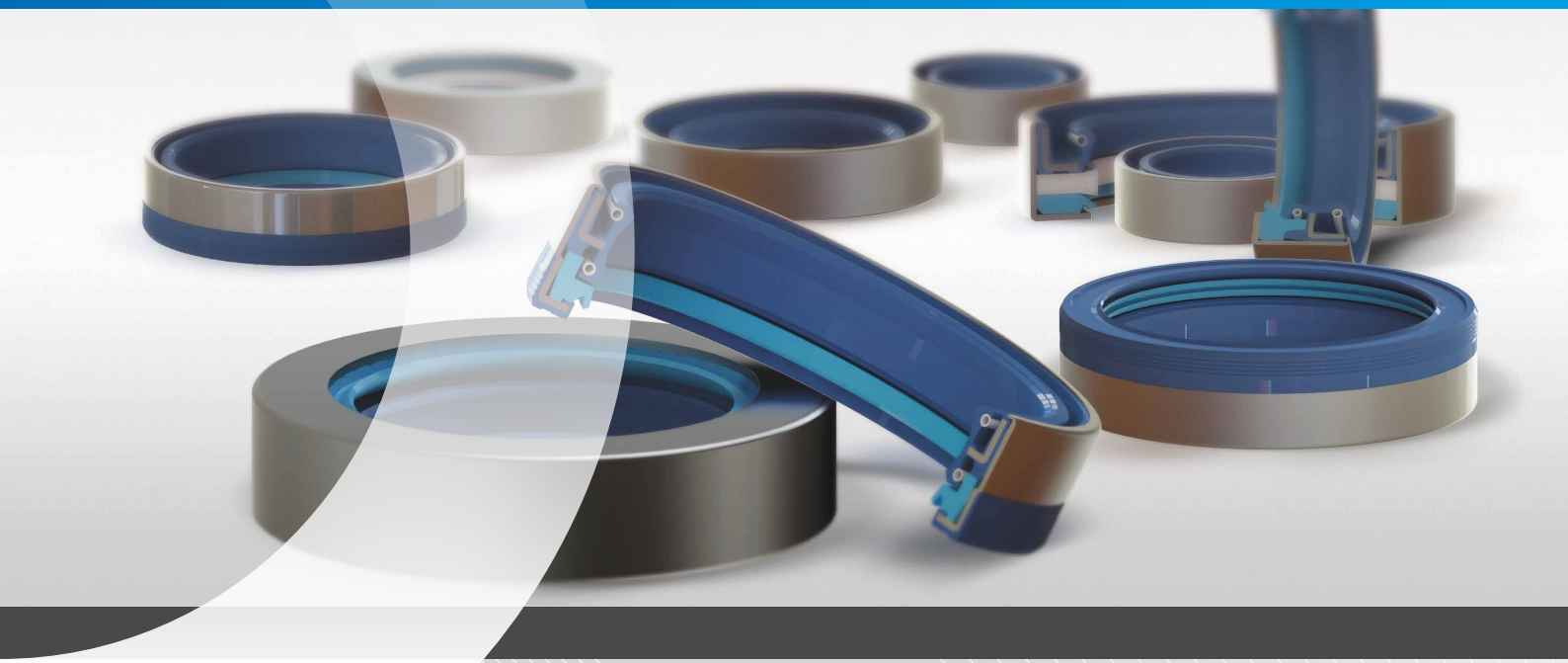
AUTOMOTIVE | AEROSPACE | FOOD & BEVERAGE | FLUID TECHNOLOGIES | MOBILE MACHINERY

FRANCEJOINT

SEALING SYSTEMS



COMBI SEALS

FRANCEJOINT
SEALING SYSTEMS

FRANCEJOINT

SEALING SYSTEMS

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FRANCEJOINT SEALING SYSTEMS

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FRANCEJOINT
SEALING SYSTEMS

Since 1981, FRANCE JOINT – SEALING SYSTEMS has been designing, manufacturing and distributing seals and precision rubber parts for its customers for whom quality is a determining factor.

Faced with tough competition among the big decision-makers of the industrial world, FRANCE JOINT has responded with innovation, research and development, experience in Best-Cost manufacturing, and a consistently high level of quality, thanks to certificates ISO 9001, IATF 16949, EN/AS 9100 and ISO 14001.

Today, FRANCE JOINT is working in close collaboration with its customers, meeting challenges head on with success. Automotive, Aeronautics, Mobile hydraulics, Beverages & Foods, Fluid engineering industries... every solution emerges from a uniquely individual partnership, constantly fostered and renewed.

Our prime objective, based on unrivalled quality, is to find the most suitable solutions for ensuring that you will stand out in what has become an extremely competitive domain. Our position of excellence has led us since the birth of our company to acquire the tools necessary to anticipate and prevent risks and maximize our service; the ultimate objective being of course to help you keep ahead of developments in this more and more technological market.

- AUTOMOTIVE
- AERONAUTICS
- BEVERAGES & FOODS
- FLUID ENGINEERING
- MOBILE HYDRAULICS


Compression molding


Injection molding


Machining / Tooling

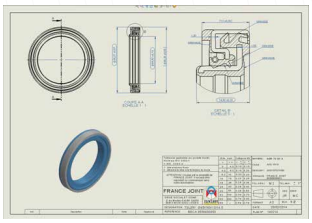

Logistics / Packaging

RESEARCH & **DEVELOPMENT**

Innovation, reliability, safety, minimization of risk: your expectations are our daily concern. To get from the idea to the finished product demands firm managerial control over a wide range of projects in addition to expertise in manufacturing.

FRANCE JOINT's contributors, who are as much inventors as technicians, get the best of fully automated, state-of-the-art technology that takes them from drawing-board to prototype and finally to assembly line. From writing specifications to putting on a major technical event through designing (3D Solidwrks software) and testing for validation and compliance, FRANCE JOINT engineering works hand in hand with you to find the best solutions guaranteeing the level of expected performance.

More than 1000 compounds integrating elastomers, PTFE materials, Polyurethane, or even thermoplastics, as many solutions vis-a-vis the new most complex requirements which will put you in pole position today so that we can all be winners tomorrow. FRANCE JOINT puts in place qualifications in order to examine the behavior of its seals according to various parameters intervening on frictions, pressures, temperatures, speeds, strokes, leakages…



QUALITY **IN OUR CONCERNS**

Several certificates obtained, ISO 9001, IATF 16949, EN/AS 9100 and ISO 14001, testify to the quality department's commitment to constant progress at every level of the company, at all stages of the realization, particularly where continual improvement is what has made FRANCE JOINT the name it is today.

Ambitious with customer satisfaction a priority, FRANCE JOINT has thus obtained the most powerful methods (PPAP, AMDEC, value analysis, Audits, MRP, 8D analysis, SPC, R&R ...) in order to optimize simultaneously the capacity of machines and processes, operational manpower performances, organizational methods, and finally, product and financial results.

FRANCE JOINT guarantees the best technology and pursues its daily objectives of a "Zero defects" production, through physico chemical controls (rheometer, spectrometer, durometer…), through dimensional and final aspects (unit controlling equipment, 3D camera ...). This is because the search for competitiveness is as important as the search for continuous improvement.

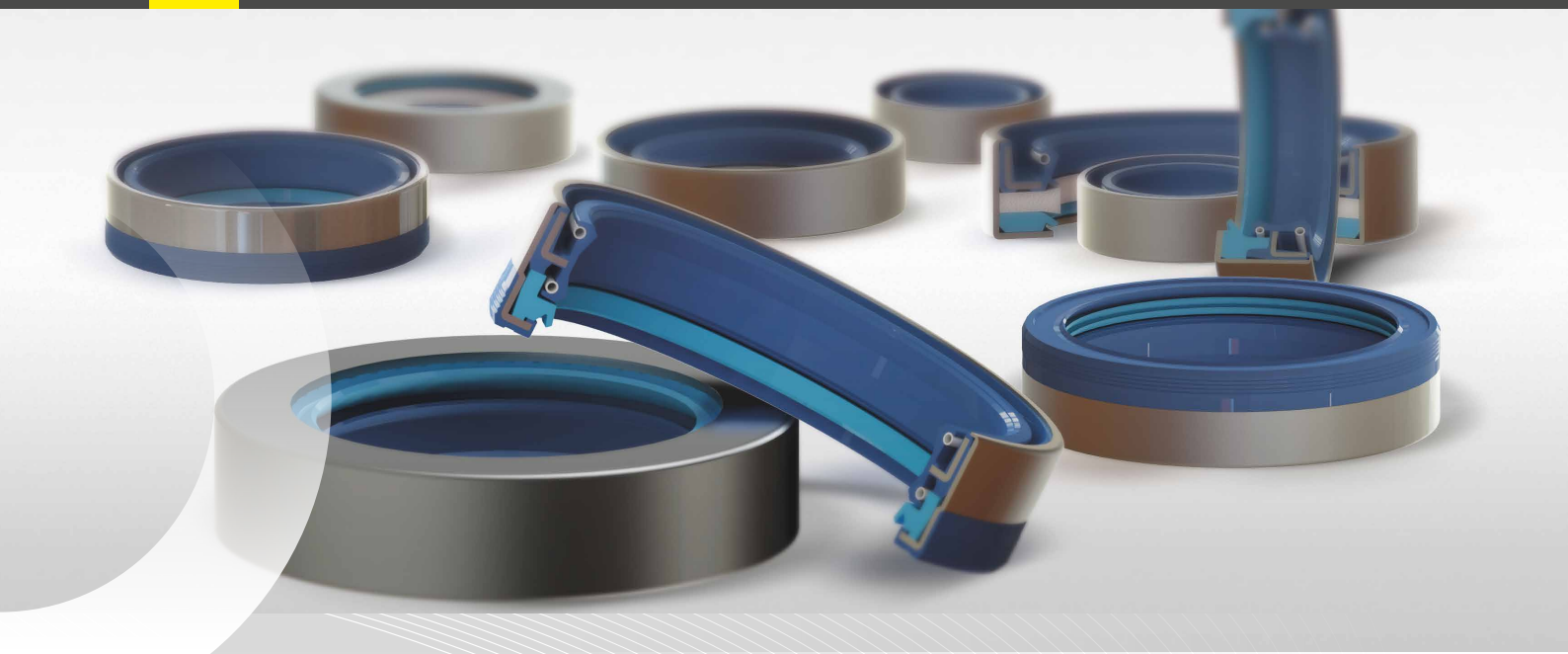
3D test device

CERTIFIÉ ISO 9001 CERTIFIED

CERTIFIÉ ISO 14001 CERTIFIED

CERTIFIÉ IATF 16949 CERTIFIED

CERTIFIÉ EN 9100 CERTIFIED



COMBI SEALS

1. Introduction

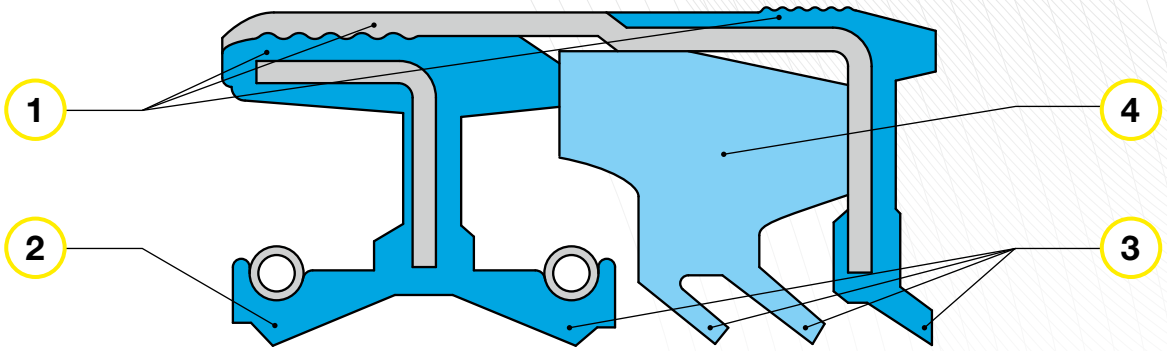
Combi seals are inseparable entities linked by metal frames, composed of standard or custom-made shaft seals and polyurethane anti-pollution deflectors. They are particularly valued for their great ability to form an anti-pollution barrier.

1.1 CHARACTERISTICS

- Development of specific materials (ACM, FKM, HNBR, NBR, PU, Felt, PU foam, special coatings)
- Standard or custom-made shaft seals
- Optimised or double-lip primary sealing lip
- Integrated pumping leads
- Multiple anti-pollution deflectors

1.2 ADVANTAGES

- Materials of superior quality for excellent resistance to temperatures, contact fluids and corrosion
- Optimised dynamic sealing whatever the pollution level
- Improved static sealing through special coatings
- Better pumping effect between the primary sealing lip and the shaft during friction
- Solid and precise positioning in its housing
- Excellent heat dissipation



1 Metal/rubber outside diameter

The combi seal's ouside diameter design provides better static sealing against low- or high-viscosity fluids, limited bounce-back effect, accurate positioning and a solid foundation for the seal in its housing, as well as better heat dispersion.

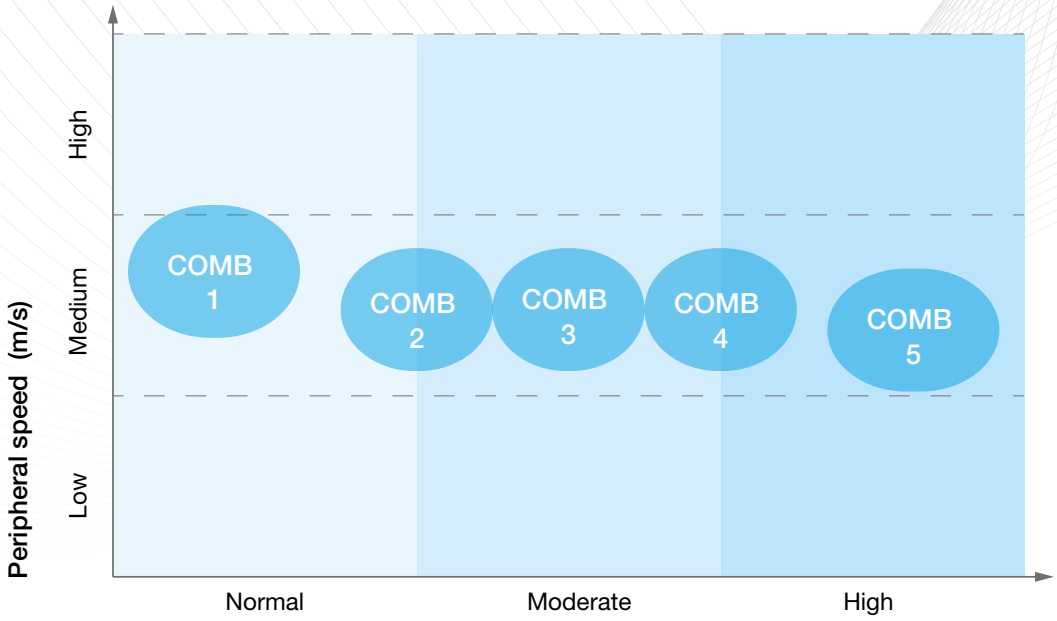
2 Primary sealing lip

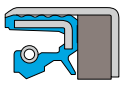
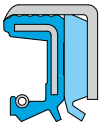
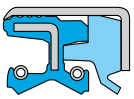
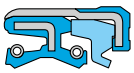
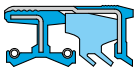
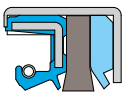
The primary sealing lip is pre-stressed by a spring, which guarantees optimal sealing against media when in rotation, whilst compensating for potential shaft run-out and eccentricity faults. The sealing lip's optimised geometries ensure reduced friction and longer product lifespan.

3 Anti-pollution barriers

There are several barriers, which are designed to prevent the potential entry of external pollutants. Different sizes and types of materials are used to prevent the entry of impurities, depending on the environment contamination level.

The chart below sets out the most suitable standard combi seal profiles, depending on the environment contamination level and rotation speed.



TYPE		COMB1	COMB2	COMB3	COMB4	COMB5	COMB6
							
Fluids	Mineral oils < +100°C	●	●	●	●	●	●
	Mineral oils > +100°C	●	●	●	●	●	●
	Synthetic oils < +80°C	●	●	●	●	●	●
	Synthetic oils > +80°C	●	●	●	●	●	●
	Greases	●	●	●	●	●	●
	Aggressive fluids	●	●	●	●	●	●
Conditions for use	Pressure	0.05 MPa	0.05 MPa	0.05 MPa	0.05 MPa	0.05 MPa	0.05 MPa
	Speed	5 m/s*	4 m/s*	4 m/s*	4 m/s*	4 m/s*	4 m/s*
	Axial offset	Low	Low	Medium	Medium - High	High	Low
	Level of pollution	Normal	Normal - Moderate	Moderate	Moderate	High	Moderate

● Recommended use
● Use only with specific materials

* use only with NBR-based materials, as speeds may be too great for other materials (ACM – FKM – HNBR)

2. Materials

2.1 METAL CAGE - SPRING

The table below shows the materials that we can offer for metal cages and springs.

Application	Material	Standard	Characteristics
Metal cage	Non-alloy standard steel	AISI 1010 (DIN 1624)	Cold rolled steel
Metal cage	Nickel chrome steel	AISI 304 (DIN 1.4301 - V2A)	Standard stainless steel
Metal cage and spring	Chrome-nickel-molybdenum steel	AISI 316 (DIN 1.4401 - V4A)	Stainless steel highly resistant to corrosion
Spring	Steel for springs	AISI 1070 - 1090 DIN 17223	Cold drawn carbon steel wire
Spring	Nickel chrome steel	AISI 302 (DIN 1.4300)	Stainless steel for springs with a high carbon content

2.2 RUBBERS

ACM (Polyacrylate)

Polymers containing ethyl acrylate (or butyl acrylate) have a small amount of monomer, which is necessary for cross-linking; ACM is a material with better heat resistance than NBR. It is often used for automatic gearboxes.

Chemical resistance
Mineral oils (motor oils, gear box oils, ATF oils)
Atmospheric and ozone agents

Compatibility issue
Glycol-based brake fluids (Dot 3 & 4)
Aromatic and chlorinated hydrocarbons
Water and steam
Acids, alkalis and amines

Temperature range
-25°C to + 150°C (short-term peak at +160°C)
-35°C / +150°C with special ACMs

FKM (fluorinated rubber)

Depending on their structure and fluorine content, fluoroelastomers can vary in terms of chemical resistance and resistance to cold. This FKM-based rubber is very often used for high-temperature hydraulics and pneumatics, for industrial valves, injection/fuel systems, motor seals and high-vacuum systems.

Resistance to chemicals
Mineral oils and greases, ASTM n°1, IRM 902 and IRM 903 oils.
Fire-resistant liquids (HFD)
Silicone oils and greases
Mineral and vegetable oils and greases
Aliphatic hydrocarbons (propane, butane, petroleum)
Aromatic hydrocarbons (benzene, toluene)
Chlorinated hydrocarbons (trichlorethylene)
Petrol (including high alcohol content)
Atmospheric and ozone agents

Compatibility issue
Glycol-based brake fluids
Ammoniac gas
Organic acids with a low molecular weight (formic and acetic acids)

Temperature range
-20°C / +200°C (short-term peak at +230°C)
-40°C / +200°C with special FKMs

HNBR (Hydrogenated Nitrile Butadiene Rubber)

This HNBR-based elastomer is obtained through selective hydrogenation of the NBR's butadiene groups. It is commonly used for power-assisted steering and for air conditioning.

Chemical resistance	Aliphatic hydrocarbons Mineral and vegetable oils and greases Fire-resistant fluids (HFA, HFB and HFC) Diluted acids, saline solutions and bases for low temperatures Water and steam up to +150°C Atmospheric and ozone agents
Compatibility issue	Chlorinated hydrocarbons Polar solvents (ketones, esters and ethers) Strong acids
Temperature range	-30°C / +150°C (short-term peak at +160°C) -40°C / +150°C with special HNBRs

NBR (Nitrile Butadiene Rubber)

Nitrile rubber (NBR) is the general term for acrylonitrile-butadiene copolymer. The ACN content can vary between 18% and 50%. While the acrylonitrile content is important, the resistance to oil and fuel is more so. Conversely, the elasticity and compression set are not as good. The NBR has good mechanical properties and good wear resistance. However, its resistance to atmospheric agents and the ozone is relatively low.

Resistance to chemicals	Aliphatic hydrocarbons (propane, butane, petroleum, diesel fuel) Mineral oils and greases Fire-resistant fluids (HFA, HFB and HFC) Diluted acids, alkaline and saline solutions for low temperatures Water (up to +100°C max)
Compatibility issue	Fuels with a high aromatic content Aromatic hydrocarbons (benzene) Chlorinated hydrocarbons (trichlorethylene) Polar solvents (ketone, acetone, acetic acid, ethylene-ester) Strong acids Glycol-based brake fluids Atmospheric and ozone agents
Temperature range	-30°C / +100°C (short-term peak at +120°C) -40°C / +100°C with special NBRs

PU (Polyurethane)

Polyurethane is a material that has the elastic properties of rubber. The proportion in its composition (diisocyanate, polyol, chain extender) is determined by its properties. This material is characterised by a strong mechanical resistance, good wear resistance, high elastic modulus, good flexibility and a very good ozone and oxidation resistance.

Resistance to chemicals	Pure aliphatic hydrocarbons (propane, butane) Mineral oils and greases Silicone oils and greases Water (up to +50°C)
Compatibility issue	Ketones, esters, ethers, alcohols, glycols Hot water, steam, alkalis, amines, acids
Temperature range	-30°C / +90°C -30°C / +110°C with our special PU (+150°C over a short time)

The table below gives an overview of the physical, chemical and mechanical characteristics for each of the materials.

Characteristics/Materials	ACM	FKM	HNBR	NBR
Abrasion-resistant	●	●	●	●
Acid resistant	●	●	●	●
Resistance to chemicals	●	●	●	●
Resistance to cold	●	●	●	●
Dynamic properties	●	●	●	●
Electrical properties	●	●	●	●
Resistance to fire	●	●	●	●
Resistance to heat	●	●	●	●
Sealing water	●	●	●	●
Oil-resistant	●	●	●	●
Ozone-resistant	●	●	●	●
Resistance to tearing	●	●	●	●
Tensile strength	●	●	●	●
Resistance to water/steam	●	●	●	●
Resistance to atmospheric agents	●	●	●	●

● Excellent properties / ● Good properties / ● Average properties / ● Poor properties

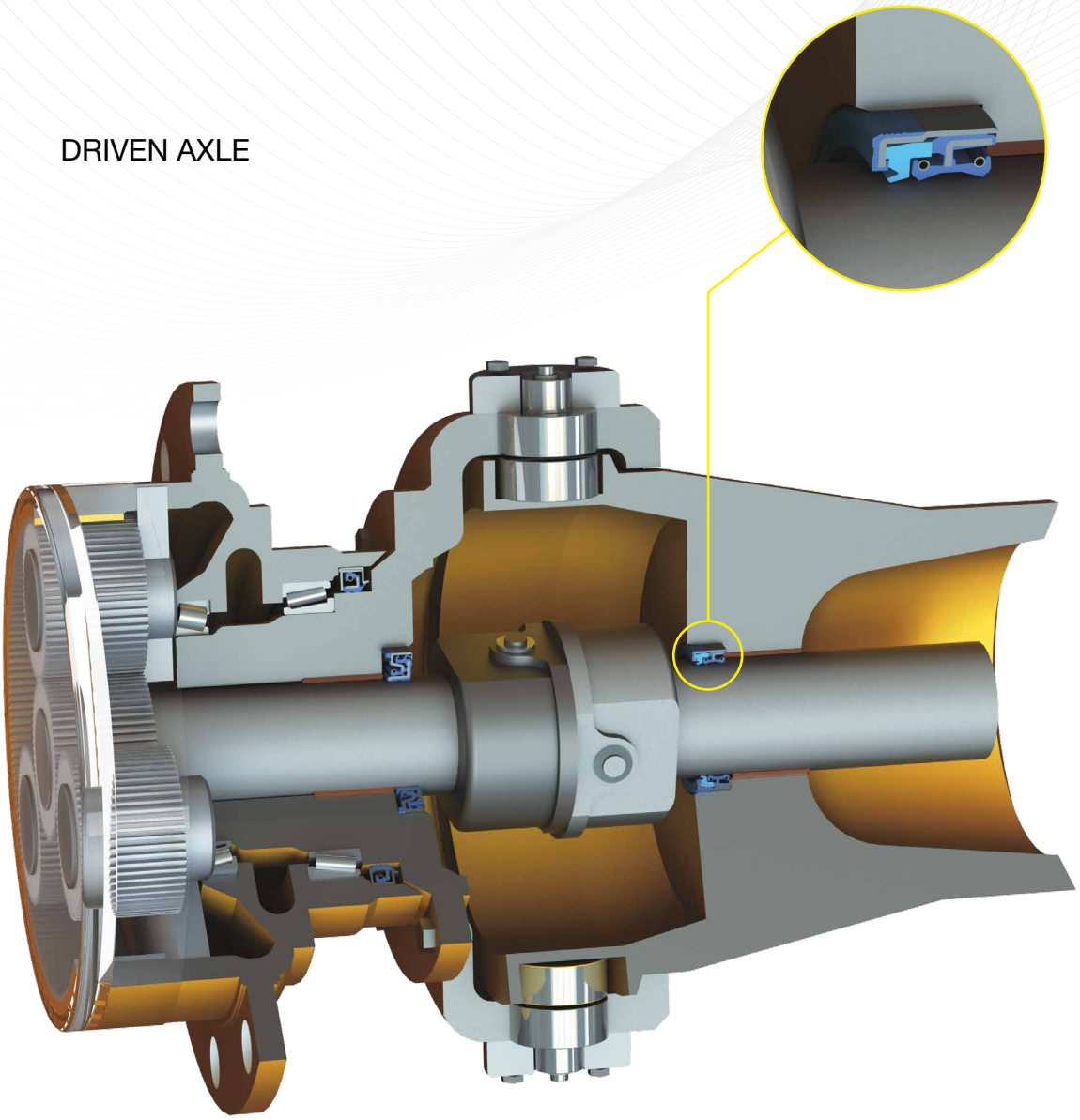
2.3 CHEMICAL COMPATIBILITY

A "Chemical compatibility guide" catalogue can be downloaded from the Literature section. You can also use our online "Chemical compatibility" tool free of charge.

These two tools enable you to measure the behaviour of our materials that come into contact with the majority of existing fluids. The data displayed is the result of rigorous testing at the ambient temperature and takes previous publications into consideration. Test results are not fully representative because of the specific features of your application. The tests performed actually do not consider additives and impurities that may exist under actual conditions of use, nor the potential elevation of temperatures. Other parameters can also alter the behaviour of our materials, such as the hardness, compression set, abrasion, etc. We therefore recommend performing your own tests to verify the compatibility of our materials depending on your specific application. Our technical team can provide you with any additional information.

3. Examples of applications

DRIVEN AXLE

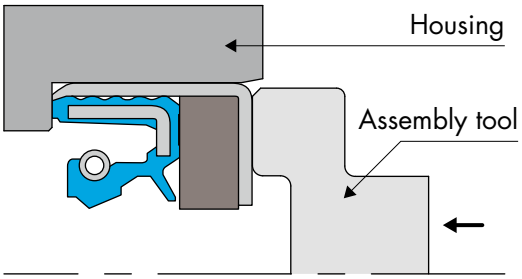


4. Assembly recommendations

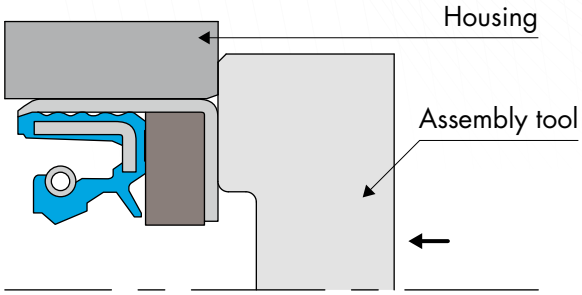
Several essential rules must be followed before fitting the combi seals.

- Check that the mechanical parts (shaft and housing) have an inlet chamfer.
- Flash and chamfer or round off the sharp edges; cover the threaded parts.
- Remove the machining shavings and all impurities and other foreign bodies. Clean all mechanical parts carefully.
- Grease or oil the seal (rubber only) and shaft to facilitate assembly. Only use clean grease or oil to do this.
- Ensure beforehand that the lubricants are compatible with the seal's materials. Avoid greases containing solid additives (molybdenum disulphide or zinc sulphide).
- If using installation tools, check that they are clean and do not have sharp edges.
- Do not remove the spring.

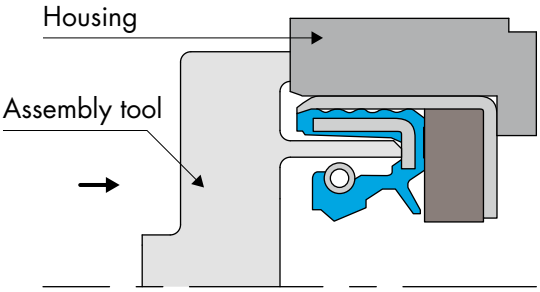
Fit with the combi seal against stop



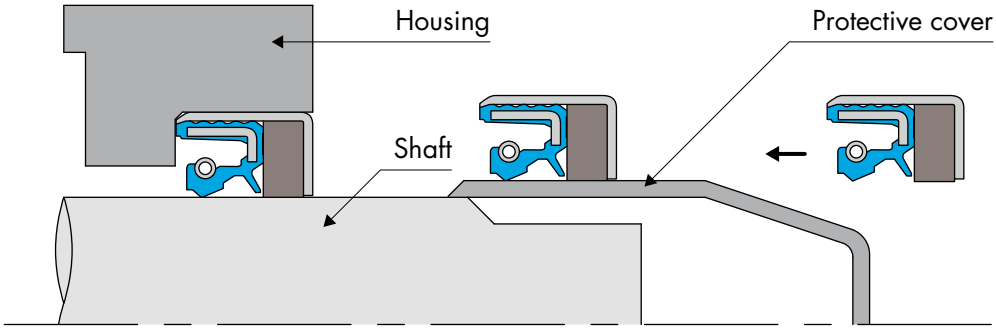
Fit with the mandrel against stop



Inverted fit with the combi seal against stop



Fit with assembly cone



5. Storage recommendations and lifespan

Seals, which are regularly used as spare parts, can be stored over a long-term period. During storage, rubbers are subject to physical alterations, meaning that they can sometimes become unusable due to deformation, hardening, softening or cracking when they are exposed to oxygen and ozone, light, heat, moisture, oils and solvents.

ISO Standard 2230: 2002 "Rubber Products - Guidelines for Storage" sets out the storage recommendations and length of storage for rubbers depending on material classification, in order to ensure optimal preservation of the physical and chemical features of parts.

Temperature

The temperature in the storage area must preferably be between +5°C and +25°C. If the temperature exceeds +25°C, the rubber seals may undergo physical changes, no longer retaining their original technical features, and may break down prematurely. All heat sources (radiators, lamps, sunlight, etc.) must be controlled so that the temperature does not exceed +25°C.
On the other hand, if the temperature in the storage area is below +5°C, the seals may become more rigid, which will not necessarily alter their chemical and physical features. Returning them to +20°C is advised before putting them into operation.

Humidity

Generally speaking, the relative humidity of the storage area should not exceed 70% for rubber seals (65% for polyurethane seals). Avoid humid areas, as well as areas that are prone to condensation.

Light

Rubber seals must not come into contact with sunlight or artificial light with a high UV ray content. Using normal incandescent lighting is recommended, as is covering windows in the storage area with a protective red or orange paint. Using special anti-UV bags will ensure that seals are better protected.

Radiation

Precautions must be taken to protect stored parts from all sources of ionising radiation.

Ozone

As ozone is very damaging to rubber seals, the storage area must not contain ozone-producing equipment, such as mercury-vapour lamps, high-voltage electrical equipment, electric motors or other products likely to produce soundless electrical charges or sparks. No combustible gases or organic vapours must be present, as their photochemical processes may lead to ozone production.

Distortion

Seals must preferably be stored where they are not subjected to constraints, pressures or any other force that could cause them to become misshapen. Seals should be kept in their original packaging as far as possible.

Contact with liquids and semi-liquids

Seals must not be stored in contact with liquids (acids, disinfectants, oils, greases, etc.) or other semi-liquid materials, unless packaged in this way by the manufacturer.

Contact with metals

Certain metals, such as manganese, iron, copper, brass and other compounds are damaging to rubbers. Seals must not be stored in contact with such metals unless the rubber parts are affixed to them, in which case a rolled packaging would be preferable.

Contact with other materials

Rubber seals must not be stored in contact with PVC due to the risk of potentially transferring plasticiser or other ingredients. Rubbers with different compositions must be separated from one another.

Cleaning

If necessary, clean seals with soap and water, or denatured alcohol. Cleaning with water should particularly be avoided for seals with textile fibre, and steel-rubber (corrosion problems) or polyurethane seals. Parts must be dried at ambient temperature and not near a heat source. Seals must not come into contact with wire brushes or sharp objects.

Storage and control

Storage duration largely depends on the type of material, rubbers being particularly sensitive to storage. The table below sets out the initial storage period.

Type of materials	Initial storage period	Extension period
NR - PU	5 years	2 years
ACM - AEM - CR - HNBR - NBR	7 years	3 years
EPDM - FFKM - FKM - FVMQ - VMQ	10 years	5 years
PTFE - PA6 - POM	Unlimited	-

Quality control is carried out at the end of this period. An extension may be possible, depending on the results.

6. The combi seals

COMB1 P. 16

Materials: NBR + Felt/Foam + Steel
Temperature: < 100°C
Pressure: 0.05 MPa
Speed: 10 m/s
Accepted axial offset: Low
Environment contamination level: Normal

COMB2 P. 20

Materials: NBR + PU + Steel
Temperature: < 100°C
Pressure: 0.05 MPa
Speed: 6 m/s
Accepted axial offset Low
Environment contamination level: Normal - Moderate

COMB3 P. 24

Materials: NBR + PU + Steel
Temperature: < 100°C
Pressure: 0.05 MPa
Speed: 6 m/s
Accepted axial offset: Medium
Environment contamination level: Moderate

COMB4 P. 28

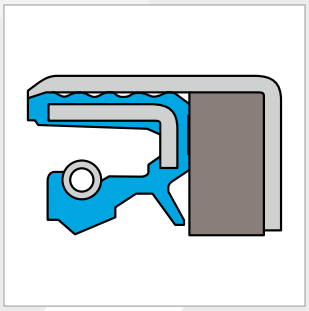
Materials: NBR + PU + Steel
Temperature: < 100°C
Pressure: 0.05 MPa
Speed: 6 m/s
Accepted axial offset: Medium - High
Environment contamination level: Moderate

COMB5 P. 32

Materials: NBR + PU + Steel
Temperature: < 100°C
Pressure: 0.05 MPa
Speed: 6 m/s
Accepted axial offset: High
Environment contamination level: High

COMB6 P. 36

Materials: NBR + Felt/Foam + PU + Steel
Temperature:
Pressure: 0.02 MPa
Speed: 6 m/s
Accepted axial offset: Low
Environment contamination level: Moderate



COMBI SEALS

COMB1

DESCRIPTION

The COMB1 profile is a combi seal composed of a metal cage, a TC-TCW shaft seal and a felt or polyurethane foam anti-pollution deflector.

ADVANTAGES

Long lifespan

Moderate/high rotation speeds

Small axial displacements

APPLICATIONS

Agriculture

Transmissions

Rotations during high levels of pollution

MATERIALS

Rubber

NBR 70 - 75 Shore A

Deflector

Felt

PU foam

Metal cage

Steel - AISI 1010

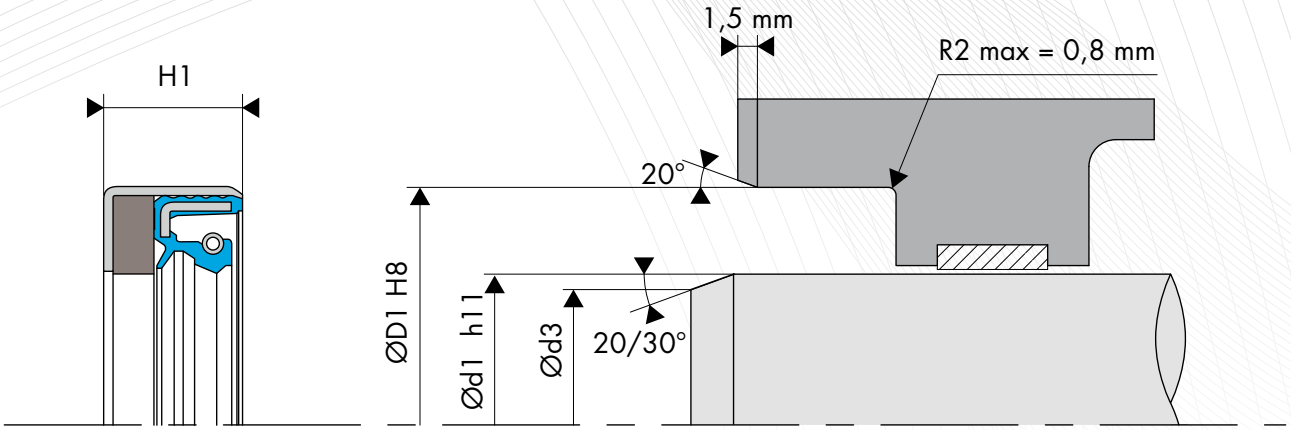
Spring

Steel - AISI 1070 - 1090

TECHNICAL DATA

Technical data	NBR 70 - 75 Shore A	FKM 70 - 75 Shore A	ACM 70 - 75 Shore A	HNBR 70 - 75 Shore A
Temperature	-30°C / +80°C	-20°C/+100°C	-25°C/+90°C	-30°C/+90°C
Speed	5 m/s	10 m/s	7 m/s	7 m/s
Pressure	0.02 - 0.05 MPa	0.02 - 0.05 MPa	0.02 - 0.05 MPa	0.02 - 0.05 MPa
Accepted axial offset	Low	Low	Low	Low
Level of pollution	Normal	Normal	Normal	Normal

The figures above indicate the maximum values and may not be cumulated. They may be developed, depending on the materials used.



SHAFT DESIGN

Shaft hardness

Rotation speed	Hardness in HRC
s ≤ 4.0 m/sec	45 HRC
4.0 < s ≤ 10.0 m/s	55 HRC
s > 10.0 m/sec	60 HRC

Surface roughness

Ra *	0.2 to 0.8 µm
Rz	1.0 to 4.0 µm
Rmax	≤6.3 µm

*Ra = 0.1 µm for demanding applications

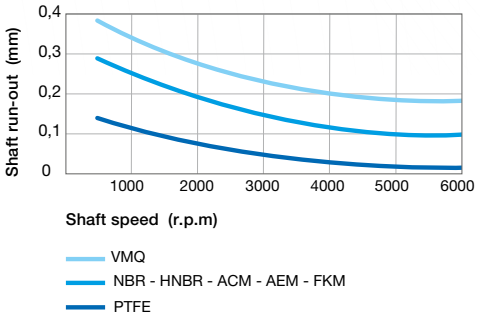
Shaft tolerance

Shaft diameter Ød1 (mm)	Tolerance h11 (mm)
Ød1 ≤ 3.0	-0.060 / 0
3.0 < Ød1 ≤ 6.0	-0.075 / 0
6.0 < Ød1 ≤ 10.0	-0.090 / 0
10.0 < Ød1 ≤ 18.0	-0.110 / 0
18.0 < Ød1 ≤ 30.0	-0.130 / 0
30.0 < Ød1 ≤ 50.0	-0.160 / 0
50.0 < Ød1 ≤ 80.0	-0.190 / 0
80.0 < Ød1 ≤ 120.0	-0.220 / 0
120.0 < Ød1 ≤ 180.0	-0.250 / 0
180.0 < Ød1 ≤ 250.0	-0.290 / 0
250.0 < Ød1 ≤ 315.0	-0.320 / 0
315.0 < Ød1 ≤ 400.0	-0.360 / 0
400.0 < Ød1 ≤ 500.0	-0.400 / 0

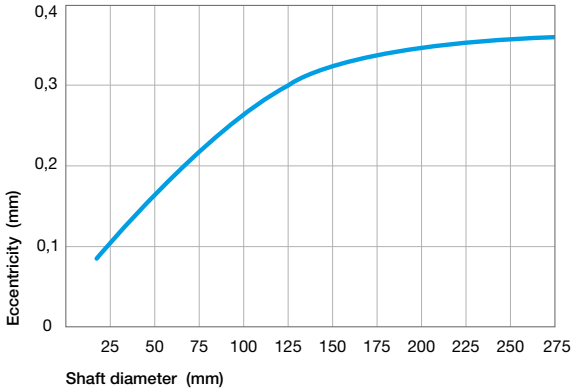
Chamfer

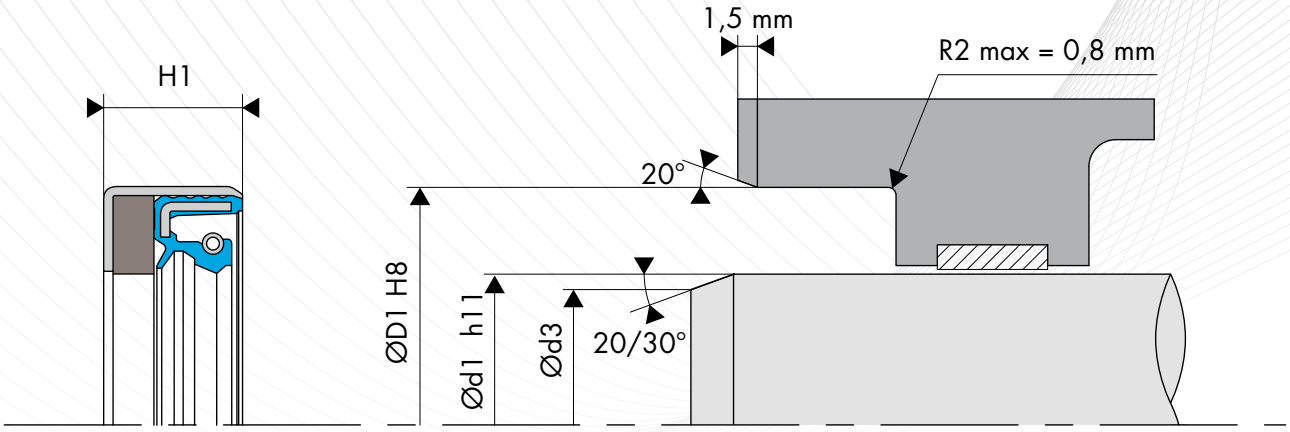
Shaft diameter Ød1 (mm)	Chamfer diameter Ød3 (mm)
Ød1 ≤ 10.0	Ød1 - 1.50
10.0 < Ød1 ≤ 20.0	Ød1 - 2.00
20.0 < Ød1 ≤ 30.0	Ød1 - 2.50
30.0 < Ød1 ≤ 40.0	Ød1 - 3.00
40.0 < Ød1 ≤ 50.0	Ød1 - 3.50
50.0 < Ød1 ≤ 70.0	Ød1 - 4.00
70.0 < Ød1 ≤ 95.0	Ød1 - 4.50
95.0 < Ød1 ≤ 130.0	Ød1 - 5.50
130.0 < Ød1 ≤ 240.0	Ød1 - 7.00
240.0 < Ød1 ≤ 500.0	Ød1 - 11.00

Shaft run out



Eccentricity





HOUSING DESIGN

Surface roughness

Ra	0,8 to 3,2 µm
Rz	6,3 to 16,0 µm
Rmax	≤ 16,0 µm

Chamfer

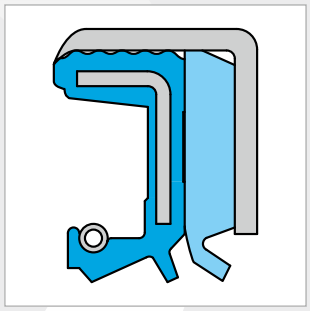
Housing	20° (+/-5°) x 1.5 mm

Housing tolerance

Bore diameter ØD1 (mm)	Tolerance H8 (mm)
3.0 < ØD1 ≤ 6.0	0 / +0.018
6.0 < ØD1 ≤ 10.0	0 / +0.022
10.0 < ØD1 ≤ 18.0	0 / +0.027
18.0 < ØD1 ≤ 30.0	0 / +0.033
30.0 < ØD1 ≤ 50.0	0 / +0.039
50.0 < ØD1 ≤ 80.0	0 / +0.046
80.0 < ØD1 ≤ 120.0	0 / +0.054
120.0 < ØD1 ≤ 180.0	0 / +0.063
180.0 < ØD1 ≤ 250.0	0 / +0.072
250.0 < ØD1 ≤ 315.0	0 / +0.081
315.0 < ØD1 ≤ 400.0	0 / +0.089
400.0 < ØD1 ≤ 500.0	0 / +0.097
500.0 < ØD1 ≤ 630.0	0 / +0.110

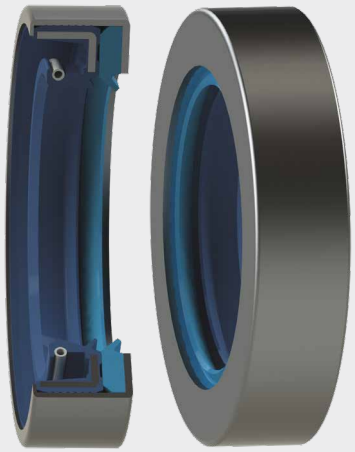
DIMENSIONS

Part number	Shaft diameter Ød1 h11	Bore diameter ØD1 H8	Seal height H1
COMB1 30 x 44 x 11	30.00	44.00	11.00
COMB1 35 x 50 x 10	35.00	50.00	10.00
COMB1 35 x 52 x 10	35.00	52.00	10.00
COMB1 35 x 52 x 16	35.00	52.00	16.00
COMB1 35 x 62 x 12	35.00	62.00	12.00
COMB1 35 x 72 x 12	35.00	72.00	12.00
COMB1 40 x 55 x 10	40.00	55.00	10.00
COMB1 40 x 58 x 10	40.00	58.00	10.00
COMB1 40 x 62 x 10	40.00	62.00	10.00
COMB1 42 x 62 x 14	42.00	62.00	14.00
COMB1 45 x 62 x 11	45.00	62.00	11.00
COMB1 45 x 65 x 12	45.00	65.00	12.00
COMB1 48 x 65 x 11	48.00	65.00	11.00
COMB1 48 x 74 x 13	48.00	74.00	13.00
COMB1 50 x 75 x 12	50.00	75.00	12.00
COMB1 55 x 72 x 12	55.00	72.00	12.00
COMB1 55 x 80 x 11	55.00	80.00	11.00
COMB1 60 x 80 x 12	60.00	80.00	12.00
COMB1 65 x 92 x 14	65.00	92.00	14.00
COMB1 65 x 98 x 15	65.00	98.00	15.00
COMB1 68 x 85 x 12	68.00	85.00	12.00
COMB1 75 x 102 x 14	75.00	102.00	14.00
COMB1 80 x 110 x 16	80.00	110.00	16.00
COMB1 85 x 110 x 16	85.00	110.00	16.00
COMB1 95 x 120 x 13	95.00	120.00	13.00
COMB1 100 x 130 x 16	100.00	130.00	16.00
COMB1 105 x 125 x 16	105.00	125.00	16.00
COMB1 105 x 130 x 12	105.00	130.00	12.00
COMB1 105 x 140 x 16	105.00	140.00	16.00
COMB1 110 x 130 x 12	110.00	130.00	12.00
COMB1 110 x 130 x 16	110.00	130.00	16.00
COMB1 110 x 150 x 16	110.00	150.00	16.00
COMB1 112 x 140 x 13.2	112.00	140.00	13.20
COMB1 120 x 150 x 15	120.00	150.00	15.00
COMB1 130 x 170 x 16	130.00	170.00	16.00
COMB1 145 x 170 x 16	145.00	170.00	16.00
COMB1 150 x 170 x 16	150.00	170.00	16.00
COMB1 155 x 176 x 16	155.00	176.00	16.00
COMB1 165 x 190 x 17	165.00	190.00	17.00
COMB1 170 x 190 x 15	170.00	190.00	15.00
COMB1 170 x 205 x 17	170.00	205.00	17.00
COMB1 180 x 205 x 17	180.00	205.00	17.00
COMB1 190 x 215 x 17	190.00	215.00	17.00
COMB1 190 x 220 x 20	190.00	220.00	20.00



COMBI SEALS

COMB2



DESCRIPTION

The COMB2 profile is a combi seal composed of a metal cage, a TC-TCW shaft seal and a compact polyurethane anti-pollution deflector.

ADVANTAGES

Long lifespan

Moderate/high rotation speeds

Small axial displacements

Moderate/high protection against external dirt

APPLICATIONS

Agriculture

Transmissions

Rotations during high levels of pollution

MATERIALS

Rubber

NBR 70 - 75 Shore A

FKM 70 - 75 Shore A

Deflector

PU 92 Shore A

PU 94 Shore A

Metal cage

Steel - AISI 1010

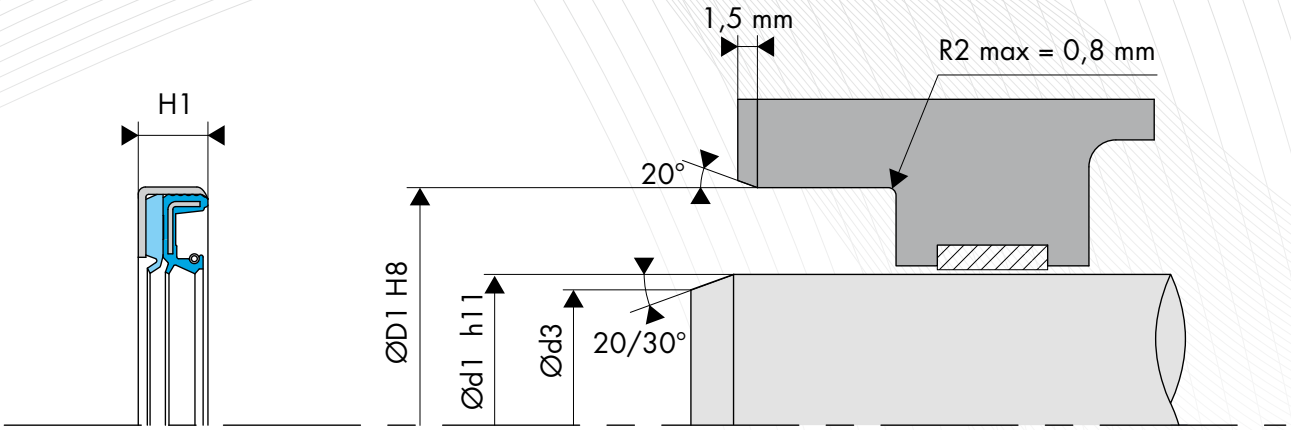
Spring

Steel - AISI 1070 - 1090

TECHNICAL DATA

Technical data	NBR 70 - 75 Shore A	FKM 70 - 75 Shore A	ACM 70 - 75 Shore A	HNBR 70 - 75 Shore A
Temperature	-30°C / +80°C	-20°C/+100°C	-25°C/+90°C	-30°C/+90°C
Speed	4 m/s	6 m/s	5 m/s	5 m/s
Pressure	0.02 - 0.05 MPa	0.02 - 0.05 MPa	0.02 - 0.05 MPa	0.02 - 0.05 MPa
Accepted axial offset	Low	Low	Low	Low
Level of pollution	Normal - Moderate	Normal - Moderate	Normal - Moderate	Normal - Moderate

The figures above indicate the maximum values and may not be cumulated. They may be developed, depending on the materials used.



SHAFT DESIGN

Shaft hardness

Rotation speed	Hardness in HRC
s ≤ 4.0 m/sec	45 HRC
4.0 < s ≤ 10.0 m/s	55 HRC
s > 10.0 m/sec	60 HRC

Surface roughness

Ra *	0.2 to 0.8 µm
Rz	1.0 to 4.0 µm
Rmax	≤6.3 µm

*Ra = 0.1 µm for demanding applications

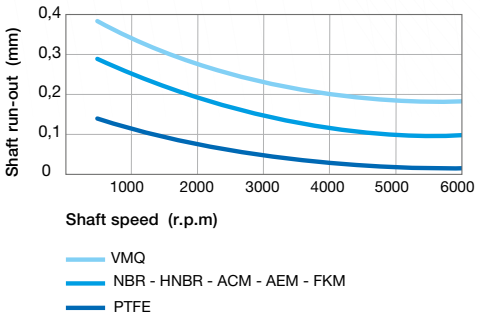
Shaft tolerance

Shaft diameter Ød1 (mm)	Tolerance h11 (mm)
Ød1 ≤ 3.0	-0.060 / 0
3.0 < Ød1 ≤ 6.0	-0.075 / 0
6.0 < Ød1 ≤ 10.0	-0.090 / 0
10.0 < Ød1 ≤ 18.0	-0.110 / 0
18.0 < Ød1 ≤ 30.0	-0.130 / 0
30.0 < Ød1 ≤ 50.0	-0.160 / 0
50.0 < Ød1 ≤ 80.0	-0.190 / 0
80.0 < Ød1 ≤ 120.0	-0.220 / 0
120.0 < Ød1 ≤ 180.0	-0.250 / 0
180.0 < Ød1 ≤ 250.0	-0.290 / 0
250.0 < Ød1 ≤ 315.0	-0.320 / 0
315.0 < Ød1 ≤ 400.0	-0.360 / 0
400.0 < Ød1 ≤ 500.0	-0.400 / 0

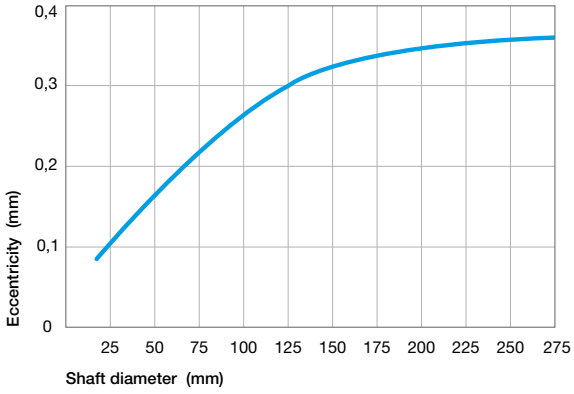
Chamfer

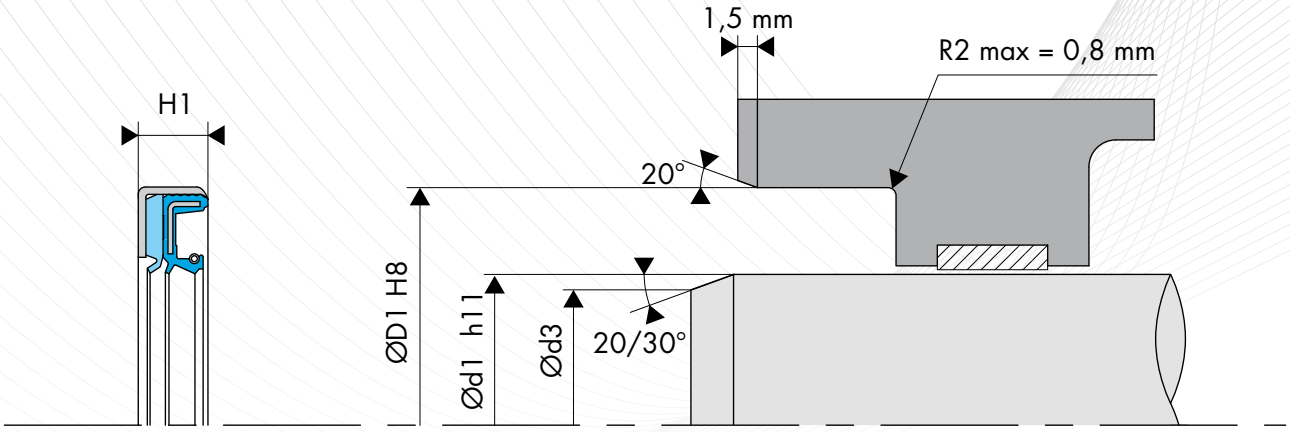
Shaft diameter Ød1 (mm)	Chamfer diameter Ød3 (mm)
Ød1 ≤ 10.0	Ød1 - 1.50
10.0 < Ød1 ≤ 20.0	Ød1 - 2.00
20.0 < Ød1 ≤ 30.0	Ød1 - 2.50
30.0 < Ød1 ≤ 40.0	Ød1 - 3.00
40.0 < Ød1 ≤ 50.0	Ød1 - 3.50
50.0 < Ød1 ≤ 70.0	Ød1 - 4.00
70.0 < Ød1 ≤ 95.0	Ød1 - 4.50
95.0 < Ød1 ≤ 130.0	Ød1 - 5.50
130.0 < Ød1 ≤ 240.0	Ød1 - 7.00
240.0 < Ød1 ≤ 500.0	Ød1 - 11.00

Shaft run out



Eccentricity





HOUSING DESIGN

Surface roughness

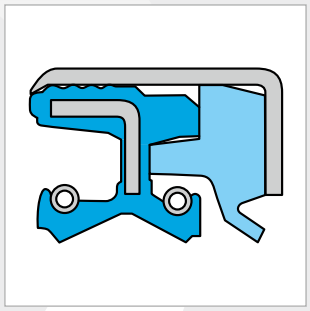
Ra	0,8 to 3,2 µm
Rz	6,3 to 16,0 µm
Rmax	≤ 16,0 µm

Chamfer

Housing	20° (+/-5°) x 1.5 mm

Housing tolerance

Bore diameter ØD1 (mm)	Tolerance H8 (mm)
3.0 < ØD1 ≤ 6.0	0 / +0.018
6.0 < ØD1 ≤ 10.0	0 / +0.022
10.0 < ØD1 ≤ 18.0	0 / +0.027
18.0 < ØD1 ≤ 30.0	0 / +0.033
30.0 < ØD1 ≤ 50.0	0 / +0.039
50.0 < ØD1 ≤ 80.0	0 / +0.046
80.0 < ØD1 ≤ 120.0	0 / +0.054
120.0 < ØD1 ≤ 180.0	0 / +0.063
180.0 < ØD1 ≤ 250.0	0 / +0.072
250.0 < ØD1 ≤ 315.0	0 / +0.081
315.0 < ØD1 ≤ 400.0	0 / +0.089
400.0 < ØD1 ≤ 500.0	0 / +0.097
500.0 < ØD1 ≤ 630.0	0 / +0.110



COMBI SEALS

COMB3

DESCRIPTION

The COMB3 profile is a combi seal composed of a metal cage, a DC-DCW double sealing lip and a compact polyurethane anti-pollution deflector.

ADVANTAGES

Long lifespan

Moderate rotation speeds

Moderate axial displacements

Moderate/high protection against external dirt

APPLICATIONS

Agriculture

Transmissions

Rotations during high levels of pollution

MATERIALS

Rubber

NBR 70 - 75 Shore A

FKM 70 - 75 Shore A

Deflector

PU 92 Shore A

PU 94 Shore A

Metal cage

Steel - AISI 1010

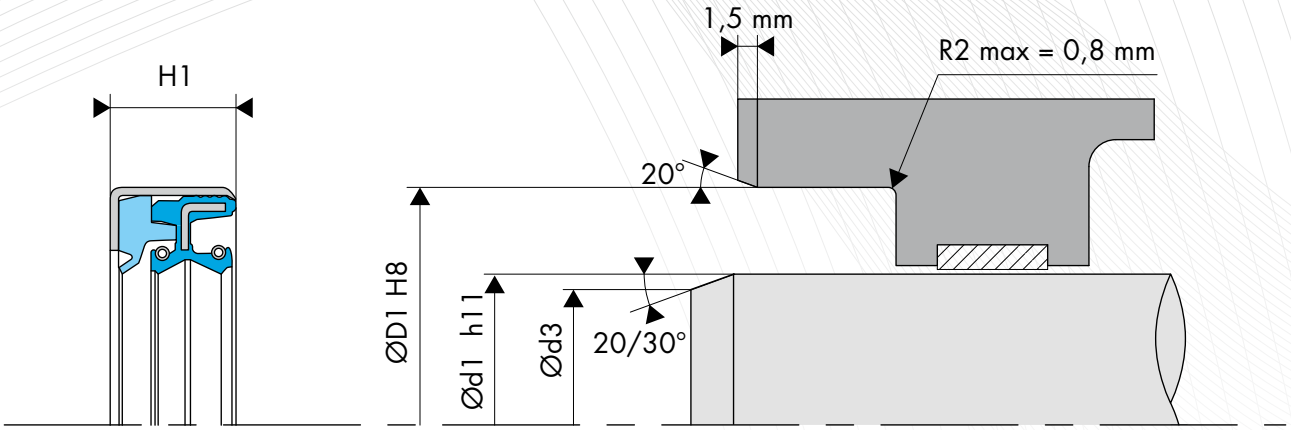
Spring

Steel - AISI 1070 - 1090

TECHNICAL DATA

Technical data	NBR 75 Shore A	FKM 75 Shore A	ACM 75 Shore A	HNBR 75 Shore A
Temperature	-30°C / +80°C	-20°C/+100°C	-25°C/+90°C	-30°C/+90°C
Speed	4 m/s	6 m/s	5 m/s	5 m/s
Pressure	0.02 - 0.05 MPa	0.02 - 0.05 MPa	0.02 - 0.05 MPa	0.02 - 0.05 MPa
Accepted axial offset	Medium	Medium	Medium	Medium
Level of pollution	Moderate	Moderate	Moderate	Moderate

The figures above indicate the maximum values and may not be cumulated. They may be developed, depending on the materials used.



SHAFT DESIGN

Shaft hardness

Rotation speed	Hardness in HRC
s ≤ 4.0 m/sec	45 HRC
4.0 < s ≤ 10.0 m/s	55 HRC
s > 10.0 m/sec	60 HRC

Surface roughness

Ra *	0.2 to 0.8 µm
Rz	1.0 to 4.0 µm
Rmax	≤6.3 µm

*Ra = 0.1 µm for demanding applications

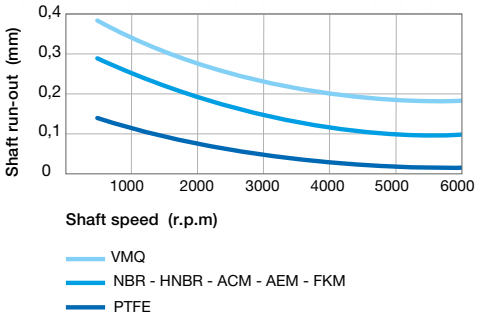
Shaft tolerance

Shaft diameter Ød1 (mm)	Tolerance h11 (mm)
Ød1 ≤ 3.0	-0.060 / 0
3.0 < Ød1 ≤ 6.0	-0.075 / 0
6.0 < Ød1 ≤ 10.0	-0.090 / 0
10.0 < Ød1 ≤ 18.0	-0.110 / 0
18.0 < Ød1 ≤ 30.0	-0.130 / 0
30.0 < Ød1 ≤ 50.0	-0.160 / 0
50.0 < Ød1 ≤ 80.0	-0.190 / 0
80.0 < Ød1 ≤ 120.0	-0.220 / 0
120.0 < Ød1 ≤ 180.0	-0.250 / 0
180.0 < Ød1 ≤ 250.0	-0.290 / 0
250.0 < Ød1 ≤ 315.0	-0.320 / 0
315.0 < Ød1 ≤ 400.0	-0.360 / 0
400.0 < Ød1 ≤ 500.0	-0.400 / 0

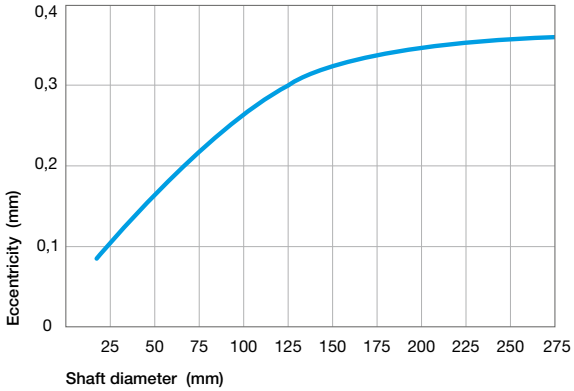
Chamfer

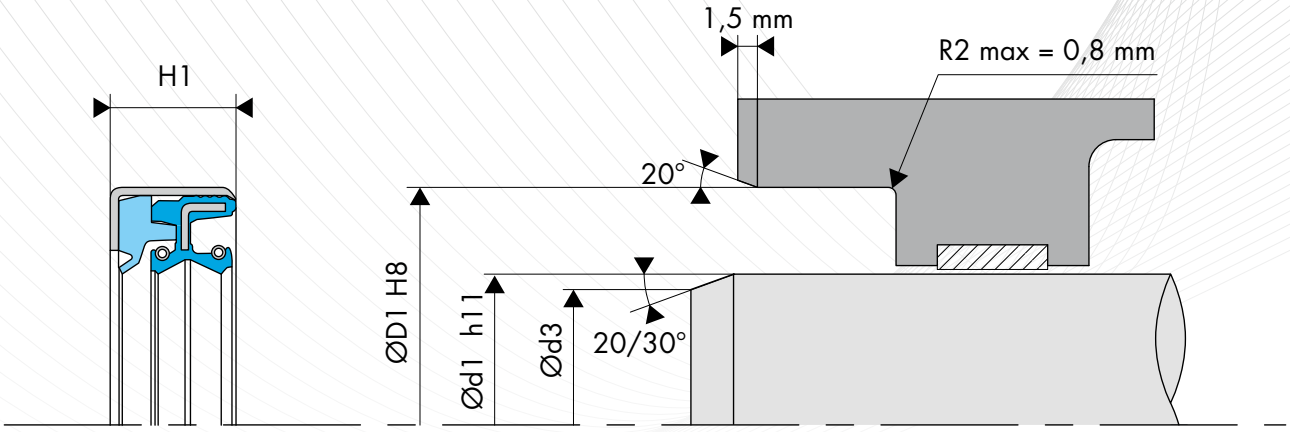
Shaft diameter Ød1 (mm)	Chamfer diameter Ød3 (mm)
Ød1 ≤ 10.0	Ød1 - 1.50
10.0 < Ød1 ≤ 20.0	Ød1 - 2.00
20.0 < Ød1 ≤ 30.0	Ød1 - 2.50
30.0 < Ød1 ≤ 40.0	Ød1 - 3.00
40.0 < Ød1 ≤ 50.0	Ød1 - 3.50
50.0 < Ød1 ≤ 70.0	Ød1 - 4.00
70.0 < Ød1 ≤ 95.0	Ød1 - 4.50
95.0 < Ød1 ≤ 130.0	Ød1 - 5.50
130.0 < Ød1 ≤ 240.0	Ød1 - 7.00
240.0 < Ød1 ≤ 500.0	Ød1 - 11.00

Shaft run out



Eccentricity





HOUSING DESIGN

Surface roughness

Ra	0,8 to 3,2 µm
Rz	6,3 to 16,0 µm
Rmax	≤ 16,0 µm

Chamfer

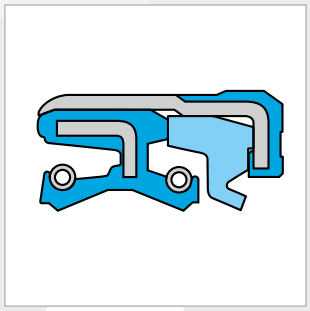
Housing	20° (+/-5°) x 1.5 mm

Housing tolerance

Bore diameter ØD1 (mm)	Tolerance H8 (mm)
3.0 < ØD1 ≤ 6.0	0 / +0.018
6.0 < ØD1 ≤ 10.0	0 / +0.022
10.0 < ØD1 ≤ 18.0	0 / +0.027
18.0 < ØD1 ≤ 30.0	0 / +0.033
30.0 < ØD1 ≤ 50.0	0 / +0.039
50.0 < ØD1 ≤ 80.0	0 / +0.046
80.0 < ØD1 ≤ 120.0	0 / +0.054
120.0 < ØD1 ≤ 180.0	0 / +0.063
180.0 < ØD1 ≤ 250.0	0 / +0.072
250.0 < ØD1 ≤ 315.0	0 / +0.081
315.0 < ØD1 ≤ 400.0	0 / +0.089
400.0 < ØD1 ≤ 500.0	0 / +0.097
500.0 < ØD1 ≤ 630.0	0 / +0.110

DIMENSIONS

Part number	Shaft diameter Ød1 h11	Bore diameter ØD1 H8	Seal height H1
COMB3 30 x 44 x 14	30.00	44.00	14.00
COMB3 35 x 60 x 18.5	35.00	60.00	18.50
COMB3 40 x 55 x 15.5	40.00	55.00	15.50
COMB3 40 x 60 x 18.5	40.00	60.00	18.50
COMB3 40 x 65 x 18.5	40.00	65.00	18.50
COMB3 42 x 62 x 21.5	42.00	62.00	21.50
COMB3 45 x 65 x 18.5	45.00	65.00	18.50
COMB3 47 x 65 x 16.5	47.00	65.00	16.50
COMB3 48 x 65 x 16.5	48.00	65.00	16.50
COMB3 48 x 74 x 18.5	48.00	74.00	18.50
COMB3 50 x 72 x 16.5	50.00	72.00	16.50
COMB3 55 x 82 x 16.5	55.00	82.00	16.50
COMB3 56 x 75 x 16.5	56.00	75.00	16.50
COMB3 56 x 80 x 16	56.00	80.00	16.00
COMB3 58 x 80 x 16.5	58.00	80.00	16.50
COMB3 58 x 82 x 16	58.00	82.00	16.00
COMB3 65 x 92 x 18	65.00	92.00	18.00
COMB3 70 x 90 x 16.5	70.00	90.00	16.50
COMB3 70 x 95 x 15	70.00	95.00	15.00
COMB3 80 x 100 x 18	80.00	100.00	18.00
COMB3 130 x 154 x 18	130.00	154.00	18.00



COMBI SEALS

COMB4

DESCRIPTION

The COMB4 profile is a combi seal composed of a metal cage with a rubber coating covering half of the outside of the cage, a DC-DCW double sealing lip and a compact polyurethane anti-pollution deflector.

ADVANTAGES

Long lifespan

Moderate rotation speeds

Elevated/moderate axial displacements

Moderate/high protection against external dirt

Improved static sealing

APPLICATIONS

Agriculture

Transmissions

Rotations during high levels of pollution

MATERIALS

Rubber

NBR 70 - 75 Shore A

FKM 70 - 75 Shore A

Deflector

PU 92 Shore A

PU 94 Shore A

Metal cage

Steel - AISI 1010

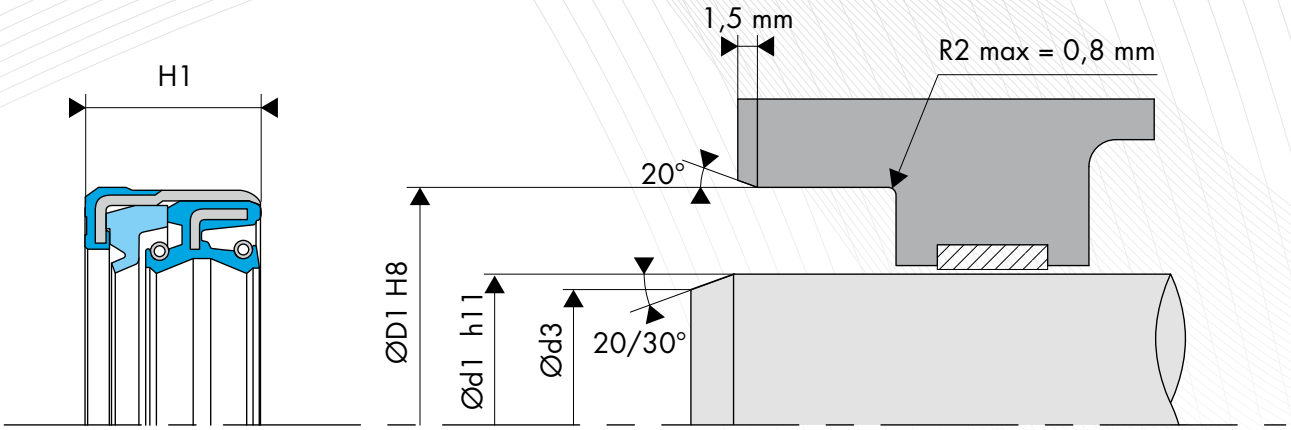
Spring

Steel - AISI 1070 - 1090

TECHNICAL DATA

Technical data	NBR 70 - 75 Shore A	FKM 70 - 75 Shore A	ACM 70 - 75 Shore A	HNBR 70 - 75 Shore A
Temperature	-30°C / +80°C	-20°C/+100°C	-25°C/+90°C	-30°C/+90°C
Speed	4 m/s	6 m/s	5 m/s	5 m/s
Pressure	0.02 - 0.05 MPa	0.02 - 0.05 MPa	0.02 - 0.05 MPa	0.02 - 0.05 MPa
Accepted axial offset	Medium - High	Medium - High	Medium - High	Medium - High
Level of pollution	Moderate	Moderate	Moderate	Moderate

The figures above indicate the maximum values and may not be cumulated. They may be developed, depending on the materials used.



SHAFT DESIGN

Shaft hardness

Rotation speed	Hardness in HRC
s ≤ 4.0 m/sec	45 HRC
4.0 < s ≤ 10.0 m/s	55 HRC
s > 10.0 m/sec	60 HRC

Surface roughness

Ra *	0.2 to 0.8 µm
Rz	1.0 to 4.0 µm
Rmax	≤6.3 µm

*Ra = 0.1 µm for demanding applications

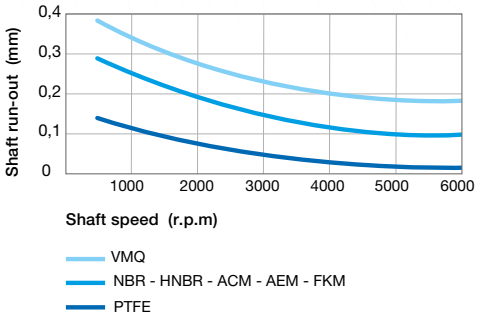
Shaft tolerance

Shaft diameter Ød1 (mm)	Tolerance h11 (mm)
Ød1 ≤ 3.0	-0.060 / 0
3.0 < Ød1 ≤ 6.0	-0.075 / 0
6.0 < Ød1 ≤ 10.0	-0.090 / 0
10.0 < Ød1 ≤ 18.0	-0.110 / 0
18.0 < Ød1 ≤ 30.0	-0.130 / 0
30.0 < Ød1 ≤ 50.0	-0.160 / 0
50.0 < Ød1 ≤ 80.0	-0.190 / 0
80.0 < Ød1 ≤ 120.0	-0.220 / 0
120.0 < Ød1 ≤ 180.0	-0.250 / 0
180.0 < Ød1 ≤ 250.0	-0.290 / 0
250.0 < Ød1 ≤ 315.0	-0.320 / 0
315.0 < Ød1 ≤ 400.0	-0.360 / 0
400.0 < Ød1 ≤ 500.0	-0.400 / 0

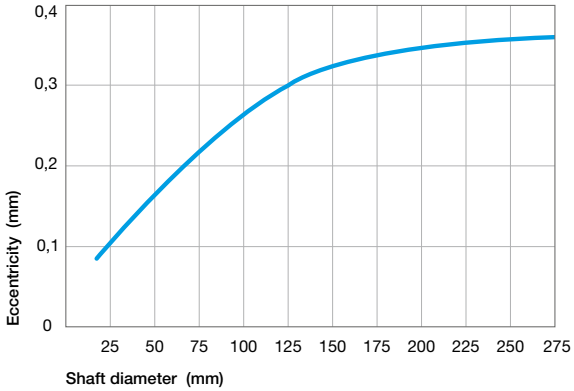
Chamfer

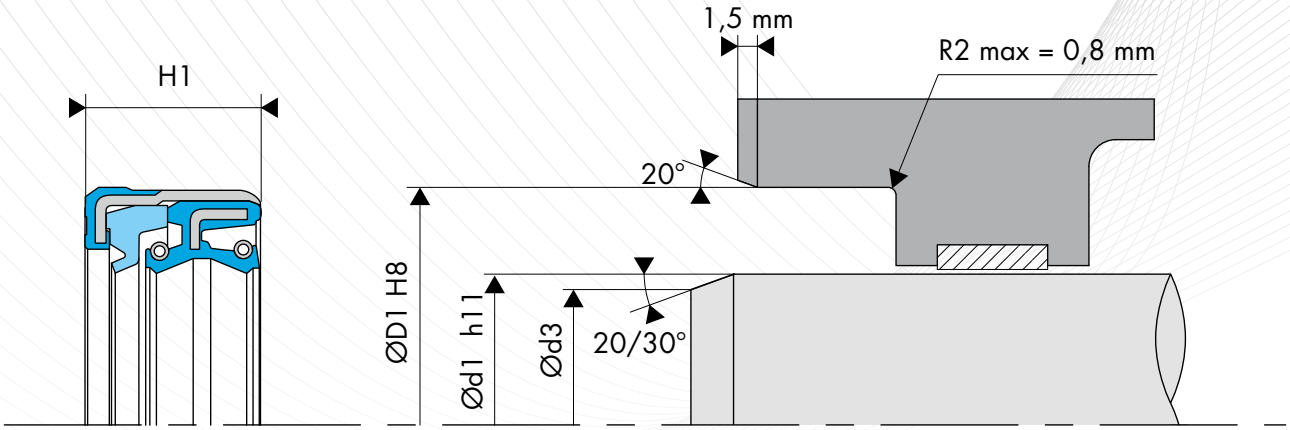
Shaft diameter Ød1 (mm)	Chamfer diameter Ød3 (mm)
Ød1 ≤ 10.0	Ød1 - 1.50
10.0 < Ød1 ≤ 20.0	Ød1 - 2.00
20.0 < Ød1 ≤ 30.0	Ød1 - 2.50
30.0 < Ød1 ≤ 40.0	Ød1 - 3.00
40.0 < Ød1 ≤ 50.0	Ød1 - 3.50
50.0 < Ød1 ≤ 70.0	Ød1 - 4.00
70.0 < Ød1 ≤ 95.0	Ød1 - 4.50
95.0 < Ød1 ≤ 130.0	Ød1 - 5.50
130.0 < Ød1 ≤ 240.0	Ød1 - 7.00
240.0 < Ød1 ≤ 500.0	Ød1 - 11.00

Shaft run out



Eccentricity





HOUSING DESIGN

Surface roughness

Ra	0,8 to 3,2 µm
Rz	6,3 to 16,0 µm
Rmax	≤ 16,0 µm

Chamfer

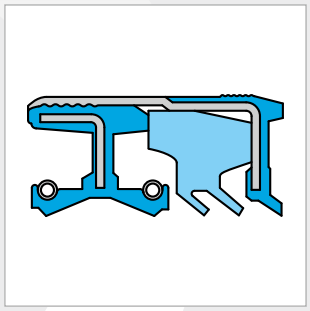
Housing	20° (+/-5°) x 1.5 mm

Housing tolerance

Bore diameter ØD1 (mm)	Tolerance H8 (mm)
3.0 < ØD1 ≤ 6.0	0 / +0.018
6.0 < ØD1 ≤ 10.0	0 / +0.022
10.0 < ØD1 ≤ 18.0	0 / +0.027
18.0 < ØD1 ≤ 30.0	0 / +0.033
30.0 < ØD1 ≤ 50.0	0 / +0.039
50.0 < ØD1 ≤ 80.0	0 / +0.046
80.0 < ØD1 ≤ 120.0	0 / +0.054
120.0 < ØD1 ≤ 180.0	0 / +0.063
180.0 < ØD1 ≤ 250.0	0 / +0.072
250.0 < ØD1 ≤ 315.0	0 / +0.081
315.0 < ØD1 ≤ 400.0	0 / +0.089
400.0 < ØD1 ≤ 500.0	0 / +0.097
500.0 < ØD1 ≤ 630.0	0 / +0.110

DIMENSIONS

Part number	Shaft diameter Ød1 h11	Bore diameter ØD1 H8	Seal height H1
COMB4 37 x 52 x 16	37.00	52.00	16.00
COMB4 45 x 60 x 16	45.00	60.00	16.00
COMB4 50 x 65 x 18	50.00	65.00	18.00
COMB4 55 x 80 x 16	55.00	80.00	16.00
COMB4 60 x 75 x 16	60.00	75.00	16.00
COMB4 75 x 95 x 16.5	75.00	95.00	16.50



COMBI SEALS

COMB5

DESCRIPTION

The COMB5 profile is a combi seal composed of a metal cage with a rubber coating covering half of the outside of the cage, a DC-DCW double sealing lip, double compact polyurethane anti-pollution deflector and an additional anti-pollution lip bonded in rubber.

ADVANTAGES

Long lifespan
Moderate rotation speeds
Elevated axial displacements
Strong protection against external dirt
Very good static sealing

APPLICATIONS

Agriculture
Transmissions
Rotations during high levels of pollution

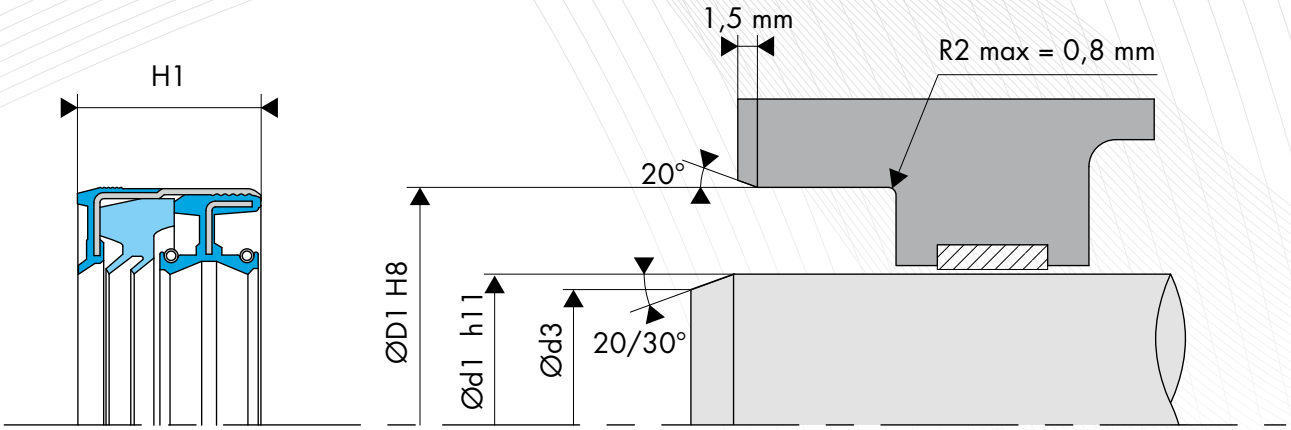
MATERIALS

Rubber
NBR 70 - 75 Shore A
FKM 70 - 75 Shore A
Deflector
PU 92 Shore A
PU 94 Shore A
Metal cage
Steel - AISI 1010
Spring
Steel - AISI 1070 - 1090

TECHNICAL DATA

Technical data	NBR 70 - 75 Shore A	FKM 70 - 75 Shore A	ACM 70 - 75 Shore A	HNBR 70 - 75 Shore A
Temperature	-30°C / +80°C	-20°C/+100°C	-25°C/+90°C	-30°C/+90°C
Speed	4 m/s	6 m/s	5 m/s	5 m/s
Pressure	0.02 - 0.05 MPa	0.02 - 0.05 MPa	0.02 - 0.05 MPa	0.02 - 0.05 MPa
Accepted axial offset	High	High	High	High
Level of pollution	High	High	High	High

The figures above indicate the maximum values and may not be cumulated. They may be developed, depending on the materials used.



SHAFT DESIGN

Shaft hardness

Rotation speed	Hardness in HRC
s ≤ 4.0 m/sec	45 HRC
4.0 < s ≤ 10.0 m/s	55 HRC
s > 10.0 m/sec	60 HRC

Surface roughness

Ra *	0.2 to 0.8 µm
Rz	1.0 to 4.0 µm
Rmax	≤6.3 µm

*Ra = 0.1 µm for demanding applications

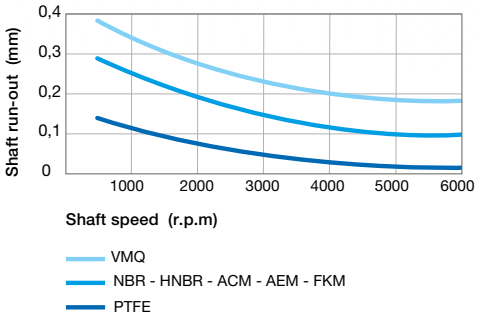
Shaft tolerance

Shaft diameter Ød1 (mm)	Tolerance h11 (mm)
Ød1 ≤ 3.0	-0.060 / 0
3.0 < Ød1 ≤ 6.0	-0.075 / 0
6.0 < Ød1 ≤ 10.0	-0.090 / 0
10.0 < Ød1 ≤ 18.0	-0.110 / 0
18.0 < Ød1 ≤ 30.0	-0.130 / 0
30.0 < Ød1 ≤ 50.0	-0.160 / 0
50.0 < Ød1 ≤ 80.0	-0.190 / 0
80.0 < Ød1 ≤ 120.0	-0.220 / 0
120.0 < Ød1 ≤ 180.0	-0.250 / 0
180.0 < Ød1 ≤ 250.0	-0.290 / 0
250.0 < Ød1 ≤ 315.0	-0.320 / 0
315.0 < Ød1 ≤ 400.0	-0.360 / 0
400.0 < Ød1 ≤ 500.0	-0.400 / 0

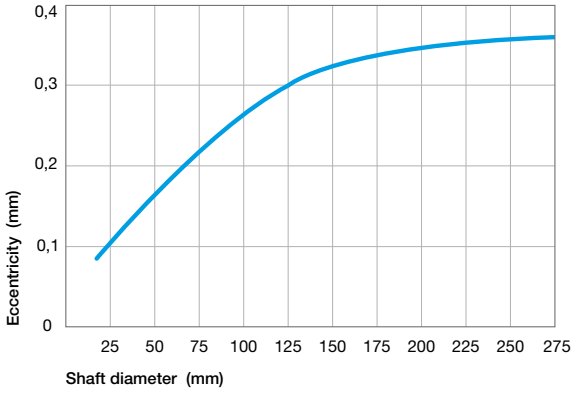
Chamfer

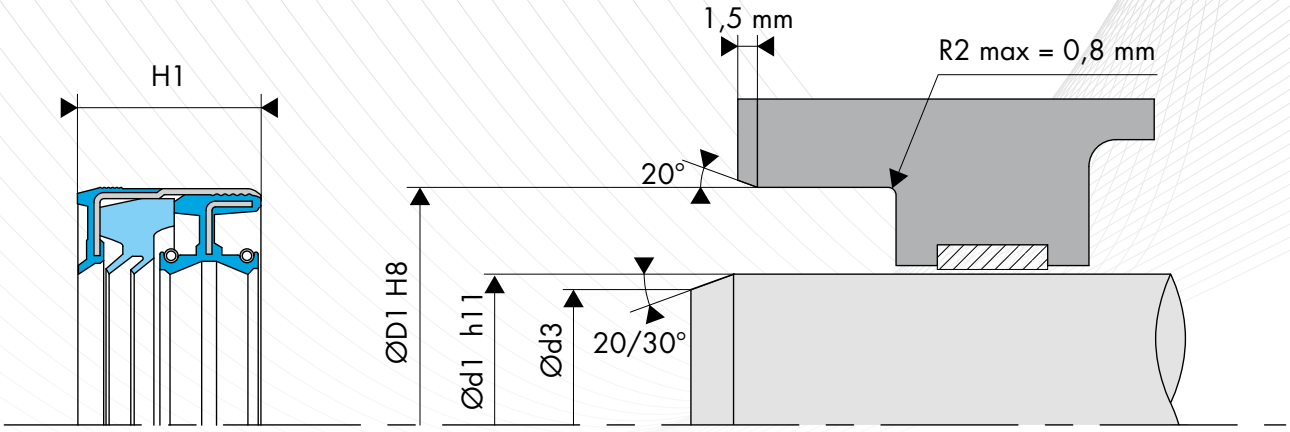
Shaft diameter Ød1 (mm)	Chamfer diameter Ød3 (mm)
Ød1 ≤ 10.0	Ød1 - 1.50
10.0 < Ød1 ≤ 20.0	Ød1 - 2.00
20.0 < Ød1 ≤ 30.0	Ød1 - 2.50
30.0 < Ød1 ≤ 40.0	Ød1 - 3.00
40.0 < Ød1 ≤ 50.0	Ød1 - 3.50
50.0 < Ød1 ≤ 70.0	Ød1 - 4.00
70.0 < Ød1 ≤ 95.0	Ød1 - 4.50
95.0 < Ød1 ≤ 130.0	Ød1 - 5.50
130.0 < Ød1 ≤ 240.0	Ød1 - 7.00
240.0 < Ød1 ≤ 500.0	Ød1 - 11.00

Shaft run out



Eccentricity





HOUSING DESIGN

Surface roughness

Ra	0,8 to 3,2 µm
Rz	6,3 to 16,0 µm
Rmax	≤ 16,0 µm

Chamfer

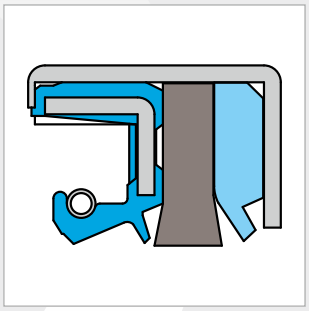
Housing	20° (+/-5°) x 1.5 mm

Housing tolerance

Bore diameter ØD1 (mm)	Tolerance H8 (mm)
3.0 < ØD1 ≤ 6.0	0 / +0.018
6.0 < ØD1 ≤ 10.0	0 / +0.022
10.0 < ØD1 ≤ 18.0	0 / +0.027
18.0 < ØD1 ≤ 30.0	0 / +0.033
30.0 < ØD1 ≤ 50.0	0 / +0.039
50.0 < ØD1 ≤ 80.0	0 / +0.046
80.0 < ØD1 ≤ 120.0	0 / +0.054
120.0 < ØD1 ≤ 180.0	0 / +0.063
180.0 < ØD1 ≤ 250.0	0 / +0.072
250.0 < ØD1 ≤ 315.0	0 / +0.081
315.0 < ØD1 ≤ 400.0	0 / +0.089
400.0 < ØD1 ≤ 500.0	0 / +0.097
500.0 < ØD1 ≤ 630.0	0 / +0.110

DIMENSIONS

Part number	Shaft diameter Ød1 h11	Bore diameter ØD1 H8	Seal height H1
COMB5 30 x 44 x 17	30.00	44.00	17.00
COMB5 40 x 65 x 27.5	40.00	65.00	27.50
COMB5 42 x 62 x 23	42.00	62.00	23.00
COMB5 45 x 75 x 27.5	45.00	75.00	27.50
COMB5 47 x 65 x 19	47.00	65.00	19.00
COMB5 52 x 72 x 16.5	52.00	72.00	16.50



COMBI SEALS

COMB6

DESCRIPTION

The COMB6 profile is a combi seal made up of a metal cage, TC-TCW shaft seal and 2 anti-pollution deflectors, where the first is made from felt or polyurethane foam and the second from compact polyurethane.

ADVANTAGES

Long lifespan

Moderate/high rotation speeds

Small axial displacements

Moderate/high protection against external dirt

APPLICATIONS

Agriculture

Transmissions

Rotations during high levels of pollution

MATERIALS

Rubber

NBR 70 - 75 Shore A

FKM 70 - 75 Shore A

Deflectors

Felt

PU foam

PU 92 Shore A

PU 94 Shore A

Metal cage

Steel - AISI 1010

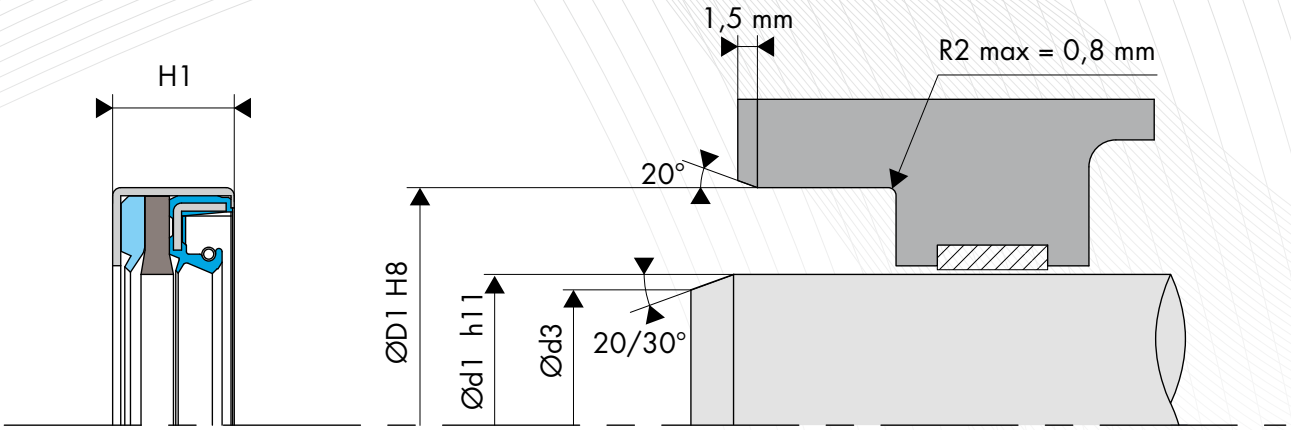
Spring

Steel - AISI 1070 - 1090

TECHNICAL DATA

Technical data	NBR 70 - 75 Shore A	FKM 70 - 75 Shore A	ACM 70 - 75 Shore A	HNBR 70 - 75 Shore A
Temperature	-30°C / +80°C	-20°C/+100°C	-25°C/+90°C	-30°C/+90°C
Speed	4 m/s	6 m/s	5 m/s	5 m/s
Pressure	0.02 - 0.05 MPa	0.02 - 0.05 MPa	0.02 - 0.05 MPa	0.02 - 0.05 MPa
Accepted axial offset	Low	Low	Low	Low
Level of pollution	Moderate	Moderate	Moderate	Moderate

The figures above indicate the maximum values and may not be cumulated. They may be developed, depending on the materials used.



SHAFT DESIGN

Shaft hardness

Rotation speed	Hardness in HRC
s ≤ 4.0 m/sec	45 HRC
4.0 < s ≤ 10.0 m/s	55 HRC
s > 10.0 m/sec	60 HRC

Surface roughness

Ra *	0.2 to 0.8 µm
Rz	1.0 to 4.0 µm
Rmax	≤6.3 µm

*Ra = 0.1 µm for demanding applications

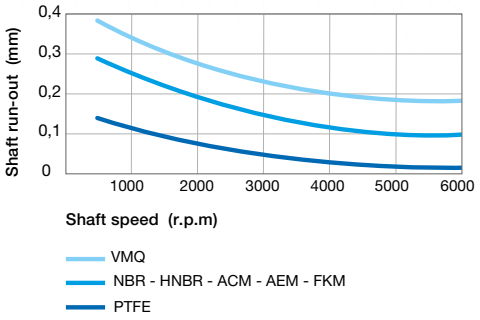
Shaft tolerance

Shaft diameter Ød1 (mm)	Tolerance h11 (mm)
Ød1 ≤ 3.0	-0.060 / 0
3.0 < Ød1 ≤ 6.0	-0.075 / 0
6.0 < Ød1 ≤ 10.0	-0.090 / 0
10.0 < Ød1 ≤ 18.0	-0.110 / 0
18.0 < Ød1 ≤ 30.0	-0.130 / 0
30.0 < Ød1 ≤ 50.0	-0.160 / 0
50.0 < Ød1 ≤ 80.0	-0.190 / 0
80.0 < Ød1 ≤ 120.0	-0.220 / 0
120.0 < Ød1 ≤ 180.0	-0.250 / 0
180.0 < Ød1 ≤ 250.0	-0.290 / 0
250.0 < Ød1 ≤ 315.0	-0.320 / 0
315.0 < Ød1 ≤ 400.0	-0.360 / 0
400.0 < Ød1 ≤ 500.0	-0.400 / 0

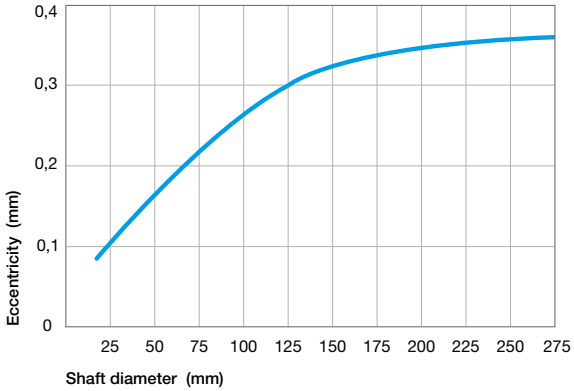
Chamfer

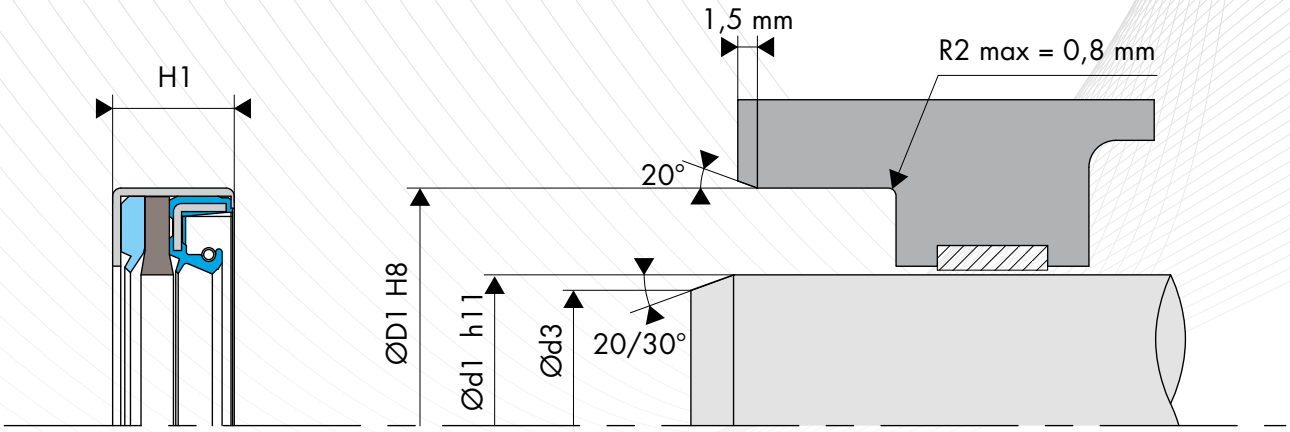
Shaft diameter Ød1 (mm)	Chamfer diameter Ød3 (mm)
Ød1 ≤ 10.0	Ød1 - 1.50
10.0 < Ød1 ≤ 20.0	Ød1 - 2.00
20.0 < Ød1 ≤ 30.0	Ød1 - 2.50
30.0 < Ød1 ≤ 40.0	Ød1 - 3.00
40.0 < Ød1 ≤ 50.0	Ød1 - 3.50
50.0 < Ød1 ≤ 70.0	Ød1 - 4.00
70.0 < Ød1 ≤ 95.0	Ød1 - 4.50
95.0 < Ød1 ≤ 130.0	Ød1 - 5.50
130.0 < Ød1 ≤ 240.0	Ød1 - 7.00
240.0 < Ød1 ≤ 500.0	Ød1 - 11.00

Shaft run out



Eccentricity





HOUSING DESIGN

Surface roughness

Ra	0,8 to 3,2 µm
Rz	6,3 to 16,0 µm
Rmax	≤ 16,0 µm

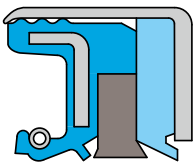
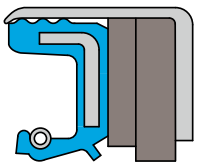
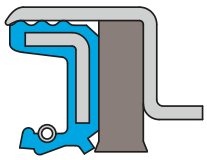
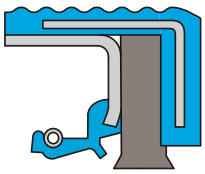
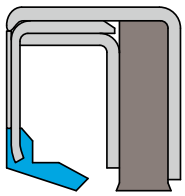
Chamfer

Housing	20° (+/-5°) x 1.5 mm

Housing tolerance

Bore diameter ØD1 (mm)	Tolerance H8 (mm)
3.0 < ØD1 ≤ 6.0	0 / +0.018
6.0 < ØD1 ≤ 10.0	0 / +0.022
10.0 < ØD1 ≤ 18.0	0 / +0.027
18.0 < ØD1 ≤ 30.0	0 / +0.033
30.0 < ØD1 ≤ 50.0	0 / +0.039
50.0 < ØD1 ≤ 80.0	0 / +0.046
80.0 < ØD1 ≤ 120.0	0 / +0.054
120.0 < ØD1 ≤ 180.0	0 / +0.063
180.0 < ØD1 ≤ 250.0	0 / +0.072
250.0 < ØD1 ≤ 315.0	0 / +0.081
315.0 < ØD1 ≤ 400.0	0 / +0.089
400.0 < ØD1 ≤ 500.0	0 / +0.097
500.0 < ØD1 ≤ 630.0	0 / +0.110

OTHER SPECIFIC COMBI SEAL PROFILES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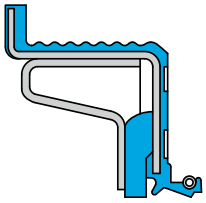	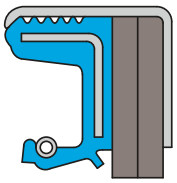	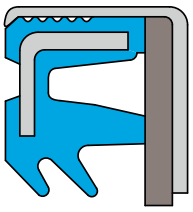	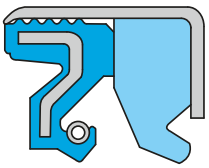	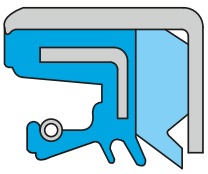
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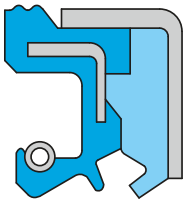	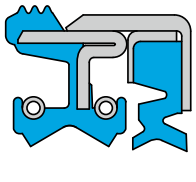	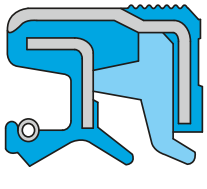		
COMB17	COMB18	COMB19		

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