



Vulcan Seals Presentation

SINGLE SPRING MECHANICAL SEALS



Vulcan Seals Presentation

A brief explanation about Mechanical Seals and how to get the best from them.



Vulcan Seals Presentation

Part 1 – Basics of Mechanical Seals and Soft Packing.

Part 2 – Mechanical Seal Materials.

Part 3 – Mechanical Seal Failure Modes.

Part 4 – Mechanical Seal General Types.

Part 5 – Mechanical Seal Types Specific to Refrigeration Equipment.



Mechanical Seal History



Invented in late 1930's early 1940's as more equipment moved from steam-powered reciprocating motion to electric powered rotary motion.



More efficient sealing alternative to soft packing.



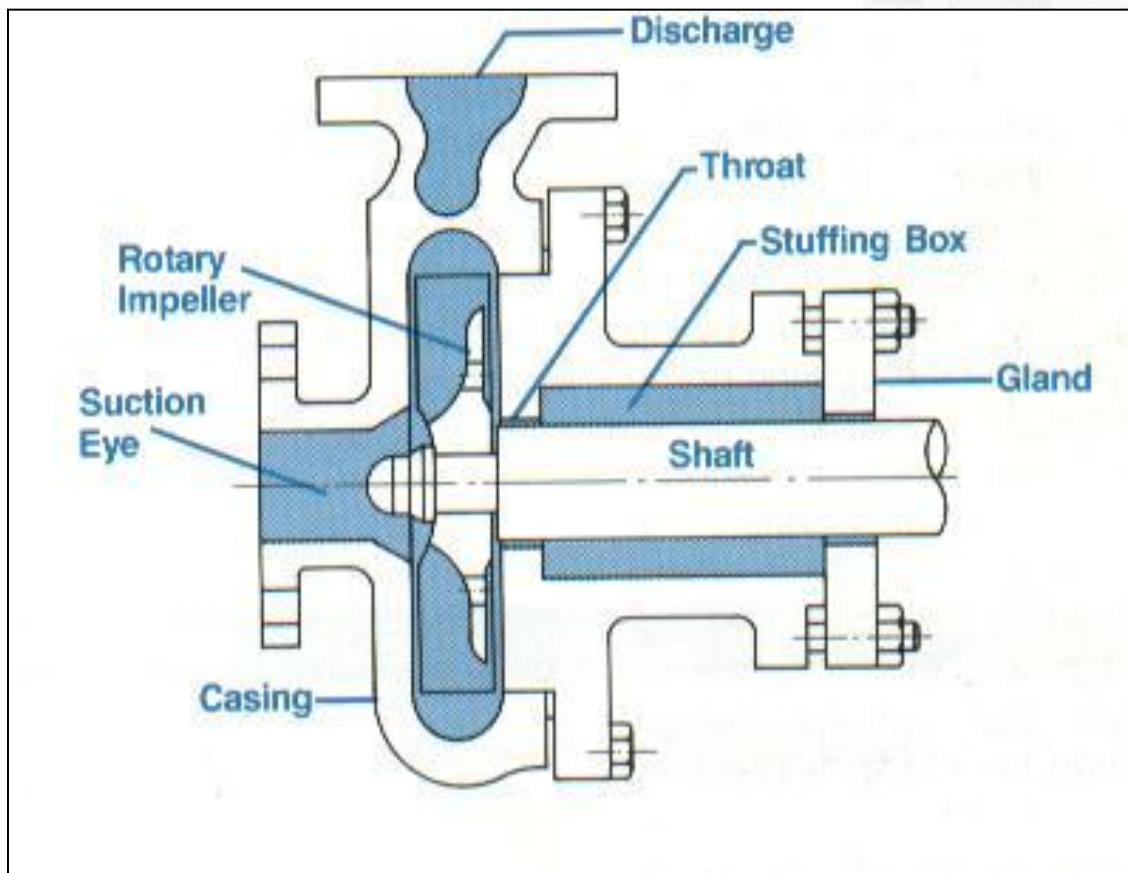
Mechanical Seals and soft packing create a seal between a rotating drive shaft and the static casing wall. This;



Retains media inside the equipment.
Prevents media entering electrical parts of the equipment.
Allows the power source to be external to the hydraulic parts.







Seal Basics – Centrifugal Pump



Create an effective seal in the stuffing box to prevent the media (in blue) escaping to atmosphere. Shaft is rotating, stuff box static.

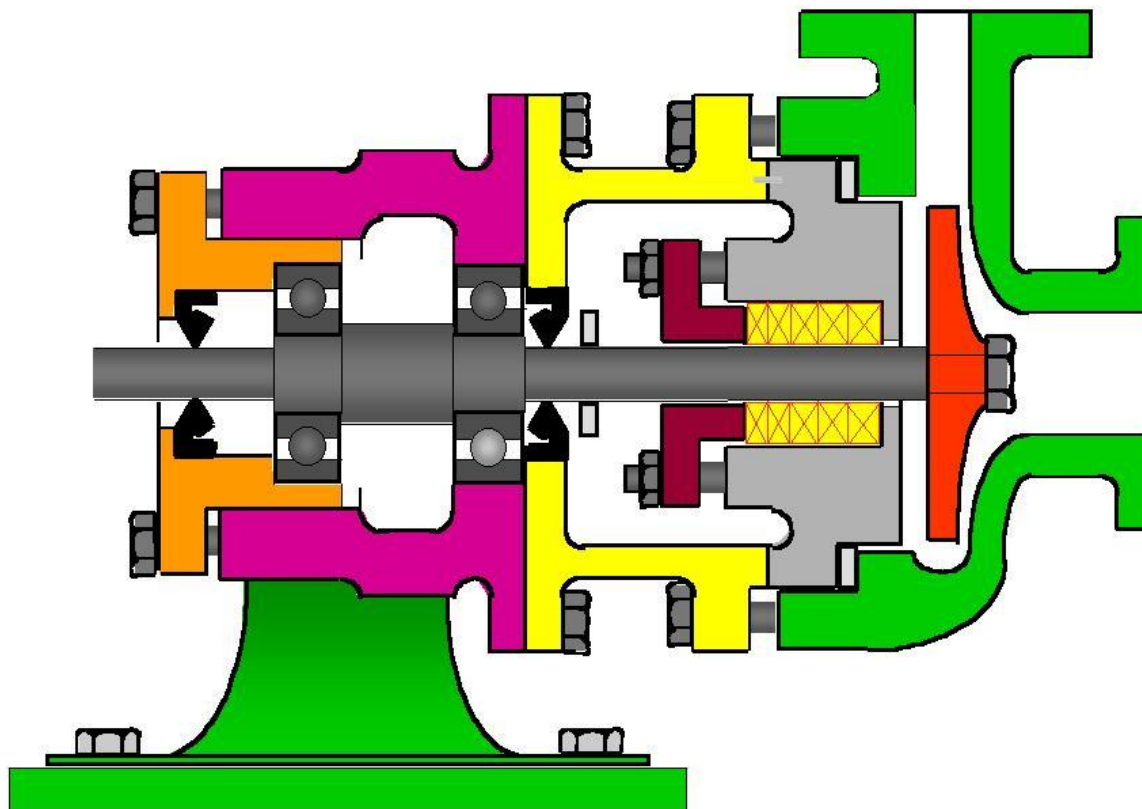


Gland Packing Basics

-  Simply fills the space between the shaft and inner wall. Remains static at all times.
-  If packing starts to drip, tighten the gland follower to increase compression pressure on the packing and reduce the drip.
-  Defining features are cross-section, designed to fill space with only one layer, and fibre material, different lubrication levels, strengths & chemical/temperature compatibilities.
-  Downside – Never makes a complete seal, allows vapours to leak. Constant abrasive contact with rotating shaft generates heat and wears shaft.



Gland Packing Basics





Mechanical Seal Basics



Normally two components, one sealed to and rotating with the shaft, one sealed to and remaining static in the housing.



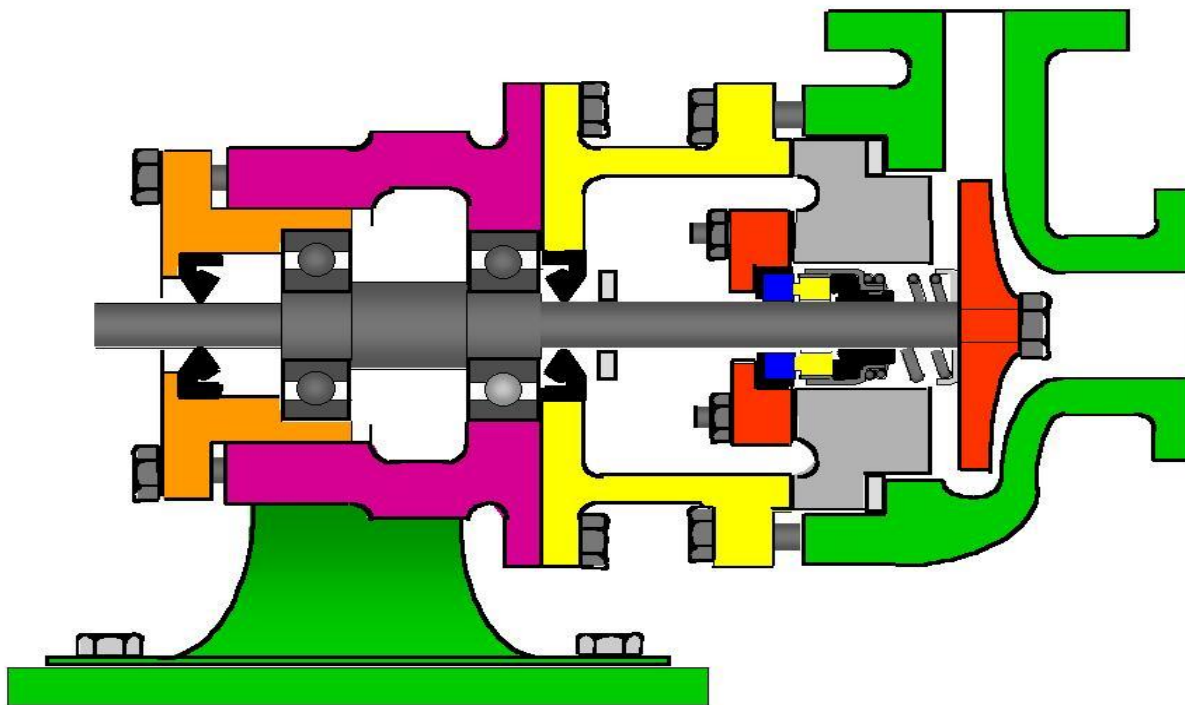
Each part has a technically flat polished sealing face. The polishing allows the rotary face to run against the static face while generating the minimum of friction.



A small amount of media enters between the faces and acts as a running film further reducing friction. This film evaporates before it reaches the inside of the running faces.



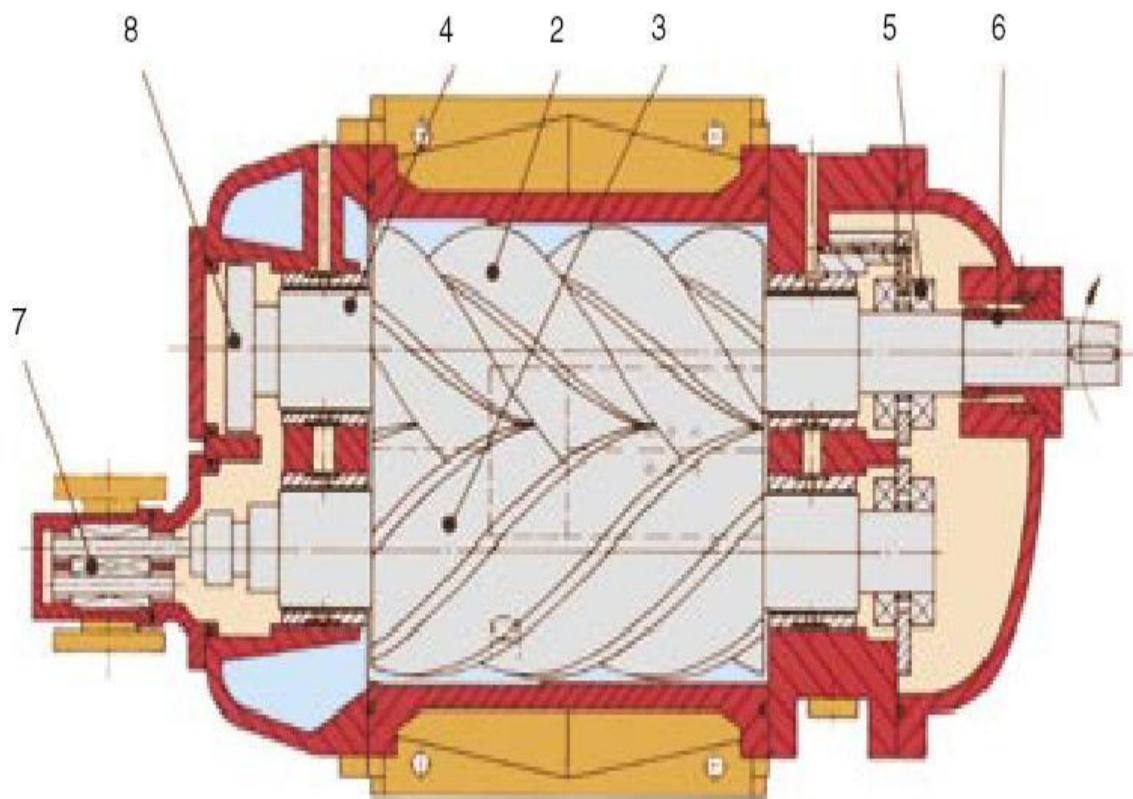
Mechanical Seal Basics



BLUE face is static face, **YELLOW** face is rotary face. Seal is mounted INTERNALLY, with media pressure in same direction as seal spring pressure – pushing towards static face.



Screw Compressor Seal



- 1 cylinder
- 2 male rotor
- 3 female rotor
- 4 radial bearing
- 5 axial thrust bearing
- 6 mechanical sealing
- 7 oil pump
- 8 compensating rotor
- 9 slide valve
- 10 hydraulic rotor

longitudinal section: horizontal



Reasons For Seal Failure

 Seals will fail to seal at some point, only a failure if this happens prematurely.

 No.1 – Dry Running – no lubrication to seal faces causes heat build up and face wear. Faces no longer flat, seal leaks.

 No.2 – Elastomer failure – chemical attack or heat. Elastomer no longer makes universal contact with surfaces, leak starts.

 No.3 – Running faces not flat or contaminated. Always a drip on start-up when new. If faces are not flat or particles between faces, face no longer flat and will leak.



Mechanical Seal Types



Defined by shaft size – measure at point where rotary part seals to the shaft.



Defined by spring type – single coil spring, single wave-spring, or multiple coil springs.



Defined by sealing element type – 'O'-ring, moulded elastomers, PTFE gaskets, or combination of these.



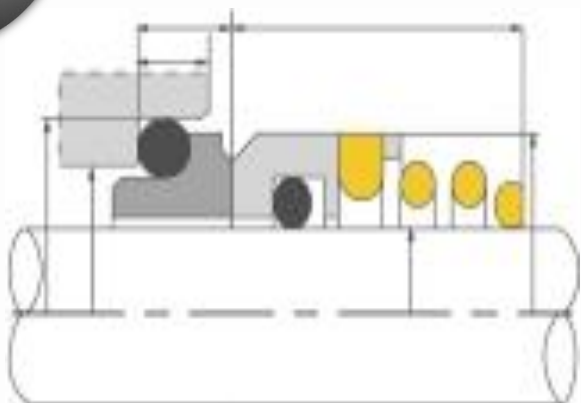
Defined by seal face materials – Carbon, carbides & metal.



Defined by fitting dimensions – Most compressors have unique stuffing box dimensions, and therefore unique dimension seals to suit the required dimensions.



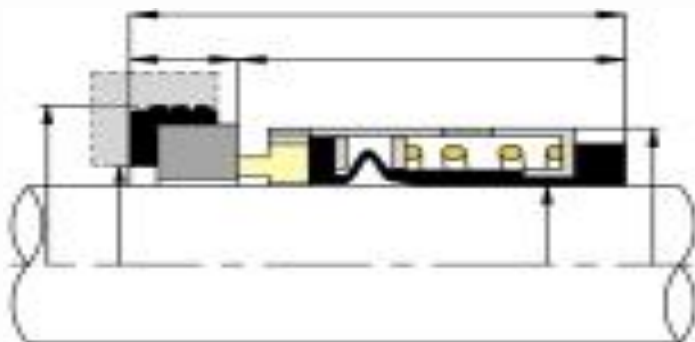
Mechanical Seal Types



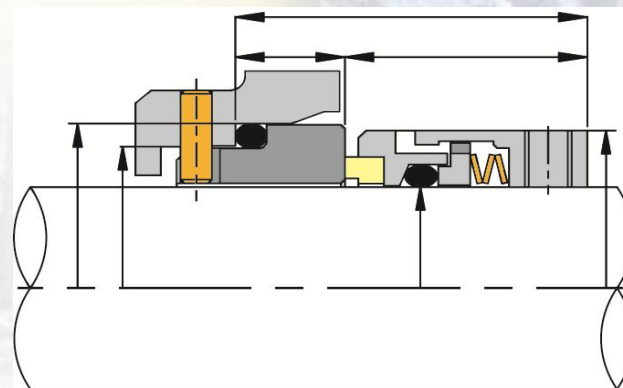
Single, tapered coil,
'O'-ring mount



Single, parallel coil,
diaphragm mount



Single, parallel coil,
bellows mount



Single wave-spring,
'O'-ring mount

Type 12 DIN Description

A range of highly proficient, widely utilised, 'O'-Ring mounted, conical spring seals with solid, stainless steel head and carbon seat. To suit standard housings. Suitable for a wide variety of duties. For photo and line drawing see Type 12 DIN page.

Seal Compatibility

(European Based manufacturers)

M.T.U® Europa 1

Uniten® Type 4

Positive Drive

Seal is shaft driven, via the coil, providing a positive drive at its base and eliminating common drive pin failures.

Materials

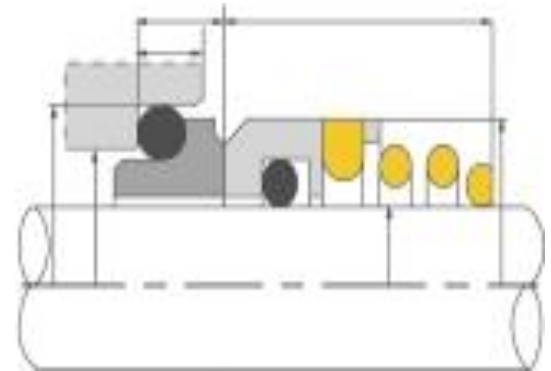
Suitable for a large variety of applications, through a wide choice of 'O'-Ring and face materials.

Design

Single conical spring, stainless steel, face retainer provides a strong and effective seal, suitable for many duties, including clogging media and hygienic applications.



Cross Sectional Line Drawing



Customisable

Can be specially produced to any working length and seat housing dimensions.

Self-Aligning

The combination of a resilient 'O'-Ring and single spring design results in a technically efficient and versatile design, that accommodates both misalignment and vibrations.

'O'-Ring Housing

The 'O'-Ring is held within a completely recessed groove providing performance benefits, compared to competitor designs that use a separate drive ring.

Reliable

Robust, non-clogging, self-adjusting and durable, giving highly effective performance.

VULCAN TYPE 12 DIN

CONICAL SPRING

Type 10/20 Description

Metric and imperial shaft size resilient, single spring, rubber diaphragm seal with boot mounted seat as standard. A widely specified and utilised seal Type, capable of long service life.

Seal Compatibility

(European Based manufacturers)

Tekhniseal® Type 100/200

Roten® Type 51/21

John Crane® Type 1A/2

Burgmann® Type MG910/920

Accommodating

The seal head automatically adjusts to accommodate misalignment and seal face wear, through the design and flexibility of the rubber diaphragm.

Retained Components

Faces and base plates are retained by adhesive and by mating components, respectively, making handling and fitting easier and more secure.

Cross Sectional Line Drawing



Improved

Vulcan's attention to detail and modern in-house design and manufacturing facilities, have enabled Vulcan to create Parallel Spring Seals, with additional improvements to the original designs, whilst still maintaining the main design features, such as self aligning, non fretting/clogging and vacuum application suitability. These improvements result in a superior Vulcan Mechanical Seal, to both the original replacement seal and their other direct market copies.



Material Quality

A wide selection of high quality face materials and elastomers are readily available as standard.

Customisable

The technically efficient and highly versatile, parallel spring, seal design can be readily customised to suit individual requirements; where a standard seal cannot be utilised.

Reliable

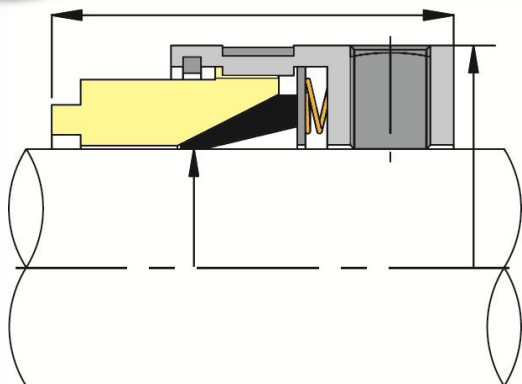
The resulting Vulcan Quality Seal and the high strength and flexibility of the diaphragm, provide a very reliable and accommodating mechanical seal design.

VULCAN TYPE 10/20

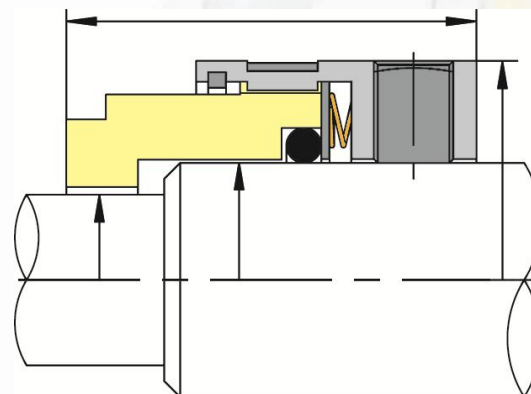
PARALLEL SPRING DIAPHRAGM



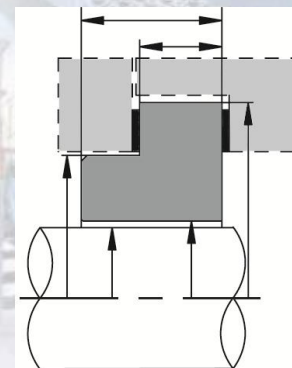
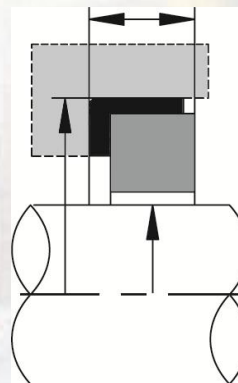
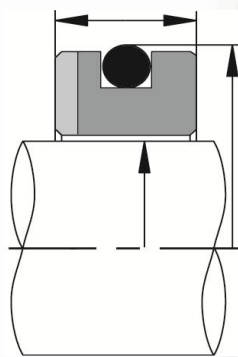
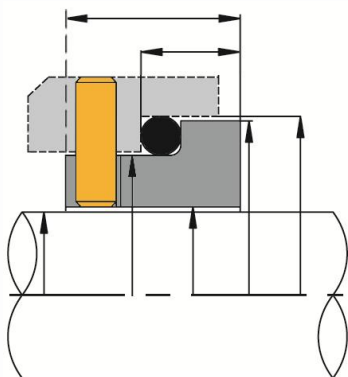
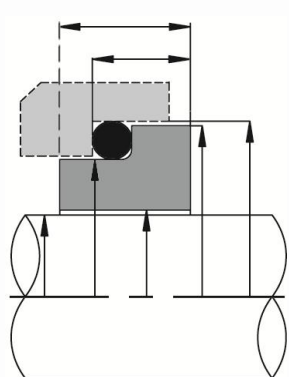
Mechanical Seal Types



Multi-spring, PTFE mount,
unbalanced



Multi-spring, 'O'-ring mount,
balanced by step shaft



'O'-ring mounts, std, and with anti-rotation – Boot mount – PTFE mount

Type 1609/1609S Description

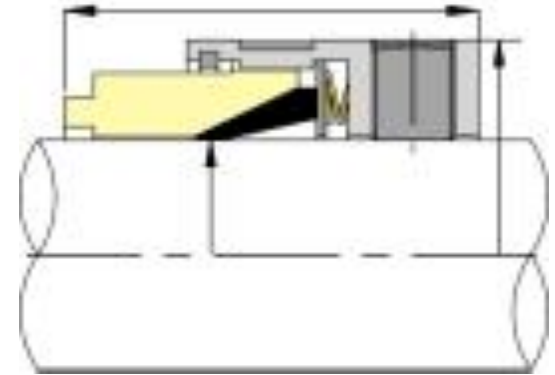
Multiple Spring seal with a highly effective design, commonly used in chemical and petro-chemical duties. These seals are frequently fitted with the Type 25 seat. Standard Type 1609 incorporates a PTFE Wedge secondary seal, with the alternative 'O'-Ring Type as 1609S.

Seal Compatibility

(European Based manufacturers)

John Crane® Type 109
or 8-1 ('O'-Ring)

Cross Sectional Line Drawing



Range

A comprehensive range of these common chemical industry seals are available, from Vulcan, as standard.

Materials

Grade M825 Triple Phenolic Resin Impregnated Carbon has been adopted by Vulcan, as our standard for the 16XX range, in order to offer direct face material equivalence, as well as the ability to swap faces into our most common competitors seals. 316 stainless steel is standard throughout all metal components in the 16XX seal ranges, improving chemical resistance capabilities. Please refer to our data-sheets for all materials alternatives, such as; Hastelloy® Metal parts, Glass Filled P.T.F.E. Wedges or faces and 'O'-Ring material options.

Reliability

These are proven, very effective designs, highly utilised in many applications. They give extremely reliable performance based upon Vulcan's design improvements and the quality materials utilised.

Improved Design

The Vulcan 16XX range are superior performance seals, specifically designed to incorporate a number of improvements, compared to the original seal design and other direct copies.

- No awkward setting pieces

The 16XX designs have eliminated the setting clips, making the seals easier and more reliable to fit.

- Improved face loading values

Vulcan's 16XX proven face loading designs are superior to competitor designs with higher loading values, which are detrimental to seal performance and life.



VULCAN TYPE 1609/1609S

P.T.F.E. WEDGE SEALS



Vulcan Code Examples

Conical Spring

0250.12.R.E.P

Type 12 seal to suit a 25mm shaft, right hand spring E.P elastomers, with a stainless steel face vs carbon ceramic.

Parallel Spring

0250.20.N.C

Type is a type 20 seal to suit a 25mm shaft, bidirectional spring, Nitrile elastomer . With a carbon face vs ceramic stat.

Bellows Design

0250.19.V.C

Type 19 seal to suit a 25mm shaft, bidirectional spring ,Viton elastomer, with a carbon face vs ceramic stat.

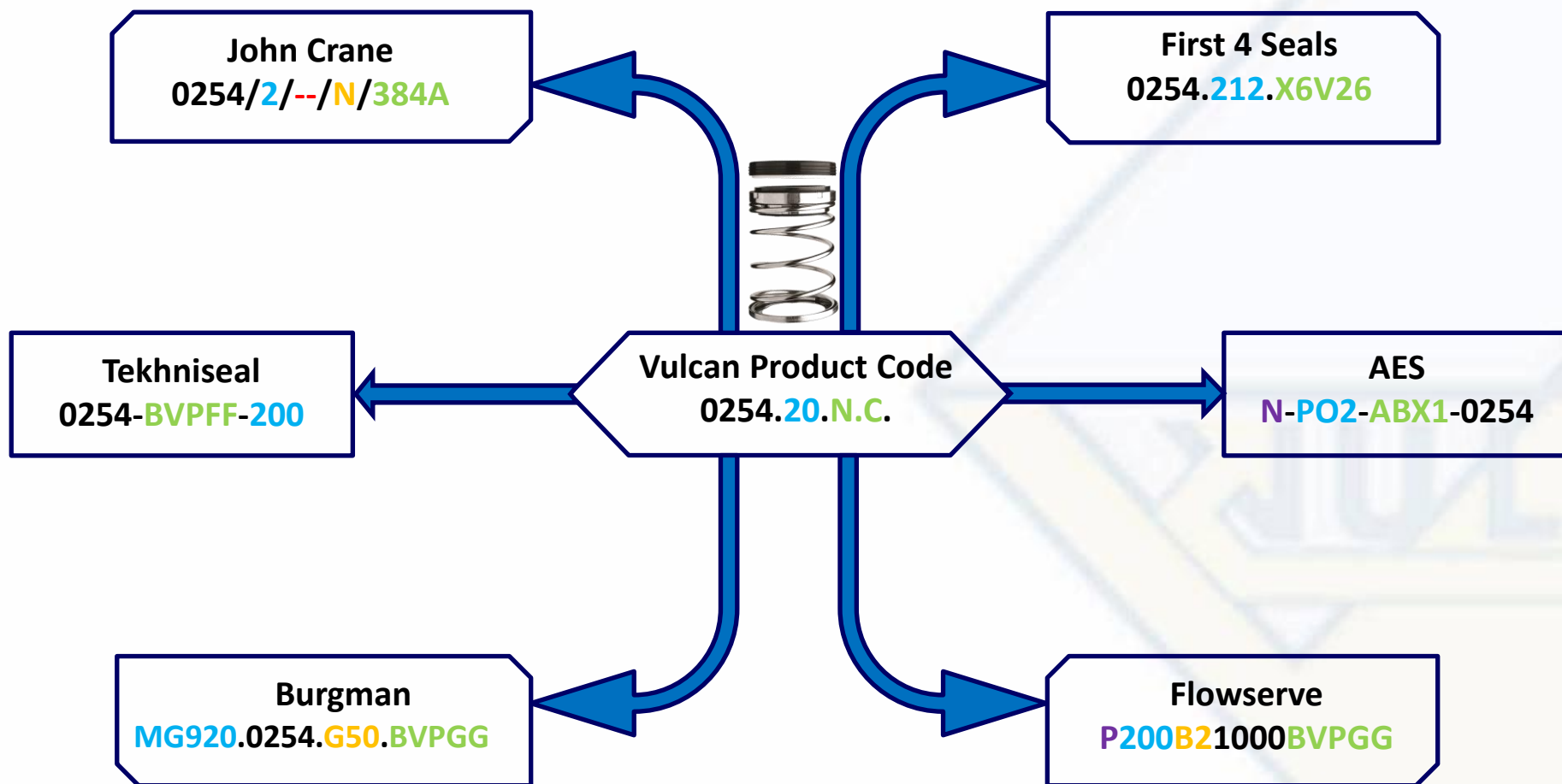
Multi Spring

0250.1609.P.C.SEAL

Type 1609 to suit a 25mm shaft, bidirectional multi springs, P.T.F.E elastomer (wedge), Carbon rotary only.



Mechanical Seal Code Cracker



SHAFT SIZE

MATERIAL

TYPE

WAREHOUSE

SEAT TYPE



Summary

Vulcan are dedicated to being the;
**“World’s Best Standard
Mechanical Seal
And
Encapsulated ‘O’ Rings Company”**