









## COMPANY

**CAAST srl** is a dynamic and highly reliable company based in Italy with a 20-years-long presence in the sealing-system's market. Since 1998 we design, search, develop, manufacture high performance tailored sealing solutions to secure the needs of mostly every sector of industries.

**CAAST offers** a wide range of products and materials specifically designed and tested for Offshore platforms and extraction wells , compressors, manifolds, pipelines and slew rings, actuators, safety valves, accumulators, cylinders, drill bits, advanced filters and perforation.

We manufacture and supply components according to the most restrictive standards to secure the best safety needs for petroleum industry. Our passion and our experience is focused on technical research and development of new applications to move forward the limit of what is nowadays considered "standard" in the market.

#### CAAST ENSURE:

- Full traceability of materials
- Quality controls according to the most severe standards
- Technical support on developing new applications
- Customized Test on materials according to End-user requests

## VALUE PROPOSITION

#### TURNING/MOLDING TECHNOLOGY

The special turning and molding technologies with innovative machines allow in succeding in the most demanding heavy duty applications .

#### CUSTOM TAILORED SOLUTION AND DESIGN

Thanks to its experience and knowhow, CAAST offers highly customized solutions to secure the needs of its customer and to obtain the best performances for their applications.

#### THE MOST FLEXIBLE SEALS PRODUCTION TECHNOLOGY

Our production technologies are focused on fast track delivery and fully customized items from small volumes to mediumlarge series.

#### XXL SEALS

We can machine or mold in one piece large diameter seals up to 3 mt or even without any limits in sizes with endlsess vulcanization.

#### COMPETITIVENESS

Observing our customer needs, studing the best effective and efficient solution to allow our partner to better perform for the future.



a XXL seals during the machining process



## **OUR COMPANY**



CA4 ST OBSERVING

















# INDUSTRY APPLICATIONS







OIL & GAS



# **AEROSPACE**

CAAST offers a wide range of products and materials specifically designed and tested for offshore platforms and extraction wells, compressors, manifolds, pipelines and slew rings, actuators, safety valves, accumulators, cylinders, drill bits, advanced filters and perforation. CAAST manufactures and supplies components according to the most restrictive standards to secure the best safety needs for petroleum industry.

CAAST High Performance Elastomers is a new special line of Premim Elastomer engineered and produced according to aerospace and military standards in order to operate in critical condition such as in rocket propellers, engines, compressors, cryopumps, fuel tanks.



## FOOD & PHARMA

CAAST satisfies the needs of the food industry characterized by the diversity of the products and flavors used, but also by an intensive use of the equipment which causes frequent product changes and cleaning cycles. In the pharmaceutical industry CAAST products ensure excellent strength and tightness, avoiding any process contamination.



CAAST products are resistant to aggressive fluids, pressures and extreme temperatures, therefore they are ideal for use in industrial applications (such as compressors, pumps and valves, commercial machinery and the food industry) ensuring the reduction of energy consumption, compliance with standards environmental and safety standards.

# INDUSTRIAL



## POWER GENERATION



# HEAVY DUTY

CAAST is actively committed to promoting the use of renewable energy, in particular wind energy because it represents an economic, clean and sustainable technology. CAAST products guarantee considerable reliability and are used for example in windmills characterized by continuous use and the need for a very long maintenance interval.

CAAST specifically designs and manufactures components that meet the requirements of the earthmoving sector, characterized by extreme operating conditions and extended service intervals: they are able to meet the most stringent parameters in terms of resistance to high pressures, vibrations and contaminants and abrasives.

# QUALITY CONTROL



COMPOUND DEVELOPMENT AND TESTING

C h re d D fc S A Ir V C

We have developed during years expertise in designing compounds based on HNBR, FKM, FFKM, EPDM that have properties that can meet a variety of end use requirements in the Oil and Gas Sector. Tailored materials require tailored compouding processes. Therefore, Caast decided to produce its rubber mixtures in-house.

Daily research and continuos testing of polymers and new formulation gives us the capability to challenge the most stringent demands in therms of HP-HT, RGD restistance, Ammine and sour gas services, Ultra low temperature.

In our internal laboratory we perfom every day a variety of specific test and campaigns of test on chemical compatibilities, mechanical properties, sealing performances, permeations, ageing to bring forward the safe limit of applications of our propietary compounds.

#### **HIGH PERFORMACE RGD ELASTOMERS**



CAAST High Performance RGD Elastomers is a new special line of **Premium Elastomer** specially designed for the Oilfield industries. These polymers can withstand the harsh abuse encountered in drilling operations and are also able to stand up from the lowest temperature (-63°C) to more than 300°C and pressures up to 15000psi encountered in the well. It has been developed according to Norsok M-710 and API 6A standards to secure the best safety needs for petroleum industry developments and operations.We can mould or machine O-Rings and special profiles up to Ø 3000mm. No mould needed for machined seals. *For more informations please contact our technical department.* 

A340-90	-0/+230°C
AFLAS 90 - High H2S concentration Explosive Decompression (AED) Resistance	
V547-90	-47/+225°C
FKM 90 Ultra Low Temperature - Explosive Dec Resistance Improved chemical resistance to ba certified	compression (ED) ase and 25% H <sub>2</sub> S
H563-90	-63/+150°C
HNBR 90 - Explosive Decompression (ED) Resistance Ultra-Low Temperature	
X532-90	-15/+320°C
EEKM on Explosive Decompression (ED)	

FFKM 90 - Explosive Decompression (ED) Resistance Water Steam Resistance Up To +300°C

#### **ECUP-SEALS AND V-PACKS**



CAAST ECup-seal is a spring-energized U-cup jacket available in a variety of configurations for Rod, Piston, Face and Rotary applications. The sealing concept is based on the constant force applied by the internal spring that makes the external jacket resilient. As pressure is introduced in the system the seal expands increasing the initial sealing force provided by the spring. ECup-seal and V-Packs can be used in: Valves, actuators, pumps, oil production and service equipment, pressure caps, cryogenic valves and vessels, compressors and much more.

CERTIFICATION, TEST AND QUALITY STANDARD:

NORSOK M710, ISO 15848-1 (fugitive emissions test) API6A, API 17D and others.

## **POLYURETHAN O-RINGS AND SEALS**



Polyurethane O-Rings combine a unique abrasion resistance and the high resilience and low compression set characteristics of a nitrile polymer. HPU O-Rings simplify installation reducing damages due to spiral failure. They can eliminate need for back-up rings when pressure increase.

No Better solution for shell hydrostatic test!!

#### **HIGH PERFORMANCE METAL SEALS**



High Performance Seals for extreme service conditions. Resilient Metal Seals are designed and produced to provide the required tightness, when subjected to extremes of temperatures, pressure and media. Metallic seals can be used to seal at temperatures outside the recommended operating range of elastomer and PTFEs seals, for highpressure use, they are designed and packaged for Metal BX, Ring Joints or norsok L005 seal can be supplied in our special thermoplastic material in order to find out an incredible range of application advantages:

- Easy installation (no time to tighten huge bolts with hydraulik equipement
- No damage on counterglanges grooves
- Complete re-usable seals, up to 25 times.

infinite shelf life. Plating or coating with soft, ductile material will provide better sealing by filling up groove imperfections.

For more informations please contact our technical department.







# HIGH PERFORMANCE RESILIENT METAL SEALS

#### RESILIENT **METAL SEALS**

High Performance Seals for extreme service conditions. Resilient Metal Seals are designed and produced to provide the required tightness, when subjected to extremes of temperatures, pressure and media. Produced from stainless steel or high temperature alloy tubing, strip and wire, Metallic seals can be used to seal at temperatures outside the recommended operating range of elastomeric and PTFEs seals, for high-pressure use, they are designed and packaged for infinite shelf life. The sealing performance of resilient Metal Seals is based on a the relative high specific contact load at the sealing line and a certain resiliency or spring back of the elastic metal seal.

The seating load and the corresponding sealing line width, are a function of the selected seal type, cross section, material, material thickness and the alloy properties itself. Depending on the required tightness and the media to be sealed, a specific seating load will be required. Plating or coating with soft, ductile mate-rial will provide better sealing by filling up groove imperfections. The seating load will make the ductile layer to flow and fill up the groove surface irregularities. Resilient Metal Seals reguire a controlled compres-sion. Typically these seals are installed in a machined groove, or the compression is limited by a so called retainer plate.

#### WHERE TO USE?

Where PTFE seals fail to meet the temperature range, chemical resistance, leakage tightness or long life requirements.



### **OPERATING ADVANTAGES**

#### M-CUPSEALS HAVE SPECIFIC CHARACTERISTICS WHICH OFFER SIGNIFICANT OPERATING ADVANTAGES:

- Resilience or springback
- Temperature: Cryogenic to +1100°C
- Low seal friction with mating surfaces
- Pressure: From ultra high vacuum to +500 MPa
- Available in circular, race track, oval and other shapes

- Excellent resistance to corrosion and radiation
- Maintains elasticity or spring back over an extended service life
- Does not suffer from explosive decompression
- No shelf-life limitations
- Capable of reaching tightness better than 10-9 mbar.l/s

#### SEAL **DYNAMICS**



Tab. 1 Generic compression-decompression grapgh of a stanard spring energized C-ring

The sealing performance of any elastic metal seal is based on the relative high specific contact load between the seal and the mating surface. This linear load or seating load is generated by the reaction of the seal (with or without spring) against its deformation by compressing the seal to a well-defined groove depth.

The graph on the previous page represents the compression and decompression characteristics of a standard spring energised C Ring. The curve "A-B-C" gives the increasing linear load by compression rate, whereas the curve "C-D-E" represents the reduction of linear load when the seal flanges separate and compression is reduced.

The curve shows a plastic deformation of the metal seal. Point "B" on the compression curve is the transition point between elastic and plastic deformation. In this example almost 80% of the max. linear load is achieved. Point "C" indicates the point of maximum compression (min.groove depth).

#### SEATING STRESS

The initial line contact between the seal and the mating surface will gradually increase with the rate of compression to form a footprint. The width of the footprint depends on the seal type, the cross section of the seal and the rate of seal compression.

The seating stress will equal the linear load divided by the foot print width. Linear loads vary from as low as 20 N/mm to more than 500 N/mm seal circumference.

Metal seals should be compressed approximately 20%, as higher compression can lead to seal failure. The total spring back or elastic recovery is situated from point "C" to "E".

As a rule of thumb, the spring back varies between 4 and 6% of the original cross section of the seal. It will be clear that as soon as the flange separation equals the spring back, the seating load will fall back to zero. At that point the sealing performance will be highly questionable. Therefore it is strongly advised to design flange and bolts in such a manner that the flange rotation at the seal location is smaller than 1/3 of the total spring back. The latter is outlined with the green coloured section of the decompression curve.

For safe operation the seal has to be maintained in the areen section (line C-D) of the decompression curve. Depending on the number of variables it might be required to move point "D" upwards, i.e. reducing the useful spring back.

The seal width or footprint varies from less than 1 mm to about 3 mm for the bigger cross section seals. Based on this, the seating stress varies from a minimum of 30 MPa to over 150 MPa. With a heavy duty spring, the seating stress can be increased to above 300 MPa.

The high seating stress is required to make the selected plating or coating flow into the irregularities of the flanges, thereby sealing off all leak paths.

# SEAL SELECTION

Depending on the required tightness, the groove surface finish and the media to be sealed, a specific plating or coating shall be selected. For a softer plating or coating, the seating load of a low load C Ring may suffice to create the necessary stress to make the selected plating material flow.

In case of higher temperature or when other service conditions dictate the use of harder plating, a spring energised seal may be the right choice.

At all times it is recommended to select the biggest possible cross section for a given diameter.

By doing so, the useful spring back will be at its largest,

## **PROFILES**

OI/OE

Vented and Non-vented rings. Medium to high load, medium to high leak tight-ness, medium spring back. Use vented (OVI-OVE) version for Higher pressure.

Spring-energised metal O Ring for

Inter-nal pressure (OHI) and (OHE)

for external pressure are designed

for extreme low leakage at moderate

OHI/OHE CCI/CCE

Metal C-Ring for Internal Pressure (CCI) and External Pressure (CCE) are designed for high pressure (system pressure ener-gised). Medium to high leak tightness.

pressures.

Metal Spring energized C-Ring for Internal Pressure (HCI) and External Pressure (HCE) designed for high pressure and excellent tightness performance.

CVI and CVE are designed for maximum spring back. As a consequence are a low load seal. Medium to low leak tightness. enabling performance within the widest possible tolerance range for that given diameter (line C-D in the graph on page 6) and as such creating a more robust sealing solution.

A higher spring back allows more flange rotation due to internal or external loads. The selection of the most suitable seal for any service condition is often a delicate trade-off between load and spring back of the seal. The higher the request-ed load to compress the seal the better the tightness level, whereas the useful spring back of the seal will determine how well this tightness will be maintained with varying temperatures and pressures.

VCE



Radial Metal Spring energized C-Ring for HFI are designed for high pressure and excellent tightness performance (system pressure energised+spring load).

VCE are special spring energized

C-Ring designed to seal ultra high

Radial Metal C-Ring CFI are designed

for high pressure (system pressure

ener-gised). Static or Dynamic.

vacuum. External pressure.

High leak tightness.



Spring-energised metal O-Ring for dynamic application. Internal pressure (CMI) and (CME) for external pressure are designed for extreme low leakage at moderate pressures.

# MATERIAL SELECTION

Not only the application but also the specifications determine the material to be used. In general however, high nickel alloys are most commonly used for C-Rings and spring energised C-Rings. High strength stainless steel and high nickel alloys are materials used for metal O-Rings. We have a wide range of available materials listed below. Special ma-terials are also available to meet unusually severe operational requirements, or unique procurement specifications. Generally, these will not be stock item materials and may be subject to some additional lead time and material lot charges.

## HEAT TREATMENT

We recommend to heat treat all non spring energised Metal C Rings. Heat treatment of super alloys such as Inconel X750 ®, Inconel 718 ®, Haynes 214 ®, will increase the yield strength of the material.

This influences directly the seal performances, because of increasing seating load and a better spring back. The increased seating load will press the soft plating better into the surface irregularities, thereby creating a better seal.

The higher spring back means that the intimate contact between the seal and the mating surface is maintained longer in case of flange deflec-tion.

		TREATMENT CODE						
MATERIAL CODE		1	2	3	4	5	6	7
1	SS 304 L	•						
2	Elgiloy	•	•					
3	SS 321	•						
4	Alloy 600 / Inconel 600	•		•				
5	Alloy X-750 / Inconel X-750	•	•		•			
6	SS 304 high tensile	•						
7	SS 302	•						
8	Alloy 718 / Inconel 718	•	•		•	•		
А	Haynes 214	•					•	
В	Aluminum 1050	•						
С	Alloy 625/ Inconel 625	•		•			•	•
D	Nimonic 90	•	•					
E	Hastelloy C-276	•					•	
F	Haynes 188	•					•	
G	Aluminum 6060	•		•				
Н	Tantalum	•						
I	Alloy A-286	•						



#### TREATMENT CODES

- 1 Work hardened
- 2 Age hardened
- 3 Soft annealing
- 4 Solution annealing + precipitation hardened
- 5 Like 4 (Nace MR 0175)
- 6 Solution annealing
- 7 Stress annealing

Such flange deflection can be a result of high temperatures, high pressures and/or a combination thereof. Heat treatment is mostly not required for Spring Energised C Rings and Metal O Rings. However some demanding applications in Oil and Gas environment do require heat treatment to prevent material embrittlement. (Heat treatment according to NACE).

Annealing and heat treatment also im-proves the seals' resistance against fatigue under cyclic loads. Structural integrity will be maintained for an extended period of time.







## HIGH PERFORMANCE O-RINGS

O-rings are the most widely used seal in history because of its simplicity, cost, ease of installation and small space requirements. O-rings are designed for both static and dynamic applications.

A properly designed O-ring groove allows the O-ring to be squeezed diametrically out-of-round even before the pressure is applied.

The distortion of the O-ring's resilient elastic compound lls the leakage path, thus, creating a seal. **CAAST High Performance O-rings** is a new special line of **Premium Elastomer compounding** specially designed for the Oileld industries.

These polymers can withstand the harsh abuse encountered in drilling operations and are also able to face the lowest temperature (-63°C) to more than 300°C and pressures up to 15000psi encountered in the well. It has been developed according to Norsok M-710 - API 6A standards to secure the best safety needs for oil industry developments and operations.



## TECNICAL SUPPORT

There are many reasons for O-Rings to fail. Chemical attack or swell, abrasion, compression set, explosive decompression, extrusion, thermal degradation or thermal expansion exceeding the groove dimension and installation damages are just few of the possible causes of failure.

Caast technical department is at your full disposal to help to diagnose the problem and to suggest possible solutions through a full service including:

- Customized Chemical compatibility test
- Housing ang grooves design
- Material selection
- Special compound developement
- Application and life prediction test
- Special prole selection according to design conditions

## COMPOUND DEVELOPMENT AND TESTING

We have developed during years expertise in designing compounds based on HNBR, FKM, FFKM, EPDM that have properties that can meet a variety of end use requirements in the Oil and Gas Sector.

Tailored materials require tailored compouding processes. Therefore, Caast decided to produce its rubber mixtures in-house.

Daily research and continuos testing of polymers and new formulation gives us the capability to challenge the most stringent demands in therms of HP-HT, RGD restistance, Ammine and sour gas services, Ultra low temperature.

In our internal laboratory we perform every day a variety of specic test and campaigns of test on chemical compatibilities, mechanical properties, sealing performances, permeations, ageing to bring forward the safe limit of applications of our propietary compounds.

#### APPROVED COMPOUNDS

Many end users have established specifi c testing and qualifi cation standards to ensure that materials used in the harsh Oil and Gas drilling and production environments meet the critical demands of these applications. Most common Oil and Gas standards:



ТҮРЕ	COMPOUND	MIN	MAX	DESCRIPTIONS	
	H325-90	-25	160	HNBR 90 RGD	
HNBR	H528-90	-25	160	HNBR 90 RGD High modulus	
	H547-90	-47	150	HNBR 90 RGD LT	
	H563-90	-63	150	HNBR 90 RGD Ultra low temperature	
	H505-75	-25	160	HNBR 75	
	H563-75	-64	150	HNBR 75 Ultra low temperature	
	H595-75	-40	175	HNBR High temperature	
FKM	V314-90	-15	205	FKM 90 RGD	
	V531-90	-31	205	FKM 90 GLT RGD	
	V547-90	-47	225	FKM 90 RGD Ultra low teperature for sour services	
	V560-75	-60	225	FKM 75 Ultra low Temperature	
	X510-75	-15	260	FFKM 75	
FFKM	X510-90	-15	260	FFKM 75	
	X541-90	-41	260	FFKM 90 RGD Low Temperature	
	X542-90	-15	260	FFKM 90 RGD	
	X532-90	-15	320	FFKM 90 RGD high temperature	
FEPM	A340-90	0	230	Aflas 90	
FVMQ	F580-80	-60	175	FVMQ 80	

These are just few of our available materials, ask for RGD O-rings catalogue for a full explanation.

**NORSOK** standards are developed by the Norwegian Petroleum Industry to outline and secure adequate safety and cost effi cient needs for petroleum industry developments and operations.

**API-6A** is the specifi cation for drilling and production, Wellhead and Christmas tree equipment.

**NACE TM0187 and TM0297** specification provides a test method that measures the ability of elastomeric materials to withstand static exposure to elevated pressure and vapor-phase sour gas environments and test procedures to measure the eff ect of rapid depressurization from elevated pressures and temperatures in dry CO2 environments on elastomeric materials.

GOST standards concern mostly the russian market, Total GS EP PVV142 defi nes the requirements for nonmetallic sealing materials concerning elastomers in pipeline valves.



### EXPLOSIVE DECOMPRESSION

Explosive Decompresion occours when rapid pressure drops in a gas containing system causes the fluid trapped inside an elastomer (polymer) to expand. The gas absorbed by the polymer expands rapidly within the polymer creating micro bubbles. If the pressure drop rate is faster than the diff usion rate of the fluid inside the polymer the trapped gas expands beyond the materials ability to contain the gas bubbles. The consequences to a seal can be catastrophic failure. Such failure can occur in gas compressors, down-hole applications, and other situations where high pressure is commonly encountered. CAAST has been working to expand the limit of its **RGD materials** for more than 10 years. Do not hesitate to ask more information about **RGD approved compounds** to our Tecnical department.

#### 100% METHANOL

Methanol is mainly used for dehydration and deicing in the oil and gas industry. Methanol is injected both continuously and intermittently. It prevents the formation of hydrates, mainly in off shore sources, and lowers the freezing point of water percentages during the oil and gas transport. CAAST developed a full range of HNBR and FKM completely suitable for 100% Methanol service, with an outstanding low swelling tested according to GOST 068-12 PR for the russian Market.

## SOUR SERVICES H2S AND AMMINES

Sour gas is natural gas or any other gas containing signifi cant amounts of hydrogen sulfi de (H2S). Exploration of new resources continually pushes oil and gas production to new limits. Oil & Gas industries are inventing everyday new tools and techniques required to access residual reserves on conventional acreage. Reserves of natural gas are abundant, totaling some 180,000 billion cubic meters worldwide. However, nearly 40% of the fi elds lying untapped contain concentrations of carbon dioxide (CO2) and hydrogen sulfi de (H2S) that pose obstacles to their development. Caast developed a series of special materials certified up to 25% of H2S and Ammine resistant up to 200°C to withstand the harsh environments in many of the most demanding oil and gas extraction fields.







## **CRYOGENIC & LOW TEMPERATURES**

The low temperature performance of elastomer sealing components can be critical below  $-30^{\circ}$ C with standard compounds.

Caast developed a new generation of premium elastomer capable to ensure sealeability **down to -63°C** in dinamic application.

We do not use "commercial temperature range" as a benchmark for our elastomers, but sealing capability down to -63°C is based on a DSC mid-point higher than that temperature.

- H563-90 HNBR RGD -63°C
- V547-90 FKM RGD 47°C
- V560-75 FKM -60°C

## HIGH TEMPERATURES

FFKM is one of the most chemically and thermally stable polymers, ideal for demanding sealing applications when customers require high temperature resistace. The unique properties of this material help maintain its seal integrity where other compounds fail.

This can reduce maintenance, operating costs and improve safety.

Caast proprietary FFKM compunds are designed to extend the limit of oil and gas applications.

Temperature range from **-41°C to +325°C** Outstanding chemical resistance,

ED (explosive decompression) resistant compounds Ultra high purity compounds.

## CO2 & OXIGEN

Onsite oxygen and CO2 production has been implemented in the last few decades in many sectors and applications to make the plants independent on deliveries of liquid Oxygen from remote locations. This fast demand of higher pressure and volume capacity compressors and equipments has moved ahead the need of elastomers with an improved resistance to 100% CO2 and Oxygen. Our new EPDM and FKM compounds have excellent resistance to high pressure gaseous and supercritical carbon dioxide. This allowed CAAST to fill a market niche in the chemical process industry for carbon dioxide high pressure compressors.







### **BACK UP RINGS**

Back-up rings help prevent extrusion in high pressure service and compensate for loose fitting parts where "E" gap between the metal parts is not suitable for Temperature and pressure combination.

Anti-extrusion rings made from PTFE are the most common solution since they are resistant to oils and solvents and offer a wide temperature range. For installation, PTFE back-up rings are supplied either scarf or spiral cut

For High pressure or high estrusion gap other plastic material such as PEEK and Nylon can be used.





## POLYURETHAN **O-RINGS AND SEALS**

Polyurethane O-Rings are especially suited for heavy duty applications where high dynamic load can be found.

CAAST HPU compounds are resistant to hydrolisys and can operate with Water up to 100°C, Sea Water, Mineral Oils, Vegetable Oils, Silicone Oils, Ozone, Oxygen (cold), HFA fluids, HFB fluids, diluted Acids and Lyes.

Polyurethane O-Rings combine a unique abrasion resistance and the high resilience and low compression set characteristics of a nitrile polymer. HPU O-Rings simplify installation reducing damages due to spiral failure. They can eliminate need for back-up rings when pressure increase. Available in standard and custom sizes, injection moulded or lathe-cutted.

#### No Better solution for shell hydrostatic test!!

Metal BX. Ring Joints or norsok L005 seal can be supplied in our special thermoplastic material in order to find out an incredible range of application advantages:



High stresses, usually as a result of high pressures, forces the material into the clearance gap, this process is typically called extrusion.

Pulses of high pressure can cause the clearance gap between the mating edges to open and close.

This can lead to the O-ring becoming trapped between the sharp edges of the mating surfaces, resulting in physical damage to the seal surface often referred to as nibbling. A harder seal material can help, as can the use of backup devices to effectively reduce clear-ance gaps.



- Easy installation (no time to tighten huge bolts with hydraulik equipement
- No damage on counterglanges grooves
- Complete re-usable seals, up to 25 times.



#### NON STANDARD SHAPES



CAAST designs and develops special application in a wide range of materials available for turning or moulding. RGD approved elastomers, H2S resistant FKMs or Methanol compatible HNBRs, Filled mod. PTFEs or engeenering plastics are just few of our available materials.



X-Ring profile, improved flexibility. Prevent twisting in the housing during instal-lation. Faster response to pressurization.



Dual Seal profile, inproved flexibility. Can fit non standard grooves the metal parts is not suitable for.



Integrates OR profile and double BK ring. Self activating BK, compact design. Can fit non standard grooves.



Rotary seals specially designed for low friction applications.



U-Cup elastomeric Seal. Alternative to standard PTFE energized lipseal. Low pressure self relieving.

CAAST can design non-standard shapes and profiles specially related to existing hardware or brand new products keeping in the same time tightness requirements generally achieved with standard O-rings or lipseals. A combination of multiple seals in different materials could be the best choice when multiple high level of working conditions can't accempt a single seal. Single acting with elastomeric seal, when O-rings are for definition a double acting component,

Self-rielieving at low pressure, lower friction, easier installation, better performance for fugitive emissions test are only few of the possible field of application of our non stadard elastomeric shaped seals.

Where abrasion or high pressure resistance is required Polyhuretan based materials can be the first choice in particular for mining and drilling operations. No limit on shapes or geometries due to the special turning and milling process.

For more informations please contact our technical department.



V-Shaped ring, could be integrated in Chevron type seals



Alternative to standard PTFE energized lipseal. Improved sealeability at low pressure.



Double acting composite seal, especially designed for actuators. Improved sealeability even at low pressure. (-63°C )



Single acting composite seal, especially designed for actuators.









#### **ECUP-SEALS**



CAAST ECup-seal is a spring-energized U-cup jacket available in a variety of configurations for Rod, Piston, Face and Rotary applications. The sealing concept is based on the constant force applied by the internal spring that makes the external jacket resilient. As pressure is introduced in the system the seal expands increasing the initial sealing force provided by the spring.

ECup-seal can be used in many types of components that handle gases or liquids under extreme environmental conditions such as: Valves, actuators, pumps, oil production and service equipment, pressure caps, cryogenic valves and vessels, compressors and much more.

Our Technical Service Department works everyday on non-conventional new application to push forward the limit of ECup-Seal in Oil & Gas market. Special design are available on request (RGD Elastomeric energizer or jackets, angular-sealing design and much more)

We can guarantee the best approval and quality requirements such as NORSOK M710 – ISO 15848-1 (low fugitive emissions test) API6A PSL 3-4.

#### WHERE TO USE?

Where elastomeric seals fail to meet the temperature range, chemical resistance, friction or long life requirements.

## OPERATING ADVANTAGES

Energized PTFE (or other thermoplastic) Lipseals have specific characteristics which offer significant operating advantages:

- Resilience or spring-back
- Continuous energizing of the outer jacket insures seal mating-surface contact
- Low seal friction with mating surfaces
- Resistance to Extrusion @ high pressure (up to 15000 psi)
- Broad operating temperature range (-196/+250 °C)
- Outstanding chemical compatibilities for Sour Services
- Ultra low leakage rating for FEM test.
- No shelf-life limitations
- Metal spring expander prevents shrinkage in cryogenic applications



#### MATERIALS



**PTFEs** are the first choice materials for **ECup-Seals and VPack-Seals**. PTFEs are suitable for use in harsh environments with temperatures ranging from cryogenic to 250°C in combination with highly aggressive media. Mixing virgin PTFE powder with diff er-ent fi llers gives PTFE specifi c properties. In spite of its remarkable properties pure, unfi lled or virgin PTFE is inadequate for a number of more demanding engineering applications. In particular, its cold fl ow or creep behaviour precluded the use of PTFE in mechanical applications. Even at room temper-ature, PTFE experiences a signifi cant deformation over time when it is subjected to a continuous load. Also, virgin PTFE has hardly any resilience and wears quickly despite its low coeffi cient of friction.



The addition of fillers was found to improve a number of physical properties, particularly creep and wear rate. Most fillers are stable up to 400°C, so they do not restrict use in high temperatures.

 ${\bf T48}$  - Mineral fi lled PTFE- Excellent RPTFE low leakage

T32 - PTFE Carbographite

**T33** - PTFE Polymer filled - Excellent extrusion resistance - FDA certified

**T61** - PTFE Polymer fi lled- best material for soft mating surfaces

**T65** - PTFE Mineral filled - Best compound for rotary seals. Excellent creep resistance.

**T58** - PTFE Mineral filled - Outstanding Extrusion resistance and low friction rate combined.

**T96** - PTFE special fillers - Best material for FDA application with aggressive media

**T95** - Mineral fi lled PTFE - Excellent wear resistance

T11 - Modifi ed PTFE - Low Gas permeability

**Devlon, PEHD** and other materials available. ECup-Seal and VPack-Seals are also available in **RGD Elastomer**. Ask our technicians for more informations

<b>H85</b> - HNBR 85	-25+160°C
H80 - HNBR90 RGD Norsok	-20/+150°C
H81 - HNBR90 RGD Norsok	-40∕+150°C
<b>H63</b> - HNBR90 RGD	-63/+150°C
<b>V85</b> - FKM 85	-20/+200°C
V81 - FKM 90 RGD Norsok	-30/+210°C
<b>A85</b> - AFLAS 90	-0/+230°C

## **AVAILABLE PROFILES**

#### **C-SERIES** Single Acting Helicoil Spring



Co1 - Standard Helicoil Lipseals for low pressure. Commonly used on Stem or Quarter turn applications.



Co2 - Similar to C01 but with extended heel for medium pressure.



Co3 - Standard Co1+Back-up ring. For Moderate High pressure.

C13 - Standard C01+Automatic Back-up ring. For High pressure. Not recommend-ed for Dynamic applications.



Co2T - Extended heel Helicoil Lipseals for medium pressure with Anti-back pressure ring. Seat SPE low temperature.

Co3T - Standard Helicoil Lipseals+Back up ring for moderate high pressure with Anti back-pressure ring. Seat SPE



C

Co7 - Double Helicoil spring lipseal. Suit-able for cryogenic services. Seat SPE Low Pressure.

C08 - Extended heel Double Helicoil spring lipseal. Suitable for cryogenic services. Seat SPE Moderate Pressure.





C11 - Flanged lipseals for Inside rotary applications.

#### **D-SERIES** Single Acting V-Spring

closina.











**D01T** - V spring lipseal for low pressure + T back-pressure Ring. Commonly used in SPE seats

Do2T - Extended heel V spring

lipseal for moderate pressure + T

back-pressure Ring. Commonly

DogT - V spring lipseal for high

pressure + Back up ring + T back-

Do1 - Standard V spring lipseal for

low pressure. Commonly used in

Do2 - Extended heel V spring lipseal

**Do3** - V spring lipseal+back up ring

D13 - D01+Automatic Back-up ring.

Not recommended for Dynamic

for moderate high pressure.

static appli-cation such as body

for moderate pressure.

Up to 15000 Psi.

For High pressure.

used in SPE seats.

application





pressure Ring . Commonly used in SPE seats. D13T - D01+Automatic Back-up R ring+T back-pressure Ring. For High



pressure. Not recommended for Dynamic application. **D04** - Standard Double V spring



lipseal for low pressure. Low temperatures, big CS

Do5 - Extended heel Double V spring lip-seal for moderate pressure. Low temperatures, big CS.



Do6 - Double V spring lipseal+back up ring for moderate high pressure.

Low temperatures, big CS.

#### **A-SERIES Double Acting Helicoil Spring**



A01T - Standard DPE Helicoil spring lipseal for low pressure. Low temperature



applications. A02T - Extended Heel

for medi-um pressure. Low temperature.



A03T - A01T + Back up ring for moderate high pressure. Low temperature. Up to cl.900.





A05 - DPE Extended heel for Cryogenic services. Moderate pressure.



A06 - A01 + Back up ring for Cryogenic services. High pressure.

#### **FRONTAL ECUP-SEALS**

All ECup-seal's profiles listed in the previous pages are available for Frontal ap-plications, Internal and External Pressure

Just replace the first letter as listed below:

C Series -> F Series (for Frontal Design - Int.Pressure.) D Series ->G Series (for Frontal Design - Int.pressure.) C Series -> H Series (for Frontal Design - Ext.Pressure.) D Series -> I Series (for Frontal Design - Ext.pressure.)



#### **B-SERIES Double Acting V-Spring**



B01T - Standard DPE V-spring lipseal.

Bo2T - Extended Heel for medi-um pressure.

Bo3T - B01T + Back up ring for moderate high pressure

B04 - Double V-Spring for low pressure. Low temperature.

Bo5 - Extended Heel Double V-Spring lipseals for medium pressure. Low temperature.

**B06** - B04 + Back up ring for moderate high pressure. Low temperature.

#### T - L - H Retainers available



V-Spring - Internal Pressure

#### Ext. Pressure



G02



G02T

M

G02



G01

G01T



G02T





G03T

#### **VPACK-SEALS**



CAAST VPacks-seal are multiple lip (chevron) packing sets designed to seal static, quarter turn or rising stem and seats SPE/DPE. The male and female adaptors are used to complete a set of vee's with different shapes and to assist in sealing when compressed. CAAST Vpacks-seal permits immediate reaction even to minor pressure changes. Each individual lip of a packing set independently reacts to pressure, and automatically effects a seal.

The multiple lip configuration automatically distributes pressure and an effective seal along the shaft. The Ecup-Seals installed before the vees also permits an automatic reaction to pressure shock and overloads. The selection of harder thermoplastic or soft elastomeric compounds should be made on the basis of operating pressure, temperature, and the type of gaseous or fluid medium with which the packing must function.

#### WHERE TO USE?

Where low fugitive emission rate is required. For High pressure and High temperature. For Cryogenic applications.

## OPERATING ADVANTAGES

VPack-Seals have specific characteristics which offer significant operating advantages:

- Initial pre-load and System Pressure insure seal mating-surface contact
- Resistance to Extrusion @ high pressure (up to 15000 psi) @ high temperatures
- Broad operating temperature range (-196/+250 °C)
- Outstanding chemical compatibilities for Sour Services
- Ultra low leakage rating for FEM test even in harsh conditions.
- No shelf-life limitations
- In automatic version Metal spring expander prevents shrinkage in cryogenic applications



#### HIGH PRESSURE HIGH TEMPERATURE



HP-HT - High pressures and High tempera-tures are the most stringent requirements of the equipments installed in deep wells nowadays. Sealing (a) pressure above 15000 psi and temperature close to 200°C is a tough challenge for lipseals and VPack-seals. CAAST developed in these recent years a special trim of dedicated thermoplastic material, spring and jacket geometries for High pressure lipseals and V-packings. We continuously develop and test to-gether with our partners and our customer new de-sign in order to secure the end-user requirements.

#### **CRYOGENICS**



"Cryogenics" often describes the processes used to reach low temperatures and liquefy gases. Cryogenic temperatures range from -150°F to -321°F (-101°C to -196°C). When cryogenic substances are sealed, moved, or stored by valves, pumps, or their components, the seals used must contain pressure preventing leakage as well as withstand the de-sign and test pressure at extreme cold temperature.

## FUGITIVE EMISSIONS



When valves are used to process volatile air pollutants and hazardius fl uids such as ammine or H2S, special test procedures must be applied for external leakage eval-uation of valves' stem and body/gland/trunnion seals. CAAST applied special compounds with a very low permeability rate to respect helium leakage limit for the diff erente tightness classes.

Accord-ing to ISO 15848, Shell TAT test or API 6A PR2.

#### **SUBSEA**



CAAST has designed sealing solutions qualifed according to Norsok, API 6A annex F, API 17D to be used on subsea equipements, (ball valves, gate valves, raisers, actuators, swivels, compressors, pumps) at very critical conditions, pressure up to 15.000 psi operating up to 250°C

#### CAAST s.r.l.

Via Luigi Fumagalli, 91, 22066 - Mariano Comense (CO) Telefono: +39 031 766690 E-mail: info@caast.it

www.caast.it