into the 'stuffing box' (an annular space about the shaft in the equipment housing), which retains the packing. The installed packing is 'compressed' by tightening a gland against the packing, which is then forced to expand radially between the shaft and housing. This action creates a 'seal'.

Gasket is a deformable material clamped between essentially stationary faces to prevent the passage of matter through an opening or joint. Nahadin Arman produces a wide range of Gaskets including gaskets with high temperature materials and compressed non-asbestos materials for use in various industries.

