HUTCHINSON®
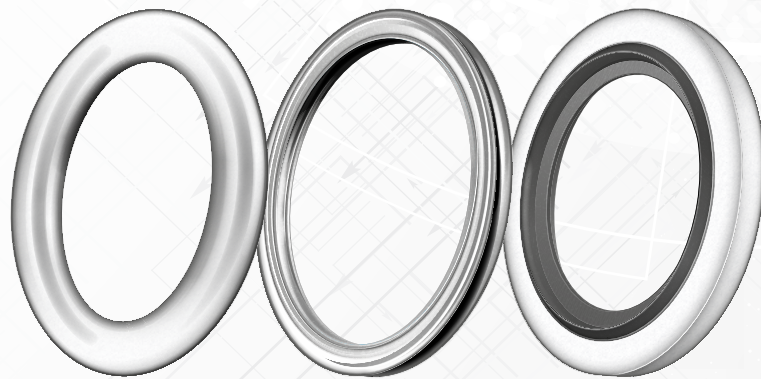
PRECISION SEALING

O-RINGS, X-RINGS, BONDED SEALS

In-house Manufacturing, Safe Sealing

Hutchinson, O-Rings and Bonded Seals designs and manufactures precision sealing solutions such as O-Rings, X-Rings and Bonded Seals.

Our manufacturing process guarantees the origin and quality of our products and allows us to offer safe and reliable sealing solutions.

Full control of the process: from development to production, our technical expertise in industrial markets and our "zero defect" quality approach avoid any risk of leakage and ensure customers peace of mind.

The commitment of our teams to quality, safety, ethics and respect for the environment has contributed to making Hutchinson, O-Rings & Bonded Seals a leader in the supply of high-tech seals that meet the highest requirements, and this for more than 70 years.

Our sites have received following quality and environmental certifications:

afaq ISO 14001 Environnement AFNOR CERTIFICATION

afaq IATF 16949 Automobile AFNOR CERTIFICATION

afaq ISO 45001 Santé Sécurité au Travail AFNOR CERTIFICATION

afaq ISO 50001 Énergie AFNOR CERTIFICATION

afaq ISO 9001 Qualité AFNOR CERTIFICATION

afaq EN/AS/JISQ 9100 Aéronautique AFNOR CERTIFICATION

CONTENTS

HUTCHINSON®

INTRODUCTION

We make it *possible*

1 – HUTCHINSON GROUP

To meet the needs of its global customers on land, in the air and at sea, Hutchinson has been designing, developing and manufacturing high-performance solutions for over 160 years.

Our innovations cover a wide variety of demanding markets: automotive, aerospace, defence, energy, rail and industry in general.

Hutchinson is a global leader in anti-vibration systems, fluid management and sealing solutions, our group stands out for its multi-market and multi-expertise approach, a source of synergies and added value.

A wide spectrum of resources

A corporate Research & Innovation Centre brings together more than 200 engineers and technicians conducting fundamental and applied research. Innovative solutions are developed by combining our key technologies and skills:

- Chemistry and Materials Science
- Mechanical engineering
- Composite Materials
- Transformation processes
- Vibration and Acoustics
- Thermal insulation
- Mechatronics

Our teams in our technical centres around the world develop high added value solutions. They dedicate their resources in applied engineering to our customers.

PRECISION SEALING SYSTEMS

BODY SEALING SYSTEMS

FLUID MANAGEMENT SYSTEMS

MATERIALS AND STRUCTURES

VIBRATION CONTROL

BELT DRIVE SYSTEMS

"Our ambition: participate in the mobility of the future that is safer, more comfortable, and more responsible."

2 – O-RINGS & BONDED SEALS

Leading manufacturer of precision sealing systems since 1907, Le Joint Français introduced the O-Ring in Europe in 1948 and has always kept control of all processes, from design to production, in its plants.

Le Joint Français joined Hutchinson in 1987, becoming the O-Rings & Bonded Seals (ORBS) and is part of Precision Sealing Systems Activity (PSS).

Complete control of the production chain

We design, develop and manufacture sealing solutions such as O-Rings, X-Rings, special shaped seals, bonded seals, flange seals and tailormade seals.

Development of materials, design of optimal solutions, production of tools and parts, we are committed to the entire process to meet the most demanding requirements and guarantee the peace of mind and safety of our customers and users.

Global presence

Hutchinson O-Rings & Bonded Seals has a global footprint with manufacturing plants in Europe (France, Portugal, Great Britain and Malta), Asia (China) and America (Mexico and Brazil). Our plants are ISO 9001 and IATF 16949 certified. Thanks to the one plant concept, our processes are the same in all the countries we work in, to ensure the same level of quality while keeping production close to our customers.

Alongside constructors and manufacturers around the world, our teams pursue the same objective: zero defects for safe sealing.

Designer and manufacturer of your future sealing solutions

> 40,000 employees	25 countries	100 sites	5% invested R&D	> €4,8 billion turnover

www.hutchinson.com

oring.hutchinson.fr/en

3-MARKETS

Aerospace

Food

Automotive

Heating

Chemicals

Cosmetics

Drinking water

Energy

Railway

Hydraulics

Industrial air-conditioning

Off-Road

Pharmaceutical / Medical

Industrial pneumatics

Trucks

Power transmission

4-OUR COMMITMENT TO EXCELLENCE

In-house manufacturing
Compound development
Tooling conception
Parts manufacturing

Reliability
Trusted partner
70 years of experience
World leader in sealing solutions

Wide product range
Wide range of dimensions
All elastomer families
From unit to mass production

Presence
Exclusive contact person
Global presence, local production
Distributors' network

Expertise
Rubber formulation experts
Technical engineering support
Conception of tailormade solutions

Reactivity
5,000 references in stock
3 days express
10 days express

Quality
0 ppm approach
100% inspection
Approvals & certifications

Services
Assembly aid app
E-commerce website
Unit micro-engraving

5 — TOOLS, RESOURCES & DEVELOPMENTS

5.1 — Website

Our website allows you to download the catalogue, brochures, data sheets, watch our videos, access mobile applications and use the *O-Ring* fitting tool.

In addition, you will find the latest news, upcoming trade fairs, as well as information on our products and markets.
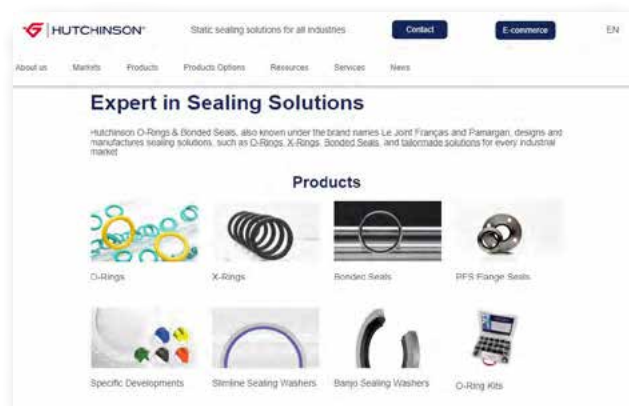
www.oring.hutchinson.fr/en/

5.2 — E-commerce for distributors

An e-commerce website is available for our distributors and access can be given on request by your sales contact.

It offers following features:

- Reference search
- Stock queries
- Price queries
- Determination of delivery time
- Placing orders
- Quick code entry
- Delivery management
- Order template management
- Access to delivery notes and invoices

https://ecommerce.oring.hutchinson.fr

5.3 — Documentation

Our documentation is available for download on our website.

Catalogue and general brochure

Market brochures

- Food industry
- Cosmetics
- Pharmaceutical
- Heating
- Energy
- Off-road
- Chemicals
- Medical
- Industrial air-conditioning
- Defense
- Naval
- Aerospace

Product brochures

- Bonded seals
- PFS Flange seals
- Slimline sealing washers
- Surface treatments
- Stainless-steel bonded seals
- Compound FKM FDA

Specific compound flyers

- Drinking water, natural gas, oil & gas, etc.

Services flyers

- Assembly Aid Smartphone App
- Micro-engraving
- E-commerce

Compound sheets
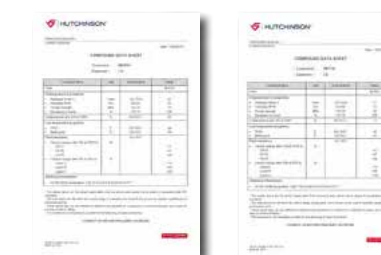
5.4 – O-Ring assembly aid tool

The O-Ring fitting assistance application allows you to define the groove geometry and select the correct O-Ring. Get it on your smartphone or on our website.

Groove geometry
Determine the machining dimensions according to the type of assembly (shaft, bore, cover, internal or external pressure)

Catalogue Dimensions
Consult the list of standard codes

Measure a seal
Determine the dimensions of an O-Ring using the camera on your smartphone and a coin

Fluid compatibility
Select the elastomer family suited to your fluid

5.5 – Computer Aided Design (CAD)

The PARTcommunity CAD service is included on our website under the Services tab. It offers the possibility of configuring standard sealing solutions and exporting models in 2D and 3D formats (AutoCAD, Catia, Inventor, SolidWorks, Solid Edge, Creo, NX, etc.).

A PARTcommunity account is required to download the CAD model and can be opened directly from our website.

https://www.oring.hutchinson.fr/en/services/cao_services/

5.6 – Technical support

Our application engineers support our customers in the design and development of reliable and optimised sealing solutions:

- Help in the choice of compound
- Dimensional definition of groove and O-Ring
- Definition of seals and shaped parts
- Assembly analysis
- Surface roughness recommendations
- Proposal for surface treatments and cleanliness level
- Packaging adapted for assembly lines
- Development of customised solutions
- Finite Element Method calculations (FEM)
- Study of laboratory analyses
- Analysis after functional trials

Functional validation remains the responsibility of the customer.

Documentation available on request

- Parts drawings
- Material Specification Sheets
- Certificates of Compliance
- Certificates of Approval

Our teams of experts are able to respond to specific requests with recommendations tailored to your environment, application and fluids in contact.
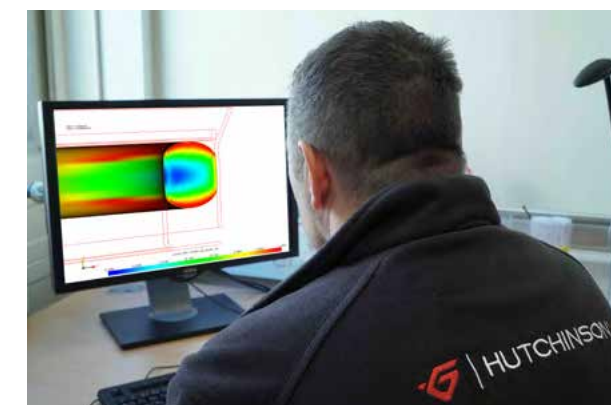
6 – QUALITY

6.1 – Quality controls

Our production process is designed to meet the highest quality requirements with rigorous process parameters.

To move ever closer to 0 ppm, all seals are subject to both visual and automatic inspection.

6.2 – Material characteristics

Each step of the manufacturing process contributes to the quality and final performance of the seal. The final inspection in production ensures that parts comply with customer requirements and allows traceability information to be recorded.

The material characteristics like hardness, density and compression set are measured according to the standards in force.

6.3 – Dimensional tolerances

The dimensional tolerance intervals are in accordance with ISO 3601-1:2012 class B for standard seals.

We can respond to requests for more stringent dimensions and tolerances.

Cross section Ø (mm)		Tolerances (mm)
from	to	
0.80	2.25	± 0.08
2.26	3.15	± 0.09
3.16	4.50	± 0.10
4.51	6.30	± 0.13
≥ 6.30		± 0.15

Inside diameter d1

Tolerances in mm +/−
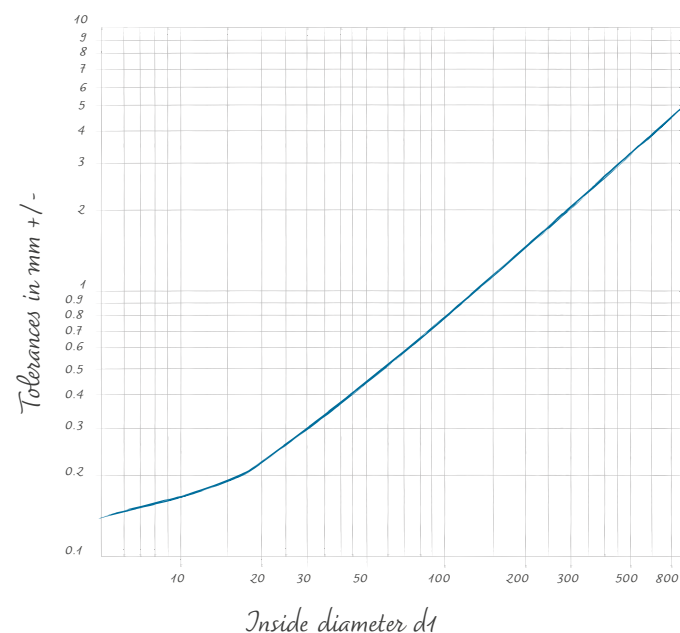
6.4 – Surface imperfections

The table below shows the maximum permissible limits for surface imperfections in standard O-Rings as defined in ISO 3601- 3:2005, N Grade.

These standards define maximum defect limits which do not impact usual industrial applications. Our standard O-Rings meet this standard.

We are also able to meet higher levels of requirements in case of specific needs (technical specifications, special applications, etc.) with S Grade.

Type of surface imperfection	Diagrammatic representation	Limiting dimensions	Maximum defect limits Class N O-Rings cross section diameter d2 (mm)				
			> 0.8[b] ≤ 2.25	> 2.25 ≤ 3.15	> 3.15 ≤ 4.50	> 4.50 ≤ 6.30	> 6.30 ≤ 8.40[b]
Offset off-register, mismatch		e	0.08	0.10	0.13	0.15	0.15
Combined flash, offset and parting line projection		x	0.10	0.12	0.14	0.16	0.18
		y	0.10	0.12	0.14	0.16	0.18
		a	If the flash can be distinguished it must not exceed 0.07 mm.				
Backrind		g	0.18	0.27	0.36	0.53	0.70
		u	0.08	0.08	0.10	0.10	0.13
Excessive trimming Radial machining marks are not permissible		n	Departure from a circular cross section due to trimming is allowed provided that the resulting surfaces are smoothly blended and are within the size tolerance limits for d2.				
Flow marks (radial orientation of flow marks is not permissible)		v	1.5[a]	1.5[a]	6.5[a]	6.5[a]	6.5[a]
		k	0.08	0.08	0.08	0.08	0.08
Non-fills and indentations Including parting line indentations		w	0.6	0.8	1.0	1.3	1.7
		t	0.08	0.08	0.10	0.10	0.10

a) Or 0.05 times the O-Ring's inside diameter (d1), by using the highest.
b) Limits of imperfections for cross sections < 0.8 mm or > 8.40 mm shall be agreed upon between manufacturer and customer.
c) Rounded angles

7 – PACKAGING

As standard, our seals are packaged in bags or translucent microperforated polyethylene sheets.

Depending on customers requirements, we offer different types of bags: UV protective, microperforated, non-microperforated, zipped, translucent, opaque or in different colours.

We also offer packaging that meets severe cleanliness requirements according to ISO 16232-2018, such as double-bagging under laminar flow.

The quantity per bag is optimised as standard, but can be adapted to the customer's needs (unit bagging, for example). Our bags of parts are delivered in Galia boxes (A or C). We will consider requests for specific packaging (plastic tray or other).

Hutchinson has also developed specific packaging to ensure the flatness needed for seals in automatic assembly: inflated bag, tube, plastic shell, etc.

For distributors ordering standard catalogue parts, the quantity of O-Rings per bag is determined by the inner diameter.

8 – STORAGE

8.1 – Storage conditions

We recommend to store the seals in their original packaging until they are used.

Light

Avoid direct exposure to sunlight or intense artificial light.

Temperature

Maintain storage areas at a temperature between 5 and 35°C.

Avoid storing parts next to a heat source (radiator, lamp, etc.).

Atmosphere

Ensure relative humidity between 45 and 70%. The air should not contain aggressive vapours (solvents, acids, etc.). Because ionising radiation and ozone are particularly harmful, the vicinity of any device that is likely to produce ozone is to be avoided (mercury vapour lamps, high-voltage electrical equipment, spark-generating devices, etc.). Any mechanical constraint favours the action of ozone.

Deformation

Avoid stacking and folding bags.

8.2 – Storage time

The international standard ISO 2230-2002 recommends storage periods for elastomer-based products.

The families of materials are classified according to their sensitivity to ageing.

The extension corresponds to the period for which a rubber product, appropriately packaged, may be stored after the initial storage period, before further inspection and re-testing is necessary.

Longevity group	B	C
Storage characteristics	low sensitivity	very low sensitivity
Families of elastomer	NBR, HNBR, NBR/PVC, CR, ACM, AEM, IIR	EPDM, FKM, FVMQ, Q, FFKM
Initial storage period	7 years	10 years
Extended storage period	3 years	5 years

9 – DELIVERY

To meet all needs, we offer a variety of fast production and delivery services.

We ship daily and regular grouped shipments are possible (weekly / monthly).

Our 3 Days Express service allows you to cope with urgent requirements, as we ship your parts within 72 hours for usually ordered parts, and one week for specific dimensions with mould creation.

3 Days Express
72 hours

Special production
4-6 weeks

Parts from stock
24 hours

Standard parts
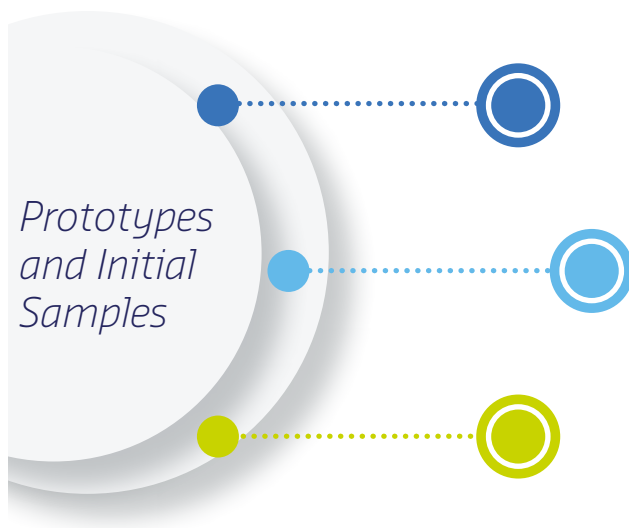
Prototypes and Initial Samples

Initial samples
existing tooling
4 weeks

Initial samples
new tooling
8-10 weeks

Prototypes
existing tooling
2 weeks

ORDER   PRODUCTION   DELIVERY

With our 3 DAYS EXPRESS services, your
O-Rings will be manufactured and delivered in just a few days!

INTRODUCTION

HUTCHINSON®

COMPLEMENTARY PRODUCTS & SERVICES

We make it *possible*

1 – SURFACE TREATMENTS

1.1 – Improved surface efficiency

Hutchinson offers a wide range of high-performance surface treatments. These treatments optimise the seal's surface by adapting it to the required conditions of use. They are tested and validated according to standards and to customers requirements.

We develop and apply all our treatments in our plants using specific processes, thus guaranteeing optimal quality.

Our processes respect the environment, the regulations in force and preserve the properties of the rubber.

Benefits

- Reduce insertion forces
- Reduce friction forces and seal wear for dynamic applications
- Enable distinction between two identical seals (Poka-Yoke)
- Facilitate use in automatic feeding O-Ring distribution systems
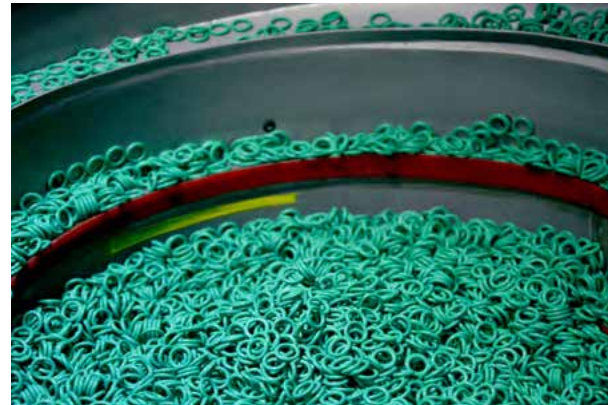
🖊 **Marking**

☁ **Powders**

💧 **Wet films**

☀ **Dry coatings**

⚗ **Chemical treatments**

1.2 – Surface Treatment process

To guarantee optimum quality, the application of surface treatments is always carried out in our plants and follows specific processes:

Specific process for Lubricoats

Untreated seal → Washed/dried seal → Plasma activation → Application of coating → Post-curing in oven

General process for surface treatments

Untreated seal → Application of treatment

1.3 – Our surface treatments

Designation	Colour	Aspect	Compatibility with elastomer families	Ease of assembly *Non-persistent product*	Ease of assembly *Persistent product*	Ease of automated fitting	Dynamic applications	Colour identification
Marking (On a side or line on external diameter)	white, blue, yellow, orange, red, green	-	all except silicone	-	-	-	-	++
Talcum	white	mat	all	o	-	++	-	-
Molycoting	silver	very shiny	all	o	-	++	-	-
Lubrifilm SG	transparent	non-oily grease	AEM, EPDM, FKM, FVMQ, HNBR, NBR	++	-	-	-	-
Lubrifilm FP / Lubrifilm FP-ST	transparent	greasy, slightly shiny	AEM, EPDM, FKM, FVMQ, HNBR, NBR	++	-	o	-	-
Silicone HF	transparent	greasy, very shiny	all except silicone	++	-	-	-	-
Lubricoat A WB3-N	blue, red, black, mottled grey orange, green	dry	AEM, EPDM, FKM, HNBR, NBR	-	++	+	+	++
Lubricoat HT	transparent	dry	ACM, AEM, FKM, HNBR, NBR	-	o	+	++	-
Lubricoat I	blue, orange, red, transparent (slightly milky)	dry	EPDM, FKM, HNBR, NBR	-	+	+	-	++
Lubricoat J	white, blue, orange, red, transparent, green	dry	AEM, EPDM, FKM, HNBR, NBR	-	-	++	-	++
Lubricoat KT	transparent	dry	AEM, EPDM, FKM, HNBR, NBR	-	++	+	+	-
Lubri PB	transparent	dry	mainly NBR	-	o	+	++	-

NOTE: The Silicone HF and Lubricoat I (transparent version) treatments are approved for drinking water.

Key

- **-** Not recommended
- **o** Quite suitable
- **+** Suitable
- **++** Highly suitable

2 – MECHANICAL CLEANLINESS

2.1 – Interest

For many years, Hutchinson has been aware of the requirements for special cleanliness in many fields, such as the automotive market, and has equipped itself with many resources and skills to meet customers' technical specifications.

The absence of particulate pollution in a circuit is recognised as a key factor, essential to the lifespan and reliability of the circuit. The presence of particles, in particular mechanical particles, from the manufacturing process leads to a substantial increase in the wear of the system during initial use and can cause irreversible failures such as sealing problems.

Our production process does not generate abrasive and/or metallic particles, but Hutchinson offers efficient cleaning solutions for its parts.

2.2 – Cleanliness levels

To meet customers requirements, Hutchinson has defined four levels of cleanliness corresponding to specific washing and packaging processes:

- Standard
- Intermediate
- Stringent
- Very stringent

The cleanliness expertise unit analyses the specifications for each need, to establish the appropriate washing and packaging process.

2.3 – Means of production

Washing is carried out using environmentally friendly machines that guarantee the integrity of the seals.

For stringent and very stringent cleanliness, the washing and packaging operations are carried out in in an ISO 7 clean room (according to ISO 14644-1).

2.4 – Test facilities

Hutchinson has specific equipment to enable:

- the extraction of particle contamination from the parts,
- gravimetric measurement (mass of pollutant),
- the quantitative and qualitative measurement of particles

in compliance with the international reference standards, ISO 16232-2018 and VDA19.1.

ISO 7 class					
Maximum allowable concentrations (particles per m3 of air) of particles of size equal to or greater than that given below					
≥0.10µ	≥0.20µ	≥0.30µ	≥0.50µ	≥10µ	≥50µ
-	-	-	352,000	83,200	2,930

3 – TRACEABILITY BY MICRO-ENGRAVING

Micro-engraving keeps traceability information directly on the seals.

A simple search of the engraved identification code on the *O-Ring Info* smartphone app enables to access following traceability information:

- Part code number
- Part dimensions
- Rubber compound
- Date of manufacture
- Hutchinson guarantee of origin

O-RING INFO

Available on the App Store

GET IT ON Google Play

DETECTION OF COUNTERFEITING	TRACEABILITY
GUARANTEE OF ORIGIN	UNIT IDENTIFICATION

4 – URGENT ORDERS

4.1 – 3 Days Express

Our 3 Days Express service allows you to cope with urgent requirements, as we ship your parts within a time limit of 72 hours for usually ordered parts, and one week for specific dimension with mould creation.
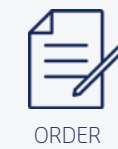
3 Days Express
72 hours

Express
3 days

ORDER   PRODUCTION   DELIVERY

With our 3 DAYS EXPRESS services, your
O-Rings will be manufactured and delivered in just a few days!

5 – O-RING KITS

5.1 – EPDM 70 – Drinking water and food
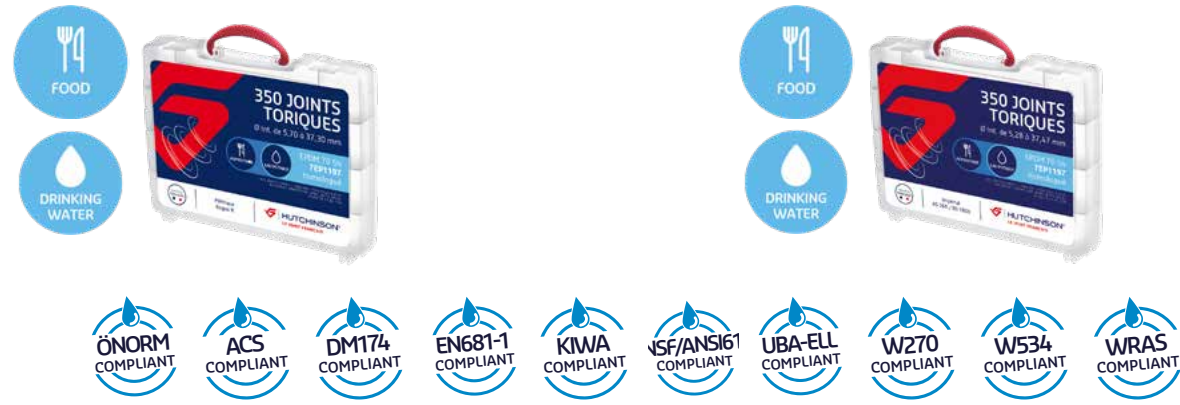
Metric

- Elastomer family: EPDM
- Compound: 7EP1197
- Hardness: 70 Sh.A
- Dimensions: 20 sizes,
  inner Ø from 5.70 to 37.30 mm
  cross section Ø from 1.90 to 3.60 mm
- LJF part number: 199071

Imperial

- Elastomer family: EPDM
- Compound: 7EP1197
- Hardness: 70 Sh.A
- Dimensions: 20 sizes,
  inner Ø from 5.28 to 37.47 mm
  cross section Ø from 1.78 to 5.33 mm
- LJF part number: 199072

5.2 – Green FKM 70 – Chemical industry

Metric

- Elastomer family: FKM
- Compound: 7DF2067
- Hardness: 72 Sh.A
- Dimensions: 20 sizes,
  inner Ø from 5.70 to 37.30 mm
  cross section Ø from 1.90 to 3.60 mm
- LJF part number: 199080

Imperial

- Elastomer family: FKM
- Compound: 7DF2067
- Hardness: 72 Sh.A
- Dimensions: 20 sizes,
  inner Ø from 5.28 to 37.47 mm
  cross section Ø from 1.78 to 5.33 mm
- LJF part number: 199073

5.3 – NBR 80 – Gas

Metric

- Elastomer family: NBR
- Compound: PC851
- Hardness: 78 Sh.A
- Dimensions: 20 sizes,
  inner Ø from 5.70 to 37.30 mm
  cross section Ø from 1.90 to 3.60 mm
- LJF part number: 199081

Imperial

- Elastomer family: NBR
- Compound: PC851
- Hardness: 78 Sh.A
- Dimensions: 20 sizes,
  inner Ø from 5.28 to 37.47 mm
  cross section Ø from 1.78 to 5.33 mm
- LJF part number: 199082

5.4 – O-Ring splicing kit

Our O-Ring splicing kit allows the independent assembly of seals from 8 different diameters. Inside the kit you will find all the tools you need to make your own O-Rings: glue, white pencil, aluminium anvil and blade.

- Elastomer family: NBR
- Compound: PB701
- Hardness: 68 Sh.A
- Dimensions: 8 different cord diameters, from 1.90 to 10 mm
- LJF part number: 199001

https://www.oring.hutchinson.fr/en/products/o-ringkits/

ELASTOMERS & COMPOUNDS

We make it *possible*

1–CHARACTERISTICS OF ELASTOMER FAMILIES

A rubber compound is composed of many ingredients in very precise proportions. The elastomer used to make a compound will determine its main physical and chemical characteristics.

In increasingly demanding technical environments, with growing numbers of standards, approvals, and regulations, our Hutchinson O-Rings and Bonded Seals development laboratory brings its expertise and guarantees the best compound characteristics.

Rubber appears in three different forms during its processing:

- **Base gum (polymer):** fragile structure and low elasticity
- **Raw compound**, a dispersion of the following ingredients: the polymer, reinforcing fillers (carbon black, silica, etc.), plasticisers, the vulcanisation system (sulphur, sulphur donor, peroxide, resin, etc.), activators (ZnO, stearic acid, etc.), processing aids, protective agents and colourants if applicable
- **Vulcanisation of the raw compound:** the reaction takes place at high temperature and gives the rubber its final properties. The elasticity is excellent and the compression set is low.

PEROXIDE

SYNTHETIC RUBBER

WAX

STEARIC ACID

COLOURANTS

CARBON BLACK

SILICA

ZINC OXIDE

OIL

SULPHUR

Overview of the elastomer families

Standardised symbols		IIR	EPDM	CR	NBR	VMQ	FVMQ	ACM	FKM	HNBR	AEM
O-Rings & Bonded Seals designation		BU	EP	N	P	SL	SF	DA	DF	DT	DE
Common and chemical elastomer names		Butyl (isobutylene isoprene copolymer)	Ethylene propylene (ethylene propylene diene terpolymer)	Chloroprene (polychloroprene)	Nitrile (acrylonitrile butadiene copolymer)	Silicone	Fluorosilicone	Polyacrylic	Fluorocarbon	Hydrogenated nitrile	Ethylene acrylate
Mechanical properties	Traction										
	Compression set										
Resistance	Air										
	Light										
	Ozone (weather)										
	Heat										
	Cold										
Dielectric use											
Impact of fluids at normal temperatures	Mineral oils and petroleum products										
	Water, dilute bases, dilute non-oxidising acids										
	Strong acids										
	Strong oxidising acids										
	Gas impermeability										
	Glycol (cooling systems, braking)										

Key

Very good to excellent	Good	Quite good	Poor	Low to zero

1.1 – ACM (Polyacrylate)

Good resistance	Aggressive mineral oils
	Atmospheric agents
	Heat
Low resistance	Fuels
	Water
	Low temperatures
Particularities	Average mechanical behaviour
Typical applications	Automatic transmissions
	Reducing gears

1.2 – AEM (Ethylene acrylate copolymer)

Good resistance	Aggressive mineral oils
Particularities	Good mechanical behaviour
Typical applications	Sensors

1.3 – CR (Polychloroprene)

Good resistance	Mineral greases
	Atmospheric agents
Moderate resistance	Mineral oils
	Water up to 70°C
Low resistance	Fuels
	Water vapour
Particularities	Very good mechanical and abrasion resistance
Typical applications	Industrial air conditioning

1.4 – EPDM (Ethylene propylene)

Very good resistance	Water, steam and aqueous solutions
	Synthetic brake fluid
	Atmospheric agents
	Low temperatures
Low resistance	Mineral oils and hydrocarbons
Particularities	Quite good mechanical behaviour
Typical applications	Hot and cold water valves and fittings
	Drinking water
	SF6 circuit breakers
	Cooling systems
	Brake systems
	Heating systems

1.5 – FKM (Fluorocarbon)

Very good resistance	Heat
	Mineral oils
	Household gas
	Atmospheric agents
	Fuels
Good resistance	Chemicals
	Acids
Low resistance	Bases
	Brake fluid
Particularities	Limited resistance to cold
	Quite good mechanical behaviour
	Good impermeability
Typical applications	High vacuum
	High-temperature hydraulic and pneumatic
	Industrial valves and fittings
	Fuel lines
	Fuel injection

1.6 – HNBR (Hydrogenated nitrile)

Good resistance	Aggressive mineral oils
	Atmospheric agents
	Water, steam
	Dilute bases
Low resistance	Fuels
	Brake fluid
Particularities	Very good mechanical behaviour
	Abrasion resistance
Typical applications	Power steering
	Air conditioning

1.7 – IIR (Butyl)

Very good resistance	Water and steam
	Atmospheric agents
Low resistance	Mineral oils and hydrocarbons
Particularities	Very good gas impermeability
	Relatively poor mechanical behaviour
Typical applications	High vacuum
	Dielectric gas

1.8 – FVMQ (Fluorosilicone)

Very good resistance	Cold
	Mineral oils and hydrocarbons
	Atmospheric agents
	Low temperature
Particularities	Poor mechanical behaviour
Typical applications	Fuel fitting seals
	Electrical

1.9 – NBR (Nitrile)

Good resistance	Mineral oils
	Household gases
	Water up to 70°C
	Fuels
Low resistance	Atmospheric agents
	Acids
Particularities	Good mechanical behaviour
	Good impermeability
Typical applications	Hydraulic and pneumatic
	Water and mineral gas valves and fittings
	Mineral oil and fuel lines

1.10 – VMQ (Silicone)

Very good resistance	Heat
	Atmospheric agents
	Water up to 100°C
	Very low temperatures
Moderate resistance	Mineral oils
	Household gases
Low resistance	Fuels
Particularities	High permeability
	Poor mechanical behaviour
Typical applications	Pharmaceutical
	Cosmetics
	Food industry
	Household electrical

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2–MATERIAL CHARACTERISTICS

2.1–Compression set

Elasticity is the ability of a rubber part to return to its original shape after deformation. The compression set (CS) measures the change in elastic performance over time and under defined operating conditions.

The CS thus measures the permanent (non-elastic) deformation of a material after a force is removed from it.

The elastic properties of rubber can vary depending on time, temperature and the fluids in contact.

Our compounds for O-ring applications have been specially designed to have low CS levels.

The CS is measured as shown on the adjacent pictures.

initial thickness of test slab

constraint => deformation under specific conditions (duration, temperature, fluid)

removal of constraint => elastic recovery

Test method
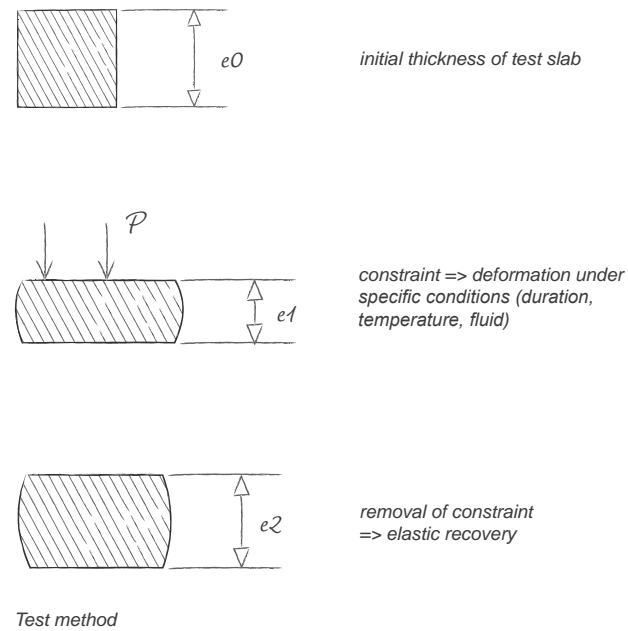
$$CS \% = \frac{e0\text{-}e2}{e0\text{-}e1} \times 100$$

Perfectly elastic body	e2 = e0
Full creep	e2 = e1

The lower the CS value, the better the rubber sealing performance.

CS tests can be performed according to various specifications and standards (e.g. ISO 815).

2.2–Hardness

Hardness characterises the resistance of the material to distortion. It is measured in Shore A (Sh.A) for standardised test pieces and in micro IRHD (International Rubber Hardness Degrees) for parts.

Our range consists of compounds hardness going from 55 to 98 Sh.A.

The hardness directly influences fitting force, assembly force and pressure resistance.

The choice of hardness is a compromise between these influencing factors, while taking into account the fact that excessive pressure can lead to extrusion in case of insufficient hardness. See 3.2 on page 68.

2.2.1–Limit temperatures

Working temperatures depend on numerous factors:

- Environment
- Operating time
- Assembly conditions

Resistance to low temperature is provided as an indication and corresponds to the preservation of a certain flexibility, at an intermediate level between:

- The brittle temperature as determined by the AFNOR NF T 46-018 standard. The brittle temperature is the temperature below which a rubber compound is brittle (loss of elasticity).
- The TR10 temperature as determined by the standards AFNOR NF T 46-032 and ISO 2921 standards.
  A rubber sample brought to a temperature below the brittle temperature regains its elasticity when the temperature rises. TR10 is the temperature at which a stretched sample has recovered 10% of the initial stretch.

The low-temperature resistance of a compound can be affected by the action of a fluid in contact. At low temperatures, slight shrinkage and hardening of the material can cause leakage. These phenomena mainly occurs with gas sealing and when the initial compression rate of the parts is low.

Hardening of the material at low temperature is a reversible phenomenon:
the rubber completely regains its original properties when the temperature rises.
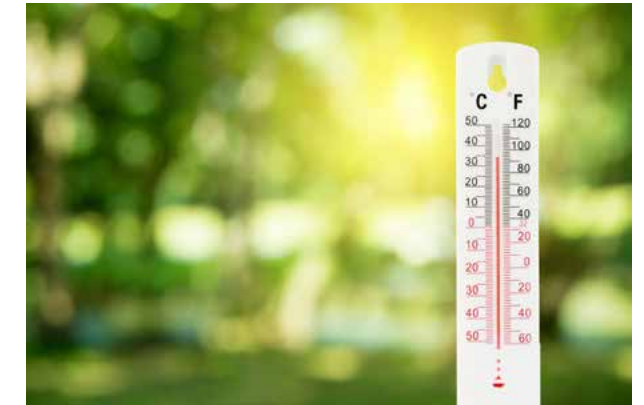
High temperature changes the properties of rubber (reduction in hardness, increase in CS and hence creep).

Rubbers have higher thermal expansion coefficients than metals. At high temperature, the recommended groove sizes are sufficient to cover the expansion of the material.

2.2.2–Observations

The conditions of service (temperature, pressure, friction, etc.) and the combination of several products can significantly alter the aggressiveness of fluids in contact.

It is recommended to carry out tests before final selection of a material.

If the temperature of use is too high, an irreversible change in properties is inevitable, resulting in hardening of the material, a loss of elasticity and a strong deterioration of the compression set.

If the maximum recommended temperatures are respected, the normal change in the characteristics of the compounds should ensure the functionality of the seal.

2.3 – Impact of fluids in contact

2.3.1 – Swelling

Swelling is the penetration of a fluid inside the compound, leading to an increase in volume.

If the compound swells excessively, its properties may change, with the risk of extrusion due to a loss of hardness and mechanical resilience.

In static applications, swelling of up to about 30% by volume of the seal can be considered, with a suitable assembly.

In dynamic applications, swelling of 8 to 10% by volume is generally quite well tolerated.

2.3.2 – Extraction

Some fluids have the ability to extract ingredients from the rubber compound with which they are in contact. The result is a loss of volume and deterioration of the physical, chemical and mechanical properties of the compound (loss of elasticity, increased hardness, etc.).

Extraction leads to a risk of leakage by reducing the cross section of the seal, and hence deformation of the seal in the groove.

Dynamic applications are more sensitive to extraction because the initial compression rate is usually lower than for static applications.

If in doubt about the influence of a fluid, a compatibility test should be performed.

2.3.3 – Chemical attack

Independently of volume effects, in the event of chemical incompatibility, a fluid may cause changes to the characteristics of the rubber over time.

The most common signs are:

- Hardness change
- Appearance of cracks
- Compression set increase

3 – COMPOUND RANGE

3.1 – Development and manufacture of our compounds

Our rubber compounds are formulated and developed in our laboratories and manufactured in our factories. We can therefore guarantee the performance and longevity of our parts.

Integrated into our organisation, production monitoring by the laboratory ensures the repeatability of the performance of our elastomers.

In total, more than 300 specific formulations are available to cover any sealing need, from the following elastomer families:

NBR - EPDM - HNBR - FKM - AEM - ACM – IIR - CR - VMQ- FMVQ.

Most of our compounds are approved by our customers in the automotive and industrial sectors and accredited by recognised international organisations in the fields of drinking water, food, gas and oil.
We monitor the regulations applicable to rubber and their evolution (REACH regulations, health standards).

3.2 – Standard compounds from stock

Standard compounds have been selected to meet a wide range of applications.

Seals made from these materials are kept in stock and are available quickly.

Family	Compound	Hardness Sh.A	Colour	CS (%)	Max peak TºC	TR10 (ºC)		Approvals
NBR	PD501	54	Black	15	120	-30		
NBR	PB701	68	Black	12	120	-20	Gas	EN 549
NBR	7PD1612	74	Black	15*	120	-24	Drinking water Food Gas	CLP, UBA, WRAS... FDA, EC 1935/2004... EN 549
NBR	PC851	78	Black	15	120	-25	Gas	EN 549
EPDM	EP7010	70	Black	12	175	-46		
EPDM	7EP1197	70	Black	12	175	-46	Drinking water, food	ACS, KIWA, WRAS, UBA... FDA, EC 1935/2004... USP Class VI, ACS
EPDM	EP856	80	Black	15	175	-46	Drinking water, food	ACS, CLP, UBA, ACS, WRAS...
EPDM	EP851	80	Black	12	175	-46		
FKM	7DF2067	72	Green	20	250	-15		
FKM	DF801	79	Black	18	250	-14	Gas	EN 549, EN 682
VMQ	6SL2065	64	Translucent blue	22	225	-45	Food	FDA, decree 92

Compression Set conditions:
NBR: 24h at 100°C / *: 24h at 125°C; EPDM: 24h at 150°C; FKM: 72h at 200°C; VMQ: 72h at 150°C

3.3 – Compound selection guide

The following criteria should be taken into account when selecting a compound:

3.3.1 – Selecting the family

- Fluids in contact
- Continuous and peak service temperatures
- Special functional requirements (abrasion resistance, ozone resistance, etc.)

3.3.2 – Selecting the hardness

- Service pressure
- Surface roughness
- Type of use (static or dynamic)
- Service temperature

3.3.3 – Approvals & certifications

- Drinking water
- Gas
- Food

Fluid	Continuous T°C	< – 50 °C	– 50 °C	– 30 °C	+ 70 °C	+ 100 °C	+ 125 °C	+ 150 °C	+ 200 °C
	Peak T°C	< – 50 °C	– 50 °C	– 40 °C	+ 100 °C	+ 125 °C	+ 150 °C	+ 175 °C	+ 250 °C
Water Water vapour Coolant		VMQ	EPDM VMQ	EPDM FKM NBR VMQ	EPDM FKM NBR VMQ	EPDM FKM VMQ	EPDM FKM VMQ	EPDM	
Compressed air		VMQ	VMQ	FKM NBR VMQ	FKM NBR VMQ	FKM VMQ	FKM VMQ	FKM	FKM
Mineral oils Oil & Gas products				FKM NBR	FKM NBR	FKM NBR	FKM	FKM	FKM
Food products				VMQ EPDM NBR approved	VMQ EPDM NBR approved	VMQ EPDM NBR approved	VMQ EPDM approved	

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3.4 – Usual compounds overview

In addition to standard compounds from stock, we have a wide range of compounds from many elastomer families.

The following table will help you to make your choice according to your needs. Compounds are classified by family and then by increasing hardness.

Compound	Family	Hardness Sh.A	Approvals	Particularities	Colour*	Min T°C	Max cont. T°C	Max peak T°C	CS %	CS conditions	Tensile strength	Elongation at break	TR 10 °C	Brittle T°C
NBR														
5PD1883	NBR	54			●	-30	100	120	15	24h 100°C	12	400	-30	-40
PD501	NBR	54			●	-30	100	120	15	24h 100°C	12	400	-30	-40
6PB1729	NBR	61	Gas: EN 549 - H3B1		●	-30	100	120	12	24h 100°C	17	450	-26	-35
6PB2053	NBR	61		Diesel resistant Ozone resistant	●	-25	100	120	12	24h 100°C	13	470	-20	-30
6PB2064	NBR	61		Diesel resistant Ozone resistant Colour	●	-25	100	120	11	24h 100°C	17	400	-20	-30
7PB1860	NBR	68		Self-lubricating Ozone resistant	●	-30	100	120	11	24h 100°C	16	350	-27	-35
PB701	NBR	68	Gas: EN549 - H3B2		●	-30	100	120	12	24h 100°C	17	400	-20	-30
7PB1871	NBR	69	Gas: EN682 - GBL	Ozone resistant	●	-35	90	120	12	24h 100°C	18	340	-32	-40
7PB496	NBR	69	Gas: EN549 - H3B1		●	-30	110	130	10	24h 100°C	20	370	-25	-35
7PD1630	NBR	70		Low T°C resistant	●	-50	100	130	12	24h 100°C	18	275	-45	-55
7PD1612	NBR	74	Food: FR, USA Drinking water: DE, FR, GB, USA Gas: EN549 - H3B2		●	-30	100	130	15	24h 125°C	21	225	-24	-35
8PB1390	NBR	74			●	-30	110	130	12	24h 100°C	20	325	-27	-36
9PD31	NBR	78		X-Ring only	●	-30	100	120	15	24h 100°C	17	225	-25	-35
PC851	NBR	78	Gas: EN549 - H3B1		●	-30	100	120	15	24h 100°C	17	225	-25	-35
PD853	NBR	79		Low T°C resistant	●	-40	90	120	15	24h 100°C	17	175	-35	-50
9PC1708	NBR	87			●	-25	90	120	15	24h 100°C	20	170	-25	-30
8PA1393	NBR / PVC	77		Ozone resistant	●	-30	90	120	20	24h 100°C	14	270	-24	-35
EPDM														
6EP1713	EPDM	55		Self-lubricating	●	-55	120	160	17	24h 150°C	12	500	-50	-60
6EP1385	EPDM	60			●	-55	130	175	18	24h 150°C	13	350	-50	-60
6EP1862	EPDM	60	Food: FR, USA Drinking water: DE, FR, GB, IT		●	-55	130	175	18	24h 150°C	13	350	-50	-60
7EP1722	EPDM	65		Self-lubricating	●	-50	125	165	20	24h 150°C	12	280	-46	-55
7EP2106	EPDM	68		Colour	●	-50	140	170	15	24h 150°C	11	330	-50	-55
7EP1197	EPDM	70	Food: FR, USA Drinking water: DE, FR, GB, IT, NL, USA		●	-50	140	175	12	24h 150°C	14	180	-46	-55
7EP1726	EPDM	70			●	-50	110	150	25	24h 125°C	14	350	-46	-55
EP7010	EPDM	70			●	-50	140	175	12	24h 150°C	14	180	-46	-55
8EP2058	EPDM	78		Colour	●	-50	140	175	10	24h 150°C	12	190	-46	-55
8EP2147	EPDM	78		Colour Air conditioning	●	-50	140	170	10	24h 150°C	13	270	-46	-55
EP851	EPDM	80			●	-50	140	175	12	24h 150°C	16	160	-46	-55

Compound	Family	Hardness Sh.A	Approvals	Particularities	Colour*	Min T°C	Max cont. T°C	Max peak T°C	CS %	CS conditions	Tensile strength	Elongation at break	TR 10°C	Brittle T°C
EP856	EPDM	80	Food: FR, USA Drinking water: DE, FR, GB		●	-50	140	175	15	24h 150°C	16	160	-46	-55
9EP2094	EPDM	90			●	-45	140	170	10	24h 150°C	16	95	-46	-55
FKM														
DF651	FKM	62			●	-25	200	250	22	72h 200°C	11	250	-15	-27
6DF2060	FKM	64		Colour	●	-25	200	250	20	72h 200°C	14	200	-15	-27
6DF1882	FKM	65		Colour	●	-25	200	250	11	72h 200°C	11	180	-18	-30
6DF2087	FKM	66		Improved resistance to fuels containing alcohol	●	-25	200	250	28	72h 200°C	13	250	-13	-23
DF701	FKM	68	Gas: EN549 - H3E1		●	-25	200	250	20	72h 200°C	13	210	-14	-25
7DF2355	FKM	71		Acid resistant	●	-25	200	250	25	72h 200°C	23	320	-17	-27
7DF2067	FKM	72		Colour	●	-25	200	250	20	72h 200°C	14	180	-15	-25
7DF2371	FKM	73	certified ECE R110, ISO 15500-2, ANSI NGV3.1-2014	CNG & LPG applications	●	-40	200	250	25	72h 200°C	16	190	-40	-45
7DF2116	FKM	74		Colour, Low T°C resistant	●	-35	200	250	25	72h 200°C	13	290	-28	-35
7DF2148	FKM	74		Low T°C resistant	●	-35	200	250	23	72h 200°C	18	260	-28	-35
8DF1368	FKM	74			●	-25	200	250	20	72h 200°C	15	175	-15	-25
7DF1719	FKM	75			●	-25	200	250	22	72h 200°C	15	200	-18	-28
7DF2352	FKM	75		Low T°C resistant	●	-40	200	250	25	72h 200°C	16	180	-35	-40
8DF1872	FKM	77		Colour	●	-25	200	250	20	72h 200°C	16	160	-15	-25
7DF2075	FKM	78	Gas: EN549 - H3E1	Colour	●	-25	200	250	23	72h 200°C	14	180	-18	-28
DF801	FKM	79	Gas: EN549 - H3E1, EN682 - H80		●	-25	200	250	18	72h 200°C	15	175	-14	-25
DF851	FKM	84			●	-25	200	250	20	72h 200°C	14	175	-14	-23
DF901	FKM	91			●	-25	200	250	20	72h 200°C	16	140	-14	-23
V95	FKM	95	Oil & Gas: Norsok M710, Total GS PVV 142	Oil & Gas resistant RGD	●	-25	200	250	25	72h 200°C	22	130	-15	-17
HNBR														
6DT2078	HNBR	60		Self-lubricating Improved oil resistance	●	-30	130	170	22	72h 150°C	18	420	-22	-50
7DT1870	HNBR	66	Gas: EN549 - H3C1	Colour	●	-30	130	170	27	72h 150°C	17	350	-22	-50
7DT1877	HNBR	70		Improved oil resistance, Colour	●	-30	125	165	22	72h 150°C	22	320	-22	-50
7DT2146	HNBR	70	Gas: EN549 - H3B2, EN682 - GBL	Colour	●	-35	130	160	27	72h 150°C	17	260	-29	-50
7DT1743	HNBR	71		Colour	●	-30	130	170	27	72h 150°C	19	320	-22	-50
7DT1593	HNBR	72			●	-30	130	170	25	72h 150°C	23	260	-20	-50
7DT2072	HNBR	72		Low T°C resistant	●	-40	130	160	34	72h 150°C	18	240	-35	-50
7DT2091	HNBR	72		Colour Low T°C resistant	●	-40	130	170	25	72h 150°C	16	280	-35	-50
7DT2074	HNBR	73		Colour, Self-lubricating, Improved oil resistance	●	-30	125	165	24	72h 150°C	21	340	-21	-50
7DT1730	HNBR	75		Colour	●	-30	130	170	27	72h 150°C	20	300	-21	-50
7DT2080	HNBR	75	Gas: EN549 - H3C1	Colour Self-lubricating	●	-30	130	170	29	72h 150°C	19	300	-22	-50
7DT2373	HNBR	77	certified ECE R110, ISO 15500-2, ANSI NGV3.1-2014	CNG & LPG applications	●	-35	130	160	35	72h 150°C	19	210	-33	-50
8DT1724	HNBR	82			●	-30	130	170	22	72h 150°C	22	200	-18	-50
9DT1889	HNBR	90		Colour Improved oil resistance	●	-30	125	165	24	72h 150°C	22	200	-20	-50
ACM														
DA65	ACM	55	Gas: EN549 - H2C1		●	-20	150	175	35	24h 150°C	12	225	-12	-13
7DA1163	ACM	68			●	-25	150	175	35	24h 150°C	12	200	-20	-22
8DA1398	ACM	71			●	-25	150	175	35	24h 150°C	13	220	-18	-20
DA80	ACM	75	Gas: EN549 - H3C1		●	-20	150	175	35	24h 150°C	13	190	-11	-12
AEM														
6DE2142	AEM	60		No DOTG Self-lubricating	●	-35	155	175	18	72h 150°C	13	240	-26	-35
6DE2395	AEM	62		Colour	●	-35	130	160	40	72h 150°C	13	360	-30	-40
7DE2138	AEM	73		No DOTG	●	-35	160	180	18	72h 150°C	17	230	-26	-40
7DE2144	AEM	73		No DOTG Improved low T°C resistance	●	-40	160	180	18	72h 150°C	17	230	-32	-45
CR														
6N1851	CR	60			●	-45	90	125	20	24h 100°C	18	350	-44	-50
7N1747	CR	71			●	-45	90	125	15	24h 100°C	20	250	-42	-50
IIR														
D706	IIR	67			●	-45	125	175	10	24h 125°C	13	240	-40	-50
VMQ														
SL1010	VMQ	52		Colour	●	-50	200	225	20	72h 150°C	6	275	-45	-70
SL1002	VMQ	60	Gas: EN549 - H2E2	Colour	●	-50	200	225	20	72h 150°C	7	250	-45	-70
6SL2136	VMQ	63	Food: FR, USA	Food contact, Colour	○	-50	200	225	28	72h 150°C	9	550	-45	-70
6SL2065	VMQ	64	Food: FR, USA	Colour	●	-50	200	225	22	72h 150°C	10.5	500	-45	-70
6SL2141	VMQ	66		Heat resistant	●	-50	225	250	50	72h 150°C	9	310	-45	-70
7SL1746	VMQ	71		Colour	●	-50	200	225	10	72h 150°C	8	320	-45	-70
SL1000	VMQ	72	Gas: EN549 - H3E2	Colour	●	-50	200	225	15	72h 150°C	8	180	-45	-70
FVMQ														
7SF2081	FVMQ	74		Colour	●	-60	175	200	13	72h 150°C	8	250	-60	-70
7SF2084	FVMQ	74		Colour	●	-60	175	200	9	72h 150°C	8	250	-60	-70
8SF2062	FVMQ	81		Colour	●	-60	175	200	15	72h 150°C	9	174	-46	-65

*Non-representative colours

ELASTOMERS & COMPOUNDS

3.5 – Chemical compatibility

The following tables indicate the appropriate elastomer families for different products, in the order of recommendation.

The conditions of service (temperature, pressure, friction, etc.) and the combination of several products can significantly change the aggressiveness of fluids in contact.

It is recommended that tests to carry out tests before final selection of an elastomer.

Key:

*: extreme fluid: No elastomer is unaltered when in contact with this fluid. The specified product families are those with the least poor resistance.

Food

Product	Recommended elastomers
Animal fat	EPDM - NBR - CR
Beer	NBR - CR - EPDM - IIR
Butter	NBR - EPDM - CR - VMQ
Castor oil	IIR - NBR - EPDM - CR
Coffee	EPDM, NBR, FKM, VMQ, HNBR
Cotton oil	NBR - EPDM - VMQ - FKM
Fruit juice	All elastomers
Gelatin	EPDM, NBR, HNBR, VMQ, FKM
Glucose	EPDM, NBR, HNBR, VMQ, FKM
Lard	NBR - CR - FKM
Milk	NBR - CR - EPDM - IIR
Molasses	EPDM - IIR
Olive oil	NBR - IIR - EPDM - CR
Sweet juice	All elastomers
Vegetable fat	EPDM - NBR - CR
Vegetable oil	NBR - EPDM
Vinegar	EPDM - CR - NBR
Water (<70°C)	NBR - EPDM
Water (>70°C)	EPDM - IIR - HNBR
Whisky	EPDM - CR - NBR
Wine	EPDM - CR - NBR

Petroleum derivatives

Product	Recommended elastomers
Aliphatic compounds	NBR - CR - FKM
Aromatic compounds (<40% aromatics)	NBR - FKM - FVMQ
Aromatic compounds (>40% aromatics)	FKM - FVMQ
Asphalt	FKM - NBR
Butadiene	NBR - FKM
Butylene	FKM - NBR
Decahydronaphthalene	FKM - FVMQ
Decaline	FKM - FVMQ
Ethylene	NBR - FKM - FVMQ
Fuel oil	NBR - FKM - FVMQ
Household heating oil	NBR - FKM - FVMQ
Kerosene	NBR - FKM - FVMQ
Mineral greases	NBR - CR - FKM - HNBR
Mineral oils	NBR - FKM - CR - FVMQ
n-Pentane	NBR - FKM
Naphtha (solvent)	NBR - FKM - FVMQ
Naphthalene	FKM - FVMQ
Paraffin	NBR - CR - FKM
Petroleum	NBR - FKM - FVMQ
Tetralin	FKM - FVMQ - NBR

Freons

Product	Recommended elastomers
Freon 11	NBR - FKM - CR
Freon 112	NBR - CR - FKM
Freon 113	NBR - CR - FKM
Freon 114	NBR - CR - FKM
Freon 114 b 2	CR - FKM
Freon 115	EPDM - NBR - CR
Freon 12	NBR - CR - FKM
Freon 13	EPDM - NBR - CR - FKM
Freon 13 b 1	EPDM - NBR - CR - FKM
Freon 134 a	CR - EPDM - HNBR
Freon 142 b	CR - FKM
Freon 152 a	EPDM - NBR - CR
Freon 21	CR
Freon 218	EPDM - NBR - CR
Freon 22	CR
Freon 31	EPDM - CR - IIR
Freon 32	EPDM - CR - IIR
Freon 502	CR - NBR - FKM
Freon BF	NBR - CR
Freon C 316	NBR - CR
Freon C 318	EPDM - NBR - CR
Freon MF	NBR - FKM
Freon TA	EPDM - NBR - CR
Freon TC	EPDM - NBR - CR
Freon TF	NBR - CR

Common gases

Common gases

Product	Recommended elastomers
Acetylene	NBR - EPDM - FKM
Ammonia (hot gas)	EPDM - VMQ - IIR - HNBR
Ammonia (cold gas)	EPDM - IIR - NBR - VMQ - HNBR
Nitrogen	All elastomers (for impermeability: IIR - NBR)
Carbon dioxide	EPDM - NBR - CR
Butane	NBR - FKM
Moist chlorine	FKM - FVMQ
Dry chlorine	FKM
Ethane	NBR - FKM - FVMQ
Diesel oil	NBR - FKM - FVMQ
Carbon dioxide	EPDM - NBR - CR
Coke oven gas	FKM - VMQ - FVMQ
Blast furnace gas	FKM - NBR - VMQ
Natural gas	NBR - FKM
Helium	All elastomers (for impermeability: IIR - NBR)
Hydrogen	All elastomers (for impermeability: IIR - NBR)
Hydrogen sulphide	EPDM - IIR - CR - HNBR
Krypton	All elastomers (for impermeability: IIR - NBR)
Methane	NBR - FKM - HNBR
Oxygen (hot gas)	VMQ - FKM
Oxygen (cold gas)	EPDM - IIR - FKM - VMQ
Ozone	Depends on concentration
Propane	NBR - FKM
Propene	FKM - NBR
Propylene	FKM - NBR
Water vapour	IIR - EPDM - HNBR
Xenon	All elastomers (for impermeability: IIR - NBR)

Common chemicals

Product	Recommended elastomers
Acetic acid 30%	EPDM - CR - VMQ
Acetone	EPDM
Ammonia	EPDM - CR - IIR - HNBR
Aniline	EPDM - FKM
Benzene	FKM - FVMQ
Bleach	EPDM
Chloroform	FKM - FVMQ
Citric acid	All elastomers
Cyclohexane	NBR - FKM - FVMQ
Denatured alcohol	EPDM - NBR - CR
Dimethyl ketone	EPDM
Dimethyl sulfoxide	EPDM - VMQ
Ethanol	EPDM - NBR - FKM
Ether	EPDM - IIR - NBR
Ethyl alcohol	EPDM - NBR - FKM
Ethylene glycol	EPDM - IIR
Formaldehyde	EPDM - IIR - FKM - NBR
Formol	EPDM - IIR - FKM - NBR
Glacial acetic acid	EPDM - VMQ
Glycerine	EPDM - CR - NBR
Hydrochloric acid, 37%	EPDM - FKM
Hydrogen peroxide	EPDM - FKM - VMQ
Methyl alcohol	EPDM - NBR - CR
Nitric acid (diluted)	FKM - EPDM
Ordinary alcohol	EPDM - NBR - FKM
Phosphoric acid, 20%	EPDM - FKM
Phosphoric acid, 45%	EPDM
Phosphoric acid, pure	EPDM
Sea water	NBR - EPDM - HNBR - FKM
Sulphuric acid, 60%	FKM
Sulphuric acid, diluted	EPDM - FKM
Turpentine	NBR - FKM - FVMQ

Product	Recommended elastomers
Carbon tetrachloride	FKM - FVMQ
Glycerol	EPDM - CR - NBR
Glycol	EPDM - IIR
Hexane	NBR - FKM - CR
Hexanol	NBR - FKM - EPDM
Hydrogen peroxide	EPDM - FKM - VMQ
Linseed oil	EPDM - NBR
Methanal	EPDM - IIR - FKM - NBR
Methanol	EPDM - NBR - CR
Methyl ethyl ketone	EPDM - IIR
Naphthalene	FKM - FVMQ
Oxygen (liquid)	VMQ - FKM - FVMQ
Pentane*	NBR - FKM
Potash	EPDM - CR - IIR - HNBR
Potassium hydroxide	EPDM - CR - IIR - HNBR
Soap solution	NBR - EPDM - HNBR - FKM
Sodium hydroxide	EPDM - CR - IIR - HNBR
Sodium hydroxide	EPDM - CR - IIR - HNBR
Toluene	FKM - FVMQ
Vaseline	NBR - FKM - FVMQ
White spirit	NBR - FKM - FVMQ
Xylene	FKM - FVMQ

*: **extreme fluid:** No elastomer is unaffected in its presence: the specified product families are those with the least poor resistance.

Chemical specialities

Product	Recommended elastomers
Acetaldehyde	EPDM - VMQ
Acetaldehyde	EPDM - VMQ
Acetamide	EPDM - IIR - VMQ
Acetic anhydride	CR - EPDM
Acetic ether	EPDM
Acetonitrile	CR - EPDM - IIR
Acetonitrile	CR - EPDM - IIR
Acetophenone	EPDM - IIR
Acetyl chloride	FKM - FVMQ
Acetylene tetrabromide	FKM - FVMQ - EPDM
Acetylene tetrachloride	FKM - FVMQ
Acetyl ricinoleate / butyl acetyl ricinoleate	EPDM - IIR
Acrolein	EPDM - IIR
Acrylic acid	FKM
Acrylic aldehyde	EPDM - IIR
Acrylic nitrile	CR
Acrylonitrile*	CR
Adipic acid	NBR - FVMQ
Alum	EPDM - NBR
Aluminium acetate	EPDM
Aluminium chloride	EPDM - NBR
Aluminium fluoride	EPDM - CR - NBR
Aluminium nitrate	EPDM - NBR
Aluminium phosphate	EPDM - NBR
Aluminium sulphate	EPDM - NBR
Ammonium carbonate	EPDM - NBR
Ammonium chloride	EPDM - NBR
Ammonium hydroxide	EPDM - CR - IIR - HNBR
Ammonium nitrate	EPDM - NBR
Ammonium nitrite	EPDM - IIR
Ammonium persulphate	EPDM - IIR
Ammonium phosphate	EPDM - NBR
Ammonium sulphate	EPDM - NBR
Amyl alcohol	EPDM - IIR - NBR
Amyl borate	NBR - CR
Aniline oil	EPDM - IIR

Product	Recommended elastomers
Anthracene oil	FKM
Arsenic acid	EPDM - NBR - CR - FKM
Arsenic trichloride	NBR - CR
Barium chloride	EPDM - NBR
Barium hydroxide	EPDM - CR - IIR - HNBR
Barium sulphate	EPDM - NBR
Benzaldehyde	EPDM - IIR
Benzoic acid	FKM - FVMQ - VMQ
Benzoic aldehyde	EPDM - IIR
Benzyl / dibenzyl sebacate	FKM - EPDM
Benzyl alcohol	FKM - EPDM - IIR - FVMQ
Benzyl benzoate	FKM - FVMQ - EPDM
Benzyl chloride	FKM - EPDM - IIR - FVMQ
Borax	EPDM - NBR - FKM
Boric acid	EPDM - NBR - VMQ - FKM
Bromine (anhydrous)	FKM - FVMQ
Bromine water	FKM - FVMQ
Bromobenzene	FKM - FVMQ
Butanol	EPDM - NBR - FKM
Butyl / dibutyl phthalate	FKM - VMQ - EPDM
Butyl / dibutyl sebacate	FKM - EPDM
Butyl acetate	EPDM
Butyl acrylate*	EPDM - IIR
Butylamine	VMQ - EPDM
Butyl benzoate	EPDM - FKM - FVMQ
Butyl carbitol acetate	EPDM - IIR
Butyl carbitol	EPDM - NBR - IIR
Butyl diethylene glycol acetate	EPDM - IIR
Butyl diglycol acetate	EPDM - IIR
Butyl glycol acetate	EPDM - IIR
Butyl glycol	EPDM - IIR
Butyl lactate	NBR
Butyl maleate	EPDM - IIR
Butyl oleate	NBR - FKM
Butyl stearate	NBR
Butyraldehyde	EPDM - CR - IIR

*: **extreme fluid:** No elastomer is unaffected in its presence: the specified product families are those with the least poor resistance.

Product	Recommended elastomers
Butyric acid	EPDM
Calcium carbonate	EPDM - NBR
Calcium chloride	EPDM - NBR
Calcium hydroxide	NBR - EPDM - CR - HNBR
Calcium hypochlorite	IIR - EPDM
Calcium nitrate	EPDM - NBR
Calcium sulphate	EPDM - NBR
Caprolactam	EPDM - IIR
Carbitol acetate	EPDM - CR - NBR - FKM
Carbitol	EPDM - NBR - IIR
Carbon disulphide	FKM - FVMQ
Carbon disulphide	FKM - FVMQ
Carbonic acid	EPDM - NBR - CR
Carbonic anhydride	EPDM - NBR - CR
Carbon monoxide	NBR - EPDM - IIR
Carbon tetrabromide	FKM - FVMQ
Chlorinated biphenyls	FKM
Chlorine dioxide	FKM - EPDM
Chlorine trifluoride	FKM - FVMQ
Chloroacetic acid	EPDM - CR - FKM
Chlorobenzene	FKM - FVMQ
Chlorobromomethane	FKM - FVMQ - EPDM
Chloroethane	FKM - EPDM - NBR - FVMQ
Chloronaphthalene	FKM - FVMQ
Chloropropionic acid	EPDM - IIR - FKM
Chlorotoluene	FKM
Chromic acid	EPDM
Chromic anhydride	FKM
Cobalt chloride	EPDM - NBR
Copper acetate	EPDM - IIR
Copper chloride	EPDM
Copper sulphate	EPDM
Creosote oil	NBR - EPDM - IIR
Cresols	FKM - IIR
Cumene	FKM - FVMQ
Cyclohexanecarboxylic acid	FKM - NBR
Cyclohexanol	CR - FKM - FVMQ

Product	Recommended elastomers
Cyclohexanone	IIR
Cyclohexyl acetate	EPDM - IIR
Decane	NBR - FKM - FVMQ
Diacetone alcohol	EPDM - IIR
Diacetone	EPDM - IIR
Dibenzyl ether	EPDM - IIR
Dibromodifluoromethane	FKM
Dibromoethylene	FKM
Dibromomethane	FKM
Dibutyl diethylene glycol	EPDM - IIR
Dibutyl ethylene glycol	EPDM - IIR
Dibutyl glycol	EPDM - IIR
Dibutyl phthalate	FKM - VMQ - EPDM
Dibutyl sebacate	FKM - EPDM
Dibutyl "carbitol"	EPDM - IIR
Dichloroacetic acid	EPDM - FKM
Dichlorobenzene	FKM
Dichlorodifluoromethane	FKM
Dichloroethane	FKM
Dichloroisopropyl ether	ACM
Dichloromethane	FKM - EPDM
Dicyclohexylamine*	NBR
Diethanolamine*	NBR
Diethylamine	VMQ
Diethylbenzene	FKM - FVMQ
Diethylene glycol acetate	EPDM - CR - NBR - FKM
Diethylene glycol	EPDM - CR
Diethylene glycol stearate	NBR
Diethyl ether	EPDM - IIR - NBR
Diglycol acetate	EPDM - CR - NBR - FKM
Diisobutylene	NBR - FKM
Diisopropyl benzene	FKM - FVMQ
Diisopropyl ketone	EPDM - IIR
Dimethylamine	EPDM - VMQ
Dimethylaniline	EPDM
Dimethylformamide	EPDM
Dinitrotoluene*	FKM

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Product	Recommended elastomers
Dioxalane	EPDM
Dioxane	EPDM - IIR
Dipentene	FKM - NBR
Diphenyl	FKM - FVMQ
Diphenyl oxide	EPDM - FKM
Diphenyl oxide	FVMQ - FKM
Dry cleaning products	FKM - FVMQ
Ethanolamine	EPDM - NBR - VMQ
Ethyl / diethyl sebacate	FKM - EPDM - VMQ
Ethyl acetate	EPDM
Ethyl acetoacetate	EPDM - IIR
Ethyl acetoacetate	EPDM - IIR
Ethyl acrylate*	EPDM - IIR
Ethyl aldehyde	EPDM - VMQ
Ethylbenzene	FKM - FVMQ
Ethyl benzoate	EPDM - FKM - FVMQ
Ethyl cellulose	NBR - CR - EPDM
Ethyl chloride	EPDM - NBR - FKM
Ethyl chlorocarbonate	FKM - FVMQ
Ethyl chloroformate	FKM - FVMQ
Ethylene chloride	FKM - FVMQ - EPDM
Ethylenediamine	EPDM - NBR - CR - VMQ
Ethylene glycol acetate	EPDM - IIR
Ethylene glycol acrylate*	EPDM - IIR
Ethylene oxide*	EPDM - IIR - VMQ
Ethyl formate	EPDM - FKM
Ethyl glycol acetate	EPDM - IIR
Ethyl glycol acetate	EPDM - IIR
Ethyl glycol acrylate*	EPDM - IIR
Ethyl glycol	EPDM - IIR
Ethyl lactate	NBR
Ethyl mercaptan	FKM
Ethyl pentachlorobenzene	FKM - FVMQ
Ethyl propyl acrolein	IIR
Ethyl silicate	EPDM - NBR - CR - FKM
Ferric chloride	EPDM - CR - NBR
Ferric nitrate	NBR - EPDM

Product	Recommended elastomers
Ferric sulphate	EPDM - NBR
Fluoboric acid	EPDM - NBR - CR
Fluoroacetic acid	EPDM - CR
Fluorobenzene	FKM - FVMQ
Fluorochloroethylene	FKM
Fluorosilicic acid	EPDM - CR - NBR
Fluorotrichloromethane	FKM
Formic acid	EPDM - CR
Formic aldehyde	EPDM - IIR - FKM - NBR
Furan*	EPDM
Furfural	EPDM - IIR - CR
Furfuran	EPDM - IIR
Furfurol	IIR - EPDM
Gallic acid	FKM - FVMQ
Glycol acetate	EPDM - IIR
Hexachlorobenzene	FKM
Hexachlorocyclohexane	FKM
Hexachloroethane	FKM
Hexachlorophene	FKM
Hexanal	EPDM - IIR - VMQ
Hexene	NBR - FKM - CR
Hexyl alcohol	NBR - FKM - EPDM
Hexyl aldehyde	EPDM - IIR - VMQ
Hydrazine hydrate	IIR - EPDM
Hydrazine	IIR - EPDM
Hydrobromic acid	EPDM - FKM
Hydrocyanic acid	NBR - EPDM - FKM
Hydrofluoric acid	FKM - EPDM
Hydrogen sulphide	EPDM - NBR
Hydroquinone	EPDM - IIR - CR
Iodoform	EPDM - IIR
Isobutyl alcohol	EPDM - NBR - FKM
Isooctane	NBR - FKM
Isophorone	EPDM - IIR
Isopropyl acetate	EPDM - IIR
Isopropyl alcohol	EPDM - NBR
Isopropyl chloride	FKM - FVMQ

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Product	Recommended elastomers
Isopropyl ether	CR - NBR
Lactic acid	EPDM - NBR - CR
Lead acetate	EPDM - IIR
Lead nitrate	EPDM - NBR
Magnesium chloride	EPDM - NBR
Magnesium hydroxide	EPDM - CR - IIR
Magnesium sulphate	EPDM - NBR
Maleic acid	FKM
Maleic anhydride	FKM
Malic acid	NBR - CR - VMQ
Mercuric chloride	EPDM - NBR
Mercurous chloride	EPDM - NBR
Mercury	All elastomers
Mesityl oxide	EPDM - IIR
Methacrylic acid	EPDM - CR - FKM
Methyl / dimethyl phthalate	EPDM - IIR
Methyl acetate	EPDM - IIR
Methyl acrylate*	EPDM - IIR
Methylacrylic acid	EPDM - CR - FKM
Methyl bromide	FKM - FVMQ
Methyl butyl ketone	EPDM
Methyl chloride	FKM - EPDM
Methyl cyanide	CR - EPDM - IIR
Methylcyclopentane	NBR - FVMQ - FKM
Methylene chloride	FKM - EPDM
Methyl formate	EPDM - IIR - CR
Methyl isobutyl ketone*	EPDM
Methyl methacrylate*	VMQ
Methyl oleate	NBR - FKM
Methyl salicylate	EPDM - IIR
Monochlorobenzene	FKM - FVMQ
Monochloroethane	FKM - EPDM - NBR - FVMQ
Monoethanolamine	EPDM - IIR - VMQ
Naphthenic acid	FKM - NBR
Naphthoic acid	FKM - NBR - FVMQ
Nickel acetate	EPDM
Nickel chloride	EPDM - NBR
Nickel sulphate	EPDM - NBR

Product	Recommended elastomers
Nitrobenzene	FKM - EPDM
Nitroethane	EPDM - IIR
Nitrogen peroxide*	IIR - EPDM
Nitromethane	EPDM - IIR
Nitropropane	EPDM - IIR
Nitrotoluene	FKM
Octane	NBR - FKM - FVMQ
Octyl / dioctyl phthalate	NBR - EPDM
Octyl / dioctyl sebacate	FKM - EPDM
Octyl acetate	EPDM
Octyl adipate	NBR - FVMQ
Octyl alcohol	FKM - EPDM
Oleic acid	EPDM - NBR - FKM
Oxalic acid	EPDM - NBR - FKM
Palmitic acid	NBR - CR - EPDM
Paradichlorobenzene	FKM - FVMQ
Perchloric acid	EPDM - FKM
Perchlorobenzene	FKM
Perchloroethylene	FKM - FVMQ
Petroleum ether	NBR - FKM
Phenol	FKM - EPDM
Phenylhydrazine	FKM
Phorone	EPDM - IIR
Picric acid, pure	FKM
Picric acid in solution	NBR - EPDM
Pinene	FKM - NBR
Polyglycols	EPDM
Potassium acetate	EPDM - IIR
Potassium chloride	EPDM - NBR
Potassium cyanide	EPDM - NBR
Potassium nitrate	EPDM - NBR
Potassium sulphate	EPDM - NBR
Propionic acid	IIR - EPDM - FKM
Propyl acetate	EPDM - IIR
Propyl alcohol	EPDM - NBR
Propyl chloride	FKM
Propylene chloride	FKM
Propylene glycol	EPDM - IIR

Product	Recommended elastomers
Prussic acid	NBR - EPDM - FKM
Pyridine	IIR - EPDM
Pyroligneous acid	EPDM - CR
Pyrrole	VMQ - FVMQ
Salicylic acid	EPDM - NBR - FKM
Sebacic oils	NBR - FKM
Sewage	EPDM - NBR - IIR
Silicic oils	CR - FKM - FVMQ
Silicone oil	All elastomers except VMQ
Silicones (oils and greases)	All elastomers except VMQ
Sodium acetate	EPDM - IIR
Sodium bicarbonate	NBR - EPDM - IIR
Sodium borate	EPDM - NBR - FKM
Sodium carbonate	EPDM - NBR
Sodium chloride	NBR - EPDM
Sodium cyanide	EPDM - NBR
Sodium hypochlorite	EPDM
Sodium metaphosphate	EPDM - IIR - NBR
Sodium nitrate	EPDM - IIR
Sodium perborate	EPDM - IIR
Sodium peroxide	EPDM - IIR - FKM
Sodium phosphate	EPDM - NBR
Sodium silicate	EPDM - NBR - CR - FKM
Sodium sulphate	EPDM - NBR
Sodium thiosulphate	EPDM - NBR
Stannous chloride	NBR - FKM
Stearic acid	EPDM - NBR - CR
Stearine	EPDM - NBR - CR
Styrene	FKM - FVMQ
Sulphur chloride	FKM - FVMQ
Sulphur	EPDM - IIR - FKM
Sulphur hexafluoride	CR - EPDM - IIR
Sulphuric anhydride	FKM - EPDM
Sulphurous acid	FKM
Sulphurous anhydride	FKM - EPDM
Tannic acid	EPDM - NBR - CR - FKM
Tannin	EPDM
Tartaric acid	NBR - EPDM - CR - FKM

Product	Recommended elastomers
Terpene	FKM
Terpineol	FKM
Terpinolene	FKM
Tetrabromoethane	FKM - FVMQ
Tetrabromomethane	FKM - FVMQ
Tetrachloroethane	FKM - FVMQ
Tetrachloroethylene	FKM - FVMQ
Tetrachloromethane	FKM - FVMQ
Tetraethyl lead	NBR - FKM - FVMQ
Tetrahydrofuran	EPDM - IIR
Tetrahydronaphthalene	FKM - FVMQ
Thionyl chloride	FKM
Thymol	EPDM
Titanium tetrachloride	FKM - FVMQ
Toluol	FKM - FVMQ
Triacetin	EPDM - NBR - CR
Triacetin glycerol	EPDM - NBR - CR
Tributyl phosphate	EPDM - IIR
Tributylphosphate	EPDM - IIR
Trichloroacetic acid	EPDM - NBR - CR
Trichloroethane	FKM - FVMQ
Trichloroethylene	FKM - FVMQ
Trichlorofluoromethane	FKM - FVMQ
Tricresyl phosphate	EPDM - FKM
Tricresyl phosphate	EPDM - FKM
Triethanolamine	NBR - EPDM - CR - IIR
Triethylamine	CR
Trinitrotoluene	FKM - CR - FVMQ
Trioctyl phosphate	EPDM - FKM
Trioctylphosphate	EPDM - FKM
Turpentine	NBR - FKM - FVMQ
Vinyl acetate	EPDM - IIR
Vinyl chloride	FKM - EPDM
Vinylidene chloride	FKM
Xylidine*	NBR
Zinc acetate	EPDM - IIR
Zinc chloride	EPDM
Zinc sulphate	EPDM - NBR

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3.6 – Official market approvals

3.6.1 – Food

To ensure consumer safety, the regulations concerning rubbers coming in contact with water or food products for human consumption have changed considerably in recent years.
The changes have strengthened requirements and led to systematic checks on parts and means of production.

With its dedicated teams of experts, Hutchinson is able to understand and monitor these regulations and can offer compounds with the most recent approvals for drinking water or food.

Official certificates are provided to our customers on request.

Decree of 25.11.1992 (France)

Order concerning silicone materials and products in contact with foodstuffs, food products and beverages.

Decree of 05.08.2020 (France)

Order concerning rubber materials and products in contact with foodstuffs, food products and beverages (replace the decree 09.11.94).

FDA (USA)

Compliance with FDA requirements for components of articles intended for contact with foodstuffs, in particular FDA-21CFR §177.2600 "Rubber articles intended for repeated use".

European regulations (EC)

Compliance with EC Regulations No. 1935/2004 of 27.10.2004 and No. 2023/2006 of 22.12.2006.

Family	Compound	Hardness Sh.A	FDA	FR Order 25.11.92	FR Decree 05.08.2020	EC 1935/2004
EPDM	6EP1862	60	✓		✓	✓
EPDM	7EP1197	70	✓		✓	✓
EPDM	EP856	80	✓		✓	✓
Silicone	6SL2136	63	✓	✓		✓
Silicone	6SL2065	64	✓	✓		✓
FKM	7DF3410	70	✓			✓

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3.6.2 – Drinking water

ACS / CLP (France)

Health certificate certifying materials and equipment in contact with water for human consumption.

DM 174 (Italy)

Migration tests, according to Ministerial Decree 06.04.2004 N174 for use in contact with drinking water on vulcanised rubber sheets.

EN681-1 (Europe)

Requirements for vulcanised elastomer seals for drinking water pipes.

KIWA BRL17504 II and III (Netherlands)

Certifies vulcanised elastomer products for cold and hot drinking water applications in accordance with BRL 17504.

NSF 61 (United States)

Certifies the compliance of components of drinking water systems and their effects on health as required by the standard.

UBA Leitlinie / KTW (Germany)

UBA replaces KTW and specifies the requirements for elastomers in contact with drinking water, as defined by the independent German body DVGW.

W270 (Germany)

Bacteriological growth standard supplementing the KTW certificate in accordance with DVGW sheet W270. Testing and certification by TZW.

W534 (Germany)

Certifies elastomer materials used in drinking water installations with or without coating in accordance with DVGW sheet W534.

WRAS (Great Britain)

Suitability of non-metallic products for use in contact with drinking water in accordance with standard BS 6920-1 / 2000.

Family	Compound	Hardness Sh.A	CLP	ACS	DM174	EN681-1	KIWA BRL 17504 II and III	UBA	W270	W534	NSF / ANSI61	WRAS
EPDM	EP856	80	✓	✓	✓	✓		✓	✓	✓		✓
EPDM	6EP1862	60	✓	✓	✓				✓			✓
EPDM	7EP1197	70	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NBR	7PD1612	74	✓		✓							

3.6.3 – Domestic gas

Family	Compound	Hardness Sh.A	EN 549	EN 682
NBR	6PB1729	61	H3B1	
NBR	PB701	68	H3B2	
NBR	7PB1871	69		GBL
NBR	7PB496	69	H3B1	
NBR	7PD1612	74	H3B2	
NBR	PC851	78	H3B1	
FKM	DF701	68	H3E1	
FKM	7DF2075	78	H3E1	
FKM	DF801	79	H3E1	H80
HNBR	7DT1870	66	H3C1	
HNBR	7DT2146	70	H3D2	GBL
HNBR	7DT2080	75	H3C1	
ACM	DA65	55	H2C1	
ACM	DA80	75	H3C1	
VMQ	SL1002	60	H2E2	
VMQ	SL1000	72	H3E2	

EN 549 (EU)

European Directive certifying rubber materials for seals and diaphragms for gas appliances and gas equipment

EN 682 (EU)

European Directive certifying materials for seals used in pipes and fittings carrying gas and hydrocarbon fluids.

3.6.4 – NGV and LPG fuels

Our 7DF2371 and 7DT2373 compounds respond to the latest market developments and offer optimal behaviour at very low temperature and under the high pressure of natural gas engines.

Both compounds have been tested by TÜV and received ECE R110, ISO 15500-2 and ANSI NGV3.1-2014 certifications.

ECE R110 (EU)

Regulation No. 110 of the Economic Commission for Europe of the United Nations (UN/ECE) Uniform provisions concerning the approval of (i) specific components of motor vehicles using compressed natural gas (CNG) in their propulsion system; (ii) vehicles with regard to the installation of specific components of an approved type for the use of compressed natural gas (CNG) in their propulsion system.

ISO 15500-2 (EU)

Specifies the performance and general test methods for components of compressed natural gas (CNG) fuel systems.

ANSI NGV 3.1-2014 (EU)

Requirements for components of recently produced compressed natural gas fuel systems for use on natural gas vehicles.

Family	Compound	Hardness Sh.A	ECE R110	ISO 15500-2	ANSI NGV 3.1-2014
FKM	7DF2371	73	✓	✓	✓
HNBR	7DT2373	77	✓	✓	✓

ELASTOMERS & COMPOUNDS

3.6.5 – Oil & Gas

Numerous HNBR and FKM compounds have been tested and certified to NORSOK M-710 and TOTAL PVV-142 for their resistance to rapid gas decompression (RGD).

Other NBR, HNBR and FKM compounds are also suitable for oil & gas applications. Some are kept in stock.

NORSOK M-710 (Norway)

The Norsok M-710 standard, developed by the Norwegian oil industry, defines the requirements for elastomer sealing materials for permanent underwater use, such as well completion, Christmas trees (oil wells), valves and control systems, as well as topside valves in critical gas systems.

TOTAL PVV-142

The TOTAL PVV-142 standard defines the requirements and procedures for testing the resistance of sealing materials to rapid gas decompression.

Family	Compound	Vulcanisation	Hardness (Sh.A)	Norsok M-710	Total PVV-142
HNBR	T49/TED	Peroxide	98	✓ 1	✓ 3
HNBR	T48/TED	Peroxide	90		✓ 3
FKM	T57/VED	Bisphenol	90	✓ 1	✓ 3
FKM	T57/GED	Peroxide	90	✓ 1	✓ 3
FKM	T57/FED	Peroxide	90		✓ 3
FKM	V95	Peroxide	95	✓ 1	✓ 4-5-6
FKM	T58/VED	Bisphenol	98	✓ 1-2	✓ 3
FKM	T58/GED	Peroxide	98	✓ 1	✓ 3
FKM	T58/FED	Peroxide	98	✓ 1-2	✓ 3

RGD test conditions

Tests performed on O-ring No. 312 (15.24 x 5.33):

Norsok M710B - CH_4/ CO_2

1. 90/10; 150 bar, 100°C
2. 90/10; 150 bar, 120°C

Total GS PVV 142 03/01 - CH_4/ CO_2

3. 80/20; 190 bar, 75°C
4. 80/20; 400 bar, 90°C
5. 80/15; 5% H_2S, 400 bar, 90°C
6. 80/20; 400 bar, 120°C

3.6.6 – Other regulations

Our compounds comply with the European regulations in force at the date of printing this catalogue.

REACH

Compliance with European Regulation No. 1907/2006, protecting human health and the environment from risks related to chemical substances.

RoHS

Compliance with the European RoHS Directive (2002/95/EC) which aims to limit the use of six hazardous substances in electrical and electronic equipment.

Heavy metals

European Directive 94/62/EC. Free from cadmium, lead, mercury, chromium VI.

Phthalate free

Free of phthalates.

Some of our compounds also meet the following requirements:

USP Class VI

In vivo and in vitro biological safety tests according to USP, NF39 chapters <87> and <88> and compliance with the bio-compatibility requirements for Class VI plastics.

BSE compliant

The materials are free of Specified Risk Materials: Declaration on the Transmission of Bovine Spongiform Encephalopathy.

Latex free

Free of latex-containing products.

HUTCHINSON®

O-RINGS

We make it *possible*

1 – GENERAL INFORMATION

1.1 – Definition

The O-Ring is a circular ring with a round cross section. It represents the simplest sealing system, combining:

- definition by two dimensions: inside diameter d1 and cross section diameter d2
- maximum effectiveness
- a groove that is easy to machine, of small size
- symmetry, avoiding the risk of incorrect fitting
- low cost

It can be used:

- in static or dynamic applications (slow rotary or reciprocating)
- for applications ranging from cryogenic to high temperatures, and commonly in the range - 50°C to + 250°C
- at pressures ranging from high vacuum up to 2,000 bar.

International standardisation makes it possible to guide users towards the most common sizes, generally kept in stock.

To ensure optimal performance of the O-Ring, it is important to choose the right compound and fit it according to the recommendations for use:

- fluid to seal
- pressure
- temperature
- static or dynamic application
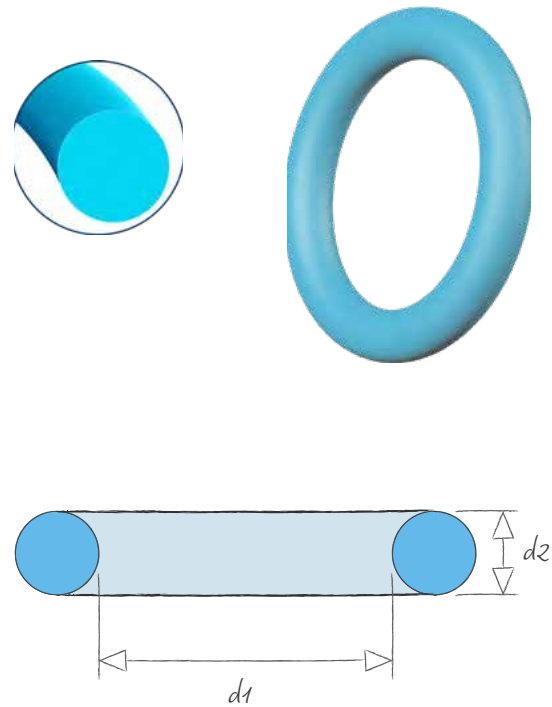
1.2 – Operation of an O-Ring

When an O-Ring fitted in a groove is subjected to pressure from a fluid, it is flattened on the opposite side from the pressure. The seal acts as a wedge in the angle that exists between contact surfaces a and b.

Sealing results from the combination of the deformation of the O-Ring and the elastic action of rubber.

The deformation of the O-Ring is a function of pressure; the higher the pressure p, the higher the contact forces at a and b. Sealing is reinforced by the pressure of the circuit.

The O-Ring is usually fitted in its groove with an initial compression rate (the depth of the groove is thus less than the cross section diameter of the O-Ring). The contact forces caused by the change in the O-Ring's shape make it possible to maintain its effectiveness when the pressure of the fluid is either low or non-existent since, in this case, the pressure does not press the seal against the sealing areas.

No initial compression rate   *With initial compression rate*
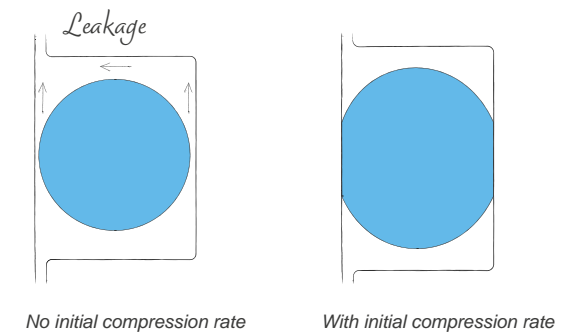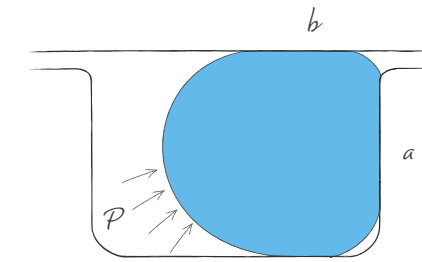
1.3 – Groove design

Since rubber is deformable, but incompressible, the volume of the groove must always be greater than the volume of the O-Ring in service. Consideration should be given to:

- the groove at the minimum tolerances
- the O-Ring at the maximum tolerances
- the possible swelling of the compound in contact with the fluid
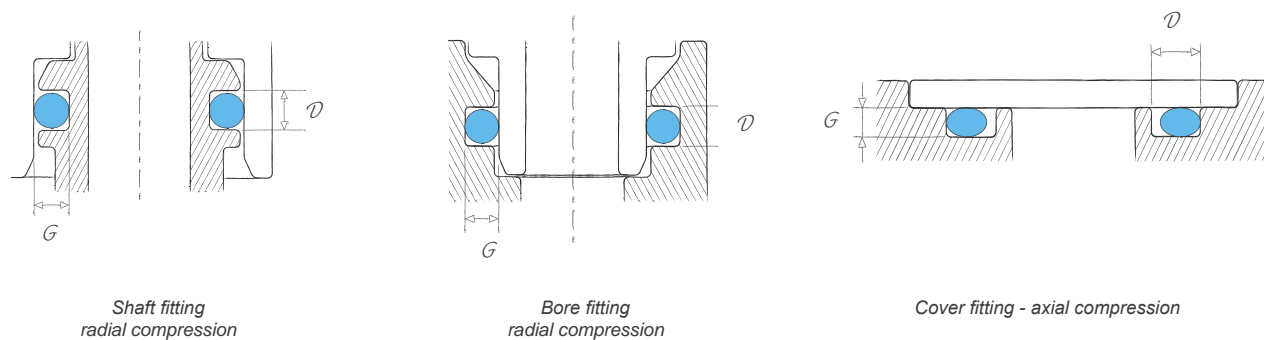
In order to maintain sufficient volume in the groove, the required width of the groove will be larger when the initial compression rate is higher.

O-RINGS

2 – FITTING INSTRUCTIONS

O-Rings are fitted in three main types of assembly:

Shaft fitting
radial compression

Bore fitting
radial compression

Cover fitting - axial compression

Compression

The compression is the compression of the O-Ring's cross section installed in its housing, which can be applied in a radial or axial direction:

- radial compression, perpendicular to the O-Ring axis (bore and shaft applications).
- axial compression, in the O-Ring axis (cover applications, internal or external pressure).

There are also mixed assemblies combining radial and axial compression, which is notably the case for triangular grooves. (see section 2.3 on page 67).

The compression rate corresponds to the deformation from flattening divided by the initial cross section.

To guarantee sealing, a positive compression rate must be ensured over the entire range of dimensional tolerances of the O-Ring and its housing.

The recommended compression rate depends on the type of assembly and the application.

$$\text{Compression rate (\%)} = \frac{\text{cross section } \varnothing - \text{depth of groove G}}{\text{cross section } \varnothing} \times 100$$

## 2.1 – Radial assembly shaft/bore

Shaft application

To avoid the risk of pinching of the seal during assembly, it is recommended to plan extension of the O-Ring.

In practice, a 3% elongation is enough, but it is possible to go up to 10% without damaging it. This elongation causes a decrease in cross section diameter.

For X% elongation, the reduction in cross section diameter is approximately: $\frac{X}{2}$ %

Bore application

When the groove has been made in the bore, the O-Rings should be fitted with slight compression on their external diameter.
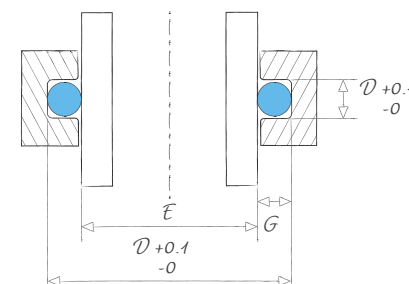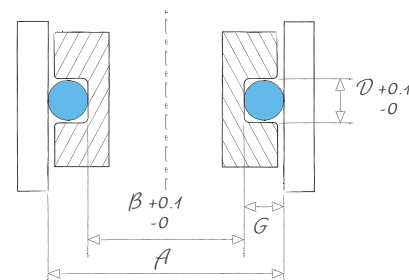
2.1.1 – Groove dimensions and shape for static applications

Rectangular grooves

In shaft / bore applications, the compression rate is radial and the grooves are usually rectangular. The lead angles and the base of the groove should be rounded.

The dimension R is indicated in terms of the cross section diameter d2. Dimensions D and G are shown in the table below.

The grooves may have parallel walls or a taper of up to 5°, which is added to the dimensions on each side of the groove.

Determination of groove dimensions in static applications - radial assembly shaft/bore

The table opposite shows the groove dimensions for the most common cross section diameters (see diagrams page 62).

Shaft application - Calculation of dimension B

B = A - 2G

Bore application - Calculation of dimension H

H = E + 2G

While the dimensions shown will suit most applications, the combined effects of temperature, pressure and the fluid mean that validation by testing is required (O-Ring compound and dimensions).

Dimensional tolerance of O-Rings: refer to section 6.3 on page 14 of this catalogue.

See the list of sizes on page 72 with O-Rings sorted by increasing inside diameter.

For clearance fit, the ISO H7f7 (pressure < 80 bar) and ISO H7g6 (pressure > 80 bar) tolerances can be allowed.

Groove dimensions for radial (shaft / bore) assembly in static applications

Cross section Ø d2 (mm)	D (mm) +0.1-0	G (mm)
1.00	1.40	0.78
1.25	1.70	0.98
1.50	2.10	1.18
1.60	2.20	1.26
1.78	2.40	1.41
1.90	2.60	1.51
2.00	2.70	1.59
2.20	3.00	1.75
2.40	3.30	1.91
2.50	3.40	2.00
2.62	3.60	2.10
2.70	3.70	2.16
3.00	4.10	2.42
3.15	4.30	2.54
3.53	4.80	2.84
3.60	4.90	2.92
4.00	5.40	3.26
4.50	6.10	3.67
5.00	6.80	4.10
5.33	7.10	4.35
5.70	7.70	4.70
6.00	8.10	4.98
6.99	9.50	5.84
8.00	10.80	6.85

NOTE: Dimensions for cross section diameters not shown in the table may be found by interpolation between two existing values.

2.1.2 – Groove dimensions and shape for dynamic applications - reciprocating

O-Rings can be fitted either on the shaft or in the bore.

For dynamic sealing, the compression rate must be lower than for static applications (deeper groove).

Deviations can be considered for each application to favour one or more of the operating criteria (e.g. reduced assembly force, lower friction, etc.).

Determination of groove dimensions in dynamic applications - radial shaft / bore assembly

The table opposite shows the groove dimensions for radial (shaft / bore) assembly in dynamic applications for the most common cross section diameters.

Shaft application - Calculation of dimension B

B = A - 2G

Bore application - Calculation of dimension H

H = E + 2G

Shaft assembly   *Bore assembly*
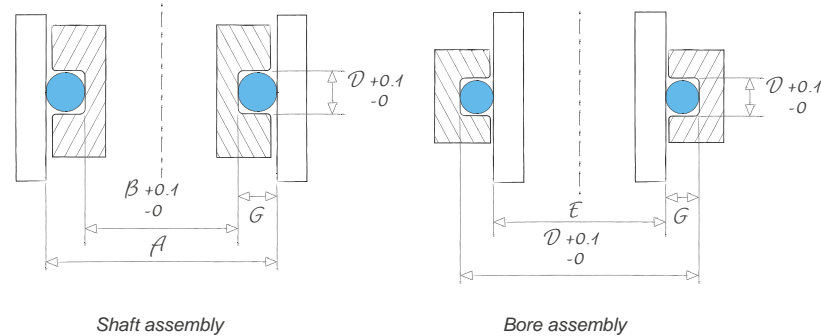
While the dimensions shown will suit most applications, the combined effects of temperature, pressure and the fluid mean that validation by testing is required (O-Ring compound and dimensions).

Dimensional tolerance of O-Rings: refer to section 6.3 on page 14 of this catalogue.

Clearance fit: we recommend ISO H7/g6 tolerances.

NOTE: Dimensions for cross section diameters not shown in the table may be found by interpolation between two existing values.
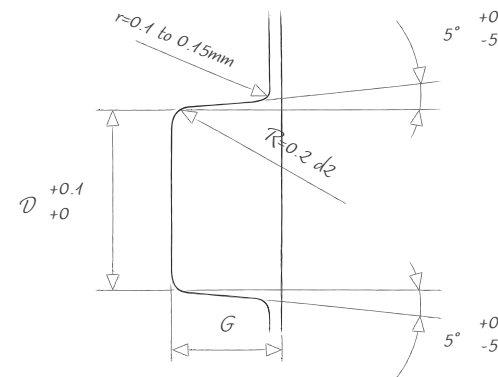
Groove dimensions for radial (shaft / bore) assembly in dynamic applications.

Cross section Ø d2 (mm)	D +0.1-0	G (mm)
1.00	1.30	0.80
1.25	1.60	1.00
1.50	2.00	1.20
1.60	2.10	1.29
1.78	2.30	1.45
1.90	2.50	1.56
2.00	2.60	1.65
2.20	2.80	1.84
2.40	3.10	2.01
2.50	3.20	2.11
2.62	3.30	2.21
2.70	3.40	2.28
3.00	3.80	2.57
3.15	4.00	2.68
3.53	4.50	3.02
3.60	4.60	3.08
4.00	5.00	3.46
4.50	5.60	3.94
5.00	6.20	4.37
5.33	6.60	4.67
5.70	7.10	4.99
6.00	7.50	5.28
6.99	8.70	6.15
8.00	10.00	7.05

2.1.3 – Groove dimensions and shape for dynamic applications - low-speed rotary

Due to heat effects caused by the speed of rotation, the use of O-Rings is generally recommended only for low-speed or occasionnal rotative applications, such as valve operation.

It is preferable to install seals within the bore. The rectangular cross section groove should be machined in accordance with the following guidelines:

- Choose an O-Ring with an inside diameter (d1) no more than 5% greater than the shaft diameter (E).
- The O-Ring will be subject to radial compression of 5 to 10%. The depth of the groove must therefore be 5 to 10% less than the cross section diameter d2 of the O-Ring.
- The width of the groove must be 5% greater than the cross section diameter d2 of the O-Ring.
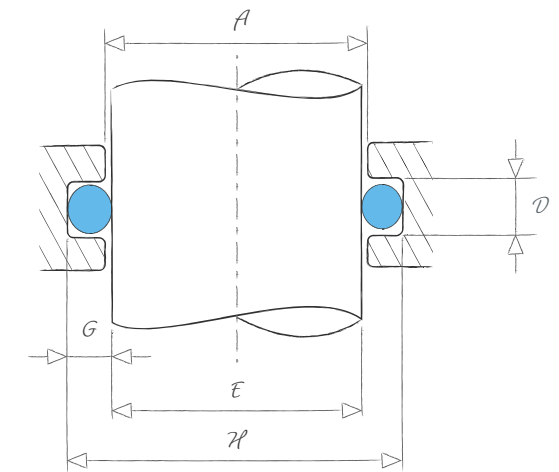
2.1.4 – Groove dimensions and shape for dynamic applications - floating assembly

Floating assembly is reserved for circuits that can tolerate a leak at start-up (non-toxic gases), such as a compressed air tools.

In the case of low-pressure air (10 bar max.), a floating assembly may offer a low coefficient of friction:

- The grooves are machined in such a way that the O-Ring cross section is not compressed when the assembly is at rest and without pressure.
- The inner or outside diameter of the O-Ring is in permanent contact with the floating section.

The table below specifies the D and G dimensions to be observed for the most commonly used cross section diameters d2 (use extrapolation for intermediate cross section diameters).

Shaft

Bore

Groove dimensions and shape

Selection of O-Rings for floating assembly

Shaft application
O-Ring outer ø = bore ø +1 to 2%
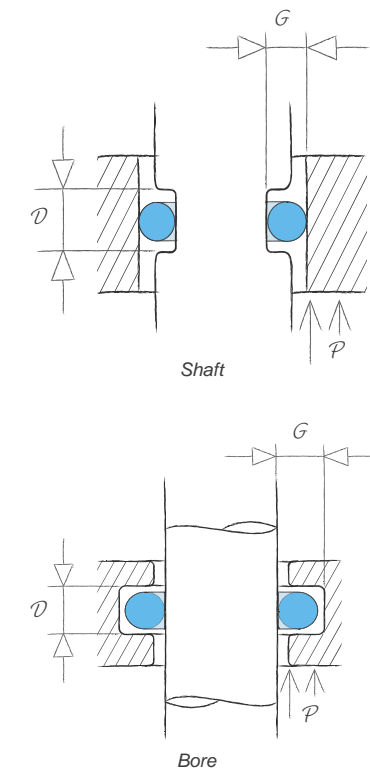
Bore application
O-Ring inner ø = shaft ø -1 to -2%

Cross section Ø d2 (mm)	D (mm)	G (mm)
1.90	2.00	2.20
2.70	2.80	3.00
3.60	3.75	4.00
5.33	5.50	5.80
6.99	7.25	7.50

2.2 – Axial cover assembly (triangular, dovetail, half-dovetail grooves)

### 2.2.1 – Groove dimensions and shape - rectangular grooves

In cover assemblies, the compression rate is axial and the grooves are usually rectangular. The lead angles and the base of the groove should be rounded.

The dimension R is indicated in terms of the cross section diameter d2. Dimensions D and G are shown in the table opposite.

The grooves may have parallel walls or a taper of up to 5°, which is added to the dimensions on each side of the groove.

If pressure is exerted:

- from the inside towards the outside: the O-Ring will have an outside diameter slightly greater than dimension H, against which it will be seated (see diagram).
- from the outside towards the inside: the O-Ring will be fitted slightly stretched, seated against dimension B.

While the dimensions shown will suit most applications, the combined effects of temperature, pressure and the fluid mean that validation by testing is required (O-Ring compound and dimensions).

Dimensional tolerance of O-Rings: refer to section 6.3 on page 14 of this catalogue.

NOTE: Dimensions for cross section diameters not shown in the table may be found by interpolation between two existing values.
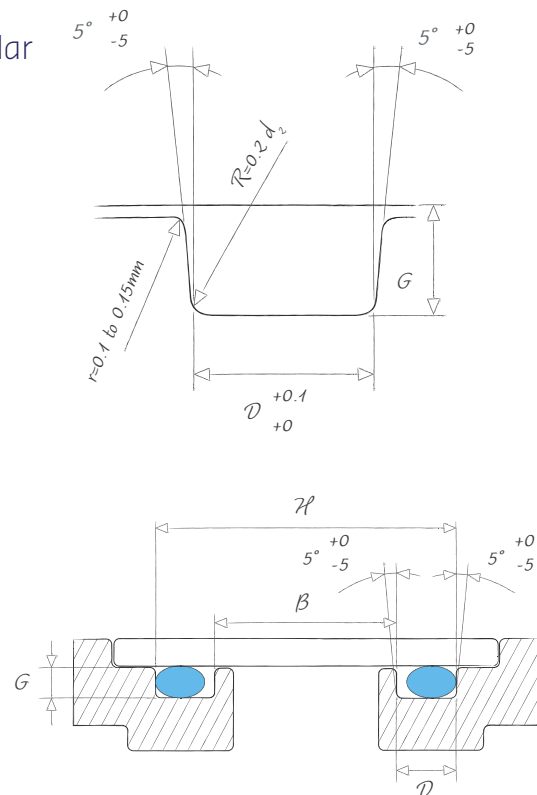
Groove dimensions for axial assembly (cover)

Cross section Ø d2 (mm)	D +0.1 -0	G (mm) +0.1 -0
1.78	2.60	1.25
1.90	2.80	1.35
2.00	2.90	1.45
2.20	3.20	1.60
2.40	3.40	1.75
2.50	3.60	1.85
2.62	3.80	1.95
2.70	3.90	2.00
3.00	4.30	2.15
3.15	4.50	2.35
3.53	5.00	2.70
3.60	5.10	2.75
4.00	5.60	3.10
4.50	6.30	3.50
5.00	6.70	3.90
5.33	7.40	4.20
5.70	7.90	4.50
6.00	8.30	4.80
6.99	9.70	5.70
8.00	11.00	6.55

2.2.2 – Groove dimensions and shape - dovetail grooves

To be used when the O-Ring is to be held in its groove to prevent it from falling, e.g. a door seal.

Cross section Ø (mm)	K (mm) -0.05	G (mm) +/-0.05	R (mm)	r (mm)
1.78	1.27	1.42	0.2	0.10
2.62	2.03	2.16	0.3	0.15
3.53	2.82	2.92	0.3	0.15
5.33	4.90	4.00	0.5	0.25
6.99	6.40	5.20	0.7	0.30
8.00	7.30	6.00	0.8	0.40
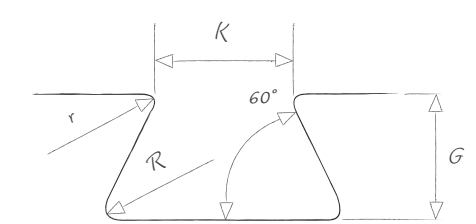
2.2.3 – Groove dimensions and shape - half-dovetail grooves

If the O-Ring must be held firmly in its groove without risk of falling, it may be easier to create a half-dovetail groove, and this will make the O-Ring easier to fit.

The seal is significantly stretched to be held in the side of the groove at 75°.

This groove is therefore a combination of a dovetail groove on one side and a rectangular groove on the other. The undercut angle is 75°. This type of groove can be used when machining the end of a tube to fit an O-Ring.

The basic width to be considered is that indicated for rectangular grooves.
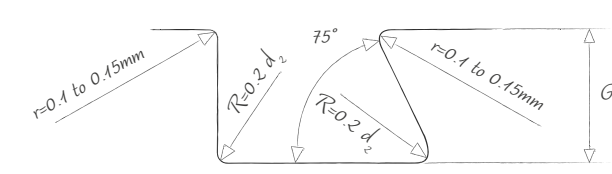
2.3 – Triangular grooves

The outside diameter of the O-Ring will be slightly greater than the outside diameter of the chamfered section, dimension H, against which it will be seated.

h = cross section Ø d2 of the O-Ring x 1.35 to 1.40
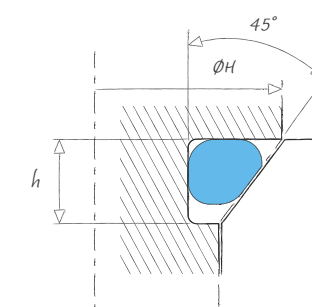
3.1 – Tolerances and fit

Dynamic usage

We recommend an H7g6 mechanical fit.

An O-Ring used for sealing purposes should not be used as a guide in a moving assembly. Moving parts must be guided using a mechanical seating.

Static usage

Pressure below 80 bar: ISO H7f7 tolerances can be allowed.

Pressure above 80 bar:
We recommend ISO H7g6 tolerances.

Anti-extrusion washer ("Back-up Ring")

The back-up ring is made of PTFE, a material with excellent chemical inertness and an extremely low coefficient of friction. It extends the useful life of O-Rings in high-pressure applications.

Back-up rings are rectangular in cross section. They are split for fitting in unopened grooves.

Fitting back-up rings

The width of the groove D must be increased by the thickness of one back-up ring (D1) or two back-up rings (D2).

This applies in static or dynamic assemblies.
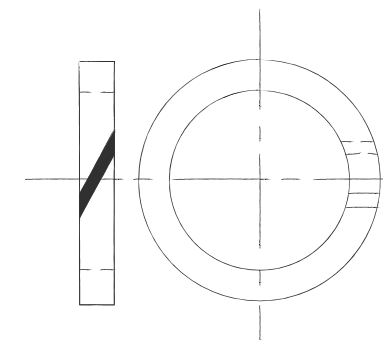
3.2 – Mechanical clearance - extrusion

Extrusion is the passage of material into the mechanical clearance.

Pressure pulses, high temperatures, chemical incompatibility of the rubber, rapid translational motion and long strokes – and a combination of these factors – can exacerbate O-Ring extrusion.

There are several solutions to prevent extrusion:

- Reduce the clearance fit: the risk of extrusion is zero if there is no clearance
- Increase the hardness of the rubber
- Check the flatness of the assembled parts (in the case of a cover application)
- Use an anti-extrusion washer (back-up ring)

without pressure

under moderate pressure

extrusion

under very high pressure
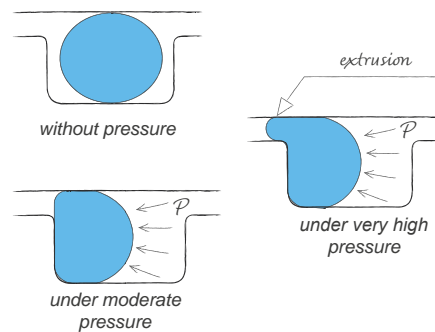
Groove dimensions

Cross section Ø (mm)	J max. (mm)	G or G1 (mm)
1.78 - 1.90	0.13	1.55
2.62 - 2.70	0.13	2.30
3.53 - 3.60	0.15	3.20
5.33 - 5.35	0.15	4.75
6.99 - 7.00	0.18	6.10

The higher the pressure, the more the clearance needs to be reduced, the more the hardness needs to be increased.

Max. bore Ø
Min. bore Ø
Max. shaft Ø
Min. shaft Ø
Nominal

Min. clearance
Max. clearance
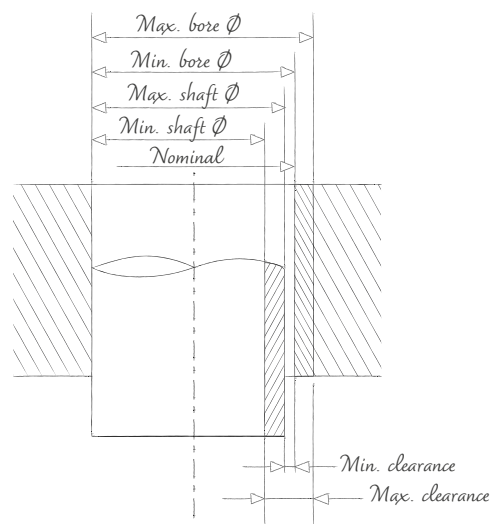
Graph showing the extrusion of an O-Ring according to the hardness of the rubber, the clearance fit and the pressure. These values are to be put into perspective for small cross section diameters.

hardness 60
hardness 70
hardness 85
hardness 95

Extrusion

No extrusion

Pressure in bar

500 400 300 200 100 80 60 40 30 20 10 0

Maximum clearance allowed (mm)
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1

$Ra = 0.4\mu$

$Ra = 0.8\mu$

$Ra = 0.4\mu$

D1
G1
J
D
J
G
D2
G
J
D1
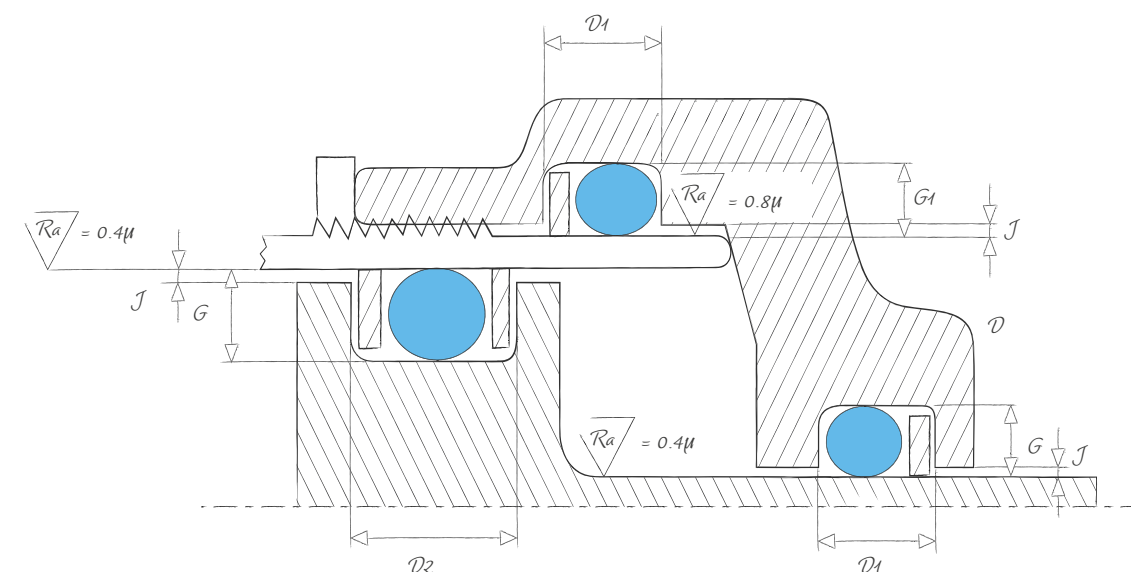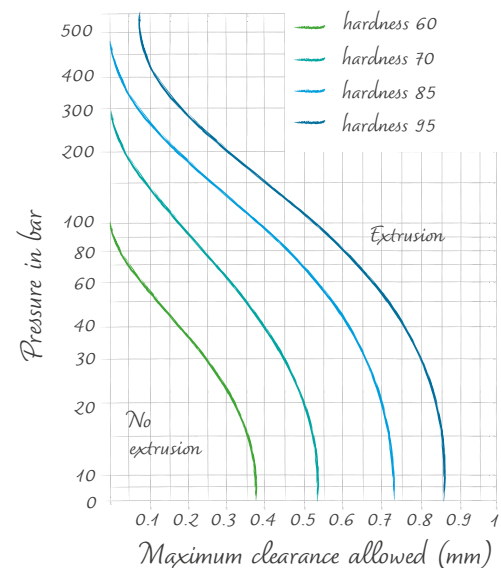
3.3 – Surface roughness

In fully static assemblies, with no moving parts in contact with the O-Ring, a surface roughness Ra in the range 0.8-1.6μ is sufficient.

A surface roughness Ra of 0.4μ is recommended for O-Rings subject to internal micro-friction (or friction on the housing wall) during deformation due to variations in fluid pressure or temperature.

To obtain a very good level of sealing with gases,

particular attention should be paid to the surface roughness (Ra 0.2 to 0.4μ). The same is true to obtain a high vacuum.

The surface roughness can be improved with a polished or burnished finish, which smooths out the peaks.

3.4 – Chamfers

Lead-in chamfers are essential to avoid damaging the O-Rings during installation. An angle of 20 to 30° represents the best compromise.
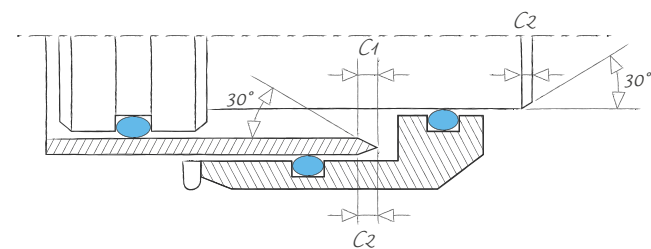
Chamfer dimensions

Cross section Ø (mm)	C1 (mm) cylinder	C2 (mm) shaft
≤ 3.60	1.5	2.5
from 3.61 to 5.33	2.5	4.0
> 5.33	3.0	4.0
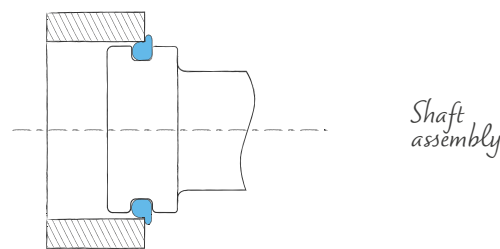
Pinching of the O-Ring due to the absence of chamfers

Shaft assembly
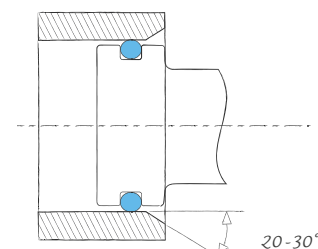
Recommended chamfers

Recommended chamfers

Bore assembly
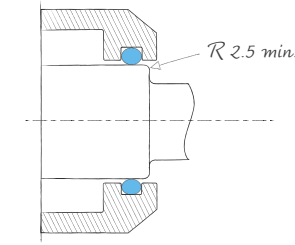
Recommended radius

3.5 – Installation

Take particular care to ensure that the workspace is clean, avoiding dusty environments.

Use blunt tools, without sharp edges.

Insert the O-Ring into the groove, sliding it into position while taking following precautions:

- avoid passing it over rough areas, threads, or sharp edges: use conical or cylindrical fitting rings, as shown in the sketches opposite
- do not distort the O-Ring by rolling, oscillating or twisting it
- avoid excessive stretching of the O-Ring

Make sure that the O-Ring is correctly positioned, making particularly sure that there is no twisting in relation to the flash line.

Conical fitting ring

Protection against a thread

Cylindrical fitting ring
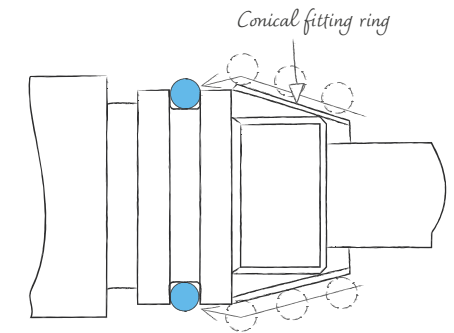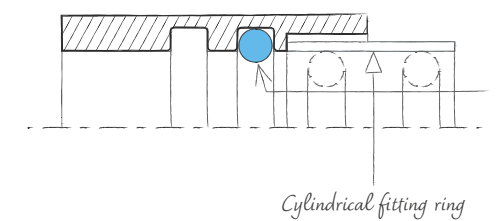
Protection against a tapping

3.6 – Automated installation

Various solutions are offered to improve supply to installation machines:

- Surface treatments: sliding is made easier by reducing the friction force. (see page 22)
- Specific packaging to ensure the flatness of the O-Ring during handling and storage: under a plastic shell, on a tube, or in an inflated bag. (see page 16)
- Picot seals: a specially designed surface facilitates the fitting and sliding of seals in distribution systems by preventing seals from sticking to each other and forming tubes.
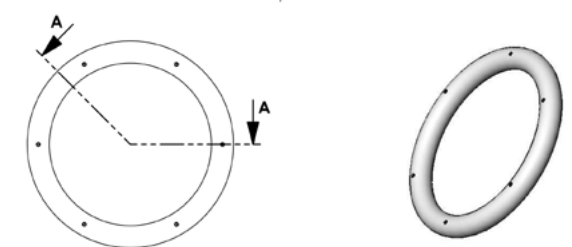
4–SIZE CHARTS

The following list of dimensions gives the standard codes kept in stock for more than 1.000 sizes and in our eight standard compounds.

The nominal dimensions of the O-Rings in the catalogue are valid for PB701 and PC851 compounds.

Other compounds show slightly different shrinkage, which can lead to variations in the nominal dimensions.

NEW We have added new standard codes for four compounds.

Custom development on request

Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
0.74	1.00	100100	100101	100103	100104					BS1806-001 / AS568-001	2.34	2.41	0.73	0.84	☐	△
1.07	1.27	101203	101204	101206	101207					BS1806-002 / AS568-002	3.10	3.20	1.18	1.29	☐	△
1.15	1.00	101100	101101	101103	101104	101088	101089	101090	101091	R000	2.75	2.85	1.20	1.30	☐	△
1.25	1.25	101213	101214	101216	101217						3.25	3.36	1.34	1.45	☐	△
1.40	1.25	101218	101219	101221	101222						3.40	3.53	1.47	1.59	☐	△
1.42	1.52	101300	101301	101303	101304					BS1806-003 / AS568-003	3.88	4.01	1.51	1.64	☐	△
1.60	1.25	101223	101224	101226	101227						3.60	3.74	1.65	1.77	☐	△
1.60	1.60	101400	101401	101403	101404						4.19	4.34	1.68	1.82	☐	△
1.78	1.78	101405	101406	101408	101409					BS1806-004 / AS568-004	4.66	4.82	1.87	2.03	☐	△
1.80	1.00	101105	101106	101108	101109						3.40	3.56	1.78	1.90	☐	△
1.80	1.25	101228	101229	101231	101232						3.80	3.96	1.83	1.96	☐	△
1.80	1.50	101305	101306	101308	101309						4.20	4.36	1.87	2.02	☐	△
1.90	2.55	101710	101701	101711	101702						6.18	6.36	1.95	2.16	☐	△
2.00	1.25	102200	102201	101233	101234						4.00	4.18	2.01	2.14	☐	△
2.00	1.60	102400	102401	101415	101416						4.59	4.77	2.04	2.19	☐	△
2.06	2.62	102746	102747	102701	102748					BS1806-103 / AS568-103	6.46	6.65	2.24	2.46	☐	△
2.20	1.00	102146	102145	102147	102144						3.80	4.00	2.22	2.35	☐	△
2.20	1.60	102403	102404	102406	102407	102313	102314	102315	102316	R00	4.79	4.99	2.32	2.48	☐	△
2.40	1.90	102413	102414	102416	102417	102317	102318	102319	102320	R0	5.48	5.69	2.56	2.75	☐	△
2.50	1.25	102210	102211	102212	102213						4.50	4.73	2.55	2.70	☐	△
2.50	1.60	102418	102419	102421	102422						5.09	5.32	2.60	2.77	☐	△
2.57	1.78	102423	102424	102426	102427					BS1806-005 / AS568-005	5.45	5.68	2.69	2.88	☐	△
2.60	1.00	102100	102101	102103	102104						4.20	4.43	2.59	2.72	☐	
2.60	1.90	102428	102429	102431	102432	102321	102322	102323	102324	R1	5.68	5.91	2.75	2.94	☐	△
2.75	1.60	102433	102434	102436	102437	102325	102326	102327	102328	R1 BIS	5.34	5.59	2.82	3.00	☐	△
2.84	2.62	102749	102750	102751	102752					BS1806-104 / AS568-104	7.24	7.50	2.95	3.19	☐	△
2.90	1.20	102217	102218	102219	102220						4.82	5.08	2.90	3.06	☐	△
2.90	1.78	102443	102444	102446	102447	102264			102286	BS1806-006 / AS568-006	5.78	6.04	3.00	3.19	☐	△
3.00	1.00	103109	103127	103128	103126						4.60	4.87	2.95	3.10	☐	
3.10	1.60	103403	103404	103406	103407						5.69	5.97	3.14	3.33	☐	△
3.30	2.40	103600	103601	103603	103604						7.28	7.58	3.39	3.63	☐	△
3.35	1.60	103413	103414	103416	103417						5.94	6.24	3.37	3.57	☐	△
3.40	1.90	103500	103501	103503	103504	103219	103221	103222	103223	R2	6.48	6.78	3.47	3.69	☐	△
3.50	1.50	103314	103313	103129	103317						5.90	6.22	3.52	3.71	☐	△

Shaft

Bore

Key

☐ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

O-RINGS

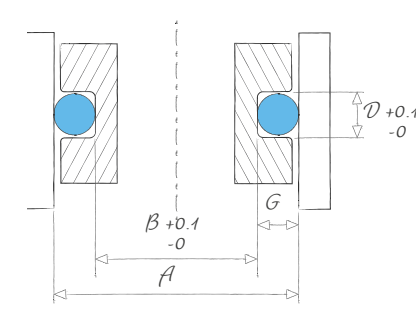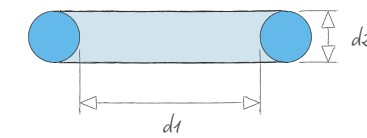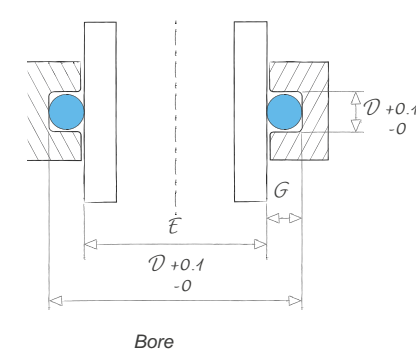| Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
3.55	1.60	103418	103419	103421	103422						6.14	6.46	3.55	3.75	□	△
3.60	2.40	103605	103606	103608	103609						7.58	7.91	3.66	3.91	□	△
3.68	1.78	103423	103424	103426	103427	103225	103226	103227	103228	BS1806-007 / AS568-007	6.56	6.89	3.70	3.92	□	△
3.75	1.60	103428	103429	103431	103432						6.34	6.68	3.73	3.94	□	△
3.80	1.30	103318	103319	103320	103321						5.88	6.22	3.74	3.94	□	
4.00	1.00	104100	104102	103103	103112						5.60	5.92	3.86	4.04	□	
4.00	1.50	104300	104301	103300	103301						6.40	6.72	3.97	4.18	□	
4.00	1.80	104859	104860	104861	104862						6.92	7.24	4.00	4.23	□	△
4.00	2.00	104500	104501	103505	103506						7.32	7.64	3.96	4.20	□	△
4.10	1.60	104400	104401	104403	104404						6.69	7.02	4.05	4.27	□	
4.20	1.90	104503	104504	104506	104507	104280	104281	104282	104283	R3	7.28	7.61	4.20	4.44	□	△
4.25	2.00	104508	104509	104511	104512						7.57	7.91	4.19	4.44	□	△
4.30	2.40	104600	104601	104603	104604						8.28	8.63	4.30	4.57	□	△
4.42	2.62	104129	104130	104132	104131					BS1806-106 / AS568-106	8.82	9.18	4.39	4.68	□	△
4.47	1.78	104405	104406	104408	104409	104285	104286	104287	104288	BS1806-008 / AS568-008	7.35	7.71	4.42	4.66	□	
4.50	1.00	104113	104112	104114	104115	104492					6.10	6.46	4.32	4.51	□	
4.50	1.50	104340	104310	104341	104342						6.90	7.26	4.43	4.65	□	
4.50	2.00	104513	104514	104516	104517						7.82	8.18	4.42	4.67	□	△
4.65	2.62	104703	104705	104701	104746						9.05	9.42	4.60	4.90	□	△
4.70	1.42	104303	104304	104306	104307	104290	104291	104292	104293	AS568-901	6.97	7.35	4.59	4.82	□	
4.75	2.00	104518	104519	104521	104522						8.07	8.45	4.64	4.91	□	△
4.90	1.90	104523	104524	104526	104527	104295	104296	104297	104298	R4	7.98	8.37	4.84	5.10	□	
5.00	1.00	105135	105123	105140	105138						6.60	7.00	4.77	4.98	□	
5.00	1.50	105300	105301	104308	104309						7.40	7.80	4.88	5.12	□	
5.00	1.80	105739	105740	105741	105742						7.92	8.32	4.91	5.17	□	
5.00	2.00	105500	105501	104528	104529						8.32	8.72	4.87	5.14	□	
5.00	2.50	105136	105137	105141	105139						9.20	9.60	4.90	5.20	□	△
5.00	3.00	105800	105804	104812	104803						10.04	10.44	4.97	5.30	□	△
5.10	1.60	105409	105400	105450	105451						7.69	8.10	5.13	5.42	□	
5.28	1.78	105401	105402	105404	105405	105291	105292	105293	105294	BS1806-009 / AS568-009	8.16	8.59	5.34	5.65	□	
5.30	2.00	105515	105516	105518	105519						8.62	9.04	5.33	5.65	□	
5.30	2.40	105600	105601	105603	105604						9.28	9.71	5.41	5.76	□	△
5.50	1.00	105120	105145	105146	105144						7.10	7.54	5.38	5.64	□	
5.50	1.50	105323	105324	105325	105326						7.90	8.34	5.51	5.80	□	
5.60	1.80	105429	105430	105431	105432						8.52	8.96	5.64	5.96	□	
5.60	2.40	105605	105606	105608	105609						9.58	10.03	5.69	6.05	□	△
5.70	1.20	105201	105208	105209	105210						7.62	8.08	5.61	5.90	□	
5.70	1.90	105508	105509	105511	105512	105296	105297	105298	105299	R5	8.78	9.23	5.76	6.09	□	
6.00	1.00	106100	106101	105100	105101						7.60	8.08	5.84	6.12	□	
6.00	1.50	106300	106301	105303	105304						8.40	8.88	5.97	6.29	□	
6.00	2.00	106500	106501	105513	105514	106995					9.32	9.80	5.98	6.33	□	
6.00	2.20	106600	106601	105610	105611	106693	106694	106695	106696	R6 BIS	9.65	10.13	6.02	6.38	□	
6.00	3.00	106800	106801	106805	106806						11.04	11.52	6.12	6.54	□	△
6.07	1.63	106400	106401	106403	106404	106750	106751	106752	106753	AS568-902	8.71	9.20	6.04	6.36	□	
6.07	1.78	106405	106406	106408	106409	106698	106699	106745	106746	BS1806-010 / AS568-010	8.95	9.44	6.07	6.41	□	
6.30	2.00	106503	106504	106506	106507						9.62	10.12	6.26	6.62	□	
6.30	2.40	106603	106604	106606	106607						10.28	10.79	6.34	6.73	□	

Key

□ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

Shaft

Bore

NEW

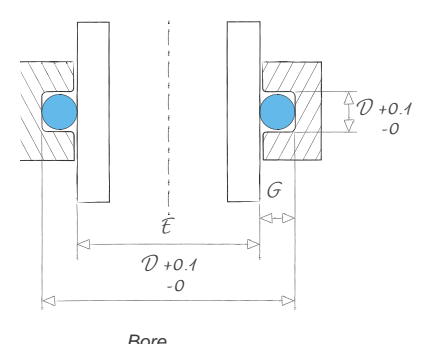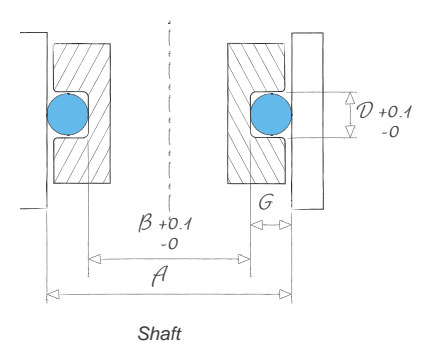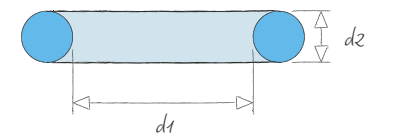| Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
6.35	1.78	106412	106413	106415	106416	106763	106764	106766	106767	R5 BIS	9.23	9.74	6.33	6.68	□	
6.40	1.90	106508	106509	106511	106512	106769	106770	106771	106772	R5 A	9.48	9.99	6.41	6.77	□	
6.60	2.40	106608	106609	106611	106612						10.58	11.11	6.62	7.02	□	
6.70	2.00	106513	106514	106516	106517						10.02	10.56	6.63	7.01	□	
6.75	1.78	106417	106418	106420	106421						9.63	10.17	6.70	7.07	□	
7.00	1.50	107127	107131	107136	107133						9.40	9.96	6.90	7.25	□	
7.00	3.00	106131	106132	106134	106133						12.04	12.60	7.05	7.51	□	△
7.10	1.60	107400	107401	107403	107404						9.69	10.26	6.99	7.35	□	
7.10	1.80	107424	107425	107426	107427						10.02	10.58	7.04	7.41	□	
7.10	2.00	107500	107501	107503	107504						10.42	10.99	7.00	7.39	□	
7.20	1.90	107505	107506	107508	107509	107857	107866	107867	107868	R6	10.28	10.85	7.15	7.54	□	
7.30	2.40	107600	107601	107603	107604						11.28	11.87	7.27	7.69	□	
7.30	2.70	107801	107800	107809	107810						11.84	12.42	7.28	7.72	□	
7.50	1.80	107428	107429	107430	107431						10.42	11.02	7.41	7.80	□	
7.50	2.00	107510	107511	107513	107514						10.82	11.42	7.38	7.78	□	
7.59	2.62	107757	107706	107758	107759	107870	107871	107872	107873	BS1806-109 / AS568-109	11.99	12.60	7.53	7.98	□	
7.60	2.40	107605	107606	107608	107609						11.58	12.19	7.55	7.98	□	
7.65	1.63	107405	107406	107408	107409	107880	107881	107882	107883	AS568-903	10.29	10.90	7.51	7.89	□	
7.65	1.78	107410	107411	107413	107414	107875	107876	107877	107878	BS1806-011 / AS568-011	10.53	11.15	7.54	7.93	□	
7.65	2.54	107700	107701	107703	107704						11.92	12.53	7.57	8.02	□	
7.80	3.60	107913	107914	107915	107916						13.92	14.54	7.83	8.36	□	△
8.00	1.00	108154	108155	108156	108134	108571					9.60	10.24	7.70	8.05		
8.00	1.50	107128	107130	107137	107134	108572			108769		10.40	11.04	7.83	8.22	□	
8.00	1.80	108465	108311	108312	108313						10.92	11.56	7.87	8.28	□	
8.00	1.90	108500	108501	107515	107516	108448	108449	108458	108461	R6A	11.08	11.72	7.90	8.31	□	
8.00	2.00	108503	108504	107517	107518	108573			108770		11.32	11.96	7.84	8.26	□	
8.00	2.40	108600	108601	107610	107645						11.98	12.62	7.92	8.37	□	
8.00	3.00	107129	107132	107138	107135	108574			108771		13.04	13.68	7.98	8.47	□	
8.00	5.00	108900	108901	107900	107901	108575			108772		16.70	17.34	8.04	8.67	□	△
8.10	1.60	108400	108401	108403	108404	108576					10.69	11.34	8.20	8.48	□	
8.30	2.40	108602	108603	108605	108606						12.28	12.95	8.53	8.85	□	
8.50	1.90	108751	108709	108752	108753						11.58	12.26	8.67	8.98	□	
8.60	2.40	108607	108608	108610	108611						12.58	13.27	8.81	9.15	□	
8.73	1.78	108405	108406	108408	108409	108577			108773		11.61	12.31	8.85	9.16	□	
8.90	1.90	108511	108512	108514	108515	108466	108467	108468	108469	R7	11.98	12.69	9.05	9.37	□	
8.90	2.70	108800	108801	108803	108804	108471	108472	108473	108474	R8	13.44	14.15	9.12	9.48	□	
9.00	1.50	109300	109301	108300	108301						11.40	12.12	9.06	9.36	□	
9.00	2.00	109500	109501	108516	108517						12.32	13.04	9.10	9.42	□	
9.00	2.20	109600	109601	108612	108613	109999	110950	110933	110934	R7 BIS	12.65	13.37	9.15	9.48	□	
9.00	2.50	109135	109121	109128	109124	100018		100330			13.20	13.92	9.17	9.52	□	
9.10	1.60	109400	109401	109403	109404						11.69	12.42	9.15	9.46	□	
9.12	3.53	109119	109122	109129	109125					BS1806-204 / AS568-204	15.12	15.85	9.45	9.86	□	
9.15	3.00	109800	109801	109803	109804	100431					14.19	14.92	9.43	9.81	□	
9.19	2.62	109700	109701	109703	109704	110936	110937	110938	110939	BS1806-110 / AS568-110	13.59	14.33	9.38	9.74	□	
9.25	1.78	109405	109406	109408	109409	110941	110942	110943	110944	BS1806-012 / AS568-012	12.13	12.87	9.35	9.67	□	
9.30	2.40	109603	109604	109606	109607						13.28	14.03	9.48	9.83	□	
9.50	1.40	109303	109304	109306	109307						11.74	12.50	9.51	9.81	□	

Shaft

Bore

Key

□ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

NEW

Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
9.50	1.60	109850	109415	109130	109126						12.09	12.85	9.54	9.85	☐	
9.50	2.00	109503	109504	109506	109507						12.82	13.58	9.57	9.91	☐	
9.52	1.78	109410	109411	109413	109414	110946	110947	110948	110949	R8 BIS	12.40	13.17	9.61	9.93	☐	
9.60	2.40	109608	109609	109611	109612						13.58	14.35	9.77	10.13	☐	
9.90	1.90	109508	109509	109949	109950						12.98	13.77	10.01	10.35	☐	
10.00	1.30	110100	110101	109308	109309						12.08	12.88	9.95	10.27		
10.00	1.50	109120	109123	109131	109127						12.40	13.20	10.02	10.34	☐	
10.00	1.80	110819	110820	110821	110822						12.92	13.72	10.07	10.41		
10.00	2.00	110300	110301	109510	109511						13.32	14.12	10.05	10.40		
10.00	2.50	110500	110501	109705	109706	100019			100331		14.20	15.00	10.13	10.50	☐	
10.00	3.50	110721	110722	110723	110724						15.95	16.75	10.29	10.71	☐	
10.10	1.60	110200	110201	110252	110253	100020			100333		12.69	13.50	10.11	10.44	☐	
10.30	2.40	110410	110400	110414	110415						14.28	15.11	10.44	10.81	☐	
10.50	2.00	110303	110304	110306	110307						13.82	14.66	10.53	10.89	☐	
10.50	2.70	110602	110603	110605	110606	110907	110914	110915	110916	R9	15.04	15.88	10.65	11.05	☐	
10.52	1.83	110202	110203	110205	110206	110918	110919	110920	110921	AS568-905	13.48	14.33	10.58	10.93	☐	
10.60	2.40	110401	110402	110404	110405						14.58	15.43	10.72	11.11	☐	
10.77	2.62	110508	110509	110511	110512	110923	110924	110925	110926	BS1806-111 / AS568-111	15.17	16.03	10.89	11.29	☐	
10.82	1.78	110207	110208	110210	110211	110928	110929	110930	110931	BS1806-013 / AS568-013	13.70	14.57	10.85	11.21	☐	
11.00	1.50	111100	111101	110103	110104						13.40	14.28	10.97	11.32	☐	
11.00	2.00	111300	111301	110308	110309						14.32	15.20	11.01	11.38	☐	
11.00	2.50	111500	111501	110607	110608	111781					15.20	16.08	11.08	11.48	☐	
11.00	5.00	111805	111806	111808	111807						19.70	20.58	11.36	11.88	☐	△
11.10	1.60	111200	111201	110212	110213						13.69	14.58	11.06	11.42	☐	
11.10	1.78	111203	111204	110214	110215	111482	111483	111484	111485		13.98	14.87	11.12	11.48	☐	
11.20	2.50	111503	111504	111506	111507						15.40	16.30	11.27	11.68	☐	
11.30	2.40	111400	111401	111403	111404						15.28	16.19	11.39	11.79	☐	
11.50	1.50	111103	111104	111106	111107						13.90	14.82	11.45	11.81		
11.50	2.00	111321	111322	111323	111324						14.82	15.74	11.48	11.87	☐	
11.50	3.00	111708	111709	111711	111710						16.54	17.46	11.67	12.11	☐	
11.60	2.40	111405	111406	111408	111409						15.58	16.51	11.68	12.09	☐	
11.80	2.50	111508	111509	111511	111512						16.00	16.94	11.84	12.26	☐	
11.90	2.62	111513	111514	111516	111517						16.30	17.25	11.97	12.40	☐	
12.00	1.00	112127	112128	112130	112129						13.60	14.56	11.77	12.12		
12.00	1.50	112110	112102	112111	112112	112787			112871		14.40	15.36	11.93	12.30		
12.00	2.00	112300	112301	111308	111309	112592	112593	112594	112595	AS568-906	15.32	16.28	11.96	12.36	☐	
12.00	3.00	112661	112608	112662	111618						17.04	18.00	12.15	12.60	☐	
12.10	1.60	112200	112201	111206	111207						14.69	15.66	12.02	12.40		
12.10	2.70	112600	112601	111600	111601	112597	112598	112599	112676	R10	16.64	17.60	12.18	12.61	☐	
12.29	3.53	112702	112703	112704	112705	112678	112680	112681	112682	BS1806-206 / AS568-206	18.29	19.27	12.48	12.96	☐	
12.30	2.40	112400	112401	112412	112413	112788			112872		16.28	17.27	12.35	12.77	☐	
12.37	2.62	112500	112501	112503	112504	112684	112685	112686	112687	BS1806-112 / AS568-112	16.77	17.76	12.42	12.86	☐	
12.42	1.78	112203	112204	112206	112207	112689	112690	112691	112693	BS1806-014 / AS568-014	15.30	16.30	12.38	12.78	☐	
12.50	1.50	112266	112214	112262	112261						14.90	15.90	12.40	12.79		
12.50	2.00	112303	112304	112306	112307						15.82	16.82	12.44	12.85	☐	
12.50	2.50	112505	112506	112508	112509	112789			112873		16.70	17.70	12.51	12.95	☐	
13.00	1.00	113111	113112	113114	113113						14.60	15.64	12.73	13.10		

Shaft

Bore

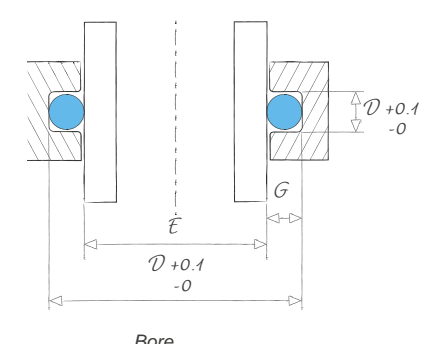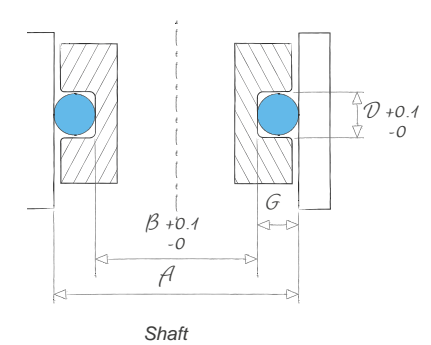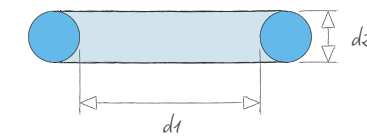*Key*

☐ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

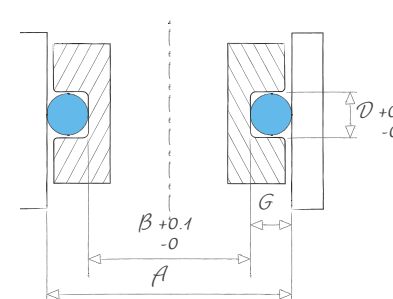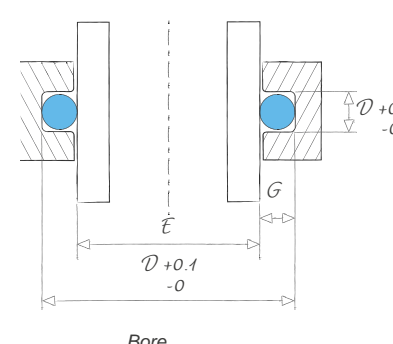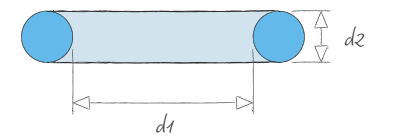| Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
13.00	2.00	113300	113301	112308	112309						16.32	17.36	12.92	13.34	□	
13.00	2.50	113500	113501	112510	112511	113478			113698		17.20	18.24	12.99	13.44		
13.00	3.00	113746	113747	112617	112616						18.04	19.08	13.11	13.58	□	
13.10	1.60	113200	113201	112208	112209						15.69	16.74	12.97	13.38		
13.10	1.80	113350	113351	113353	113352						16.02	17.06	13.03	13.45	□	
13.10	2.62	113503	113504	112512	112513						17.50	18.55	13.11	13.57	□	
13.20	2.50	113506	113507	113509	113510						17.40	18.46	13.18	13.64	□	
13.30	2.40	113400	113401	113403	113404						17.28	18.35	13.30	13.75	□	
13.46	2.08	113303	113304	113306	113307	113387	113388	113389	113391	AS568-907	16.91	17.99	13.37	13.81	□	
13.60	2.40	113405	113406	113408	113409						17.58	18.67	13.59	14.05	□	
13.60	2.70	113600	113601	113603	113604	113393	113394	113395	113396	R11	18.14	19.22	13.61	14.08	□	
13.80	3.10	113700	113701	113703	113704						19.07	20.17	13.83	14.33	□	
13.87	3.53	113842	113843	113844	113845	113398	113399	113424	113425	BS1806-207 / AS568-207	19.87	20.98	13.99	14.51	□	
13.94	2.62	113511	113512	113514	113515	113446	113447	113448	113449	BS1806-113 / AS568-113	18.34	19.46	13.92	14.39	□	
14.00	1.78	114200	114201	113203	113204	114165	114166	114167	114168	BS1806-015 / AS568-015	16.88	18.00	13.89	14.33		
14.00	2.00	114300	114301	113308	113309						17.32	18.44	13.87	14.32	□	
14.00	2.50	114500	114501	113516	113517	114185			114294		18.20	19.32	13.95	14.42	□	
14.00	3.00	114620	114619	114644	114645						19.04	20.16	14.06	14.56	□	
14.10	1.60	114203	114204	113205	113206						16.69	17.68	14.10	14.45		
14.30	2.40	114400	114401	114403	114404						18.28	19.29	14.45	14.83	□	
14.60	2.40	114405	114406	114408	114409						18.58	19.61	14.74	15.13	□	
15.00	1.00	115000	115001	114000	114001						16.60	17.65	14.81	15.15		
15.00	1.50	115100	115102	115108	115109						17.40	18.45	14.97	15.33		
15.00	1.80	115212	115213	114210	114211						17.92	18.97	15.03	15.41		
15.00	2.00	115300	115301	114303	114304						18.32	19.37	15.02	15.40	□	
15.00	2.50	115500	115501	114503	114504						19.20	20.25	15.10	15.50	□	
15.00	3.00	115612	115713	115724	115725						20.04	21.09	15.23	15.65	□	
15.08	2.62	115503	115504	114505	114506	115690			115919		19.48	20.54	15.21	15.61	□	
15.10	2.70	115600	115601	114600	114601	115478	115479	115480	115481	R12	19.64	20.69	15.25	15.66	□	
15.12	3.53	115862	115863	115865	115864						21.12	22.18	15.40	15.85	□	
15.20	1.78	115201	115235	115223	115241						18.08	19.15	15.22	15.60		
15.20	4.00	115816	115866	115823	115803						22.16	23.22	15.43	15.89	□	
15.30	2.40	115400	115401	115403	115404						19.28	20.36	15.41	15.81	□	
15.47	3.53	115830	115831	115832	115833	115483	115484	115485	115486	BS1806-208 / AS568-208	21.47	22.55	15.74	16.19	□	
15.54	2.62	115506	115507	115509	115510	115488	115489	115490	115491	BS1806-114 / AS568-114	19.94	21.03	15.65	16.07	□	
15.60	1.78	115202	115203	115205	115206	115493	115494	115495	115496	BS1806-016 / AS568-016	18.48	19.58	15.61	15.99		
15.60	2.40	115405	115406	115408	115409						19.58	20.68	15.70	16.11	□	
15.88	2.62	115511	115512	115514	115515	115498	115572	115573	115574		20.28	21.39	15.98	16.40	□	
16.00	1.25	116003	116004	115004	115005						18.00	19.12	15.85	16.22		
16.00	1.90	116300	116301	115303	115304	116257	116258	116259	116260	R12A	19.08	20.20	16.03	16.43		
16.00	2.00	116303	116304	115305	115306	116288			116396		19.32	20.44	15.98	16.38		
16.00	2.50	116500	116501	115516	115517	116289			116397		20.20	21.32	16.07	16.49	□	
16.00	3.00	116710	116630	115618	115648	116290			116398		21.04	22.16	16.19	16.63	□	
16.00	3.50	116711	116701	116712	116713						21.95	23.07	16.25	16.71	□	
16.00	4.00	116800	116802	116810	116809						22.96	24.08	16.20	16.68	□	
16.10	1.60	116200	116201	115207	115208						18.69	19.82	16.03	16.42		
16.30	2.40	116400	116401	116403	116404						20.28	21.43	16.38	16.80	□	

NEW

Shaft

Bore

Key

□ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

NEW

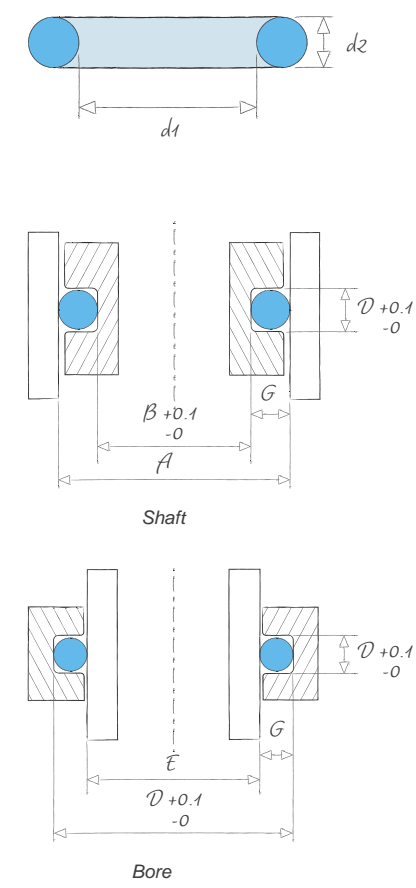| Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
16.36	2.21	116405	116406	116408	116409	116262	116263	116264	116265	AS568-908	20.03	21.17	16.38	16.80	□	
16.60	2.40	116410	116411	116413	116414						20.58	21.75	16.67	17.10	□	
16.90	2.70	116600	116601	116603	116604	116267	116268	116269	116270	R13	21.44	22.62	16.98	17.43	□	
17.00	2.00	117300	117301	116306	116307						20.32	21.51	16.95	17.37		
17.00	2.50	117500	117501	116503	116504						21.20	22.39	17.03	17.47	□	
17.00	4.00	117812	117813	117815	117814						23.96	25.15	17.17	17.67	□	
17.04	3.53	117713	117714	117715	117716	117279	117280	117281	117282	BS1806-209 / AS568-209	23.04	24.23	17.26	17.74	□	
17.06	1.50	117234	117235	117243	117242						19.46	20.65	16.96	17.36		
17.10	1.60	117200	117201	116203	116204						19.69	20.89	17.00	17.40		
17.12	2.62	117503	117504	116505	116506	117284	117285	117286	117287	BS1806-115 / AS568-115	21.52	22.72	17.18	17.62	□	
17.17	1.78	117203	117204	117206	117207	117289	117290	117291	117292	AS568-017	20.05	21.26	17.12	17.54		
17.30	2.40	117400	117401	117403	117404						21.28	22.50	17.34	17.78	□	
17.50	1.50	117100	117101	117103	117104						19.90	21.13	17.38	17.79		
17.50	2.50	117506	117507	117509	117510						21.70	22.93	17.51	17.96	□	
17.60	2.40	117405	117406	117408	117409						21.58	22.82	17.63	18.08	□	
17.86	2.62	117511	117512	117514	117515						22.26	23.51	17.89	18.35	□	
17.93	2.46	117410	117411	117413	117414	117294	117295	117296	117297	AS568-909	22.01	23.27	17.97	18.42	□	
18.00	2.00	118300	118301	117303	117304	118450			118578		21.32	22.58	17.91	18.35		
18.00	2.20	118400	118401	117415	117416						21.65	22.91	17.96	18.41		
18.00	2.50	118500	118501	117516	117517						22.20	23.46	18.00	18.46	□	
18.00	2.65	118520	118521	117524	117525						22.45	23.71	18.03	18.50	□	
18.00	2.80	118763	118764	118765	118865						22.70	23.96	18.07	18.54	□	
18.00	3.00	118767	118769	118773	118771						23.04	24.30	18.12	18.60	□	
18.00	3.15	118700	118701	117700	117701						23.36	24.62	18.09	18.58	□	
18.10	1.60	118200	118201	117208	117209						20.69	21.96	17.96	18.39		
18.20	3.00	118905	118661	118906	118907	118451			118579		23.24	24.51	18.31	18.80	□	
18.30	3.60	118800	118801	118803	118804	118318	118326	118329	118366	R15	24.42	25.70	18.49	19.00	□	
18.40	2.70	118600	118601	118603	118604	118368	118369	118370	118371	R14	22.94	24.22	18.43	18.91	□	
18.50	1.60	118203	118331	118332	118333						21.09	22.39	18.35	18.78		
18.64	3.53	118703	118704	118706	118707	118373	118374	118375	118376	BS1806-210 / AS568-210	24.64	25.95	18.80	19.31	□	
18.72	2.62	118505	118506	118508	118509	118378	118379	118380	118381	BS1806-116 / AS568-116	23.12	24.43	18.72	19.20	□	
18.77	1.78	118204	118205	118207	118208	118383	118384	118385	118386	BS1806-018 / AS568-018	21.65	22.97	18.66	19.11		
18.80	3.00	118768	118770	118774	118772						23.84	25.16	18.89	19.39	□	
19.00	1.50	119100	119101	118100	118101						21.40	22.73	18.83	19.27		
19.00	1.80	119200	119201	118209	118210						21.92	23.25	18.89	19.35		
19.00	2.50	119500	119501	118503	118504						23.20	24.53	18.96	19.44	□	
19.00	3.15	119700	119701	118708	118709						24.36	25.69	19.06	19.57	□	
19.00	3.55	119706	119707	118717	118718						25.04	26.37	19.15	19.67	□	
19.18	2.46	119400	119401	118408	118409	119146	119147	119148	119149	AS568-910	23.26	24.61	19.17	19.65	□	
19.20	3.00	119600	119601	119603	119604	119169			119230		24.24	25.58	19.28	19.78	□	
19.50	1.50	119103	119104	119123	119124						21.90	23.27	19.31	19.76		
19.60	2.40	119403	119404	119406	119407						23.58	24.96	19.56	20.05	□	
19.80	3.60	119800	119801	119803	119804	119151	119152	119153	119154	R16	25.92	27.31	19.94	20.48	□	
20.00	1.50	120251	120252	120254	120253						22.40	23.80	19.80	20.26		
20.00	1.80	120206	120207	119210	119211						22.92	24.32	19.86	20.33		
20.00	2.00	120300	120301	119300	119301	120191			120299		23.32	24.72	19.84	20.32		
20.00	2.50	120500	120501	119503	119504						24.20	25.60	19.93	20.43	□	

Shaft

Bore

Key

□ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

O-RINGS

NEW

Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
20.00	2.65	120526	120527	120642	120636						24.45	25.85	19.96	20.47	□	
20.00	3.00	120600	120601	119610	119611	120192			120322		25.04	26.44	20.05	20.57		
20.00	3.15	120700	120701	119703	119704						25.36	26.76	20.02	20.55	□	
20.22	3.53	120703	120704	120706	120707	120160	120161	120162	120163	BS1806-211 / AS568-211	26.22	27.64	20.32	20.87	□	
20.29	2.62	120510	120511	120513	120514	120165	120166	120167	120168	BS1806-117 / AS568-117	24.69	26.11	20.23	20.75	□	
20.35	1.78	120200	120201	120203	120204	120170	120171	120172	120173	BS1806-019 / AS568-019	23.23	24.66	20.19	20.67		
20.63	2.62	120515	120516	120518	120519						25.03	26.48	20.56	21.08	□	
21.00	2.00	121415	121416	121418	121417						24.32	25.79	20.81	21.31		
21.00	3.00	121600	121601	121603	121604	121196			121285		26.04	27.51	21.02	21.56	□	
21.08	1.50	121265	121264	121266	121263						23.48	24.96	20.84	21.32		
21.20	1.90	121300	121301	120303	120304						24.28	25.76	21.05	21.55		
21.20	2.50	121500	121501	121503	121504						25.40	26.88	21.08	21.61	□	
21.20	3.15	121700	121701	121703	121704						26.56	28.04	21.18	21.73	□	
21.30	3.60	121800	121801	121803	121804	121150	121151	121152	121153	R17	27.42	28.91	21.38	21.95	□	
21.50	3.00	121605	121606	121608	121609						26.54	28.05	21.50	22.05	□	
21.59	5.33	121905	121906	121902	121907	121155	121156	121157	121158	BS1806-316 / AS568-316	30.86	32.38	21.85	22.49	□	
21.60	2.40	121400	121401	121403	121404						25.58	27.10	21.49	22.02		
21.80	2.52	121627	121628	121630	121629						26.03	27.56	21.67	22.20	□	
21.82	3.53	121705	121706	121708	121709	121160	121161	121162	121163	BS1806-212 / AS568-212	27.82	29.35	21.87	22.45	□	
21.89	2.62	121505	121506	121508	121509	121165	121166	121167	121168	BS1806-118 / AS568-118	26.29	27.82	21.78	22.32	□	
21.92	2.95	121610	121611	121613	121614	121170	121171	121172	121173	AS568-911	26.88	28.41	21.89	22.45	□	
21.95	1.78	121200	121201	121203	121204	121175	121176	121177	121178	BS1806-020 / AS568-020	24.83	26.37	21.73	22.24		
22.00	1.50	122214	122101	122216	122215						24.40	25.94	21.73	22.23		
22.00	2.00	122300	122301	121303	121304						25.32	26.86	21.77	22.29		
22.10	1.60	122200	122201	121205	121206						24.69	26.24	21.82	22.33		
22.20	3.00	122600	122601	121615	121616						27.24	28.79	22.17	22.74	□	
22.22	2.62	122503	122504	122506	122507						26.62	28.18	22.10	22.65	□	
22.40	2.50	122508	122509	122511	122512						26.60	28.17	22.24	22.79		
22.40	3.15	122700	122701	122703	122704						27.76	29.32	22.34	22.91	□	
22.50	2.00	122303	122304	122309	122315						25.82	27.40	22.25	22.78		
22.50	3.00	122603	122604	122606	122607						27.54	29.12	22.46	23.03	□	
23.00	2.50	123510	123511	122513	122514						27.20	28.81	22.82	23.38		
23.00	3.60	123800	123801	122800	122801	123198	123199	123205	123210	R18	29.12	30.73	23.02	23.63	□	
23.16	5.33	123909	123910	123911	123912	123238	123247	123251	123252	BS1806-317 / AS568-317	32.43	34.06	23.36	24.04	□	
23.20	2.00	123404	123403	123405	123402						26.52	28.14	22.93	23.47		
23.39	3.53	123700	123701	123703	123704	123254	123255	123256	123257	BS1806-213 / AS568-213	29.39	31.03	23.38	23.99	□	
23.47	2.62	123500	123501	123503	123504	123259	123260	123261	123262	BS1806-119 / AS568-119	27.87	29.51	23.30	23.88		
23.47	2.95	123600	123601	123603	123604	123264	123265	123266	123267	AS568-912	28.43	30.07	23.39	23.97	□	
23.52	1.78	123200	123201	123203	123204	123269	123270	123271	123272	BS1806-021 / AS568-021	26.40	28.05	23.25	23.79		
23.60	2.50	123505	123506	123508	123509						27.80	29.45	23.40	23.97		
23.60	3.15	123705	123706	123708	123709						28.96	30.61	23.50	24.10	□	
24.00	1.50	124102	124101	124104	124105						26.40	28.08	23.66	24.20		
24.00	2.00	124300	124301	123300	123301						27.32	29.00	23.70	24.26		
24.00	2.50	124504	124505	123513	123514						28.20	29.88	23.79	24.37		
24.00	4.00	123818	123828	123848	123830						30.96	32.64	23.92	24.56	□	
24.20	3.00	124600	124601	123605	123606						29.24	30.93	24.10	24.71	□	
24.50	3.00	124603	124604	124606	124607						29.54	31.26	24.39	25.00	□	

Shaft

Bore

Key
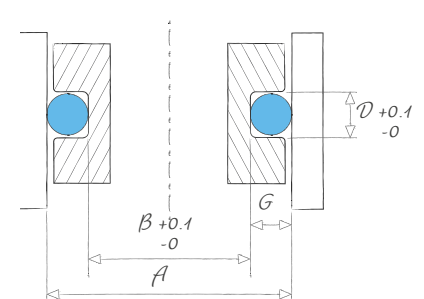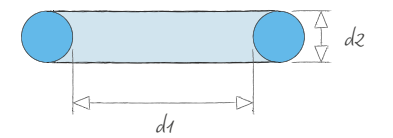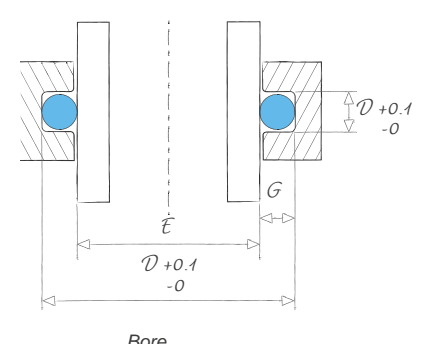
□ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

NEW

Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
24.60	2.40	124400	124401	124403	124404						28.58	30.31	24.39	24.98		
24.60	3.60	124800	124801	124803	124804	123274	123275	123276	123277	R19	30.72	32.44	24.57	25.20	□	
24.76	3.00	123761	123767	123769	123768						29.80	31.53	24.64	25.26	□	
24.99	3.53	124700	124701	124703	124704	124250	124251	124252	124253	BS1806-214 / AS568-214	30.99	32.74	24.93	25.57	□	
25.00	2.00	125303	124420	124424	124422						28.32	30.07	24.67	25.25		
25.00	2.40	125400	125401	124405	124406	124255	124256	124257	124258	R19A	28.98	30.73	24.77	25.37		
25.00	2.50	125500	125501	124500	124501	124296			124436		29.20	30.95	24.75	25.35		
25.00	3.15	125700	125701	124705	124706						30.36	32.11	24.85	25.48	□	
25.00	4.00	124854	124867	124869	124868						31.96	33.71	24.89	25.55	□	
25.00	5.00	125921	125901	124903	124907						33.70	35.45	25.08	25.78	□	
25.07	2.62	125503	125504	124502	124503	124260	124261	124262	124263	BS1806-120 / AS568-120	29.47	30.98	25.15	25.61		
25.12	1.78	125203	125204	124202	124203	124265	124266	124267	124268	BS1806-022 / AS568-022	28.00	29.51	25.08	25.51		
25.50	3.00	125603	125604	125606	125607						30.54	32.07	25.67	26.15	□	
25.80	3.53	125703	125704	125706	125707						31.80	33.35	26.04	26.53	□	
26.00	2.00	124419	124421	124425	124423						29.32	30.88	25.93	26.38		
26.00	2.50	125506	125507	125509	125510						30.20	31.76	26.03	26.49		
26.20	3.00	125608	125609	125611	125612						31.24	32.81	26.36	26.84	□	
26.20	3.60	125800	125801	125803	125804	124270	124271	124272	124273	R20	32.32	33.89	26.45	26.95	□	
26.40	3.00	124756	124758	124762	124760						31.44	33.02	26.55	27.04	□	
26.50	2.50	125511	125512	125514	125515						30.70	32.29	26.51	26.99		
26.57	3.53	125713	125714	125716	125717	124297			124437	BS1806-215 / AS568-215	32.57	34.17	26.79	27.29	□	
26.62	2.95	125618	125619	125416	125417						31.58	33.17	26.75	27.24	□	
26.64	2.62	125516	125517	125519	125520	124298			124438	BS1806-121 / AS568-121	31.04	32.64	26.68	27.16		
26.70	1.78	125206	125207	125209	125210					BS1806-023 / AS568-023	29.58	31.19	26.62	27.07		
27.00	2.00	126300	126301	125300	125301	125167			125260		30.32	31.94	26.91	27.37		
27.00	2.50	126500	126501	125521	125522						31.20	32.82	27.00	27.48		
27.06	3.00	125766	125726	125767	125753						32.10	33.72	27.19	27.69	□	
27.10	1.60	126200	126201	125211	125212						29.69	31.32	26.95	27.41		
27.30	2.50	125668	125669	125671	125670						31.50	33.14	27.29	27.78		
27.30	2.70	126600	126601	126603	126604	125357	125358	125359	125261	R20 TER	31.84	33.47	27.35	27.84		
27.50	3.00	126605	126606	126608	126609						32.54	34.19	27.62	28.13	□	
27.80	3.60	126800	126801	126803	126804	125360	125361	125362	125263	R21	33.92	35.59	28.01	28.53	□	
28.00	2.00	126303	126304	126306	126307	125168			125267		31.32	33.00	27.88	28.36		
28.00	2.50	126503	126504	126506	126507						32.20	33.88	27.98	28.47		
28.00	3.00	126621	126627	126634	125765						33.04	34.72	28.11	28.62	□	
28.00	3.15	126700	126701	126703	126704						33.36	35.04	28.09	28.60	□	
28.00	5.00	126908	126909	126910	126911	125169			125268		36.70	38.38	28.35	28.92	□	
28.17	3.53	126705	126706	126708	126709	125149	125150	125151	125152	BS1806-216 / AS568-216	34.17	35.86	28.35	28.88	□	
28.24	2.62	126508	126509	126511	126512	125170			125269	BS1806-122 / AS568-122	32.64	34.34	28.24	28.74		
28.30	1.78	126203	126204	126206	126207					BS1806-024 / AS568-024	31.18	32.88	28.18	28.66		
29.10	1.60	127100	127101	126208	126209						31.69	33.44	28.90	29.39		
29.10	2.55	127200	127201	126513	126514	126350	126351	126352	126286	R20A	33.38	35.13	29.06	29.57		
29.20	3.00	127300	127301	126610	126611						34.24	35.99	29.28	29.81		
29.30	3.60	127500	127501	127503	127504	126161	126162	126163	126164	R22	35.42	37.18	29.47	30.02	□	
29.50	3.00	127303	127304	127306	127307						34.54	36.31	29.57	30.11		
29.60	2.40	127203	127204	127206	127207						33.58	35.36	29.56	30.07		
29.74	2.95	127308	127309	127311	127312					AS568-916	34.70	36.48	29.79	30.33		

d2

d1

$\mathcal{D}$ +0.1 -0

$\mathcal{B}$ +0.1 -0

$\mathcal{A}$

G

Shaft

$\mathcal{D}$ +0.1 -0

$\mathcal{E}$

$\mathcal{D}$ +0.1 -0

G

Bore

O-RINGS

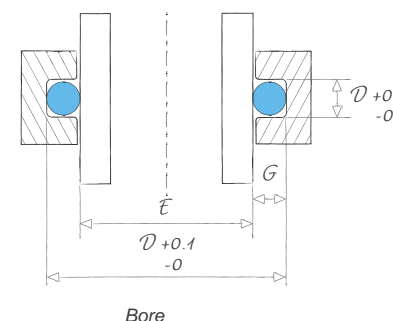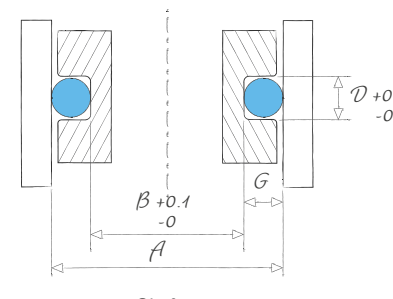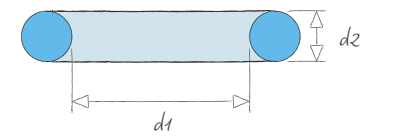*Key*

□ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

NEW

Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
29.74	3.53	127400	127401	127403	127404	126180			126287	BS1806-217 / AS568-217	35.74	37.53	29.88	30.43	□	
29.82	2.62	127208	127209	127211	127212					BS1806-123 / AS568-123	34.22	36.01	29.78	30.31		
29.87	1.78	127103	127104	127106	127107					BS1806-025 / AS568-025	32.75	34.55	29.71	30.21		
30.00	2.00	127108	127109	127111	127112	126181			126288		33.32	35.12	29.83	30.34		
30.00	2.50	127213	127214	127216	127217						34.20	36.00	29.93	30.45		
30.00	2.70	127313	127314	127316	127317						34.54	36.34	29.98	30.51		
30.00	3.00	127318	127319	127321	127322						35.04	36.84	30.06	30.60		
30.00	4.00	127505	127506	127508	127509						36.96	38.76	30.09	30.66	□	
30.80	3.60	127510	127511	127513	127514	126182	126353	126354	126289	R23	36.92	38.77	30.93	31.50	□	
31.00	2.50	126410	126411	126413	126412						35.20	37.06	30.90	31.44		
31.12	5.33	128751	128752	128753	128754	127388	127291		127498		40.39	42.26	31.46	32.09	□	
31.34	3.53	128400	128401	128403	128404	127389			127494	BS1806-218 / AS568-218	37.34	39.22	31.44	32.02	□	
31.42	2.62	128200	128201	128203	128204	127374	127375	127376	127377	BS1806-124 / AS568-124	35.82	37.71	31.34	31.89		
31.47	1.78	128100	128101	128103	128104					BS1806-026 / AS568-026	34.35	36.24	31.27	31.80		
31.50	3.00	128300	128301	128303	128304						36.54	38.43	31.52	32.09		
31.50	3.15	128405	128406	128408	128409						36.86	38.75	31.50	32.07	□	
31.60	2.40	128205	128206	128208	128209						35.58	37.48	31.51	32.05		
32.00	1.50	127166	127115	127156	127155						34.40	36.32	31.73	32.25		
32.00	2.00	128105	128106	128108	128109						35.32	37.24	31.78	32.32		
32.00	2.50	128265	128264	128246	128346						36.20	38.12	31.88	32.43		
32.10	1.60	128110	128111	128113	128114						34.69	36.62	31.83	32.36		
32.20	3.00	128305	128306	128308	128309						37.24	39.17	32.21	32.78		
32.50	1.90	128115	128116	128118	128119						35.58	37.53	32.31	32.86		
32.50	3.00	128310	128311	128313	128314						37.54	39.49	32.50	33.08		
32.50	3.60	128505	128506	128508	128509	127679	127680	127681	127497	R24	38.62	40.57	32.59	33.18	□	
32.92	3.53	128410	128411	128413	128414					BS1806-219 / AS568-219	38.92	40.90	32.98	33.58	□	
32.99	2.62	128210	128211	128213	128214	127369	127370	127371	127372	BS1806-125 / AS568-125	37.39	39.37	32.87	33.45		
33.00	3.00	128566	128567	128569	128568						38.04	40.02	32.99	33.57		
33.05	1.78	129100	129101	128120	128121					BS1806-027 / AS568-027	35.93	37.92	32.81	33.36		
33.50	3.15	129400	129401	129403	129404						38.86	40.87	33.45	34.05		
33.50	4.00	129500	129501	129503	129504	128285			128374		40.46	42.47	33.50	34.13	□	
34.00	2.00	128267	128268	128270	128269						37.32	39.36	33.73	34.30		
34.00	3.00	129300	129301	129303	129304						39.04	41.08	33.96	34.56		
34.00	5.00	128811	128812	128814	128813						42.70	44.74	34.20	34.86	□	
34.10	3.60	129505	129506	129508	129509	128196	128197	128198	128199	R25	40.22	42.27	34.15	34.77	□	
34.20	3.00	129305	129306	129308	129309	128385					39.24	41.29	34.16	34.76		
34.29	5.33	129614	129615	129616	129617					BS1806-324 / AS568-324	43.56	45.62	34.55	35.23	□	
34.50	3.00	129315	129316	129318	129319						39.54	41.61	34.45	35.06		
34.52	3.53	129405	129406	129408	129409					BS1806-220 / AS568-220	40.52	42.59	34.54	35.16	□	
34.59	2.62	129200	129201	129203	129204					BS1806-126 / AS568-126	38.99	41.07	34.43	35.03		
34.60	2.40	129205	129206	129208	129209						38.58	40.66	34.43	35.02		
34.65	1.78	129103	129104	129106	129107	128286			128375	BS1806-028 / AS568-028	37.53	39.61	34.37	34.94		
35.00	2.00	130100	130101	130108	130109	129193					38.32	40.42	34.71	35.29		
35.00	2.50	130229	130228	130230	130231						39.20	41.30	34.80	35.40		
35.00	3.00	130300	130301	129320	129321						40.04	42.14	34.94	35.55		
35.00	5.30	130600	130601	129600	129601						44.22	46.32	35.24	35.92	□	
35.10	1.60	130103	130104	129110	129111						37.69	39.80	34.75	35.33		

Shaft

Bore
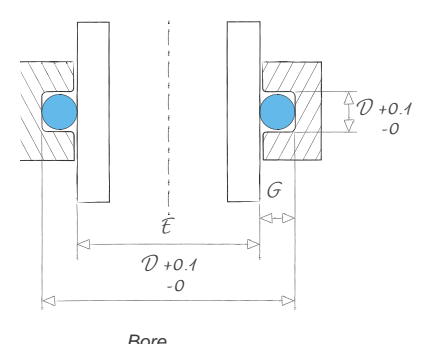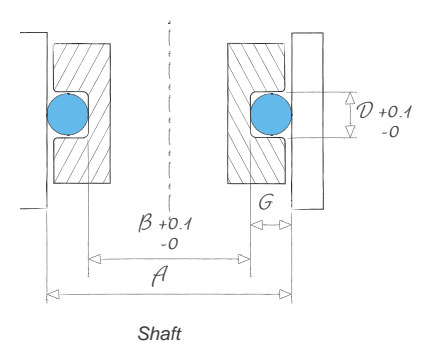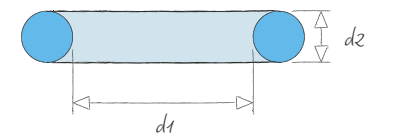
Key

□ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
35.50	3.00	130303	130304	130306	130307						40.54	42.67	35.42	36.05		
35.50	3.15	130400	130401	130403	130404						40.86	42.99	35.40	36.03		
35.50	4.00	130500	130501	130503	130504						42.46	44.59	35.45	36.11	□	
35.60	3.60	130505	130506	130508	130509	129388	129389	129390	129294	R26	41.72	43.86	35.61	36.25	□	
36.00	2.00	129242	129248	129250	129249						39.32	41.48	35.68	36.28		
36.09	3.53	130405	130406	130408	130409					BS1806-221 / AS568-221	42.09	44.26	36.07	36.72	□	
36.17	2.62	130200	130201	130203	130204					BS1806-127 / AS568-127	40.57	42.74	35.97	36.59		
36.30	2.00	129264	129262	129267	129256						39.62	41.80	35.97	36.58		
36.50	2.65	130206	130207	130208	130209						40.95	43.14	36.30	36.93		
36.50	3.00	130313	130314	130316	130317						41.54	43.73	36.40	37.04		
37.10	1.60	131100	131101	130106	130107						39.69	41.92	36.70	37.31		
37.30	3.60	131500	131501	130510	130511	130175	130176	130177	130178	R27	43.42	45.66	37.27	37.94	□	
37.40	1.80	131103	131104	131106	131107						40.32	42.56	37.06	37.67		
37.46	3.00	131300	131301	131303	131304						42.50	44.75	37.33	37.99		
37.47	5.33	131600	131601	131603	131604	130188	130352	130353	130276	R28 / BS1806-325 / AS568-325	46.74	48.99	37.65	38.37	□	
37.50	3.15	131400	131401	131403	131404						42.86	45.11	37.35	38.01		
37.50	4.00	131503	131504	131506	131507						44.46	46.71	37.40	38.09	□	
37.60	1.20	131004	131005	131006	131007						39.52	41.78	37.08	37.68		
37.60	2.40	131200	131201	131203	131204						41.58	43.84	37.36	37.99		
37.69	3.53	131405	131406	131408	131409					BS1806-222 / AS568-222	43.69	45.95	37.63	38.30	□	
37.70	2.00	130250	130252	130256	130254						41.02	43.28	37.34	37.96		
37.77	2.62	131205	131206	131208	131209					BS1806-128 / AS568-128	42.17	44.44	37.53	38.18		
37.82	1.78	131108	131109	131111	131112					BS1806-029 / AS568-029	40.70	42.97	37.46	38.08		
38.10	3.00	130567	130568	130570	130569						43.14	45.43	37.96	38.62		
38.30	4.00	130716	130718	130722	130720						45.26	47.56	38.18	38.88	□	
38.70	2.00	130251	130253	130257	130255						42.02	44.34	38.31	38.95		
38.80	4.00	130717	130719	130723	130721						45.76	48.09	38.67	39.37	□	
39.00	3.00	132300	132301	131310	131311						44.04	46.38	38.84	39.51		
39.34	2.62	132200	132201	131210	131211					BS1806-129 / AS568-129	43.74	46.10	39.06	39.73		
39.50	3.00	132306	132307	132309	132310						44.54	46.91	39.32	40.01		
39.60	2.40	132203	132204	132206	132207						43.58	45.96	39.31	39.97		
39.69	3.53	132400	132401	132403	132404	131177	131178	131179	131180		45.69	48.07	39.58	40.28	□	
39.80	2.00	131267	131269	131275	131271						43.12	45.51	39.39	40.04		
40.00	1.50	132006	132007	132008	132009						42.40	44.80	39.53	40.17		
40.00	2.50	132208	132209	132211	132212						44.20	46.60	39.68	40.35		
40.00	3.00	132316	132315	132319	131340						45.04	47.44	39.81	40.50		
40.00	3.15	132405	132406	132408	132409						45.36	47.76	39.79	40.48		
40.00	4.00	132500	132501	132503	132504						46.96	49.36	39.84	40.56	□	
40.20	2.00	131268	131270	131276	131274						43.52	45.53	40.00	40.44		
40.64	5.33	132600	132601	132603	132604	131197	131398	131399	131359	R29 / BS1806-326 / AS568-326	49.91	51.95	41.00	41.51	□	
40.87	3.53	132410	132411	132413	132414	131196			131364	BS1806-223 / AS568-223	46.87	48.91	40.97	41.45	□	
40.95	2.62	132213	132214	132216	132217						45.35	47.40	40.86	41.33		
41.00	1.78	133100	133101	132100	132101					BS1806-030 / AS568-030	43.88	45.93	40.79	41.23		
41.10	2.00	132262	132263	132268	132267						44.42	46.48	40.88	41.33		
41.40	5.30	133600	133601	132605	132606	132149	132150	132151	132152	R29A	50.62	52.69	41.74	42.26	□	
41.50	3.00	133300	133301	133303	133304						46.54	48.62	41.51	41.99		
41.60	2.40	133200	133201	133203	133204						45.58	47.66	41.49	41.95		

NEW

Shaft

Bore

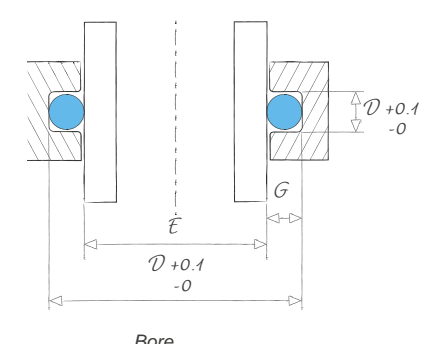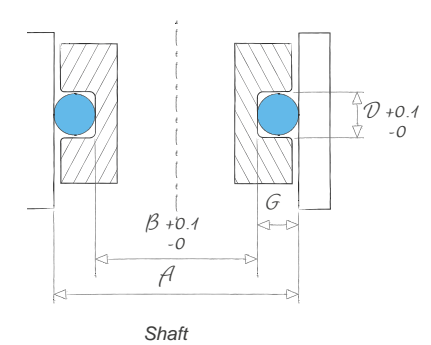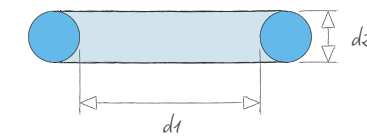Key

□ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
42.00	2.00	133107	133111	133121	133122						45.32	47.42	41.76	42.22		
42.00	4.00	132731	132741	132749	132743						48.96	51.06	42.04	42.54	□	
42.20	3.00	133305	133306	133308	133309						47.24	49.35	42.20	42.68		
42.50	3.00	133310	133311	133313	133314						47.54	49.67	42.49	42.98		
42.50	3.15	133400	133401	133403	133404						47.86	49.98	42.47	42.96		
42.50	4.00	133500	133501	133503	133504						49.46	51.59	42.53	43.04	□	
42.50	5.30	133613	133610	133612	133611						51.72	53.85	42.82	43.35	□	
42.52	2.62	133205	133206	133208	133209					BS1806-131 / AS568-131	46.92	49.05	42.40	42.88		
42.86	3.53	133405	133406	133408	133409						48.86	51.00	42.92	43.42	□	
43.00	3.00	134300	134301	133315	133316						48.04	50.19	42.98	43.47		
43.40	3.60	134500	134501	133505	133506	133189	133190	133191	133162	R29 TER	49.52	51.69	43.47	43.97	□	
43.69	3.00	134303	134304	134306	134307					AS568-924	48.73	50.91	43.66	44.15		
43.70	3.55	134413	134414	134415	134416						49.74	51.92	43.75	44.26	□	
43.82	5.33	134600	134601	134603	134604	133127	133192	133193	133163	R30 / BS1806-327 / AS568-327	53.09	55.29	44.12	44.66	□	
44.00	2.00	133245	133246	133248	133247	133098			133165		47.32	49.52	43.72	44.20		
44.05	3.53	134400	134401	134403	134404	133099			133166		50.05	52.25	44.09	44.60	□	
44.12	2.62	134200	134201	134203	134204	133124			133167	BS1806-132 / AS568-132	48.52	50.73	43.97	44.46		
44.17	1.78	134100	134101	134103	134104					BS1806-031 / AS568-031	47.05	49.26	43.89	44.37		
44.20	3.00	134308	134309	134311	134312						49.24	51.45	44.16	44.66		
44.20	5.70	134700	134701	134703	134704						54.12	56.33	44.57	45.13	□	
44.45	1.56	134000	134001	134003	134004						46.98	49.20	44.09	44.57		
44.60	2.40	134205	134206	134208	134209						48.58	50.81	44.43	44.92		
44.64	3.00	133520	133521	133524	133523						49.68	51.91	44.59	45.09		
44.64	3.52	133617	133618	133620	133619						50.62	52.86	44.66	45.18	□	
45.00	2.00	134241	135130	134244	134243	134084			134139		48.32	50.57	44.70	45.19		
45.00	2.50	135240	135227	135241	135242						49.20	51.45	44.80	45.30		
45.00	3.15	135400	135401	134405	134406						50.36	52.61	44.92	45.43		
45.00	4.00	135500	135501	134503	134504	134085			134140		51.96	54.21	44.98	45.51	□	
45.30	5.70	135700	135701	134710	134711						55.22	57.48	45.65	46.22	□	
45.54	3.60	135508	135509	135510	135504						51.66	53.94	45.57	46.09	□	
45.69	2.62	135200	135201	135203	135204	134086			134141	BS1806-133 / AS568-133	50.09	52.38	45.51	46.02		
46.00	2.00	135100	135101	135103	135104						49.32	51.62	45.68	46.18		
46.00	3.00	135300	135301	135303	135304						51.04	53.34	45.92	46.44		
46.50	2.50	135205	135206	135208	135209						50.70	53.03	46.27	46.79		
46.99	5.33	135600	135601	135603	135604	134074	134075	134076	134077	R31 / BS1806-328 / AS568-328	56.26	58.61	47.22	47.80	□	
47.00	2.00	136100	136101	135105	135106						50.32	52.67	46.66	47.17		
47.00	4.00	136519	136514	136520	136521						53.96	56.31	46.94	47.49	□	
47.20	3.00	135511	135512	135514	135513						52.24	54.60	47.10	47.63		
47.22	3.53	136400	136401	135403	135404	135136			135167	BS1806-225 / AS568-225	53.22	55.58	47.19	47.74	□	
47.29	2.62	136200	136201	135210	135211	135091	135092	135093	135094	BS1806-134 / AS568-134	51.69	54.06	47.08	47.60		
47.34	1.78	136103	136104	135107	135108						50.22	52.59	47.00	47.51		
47.50	3.15	136403	136404	136406	136407						52.86	55.23	47.37	47.91		
47.60	2.40	136203	136204	136206	136207	135145			135168		51.58	53.96	47.37	47.89		
47.63	3.53	136408	136409	136411	136412						53.63	56.01	47.60	48.14		
48.00	2.00	136106	136107	136109	136110	135146			135169		51.32	53.72	47.64	48.16		
48.00	3.00	136300	136301	136303	136304	135147			135170		53.04	55.44	47.88	48.42		
48.90	2.62	136208	136209	136211	136212	135148			135171	BS1806-135 / AS568-135	53.30	55.75	48.66	49.20		

NEW

Shaft

Bore

O-RINGS

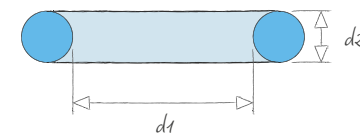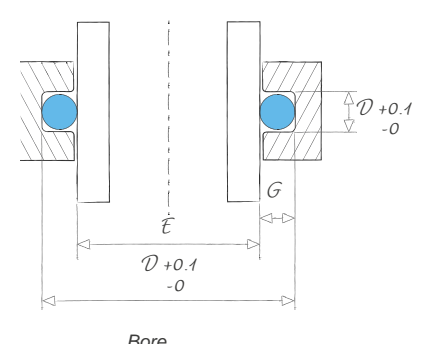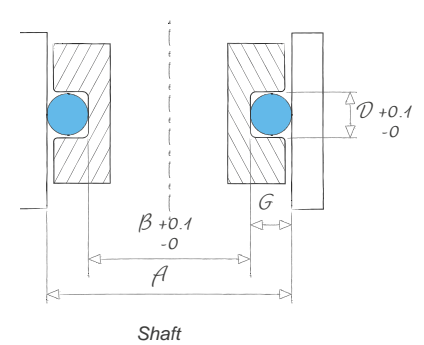*Key*

□ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

NEW

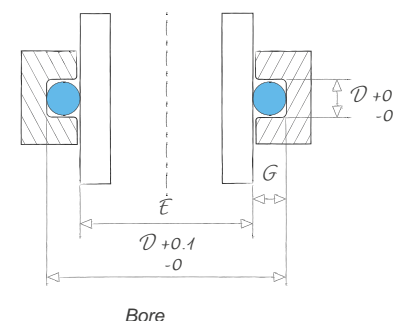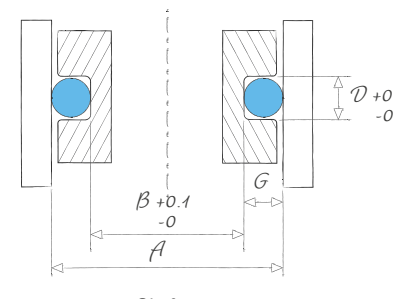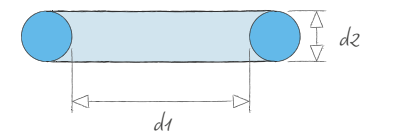| Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
49.20	5.70	137700	137701	136700	136701	136095			136011		59.12	61.58	49.47	50.08	□	
49.21	3.53	137400	137401	136413	136414						55.21	57.67	49.14	49.71		
49.50	2.00	136252	136253	136255	136254						52.82	55.30	49.11	49.65		
49.50	3.00	137300	137301	137303	137304						54.54	57.02	49.35	49.91		
49.60	2.40	137200	137201	137203	137204						53.58	56.06	49.33	49.87		
50.00	3.15	137403	137404	137406	137407						55.36	57.86	49.82	50.38		
50.00	4.00	137500	137501	137503	137504						56.96	59.46	49.88	50.46	□	
50.00	5.00	137600	137601	137603	137604	136096			136165		58.70	61.20	50.10	50.70	□	
50.17	5.33	137605	137606	137608	137609	136099	136195	136196	136166	R32 / BS1806-329 / AS568-329	59.44	61.95	50.34	50.95	□	
50.40	3.53	137408	137409	137411	137412	136098			136167		56.40	58.92	50.31	50.88		
50.47	2.62	137205	137206	137208	137209					BS1806-136 / AS568-136	54.87	57.40	50.19	50.75		
50.52	1.78	137100	137101	137103	137104					BS1806-033 / AS568-033	53.40	55.93	50.11	50.66		
50.80	3.53	137413	137414	137416	137417						56.80	59.34	50.70	51.28		
51.00	2.50	138200	138201	137210	137211						55.20	57.75	50.68	51.24		
51.60	2.40	138203	138204	138206	138207						55.58	58.16	51.29	51.85		
52.00	2.00	138100	138101	138103	138104						55.32	57.92	51.56	52.12		
52.00	3.00	138305	138306	138308	138309						57.04	59.64	51.80	52.38		
52.07	2.62	138208	138209	138211	138212					BS1806-137 / AS568-137	56.47	59.08	51.76	52.34		
52.30	5.70	138700	138701	138703	138704						62.22	64.83	52.51	53.15	□	
53.00	3.00	138515	138518	138517	138516						58.04	60.69	52.78	53.37		
53.00	4.00	139500	139501	138500	138501	138071			138087		59.96	62.61	52.82	53.43	□	
53.10	3.00	139300	139301	138310	138311						58.14	60.80	52.88	53.47		
53.34	5.33	139603	139604	138602	138603	138059	138060	138061	138062	R33 / BS1806-330 / AS568-330	62.61	65.28	53.45	54.09	□	
53.57	3.53	139400	139401	139403	139404					BS1806-227 / AS568-227	59.57	62.25	53.42	54.02		
53.64	2.62	139200	139201	139203	139204					BS1806-138 / AS568-138	58.04	60.72	53.30	53.89		
53.69	1.78	139100	139101	139103	139104						56.57	59.26	53.22	53.79		
53.90	4.00	138712	138713	138715	138714						60.86	63.56	53.70	54.32	□	
53.98	3.53	139405	139406	139408	139409						59.98	62.68	53.82	54.43		
54.00	2.00	139105	139106	139108	139109						57.32	60.02	53.52	54.10		
54.00	3.00	139303	139304	139306	139307						59.04	61.74	53.76	54.36		
54.20	5.70	139700	139701	139703	139704						64.12	66.83	54.37	55.03	□	
54.40	5.30	139606	139607	139609	139610	138126	138127	138128	138088	R33A	63.62	66.34	54.48	55.13	□	
54.50	3.00	139308	139309	139311	139312						59.54	62.27	54.25	54.86		
54.60	2.40	139205	139206	139208	139209						58.58	61.31	54.23	54.82		
55.00	2.00	140100	140101	139110	139111						58.32	61.07	54.50	55.09		
55.00	2.50	139452	139453	139461	139459						59.20	61.95	54.60	55.20		
55.00	3.50	140400	140401	139410	139411						60.95	63.70	54.81	55.43		
55.25	2.62	140200	140201	139210	139211					BS1806-139 / AS568-139	59.65	62.41	54.88	55.48		
55.30	5.70	140700	140701	139710	139711						65.22	67.98	55.45	56.12	□	
55.50	3.00	140300	140301	139313	139314						60.54	63.32	55.23	55.85		
55.56	3.53	140403	140404	140406	140407						61.56	64.34	55.37	55.99		
56.00	4.00	140500	140501	140503	140504						62.96	65.76	55.76	56.40	□	
56.00	5.00	140600	140601	140603	140604						64.70	67.50	55.98	56.64	□	
56.52	5.33	140605	140606	140608	140609	139078	139153	139154	139090	R34 / BS1806-331 / AS568-331	65.79	68.62	56.56	57.23	□	
56.75	3.53	140408	140409	140411	140412	139077			139091		62.75	65.59	56.53	57.17		
56.82	2.62	140203	140204	140206	140207					BS1806-140 / AS568-140	61.22	64.06	56.42	57.04		
56.87	1.78	140103	140104	140106	140107					BS1806-035 / AS568-035	59.75	62.60	56.34	56.94		

Shaft

Bore

O-RINGS

Key

□ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

NEW

Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
57.00	2.80	141300	141301	140303	140304						61.70	64.55	56.64	57.27		
57.00	3.10	141400	141401	140413	140414						62.27	65.12	56.67	57.30		
57.50	2.00	141100	141101	140108	140109						60.82	63.70	56.95	57.57		
57.60	2.40	141200	141201	141203	141204						61.58	64.46	57.17	57.79		
58.00	3.00	141303	141304	141306	141307						63.04	65.94	57.68	58.32		
58.00	3.55	141421	141423	141424	141425						64.04	66.94	57.76	58.41		
58.40	4.00	140744	140743	140745	140742						65.36	68.28	58.11	58.78	□	
58.42	2.62	141205	141206	141208	141209					BS1806-141 / AS568-141	62.82	65.74	57.99	58.62		
58.58	7.00	140801	140802	140804	140803						70.90	73.83	58.81	59.53	□	
58.74	3.53	141406	141407	141409	141410	140043			140053		64.74	67.68	58.48	59.14		
59.20	2.50	142200	142201	141210	141211						63.40	66.36	58.72	59.36		
59.20	5.70	142700	142701	141700	141701						69.12	72.08	59.27	59.98	□	
59.36	3.00	142300	142301	141308	141309					AS568-932	64.40	67.37	59.01	59.67		
59.69	5.33	142600	142601	142603	142604	141073			141075	R35 / BS1806-332 / AS568-332	68.96	71.95	59.67	60.37	□	
59.92	3.53	142400	142401	142403	142404					BS1806-229 / AS568-229	65.92	68.92	59.64	60.31		
59.99	2.62	142208	142209	142211	142212					BS1806-142 / AS568-142	64.39	67.39	59.52	60.18		
60.00	4.00	142500	142501	142503	142504						66.96	69.96	59.68	60.36	□	
60.00	5.00	142605	142606	142608	142609						68.70	71.70	59.90	60.60	□	
60.04	1.78	142100	142101	142103	142104					BS1806-036	62.92	65.93	59.44	60.08		
60.40	3.00	141510	141511	141513	141512		141080				65.44	68.46	60.03	60.70		
60.50	2.00	142112	142110	142113	142114						63.82	66.85	59.89	60.54		
61.60	2.40	143200	143201	142213	142214						65.58	68.66	61.09	61.75		
61.60	2.62	143203	143204	142215	142216					BS1806-143 / AS568-143	66.00	69.08	61.10	61.77		
61.91	3.53	143400	143401	143403	143404	142054			142064		67.91	71.01	61.59	62.28		
62.00	3.00	143300	143301	143303	143304						67.04	70.14	61.60	62.28		
62.00	3.50	143405	143406	143408	143409						67.95	71.05	61.67	62.36		
62.87	5.33	143600	143601	143603	143604	142055			142065	R36 / BS1806-333 / AS568-333	72.14	75.29	62.79	63.52	□	
63.00	2.00	144100	144101	143100	143101						66.32	69.47	62.34	63.01		
63.00	4.00	144500	144501	143500	143501						69.96	73.11	62.62	63.33	□	
63.10	3.53	144400	144401	143410	143411	143056			143079		69.10	72.26	62.76	63.46		
63.17	2.62	144200	144201	143206	143207	143048	143049	143050	143051	BS1806-144 / AS568-144	67.57	70.73	62.64	63.32		
63.22	1.78	144103	144104	143102	143103	143057			143080	BS1806-037 / AS568-037	66.10	69.26	62.56	63.23		
64.50	3.00	144300	144301	144303	144304						69.54	72.77	64.05	64.76		
64.60	2.40	144203	144204	144206	144207						68.58	71.81	64.03	64.72		
64.77	2.62	144208	144209	144211	144212	143058			143081	BS1806-145 / AS568-145	69.17	72.41	64.21	64.91		
65.00	2.00	144264	144265	144250	144266						68.32	71.57	64.30	64.99		
65.00	3.00	145300	145301	144305	144306						70.04	73.29	64.54	65.25		
65.09	3.53	145400	145401	144403	144404						71.09	74.35	64.71	65.43		
66.04	5.33	145600	145601	145603	145604	144049			144059	R37 / BS1806-334 / AS568-334	75.31	78.62	65.89	66.66	□	
66.27	3.53	145403	145404	145406	145407					BS1806-231 / AS568-231	72.27	75.58	65.86	66.60		
66.34	2.62	145200	145201	145203	145204	144048			144060	BS1806-146 / AS568-146	70.74	74.06	65.75	66.46		
66.39	1.78	145100	145101	145103	145104						69.27	72.59	65.67	66.37		
67.00	2.50	146200	146201	145205	145206						71.20	74.55	66.36	67.08		
67.60	2.40	146203	146204	145207	145208						71.58	74.96	66.97	67.69		
67.95	2.62	146206	146207	146209	146210					BS1806-147 / AS568-147	72.35	75.75	67.32	68.06		
68.00	2.00	146109	146102	146110	146106						71.32	74.72	67.24	67.96		
68.00	3.00	146300	146301	146303	146304						73.04	76.44	67.48	68.22		

Shaft

Bore
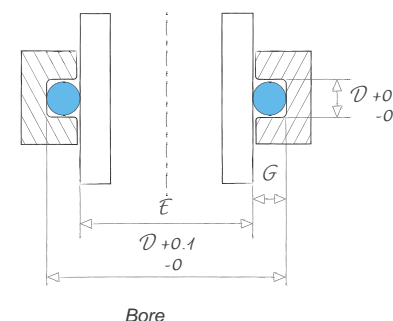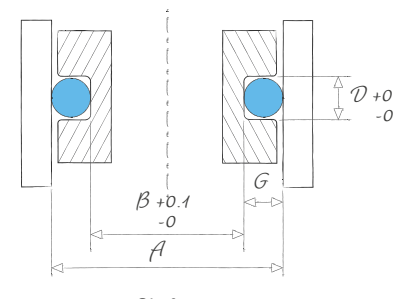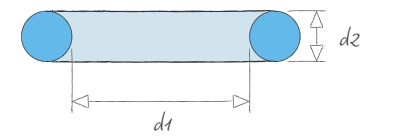
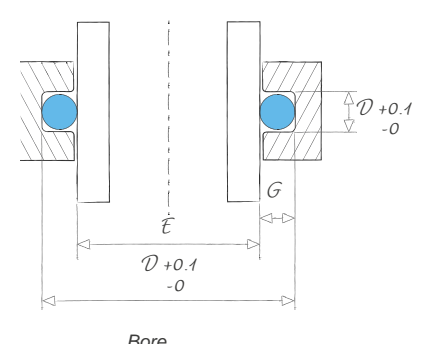Key

□ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

NEW

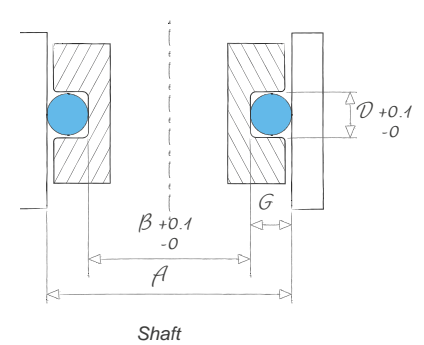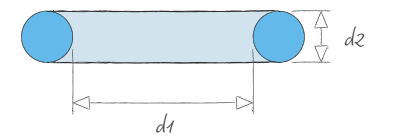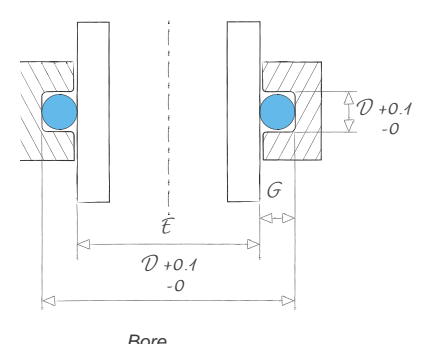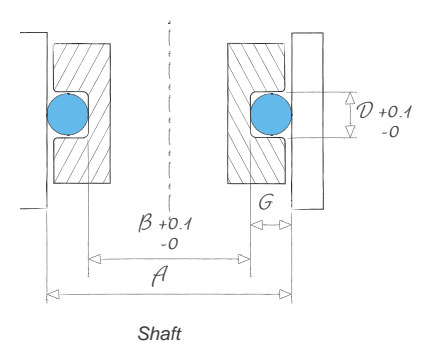| Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
68.00	4.00	145731	145732	145734	145733						74.96	78.36	67.52	68.28	☐	
68.00	5.00	145801	145802	145804	145803						76.70	80.10	67.74	68.52	☐	
68.26	3.53	146400	146401	146403	146404						74.26	77.67	67.81	68.57		
69.20	5.70	147700	147701	146700	146701						79.12	82.58	69.07	69.88	☐	
69.22	5.33	147600	147601	146603	146604	146047			146055	R38 / BS1806-335 / AS568-335	78.49	81.96	69.01	69.81	☐	
69.45	3.53	147400	147401	146405	146406						75.45	78.92	68.98	69.74		
69.52	2.62	147200	147201	146211	146212					BS1806-148 / AS568-148	73.92	77.40	68.86	69.61		
69.57	1.78	147100	147101	146100	146101	146046			146056	BS1806-039 / AS568-039	72.45	75.93	68.78	69.52		
69.85	3.53	147403	147404	147406	147407						75.85	79.34	69.37	70.14		
70.00	2.00	147108	146242	146244	146243						73.32	76.82	69.20	69.94		
70.00	2.50	147206	147207	147209	147210						74.20	77.70	69.30	70.05		
70.00	3.00	146506	146507	146509	146508						75.04	78.54	69.44	70.20		
70.00	5.00	146804	146805	146807	146806						78.70	82.20	69.70	70.50	☐	
71.00	3.55	148408	148409	147412	147413						77.04	80.59	70.50	71.28		
71.00	5.00	148600	148601	147603	147604						79.70	83.25	70.68	71.49	☐	
71.12	2.62	148200	148201	147211	147212					BS1806-149 / AS568-149	75.52	79.08	70.43	71.19		
71.50	2.50	148208	148209	147213	147214						75.70	79.28	70.77	71.54		
72.00	3.00	148300	148301	148303	148304						77.04	80.64	71.40	72.18		
72.39	5.33	148603	148604	148606	148607	147051			147054	R39 / BS1806-336 / AS568-336	81.66	85.28	72.11	72.95	☐	
72.62	3.53	148400	148401	148403	148404	147038			147055	BS1806-233 / AS568-233	78.62	82.25	72.09	72.88		
72.69	2.62	148203	148204	148206	148207					BS1806-150 / AS568-150	77.09	80.73	71.97	72.75		
72.74	1.78	148100	148101	148103	148104						75.62	79.26	71.89	72.65		
73.00	4.00	149507	149508	149509	149510						79.96	83.61	72.42	73.23	☐	
73.03	3.53	149400	149401	148405	148406						79.03	82.68	72.49	73.29		
74.00	2.00	148230	148231	148233	148232						77.32	81.02	73.12	73.90		
74.00	3.00	149300	149301	149303	149304	148027			148033		79.04	82.74	73.36	74.16		
74.20	5.70	149700	149701	149703	149704						84.12	87.83	73.97	74.83	☐	
74.30	5.70	149705	149706	149708	149709						84.22	87.93	74.07	74.93	☐	
74.61	3.53	149403	149404	149406	149407						80.61	84.34	74.04	74.85		
74.85	3.00	148505	148506	148508	148507						79.89	83.63	74.19	75.00		
75.00	2.00	150100	150101	149100	149101	149091			149130		78.32	82.07	74.10	74.89		
75.00	4.00	150500	150501	149500	149501						81.96	85.71	74.38	75.21	☐	
75.00	5.00	150600	150601	149605	149606						83.70	87.45	74.60	75.45	☐	
75.54	3.53	149639	149640	149642	149641						81.54	85.32	74.95	75.77		
75.57	5.33	150603	150604	149607	149608	149081	149082	149083	149084	R40 / BS1806-337 / AS568-337	84.84	88.62	75.23	76.09	☐	
75.79	3.53	150400	150401	150403	150404	149092			149131	BS1806-234 / AS568-234	81.79	85.58	75.19	76.02		
75.87	2.62	150200	150201	150203	150204					BS1806-151 / AS568-151	80.27	84.07	75.09	75.90		
75.92	1.78	150103	150104	150106	150107					BS1806-041 / AS568-041	78.80	82.60	75.01	75.80		
76.93	2.62	149428	149427	149429	149426						81.33	85.18	76.13	76.95		
78.00	3.00	150300	150301	150303	150304						83.04	86.94	77.28	78.12		
78.30	2.00	149213	149212	149214	149211						81.62	85.54	77.33	78.16		
78.74	5.33	150606	150607	150609	150610				149132	R41 / BS1806-338 / AS568-338	88.01	91.95	78.34	79.23	☐	
78.97	3.53	150405	150406	150408	150409					BS1806-235 / AS568-235	84.97	88.92	78.31	79.17		
79.20	5.70	150700	150701	150703	150709						89.12	93.08	78.87	79.78	☐	
79.50	3.00	150305	150306	150308	150309						84.54	88.52	78.75	79.61		
79.77	5.33	150611	150612	150614	150615						89.04	93.03	79.35	80.25	☐	
80.00	2.00	150228	150230	150234	150232						83.32	87.32	79.00	79.84		

Shaft

Bore

Key

☐ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

O-RINGS

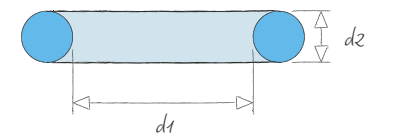| Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
80.00	2.65	151210	151211	150211	150212						84.45	88.45	79.14	80.00		
80.00	4.00	151500	151501	150503	150504						86.96	90.96	79.28	80.16	□	
80.00	5.00	151600	151601	150616	150617	150082			150098		88.70	92.70	79.50	80.40	□	
80.50	2.20	151200	151201	150205	150206						84.15	88.18	79.55	80.40		
81.00	3.00	151300	151301	151303	151304						86.04	90.09	80.22	81.09		
81.92	5.33	151603	151604	151606	151607	150069	150070	150071	150072	R42 / BS1806-339 / AS568-339	91.19	95.29	81.45	82.38	□	
82.00	2.00	151100	151101	151103	151104						85.32	89.42	80.96	81.82		
82.15	3.53	151400	151401	151403	151404						88.15	92.26	81.42	82.32		
82.22	2.62	151203	151204	151206	151207					BS1806-152 / AS568-152	86.62	90.73	81.31	82.18		
82.27	1.78	151105	151106	151108	151109					BS1806-042 / AS568-042	85.15	89.27	81.23	82.09		
84.00	3.00	151305 △	151306	151308	151309						89.04	93.24	83.16	84.06		
84.02	2.00	150229	150231	150235	150233						87.34	91.54	82.94	83.82		
84.11	5.72	150837	150838	150840	150839						94.06	98.27	83.69	84.64	□	
84.50	3.00	151310	151311	151313	151314						89.54	93.77	83.65	84.56		
84.53	2.62	150466	151226	150460	150459						88.93	93.16	83.57	84.47		
85.00	2.00	152100	152101	151110	151111						88.32	92.57	83.90	84.79		
85.00	5.00	152600	152601	151608	151609						93.70	97.95	84.40	85.35	□	
85.00	6.30	152800	152801	151803	151804						96.09	100.34	84.56	85.54	□	
85.09	5.33	152603	152604	151610	151611	151095			151151	R43 / BS1806-340 / AS568-340	94.36	98.62	84.56	85.52	□	
85.30	4.00	151749	151750	151752	151751						92.26	96.53	84.47	85.41	□	
85.32	3.53	152400 △	152401	151405	151406					BS1806-237 / AS568-237	91.32	95.59	84.53	85.46		
86.15	1.25	151909	151908	151910	151907						88.15	92.46	84.88	85.76		
87.20	2.50	152200	152201	152203	152204						91.40	95.76	86.16	87.08		
87.90	3.00	151511	151512	151514	151513						92.94	97.34	86.98	87.92		
88.27	5.33	152606	152607	152609	152610				151152	R44 / BS1806-341 / AS568-341	97.54	101.96	87.68	88.67	□	
88.50	3.53	152403	152404	152406	152407						94.50	98.93	87.65	88.60		
88.57	2.62	152205	152206	152208	152209					BS1806-153 / AS568-153	92.97	97.40	87.53	88.47		
88.62	1.78	152103	152104	152106	152107					BS1806-043 / AS568-043	91.50	95.93	87.45	88.37		
89.00	4.00	152500	152501	152503	152504	151093			151153		95.96	100.41	88.10	89.07	□	
89.50	3.00	152300	152301	152303	152304						94.54	99.02	88.55	89.51		
89.69	5.33	152611	152612	152614	152615	151159					98.96	103.45	89.07	90.07	□	
90.00	5.00	153600	153601	152616	152617	152077			152120		98.70	103.20	89.30	90.30	□	
90.00	6.30	153800	153801	152803	152804						101.09	105.59	89.46	90.49	□	
91.00	3.00	153300	153301	153303	153304						96.04	100.59	90.02	90.99		
91.38	4.04	152766	152767	152769	152768						98.41	102.98	90.44	91.44	□	
91.42	3.00	152527	152528	152530	152529						96.46	101.03	90.43	91.41		
91.44	5.33	153603	153604	153606	153607	152078			152122	R45 / BS1806-342 / AS568-342	100.71	105.29	90.78	91.80	□	
91.67	3.53	153400	153401	153403	153404					BS1806-239 / AS568-239	97.67	102.25	90.75	91.74		
93.66	2.50	152459	152460	152462	152461						97.86	102.54	92.49	93.47		
94.10	5.70	153700	153701	153703	153704						104.02	108.72	93.47	94.53	□	
94.50	3.00	153305	153306	153308	153309						99.54	104.27	93.45	94.46		
94.62	5.33	153608	153609	153611	153612	152079			152129	R46 / BS1806-343 / AS568-343	103.89	108.63	93.90	94.95	□	
94.85	2.00	152241	152240	152242	152239						98.17	102.91	93.55	94.54		
94.85	3.53	153405	153406	153408	153409						100.85	105.59	93.87	94.89		
94.92	2.62	153200	153201	153203	153204	152080			152130	BS1806-154 / AS568-154	99.32	104.07	93.76	94.76		
94.97	1.78	153100	153101	153103	153104					BS1806-044 / AS568-044	97.85	102.60	93.68	94.66		
95.00	5.00	154600	154601	153613	153614						103.70	108.45	94.20	95.25	□	

Shaft

Bore

Key
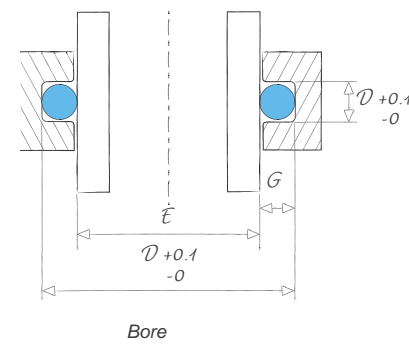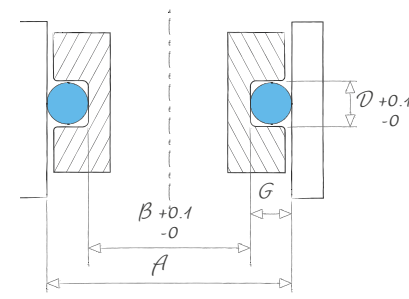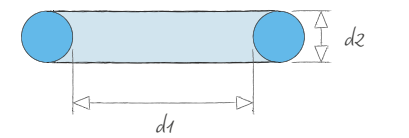
□ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

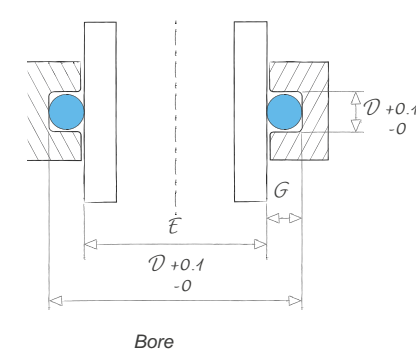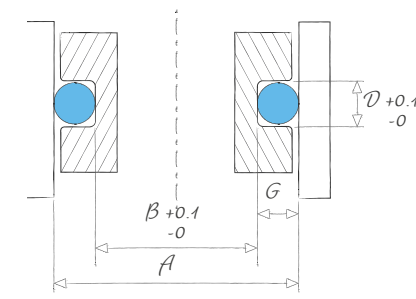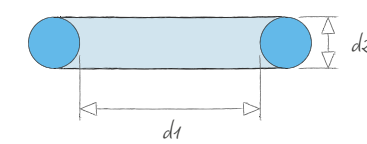| Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
95.10	2.40	154200	154201	153205	153206						99.08	103.84	93.92	94.92		
95.37	2.00	153231	153232	153234	153233						98.69	103.46	94.06	95.06		
96.00	4.00	153766	153764	153767	153765						102.96	107.76	94.96	96.00	□	
96.30	3.60	154500	154501	154503	154504						102.42	107.24	95.31	96.35		
97.79	5.33	154603	154604	154606	154607	153037	153038	153039	153040	R47 / BS1806-344 / AS568-344	107.06	111.95	97.01	98.09	□	
98.00	2.20	154203	154204	154206	154207						101.65	106.55	96.70	97.72		
98.02	3.53	154400	154401	154403	154404					BS1806-241 / AS568-241	104.02	108.92	96.98	98.03		
99.30	5.70	154700	154701	154703	154704	153044			153051		109.22	114.18	98.57	99.68	□	
99.50	3.00	154300	154301	154303	154304	153045			153052		104.54	109.52	98.35	99.41		
100.00	2.00	155100	155101	154100	154101						103.32	108.32	98.60	99.64		
100.00	5.00	155500	155501	154608	154609						108.70	113.70	99.10	100.20	□	
100.97	5.33	155506	155507	154612	154613	154063			154078	R48 / BS1806-345 / AS568-345	110.24	114.28	100.68	102.36	□	
101.00	3.00	155300	155301	154305	154306						106.04	110.08	100.36	101.96		
101.20	3.53	155303	155304	155306	155307						107.20	111.25	100.64	102.26		
101.27	2.62	155200	155201	155203	155204					BS1806-155 / AS568-155	105.67	109.72	100.51	102.11		
101.32	1.78	155103	155104	155106	155107					BS1806-045 / AS568-045	104.20	108.26	100.42	102.00		
102.00	3.00	154224	155355	154229	154227						107.04	111.12	101.34	102.96		
103.30	3.00	154225	154226	154230	154228						108.34	112.47	102.62	104.26		
104.00	4.00	155435	155419	155436	155437						110.96	115.12	103.36	105.04		
104.14	5.33	155509	155510	155512	155513				154079	R49 / BS1806-346 / AS568-346	113.41	117.58	103.80	105.53	□	
104.37	3.53	155308	155309	155311	155312					BS1806-243 / AS568-243	110.37	114.55	103.76	105.43		
104.50	3.00	155313	155314	155316	155317						109.54	113.72	103.80	105.46		
104.64	5.05	154518	154519	154521	154520						113.43	117.61	104.23	105.95	□	
105.99	2.00	155126	155127	155129	155128						109.31	113.55	105.02	106.67		
106.00	2.50	156200	156201	155205	155206						110.20	114.44	105.14	106.80		
107.32	5.33	156503	156504	156506	156507	155029	155030	155031	155032	R50 / BS1806-347 / AS568-347	116.59	120.89	106.94	108.71	□	
107.55	3.53	156300	156301	156303	156304						113.55	117.85	106.89	108.61		
107.62	2.62	156203	156204	156206	156207					BS1806-156 / AS568-156	112.02	116.33	106.77	108.46		
107.67	1.78	156100	156101	156103	156104					BS1806-046 / AS568-046	110.55	114.86	106.68	108.35		
109.30	5.70	156600	156601	156603	156604						119.22	123.59	108.97	110.78	□	
109.50	3.00	156305	156306	156308	156309						114.54	118.92	108.73	110.46		
110.00	2.00	156112	157111	156114	156113						113.32	117.72	108.97	110.68		
110.49	5.33	157500	157501	156513	156514	156057			156076	R51 / BS1806-348 / AS568-348	119.76	124.18	110.06	111.88	□	
110.72	3.53	157300	157301	156310	156311					BS1806-245 / AS568-245	116.72	121.15	110.01	111.78		
112.00	3.00	157303	157304	157306	157307						117.04	121.52	111.19	112.96		
113.67	5.33	157508	157509	157511	157512	156048	156049	156050	156051	R52 / BS1806-349 / AS568-349	122.94	127.49	113.19	115.06	□	
113.67	6.99	157705	157706	157708	157709	156058				R53 / BS1806-425 / AS568-425	125.97	130.52	113.43	115.35	□	
113.90	3.53	157308	157309	157311	157312						119.90	124.46	113.14	114.96		
113.97	2.62	157200	157201	157203	157204					BS1806-157 / AS568-157	118.37	122.93	113.02	114.81		
114.02	1.78	157100	157101	157103	157104					BS1806-047 / AS568-047	116.90	121.46	112.93	114.70		
114.30	5.70	157600	157601	157603	157604						124.22	128.79	113.90	115.78	□	
115.00	3.00	158300	158301	157318	157319						120.04	124.64	114.15	115.96		
116.00	4.00	158400	158401	157400	157401						122.96	127.60	115.18	117.04		
116.84	6.99	158700	158701	158703	158704					R54 / BS1806-426 / AS568-426	129.14	133.82	116.56	118.52	□	
117.07	3.53	158303	158304	158306	158307					BS1806-247 / AS568-247	123.07	127.75	116.27	118.13		
117.50	5.33	158505	158506	158508	158509						126.77	131.47	116.96	118.89	□	
118.00	5.30	158521	158522	158523	158524						127.22	131.94	117.45	119.38	□	

NEW

Shaft

Bore

Key

□ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

O-RINGS

Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
118.50	3.00	158308	158309	158311	158312						123.54	128.28	117.59	119.46		
119.00	4.00	158403	158404	158406	158407						125.96	130.72	118.14	120.04		
119.30	5.70	158600	158601	158603	158604						129.22	133.99	118.82	120.78	□	
119.50	3.00	158313	158314	158316	158317	157034					124.54	129.32	118.58	120.46		
120.02	6.99	159700	159701	158710	158711					R55 / BS1806-427 / AS568-427	132.32	137.12	119.69	121.70	□	
120.25	3.53	159300	159301	158318	158319	158047					126.25	131.06	119.40	121.31		
120.32	2.62	159200	159201	158200	158201					BS1806-158 / AS568-158	124.72	129.53	119.28	121.16		
120.37	1.78	159100	159101	158100	158101					BS1806-048 / AS568-048	123.25	128.07	119.19	121.05		
123.00	3.00	159303	159304	159306	159307						128.04	132.96	122.03	123.96		
123.19	6.99	159703	159704	159706	159707					R56 / BS1806-428 / AS568-428	135.49	140.42	122.81	124.87	□	
123.42	3.53	159308	159309	159311	159312					BS1806-249 / AS568-249	129.42	134.36	122.52	124.48		
123.80	5.33	159511	159512	159514	159515	158066					133.07	138.03	123.17	125.19	□	
124.50	3.00	159313	159314	159316	159317	158048					129.54	134.52	123.50	125.46		
125.00	2.00	160100	160101	159103	159104						128.32	133.32	123.75	125.68		
125.00	5.00	160500	160501	159516	159517						133.70	138.70	124.28	126.30	□	
126.00	3.00	160300	160301	159318	159319						131.04	136.08	124.98	126.96		
126.37	5.33	160503	160504	160506	160507	159064				BS1806-353 / AS568-353	135.64	140.70	125.70	127.76	□	
126.37	6.99	160700	160701	160703	160704					R57 / BS1806-429 / AS568-429	138.67	143.73	125.94	128.05	□	
126.60	3.53	160303	160304	160306	160307	159037	159038	159039	159040	BS1806-250 / AS568-250	132.60	137.67	125.65	127.66		
126.67	2.62	160200	160201	160203	160204					BS1806-159 / AS568-159	131.07	136.14	125.53	127.51		
126.72	1.78	160103	160104	160106	160107					BS1806-049 / AS568-049	129.60	134.67	125.44	127.40		
128.00	3.00	159207	159208	159210	159209						133.04	138.16	126.95	128.96		
129.30	5.70	160600	160601	160603	160604						139.22	144.39	128.67	130.78	□	
129.50	3.00	160308	160309	160311	160312						134.54	139.72	128.43	130.46		
129.54	5.33	160508	160509	160511	160512					BS1806-354 / AS568-354	138.81	144.00	128.82	130.93	□	
129.54	6.99	160705	160706	160708	160709					R58 / BS1806-430 / AS568-430	141.84	147.02	129.06	131.22	□	
129.77	3.53	160313	160314	160316	160317					BS1806-251 / AS568-251	135.77	140.96	128.78	130.83		
132.00	3.00	160218	160219	160221	160220						137.04	142.32	130.89	132.96		
132.72	5.33	161505	161506	161508	161509					BS1806-355 / AS568-355	141.99	147.30	131.96	134.11	□	
132.72	6.99	161700	161701	161703	161704					R59 / BS1806-431 / AS568-431	145.02	150.33	132.20	134.40	□	
132.94	3.53	161300	161301	161303	161304					BS1806-252 / AS568-252	138.94	144.26	131.90	134.00		
133.02	2.62	161203	161204	161206	161207					BS1806-160 / AS568-160	137.42	142.74	131.78	133.86		
133.07	1.78	161100	161101	161103	161104					BS1806-050 / AS568-050	135.95	141.28	131.70	133.75		
134.30	5.70	161600	161601	161603	161604						144.22	149.59	133.60	135.78	□	
134.50	3.00	161305	161306	161308	161309						139.54	144.92	133.35	135.46		
135.00	4.00	162400	162401	161400	161401						141.96	147.36	133.90	136.04		
135.89	6.99	162700	162701	161710	161711					R60 / BS1806-432 / AS568-432	148.19	153.63	135.32	137.57	□	
136.12	3.53	162300	162301	161310	161311					BS1806-253 / AS568-253	142.12	147.57	135.03	137.18		
136.50	5.33	162503	162504	162506	162507						145.77	151.23	135.68	137.89	□	
137.00	3.00	162303	162304	162306	162307						142.04	147.52	135.82	137.96		
138.70	1.80	162106	162102	162107	162103						141.62	147.16	137.25	139.38		
139.00	4.00	162403	162404	162406	162407						145.96	151.52	137.84	140.04		
139.07	6.99	162703	162704	162706	162707	161046				R61 / BS1806-433 / AS568-433	151.37	156.94	138.45	140.75	□	
139.30	3.53	162308	162309	162311	162312	161047				BS1806-254 / AS568-254	145.30	150.87	138.16	140.36		
139.37	2.62	162200	162201	162203	162204					BS1806-161 / AS568-161	143.77	149.35	138.04	140.21		
139.50	3.00	161228	161227	161229	161226						144.54	150.12	138.28	140.46		
139.70	5.33	162513	162514	162516	162517						148.97	154.56	138.83	141.09	□	

Shaft

Bore

Key
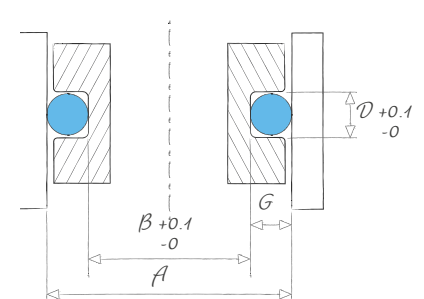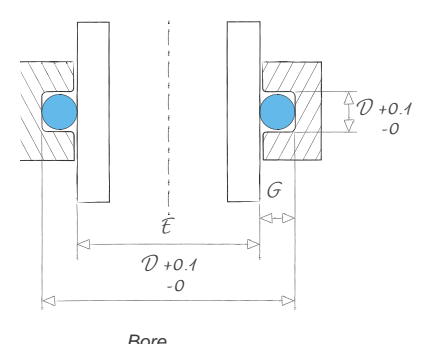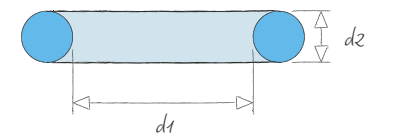
□ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

NEW

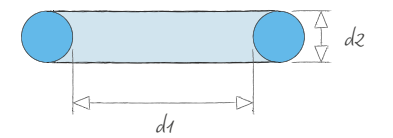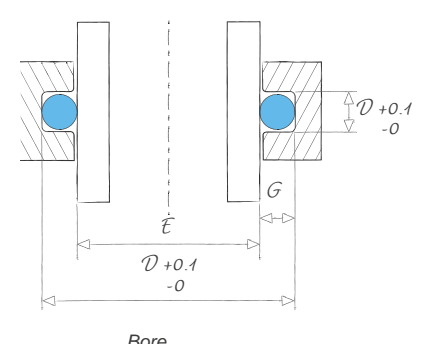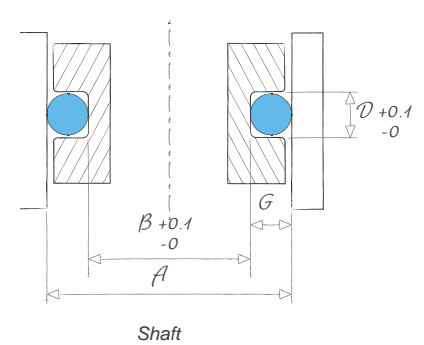| Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
139.96	3.00	161222	161223	161225	161224						145.00	150.60	138.73	140.92		
140.00	5.00	163500	163501	162518	162519						148.70	154.30	139.05	141.30	□	
141.00	3.00	162209	162210	162212	162211						146.04	151.68	139.76	141.96		
142.24	5.33	163508	163509	163506	163507					BS1806-358 / AS568-358	151.51	157.20	141.33	143.63	□	
142.24	6.99	163700	163701	163703	163704					R62 / BS1806-434 / AS568-434	154.54	160.23	141.57	143.92	□	
142.47	3.53	163300	163301	163303	163304					BS1806-255 / AS568-255	148.47	154.17	141.29	143.53		
144.00	3.70	163400	163401	163403	163404						150.29	156.05	142.84	145.11		
144.30	5.70	163600	163601	163603	163604						154.22	159.99	143.45	145.78	□	
144.50	3.00	163305	163306	163308	163309						149.54	155.32	143.20	145.46		
145.00	4.00	164400	164401	163405	163406						151.96	157.76	143.75	146.04		
145.42	6.99	164700	164701	163705	163706					R63 / BS1806-435 / AS568-435	157.72	163.54	144.71	147.10	□	
145.64	3.53	164300	164301	163310	163311	163031				BS1806-256 / AS568-256	151.64	157.47	144.41	146.70		
145.72	2.62	164200	164201	163200	163201					BS1806-162 / AS568-162	150.12	155.95	144.29	146.56		
146.10	5.33	164503	164504	163515	163516						155.37	161.22	145.13	147.49	□	
148.00	3.00	163210	163211	163213	163212						153.04	158.96	146.65	148.96		
148.59	5.33	164506	164507	164509	164510					BS1806-360 / AS568-360	157.86	163.81	147.59	149.98	□	
148.59	6.99	164703	164704	164706	164707	163040				R64 / BS1806-436 / AS568-436	160.89	166.84	147.83	150.27	□	
148.82	3.53	164303	164304	164306	164307					BS1806-257 / AS568-257	154.82	160.77	147.54	149.88		
149.20	5.33	164511	164512	164514	164515						158.47	164.44	148.19	150.59	□	
149.32	5.68	163609	163610	163612	163611						159.22	165.19	148.37	150.78	□	
150.00	2.00	164102	164103	164105	164104						153.32	159.32	148.37	150.68		
150.00	3.40	165300	165301	164313	164314						155.78	161.78	148.67	151.02		
150.00	5.00	165500	165501	164516	164517	164023					158.70	164.70	148.90	151.30	□	
151.00	3.00	165303	165304	164315	164316						156.04	162.08	149.61	151.96		
151.77	6.99	165700	165701	165703	165704	164039				R65 / BS1806-437 / AS568-437	164.07	170.14	150.96	153.45	□	
152.00	3.53	165306	165307	165309	165310						158.00	164.08	150.67	153.06		
152.07	2.62	165200	165201	165203	165204					BS1806-163 / AS568-163	156.47	162.55	150.55	152.91		
154.30	5.70	165600	165601	165603	165604						164.22	170.39	153.30	155.78	□	
154.50	3.00	165311	165312	165314	165315						159.54	165.72	153.05	155.46		
155.00	3.50	166300	166301	165316	165317						160.95	167.15	153.62	156.05		
156.00	2.00	165102	165103	165105	165104						159.32	165.56	154.28	156.68		
158.12	5.33	166500	166501	166503	166504					BS1806-362 / AS568-362	167.39	173.72	156.97	159.51	□	
158.12	6.99	166703	166704	166706	166707					R66 / BS1806-438 / AS568-438	170.42	176.75	157.22	159.80	□	
158.34	3.53	166303	166304	166306	166307					BS1806-259 / AS568-259	164.34	170.67	156.92	159.40		
158.42	2.62	166200	166201	166203	166204					BS1806-164 / AS568-164	162.82	169.16	156.80	159.26		
159.30	5.70	166600	166601	166603	166604						169.22	175.59	158.22	160.78	□	
159.50	3.00	166308	166309	166311	166312						164.54	170.92	157.98	160.46		
160.00	2.00	167103	167100	167104	167105						163.32	169.72	158.22	160.68		
160.00	2.50	167200	167201	166205	166206	166026					164.20	170.60	158.33	160.80		
160.00	5.00	167500	167501	166505	166506						168.70	175.10	158.75	161.30	□	
162.50	3.50	167300	167301	167303	167304						168.45	174.95	161.01	163.55		
164.10	8.40	167803	167804	167806	167807						178.88	185.45	163.40	166.12	□	
164.30	5.70	167600	167601	167603	167604						174.22	180.79	163.15	165.78	□	
164.47	5.33	168504	168505	167514	167515					BS1806-363 / AS568-363	173.74	180.32	163.23	165.86	□	
164.47	6.99	167705	167706	167708	167709	166022	166023	166024	166025	R67 / BS1806-439 / AS568-439	176.77	183.35	163.47	166.15	□	
164.50	3.00	167305	167306	167308	167309						169.54	176.12	162.90	165.46		
164.70	3.53	167310	167311	167313	167314	166027					170.70	177.29	163.18	165.76		

Shaft

Bore

Key

□ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

O-RINGS

NEW

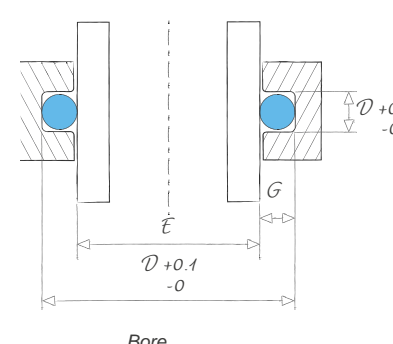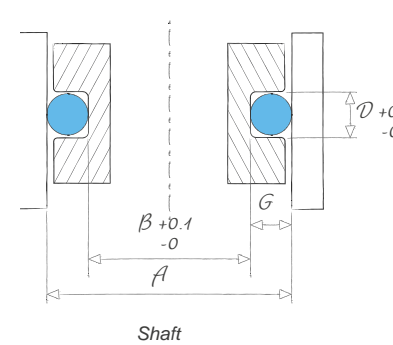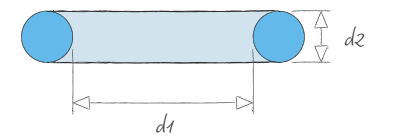| Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
164.77	2.62	167203	167204	167219	167207					BS1806-165 / AS568-165	169.17	175.76	163.06	165.61		
165.00	4.00	167408	167409	167411	167410						171.96	178.56	163.45	166.04		
166.70	6.99	168700	168701	168703	168704						179.00	185.67	165.67	168.38	□	
167.00	2.80	168300	168301	168303	168304						171.70	178.38	165.31	167.90		
169.30	5.70	168600	168601	168603	168604						179.22	185.99	168.07	170.78	□	
169.50	3.00	168305	168306	168308	168309						174.54	181.32	167.83	170.46		
170.00	5.00	169500	169501	168500	168501	168022					178.70	185.50	168.60	171.30	□	
170.82	5.33	169503	169504	168502	168503					BS1806-364 / AS568-364	180.09	186.93	169.48	172.21	□	
170.82	6.99	169700	169701	168710	168711					R68 / BS1806-440 / AS568-440	183.12	189.96	169.73	172.50	□	
171.05	3.53	169300	169301	168310	168311						177.05	183.89	169.44	172.11		
172.00	3.00	169303	169304	169306	169307						177.04	183.92	170.29	172.96		
174.50	3.00	169308	169309	169311	169312						179.54	186.52	172.75	175.46		
174.60	6.99	169703	169704	169706	169707						186.90	193.89	173.45	176.28	□	
175.00	4.00	170400	170401	169400	169401						181.96	188.96	173.30	176.04		
176.00	3.00	170300	170301	169313	169314						181.04	188.08	174.23	176.96		
177.17	5.33	170500	170501	170503	170504					BS1806-365 / AS568-365	186.44	193.53	175.74	178.56	□	
177.17	6.99	170700	170701	170703	170704					R69 / BS1806-441 / AS568-441	189.47	196.56	175.98	178.85	□	
177.40	3.53	170303	170304	170306	170307	169014					183.40	190.50	175.69	178.46		
179.30	5.70	170600	170601	170603	170604						189.22	196.39	177.92	180.78	□	
179.50	3.00	170308	170309	170311	170312						184.54	191.72	177.68	180.46		
180.00	2.50	171200	171201	170205	170206						184.20	191.40	178.03	180.80		
180.00	5.00	171500	171501	170505	170506						188.70	195.90	178.45	181.30	□	
183.52	6.99	171703	171704	171706	171707	170018				R70 / BS1806-442 / AS568-442	195.82	203.16	182.24	185.20	□	
183.74	3.53	171300	171301	171303	171304	170019				BS1806-263 / AS568-263	189.74	197.09	181.94	184.80		
183.82	2.62	171203	171204	171206	171215					BS1806-168 / AS568-168	188.22	195.57	181.82	184.66		
184.00	4.00	171412	171413	171414	171415						190.96	198.32	182.16	185.04		
184.30	5.70	171600	171601	171603	171604						194.22	201.59	182.85	185.78	□	
184.50	3.00	171305	171306	171308	171309						189.54	196.92	182.60	185.46		
187.33	6.99	171750	171755	171767	171757						199.63	207.13	185.99	189.01	□	
188.00	3.00	172321	172322	172323	172324						193.04	200.56	186.05	188.96		
189.30	5.70	172600	172601	172603	172604	171015				BS4518-1893-57	199.22	206.79	187.77	190.78	□	
189.87	6.99	172705	172706	172708	172709					R71 / BS1806-443 / AS568-443	202.17	209.77	188.49	191.55	□	
190.00	2.70	173300	173301	172305	172306						194.54	202.14	187.93	190.86		
190.00	4.00	173400	173401	172400	172401						196.96	204.56	188.07	191.04		
190.00	5.30	173507	173508	173531	173532						199.22	206.82	188.37	191.38	□	
190.10	3.53	173303	173304	172307	172308						196.10	203.71	188.20	191.16		
194.50	3.00	173306	173307	173309	173310						199.54	207.32	192.45	195.46		
196.22	5.33	174500	174501	173500	173501	173017				BS1806-368 / AS568-368	205.49	213.34	194.50	197.61	□	
196.22	6.99	174700	174701	173708	173709					R72 / BS1806-444 / AS568-444	208.52	216.37	194.74	197.90	□	
196.45	3.53	174300	174301	173311	173312	173018					202.45	210.31	194.46	197.51		
198.80	3.80	174400	174401	174403	174404						205.26	213.21	196.84	199.94		
199.30	5.70	174600	174601	174603	174604						209.22	217.19	197.62	200.78	□	
200.00	7.00	174612	174613	174615	174614						212.32	220.32	198.47	201.68	□	
201.75	4.00	174331	174332	174334	174333						208.71	214.76	199.64	202.79		
202.57	5.33	175400	175401	175436	175404	174038				BS1806-369 / AS568-369	211.84	217.92	200.76	203.96	□	
202.57	6.99	175606	175607	175609	175610	174052				R73 / BS1806-445 / AS568-445	214.87	220.95	201.00	204.25	□	
202.80	3.53	175200	175201	175203	175204	174029	174030	174031	174032	BS1806-266 / AS568-266	208.80	214.89	200.71	203.86		

Shaft

Bore

Key

□ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

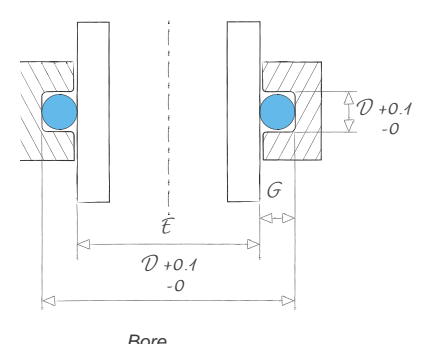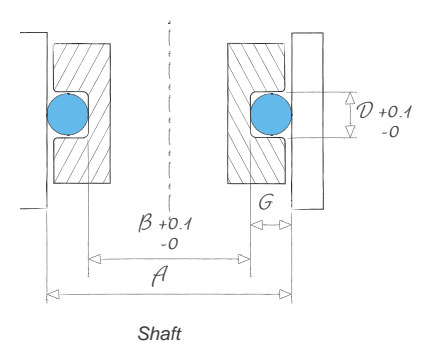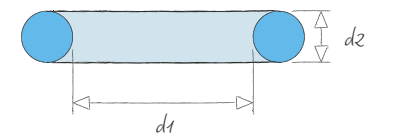| Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
204.10	8.40	175700	174734	174735	174733						218.88	225.01	202.80	206.12	☐	
209.14	3.53	175210	175211	175213	175214					BS1806-267 / AS568-267	215.14	221.42	206.96	210.20		
209.30	5.70	175500	175501	175503	175504						219.22	225.50	207.47	210.78	☐	
209.50	3.00	175215	175216	175218	175219						214.54	220.83	207.23	210.46		
210.00	4.00	176300	176301	175300	175301						216.96	223.26	207.77	211.04		
212.00	6.30	176600	176601	175616	175617						223.09	229.45	210.14	213.51	☐	
214.00	3.00	176200	176201	176203	176204						219.04	225.46	211.66	214.96		
215.27	5.33	176400	176401	176403	176404					BS1806-371 / AS568-371	224.54	231.00	213.27	216.66	☐	
215.27	6.99	176603	176604	176606	176607					R74 / BS1806-446 / AS568-446	227.57	234.03	213.51	216.95	☐	
215.49	3.53	176205	176206	176208	176209	175023				BS1806-268 / AS568-268	221.49	227.96	213.21	216.55		
221.60	6.99	177600	177601	176608	176609						233.90	240.55	219.74	223.28	☐	
221.62	5.33	177400	177401	176405	176406					BS1806-372 / AS568-372	230.89	237.54	219.52	223.01	☐	
221.84	3.53	177200	177201	176215	176216					BS1806-269 / AS568-269	227.84	234.50	219.47	222.90		
224.50	3.00	177203	177204	177206	177207						229.54	236.28	222.00	225.46		
226.32	4.00	176321	176322	176324	176323						233.28	240.07	223.85	227.36		
227.97	5.33	177403	177404	177406	177407					BS1806-373 / AS568-373	237.24	244.08	225.78	229.36	☐	
227.97	6.99	177608	177609	177611	177612					R75 / BS1806-447 / AS568-447	240.27	247.11	226.02	229.65	☐	
228.19	3.53	177208	177209	177211	177212					BS1806-270 / AS568-270	234.19	241.04	225.72	229.25		
229.30	5.70	177500	177501	177503	177504						239.22	246.10	227.17	230.78	☐	
233.00	3.00	178200	178201	178203	178204						238.04	245.03	230.38	233.96		
234.30	6.99	178600	178601	178603	178604						246.60	253.63	232.25	235.98	☐	
234.32	5.33	178400	178401	178403	178404					BS1806-374 / AS568-374	243.59	250.62	232.03	235.71	☐	
234.54	3.53	178205	178206	178208	178209					BS1806-271 / AS568-271	240.54	247.58	231.98	235.60		
234.62	2.62	178100	178101	178103	178104					BS1806-176 / AS568-176	239.02	246.06	231.86	235.46		
235.00	3.00	178210	178211	178213	178214						240.04	247.09	232.35	235.96		
236.00	6.30	178605	178606	178608	178609						247.09	254.17	233.78	237.51	☐	
240.67	5.33	179428	179429	179430	179431	178022	178023	178024	178025	BS1806-375 / AS568-375	249.94	257.16	238.29	242.06	☐	
240.67	6.99	179600	179601	178610	178611					R76 / BS1806-448 / AS568-448	252.97	260.19	238.53	242.35	☐	
240.90	3.53	179200	179201	178220	178221						246.90	254.13	238.24	241.96		
245.00	3.00	179203	179204	179206	179207						250.04	257.39	242.20	245.96		
247.02	6.99	179603	179604	179606	179607						259.32	266.73	244.78	248.70	☐	
247.24	3.53	179208	179209	179211	179212					BS1806-273 / AS568-273	253.24	260.66	244.48	248.30		
249.30	5.70	179500	179501	179503	179504						259.22	266.70	246.87	250.78	☐	
250.00	5.00	180407	180406	180414	180415						258.70	266.20	247.40	251.30	☐	
253.37	6.99	180603	180604	180606	180607					R77 / BS1806-449 / AS568-449	265.67	273.27	251.04	255.05	☐	
253.59	3.53	180200	180201	180203	180204	179014				BS1806-274 / AS568-274	259.59	267.20	250.74	254.65		
259.30	5.70	180500	180501	180503	180504	179015					269.22	277.00	256.72	260.78	☐	
259.72	6.99	180608	180609	180611	180612						272.02	279.81	257.29	261.40	☐	
260.00	3.00	181200	181201	180205	180206						265.04	272.84	256.97	260.96		
266.07	6.99	181605	181606	181608	181609					R78 / BS1806-450 / AS568-450	278.37	286.35	263.55	267.75	☐	
266.29	3.53	181203	181204	181206	181207					BS1806-275 / AS568-275	272.29	280.28	263.25	267.35		
269.30	5.70	181500	181501	181503	181504						279.22	287.30	266.57	270.78	☐	
271.00	3.00	182200	182201	181208	181209						276.04	284.17	267.81	271.96		
272.42	6.99	182600	182601	181610	181611						284.72	292.90	269.80	274.10	☐	
275.00	4.00	182300	182301	182303	182304						281.96	290.21	271.80	276.04		
278.77	5.33	182400	182401	182403	182404					BS1806-379 / AS568-379	288.04	296.41	275.81	280.16	☐	
278.77	6.99	182603	182604	182606	182607					R79 / BS1806-451 / AS568-451	291.07	299.44	276.06	280.45	☐	

NEW

Shaft

Bore

Key

☐ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

O-RINGS

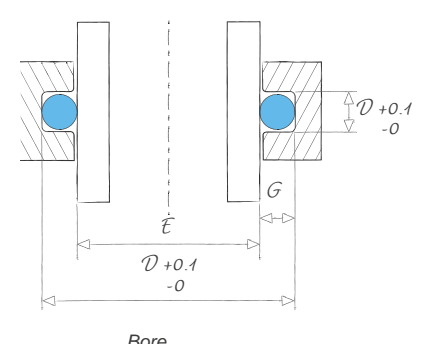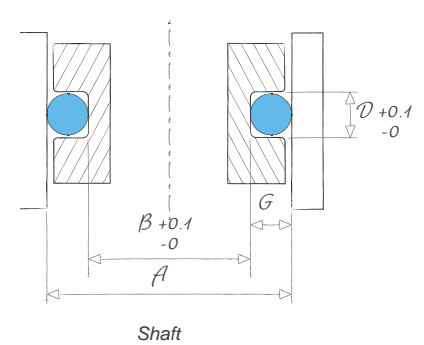| Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
278.99	3.53	182203	182204	182206	182207					BS1806-276 / AS568-276	284.99	293.36	275.76	280.05		
279.30	5.70	182500	182501	182503	182504						289.22	297.60	276.42	280.78	□	
280.00	3.00	183200	183201	182208	182209						285.04	293.44	276.67	280.96		
285.12	6.99	183603	183604	183606	183607						297.42	305.98	282.31	286.80	□	
286.45	4.00	182319	182322	182321	182320						293.41	302.00	283.07	287.49		
288.00	4.00	183300	183301	183303	183304						294.96	303.60	284.60	289.04		
290.00	3.00	184200	184201	183203	183204						295.04	303.74	286.52	290.96		
291.47	5.33	184400	184401	183400	183401					BS1806-380 / AS568-380	300.74	309.49	288.32	292.86	□	
291.47	6.99	184600	184601	183608	183609					R80 / BS1806-452 / AS568-452	303.77	312.52	288.57	293.15	□	
291.69	3.53	184203	184204	183205	183206					BS1806-277 / AS568-277	297.69	306.44	288.27	292.75		
297.82	6.99	184603	184604	184606	184607						310.12	319.06	294.82	299.50	□	
298.00	2.50	184100	184101	184103	184104						302.20	311.14	294.26	298.80		
304.17	6.99	185603	185604	185606	185607					R81 / BS1806-453 / AS568-453	316.47	325.60	301.08	305.85	□	
304.39	3.53	185200	185201	185203	185204			184037		BS1806-278 / AS568-278	310.39	319.52	300.78	305.45		
307.00	5.00	185405	185406	185408	185409						315.70	324.91	303.55	308.30		
310.00	3.00	185205	185206	185208	185209						315.04	324.34	306.22	310.96		
315.00	7.00	185634	185635	185636	185637						327.32	336.77	311.75	316.68	□	
315.00	10.00	185803	185804	185806	185807						332.60	342.05	312.38	317.40	□	
316.87	6.99	185613	185614	185616	185617					R82 / BS1806-454 / AS568-454	329.17	338.68	313.58	318.55	□	
317.50	3.20	185210	185211	185213	185214						322.94	332.47	313.60	318.46		
319.30	5.70	185500	185501	185503	185504						329.22	338.80	315.82	320.78	□	
325.00	3.00	186200	186201	185215	185216						330.04	339.79	321.00	325.96		
329.57	5.33	186400	186401	186403	186404					BS1806-382 / AS568-382	338.84	348.73	325.85	330.96	□	
329.57	6.99	186600	186601	186603	186604	185036				R83 / BS1806-455 / AS568-455	341.87	351.76	326.09	331.25	□	
329.79	3.53	186203	186204	186206	186207					BS1806-279 / AS568-279	335.79	345.68	325.80	330.85		
330.00	3.70	186300	186301	186303	186304						336.29	346.19	326.05	331.11		
335.00	3.00	186208	186209	186211	186212						340.04	350.09	330.85	335.96		
339.30	5.70	186505	186506	186508	186509						349.22	359.40	335.52	340.78	□	
342.27	6.99	186605	186606	186608	186609					R84 / BS1806-456 / AS568-456	354.57	364.84	338.60	343.95	□	
345.00	3.00	186213	186214	186216	186217						350.04	360.39	340.70	345.96		
354.97	6.99	187600	187601	187603	187604					R85 / BS1806-457 / AS568-457	367.27	377.92	351.11	356.65	□	
355.00	3.00	187200	187201	187203	187204						360.04	370.69	350.55	355.96		
355.00	5.30	187408	187409	187410	187411						364.22	374.87	350.89	356.38	□	
355.19	3.53	187205	187206	187208	187209					BS1806-280 / AS568-280	361.19	371.85	350.82	356.25		
359.30	5.70	187500	187501	187503	187504						369.22	380.00	355.22	360.78	□	
365.00	3.00	187210	187211	187213	187214						370.04	380.99	360.40	365.96		
367.67	6.99	187605	187606	187608	187609					R86 / BS1806-458 / AS568-458	379.97	391.00	363.62	369.35	□	
372.00	6.00	187505	187506	187508	187509						382.56	393.72	367.68	373.44	□	
380.37	5.33	188400	188401	188403	188404					BS1806-384 / AS568-384	389.64	401.06	375.89	381.76		
380.37	6.99	188600	188601	188603	188604	187019				R87 / BS1806-459 / AS568-459	392.67	404.08	376.13	382.05	□	
380.59	3.53	188200	188201	188203	188204						386.59	398.01	375.83	381.65		
385.00	3.00	188205	188206	188208	188209						390.04	401.59	380.10	385.96		
393.07	6.99	188605	188606	188608	188609					R88 / BS1806-460 / AS568-460	405.37	417.16	388.64	394.75	□	
395.00	3.00	188210	188211	188213	188214						400.04	411.89	389.95	395.96		
399.30	5.70	188505	188506	188508	188509						409.22	421.20	394.62	400.78	□	
405.26	3.53	189200	189201	189203	189204					BS1806-282 / AS568-282	411.26	419.37	400.13	406.32		
405.26	5.33	189400	189401	189403	189404					BS1806-385 / AS568-385	414.53	422.64	400.41	406.65		

NEW

Shaft

Bore

Key

□ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

Dimensions		Standard compound codes								Dimensional standards	Shaft		Bore		Dynamic app.	Two-part groove assembly
Inner Ø d1 (mm)	Cross-section Ø d2 (mm)	PC851	PB701	EP851	DF801	7EP1197*	EP856*	7PD1612*	7DF2067		A min.	A max.	E min.	E max.		
406.40	3.20	189205	189206	189208	189209						411.84	419.97	401.17	407.36		
412.00	8.00	189703	189704	189706	189707						426.08	434.32	407.50	413.92	□	
412.48	6.94	188632	188667	188669	188668						424.69	432.94	407.75	414.15	□	
425.00	8.00	190700	190701	190708	189709						439.08	447.58	420.31	426.92	□	
430.66	3.53	190200	190201	190203	190204					BS1806-283 / AS568-283	436.66	445.27	425.15	431.72		
430.66	6.99	190600	190601	190603	190604					BS1806-463 / AS568-463	442.96	451.58	425.67	432.34	□	
431.50	6.00	190500	190501	190503	190504						442.06	450.69	426.29	432.94	□	
439.00	6.00	190505	190506	190508	190509						449.56	458.34	433.68	440.44	□	
440.00	10.00	190803	190804	190806	190807						457.60	466.40	435.50	442.40	□	
444.00	8.00	190703	190704	190706	190707						458.08	466.96	439.02	445.92	□	
447.00	7.00	189662	189663	189665	189666						459.32	468.26	441.77	448.68	□	
459.00	8.00	191703	191704	191706	191707						473.08	482.26	453.80	460.92	□	
459.30	5.70	191500	191501	191503	191504						469.22	478.40	453.72	460.78		
465.00	5.30	191405	191406	191408	191409						474.22	483.52	459.24	466.38		
468.00	6.00	191505	191506	192508	191509						478.56	487.92	462.24	469.44	□	
486.00	6.00	192503	192504	192506	192507						496.56	506.28	479.97	487.44	□	
487.00	7.00	192614	192615	192616	192617						499.32	509.06	481.17	488.68	□	
493.72	7.00	191658	191659	191661	191660						506.04	515.91	487.78	495.40	□	
495.00	3.00	192200	192201	192203	192204						500.04	509.94	488.45	495.96		
500.00	6.00	193500	193501	192513	192514						510.56	520.56	493.76	501.44		
500.00	8.00	193700	193701	192703	192704						514.08	524.08	494.18	501.92	□	
505.00	6.00	193503	193504	192515	192516						515.56	525.66	498.69	506.44		
506.81	5.33	193400	193401	193403	193404						516.08	526.22	500.43	508.20		
522.00	6.00	193506	193507	193509	193510						532.56	543.00	515.43	523.44		
530.00	10.00	193803	193804	193806	193807						547.60	558.20	524.15	532.40	□	
531.00	6.00	193511	193512	193514	193515						541.56	552.18	524.30	532.44		
532.21	5.33	193405	193406	193408	193409						541.48	552.13	525.45	533.60		
532.26	6.99	193605	193606	193608	193609	192045				BS1806-470 / AS568-470	544.56	555.21	525.74	533.94	□	
554.00	8.00	193703	193704	193706	193707						568.08	579.16	547.37	555.92	□	
557.66	6.99	193646	193647	193648	193649					BS1806-471 / AS568-471	569.96	581.12	550.76	559.34	□	
582.68	5.33	193415	193416	193418	193419					BS1806-392 / AS568-392	591.95	603.61	575.17	584.07		
582.68	6.99	193650	193651	193652	193653					BS1806-472 / AS568-472	594.98	606.64	575.41	584.36	□	
608.08	6.99	194600	194601	194603	194604					BS1806-473 / AS568-473	620.38	632.54	600.43	609.76	□	
610.00	10.00	194803	194804	194806	194807						627.60	639.80	602.95	612.40	□	
710.00	10.00	195800	195801	195803	195804						727.60	741.80	701.45	712.40	□	
738.00	10.25	195805	195806	195808	195809						756.04	770.80	729.08	740.46	□	
800.00	10.00	196800	196801	195815	195816						817.60	833.60	790.10	802.40	□	

NEW
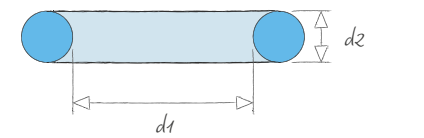
Shaft

Bore

Key

□ Recommended for dynamic applications

△ Two-part groove assembly required

* Food certified

HUTCHINSON®

X-RINGS

We make it **possible**

1 – GENERAL INFORMATION

1.1 – Definition

The X-Ring has a cross section with 4 lobes, providing a double sealing line especially suitable for hydraulic, pneumatic and oleo-pneumatic devices.

It has no assembly orientation and is defined by two dimensions: inside diameter a and cross section d.

It is particularly suitable for dynamic applications such as:

-   reciprocating movements up to 150 bar
-   rotating movements up to 1m/s

Beyond these limits, certain assembly and lubrication conditions must be observed.
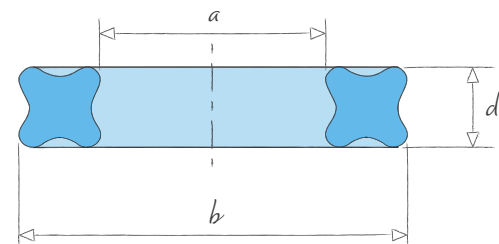
1.2 – Compound selection

The standard compound for X-Rings is 9PD31, a NBR 78 Sh systematically treated with Lubri PB.

Many other compounds are available in our compounds list (p. 132), subject to feasibility.

Family	Compound	Colour	Hardness (Sh.A)	Min temp.	Max continuous temp.	Temp. max peak	CS	Conditions
NBR	9PD31	black	78	-30°C	100°C	120°C	15%	24h at 100°C

2 – TECHNICAL BENEFITS

2.1 – Reduced friction

Compared with O-Rings the friction of X-Rings is reduced for several reasons:

-   Operating principle based on bending of the lobes and not on compression of the material, which reduces the sticking effect
-   Presence of a reserve of lubricant trapped between the lobes
-   Special LUBRI PB treatment systematically applied to our X-Rings in 9PD31
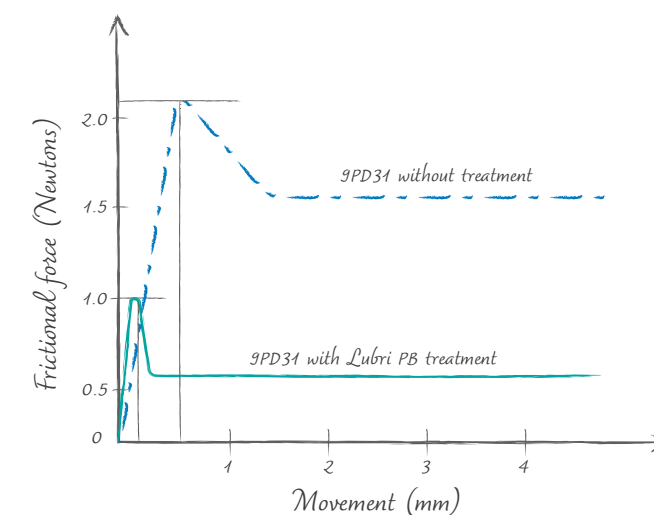
2.2 – Reduced starting torque

Some sub-assemblies require significant starting torque after prolonged downtime.

This force is reduced by about 75% compared with O-Rings.

2.3 – Position of the flash line

The friction surfaces of the X-Rings are free from any trace of flash located in the non-functional area.

Position of the flash line
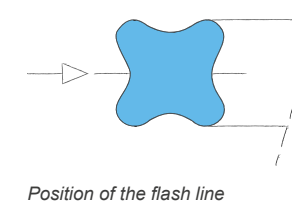
2.4 – Less wear

The friction being proportional to the pressure, the wear on an X-Ring is virtually zero when there is no pressure.

2.5 – No twisting

The square section of X-Rings eliminates the risk of twisting on fitting and in operation when installation requirements are observed.
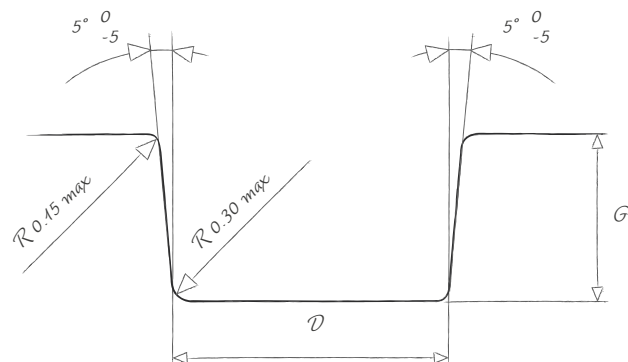
3 – FITTING INSTRUCTIONS

3.1 – Static applications

An X-Ring used in a static application should be fitted in a rectangular groove, of depth and width defined according to the cross section of the ring, as shown in the table below.

The groove may have parallel walls or an angle of up to 5° that should be added to the recommended dimensions.


Cross section (mm)	Groove (mm)	
	Depth G	Width D
1.78	1.42	2.14
2.62	2.15	3.15
3.53	2.86	4.10
5.33	4.33	6.40
6.99	5.70	8.40

3.2 – Dynamic applications (reciprocating movement)

An X-Ring for dynamic applications is fitted in a rectangular groove, preferably in the bore.

A small radius (from 0.125 mm to 0.380 mm max) is allowed in the base of the groove. It is advisable to have lead-in angles on the friction side.

An X-Ring should not be used as a guide in a moving assembly. Moving parts must be guided using a mechanical seating.
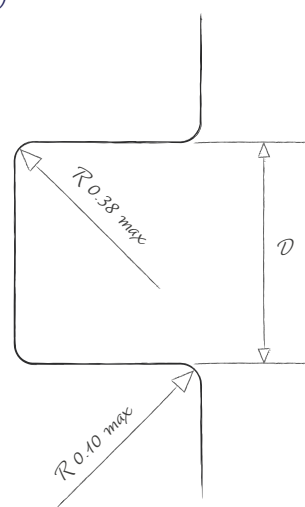
3.3 – Double X-Ring assembly

In some applications, the pressure may come alternately from one side or the other of the X-Ring. At low pressure (up to 7 bar), the use
of a single X-Ring is possible.

At medium and high pressure (> 7 bar), it is better to let the same face of the X-Ring receive the pressure. We recommend the use of two X-Rings fitted in two successive grooves.
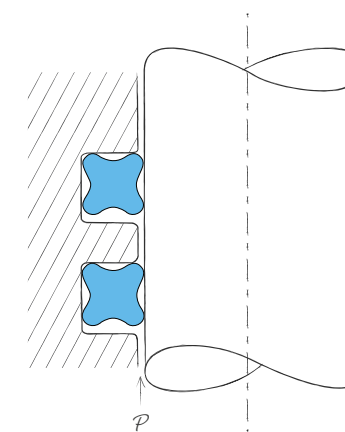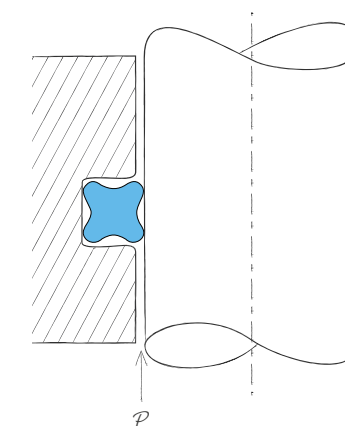

3.4 – Rotary applications

An X-Ring used in rotary applications should be fitted in the fixed part.

A peripheral compression of 5% and radial compression of 3% on the cross section is essential.

The volume of the groove must be approximately 5% greater than that of the seal.

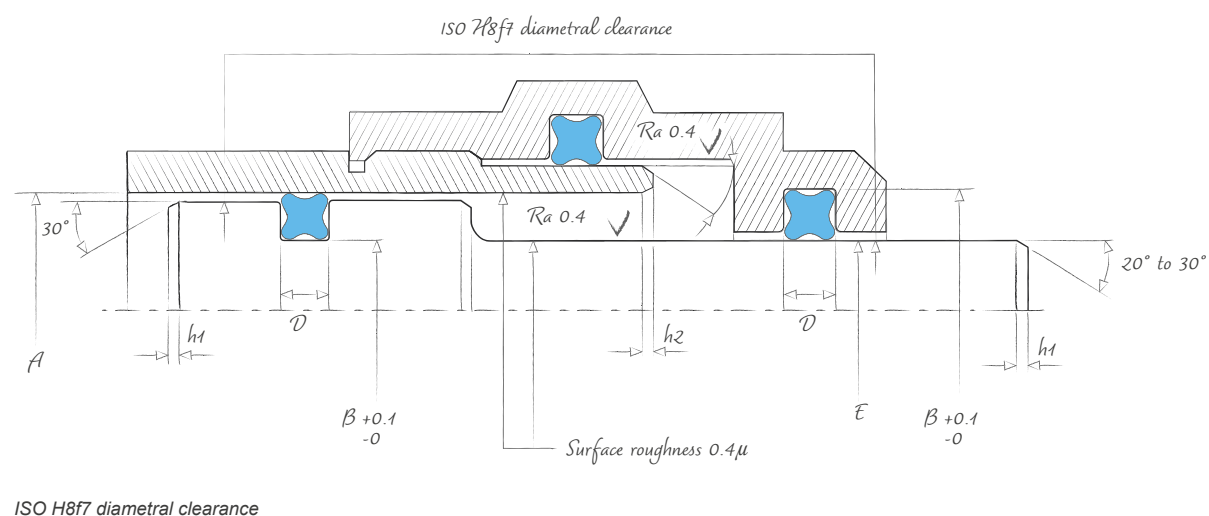# 4 – ADDITIONAL TECHNICAL INFORMATION

4.1 – Tolerances and fit

Pressure ≥ 10 bar

Restrict machining tolerances to a strict minimum, ISO H8f7 tolerances are recommended.

For large diameters do not exceed a diametral clearance of 0.12 mm.

Pressure ≤ 10 bar

Slightly wider tolerances up to H8e8 can be allowed.

ISO H8f7 diametral clearance

4.2 – Extrusion

Extrusion is the passage of material into the mechanical clearance.

Pressure pulses, high temperatures, chemical incompatibility of the rubber, rapid translational motion and long strokes – and a combination of these factors – can exacerbate X-Ring extrusion.

There are several ways to prevent extrusion:

- Reduce the clearance fit: the risk of extrusion is zero if there is no clearance
- Increase the hardness of the rubber
- Improve the cylindricity and coaxiality
- Use an anti-extrusion washer (back-up ring)

The higher the pressure, the more the clearance needs to be reduced, the more the hardness needs to be increased.
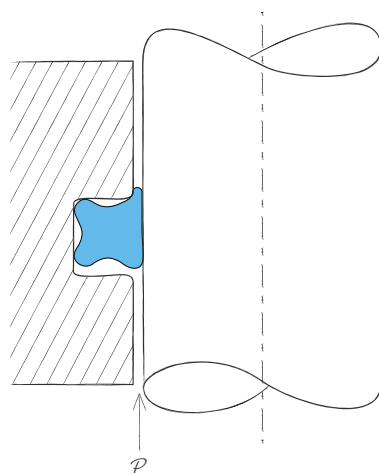
4.3 – Surface roughness

The surface roughness determines the wear on the X-Ring and hence its lifespan.

We recommend an Ra of 0.4µ.

It is recommended to filter all engine fluids and avoid any abrasive deposits on moving parts, as the latter affect the surfaces and lead to rapid deterioration of the seals.
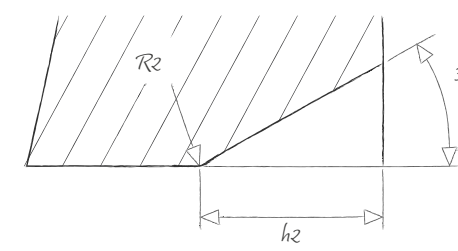
4.4 – Chamfers

Lead-in chamfers are essential to avoid damaging the X-Ring during installation. An angle of 20 to 30° represents the best compromise.

The dimensions are dependent on the cross section of the X-Ring, as shown in the table below.
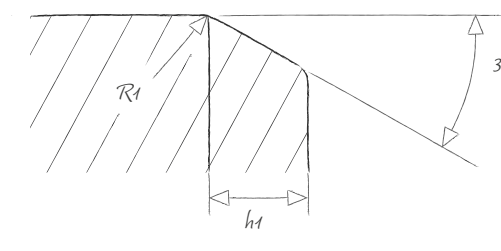
Chamfer on shaft

Cross section	On shaft		In the bore	
	h1 (mm)	R1 (mm)	h2 (mm)	R2 (mm)
1.78	1.50	3.00	2.50	5.00
2.62	1.50	3.00	2.50	5.00
3.53	1.50	3.00	2.50	5.00
5.33	2.50	5.00	3.00	6.00
6.99	3.00	6.00	4.00	8.00

Chamfer in the bore

5–SIZE CHARTS

Custom development on request

The selection of an X-Ring can be made directly from the list below according to the assembly recommendations for the usual conditions of use.
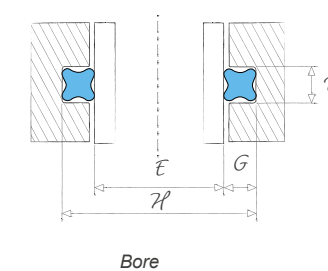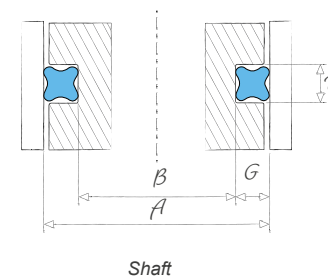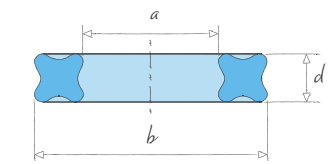
The choice of A and B (shaft) or E and H (bore) within the specified limits must lead to the indicated depth of groove G.

$$G = \frac{A - B}{2} \text{ or } G = \frac{H - E}{2}$$

Functional validation by testing remains the user's responsibility.

Standard X-Rings from stock are in NBR 78 Sh. - 9PD31 compound. Other compounds are also available on request.

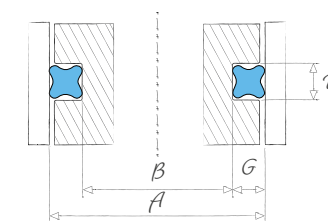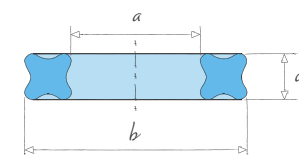| Code in 9PD31	No.	Dimensions a	b	d	Shaft application Shaft ø Min A (mm)	Max A (mm)	Base of groove Min B (mm)	Max B (mm)	Groove Width D	Groove Height G	Bore application Shaft ø Min E	Max E	Base of groove Min H	Max H
200000	1	2.90	6.46	1.78	6.10	6.20	2.95	3.05	2.00	1.58	3.25	-	6.40	-
200001	2	3.68	7.24	1.78	6.90	7.00	3.75	3.85	2.00	1.58	4.00	4.05	7.15	7.20
200002	3	4.47	8.03	1.78	7.70	7.80	4.55	4.65	2.00	1.58	4.75	4.80	7.90	7.95
200003	3 A	4.62	8.18	1.78	7.85	8.00	4.70	4.85	2.00	1.58	4.95	5.00	8.10	8.15
200004	4	5.28	8.84	1.78	8.50	8.65	5.35	5.50	2.00	1.58	5.55	5.60	8.70	8.75
200005	4 A	5.70	9.26	1.78	8.95	9.10	5.80	5.95	2.00	1.58	6.00	6.05	9.15	9.20
200006	5	6.07	9.63	1.78	9.30	9.50	6.15	6.35	2.00	1.58	6.35	6.40	9.50	9.55
200007	5 A	6.65	10.21	1.78	9.90	10.15	6.75	7.00	2.00	1.52	6.90	7.00	10.05	10.15
200008	6	7.65	11.21	1.78	10.90	11.15	7.75	8.00	2.00	1.58	7.90	8.00	11.05	11.25
200009	6 A	8.70	12.26	1.78	11.95	12.25	8.80	9.10	2.00	1.58	8.95	9.05	12.10	12.20
200010	7	9.25	12.81	1.78	12.50	12.85	9.35	9.70	2.00	1.58	9.50	9.60	12.65	12.75
200011	7 A	9.70	13.26	1.78	12.95	13.30	9.80	10.15	2.00	1.58	9.90	10.05	13.05	13.20
200232	113	10.82	14.38	1.78	14.10	14.45	10.95	11.30	2.00	1.58	11.05	11.15	14.20	14.30
200738	114	12.42	15.98	1.78	15.70	16.15	12.55	13.00	2.00	1.58	12.60	12.75	15.75	15.90
200728	115	14.00	17.56	1.78	17.35	17.85	14.20	14.60	2.00	1.58	14.15	14.30	17.30	17.45
200729	116	15.60	19.16	1.78	18.90	19.50	15.75	16.35	2.00	1.58	15.75	15.90	18.90	19.05
200730	117	17.17	20.73	1.78	20.60	21.10	17.45	17.95	2.00	1.58	17.30	17.45	20.45	20.60
200739	118	18.77	22.33	1.78	22.30	22.75	19.05	19.60	2.00	1.58	18.85	19.05	22.00	22.20
200731	119	20.35	23.91	1.78	23.45	24.35	20.60	21.20	2.00	1.58	20.40	20.65	23.55	23.80
200732	120	21.95	25.51	1.78	25.05	26.00	22.20	22.85	2.00	1.58	22.00	22.25	25.15	25.40
200740	121	23.52	27.08	1.78	26.50	27.60	23.75	24.45	2.00	1.58	23.55	23.80	26.70	26.95
201264	122	25.12	28.68	1.78	28.55	29.40	25.40	26.25	2.00	1.58	25.10	25.40	28.25	28.55
201265	123	26.70	30.26	1.78	30.15	31.05	27.00	27.90	2.00	1.58	26.65	26.95	29.80	30.10
201266	124	28.30	31.86	1.78	31.80	32.75	28.65	29.60	2.00	1.58	28.25	28.55	31.40	31.70
201267	125	29.87	33.43	1.78	33.35	34.35	30.20	31.20	2.00	1.58	29.80	30.10	32.95	33.25
201687	137	63.22	66.78	1.78	67.15	69.20	64.00	66.05	2.00	1.58	62.65	63.30	65.80	66.45
200012	8	9.19	14.43	2.62	14.00	14.45	9.20	9.65	2.90	2.40	9.45	9.55	14.25	14.35
200013	8 A	9.80	15.04	2.62	14.70	15.05	9.90	10.25	2.90	2.40	10.00	10.15	14.80	14.95
200014	9	10.77	16.01	2.62	15.70	16.10	10.90	11.30	2.90	2.40	11.00	11.10	15.80	15.90
200015	9 A	11.70	16.94	2.62	16.60	17.05	11.80	12.25	2.90	2.40	11.90	12.05	16.70	16.85
200500	10	12.37	17.61	2.62	17.30	17.75	12.50	12.95	2.90	2.40	12.50	12.70	17.30	17.50
200501	10 A	12.80	18.04	2.62	17.70	18.20	12.90	13.40	2.90	2.40	12.95	13.15	17.75	17.95
200502	10 B	13.70	18.94	2.62	18.60	18.60	13.80	14.30	2.90	2.40	13.80	14.00	18.60	18.80
200503	11	13.94	19.18	2.62	19.15	19.40	14.35	14.60	2.90	2.40	14.10	14.25	18.90	19.05
200504	11 A	14.70	19.94	2.62	19.65	20.20	14.85	15.40	2.90	2.40	14.85	15.00	19.65	19.80
200505	12	15.54	20.78	2.62	20.50	21.05	15.70	16.25	2.90	2.40	15.65	16.00	20.45	20.80
200506	13	17.12	22.36	2.62	22.00	22.55	17.20	17.75	2.90	2.40	17.20	17.40	22.00	22.20
200507	13 A	17.75	22.99	2.62	22.70	23.40	17.90	18.60	2.90	2.40	17.80	18.05	22.60	22.85
200508	14	18.72	23.96	2.62	23.70	24.40	18.90	19.60	2.90	2.40	18.80	19.00	23.60	23.80

Shaft

Bore

Key

Tolerance B: +0.1 / - 0

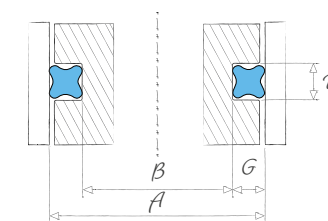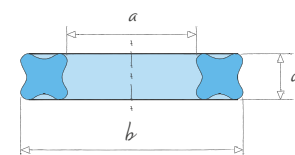Tolerance H: +0 / - 0.1

Tolerance D: +0.1 / - 0

◁ Fitting the parts in a two-part groove

X-RINGS

| Code in 9PD31 | No. | Dimensions | | | Shaft application | | | | Groove Width D | Groove Height G | Bore application | | | |
| | | a | b | d | Shaft ø | | Base of groove | | | | Shaft ø | | Base of groove | |
					Min A (mm)	Max A (mm)	Min B (mm)	Max B (mm)			Min E	Max E	Min H	Max H
200509	14 A	19.60	24.84	2.62	24.60	25.35	19.80	20.55	2.90	2.40	19.65	20.00	24.45	24.80
200733	217	20.30	25.54	2.62	25.30	26.00	20.50	21.20	2.90	2.40	20.35	20.60	25.15	25.40
200734	218	21.89	27.13	2.62	26.90	27.70	22.10	22.90	2.90	2.40	21.90	22.15	26.70	26.95
200735	219	23.47	28.71	2.62	28.50	29.35	23.70	24.55	2.90	2.40	23.50	23.75	28.30	28.55
201259	220	25.07	30.31	2.62	30.10	31.00	25.30	26.20	2.90	2.40	25.30	25.55	30.10	30.35
201260	221	26.64	31.88	2.62	31.70	32.65	26.90	27.85	2.90	2.40	26.60	26.90	31.40	31.70
201261	222	28.24	33.48	2.62	33.30	34.30	28.50	29.50	2.90	2.40	28.15	28.45	32.95	33.25
201268	223	29.82	35.06	2.62	34.90	35.95	30.10	31.15	2.90	2.40	29.75	30.05	34.55	34.85
201269	224	31.42	36.66	2.62	36.75	37.65	31.75	32.85	2.90	2.40	31.30	31.65	36.10	36.45
201270	225	32.99	38.23	2.62	38.10	39.30	33.30	34.50	2.90	2.40	32.85	33.20	37.55	38.00
201271	226	34.60	39.84	2.62	39.75	40.95	34.95	36.15	2.90	2.40	34.45	34.80	39.25	39.60
201272	227	36.17	41.41	2.62	40.35	42.60	35.55	37.80	2.90	2.40	36.00	36.35	40.80	41.15
201273	228	37.77	43.01	2.62	42.95	44.25	38.14	39.45	2.90	2.40	37.55	37.95	42.35	42.75
201274	229	39.34	44.58	2.62	44.55	45.90	39.75	41.10	2.90	2.40	39.10	39.50	43.90	44.30
201275	230	40.94	46.18	2.62	46.15	47.60	41.35	42.80	2.90	2.40	40.70	41.10	45.50	45.90
201688	231	42.52	47.76	2.62	47.75	49.25	42.95	44.45	2.90	2.40	42.25	42.70	47.05	47.50
203105	261	139.37	144.61	2.62	145.55	150.45	140.75	145.65	2.90	2.40	137.50	138.95	142.30	143.75
200510	15	18.64	25.70	3.53	25.40	26.10	18.85	19.55	3.90	3.28	18.70	19.00	25.25	25.55
200511	16	20.22	27.28	3.53	27.00	27.65	20.45	21.10	3.90	3.28	20.30	20.60	26.85	27.15
200512	16 A	20.90	27.96	3.53	27.70	28.40	21.15	21.85	3.90	3.28	21.00	21.20	27.55	27.75
200513	17	21.82	28.88	3.53	28.50	29.35	21.95	22.80	3.90	3.28	21.85	22.15	28.40	28.70
200514	18	23.39	30.45	3.53	30.00	30.80	23.45	24.25	3.90	3.28	23.45	23.70	30.00	30.25
200515	18 A	23.99	31.05	3.53	30.85	31.55	24.30	25.00	3.90	3.28	24.00	24.30	30.55	30.85
201000	19	24.99	32.05	3.53	31.85	32.55	25.30	26.00	3.90	3.28	25.00	25.40	31.55	31.95
201001	19 A	25.90	32.96	3.53	32.75	33.20	26.20	26.65	3.90	3.28	25.85	26.20	32.40	32.75
201002	20	26.57	33.63	3.53	33.40	34.10	26.85	27.55	3.90	3.28	26.50	27.00	33.05	33.55
201003	20 A	27.57	34.63	3.53	34.40	34.85	27.85	28.30	3.90	3.28	27.50	28.00	34.05	34.55
201004	21	28.17	35.23	3.53	34.95	36.10	28.40	29.55	3.90	3.28	28.15	28.45	34.70	35.00
201005	22	29.74	36.80	3.53	36.50	37.75	29.95	31.20	3.90	3.28	29.60	30.05	36.15	36.60
201006	23	31.34	38.40	3.53	38.00	39.00	31.45	32.45	3.90	3.28	31.25	31.65	37.80	38.20
201007	23 A	32.04	39.10	3.53	39.05	39.60	32.50	33.05	3.90	3.28	31.90	32.35	38.45	38.90
201008	24	32.92	39.98	3.53	39.75	40.50	33.20	33.95	3.90	3.28	32.80	33.25	39.35	39.80
201009	24 A	33.80	40.86	3.53	40.65	41.20	34.10	34.65	3.90	3.28	33.65	34.10	40.20	40.65
201010	25	34.52	41.58	3.53	41.35	42.65	34.80	36.10	3.90	3.28	34.40	35.00	40.95	41.55
201011	26	36.09	43.15	3.53	42.95	44.30	36.40	37.75	3.90	3.28	36.00	36.40	42.55	42.95
201012	27	37.69	44.75	3.53	44.50	46.10	37.95	39.55	3.90	3.28	37.50	38.00	44.05	44.55
201262	323	40.87	47.93	3.53	47.75	49.15	41.20	42.60	3.90	3.28	40.65	41.15	47.20	47.70
201689	324	44.05	51.11	3.53	50.95	52.50	44.40	45.95	3.90	3.28	43.80	44.30	50.35	50.85
201690	325	47.22	54.28	3.53	54.15	55.80	47.60	49.25	3.90	3.28	46.92	47.45	53.45	54.00
201693	326	50.39	57.45	3.53	57.35	59.10	50.80	52.55	3.90	3.28	50.05	50.60	56.60	57.15
201694	327	53.57	60.63	3.53	60.55	62.40	54.00	55.85	3.90	3.28	53.15	53.80	59.70	60.35
201691	328	56.75	63.81	3.53	63.75	65.75	57.20	59.20	3.90	3.28	56.30	59.95	62.85	63.50
201692	329	59.92	66.98	3.53	66.95	69.05	60.40	62.50	3.90	3.28	59.45	60.10	66.00	66.65
201695	330	63.09	70.15	3.53	70.15	72.35	63.60	65.80	3.90	3.28	62.55	63.25	69.10	69.80
202159	331	66.27	73.33	3.53	73.35	75.65	66.80	69.10	3.90	3.28	65.70	66.40	72.25	72.95

Shaft

Bore

Key

Tolerance B: +0.1 / - 0

Tolerance H: +0 / - 0.1
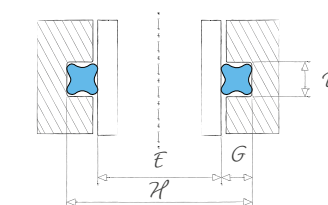
Tolerance D: +0.1 / - 0

◁ Fitting the parts in a two-part groove

X-RINGS

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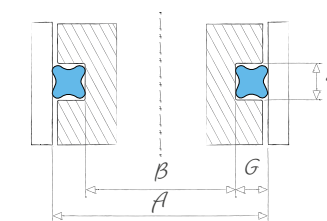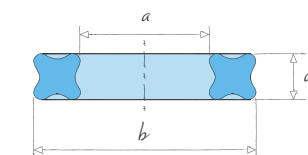| Code in 9PD31 | No. | Dimensions | | | Shaft application | | | | Groove Width D | Groove Height G | Bore application | | | |
| | | a | b | d | Shaft ø | | Base of groove | | | | Shaft ø | | Base of groove | |
					Min A (mm)	Max A (mm)	Min B (mm)	Max B (mm)			Min E	Max E	Min H	Max H
202160	332	69.44	76.50	3.53	76.55	78.95	70.00	72.40	3.90	3.28	68.80	69.55	75.35	76.10
202161	333	72.62	79.68	3.53	79.75	82.30	73.20	75.75	3.90	3.28	71.95	72.75	78.50	79.30
202162	334	75.80	82.86	3.53	82.95	85.60	76.40	79.05	3.90	3.28	75.05	75.90	81.60	82.45
202163	335	78.97	86.03	3.53	86.15	88.90	79.60	82.35	3.90	3.28	78.20	79.05	84.75	85.60
202157	336	82.15	89.21	3.53	89.35	92.20	82.80	85.65	3.90	3.28	81.30	82.20	87.85	88.75
202164	337	85.32	92.38	3.53	92.55	95.50	86.00	88.95	3.90	3.28	84.45	85.35	91.00	91.90
202165	338	88.49	95.55	3.53	95.75	98.85	89.20	92.30	3.90	3.28	87.55	88.50	94.10	95.05
202166	339	91.67	98.73	3.53	98.95	102.15	92.40	95.60	3.90	3.28	90.70	91.70	97.25	98.25
202635	340	94.84	101.90	3.53	102.15	105.45	95.60	98.90	3.90	3.28	93.80	94.85	100.35	101.40
202632	341	98.02	105.08	3.53	105.35	108.75	98.80	102.20	3.90	3.28	96.95	98.00	103.50	104.55
202633	342	101.20	108.26	3.53	108.55	112.10	102.00	105.55	3.90	3.28	100.10	101.15	106.65	107.70
202634	348	120.25	127.31	3.53	127.75	131.95	121.20	125.40	3.90	3.28	118.85	120.10	125.40	126.65
203596	363	183.74	190.80	3.53	191.75	198.15	185.21	191.60	3.90	3.28	181.40	183.30	187.95	189.85
201013	28	37.47	48.13	5.33	47.75	49.20	37.75	39.20	6.10	5.00	37.45	38.00	47.45	48.00
201014	28 A	39.64	50.30	5.33	50.00	50.70	40.00	40.70	6.10	5.00	39.50	40.10	49.50	50.10
201015	29	40.64	51.30	5.33	51.00	52.00	41.00	42.00	6.10	5.00	40.50	41.10	50.50	51.10
201500	29 A	41.80	52.46	5.33	52.10	53.80	42.10	43.80	6.10	5.00	41.65	42.25	51.65	52.25
201501	30	43.82	54.48	5.33	54.00	55.20	44.00	45.20	6.10	5.00	43.65	44.30	53.65	54.30
201502	30 A	45.04	55.70	5.33	55.35	57.00	45.35	47.00	6.10	5.00	44.90	45.50	54.90	55.50
201503	30 B	45.84	56.50	5.33	57.15	57.40	47.15	47.40	6.10	5.00	45.60	46.25	55.60	56.25
201504	31	46.99	57.65	5.33	57.50	58.50	47.50	48.50	6.10	5.00	46.90	47.40	56.90	57.40
201505	31 A	47.80	58.46	5.33	58.70	60.00	48.70	50.00	6.10	5.00	47.50	48.20	57.50	58.20
201506	32	50.17	60.83	5.33	60.50	62.00	50.50	52.00	6.10	5.00	50.00	50.60	60.00	60.60
201507	32 A	52.00	62.66	5.33	62.40	63.50	52.40	53.50	6.10	5.00	51.90	52.40	61.90	62.40
201508	33	53.34	64.00	5.33	63.75	64.70	53.75	54.70	6.10	5.00	53.00	53.75	63.00	63.75
201509	33 A	54.50	65.16	5.33	65.00	66.50	55.00	56.50	6.10	5.00	54.00	55.00	64.00	65.00
201510	34	56.52	67.18	5.33	67.00	67.50	57.00	57.50	6.10	5.00	56.00	57.00	66.00	67.00
201511	34 A	57.52	68.18	5.33	68.00	69.50	58.00	59.50	6.10	5.00	57.40	58.00	67.40	68.00
201512	35	59.69	70.35	5.33	70.00	71.70	60.00	61.70	6.10	5.00	59.30	60.00	69.30	70.00
201513	35 A	61.54	72.20	5.33	72.00	73.00	62.00	63.00	6.10	5.00	61.00	62.00	71.00	72.00
201514	36	62.87	73.53	5.33	73.40	74.80	63.40	64.80	6.10	5.00	62.50	63.20	72.50	73.20
201515	36 A	64.59	75.25	5.33	75.00	76.50	65.00	66.50	6.10	5.00	64.00	65.00	74.00	75.00
202000	37	66.04	76.70	5.33	76.60	77.80	66.60	67.80	6.10	5.00	65.50	66.40	75.50	76.40
202001	37 A	67.64	78.30	5.33	78.00	79.20	68.00	69.20	6.10	5.00	67.00	68.00	77.00	78.00
202002	38	69.22	79.88	5.33	79.80	81.00	69.80	71.00	6.10	5.00	68.60	69.50	78.60	79.50
202003	38 A	70.64	81.30	5.33	81.50	82.50	71.50	72.50	6.10	5.00	70.00	71.00	80.00	81.00
202004	39	72.39	83.05	5.33	83.00	84.40	73.00	74.40	6.10	5.00	72.00	72.70	82.00	82.70
202005	39 A	73.84	84.50	5.33	84.50	85.70	74.50	75.70	6.10	5.00	73.00	74.20	83.00	84.20
202006	40	75.57	86.23	5.33	86.00	89.00	76.00	79.00	6.10	5.00	74.90	76.00	84.90	86.00
202007	41	78.74	89.40	5.33	89.50	90.80	79.50	80.80	6.10	5.00	78.00	79.00	88.00	89.00
202008	41 A	80.09	90.75	5.33	91.00	92.70	81.00	82.70	6.10	5.00	79.50	80.35	89.50	90.35
202009	42	81.92	92.58	5.33	92.80	94.30	82.80	84.30	6.10	5.00	81.00	82.20	91.00	92.20
202010	42 A	83.39	94.05	5.33	94.50	95.75	84.50	85.75	6.10	5.00	82.50	83.50	92.50	93.50
202011	43	85.09	95.75	5.33	96.00	97.40	86.00	87.40	6.10	5.00	84.00	85.40	94.00	95.40

Shaft

Bore

Key

Tolerance B: +0.1 / - 0

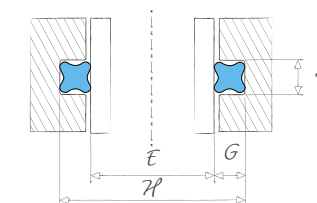Tolerance H: +0 / - 0.1

Tolerance D: +0.1 / - 0

◁ Fitting the parts in a two-part groove

Code in 9PD31	Dimensions				Shaft application				Groove Width D	Groove Height G	Bore application			
					Shaft ø		Base of groove				Shaft ø		Base of groove	
	No.	a	b	d	Min A (mm)	Max A (mm)	Min B (mm)	Max B (mm)			Min E	Max E	Min H	Max H
202012	43 A	86.64	97.30	5.33	97.50	98.90	87.50	88.90	6.10	5.00	86.00	87.00	96.00	97.00
202013	44	88.27	98.93	5.33	99.00	100.40	89.00	90.40	6.10	5.00	87.80	89.00	97.80	99.00
202014	44 A	89.59	100.25	5.33	100.50	102.00	90.50	92.00	6.10	5.00	89.00	90.50	99.00	100.50
202015	45	91.44	102.10	5.33	102.30	105.00	92.30	95.00	6.10	5.00	91.00	93.00	101.00	103.00
202500	46	94.62	105.28	5.33	105.50	108.50	95.50	98.50	6.10	5.00	94.00	96.00	104.00	106.00
202501	47	97.99	108.65	5.33	109.00	111.70	99.00	101.70	6.10	5.00	97.00	99.50	107.00	109.50
202502	48	100.97	111.63	5.33	112.00	113.30	102.00	103.30	6.10	5.00	100.00	101.50	110.00	111.50
202503	48 A	102.34	113.00	5.33	113.50	114.90	103.50	104.90	6.10	5.00	101.70	103.00	111.70	113.00
202504	49	104.14	114.80	5.33	115.00	116.00	105.00	106.00	6.10	5.00	103.50	104.50	113.50	114.50
202505	49 A	105.80	116.46	5.33	116.50	118.50	106.50	108.50	6.10	5.00	105.00	107.00	115.00	117.00
202506	50	107.32	117.98	5.33	119.00	121.00	109.00	111.00	6.10	5.00	107.00	109.00	117.00	119.00
202507	51	110.49	121.15	5.33	121.50	124.50	111.50	114.50	6.10	5.00	109.50	112.20	119.50	122.20
202508	52	113.67	124.33	5.33	124.70	127.00	114.70	117.00	6.10	5.00	112.60	115.50	122.60	125.50
202636	450	116.84	127.50	5.33	128.00	130.45	118.00	120.45	6.10	5.00	115.85	118.80	125.85	128.80
202637	451	120.02	130.68	5.33	131.20	133.75	121.20	123.75	6.10	5.00	119.00	122.00	129.00	132.00
202638	452	123.19	133.85	5.33	134.40	137.00	124.40	127.00	6.10	5.00	122.10	125.20	132.10	135.20
202639	453	126.37	137.03	5.33	137.65	140.30	127.65	130.30	6.10	5.00	125.25	128.40	135.25	138.40
202640	454	129.54	140.20	5.33	140.85	143.55	130.85	133.55	6.10	5.00	128.40	131.60	138.40	141.60
203106	455	132.72	143.38	5.33	144.05	146.85	134.05	136.85	6.10	5.00	131.50	134.80	141.50	144.80
203107	456	135.89	146.55	5.33	147.25	150.10	137.25	140.10	6.10	5.00	134.65	138.00	144.65	148.00
203108	457	139.07	149.73	5.33	150.45	153.40	140.45	143.40	6.10	5.00	137.80	141.25	147.80	151.25
202509	+88	113.67	127.65	6.99	127.70	129.60	114.70	116.60	7.90	6.50	112.50	115.50	125.50	128.50
202510	52 A	115.84	129.82	6.99	129.80	130.60	116.80	117.60	7.90	6.50	115.60	117.00	128.60	130.00
202511	+53	116.84	130.82	6.99	130.80	133.50	117.80	120.50	7.90	6.50	117.00	119.00	130.00	132.00
202512	+54	120.02	134.00	6.99	134.00	137.00	121.00	124.00	7.90	6.50	119.50	122.00	132.50	135.00
202513	+55	123.19	137.17	6.99	137.20	140.00	124.20	127.00	7.90	6.50	122.50	125.00	135.50	138.00
202514	+56	126.37	140.35	6.99	140.50	143.50	127.50	130.50	7.90	6.50	125.50	128.50	138.50	141.50
202515	+57	129.54	143.52	6.99	143.75	146.50	130.75	133.50	7.90	6.50	129.00	131.50	142.00	144.50
203000	+58	132.72	146.70	6.99	147.00	149.50	134.00	136.50	7.90	6.50	132.00	135.00	145.00	148.00
203001	+59	135.89	149.87	6.99	150.00	153.00	137.00	140.00	7.90	6.50	135.50	138.00	148.50	151.00
203002	+60	139.07	153.05	6.99	153.20	156.00	140.20	143.00	7.90	6.50	138.50	141.00	151.50	154.00
203003	+61	142.24	156.22	6.99	156.50	159.50	143.50	146.50	7.90	6.50	141.50	144.00	154.50	157.00
203004	+62	145.42	159.40	6.99	159.70	162.90	146.70	149.90	7.90	6.50	144.50	147.00	157.50	160.00
203005	+63	148.59	162.57	6.99	163.00	166.30	150.00	153.30	7.90	6.50	147.50	150.50	160.50	163.50
203006	+64	151.77	165.75	6.99	166.40	168.40	153.40	155.40	7.90	6.50	151.00	153.50	164.00	166.50
203007	64 A	155.02	169.00	6.99	169.00	172.50	156.00	159.50	7.90	6.50	154.00	156.50	167.00	169.50
203008	+65	158.12	172.10	6.99	172.70	175.40	159.70	162.40	7.90	6.50	157.00	159.50	170.00	172.50
203009	65 A	161.02	175.00	6.99	175.50	178.80	162.50	165.80	7.90	6.50	160.00	162.50	173.00	175.50
203010	+66	164.47	178.45	6.99	179.00	181.50	166.00	168.50	7.90	6.50	163.00	166.00	176.00	179.00
203011	66 A	167.02	181.00	6.99	181.70	185.00	168.70	172.00	7.90	6.50	166.50	168.50	179.50	181.50
203012	+67	170.82	184.80	6.99	185.30	187.80	172.30	174.80	7.90	6.50	169.00	172.50	182.00	185.50
203013	67 A	173.52	187.50	6.99	188.00	191.00	175.00	178.00	7.90	6.50	173.00	175.50	186.00	188.50
203014	+68	177.17	191.15	6.99	191.40	194.00	178.40	181.00	7.90	6.50	176.00	178.50	189.00	191.50
203015	68 A	180.52	194.50	6.99	195.00	197.80	182.00	184.00	7.90	6.50	179.00	182.50	192.00	195.50

Shaft

Bore

Key

Tolerance B: +0.1 / - 0

Tolerance H: +0 / - 0.1

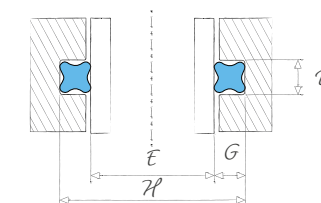Tolerance D: +0.1 / - 0

◁ Fitting the parts in a two-part groove

Code in 9PD31	No.	Dimensions			Shaft application					Groove Width D	Groove Height G	Bore application			
		a	b	d	Shaft ø		Base of groove					Shaft ø		Base of groove	
					Min A (mm)	Max A (mm)	Min B (mm)	Max B (mm)				Min E	Max E	Min H	Max H
203500	+69	183.52	197.50	6.99	198.00	200.30	185.00	187.30		7.90	6.50	183.00	185.50	196.00	198.50
203501	69 A	186.02	200.00	6.99	200.50	204.00	187.50	191.00		7.90	6.50	186.00	188.00	199.00	201.00
203502	+70	189.87	203.85	6.99	204.20	206.40	191.20	193.40		7.90	6.50	189.00	192.00	202.00	205.00
203503	70 A	192.02	206.00	6.99	206.50	210.50	193.50	197.50		7.90	6.50	192.50	194.00	205.50	207.00
203504	+71	196.22	210.20	6.99	210.75	213.30	197.75	200.30		7.90	6.50	195.00	198.50	208.00	211.50
203505	71 A	199.02	213.00	6.99	213.50	217.00	200.50	204.00		7.90	6.50	199.00	201.00	212.00	214.00
203506	+72	202.57	216.55	6.99	217.50	221.00	204.50	208.00		7.90	6.50	202.00	205.00	215.00	218.00
203507	72 A	206.80	220.78	6.99	221.30	226.00	208.30	213.00		7.90	6.50	205.50	209.00	218.50	222.00
203508	72 B	211.02	225.00	6.99	226.50	229.50	213.50	216.50		7.90	6.50	209.50	213.50	222.50	226.50
203509	+73	215.27	229.25	6.99	230.00	233.50	217.00	220.50		7.90	6.50	214.00	218.00	227.00	231.00
203510	73 A	219.02	233.00	6.99	233.70	238.30	220.70	225.30		7.90	6.50	218.50	221.00	231.50	234.00
203511	73 B	223.50	237.48	6.99	238.00	242.00	225.00	229.00		7.90	6.50	222.00	226.00	235.00	239.00
203512	+74	227.97	241.95	6.99	242.50	245.00	229.50	232.00		7.90	6.50	226.50	230.50	239.50	243.50
203513	74 A	231.02	245.00	6.99	245.50	249.50	232.50	236.50		7.90	6.50	231.00	233.50	244.00	246.50
203514	74 B	235.00	248.98	6.99	250.00	255.00	237.00	242.00		7.90	6.50	234.00	238.00	247.00	251.00
203515	+75	240.67	254.65	6.99	255.50	257.50	242.50	244.50		7.90	6.50	239.00	243.00	252.00	256.00
204000	75 A	243.02	257.00	6.99	258.00	261.00	245.00	248.00		7.90	6.50	244.00	246.00	257.00	259.00
204001	75 B	248.00	261.98	6.99	262.00	268.00	249.00	255.00		7.90	6.50	247.00	251.00	260.00	264.00
204002	+76	253.37	267.35	6.99	268.50	273.50	255.50	260.50		7.90	6.50	252.00	256.50	265.00	269.50
204003	76 A	259.00	272.98	6.99	274.00	280.00	261.00	267.00		7.90	6.50	257.00	262.00	270.00	275.00
204004	+77	266.07	280.05	6.99	280.50	287.50	267.50	274.50		7.90	6.50	264.50	269.00	277.50	282.00
204005	77 A	273.10	287.08	6.99	288.00	293.00	275.00	280.00		7.90	6.50	271.50	276.00	284.50	289.00
204006	+78	278.77	292.75	6.99	293.50	299.50	280.50	286.50		7.90	6.50	277.00	282.00	290.00	295.00
204007	78 A	284.00	297.98	6.99	300.00	303.00	287.00	290.00		7.90	6.50	283.00	287.00	296.00	300.00
204008	78 B	287.50	301.48	6.99	303.50	306.00	290.50	293.00		7.90	6.50	288.00	290.50	301.00	303.50
204009	+79	291.47	305.45	6.99	306.50	312.50	293.50	299.50		7.90	6.50	291.00	295.00	304.00	308.00
204010	79 A	298.00	311.98	6.99	313.00	318.50	300.00	305.50		7.90	6.50	296.00	301.00	309.00	314.00
204011	+80	304.17	318.15	6.99	319.00	325.50	306.00	312.50		7.90	6.50	302.00	307.00	315.00	320.00
204012	80 A	310.00	323.98	6.99	326.00	332.00	313.00	319.00		7.90	6.50	308.00	313.00	321.00	326.00
204013	+81	316.87	330.85	6.99	332.50	338.50	319.50	325.50		7.90	6.50	315.00	320.00	328.00	333.00
204014	81 A	323.50	337.48	6.99	339.00	344.50	326.00	331.50		7.90	6.50	322.00	327.00	335.00	340.00
204015	+82	329.57	343.55	6.99	345.00	351.50	332.00	338.50		7.90	6.50	328.00	333.00	341.00	346.00
204500	82 A	336.50	350.48	6.99	352.00	357.00	339.00	344.00		7.90	6.50	334.00	340.00	347.00	353.00
204501	+83	342.27	356.25	6.99	357.50	363.00	344.50	350.00		7.90	6.50	341.00	346.00	354.00	359.00
204502	83 A	348.50	362.48	6.99	363.50	370.00	350.50	357.00		7.90	6.50	347.00	352.00	360.00	365.00
204503	+84	354.97	368.95	6.99	370.50	377.50	357.50	364.50		7.90	6.50	353.00	359.00	366.00	372.00
204504	84 A	362.50	376.48	6.99	378.00	383.00	365.00	370.00		7.90	6.50	360.00	366.00	373.00	379.00
204505	+85	367.67	381.65	6.99	383.50	389.50	370.50	376.50		7.90	6.50	367.00	372.00	380.00	385.00
204506	85 A	374.00	387.98	6.99	390.00	396.00	377.00	383.00		7.90	6.50	373.00	378.00	386.00	391.00
204507	+86	380.37	394.35	6.99	396.50	403.00	383.50	390.00		7.90	6.50	379.00	384.00	392.00	397.00
204508	86 A	387.50	401.48	6.99	403.50	408.50	390.50	395.50		7.90	6.50	385.00	392.00	398.00	405.00
204509	+87	393.07	407.05	6.99	409.00	415.00	396.00	402.00		7.90	6.50	393.00	397.00	406.00	410.00
204510	87 A	401.00	414.98	6.99	416.00	423.00	403.00	410.00		7.90	6.50	398.00	405.00	411.00	418.00
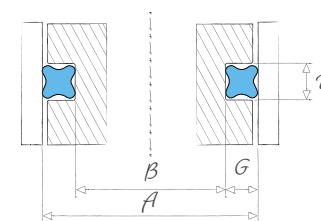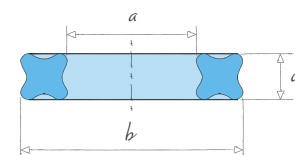
Shaft

Bore

Key

Tolerance B: +0.1 / - 0

Tolerance H: +0 / - 0.1

Tolerance D: +0.1 / - 0

◁ Fitting the parts in a two-part groove

X-RINGS

HUTCHINSON®

METAL-RUBBER
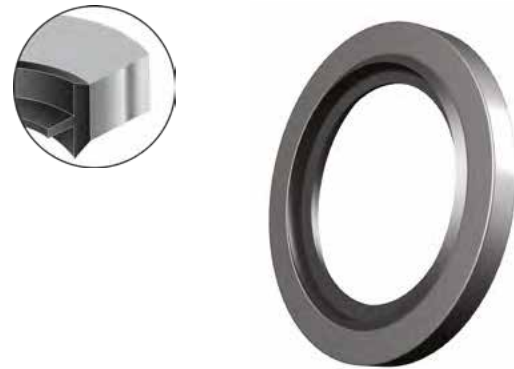## BONDED SEALS

We make it *possible*

1 – BONDED SEALS

1.1 – General information

The bonded seal consist of a metal washer of rectangular cross-section with a bonded and vulcanised inner rubber ring of trapezoidal cross-section.

The type of metal and rubber family are selected according to application, fluid to be sealed, temperature and pressure.

The bonded seal is particularly suitable for sealing under screw heads, bolts and in Banjo fittings and pipe fittings (high and low pressure). It has the advantage of being removable and reusable, unlike other seals such as copper washers.

Self-centralising bonded seal

The centred positioning of the bonded seal is achieved by a thin membrane with an inner diameter equal to the core diameter of the locating thread.

Benefits of self-centralisation:

- Correct positioning of the seal and retention in case of disassembly
- Ease of installation
- Reduced assembly time
- Lower machining costs
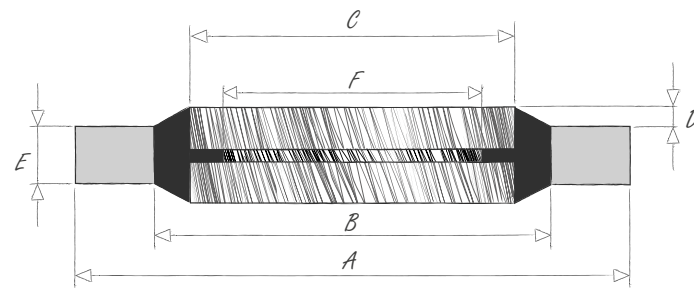
Bonded seal without self-centralisation

The bonded seal can also be made in a version without self-centralisation.

This version does not have a lip to ensure centralisation, so the recommendations in section 1.2.2 on page 147 should be followed for its correct positioning.
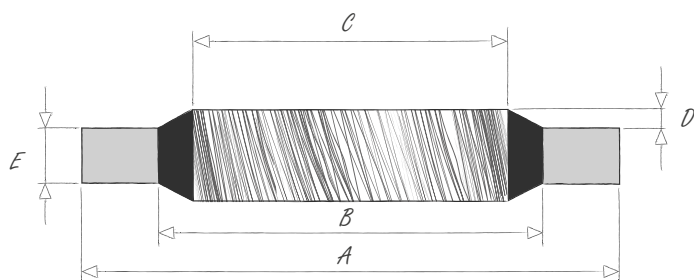
Hutchinson offers two standard metal washer:

- Rolled cold-worked mild steel with a tensile strength of 540 MPa protected by an anti-corrosion treatment
- Cold-worked T316 stainless steel with a tensile strength of 540 MPa

Other metals are listed in the table below with their specifications. The ring metal must be softer than the sub-assembly in which it is fitted. Special attention should be paid to combinations of metals that may form a bimetallic couple.

Metal	Tensile strength (MPa min.)	Specification
Rolled cold-worked mild steel DC01 (standard)	540	EN 10139
Machined mild steel EN8	540	EN 10083-2
Cold-worked stainless steel T316 (standard)	540	EN 10088-2
Machined stainless steel T316	540	EN 10088-3
T316 S1000 grade machined stainless steel	1000	EN 10088-3
Super duplex stainless steel	750	EN 10088-3
High-tensile steel	880	S154
Machined brass CZ121	380	EN 12164
Cold-worked brass CZ108	380	EN 1652
Machined cupro-aluminium alloy	700	CA104 & NES 833
Cold-worked aluminium, 5251-H22 grade	220	EN 485-2
Machined aluminium alloy	370	L102 & L168
Machined aluminium alloy (6082-T6)	295	EN 573-3

1.1.1 – Surface treatments

The metal insert can be protected by anti-corrosion surface treatment.

Surface treatment	Code	Specification
Trivalent zinc nickel passivation (transparent)	P18 (standard)	12-15% nickel - 5 microns min.
Trivalent zinc nickel passivation (black)	P26	12-15% nickel - 5 microns min.

Bonded seals are offered in the catalogue in the 4 compounds below, in combination with a mild steel or T316 stainless steel metal insert. A selection of standard dimensions to meet the needs of industrial markets is available on page 148.

To meet special requirements, our bonded seals can also be made with other compounds in our range (pages 41 to 43).

If the maximum radial clearance cannot be respected, the seal must be centred on its outer diameter by using a counter-bore.

In all cases, the overlapping (T) of the metal ring must be a minimum of 0.7 mm and the overlapping of the rubber ring at least 75% (S ≥ 0.75 R).

Counter-bore = Diameter A + diametral clearance (mm)

Metric	Max. clearance J at radius (mm)	Counter-bore (mm)
M 3 to M 8.5	0.30	Ø A + 0.20
M 9 to M 33	0.35	Ø A + 0.40
M 34 to M 60	0.50	Ø A + 0.60

Family	Compound	Colour	Hardness (Sh.A)	Temperature of use			Compression Set	
				Min (ºC)	Max continuous (ºC)	Max peak (ºC)	%	Conditions
NBR	PC851	black	78	-30	100	120	15	24h at 100°C
FKM	DF851	black	84	-25	200	250	20	72h at 200°C
FKM	7DF2075	green	78	-25	200	250	23	72h at 200°C
EPDM	7EP1197	black	70	-50	140	175	12	24h at 150°C

1.2 – Fitting instructions

1.2.1 – Tightening torque

The performance of the bonded seal depends on the quality of the fitting and the compression rate. The table opposite shows the torque required to ensure correct operation of the seal. In the case of a two-seal assembly, a coefficient should be applied to the tightening torque.

Dimensions			Recommended torque	
Metric	BOLT	BSP	Torque single ring (Nm)	Torque double ring (Nm)
< M 8	5/16	-	5.3	8.5
M 10	3/8	1/8	7.1	11.4
M 11	7/16	-	11.8	15.3
M 12	1/2	1/4	15.8	20.5
M 14	9/16	-	22.6	29.4
M 16	5/8	3/8	30.5	39.7
M 18	3/4	-	40.7	52.9
M 20	13/16	1/2	56.5	67.8
M 22	7/8	5/8	67.8	74.6
M 24	1.0	3/4	73.4	73.4
> M 27	1.1/16	-	79.0	79.0

Radial clearance J

Overall view

Self-centralising bonded seal
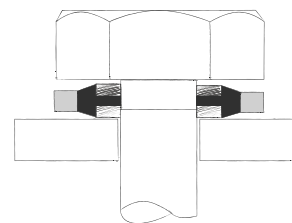
Bonded seal without self-centralisation
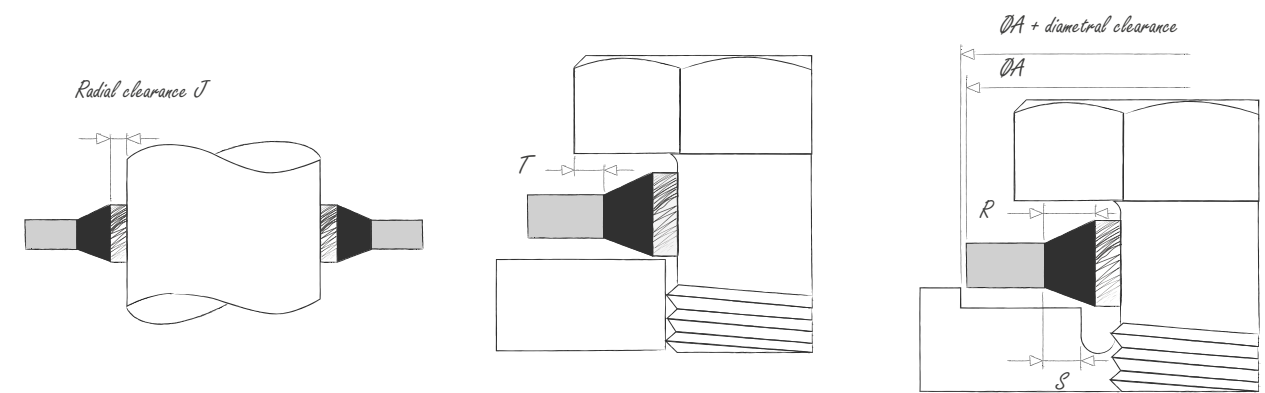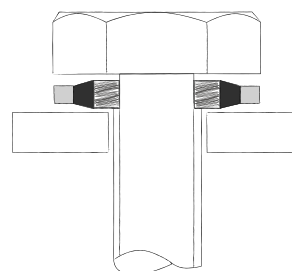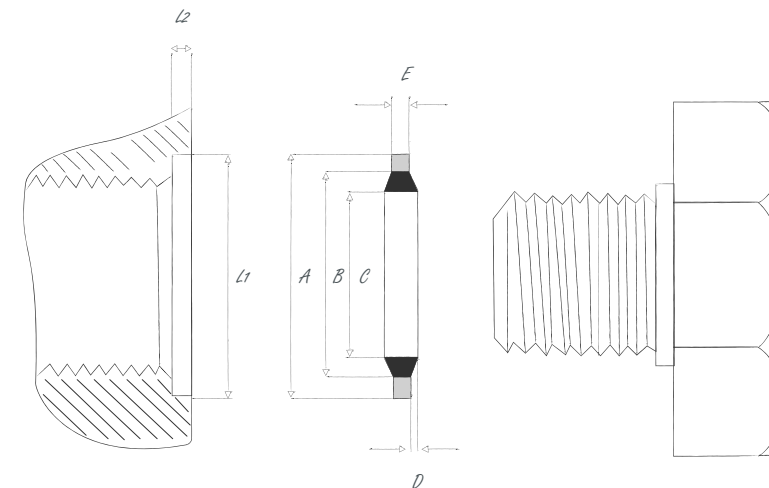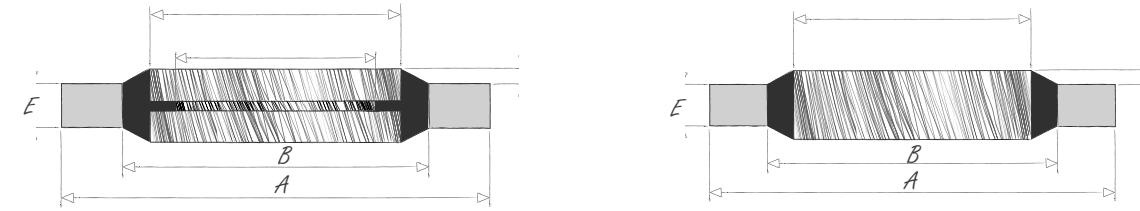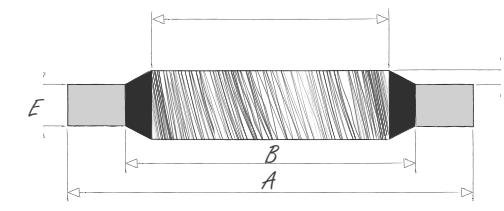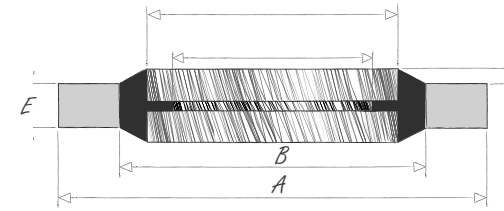

L1: ØA + diametral clearance
L2 : E/2 maximum

1.3 – British Imperial size guide

The following list of dimensions present the standard codes of our bonded seals with and without self-centralisation, available in two types of steel or stainless steel metal inserts and in 4 compounds (page 146) to meet the needs of the applications.
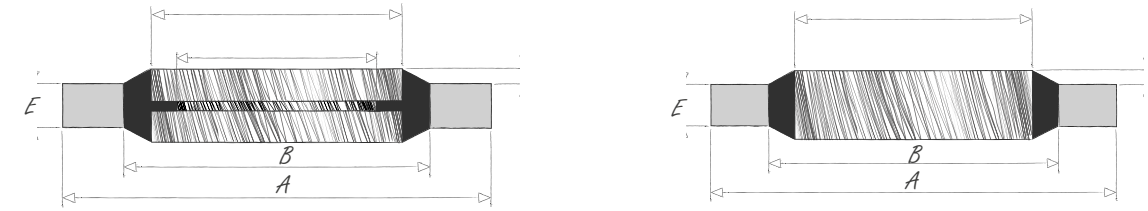
Dimension ref.	Size standards		Seal number	Dimensions (mm)						Min. burst pressure (bar)	WITH SELF-CENTRALISING					WITHOUT SELF-CENTRALISING				
											LJF part number by metal-rubber combination					LJF part number by metal-rubber combination				
	BSP	BOLT		A +0.13 -0.00	B +0.10 -0.10	C +0.10 -0.10	D	E +0.15 -0.15	F* +0.20 -0.20		STEEL + PC851	STEEL + DF851	S/STEEL + 7EP1197	S/STEEL + PC851	S/STEEL + 7DF2075	STEEL + PC851	STEEL + DF851	S/STEEL + 7EP1197	S/STEEL + PC851	S/STEEL + 7DF2075
001	-	6BA	AS2,5	6.35	4.09	3.05	0.20/0.45	1.22	-	2485	-	-	-	-	-	205112	212634	205484	205566	205525
002	-	4BA	AS3,5	7.26	5.26	4.12	0.20/0.45	1.22	-	1710	-	-	-	-	-	205114	212635	205485	205567	205526
003	-	2BA	AS4,6	8.38	6.35	5.21	0.20/0.45	1.22	-	1435	-	-	-	-	-	205115	212636	205486	205568	205527
004	-	1/4	A6,3	13.21	8.00	6.86	0.20/0.45	1.22	4.70	2930	207377	205812	205487	205569	211903	205116	212637	205921	207455	212452
005	-	1/4	A6,4	13.34	9.53	6.99	0.20/0.45	1.22	4.70	1795	206380	212780	212816	212792	212801	205126	212638	205922	205851	212453
006	-	5/16	AS7,7	13.34	9.53	8.31	0.20/0.45	1.22	6.10	1795	205242	211977	205488	205570	205529	205118	212639	212856	212128	212833
007	-	5/16	A7,9	14.22	10.04	8.64	0.20/0.45	1.22	6.10	1870	207378	212781	212817	211703	212802	205119	212640	212857	205281	212834
020	1/8	3/8	B9,7	15.88	11.84	10.37	0.25/0.51	2.03	8.56	1535	206261	206014	211662	211756	211911	206123	206191	205923	212155	212461
008	-	0.4	B10,6	18.36	12.45	11.26	0.25/0.51	2.03	8.56	2135	207379	205817	205489	205571	205530	206125	212641	212858	212133	212835
009	-	7/16	B11	19.05	13.08	11.69	0.25/0.51	2.03	8.80	2050	211344	211978	212818	212793	212803	206126	212642	212859	212135	212836
021	1/4	1/2	B13	20.57	15.21	13.74	0.25/0.51	2.03	11.45	1585	206262	206328	205490	205572	205531	210880	212649	205924	206115	212541
010	-	9/16	BS14,2	22.23	16.39	14.86	0.25/0.51	2.03	11.58	1600	206295	211979	205491	205573	205532	210864	212643	212860	212137	212837
022	-	0.6	B15,1	22.23	17.30	15.83	0.25/0.51	2.03	12.10	1280	206381	212782	212819	212794	212804	206147	212652	212861	212162	212838
011	-	5/8	BS15,8	25.40	18.75	16.51	0.25/0.51	2.03	12.90	1595	206285	205081	205492	205574	205533	206133	207424	205925	212139	212455
023	3/8	-	B16,6	23.80	18.75	17.28	0.25/0.51	2.03	14.96	1210	206263	205053	205493	205575	205534	206136	212654	212095	212165	206034
012	-	11/16	CS17,5	25.40	19.69	18.16	0.25/0.51	2.50	14.50	1300	207231	205809	205494	205576	205535	210868	205988	212862	212142	212839
024	-	3/4	CS19	26.92	21.21	19.69	0.25/0.51	2.50	15.80	1210	207242	205810	205495	205577	205536	207119	212655	205926	212167	212469
025	1/2	13/16	C20,8	28.58	23.01	21.54	0.25/0.51	2.50	18.64	1085	207210	207267	205496	205578	205537	207121	205077	205927	205290	212542
026	5/8	7/8	C22,8	31.75	24.97	23.49	0.25/0.51	2.50	20.60	1220	207211	211981	205497	205579	205538	207136	205989	205928	212175	212471
013	-	15/16	C23,6	33.27	26.04	24.26	0.25/0.51	2.50	20.20	1245	207380	205813	205498	205580	205539	210869	205990	205929	212143	212456
027	3/4	1.0	C26,4	34.93	28.53	27.05	0.25/0.51	2.50	24.13	1005	207212	205309	205499	205581	205540	207135	212657	212863	212179	212840
028	-	1.1/16	C27,1	38.61	30.61	27.82	0.25/0.51	2.50	22.90	1175	207381	212783	212820	212795	212805	210892	212659	212864	212841	212842
014	-	1.1/8	C28,6	36.58	30.86	29.33	0.25/0.51	2.50	23.90	830	211350	211980	212821	212796	212806	208105	212644	212865	212144	212843
029	7/8	1.3/16	C30,1	38.10	32.29	30.81	0.25/0.51	2.50	27.89	805	208174	211982	205500	205582	205541	208118	212660	205930	212182	205786
015	-	1.1/4	C31,9	41.40	35.69	32.64	0.25/0.51	3.38	27.10	715	207382	212784	212822	212797	212807	208117	208142	212866	212146	212844
030	1.0	1.5/16	C33,2	42.80	36.88	33.89	0.25/0.51	3.38	30.30	720	211370	211983	205980	211734	206063	210917	212661	212097	212186	212475
016	-	1.3/8	D34,9	44.45	38.99	35.94	0.25/0.51	3.38	29.50	630	207384	205811	205502	205584	205543	210872	205991	212867	212147	212458
017	-	1.1/2	D38	47.75	42.04	38.96	0.25/0.51	3.38	32.70	610	207385	212785	212823	212798	212808	205804	212645	212868	212149	212845
032	1.1/4	1.5/8	D41,9	52.38	45.93	42.93	0.25/0.51	3.38	38.96	630	205881	211984	205981	211738	206064	210918	212664	212098	212191	206035
018	-	1.3/4	D44,3	57.15	48.39	45.34	0.25/0.51	3.38	37.90	810	207386	212786	212824	212799	212809	205984	212646	212869	212846	212847
033	1.1/2	1.7/8	D47,4	58.60	51.39	48.44	0.25/0.51	3.38	44.86	630	205882	211985	205982	211740	206065	208120	212665	212870	212194	212848

Dimension ref.	Size standards		Seal number	Dimensions (mm)						Min. burst pressure (bar)	WITH SELF-CENTRALISING					WITHOUT SELF-CENTRALISING				
											LJF part number by metal-rubber combination					LJF part number by metal-rubber combination				
	BSP	BOLT		A +0.13 -0.00	B +0.10 -0.10	C +0.10 -0.10	D	E +0.15 -0.15	F* +0.20 -0.20		STEEL + PC851	STEEL + DF851	S/STEEL + 7EP1197	S/STEEL + PC851	S/STEEL + 7DF2075	STEEL + PC851	STEEL + DF851	S/STEEL + 7EP1197	S/STEEL + PC851	S/STEEL + 7DF2075
019	-	2.0	D50,7	63.50	54.74	51.69	0.25/0.51	3.38	43.60	720	211355	212787	212825	212800	212810	210876	212647	212871	212151	212849
034	1.3/4	2.1/8	D53,9	69.85	58.30	54.89	0.25/0.51	3.38	50.80	890	207387	206016	205983	211742	206066	208121	212666	212872	212196	212850
036	2.0	-	D59,6	73.03	63.63	60.58	0.25/0.51	3.38	56.67	660	211375	211986	212826	211743	212811	205875	212667	212873	212197	212851
037	-	2.1/2	D63,4	77.72	67.44	64.39	0.25/0.51	3.38	55.40	685	212788	212789	212827	211744	212812	205876	205992	212874	212199	212852
038	2.1/4	-	D65,7	79.50	69.98	66.68	0.25/0.51	3.38	62.80	610	211376	211987	212828	211745	212813	210903	205993	212875	212201	212853
039	2.1/2	-	D75,1	90.17	79.38	76.08	0.25/0.51	3.38	72.20	610	207388	212790	212829	211746	212814	210905	212668	212876	212203	212854
079	3.0	-	D88,1	101.47	92.84	89.09	0.25/0.51	3.38	85.00	415	208190	212791	212830	211747	212815	210906	212669	212877	212204	212484
9030	1.0	-	C33,2	42.80	36.88	33.89	0.25/0.51	2.50	30.30	720	207383	207459	205501	205583	205542	207341	212746	212878	212416	212855
9032	1.1/4	-	D41,9	52.38	45.93	42.93	0.25/0.51	2.50	38.96	630	208176	205310	205503	205585	205544	207343	212747	205931	212417	212584
9033	1.1/2	-	D47,4	58.60	51.39	48.44	0.25/0.51	2.50	44.86	630	208177	205664	212831	211832	211940	207340	212748	205932	212418	212586
9036	2.0	-	D59,6	73.03	63.63	60.58	0.25/0.51	2.50	56.67	660	207336	212044	212832	211833	211941	207342	212750	205933	205852	212587

METAL-RUBBER
BONDED SEALS
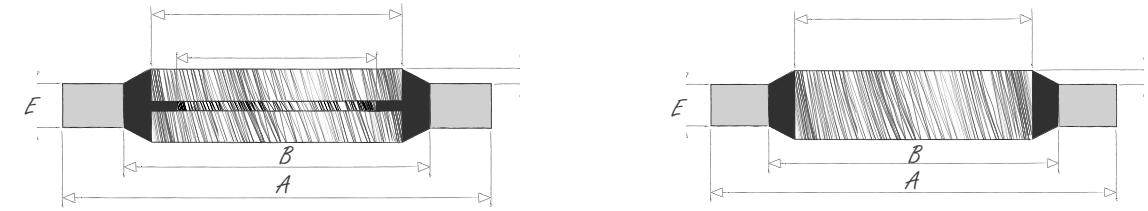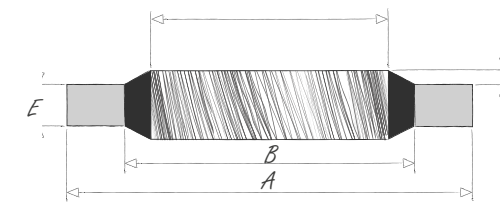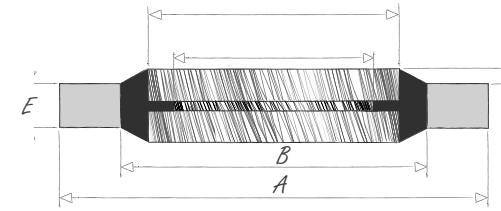
1.4 – French metric size guide

The following list of dimensions present the standard codes of our bonded seals with and without self-centralisation, available in two types of steel or stainless steel metal inserts and in 4 compounds (page 146) to meet the needs of the applications.

Dimension ref.	Size standard	Seal number	A +0.13 -0.00	B +0.10 -0.10	C +0.10 -0.10	D +0.25 -0.00	E +0.10 -0.10	F* +0.20 -0.20	Min. burst pressure (bar)	WITH SELF-CENTRALISING STEEL + PC851	STEEL + DF851	S/STEEL + 7EP1197	S/STEEL + PC851	S/STEEL + 7DF2075	WITHOUT SELF-CENTRALISING STEEL + PC851	STEEL + DF851	S/STEEL + 7EP1197	S/STEEL + PC851	S/STEEL + 7DF2075
301	M3	A3	7.50	5.00	3.60	0.30	1.00	-	2250	-	-	-	-	-	205113	212720	205464	205545	205504
302	M4	A4	9.00	6.00	4.60	0.30	1.00	-	2250	-	-	-	-	-	205122	205164	212105	205123	212549
303	M5	A5	10.00	7.00	5.60	0.30	1.00	4.50	1925	205241	205070	212885	205157	212886	205111	205166	207419	205292	212550
304	M6	A6	11.00	8.00	6.60	0.30	1.00	4.70	1685	205237	205003	205468	205550	205508	207349	205167	205934	205248	212554
306	M6	A6,4	11.40	8.40	7.00	0.30	1.00	4.70	1605	205883	206020	205909	205858	206072	205117	205994	205935	205218	206036
307	M8	AX8	13.00	10.00	8.60	0.30	1.00	6.40	1350	207403	212887	212888	205406	212889	205121	205172	205936	205291	205227
310	M10	BX10	17.00	12.10	10.70	0.30	1.50	8.56	1820	207410	207335	206154	205407	211942	206124	206174	205937	206145	212560
312	M11	B11,1	18.10	13.20	11.80	0.30	1.50	9.80	1670	207404	206021	211684	205859	206073	206127	205995	205938	205856	206037
313	M12	B12	19.00	14.10	12.70	0.30	1.50	9.73	1560	206283	207452	205474	205556	205515	206128	206197	206113	206278	206038
315	M13	B13,1	20.10	15.20	13.80	0.40	1.50	10.80	1450	205884	205001	212890	205860	205012	206130	206198	205939	206141	207435
316	M14	BS14	21.00	16.10	14.70	0.30	1.50	11.38	1365	207405	212891	205595	205079	211935	206131	206175	205940	205896	212551
317	M16	BS16	23.00	18.10	16.70	0.30	1.50	13.41	1215	207406	205593	205478	205560	205519	206134	206202	205942	212380	206253
318	M17	B16,7	23.70	18.80	17.40	0.40	1.50	13.08	1170	205885	206022	205910	205861	206074	207348	212726	205943	206277	206039
320	M18	C18	27.00	20.40	18.70	0.30	2.00	14.76	1455	205886	206023	205911	205862	206075	207118	207150	207365	207106	206040
321	M20	C20	29.00	22.40	20.70	0.30	2.00	16.76	1325	205887	206024	205912	205863	206076	207120	207160	205944	212382	206041
323	M21	C21	30.00	23.40	21.70	0.40	2.00	17.80	1265	205888	212892	212893	205440	212894	207122	207156	205945	212387	206042
324	M22	C22	31.00	24.40	22.70	0.40	2.00	18.74	1215	207407	206025	205913	205864	206077	207123	205403	205941	212389	206043
325	M23	C23	32.00	25.40	23.70	0.40	2.00	19.30	1165	206384	212895	212897	212896	212898	207124	206386	212880	212879	212881
326	M24	C24	33.00	26.40	24.70	0.40	2.00	20.11	1125	207408	206026	205914	205865	206078	210949	212728	205946	212390	212561
327	M26	C26,3	35.30	28.70	27.00	0.40	2.00	22.30	1030	206385	206027	205915	205866	206079	207127	207172	205947	212391	206044
328	M27	C27	36.00	29.40	27.70	0.40	2.00	23.30	1010	205889	206028	205916	205867	206080	207128	205996	205948	205461	206045
329	M28	C27,9	36.00	30.30	28.60	0.40	2.00	24.80	845	211465	206029	205917	205868	206081	208103	205997	205949	212393	206046
331	M30	C30	39.00	32.40	30.70	0.40	2.00	25.70	915	211391	206387	212900	212899	212901	208106	207465	212883	212882	212884
332	M33	C33	42.00	35.40	33.70	0.40	2.00	28.70	835	205890	206030	205918	205869	206082	208108	212732	205950	212394	206047
333	M36	D36	48.00	39.60	37.00	0.40	2.50	31.10	950	207409	206031	205317	205870	206083	208110	205998	205951	212395	212552
334	M39	D39	51.00	42.60	40.00	0.40	2.50	34.10	885	205891	212902	212903	205871	212904	208111	205999	205952	212396	206048
335	M42	D42	54.00	45.60	43.00	0.40	2.50	36.50	825	208189	205017	205483	205565	205524	208113	212733	205953	208150	206049
336	M45	D45	57.00	48.60	46.00	0.40	2.50	39.50	775	211468	206032	205919	205872	206084	208114	206000	205954	212397	206050

Dimensions (mm)

UF part number by metal-rubber combination

1.5 – German metric size guide

The following list of dimensions present the standard codes of our bonded seals with and without self-centralisation, available in two types of steel or stainless steel metal inserts and in 4 compounds (page 146) to meet the needs of the applications.

Dimension ref.	Size standard	Seal number	Dimensions (mm)						Min. burst pressure (bar)	WITH SELF-CENTRALISING — UF part number by metal-rubber combination					WITHOUT SELF-CENTRALISING — UF part number by metal-rubber combination				
			A +0.13 -0.00	B +0.10 -0.10	C +0.10 -0.10	D +0.25 -0.00	E +0.10 -0.10	F* +0.20 -0.20		STEEL + PC851	STEEL + DF851	S/STEEL + 7EP1197	S/STEEL + PC851	S/STEEL + 7DF2075	STEEL + PC851	STEEL + DF851	S/STEEL + 7EP1197	S/STEEL + PC851	S/STEEL + 7DF2075
202	M4	A3,9	7.00	5.40	4.50	0.30	1.00	3.40	1330	205236	205030	205302	205082	211919	210977	212681	205465	205546	205505
203	M5	A5,1	9.00	6.80	5.70	0.30	1.00	4.50	1455	207390	205816	205467	205549	205507	210979	212682	205956	212256	212503
204	M5	AS5,1	10.00	7.40	5.70	0.30	1.00	4.50	1580	205240	205016	211671	205548	205506	210921	212683	205957	205124	212544
205	M5,5	A5,6	9.20	7.20	6.20	0.30	1.00	4.70	1250	206390	212941	212965	212953	212982	210981	206002	212090	212258	212506
206	M6	AS6,1	10.00	8.00	6.70	0.30	1.00	4.70	1125	207391	212007	205469	205551	205509	210922	212684	212091	212259	212545
207	M6	AX6,1	11.00	8.20	6.70	0.30	1.00	4.70	1535	207392	212008	205905	211795	206067	205120	212685	205067	212235	212508
210	M6,7	A6,7	10.20	8.60	7.30	0.30	1.00	5.77	835	205594	212942	212966	212954	212983	212905	212908	212922	212261	212930
212	M8	AS8,1	13.00	10.00	8.70	0.30	1.00	6.40	1350	207393	205815	205471	205553	205511	210990	212686	205340	205313	212509
213	M8	A8,1	14.00	10.40	8.70	0.30	1.00	6.40	1555	205238	207460	205470	205552	205510	210923	212687	205958	212263	212546
215	M8,5	A8,7	13.30	10.50	9.30	0.30	1.00	6.90	1200	207394	212009	205906	205857	206068	207451	206003	212101	205853	212512
216	M10	B9,6	15.88	12.00	10.35	0.40	2.00	8.56	1455	212938	212943	211690	211799	212984	206383	212909	212923	212264	212931
217	M10	B10	16.00	12.40	10.70	0.40	1.50	8.05	1305	206282	205002	205472	205554	205512	210996	212688	212102	212266	212514
218	M10	BS10	18.00	12.40	10.70	0.40	1.50	8.05	2030	212939	205814	212967	212955	212985	207395	206004	205473	205555	205513
219	M11	B10,7	16.30	12.70	11.40	0.40	1.50	9.80	1275	212940	212010	212968	212956	212986	210998	212910	212924	212916	212932
221	M11	BS11,1	19.10	13.50	11.80	0.40	1.50	9.80	1865	207397	206017	205475	205557	205516	210999	206005	205959	205854	206052
222	M12	BS12	18.00	14.30	12.70	0.40	1.50	9.73	1160	207398	207314	205907	205427	211898	210924	212689	205960	212270	212515
223	M12	B12	20.00	14.40	12.70	0.40	1.50	9.73	1750	211416	212944	212969	211804	212987	205877	207464	212103	205855	212517
225	M13	B13	22.00	15.40	13.70	0.40	1.50	10.80	1925	206391	212945	212970	212957	212988	206388	212911	212925	212917	212933
226	M13,5	B13,3	18.70	15.70	14.00	0.40	1.50	11.30	855	207399	206018	205354	211805	206069	205878	212912	212099	212273	206053
227	M14	B14	22.00	16.40	14.70	0.40	1.50	11.38	1535	206284	205328	205476	205558	205517	205355	212690	205961	212275	212519
229	M16	B16	24.00	18.40	16.70	0.40	1.50	13.41	1365	206286	205371	205477	205559	205518	211007	212691	205962	212277	212520
230	M17	B16,7	24.00	19.20	17.40	0.40	1.50	13.08	1125	207400	205040	211678	211817	205092	207320	206006	205963	212326	206054
231	M17,5	B17,3	24.70	20.10	18.00	0.40	1.50	13.60	1025	206392	212946	212971	212958	212989	211047	207255	212926	212918	212934
232	M18	CS18	26.00	20.40	18.70	0.40	1.50	14.76	1235	207232	205389	205479	205561	205520	210925	212693	205964	212327	212524
233	M20	CS20	28.00	22.50	20.70	0.40	1.50	16.76	1100	207233	205333	205316	205424	206070	211050	212694	205965	212239	212526
234	M21	C20,8	28.70	23.30	21.50	0.40	2.50	17.80	1040	206393	212947	212972	212959	212990	211051	206007	205966	212919	206055
235	M22	C21,8	28.00	24.20	22.50	0.40	1.50	18.10	705	206394	212948	212973	212960	212991	206389	212913	212927	212920	212935
236	M22	CS22	30.00	24.40	22.70	0.40	2.00	18.74	1030	207204	212011	205480	205562	205521	210926	212695	205967	212331	212529
237	M22	CX22	30.00	24.40	22.70	0.40	3.00	18.74	1030	206395	212949	212974	212961	212992	212907	212914	212928	212332	212531
238	M24	CS24	32.00	26.40	24.70	0.40	2.00	20.11	950	207235	212012	205481	205563	205522	205657	212696	205968	212334	212532

Dimension ref.	Size standard	Seal number	Dimensions (mm)						Min. burst pressure (bar)	WITH SELF-CENTRALISING					WITHOUT SELF-CENTRALISING				
										LJF part number by metal-rubber combination					LJF part number by metal-rubber combination				
			A +0.13 -0.00	B +0.10 -0.10	C +0.10 -0.10	D +0.25 -0.00	E +0.10 -0.10	F* +0.20 -0.20		STEEL + PC851	STEEL + DF851	S/STEEL + 7EP1197	S/STEEL + PC851	S/STEEL + 7DF2075	STEEL + PC851	STEEL + DF851	S/STEEL + 7EP1197	S/STEEL + PC851	S/STEEL + 7DF2075
239	M26	C26	35.00	28.40	26.70	0.40	2.00	22.30	1045	207401	212013	205482	205564	205523	210927	206008	205969	212335	212533
240	M27	C26,5	36.00	29.00	27.20	0.40	2.00	23.30	1085	211441	212014	212975	211821	212993	211057	206009	205970	212336	212534
242	M30	C30,3	39.00	33.00	31.00	0.40	2.00	25.70	815	211385	212015	212976	211822	212994	210928	212697	205971	212337	212936
243	M33	C33	42.00	35.80	33.70	0.40	2.00	28.70	775	211443	212016	212977	212962	212995	210929	212698	205972	212338	212537
244	M33	C33,6	43.00	36.40	34.30	0.40	2.00	28.70	815	211444	212950	212978	211823	212996	211059	212915	212929	212921	212937
245	M36	D35,7	46.00	38.80	36.70	0.40	2.00	31.10	835	207402	206019	205908	205425	206071	205880	206010	205973	212340	206056
246	M39	D39	51.00	41.90	40.00	0.40	2.50	34.10	975	206396	212951	212979	212963	212997	211061	206011	205974	205682	206057
247	M42	D41,7	53.00	44.40	42.70	0.40	3.00	36.50	870	211446	212017	212980	211824	212998	205879	206012	212104	212341	206058
248	M48	D47,7	59.00	50.80	48.70	0.40	3.00	41.90	725	206397	212952	212981	212964	212999	210930	212699	205976	212342	206059
250	M52	D52,3	64.50	56.40	53.30	0.40	3.00	45.90	645	206482	206483	206486	206484	206485	211072	212700	205975	212350	206060
254	M88	D88	101.35	92.10	89.09	0.40	3.25	-	450	-	-	-	-	-	211073	206013	205977	212351	206061

1.6 – Cetops size guide

The CETOPS seal is recommended for general applications and hydraulic and pneumatic transmissions in accordance with standard NF EN ISO 1179.

For each thread diameter, two metal washers widths are offered, affecting the outer diameters A.
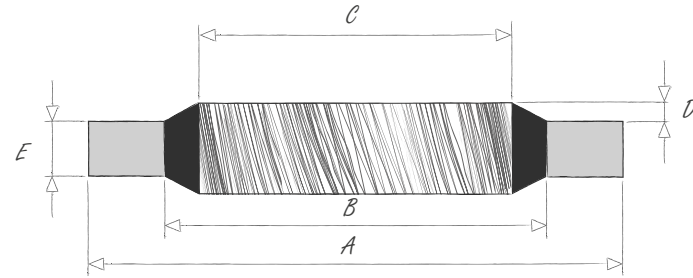
Dimension ref.	Size standard BSP	A +0.00 -0.20	B +0.20 -0.00	C +0.20 0.00	D +0.25 0.00	E +0.15 -0.15	Min. burst pressure (bar)	LJF part number combination PC851 STEEL P18
519	1/16	12.70	9.90	8.30	0.25	1.25	1270	206477
510	1/8a	14.70	12.00	10.40	0.25	1.25	1010	206321
501	1/8	16.20	12.00	10.40	0.25	1.25	1575	211114
511	1/4a	18.70	15.75	13.85	0.25	1.25	840	206314
502	1/4	20.20	15.75	13.85	0.25	1.25	1270	211115
512	3/8a	22.70	19.25	17.35	0.25	1.25	805	206315
503	3/8	24.20	19.25	17.35	0.25	1.25	1155	211116
513	1/2a	26.70	23.55	21.65	0.25	1.25	600	207259
504	1/2	29.20	23.55	21.65	0.25	1.25	1075	211118
514	3/4a	32.50	29.20	27.30	0.25	1.25	505	207258
505	3/4	35.00	29.20	27.30	0.25	1.25	890	211119
515	1.0a	39.50	36.10	34.20	0.25	2.00	420	208197
506	1.0	43.00	36.10	34.20	0.25	2.00	860	211120
516	1.1/4a	49.50	44.70	42.80	0.25	2.00	480	208198
507	1.1/4	53.00	44.70	42.80	0.25	2.00	835	211121
517	1.1/2a	55.50	50.60	48.70	0.25	2.00	435	206478
508	1.1/2	59.00	50.60	48.70	0.25	2.00	745	211122
518	2.0a	68.50	62.40	60.50	0.25	2.00	435	206479
509	2.0	73.00	62.40	60.50	0.25	2.00	760	211123

2 – BANJO SEALS

2.1 – General information

Banjo seals have been developed for systems using couplings for fluid transfer in cars and heavy goods vehicles. They offer significant advantages over copper or aluminium washers (without elastomer). The elasticity of rubber provides very reliable sealing and the self-centralising lip allows for easy fitting.

- Design and sizes based on standards: DIN 7642 for the coupling and DIN 7643 for the hollow screws.
- Standard sizes from M8 to M32
- Standard FKM compounds: DF851 - 7DF2067; other possible compounds in AEM (7DE2138) and HNBR (8DT1706)...
- Temperature range from -60°C to +250°C (depending on the rubber)
- Metal: DC01 mild steel; Tensile strength: min. 540 MPa; Specification: NF EN 10139
- Surface treatment: P18 Zinc Nickel coating; Resistance: red rust corrosion 600 hours; Specification: ISO 9227

Banjo fitting

Application markets

- Hydraulic fittings
- Turbo connections
- Banjo fuel lines
- Oil tank drain plug
- Oil return to pump
- Trucks
- Off-road
- Automotive
- Oil & Gas

2.2 – Technical advantages

- Easy fitting with self-centralisation
- Improved sealing capacity thanks to the rubber lip
- Long-life sealing solution
- Suitable for sealing surfaces with roughness requirements
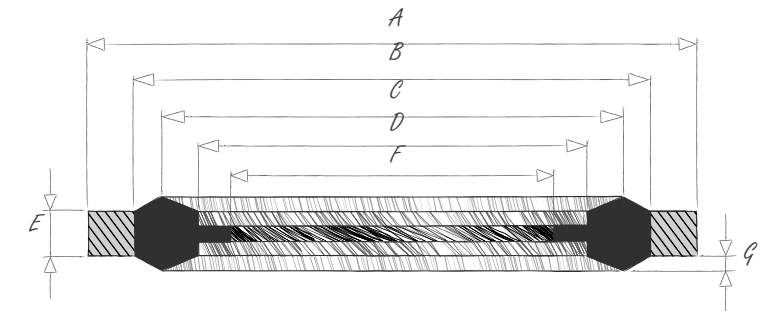
Other sizes available on request

2.3 – Dimensions

Dimension ref.	Size standard	A +0.13 -0.00	B +0.10 -0.10	C +0.10 -0.10	D +0.10 -0.10	E +0.10 -0.10	F +0.10 -0.10	G +0.05 -0.05
3413	M8	14.00	10.40	9.80	8.30	1.00	7.00	0.20
3414	M10	16.00	12.40	11.80	10.30	1.50	9.00	0.20
3397	M12	18.00	14.80	13.80	12.30	1.50	11.00	0.20
3398	M14	22.00	16.80	15.80	14.30	1.50	13.00	0.20
3415	M16	24.00	18.80	17.80	16.30	1.50	14.30	0.20
3441	M18	26.00	20.80	19.80	18.30	1.50	16.30	0.20
3456	M22	30.00	24.80	23.80	22.30	2.00	19.75	0.20

3 – SLIMLINE SEALING WASHERS

3.1 – General information

Material

The slimline seal is a metal washer with a specially shaped vulcanised elastomer lip bonded to the inside.

Our purple EPDM offers optimised chemical resistance to R1234yf fluid and is certified by many OEMs such as BMW, Daimler and GM. Other EPDM or HNBR elastomers are available on request.

The metal insert is made of carbon steel (cold-rolled and cold-worked strip) and protected by anti-corrosion treatment (Zn-Ni). Other materials are available on request: aluminium, stainless steel, etc.
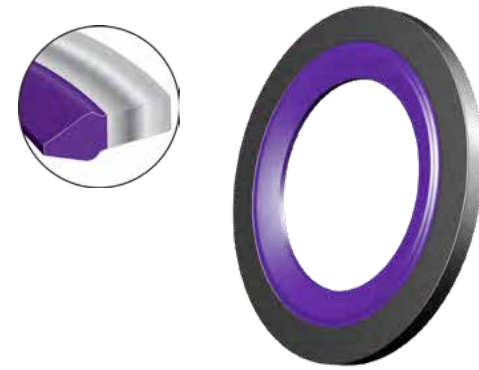
HVAC applications

The slimline sealing washer is a sealing solution for axial application of HVAC fittings in place of radially tightened O-Rings (standard air-conditioning fittings). It is compatible with the coolants R134a and R1234yf.

3.2 – Technical advantages

- Very low permeability
- Improved sealing performance
- No groove machining - reduced total cost of the fitting
- Easy fitting (no assembly force)
- Assembly without risk of seal deterioration
- Poka-Yoke thanks to the colours of the compounds
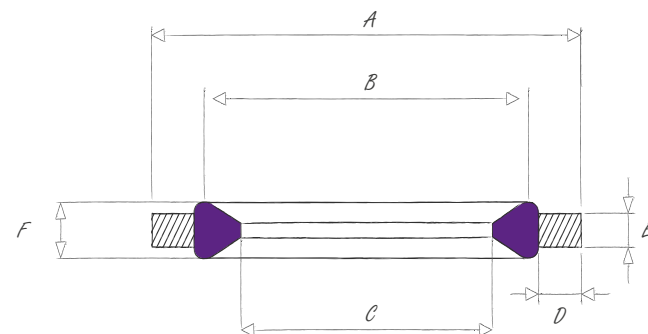
3.3 – Dimensions

Standard dimensions corresponding to the generic dimensions of the fittings:

Dimension ref.	Size standard Outer Ø of male part	A +0.13 -0.13	B +0.13 -0.13	C +0.13 -0.13	D	E +0.05 -0.05	F +0.10 -0.10	IJF part number combination 8EP2147 STEEL
3270	3/8"	16.00	10.67	8.13	1.78	1.27	2.03	205367
3249	1/2"	19.10	13.66	11.18	1.78	1.27	2.03	205364
3279	5/8"	23.62	18.03	15.49	2.00	1.27	2.13	205366
3250	3/4"	25.27	20.58	17.16	1.78	1.27	2.13	205365

4 – PFS FLANGE SEALS

4.1 – General information

Specially designed for flange-fitting pipes, the PFS flange seal is made of a stainless-steel washer and a vulcanised elastomer lip.

With its double lip, the PFS flange seal ensures permanent sealing, eliminates fugitive emissions and reduces downtime during maintenance operations. It is the ideal solution for all bolted flange fittings.

This innovative product developed by Hutchinson can usefully replace SWG (spiral wounded gaskets). The PFS flange seal guarantees a durable, safe and economical sealing. Because of its reusable design, it can be considered a life-long sealing system.

General information

- Dimensions: from 15 mm
- Temperature: -50°C to +200°C (depending on the rubber)
- Various combinations of rubbers and metal inserts (aluminium, stainless steel, etc.)
- Possibility of using materials that meet the standards for drinking water, food and oil & gas

Application markets

- Food industry
- Oil & Gas
- Hydraulic
- Transport of industrial fluids
- Energy production
- Industrial water & wastewater treatment
- Chemical industry

4.2 – Technical advantages

4.2.1 – Conditions for use

- Compatible with any type of fluid (depending on the rubber)
- Available with or without drilled bolt holes
- Easily replaces existing sealing solutions (flat-faced, raised-face and grooved flanges)
- Usable on corroded or scratched surfaces
- Resists extreme terrain conditions: handling, shocks, dust, etc.
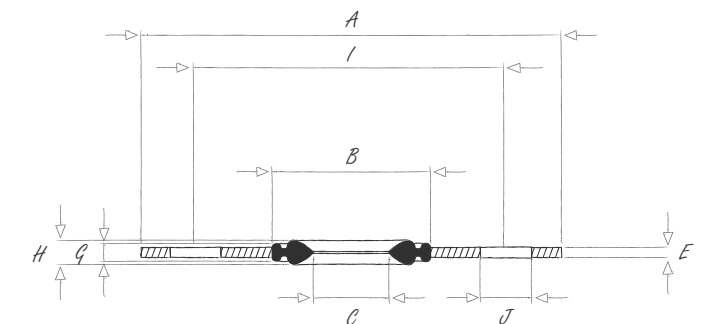
- Reusable sealing solution
- Reduced installation time
- Reduced downtime maintenance and costs
- Improved performance with a double sealing line
- Uniform compression independent of torque
- Fitting without a support ring on GRP flanges
- Compression stop and blow-out preventer

LLOYD'S REGISTER

Lloyd's Register

Pressure tested

Key
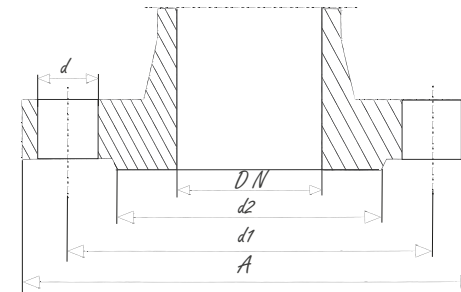
A = outer ø of flange

d1 = centre-to-centre distance

d2 = min. ø of support for the seal

n = Number of holes

d = drilling ø

DN = nominal ø

PN = nominal pressure

4.3 – Flange size table DIN EN 1092-1 / DIN 2501-1

	PN6				PN10				PN16				PN25				PN40			
DN	A	d1	d2	n x d	A	d1	d2	n x d	A	d1	d2	n x d	A	d1	d2	n x d	A	d1	d2	n x d
10	75	50	35	4x11	90	60	40	4x14	90	60	40	4x14	90	60	40	4x14	90	60	40	4x14
15	80	55	40	4x11	95	65	45	4x14	95	65	45	4x14	95	65	45	4x14	95	65	45	4x14
20	90	65	50	4x11	105	75	58	4x14	105	75	58	4x14	105	75	58	4x14	105	75	45	4x14
25	100	75	60	4x11	115	85	68	4x14	115	85	68	4x14	115	85	68	4x14	115	85	68	4x14
32	120	90	70	4x14	140	100	78	4x18	140	100	78	4x18	140	100	78	4x18	140	100	78	4x18
40	130	100	80	4x14	150	110	88	4x18	150	110	88	4x18	150	110	88	4x18	150	110	88	4x18
50	140	110	90	4x14	165	125	102	4x18	165	125	102	4x18	165	125	102	4x18	165	125	102	4x18
65	160	130	110	4x14	185	145	122	4x18	185	145	122	4x18	185	145	122	8x18	185	145	122	8x18
80	190	150	128	4x18	200	160	138	8x18	200	160	138	8x18	200	160	138	8x18	200	160	138	8x18
100	210	170	148	4x18	220	180	158	8x18	220	180	158	8x18	235	190	162	8x22	235	190	162	8x22
125	240	200	178	8x18	250	210	188	8x18	250	210	188	8x18	270	220	188	8x26	270	220	188	8x26
150	265	225	202	8x18	285	240	212	8x22	285	240	212	8x22	300	250	218	8x26	300	250	218	8x26
175	-	-	-	-	315	270	242	8x22	315	270	242	8x22	330	280	248	12x26	350	295	260	12x30
200	320	280	258	8x18	340	295	268	8x22	340	295	268	12x22	360	310	278	12x26	375	320	285	12x30
250	375	335	312	12x22	395	350	320	12x22	405	355	320	12x26	425	370	335	12x30	450	295	245	12x33
300	440	395	365	12x22	445	400	370	12x22	460	410	378	12x26	485	430	395	16x30	-	-	-	-
350	490	445	415	12x22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	PN64				PN100				PN160				PN250				PN320			
DN	A	d1	d2	n x d	A	d1	d2	n x d	A	d1	d2	n x d	A	d1	d2	n x d	A	d1	d2	n x d
10	100	70	40	4x14	100	70	40	4x14	100	70	40	4x14	125	85	40	4x18	125	85	40	4x18
15	105	75	45	4x14	105	75	45	4x14	105	75	45	4x14	130	90	45	4x18	130	90	45	4x18
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	140	100	68	4x18	140	100	68	4x18	140	100	68	4x18	150	105	68	4x22	160	115	68	4x22
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
40	170	125	88	4x22	170	125	88	4x22	170	125	88	4x22	185	135	88	4x26	195	145	88	4x26
50	180	135	102	4x22	195	145	102	4x26	195	145	102	4x26	200	150	105	8x26	210	160	102	8x26
65	205	160	122	8x22	220	170	122	8x26	220	170	122	8x26	230	180	122	8x26	255	200	122	8x30
80	215	170	138	8x22	230	180	138	8x26	230	180	138	8x26	255	200	138	8x30	275	220	138	8x30
100	250	200	162	8x26	265	210	162	8x30	265	210	162	8x30	300	235	162	8x33	335	265	162	12x36
125	295	240	188	8x30	315	250	188	8x33	315	250	188	8x33	340	275	188	12x33	380	310	188	12x36
150	345	280	218	8x33	355	290	218	12x33	355	290	218	12x33	390	320	218	12x36	-	-	-	-
175	375	310	260	12x33	385	320	260	12x33	390	320	260	12x36	-	-	-	-	-	-	-	-
200	415	345	285	12x36	430	360	285	12x36	430	360	285	12x36	485	400	285	12x42	-	-	-	-
250	470	400	345	12x36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

METAL-RUBBER BONDED SEALS

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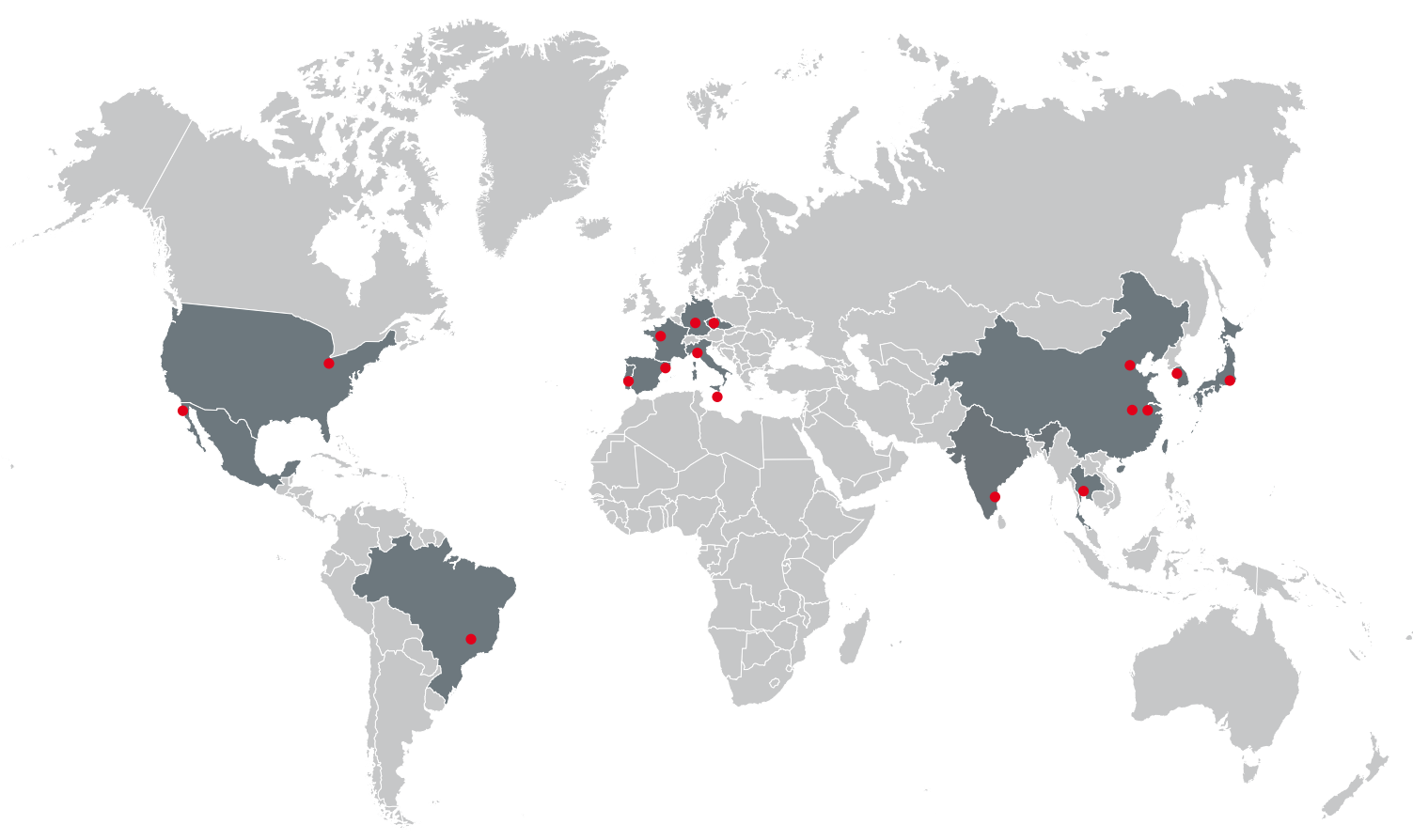
Many environmental factors influence a seal's sealing performance (fluids in contact, materials, manufacturing process, operating conditions, etc.).

This catalogue contains recommendations that should be checked with our teams and that may change depending on the seal's environment. These recommendations do not constitute a commitment on our part and all claims are excluded. It is essential to carry out final validation tests, which remain the customer's responsibility.

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