

COMPANY PRESENTATION



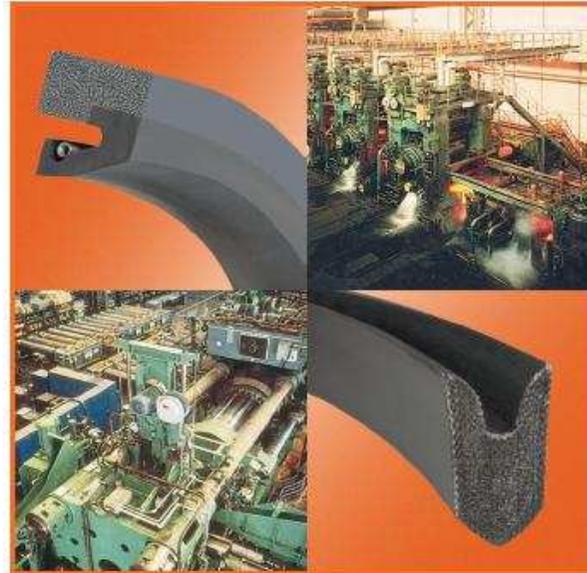
***SPECIALISTS IN SEALING SOLUTIONS
FOR HEAVY DUTY APPLICATIONS***



CARCO®

LARGE DIAMETER SEALS AND PACKINGS

CARCO®
LARGE DIAMETER SEALS AND PACKINGS



CARCO SEAL HIGH PERFORMANCE OIL SEALS FOR ROTATING SHAFTS

CARCO TEX LONG LIFE HYDRAULIC PACKINGS FOR HEAVY DUTY APPLICATIONS

Manufacturing sealing solutions



SEALING DIVISION

Location: Basiano (Milan) Italy

Area space: 5000 m²



CARCO FACTORY IN
BASIANO - ITALY

Production



CARCO HEADQUARTER
IN BASIANO - ITALY

Administration and sales



**Activity started in Milan
in the year 1900**



Core competencies



- **Manufacturing of rubber seals with fabric reinforcement**
- **Large seals up to 2,5 meters diameter and more (hot joint)**
- **Customized sealing solutions**
- **More than 7000 own moulds**
- **R&D in-house**
- **World sales network**
- **Standard delivery time:**
 - **3 weeks**
 - **Premium = only a few days**



Quality and packing

- **Test rigs for rotary shaft seals (Ø 500mm) and Vee - Packings**
- **Certification ISO 9001 since 1992**
- **100% Quality control of each single seal**
- **Contact free Laser measuring device**
- **Raw materials full traceability**
- **Individual packing**
- **Fitting instructions in every box**



Carcoseal test rig



**SHAFT DIAMETER:
UP TO mm 500**

MAX SHAFT SPEED: 40 m/s

MAX OIL PRESSURE: 5 bar

**MAX TEST TEMPERATURE:
100° C**

**STATIC ECCENTRICITY: UP
TO mm 2,5**

**DYNAMIC ECCENTRICITY:
UP TO mm 2,5**

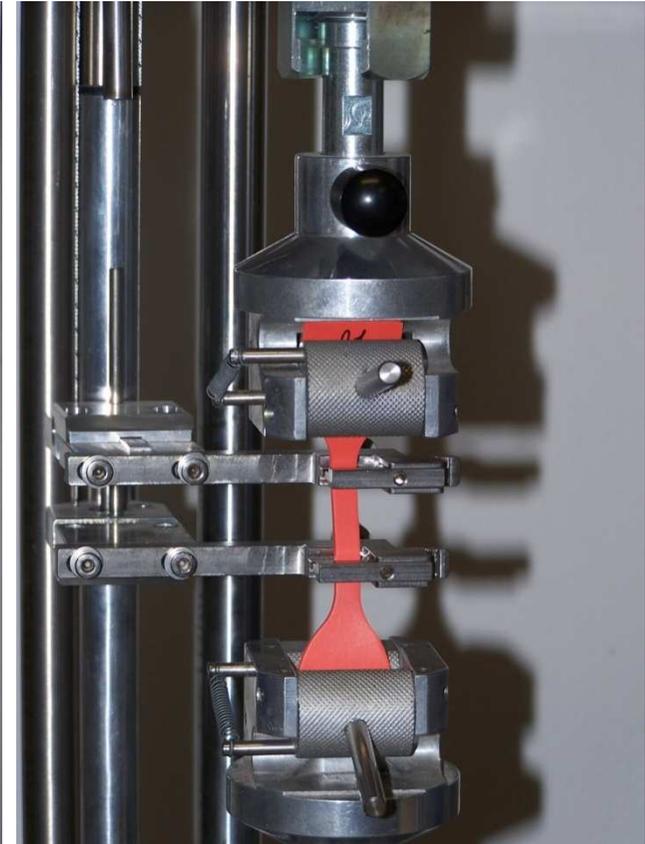


Largest press in Europe

CARCO[®]
LARGE DIAMETER SEALS AND PACKINGS



Materials R&D:



Raw Materials Production Italy & France

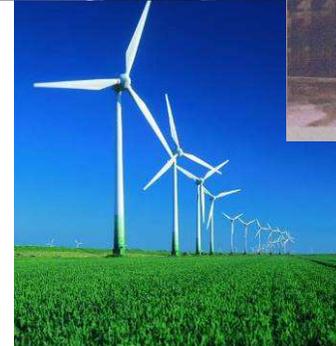
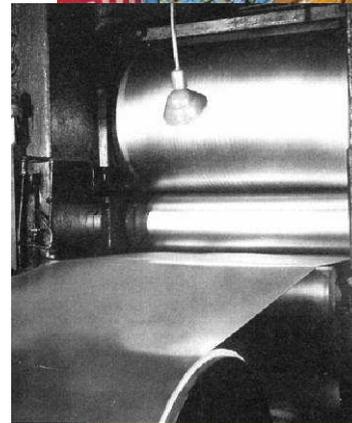
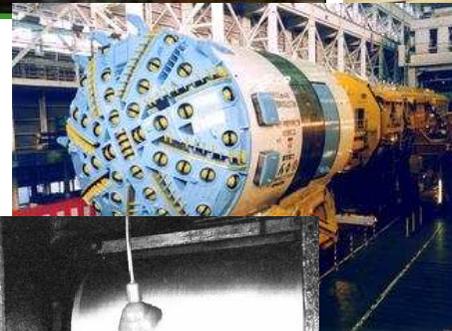


Market segments

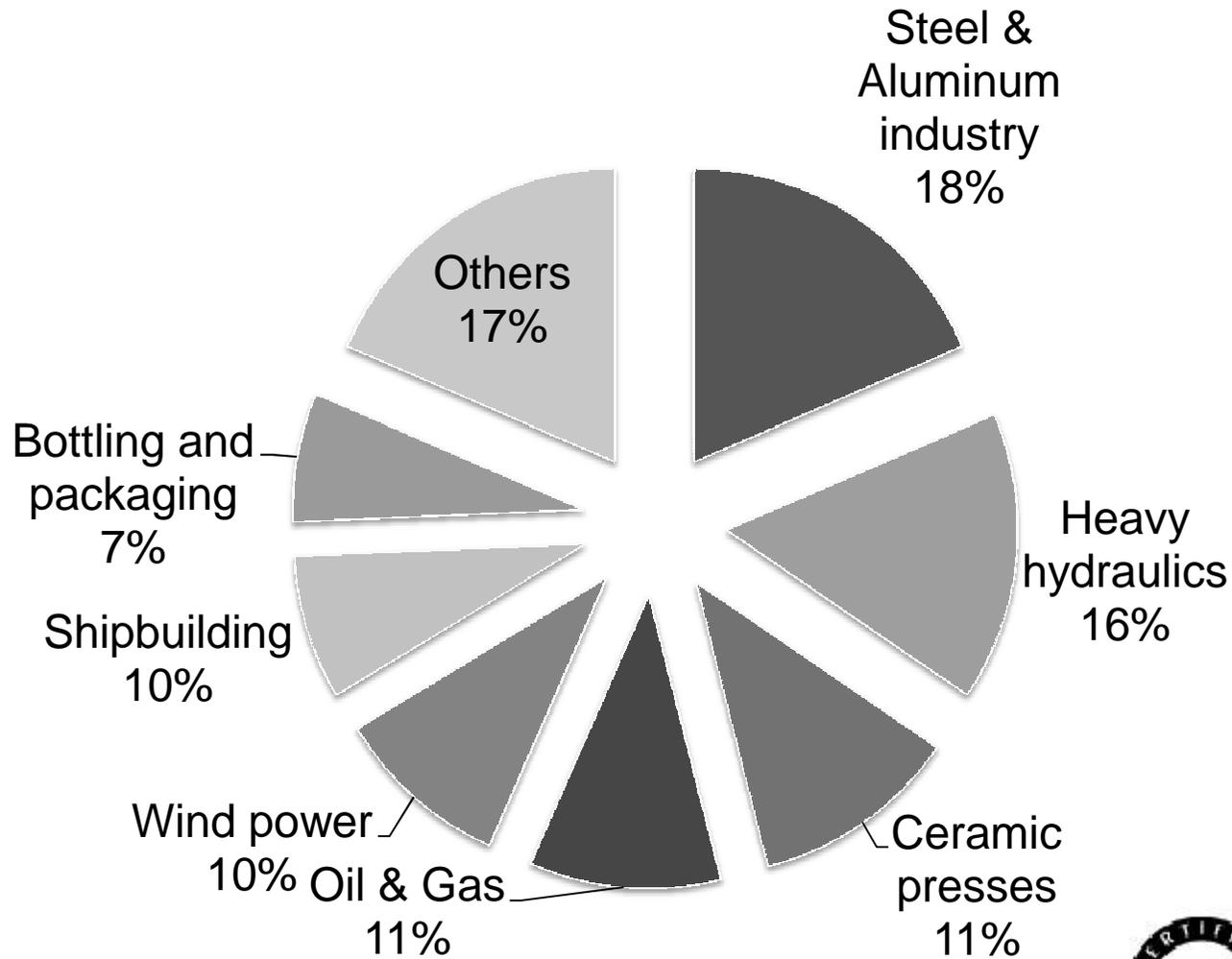
- ▶ • **Steel industry**
- **Aluminium industry**
- **Heavy Hydraulics**
- ▶ • **Shipbuilding industry**
- ▶ • **Wind power**
- ▶ • **Hydropower**
- ▶ • **Mining**
- **Paper and wood industry**
- **Cement industry**
- **Rubber industry**



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LARGE DIAMETER SEALS AND PACKINGS

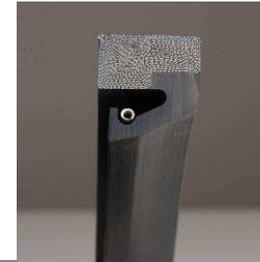


Turnover % by market Carco + PRP

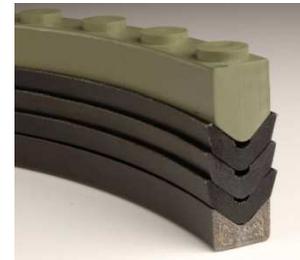


Our sealing solutions

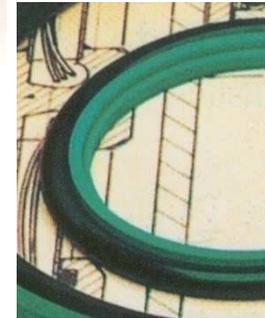
CARCOSEAL radial shaft seals



CARCOTEX V-Packings



PTFE composite seals



OTHER SEALS - V-Rings, O-Rings, braided packings, wear rings, mechanical seals, inflatable seals, customized seals.



Steel industry



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LARGE DIAMETER SEALS AND PACKINGS

Typical application :

- **Hot & cold Rolling Mills:**
 - work rolls
 - back up rolls
 - AGC hydraulic actuators
 - pass line adjustment device
 - reels
- **Continouos casting**
- **Billet Shears**
- **Heavy duty cylinders**
- **Scrap metal press**

Typical Carco Products :

- **Carcoseal/UN**
- **Carcoseal/SCA**
- **Carcoseal/ATLMP** (Anti Twist Lip)
- **Carcoseal/UN/FS**
- **Carcotex/UN**
- **Carco/TAD** (steel wire mill)
- **Carco V-ring**



Aluminium industry



CARCO[®]
LARGE DIAMETER SEALS AND PACKINGS

Typical application :

- **Hot & cold Rolling Mills:**
 - **work rolls**
 - **back up rolls**
 - **AGC hydraulic actuators**
 - **pass line adjustment device**
 - **reels**
- **Continouos casting**
- **Billet Shears**
- **Heavy duty cylinders**
- **Scrap metal press**

Typical Carco Products :

- **Carcoseal/UN**
- **Carcoseal/SCA**
- **Carcoseal/ATLMP (Anti Twist Lip)**
- **Carcotex/UN**
- **Carco V-ring**





Heavy Hydraulics: Metal forging & metal extrusion

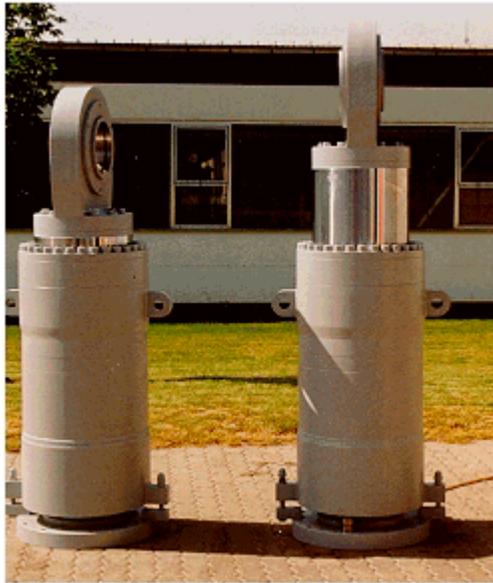
Typical application :

- Hydraulic presses:
 - main ram
 - container cylinders
 - drawback cylinders

Typical Carco Products :

- Carcotex/SP
- Carcotex/SP/SG
- Carcotex/UN
- Carcotex SG
- CarcoWIP
- Carcotex/SL
- Carcotex/OR





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Heavy hydraulics: hydraulic cylinders

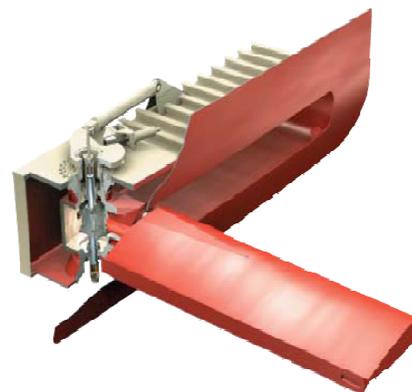
Typical application:

- Piston Seal
- Rod seal

Typical Carco Products:

- Carcotex UN
- Carcotex SG
- Carcotex UG
- Carcotex SL
- CarcoWIP





Shipbuilding Industry

Typical application :

- **Fin Stabilizers**
- **Rudders**
- **Steering gears**
- **Thrusters**
- **Propellers**
- **Gearboxes**
- **Pod System**
- **Dock lifting equipment**

Typical Carco Products :

- **Carcoseal/UN**
- **Carcoseal/AP/WT**
- **Carcoseal/SCA**
- **Carcoseal/AP**
- **Carcoseal/TM**
- **Carcotex/UN**
- **Carcotex UG**





Wind Power Industry

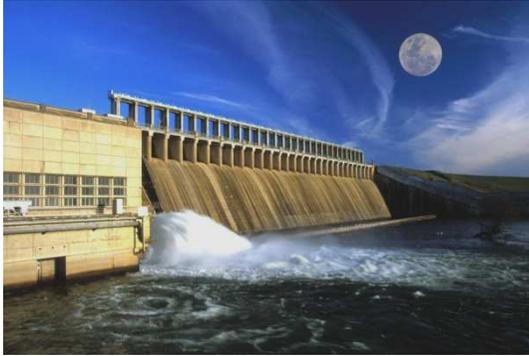
Typical application :

- Main bearing;
- Gearbox
- Blade bearings
- Rim bearings
- Yaw bearing
- Mast bearing

Typical Carco Products :

- Carcoseal/UN
- Carcoseal/SCA
- Carcoseal/Duo





Hydropower

Typical application :

- **Inlet Spherical valve**
- **Kaplan Blade runner**
- **Wicket Gate**
- **Generator Shaft**
- **Dam cylinders**

Typical Carco Products :

- **Carcotex/UG**
- **Carcotex/UN**
- **Carcotex/SG**
- **Carcotex/U-Cup**
- **Carcotex/OR**
- **Carcotex/DI**
- **Carcotex SL**
- **CarcoWIP**





Mining Industry

Typical application :

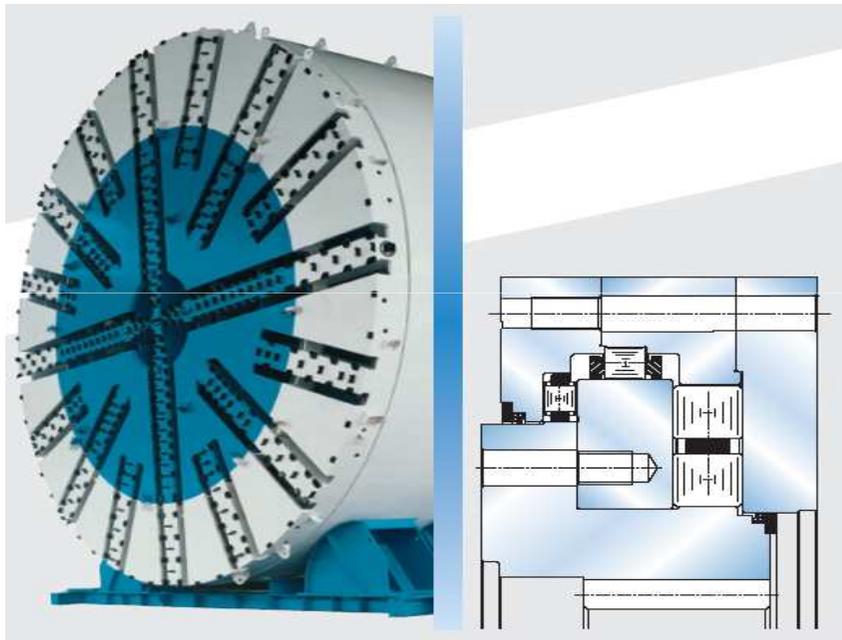
- Tunnel boring machines
- Material handling machines
- Gearboxes
- Heavy duty cylinders
- Stone crushers
- Grinding mills
- Duplex pumps

Typical Carco Products :

- Carcoseal TM
- Carcoseal/UN/LA
- Carcotex/UN
- Carcotex/SG
- Carco Pump piston seal



Tunnel boring machines



- Typical Carco Products
- **Carcoseal/TM**
- **Carcoseal/TM/FR**
- **Carcoseal/UN/LA**
- **Carcotex/UN**
- **Carcotex/SG**





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Paper & wood industry

Typical application :

- Paper machines
- Pulp machines
- Cellulose refiner machines
- Dewatering presses
- Chipboard panel presses

Typical Carco Products :

- Carcoseal/UN
- Carcoseal/TM
- Carcotex/UN
- Carcotex/SG
- Carcotex/UG





Cement mills

Typical application :

- crusher
- cement mill grinding roller
- coal mill grinding roller

Typical Carco Products :

- Carcoseal TM
- Carcoseal/UN/LA
- Carcoseal/LDS
- Carcoseal/LL



Rubber industry



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Typical application :

- rubber presses
- rubber mixers

Typical Carco Products :

- **Carcotex/UN**
- **Carcotex/SG**
- **Carcoseal/UN**
- **Carcoseal/UN/LA**





Sugar industry

Typical application :

- **Pumps and mixers in sugar processing**



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Typical Carco Products :

- **KIT Carcoseal/AP (replacing braided packings)**

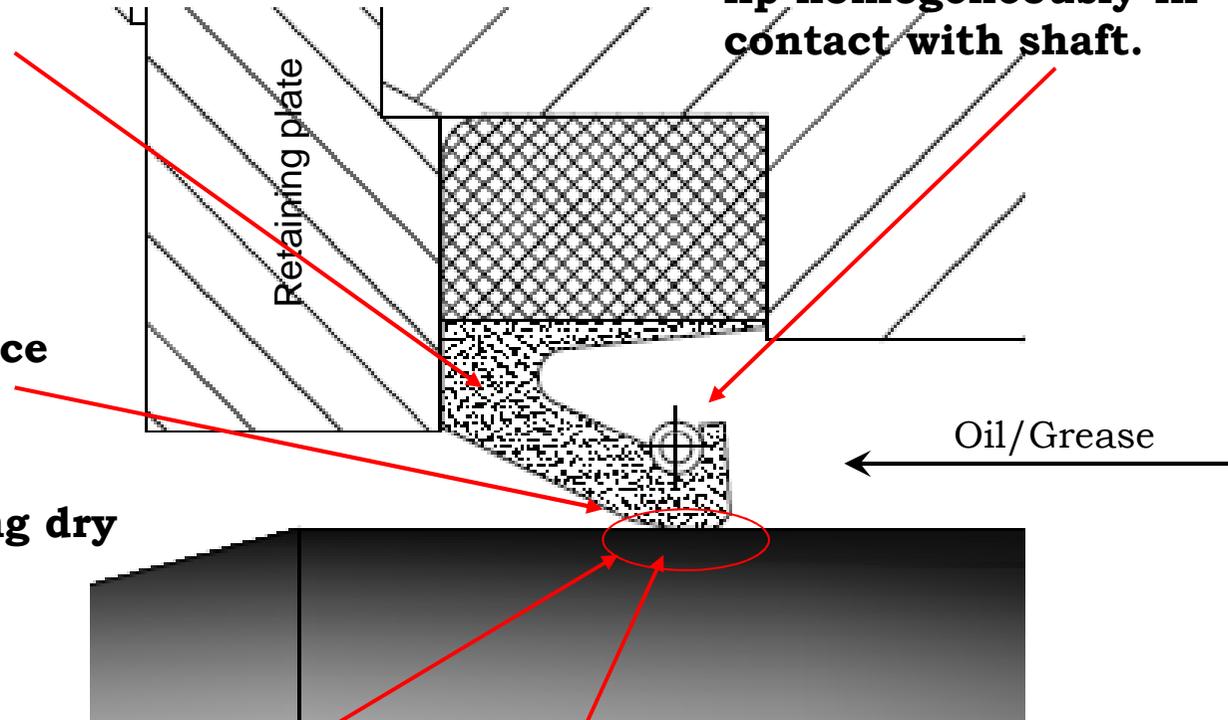


Carcoseal Benefits



Rubber formulated with PTFE to reduce friction

Stainless steel spring keeping lip homogeneously in contact with shaft.



“Carcoflon” PTFE surface treatment:

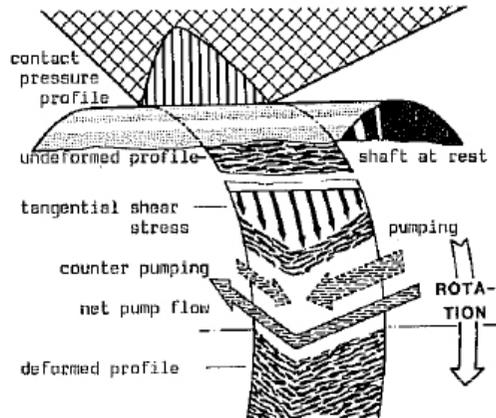
- **No stick slip effect;**
- **Lip protection during dry running.**
- **Friction reduction.**

Large contact area:

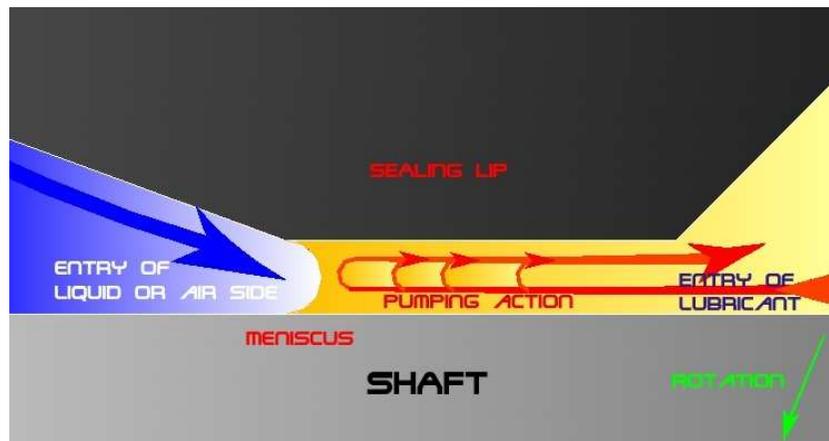
- **Guarantee against leakage;**
- **Less radial contact pressure;**
- **Less heat generation;**
- **Less shaft wear.**



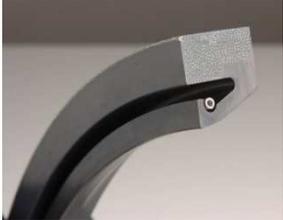
MENISCUS EFFECT



- Lubricant is pumped into the contact zone by the shaft rotation and provides a separating oil film, reducing friction and providing cooling. The reverse pumping effect keeps the lubricant contained in the contact band.



CARCOSEAL radial shaft seals



Carcoseal/UN



Carcoseal/TM



Carcoseal/SCA



Carcoseal/UN/LL



Carcoseal/AP/WT



Carcoseal/UN/LA/FS



Carcoseal/LDS

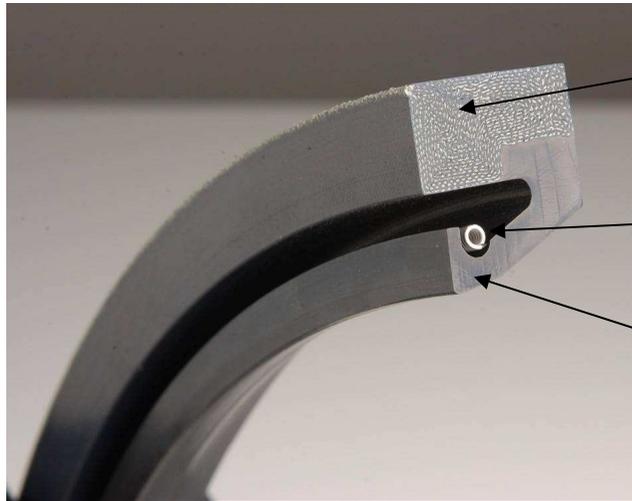


Carcoseal/TAD



Carcoseal/UN

Available endless or split



Hardened shoulder made of rubber fabric.

Stainless or Monel steel garter spring.

Lip in high performance rubber compound.

Rubber Material	Temperature	Max. Speed	Max. Pressure
NBR	-40° +120°C	15m/s (peak up to 20m/s)	0,5 bar
HNBR	-40° +170°C	25m/s	0,5 bar
FKM (Viton)	-30° +200°C	25m/s	0,5 bar

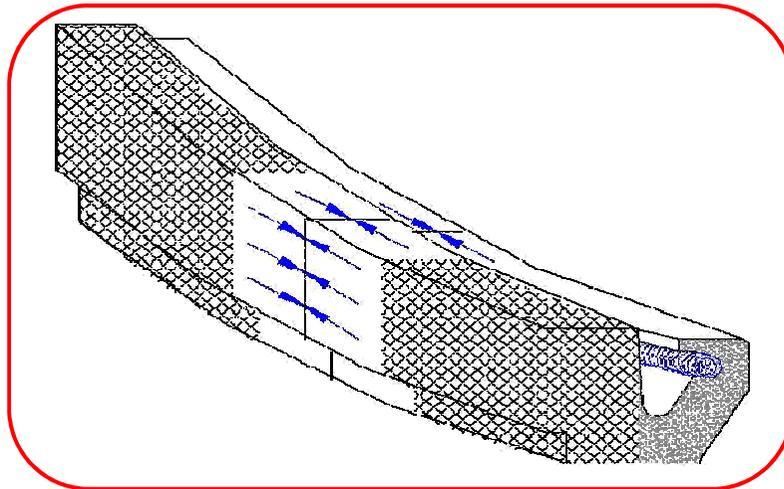
“Carcoflon” treatment gives a considerable reduction of dry friction coefficient between rubber & metal.

UN: fitted with retaining plate
UN/SF: fitted without retaining plate.



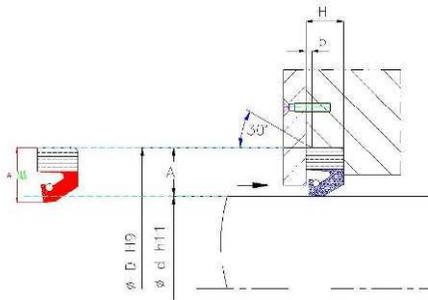
Carcoseal Split version:

cut into rubber for better sealing

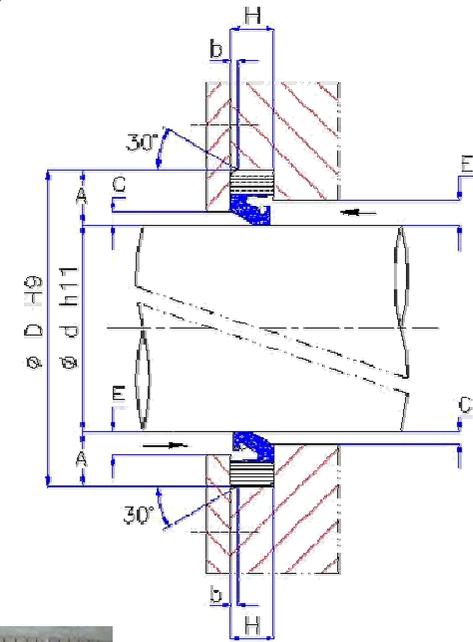


Carcoseal Fitting

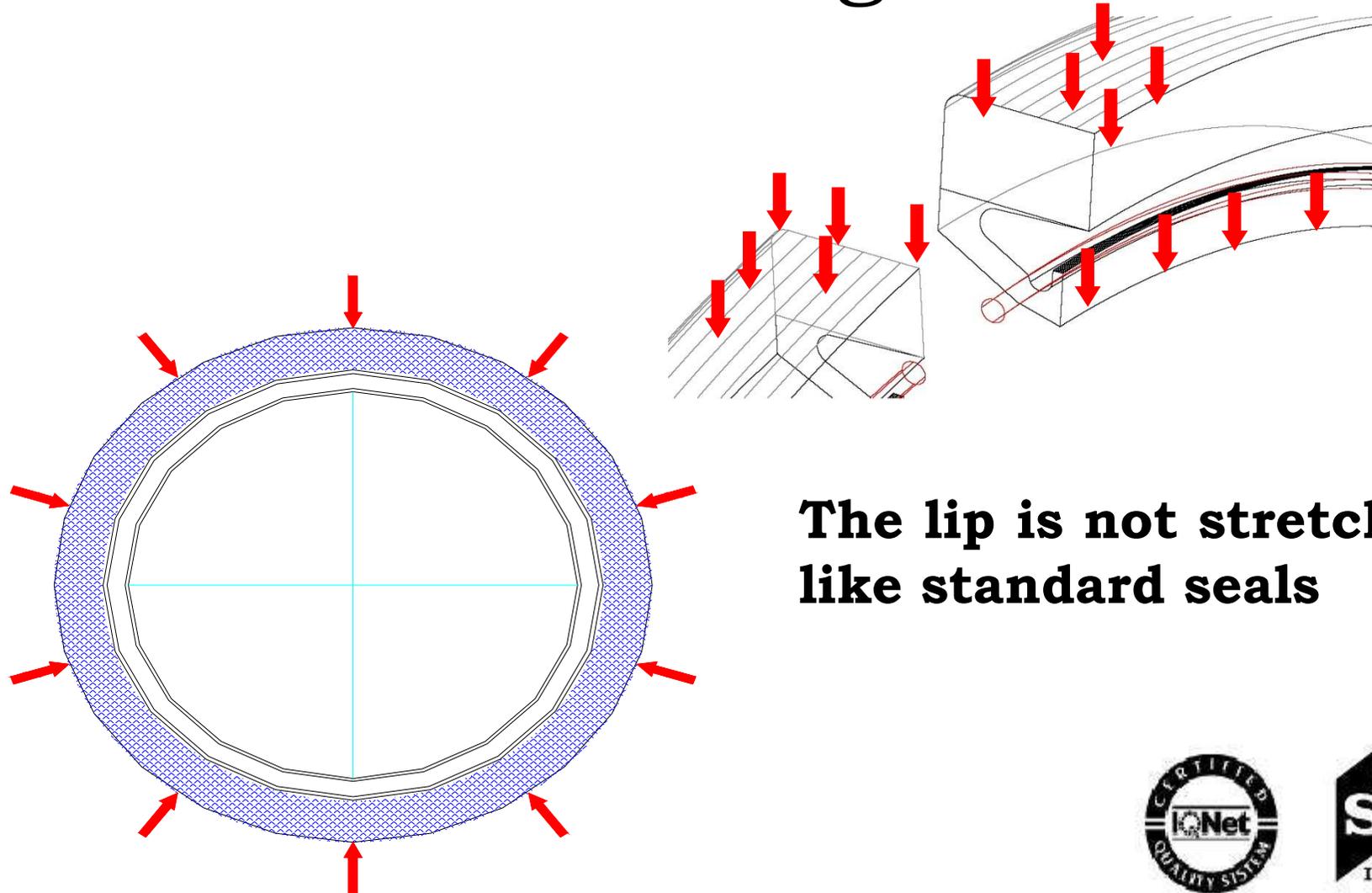
The Carcoseal is typically larger than the shaft before fitting.



Shaft
SEAL ID



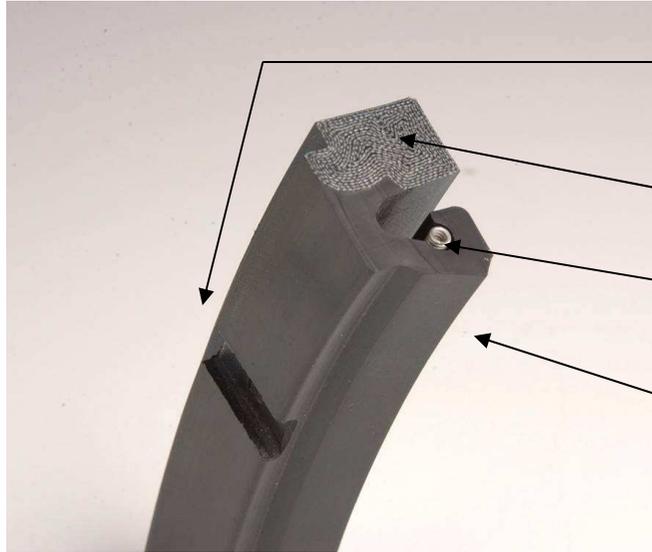
Carco seal lip compressed on the shaft for longer life



The lip is not stretched like standard seals

Carcoseal/SCA

Available endless or split



With circumference groove and radial ports for lubrication between the seals.

Hardened shoulder made of rubber fabric.

Stainless or Monel steel garter spring.

Lip in high performance rubber compound.

Rubber Material	Temperature	Max. Speed	Max. Pressure
NBR	-40° +120°C	15m/s (peak up to 20m/s)	0,5 bar
HNBR	-40° +170°C	25m/s	0,5 bar
FKM (Viton)	-30° +200°C	25m/s	0,5 bar

•back to back fitting: 2 Carcoseal/SCA fitted together as roll neck bearing seals in steel and aluminium rolling mills to prevent roll coolant and scale contaminating bearing oil.

• tandem fitting: when highest sealing performance is needed

SCA: Fitted with retaining plate

SCA/SF: Fitted without retaining plate



Carcoseal special types



Carcoseal UN/LA

The lip on the back of the seal prevents damage of the primary lip by abrasive particles, scale and dust.



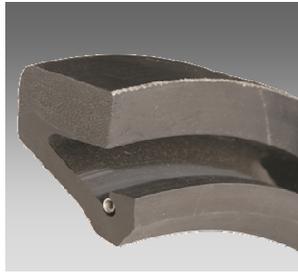
Carcoseal UN/LA/FS

This seal has a secondary “anti-dust lip” and a front seal (V-ring) integrated in fabric rubber shoulder. Suitable for housing with limited space, combining more functions in one seal.

Rubber Material	Temperature	Max. Speed	Max. Pressure
NBR	-40° +120°C	15m/s (peak up to 20m/s)	0,5 bar
HNBR	-40° +170°C	25m/s	0,5 bar
FKM (Viton)	-30° +200°C	25m/s	0,5 bar



Carcoseal special types



Carcoseal UN/LL „long lip“

The lip has a special geometry capable of sealing satisfactorily even in case of large shaft eccentricity and runout.



Carcoseal/SCA/ATLMP

The solution to the typical seal damage occurring during roll fitting in steel and aluminium rolling mills.

Rubber Material	Temperature	Max. Speed	Max. Pressure
NBR	-40° +120°C	15m/s (peak up to 20m/s)	0,5 bar
HNBR	-40° +170°C	25m/s	0,5 bar
FKM (Viton)	-30° +200°C	25m/s	0,5 bar



STANDARD MATERIALS

- NBR max 120° C max 15 m/s
- HNBR max 170° C max 25 m/s
- VITON max 200° C max 25 m/s

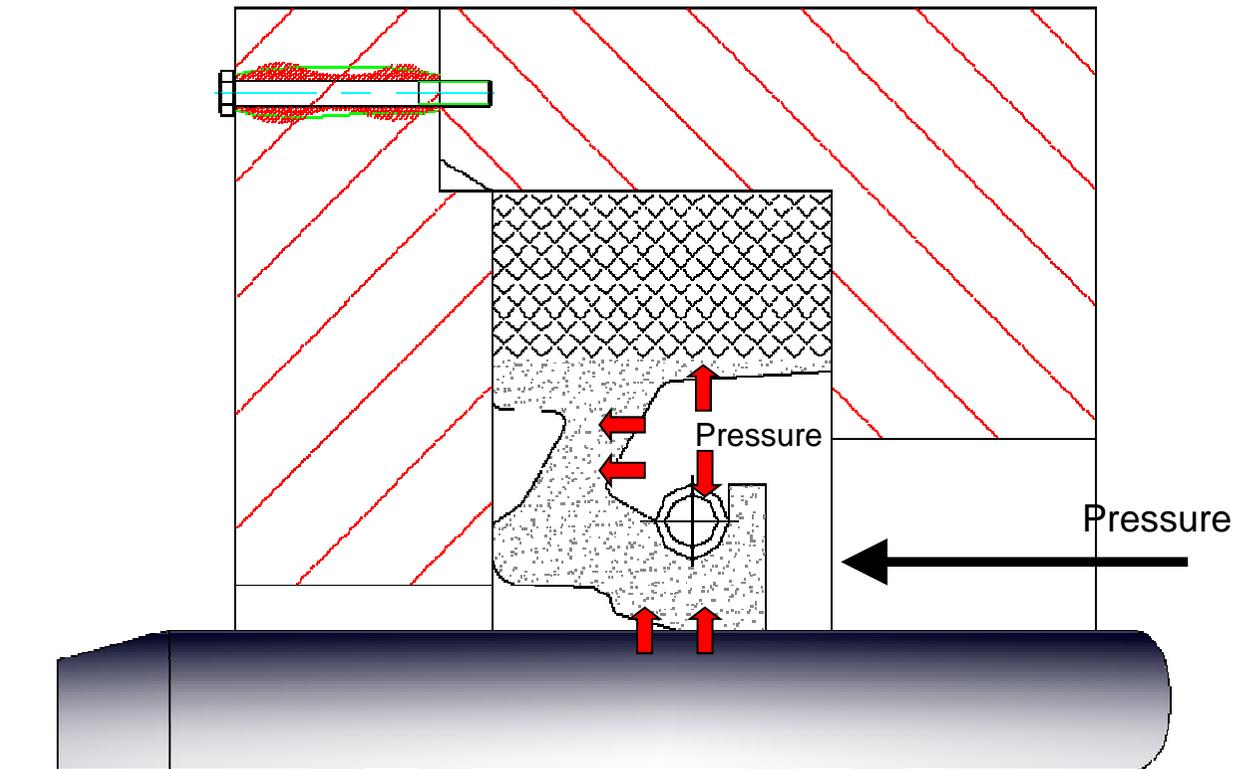


BESIDES THE ADVANTAGES OF CARCOSEAL

- Lip with surface treatment
“CARCOFLON” in PTFE:
 - no stick-slip effect
 - lip protection at machine start up and in case of dry running
 - reduction of friction and of heat generation
- Available endless or split
- Easy fitting
- Re-usable after disassembling



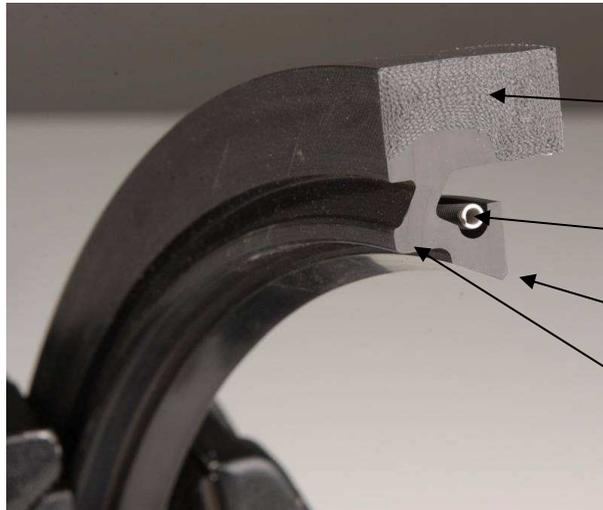
Pressure Seals



Balancing lip pressure on the shaft



Carcoseal/AP/WT



Hardened shoulder made of rubber fabric

Stainless or Monel steel garter spring.

Lip in rubber compound.

Support for pressure retaining.

Rubber Material	Temperature	Max. Speed	Max. Pressure
NBR	-40° +120°C	15m/s (without pressure)	5 bar
HNBR	-40° +170°C	25m/s (without pressure)	5 bar
FKM (Viton)	-30° +200°C	25m/s (without pressure)	5 bar

AP: with reinforced PTFE ring – only endless

AP/WT: usually endless; split version available, gluing on site recommended

“Carcoflon” treatment gives a considerable reduction of friction coefficient.



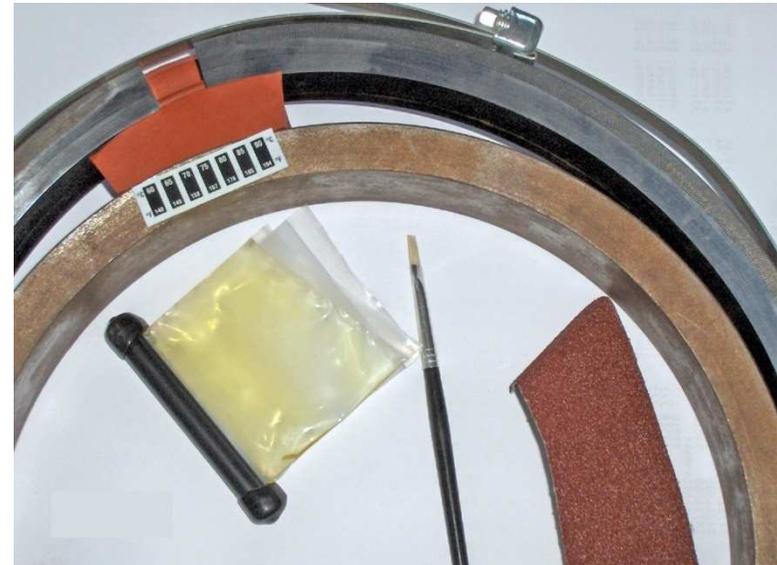
CARCO ISP (GLUING ON SITE)

Proven system to glue on site Carcoseal in split version.

When shaft removal is not possible or complicated.

Large reduction of repair time and maintenance costs.

Providing same seal performance as endless form.



CARCO ISP (GLUING ON SITE)

Main applications:

- *Shipbuilding (thrusters, fin stabilizers, rudder stocks, etc.)*
- *Hydropower (water turbine shaft)*
- *Wind power (main shaft bearing, planetary gear)*



CARCO ISP (GLUING ON SITE)

Kit consists of:

Adhesive Twin Pack;

Clamping band;

Silicon Aligning Former;

Temperature indicatine strip;

Adhesive applicator (Brush);

Abrasive Paper/Stick;

Cleaning pad.



Other equipment required:

Hot air gun;

Screwdriver.



CARCO VSP (VULCANIZATION ON SITE)

Proven system to vulcanize on site Carcoseal in split version.

When shaft removal is not possible or complicated.

Large reduction of repair time and maintenance costs.

Providing same seal performance as endless seal fitting.



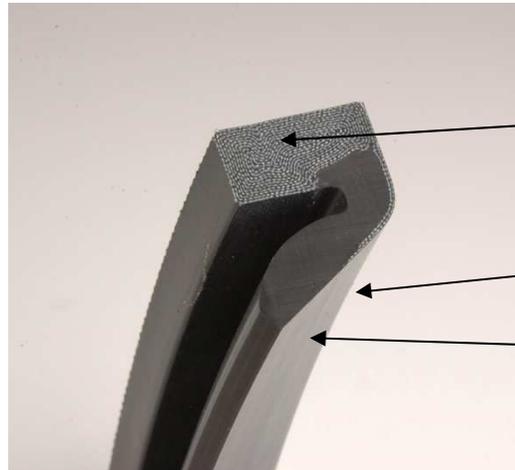
CARCO VSP (VULCANIZATION ON SITE)

VSP system is mainly used with full rubber seals :

- ***Homogeneous seal bonding with same rubber compound***
- ***Solution for specifications not accepting glue as bonding material.***



Carcoseal/TM



Hardened shoulder made of rubber fabric

“Carcoflon”

Massive lip design in rubber compound

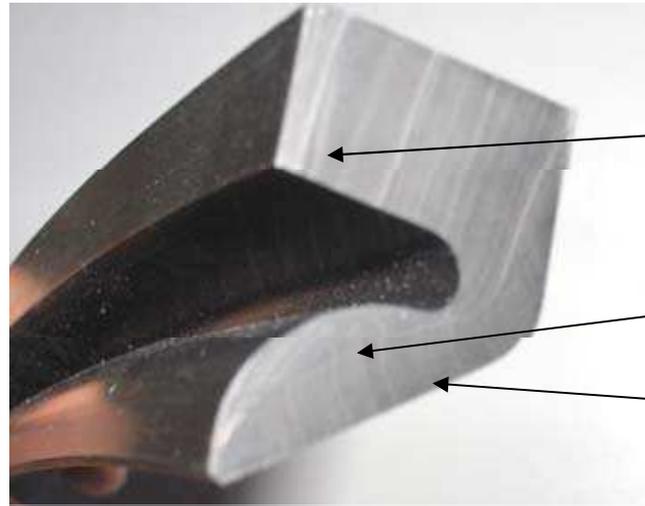
Rubber Material	Temperature	Max. Speed	Max. Pressure
NBR	-40° +120°C	2 m/s	5 bar
HNBR	-40° +170°C	2 m/s	5 bar
FKM (Viton)	-30° +200°C	2 m/s	5 bar

Design suitable for tunnel boring machines

Carcoseal/TM/FR: full rubber version suitable for diameter of 2 meters and more (hot joint)



Carcoseal/TM/FR



Shoulder made of hard rubber

Massive lip design in rubber compound

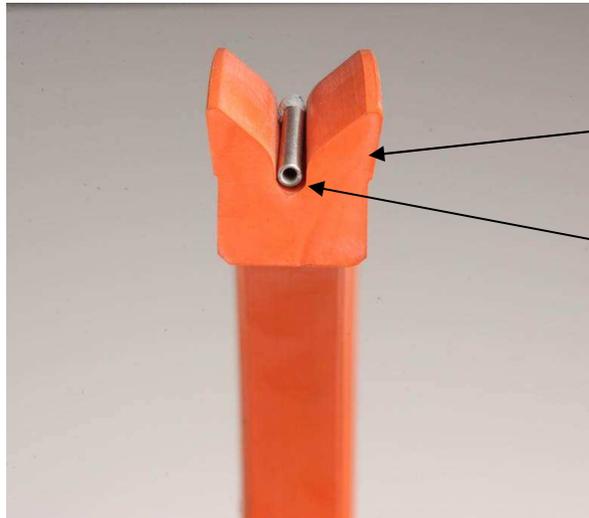
“Carcoflon”

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HNBR	-40° +170°C	2 m/s	5 bar
FKM (Viton)	-30° +200°C	2 m/s	5 bar

Carcoseal/TM/FR: full rubber version suitable for diameter of 2 meters and more (hot joint)



Carcoseal/LDS



Homogeneous full rubber seal

Stainless steel garter spring.

Rubber Material	Temperature	Max. Speed	Max. Pressure
NBR	-40° +120°C	15m/s (peak up to 20m/s)	0,5 bar
HNBR	-40° +170°C	25m/s	0,5 bar
FKM (Viton)	-30° +200°C	25m/s	0,5 bar

**LDS is a sealing system for rotating shafts which transforms the radial seal on the shaft to a front seal on the housing and a static seal on the shaft.
Recommended in the case of high shaft eccentricity values.**



Carcoseal/TAD



Special seal designed for rod-wire mills application.

Carcoseal/TAD is able to withstand extremely high speed.

Material	Temperature	Max. Speed	Max. Pressure
NBR	-40° +120°C	90 m/s	0 bar
HNBR	-40° +170°C	150 m/s	0 bar



“We want the customer to save money”



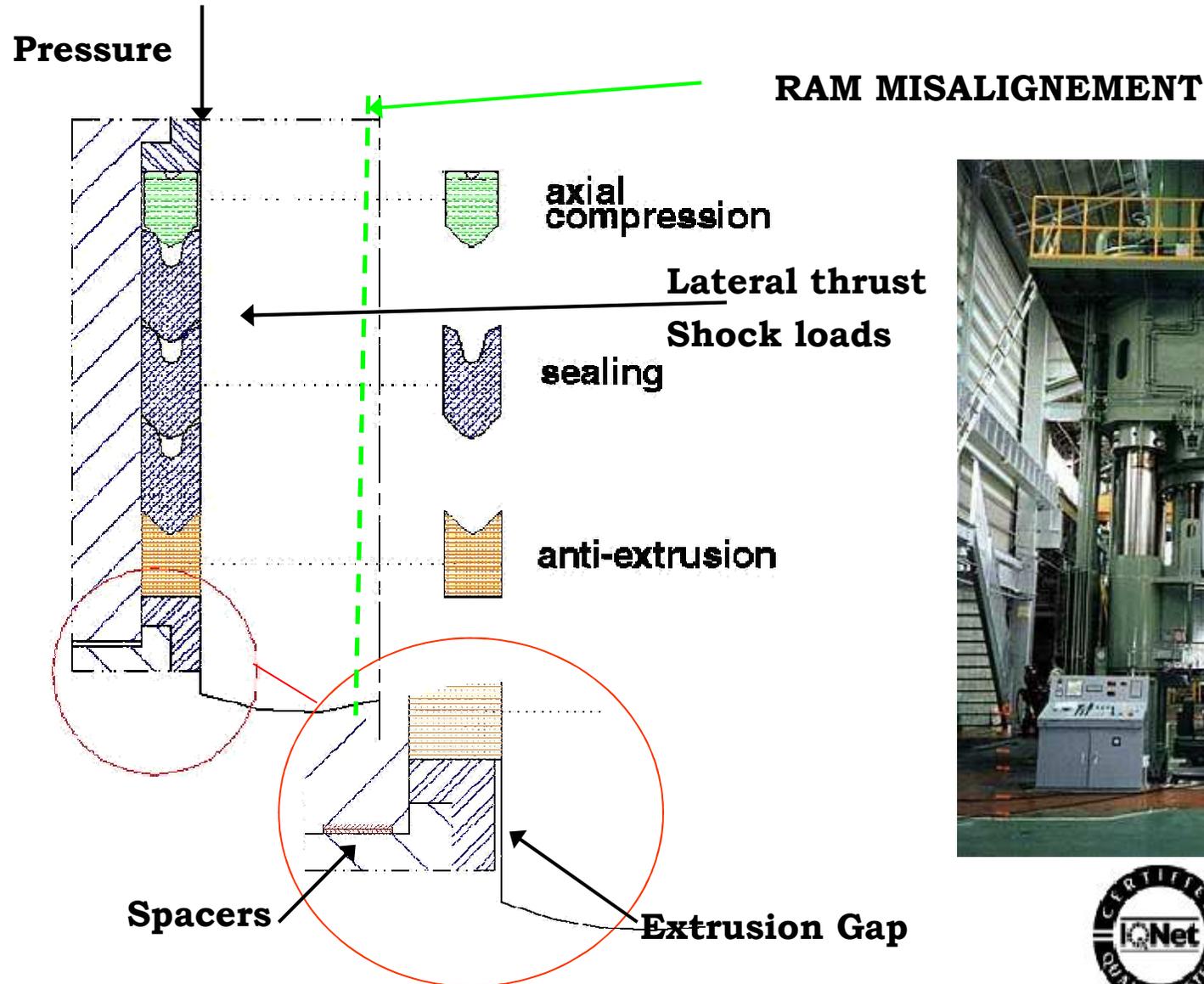
CARCOTEX V-packings

BEST SOLUTION FOR:

- **LARGE RAM MISALIGNEMENT**
- **BAD SURFACE ROUGHNESS**
- **LARGE EXTRUSION GAP**
- **NO SUDDEN SEAL BREAKDOWN**
- **DOWNTIME REDUCTION**
- **MANPOWER COST REDUCTION**
- **PRESS REVAMPING CAN BE POSTPONED**
- **BIG SAVINGS IN MAINTENANCE !**

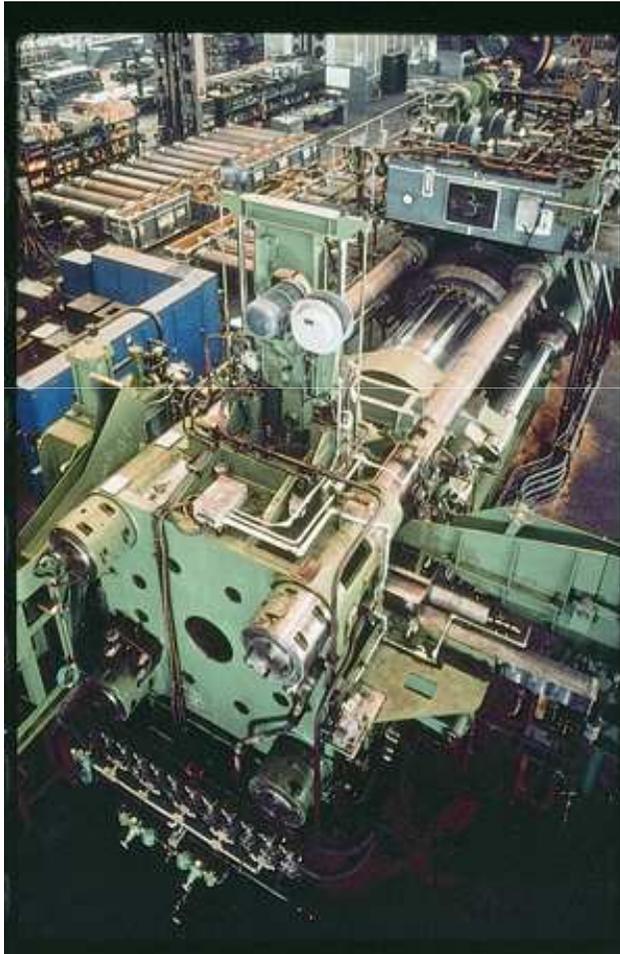


CARCOTEX/SP



Aluminium Extrusion Presses

(Steel , copper, brass, bronze)



A hot cylindrical billet of aluminium (steel or another metal) is pushed through a shaped die.

Carcotex/SP and SP/SG fitted as main ram seal.

Carcotex/UN and SG fitted in drawback and container cylinders.



“We want the customer to save money”



CARCOTEX V-packings

OTHER CLUES:

- ALL FEMALE RINGS HAVE EXTRA REINFORCEMENT IN KEVLAR
- RUBBER MALE RING HEIGHT ADJUSTABLE FOR ANY HOUSING AND BEST PRE-LOAD
- FLOATING VEE-PACKINGS (SG TYPE) SUITABLE FOR PRESSURE CYCLE
- LARGE VEE-PACKINGS SUPPLIED READY FOR FITTING, NO CUT ON SITE
- WE RECOMMEND THE FITTING HEIGHT FOR CORRECT PACKING PRELOAD



CARCOTEX V-packings



Carcotex/UN



Carcotex/SP



Carcotex/SG



Carcotex/SP/SG



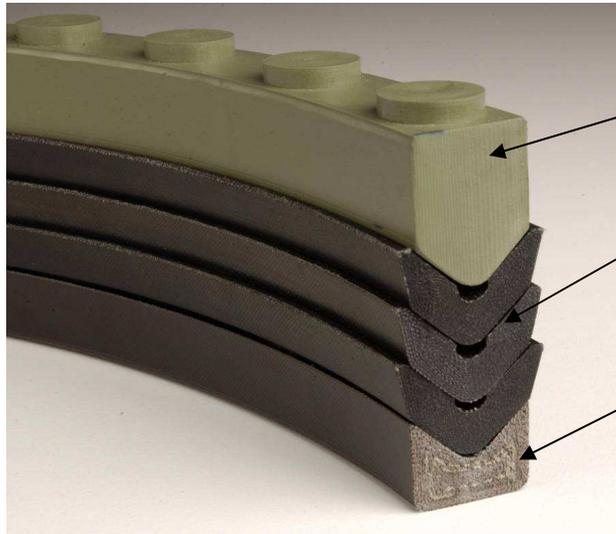
Carcotex/UG



Carcotex/ROTO



Carcotex/UN



Male ring, Material: hard Rubber

Intermediate ring, Material: Rubber fabric

Female ring, Material: Rubber fabric with Kevlar reinforcement or PTFE or Nylon.

Rubber Material	Temperature	Max. Speed	Max. Pressure
NBR	-40° +120°C	1 m/s	350 bar
HNBR	-40° +170°C	1 m/s	350 bar
FKM (Viton)	-30° +200°C	1 m/s	350 bar

- Supplied with calibrated stack height suitable for fitting as piston seal or rod seal.



Carcotex/SG



Male ring, Material: Rubber

Intermediate ring, Material: Rubber Fabric

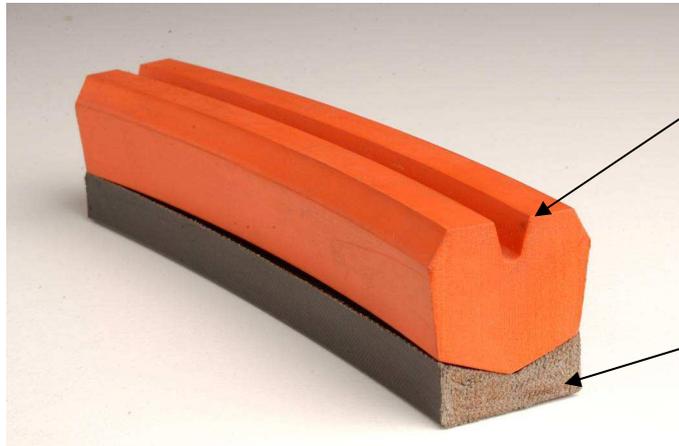
Female ring, Material: Rubber fabric with Kevlar reinforcement or PTFE or Nylon.

Rubber Material	Temperature	Max. Speed	Max. Pressure
NBR	-40° +120°C	1 m/s	350 bar
HNBR	-40° +170°C	1 m/s	350 bar
FKM (Viton)	-30° +200°C	1 m/s	350 bar

•SG is floating into the housing and doesn't require initial compression nor periodical adjustments thanks to the top terminal ring interference.



Carcotex/UG



Male ring, Material: Rubber

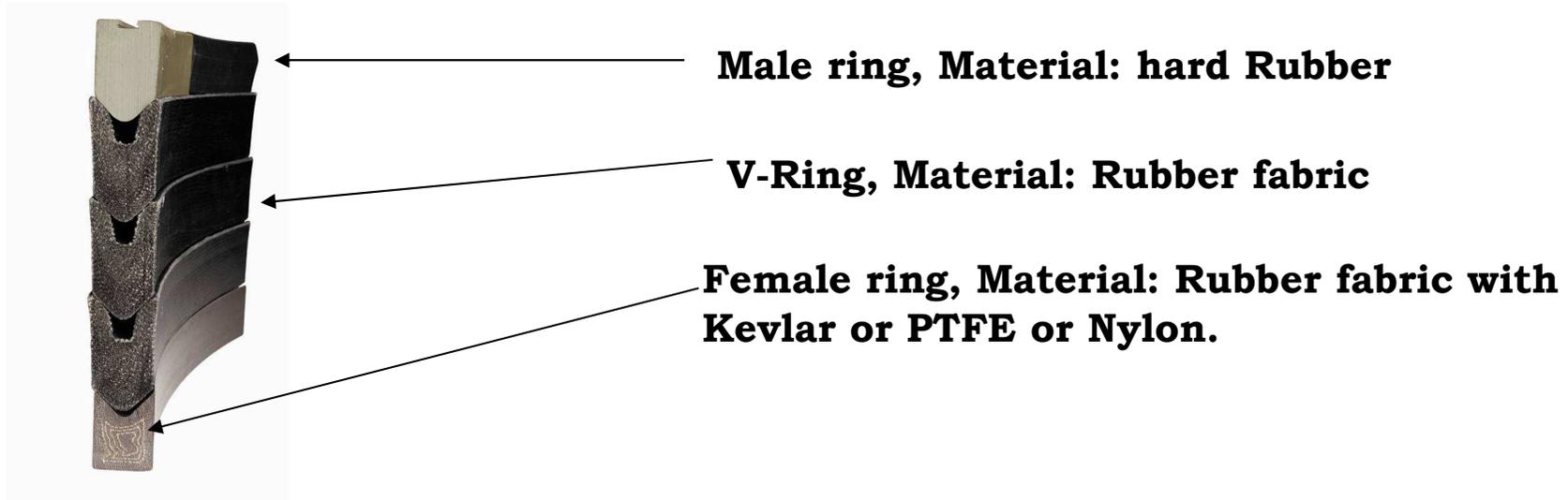
Female ring, Material: Rubber fabric or PTFE or Nylon.

Rubber Material	Temperatur	Max. Speed	Max. Pressure
NBR	-40° +120°C	1 m/s	350 bar
HNBR	-40° +170°C	1 m/s	350 bar
FKM (Viton)	-30° +200°C	1 m/s	350 bar

- UG is floating into the housing allowing large axial tolerances.
- “Carcoflon” treatment gives a considerable reduction of dry friction coefficient between rubber & metal.



Carcotex/SP



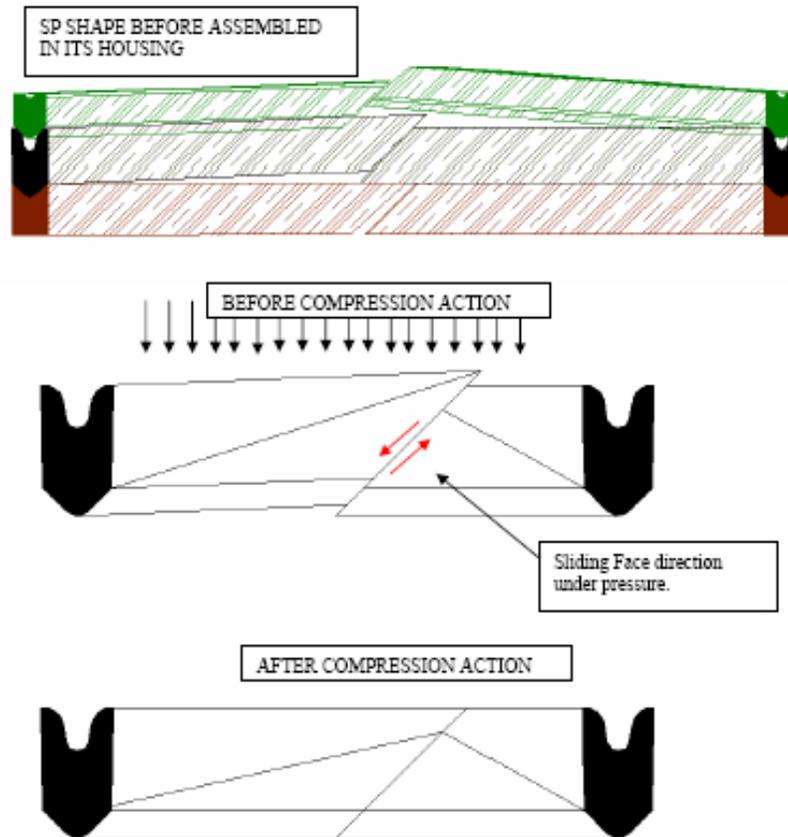
Rubber Material	Temperatur	Max. Speed	Max. Pressure
NBR	-40° +120°C	1 m/s	630 bar
HNBR	-40° +170°C	1 m/s	630 bar
FKM (Viton)	-30° +200°C	1 m/s	630 bar

- Anti-extrusion female adapter with Kevlar[®] extra reinforcement
- fitted with preload
- suitable for adjustable housing
- usually split design, ready for fitting



LARGE HYDRAULIC PACKINGS

READY FOR FITTING



- Closing the housing with the flange, the packing is axially compressed, the ring ends slide, giving the correct sealing interference.

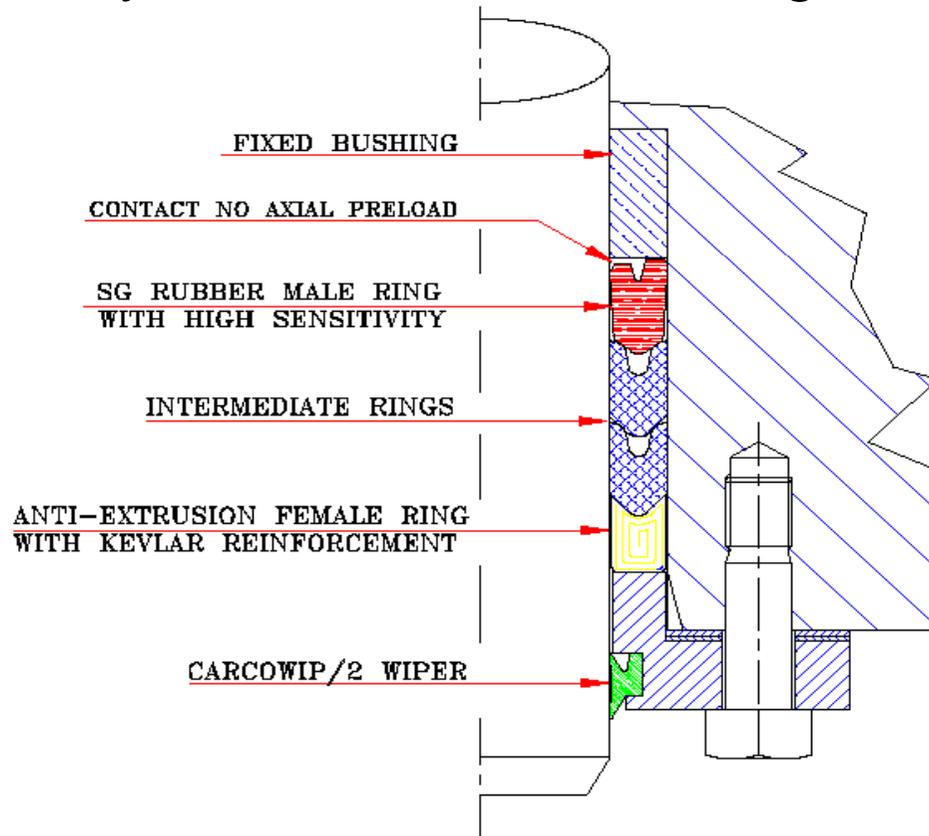
Carcotex/SP and SP/SG are provided with “fitting height certificate”.



CARCOTEX/SP/SG

Fitting WITHOUT preload

Asymmetrical SG male ring



Recommended for:

- Pressure cycles
- Very large ram misalignment
- Bad surface roughness
- Ram surface scratched



Carcotex/SP/SG



← **Male ring, Material: hard Rubber**

← **V-Ring, Material: Rubber fabric**

← **Female, Material: Rubber fabric with Kevlar or PTFE or Nylon.**

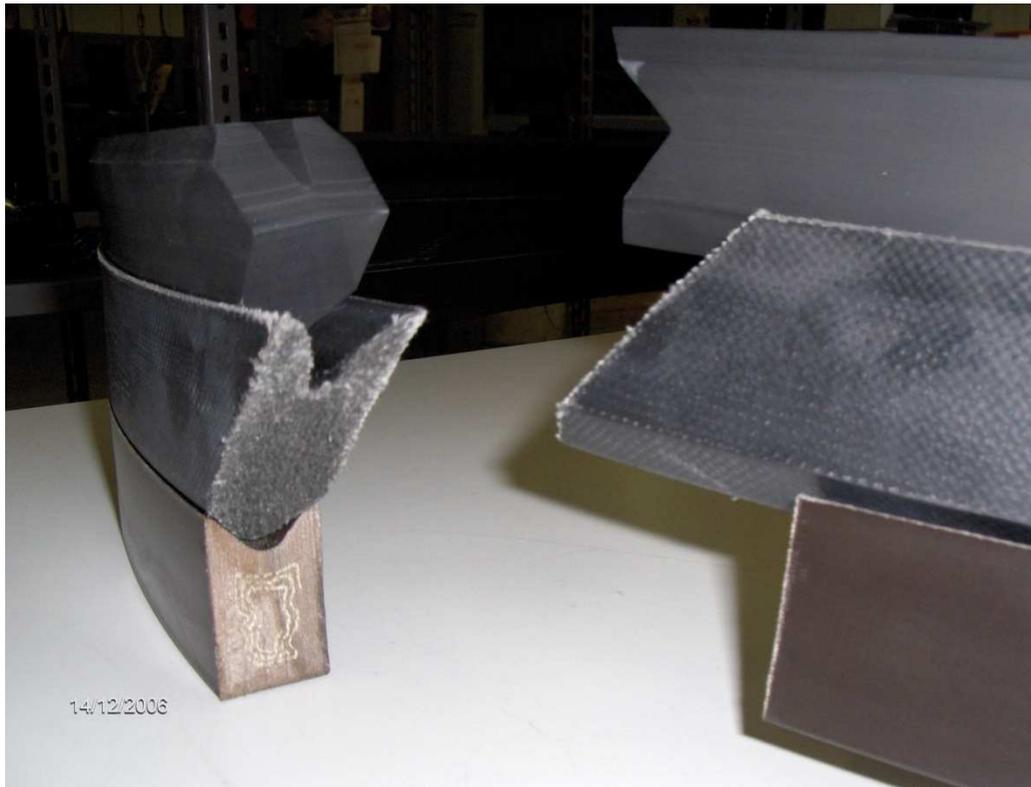
Rubber Material	Temperature	Max. Speed	Max. Pressure
NBR	-40° +120°C	1 m/s	630 bar
HNBR	-40° +170°C	1 m/s	630 bar
FKM (Viton)	-30° +200°C	1 m/s	630 bar

- special male adapter for immediate response even at very low pressure
- no-leakage performance in case of worn rams and big misalignment
- fitting without preload
- usually split design, ready for fitting

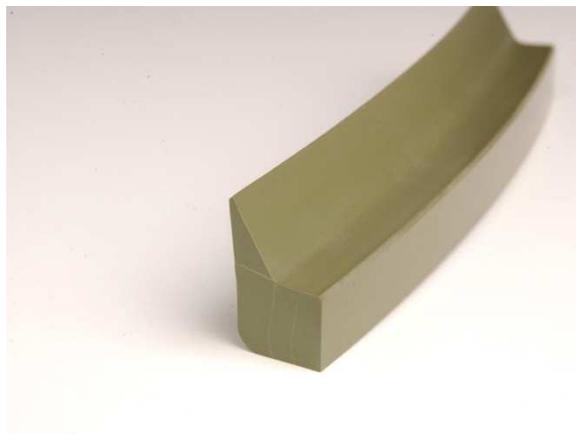


CARCOTEX/SP/SG/SPLIT 1+1+1

Reducing housing height on new hydraulic presses



Carcowip



Recommended in case of abrasive and dusty environments.

We suggest the fitting of a scraper ring after the main Carcotex packing in order to prevent impurities entering into the seal area and damaging the seal.

Rubber Material	Temperature	Max. Speed	Max. Pressure
NBR	-40° +120°C	1 m/s	0 bar
HNBR	-40° +170°C	1 m/s	0 bar
FKM (Viton)	-30° +200°C	1 m/s	0 bar

CARCOWIP/2: DOUBLE EFFECT WIPER, CLEANING THE RAM AND KEEPING LUBRICATION FILM IN THE SEAL AREA



Carcotex/ROTO



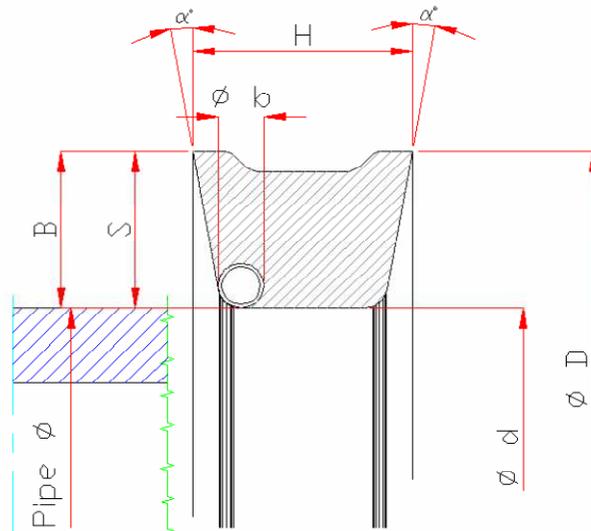
Suitable for rotating applications with pressure.

The ROTO sealing ring consists of a rubber ring vulcanized together with fabric blocks that prevent the seal from extruding into the sealing gap.

Rubber Material	Temperature	Max. Speed	Max. Pressure
NBR	-40° +120°C	0,1 m/s	200 bar
HNBR	-40° +170°C	0,1 m/s	200 bar
FKM (Viton)	-30° +200°C	0,1 m/s	200 bar



Carco/PRO



TUBE TEST SEAL for welded or seamless tubes.

To seal the media (water) used in the test at both ends of the pipe several system could be used, the most common is CARCO/PRO.

Rubber Material	Temperature	Max. Speed	Max. Pressure
NBR	-40° +120°C	Static	500 bar



“We have no limit in size...”

- **Nos. 5 CARCOTEX/SP/SPLIT DELIVERED TO FRANCE FOR ONE OF THE BIGGEST METAL FORGING PRESS OF THE WORLD, MAKING CLOSED DYE FORGING OF NICKEL ALLOY AIRCRAFT TURBINES (AIRBUS + BOEING). THE PRESS HAS GOT 4 RAMS DIAMETER mm 2160 AND ITS PRESSING FORCE IS 40.000 TONS.**



“...and no limit in time”



**STORM SURGE BARRIER ON
OOSTERSCHELDE RIVER
PROTECTING THE SOUTH OF
HOLLAND FROM NORTH SEA STORM:**

NUMBER OF CYLINDERS: 126

SEAL DIAMETER: FROM mm 300 to 800

CYLINDER STROKE: FROM m 8 to 12

PRESSURE: 100 BAR CONTINUOUS

**CARCOTEX/SG FITTED IN 1983 AS
PISTON SEAL AND PISTON ROD SEAL
AND STILL NO LEAKAGE OF ORIGINAL
VEE-PACKINGS.**



“With our philosophy we are on the most famous ship in the world”



- **SEPTEMBER 2005**

SEAL RETROFITTING ON THE CRUISE LINER “QUEEN MARY II” FIN STABILIZERS, PRODUCED BY ROLLS ROYCE MARINE, SCOTLAND.

NOS. 48 CARCOSEAL/AP/WT/RR/SPLIT ID mm 1069,5 WITH MONEL SPRING FITTED ON THE 4 FIN STABILIZERS.

