

442 Split Mechanical Seal for Large Rotating Equipment



Specialist Product Guide

A.W. Chesterton Company – for internal use only

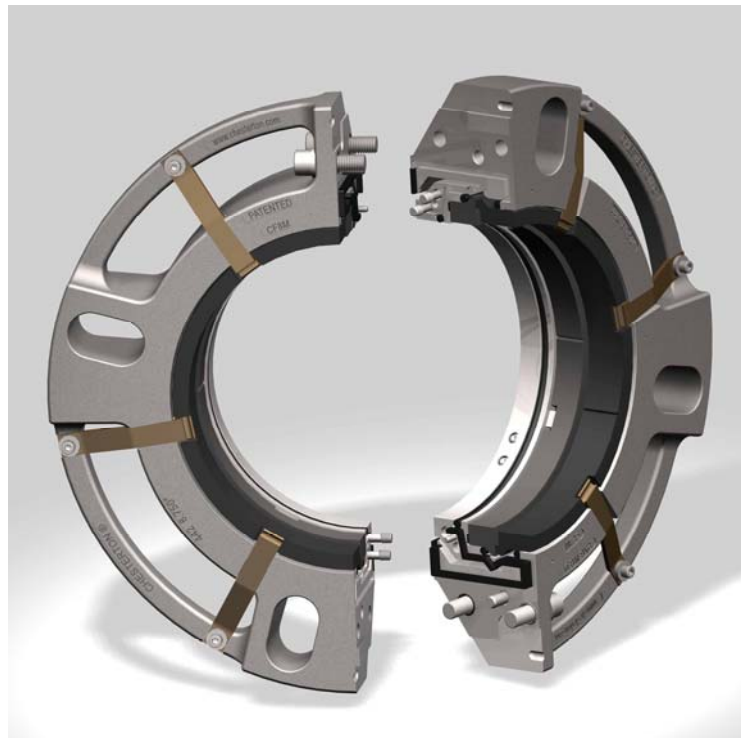
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1.0 Product Description

The new 442 Split Mechanical Seal for large rotating equipment stationary seal design advances split seal technology to a new level. The design incorporates Chesterton's decades of split seal innovation and knowledge combined with additional research to develop the most advanced split seal in the market. This new 442 Split Seal is easier to install, compact to fit a wider equipment base, has higher operating parameters, extending performance capabilities and market priced to give your customers the highest value of any large size split seal in the market.

Chesterton, the global leader in split seal technology is widening the performance gap versus other available large split seals. This guide will help you understand the product and commercial information regarding this design so that you can make the right decision for your customers to deliver the highest value and to enhance your value to your customer base.



1.1 Industry Trends and Market Drivers

Industries that move large amounts of water or aqueous solutions are markets that will value what split seal technology can offer their facilities. The rotating equipment with shaft sizes 200 mm (8.00 in.) and greater are very large in size and are not easily disassembled or moved. Special equipment is required for the disassembly and transport and additional planning is also necessary prior to any work associated. Bearing and component replacement is also more time consuming and costly. Split seal technology offers these facilities a tremendous amount of flexibility and value, not only by offering leak free technology that does not require special filtering or other types of equipment, but eliminates the maintenance required for compression packing, increases sealing reliability and eliminates the need for equipment disassembly for split seal installation.

Additionally, where compression packing was used and sleeve wear is excessive, Chesterton split

seals are installed outside the typical stuffing box area, away from the wear zone. Therefore, operators can increase their sealing reliability by changing to split seal technology without having to replace the shaft sleeve and all the hassle and costs associated with it. Sleeve replacement alone can add up to be thousands of dollars, and in many cases justifies the investment into a split seal. Chesterton split seals are simple to repair with full spare parts kits available for quick repair and minimal equipment downtime.

The primary industries which fit the general conditions above and others that we currently have successful large size split seal applications in include: thermal power, water and wastewater, hydropower, chemical, pharmaceutical, pulp and paper, and marine/navy.

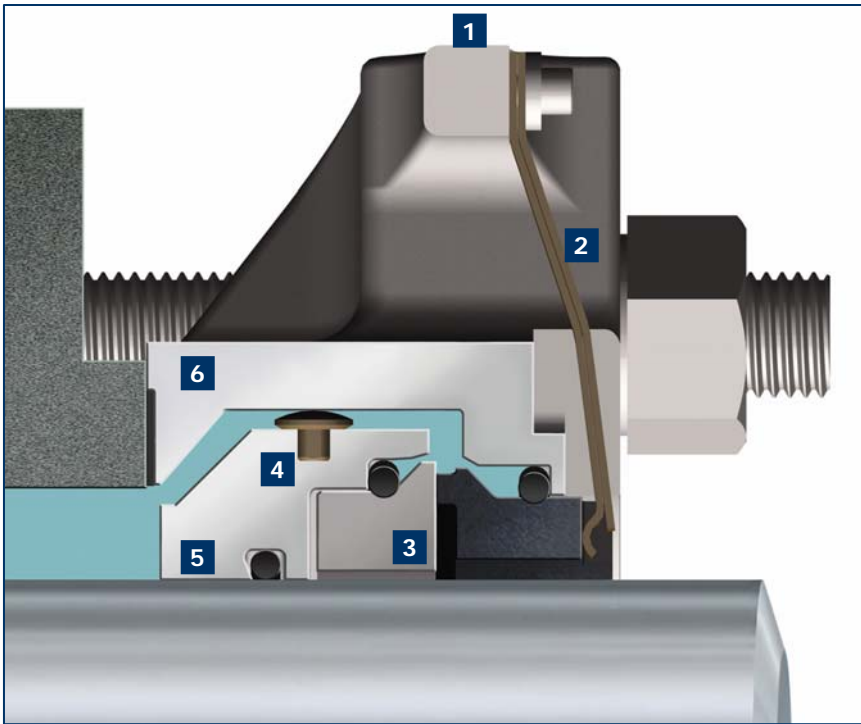
2.0 Target Industries & Applications

Chesterton split seals have been used to seal thousands of process-critical pieces of equipment with exceptional results and many years of leak-free operation. Split seal use has gained wide acceptance in large rotating equipment with a much broader application base. Industries and equipment currently sealed with Chesterton split seals include:

<p>Water & Wastewater Influent & effluent pumps Pumping station pumps</p>	<p>Thermal Power Main circulating water pumps Cooling tower pumps</p>
<p>Hydropower Water turbines - main shaft Pumped storage pumps/ turbines</p>	<p>Pulp & Paper River water intake pumps Side entry mixers/agitators</p>
<p>Marine & Navy Stern tubes</p>	<p>Chemical / Pharmaceutical Side entry mixers/agitators Top & side entry reactors</p>

Chesterton split seals provide the plant operator with proven sealing performance and reliability. The mean time between repair on typical applications for large size seals range from anywhere between 6 years to 15 years. On average, the installed population of large size split seal has achieved an mean time between repair of 11 years!

3.0 Features & Benefits



1. Integral Flush Ports

- Two flush ports 180° apart, combined with the adjustable gland gives maximum flexibility when environmental controls are required for high solids applications – more reliable sealing.

2. Stacked Elgiloy™ Finger Springs

- Non-clogging finger springs, out of the sealed fluid, allows substantial axial shaft movement.
- Spring force can be adjusted for dry running application by removing springs.
- Springs are installed after gland installation, allowing the faces to seat without spring force.

3. Balanced Seal Face Design

- Hydraulically balanced design generates less heat for longer seal life.

4. Patented Automatic Centering

- Centering buttons align the rotary holder inside the gland without the use of shims or removable clips; nothing to install or remove. Ensures rotary alignment with gland, simplifying installation and enhancing performance reliability.

5. Captive Groove Design

- Holds o-ring in place without adhesives to simplify installation and seal rebuilding.

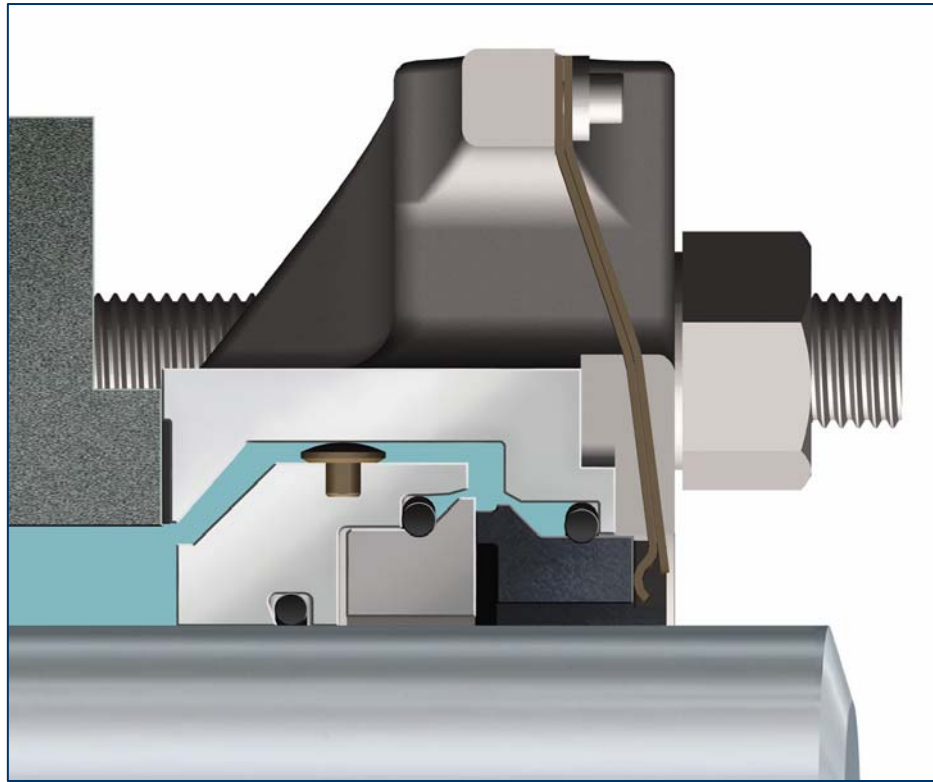
6. Compact Gland Profile

- Short axial length enables the 442 Split Seal to fit more equipment without modification or special adaptor.
- Weighs 20% less than 221 Jumbo or 442 Jumbo gland to simplify installation.

7. Patented Captured Fasteners (not shown)

- Socket head cap screws are retained in the gland and holder halves when unassembled and cannot fall out – no screws to drop or lose during seal installation or repair.

4.0 Operating Parameters & Materials of Construction



Materials	
Rotary	Silicon Carbide
Stationary	Carbon, Silicon Carbide
Elastomers	FEPM, FKM, EDPM
Metals	316 SS (1.4401)
Springs	Springs
Operating Parameters	
Size	200 mm – 305 mm 8.00 in. – 12.00 in.
Speed	15 m/s (875 rpm)
Pressure	710 mm Hg to 10 bar g 28 in. Hg to 150 Psig 710 mm
Temperature	120°C (250°F)
Motion	Runout, TIR: 3,8 mm (0.150 in.) Axial: +/- 3,2 mm (0.125 in.)

5.0 Dimensional Data

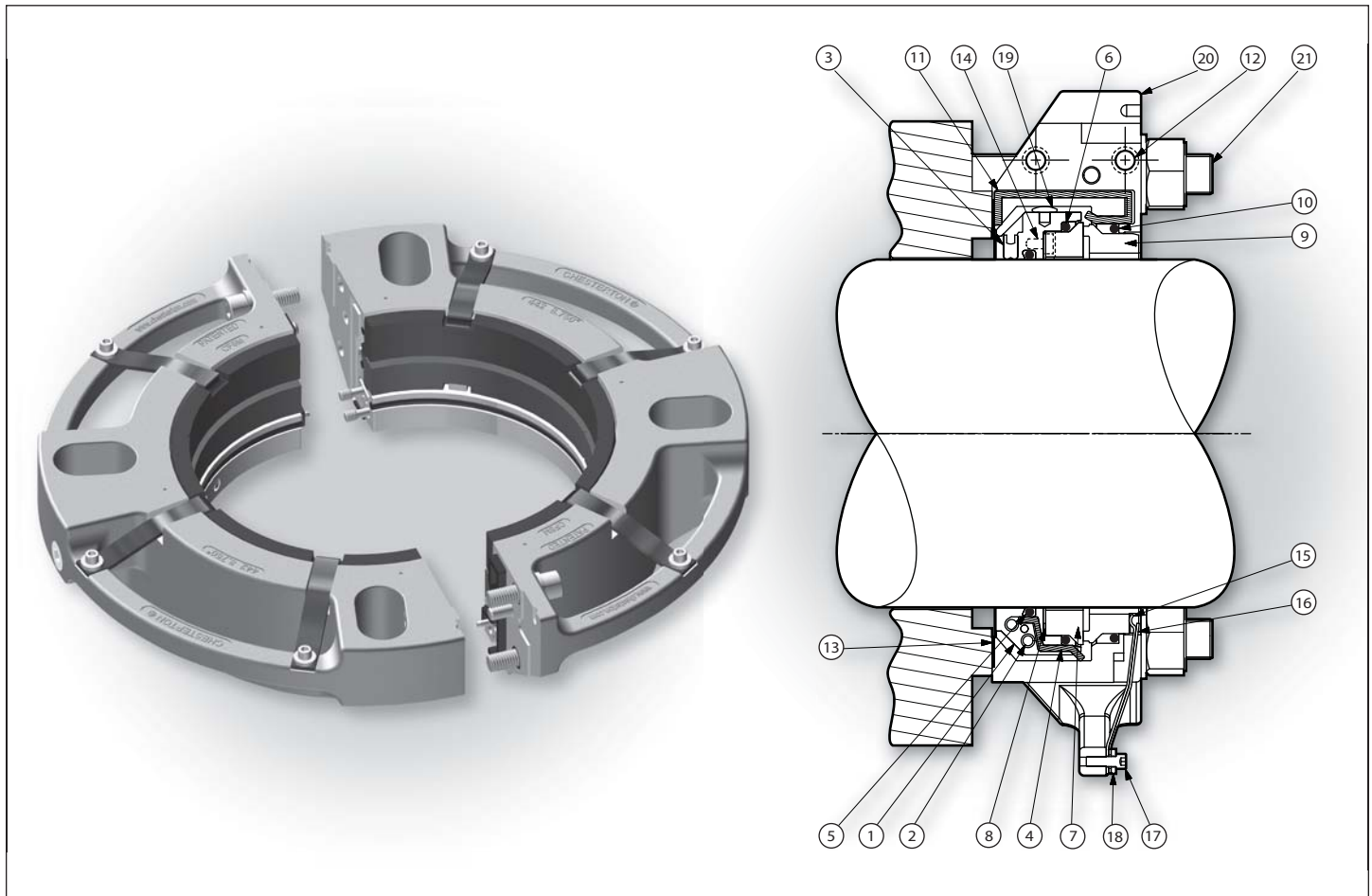
5.1 General

Dimensional and technical data can be found on the *442 Split Mechanical Seal Technical Data* sheet for large rotating equipment. The sheets are available in PDF format on our website or hardcopies can be ordered through Chesterton's "Print on Demand" site. They are available in the following languages:

Language	Reorder Number
English	EN22298
French	FR22298
German	DE22298
Italian	IT22298
Japanese	JA22298
Portuguese	PT22298
Spanish	ES22298
Swedish	SV22298

442™ Split Mechanical Seal Technical Data

For Large Shaft Diameter Equipment - 8 in. to 12 in. (200 mm to 305 mm)

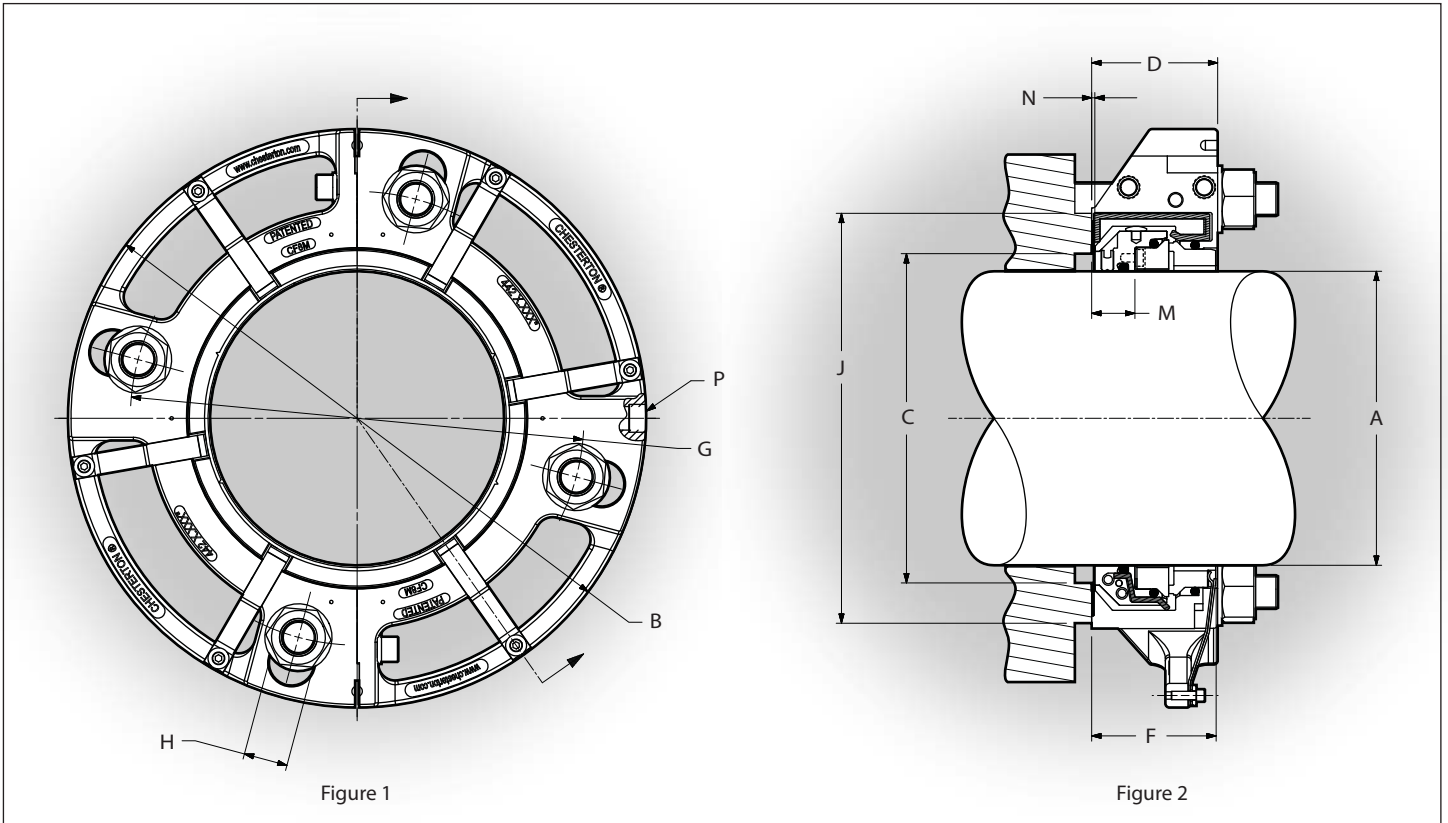


- 1 – Rotary Holder
- 2 – Socket Head Cap Screw
- 3 – Cup Point Set Screw
- 4 – Holder Gasket
- 5 – Shaft O-ring
- 6 – Rotary O-ring
- 7 – Rotary Face

- 8 – Rotary Support Gasket
- 9 – Stationary Face
- 10 – Stationary O-ring
- 11 – Gland Gasket
- 12 – Socket Head Cap Screw
- 13 – Stuffing Box Gasket
- 14 – Anti-Rotation Lug

- 15 – Spring
- 16 – Spring, Auxiliary
- 17 – Socket Head Cap Screw
- 18 – Flat Washer
- 19 – Centering Button
- 20 – Gland
- 21 – Stuffing Box Bolt

DIMENSIONAL DATA (INCH AND METRIC)



KEY - Figures 1 and 2

- | | | |
|--|---|-----------------------------------|
| A – Shaft Size | F – Outboard Length Required | M – Holder ID from Box |
| B – Max. Gland Diameter | G – Min./Max. Bolt Circle by Bolt Size | N – Installation Dimension |
| C – Min./Max. Stuffing Box Diameter | H – Min. Slot Width | P – NPT Size |
| D – Gland Length | J – Min. Stuffing Box Face OD | |

SHAFT SIZE	M HOLDER ID FROM BOX		N INSTALLATION DIMENSION		P NPT SIZE
	INCH	METRIC	INCH	METRIC	
8.00 in. to 12.00 in. (200 mm to 305 mm)	1.29	32,8	0.094	2,4	1/2 in.

DIMENSIONAL DATA (INCH)

A	B	C		D	F	G						H	J
		MIN	MAX			3/4 in.		7/8 in.		1 in.			
						MIN	MAX	MIN	MAX	MIN	MAX		
8.00	16.65	9.51	10.26	3.75	4.00	12.07	14.69	12.20	14.56	12.32	14.44	1.25	11.26
8.25	16.90	9.76	10.51	3.75	4.00	12.32	14.94	12.45	14.81	12.57	14.69	1.25	11.51
8.50	17.15	10.01	10.76	3.75	4.00	12.57	15.19	12.70	15.06	12.82	14.94	1.25	11.76
8.75	17.40	10.26	11.01	3.75	4.00	12.82	15.44	12.95	15.31	13.07	15.19	1.25	12.01
9.00	17.65	10.51	11.26	3.75	4.00	13.07	15.69	13.20	15.56	13.32	15.44	1.25	12.26
9.25	17.90	10.76	11.51	3.75	4.00	13.32	15.94	13.45	15.81	13.57	15.69	1.25	12.51
9.50	18.15	11.01	11.76	3.75	4.00	13.57	16.19	13.70	16.06	13.82	15.94	1.25	12.76
9.75	18.40	11.26	12.01	3.75	4.00	13.82	16.44	13.95	16.31	14.07	16.19	1.25	13.01
10.00	18.65	11.51	12.26	3.75	4.00	14.07	16.69	14.20	16.56	14.32	16.44	1.25	13.26
10.25	18.90	11.76	12.51	3.75	4.00	14.32	16.94	14.45	16.81	14.57	16.69	1.25	13.51
10.50	19.15	12.01	12.76	3.75	4.00	14.57	17.19	14.70	17.06	14.82	16.94	1.25	13.76
10.75	19.40	12.26	13.01	3.75	4.00	14.82	17.44	14.95	17.31	15.07	17.19	1.25	14.01
11.00	19.65	12.51	13.26	3.75	4.00	15.07	17.69	15.20	17.56	15.32	17.44	1.25	14.26
11.25	19.90	12.76	13.51	3.75	4.00	15.32	17.94	15.45	17.81	15.57	17.69	1.25	14.51
11.50	20.15	13.01	13.76	3.75	4.00	15.57	18.19	15.70	18.06	15.82	17.94	1.25	14.76
11.75	20.40	13.26	14.01	3.75	4.00	15.82	18.44	15.95	18.31	16.07	18.19	1.25	15.01
12.00	20.65	13.51	14.26	3.75	4.00	16.17	18.68	16.29	18.56	16.42	18.44	1.25	15.26

DIMENSIONAL DATA (METRIC)

A	B	C		D	F	G						H	J
		MIN	MAX			20 mm		22 mm		25 mm			
						MIN	MAX	MIN	MAX	MIN	MAX		
200	422,9	241,4	260,5	95,3	101,6	308	372	310	370	313	367	31,8	285,9
205	429,3	247,8	266,8	95,3	101,6	314	378	316	376	319	373	31,8	292,2
210	435,6	254,1	273,2	95,3	101,6	320	385	323	383	326	379	31,8	298,6
215	435,6	254,1	273,2	95,3	101,6	320	385	323	383	326	379	31,8	298,6
220	442,0	260,5	279,5	95,3	101,6	327	391	329	389	332	386	31,8	304,9
225	448,3	266,8	285,9	95,3	101,6	333	397	335	395	338	392	31,8	311,3
230	454,7	273,2	292,2	95,3	101,6	339	404	342	402	345	398	31,8	317,6
235	461,0	279,5	298,6	95,3	101,6	346	410	348	408	351	405	31,8	324,0
240	461,0	279,5	298,6	95,3	101,6	346	410	348	408	351	405	31,8	324,0
245	467,4	285,9	304,9	95,3	101,6	352	417	354	414	357	411	31,8	330,3
250	473,7	292,2	311,3	95,3	101,6	358	423	361	421	364	418	31,8	336,7
255	480,1	298,6	317,6	95,3	101,6	365	429	367	427	370	424	31,8	343,0
260	480,1	298,6	317,6	95,3	101,6	365	429	367	427	370	424	31,8	343,0
265	486,4	304,9	324,0	95,3	101,6	371	436	373	433	376	430	31,8	349,4
270	492,8	311,3	330,3	95,3	101,6	377	442	380	440	383	437	31,8	355,7
275	499,1	317,6	336,7	95,3	101,6	384	448	386	446	389	443	31,8	362,1
280	505,5	324,0	343,0	95,3	101,6	390	455	392	452	396	449	31,8	368,4
285	505,5	324,0	343,0	95,3	101,6	390	455	392	452	396	449	31,8	368,4
290	511,8	330,3	349,4	95,3	101,6	397	461	399	459	402	456	31,8	374,8
295	518,2	336,7	355,7	95,3	101,6	403	467	405	465	408	462	31,8	381,1
300	524,5	343,0	362,1	95,3	101,6	412	474	414	472	417	468	31,8	387,5
305	524,5	343,0	362,1	95,3	101,6	412	474	414	472	417	468	31,8	387,5

442 SPLIT MECHANICAL SEAL OPERATING PARAMETERS†

PRESSURE CAPABILITIES (INCH and METRIC)

SIZE RANGE	SHAFT SPEED	FACE MATERIAL COMBINATION			
		CARBON/RSC		RSC/RSC	
		Psig	bar g	Psig	bar g
8.00 in. to 12.00 in. (200 mm to 305 mm)	To 875 RPM	28 in. Hg to 150 Psig	710 mm Hg to 10 bar g	28 in. Hg to 150 Psig	710 mm Hg to 10 bar g

TEMPERATURE

To 250 °F (120 °C)

SPEED

To 3000 fpm (15 mps)

MOTION CAPABILITIES

Runout, TIR: 0.150 in. (3,8 mm)

Axial movement: ± 0.125 in. (3,2 mm)

RSC - Reaction bonded silicon carbide.

† Consult Chesterton Application Engineering for applications exceeding published operating parameters and for additional seal sizes. Significantly higher limits can be achieved depending on the application.

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6.0 Applications

Chesterton has an extensive portfolio of large split seal applications in all our target industries. We have assembled a subset of these with photographs to illustrate Chesterton's capabilities and successes that you can share with your customer base. The full presentation can be downloaded from Chesterton's *Marketing Library*.

The link below will direct you to the release information on the Marketing Library.

[http://marketinglibrary.chesterton.com/FILES/Mechanical Seals/Split Seals/442 - Large/](http://marketinglibrary.chesterton.com/FILES/Mechanical%20Seals/Split%20Seals/442%20-%20Large/) (Left click on link)

Included in the presentation are the applications below.



Hydropower, United States

- Equipment:** 12 MW water turbine, 100 rpm at 30 Psig (2 bar g)
Fluid Sealed: River water
Problem: Main shaft vibration problems accelerated packing leakage to an unacceptable level.
Solution: 24 inch (610 mm) split seal eliminated water leakage, the constant packing maintenance and pen stock pumping required. Seal has been in service for over 7 years.



Wastewater, Singapore

- Equipment:** 10 Influent pumps, 495 rpm at 4 bar g (60 Psig)
Fluid Sealed: Wastewater
Problem: State-of-the art facility wanted a sealing solution that eliminated process leakage, shaft wear and other equipment damage.
Solution: 280 mm (11 inch) split seals have been used since start-up, 3 years ago, without leakage.



Pulp & Paper, Japan

- Equipment:** Bottom entry pulper, 150 rpm at 1 bar g (15 Psig)
Fluid Sealed: Paper stock, 14% solids
Problem: Packing leakage into the gear box and bearings led to oil contamination and premature failure; MTBF was 3 months.
Solution: 220 mm (8.25 inch) split seal has operated without leakage for over 2.5 years.



Wastewater, *United States*

Equipment: 8 Influent pumps, 400 rpm at 45 Psig (3 bar g)

Fluid Sealed: Wastewater

Problem: Packing leakage caused equipment damage and safety concerns.

Solution: 8.5 inch (215 mm) split seal with reduced flush has been in service over 10 years, leak and maintenance free.



Thermal Power, *Australia*

Equipment: 5 Cooling water pumps, 900 rpm at 100 Psig (7 bar g)

Fluid Sealed: Raw water

Problem: Packing leakage caused equipment damage and bearing failure requiring unscheduled downtime and replacement.

Solution: 11.75 inch (300 mm) split seal eliminated water leakage associated problems. The first seals have been in service for over 9 years.


7.0 Supporting Products

Environmental controls and secondary sealing devices play an important role in achieving reliable long-term split seal operation. Chesterton utilizes advanced sealing technology to provide a *total system solution* that focuses on the process fluid, application criticality, equipment type, pressure and vacuum fluctuations, as well as seal water availability.

High particulate content in water can reduce seal reliability and performance by causing erosion or seal clogging. Seal water can be injected into the seal at a higher pressure than process to keep the seal free of particulates. Where seal water is unavailable or intermittent, seal reliability is impacted. SpiralTrac™ technology can significantly reduce, or in many cases eliminate, the need for flush water.

SpiralTrac environmental controllers enhance the stuffing box/seal cavity environment by removing entrapped air and particulates from the process fluid, eliminating two potential sealing device failure modes. We can integrate Chesterton split seal and SpiralTrac technology to optimize system reliability and reduce total costs.

Advanced secondary sealing and environmental control options complete the sealing solution

		
<p>442 Split Seal with ISS Safety Seal</p> <p><i>ISS Safety Seal is a static sealing device that allows the removal of the split seal during shutdown periods without the need of draining tanks or process equipment.</i></p>	<p>442 Split Seal with 14K</p> <p><i>Chesterton's 14K Seal has the unique ability to isolate the stuffing box environment for tough slurry applications. Intermittent back flows due to process fluctuations are minimized due to the 14K's sealing actuation.</i></p>	<p>442 Split Seal with SpiralTrac</p> <p><i>SpiralTrac environmental controllers enhance the stuffing box/seal cavity environment by removing entrapped air and particulates from the process fluid, eliminating two potential sealing device failure modes</i></p>
		

8.0 Competitive Analysis

8.1 Compression Packing

The pump population with shaft sizes greater than 200 mm (8.00 inches) is significantly smaller than your general pump population. This is also true with sealing device options for these pumps. Large pumps, and other types of large rotating equipment have traditionally been sealed with compression packing due to the shaft size, equipment location, the overall physical size, and the lack of other viable sealing devices. Compression packing is the lowest acquisition cost sealing device and the sealing option most OEM's utilize when designing new large rotating equipment.

In many cases, packing leakage is an acceptable consequence of using compression packing. Packing materials cause shaft wear, which increases process leakage; leads to premature bearing failure, equipment damage through corrosion and unnecessary downtime to replace bearings, shaft sleeves and other collateral equipment damage.

When shaft wear is such that packing can no longer seal adequately, or bearing or other equipment damage leads to downtime; the costs and time involved to make the pump



operational again is considerable. Large pumps move very large amounts of fluids, typically aqueous in nature. When they go down, you need to have back up capacity to make up for the capacity loss. Because these large pumps take considerably more time to return to service, back up capacity must be sufficient to handle the extensive downtime. Handling equipment and logistics must also be up to the task to lift and transport this large equipment.

There are also safety and biohazard risks associated with process leakage.

8.2 Split Mechanical Seals

Advances in split seal technology has enabled their use in larger process equipment at elevated operating conditions, with greater reliability than previous design split seals could achieve. In addition, greater understanding of the causes of system failures have allowed seal engineers to address the entire sealing system and to engineer system solutions, rather than the seal design independently.

By understanding system dynamics, split seal design can be coupled with operation knowledge to develop a more reliable, cost effective system solution in standard, as well as larger rotating equipment, in a much broader application base.

Why Use Split Seals?

- Eliminate equipment teardown and the associated downtime
- No equipment damage
- Leak-free technology
- No maintenance or break-in requirements
- Reduce or eliminate flush water usage
- Seals outside the stuffing box, away from packing wear
- Proven technology for years of reliable operation
- Reduce maintenance and operating costs
- Field repairable

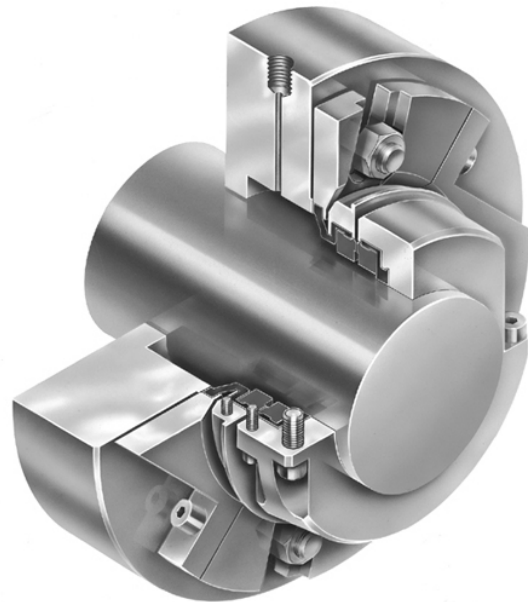
8.3 Competitive Products

Although there are many competitor's that manufacture and distribute split mechanical seals, in the larger size range we see three primary companies that manufacture split seals greater than 200 mm (8.00 inch) , John Crane, Flowserve, and AESSEAL.

John Crane 37FSB

◆ John Crane 37FSB

- Balanced version of the JC 37FS split seal for pumps & rotating equipment
- No springs: seal faces are energized with a rubber bellows
 - Rubber bellows and secondary elastomer seal must be cut with a razor and super-glued together
- Standard split seal for >8.00 inch(200 mm) sizes
 - Do not use the JC 3710
- Need flush adapter for solids/cooling conditions
- Price very high compared to the 442 Split Seal



John Crane 37FSB

John Crane specifically markets the 37FSB design in sizes 200 mm (8.00 inch) and larger, instead of the 3710 design. The John Crane 37FSB Split Seal, illustrated above, is a very simple design that uses a thin gland plate and a rubber bellows that is used as the secondary sealing element the bellows energizes the seal faces in lieu of springs. Because the process pressure acts on the inside of the seal, the forces exerted internally wants to open the seal faces up. This limits the

pressure capability of the design.

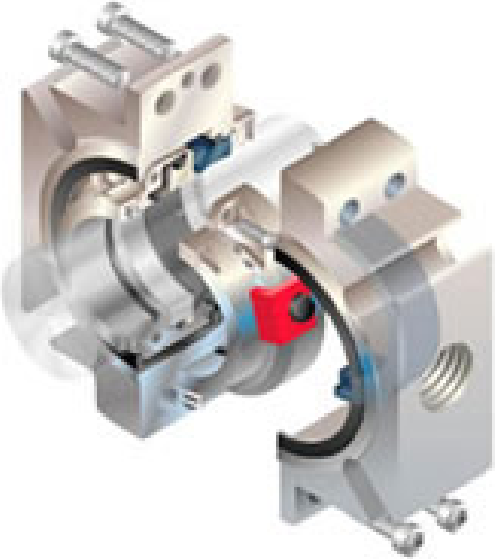
The standard seal does not have flush capabilities and contaminants will have a tendency to accumulate inside the seal, around the seal faces. Because the JC 37FSB design is internally pressurized, contaminants will have the tendency to migrate through the seal faces, reducing the seal life. Where flush is required, John Crane has a flush adaptor that fits between the seal and stuffing box at additional costs.

The rubber bellows does allow the seal good motion capabilities. To obtain more information on the John Crane 37FSB Split Seal, please review the literature, installation instructions, and specifications that can be found with all other competitive split seal information in the *Chesterton Marketing Library*.

Flowserve PSS III

◆ **Flowserve PSS III**

- Design improvement over PSS II
 - Four subassemblies combining the seal faces with rotary and gland
 - Elastomers glued in place
 - Utilized expired AWC patent features to align faces for higher pressure capabilities and no face distortion
 - Holder & gland fasteners captured
 - First obstruction very large due to design
 - Very difficult to field repair
- Price high compared to the 442 Split Seal



Flowserve PSS III

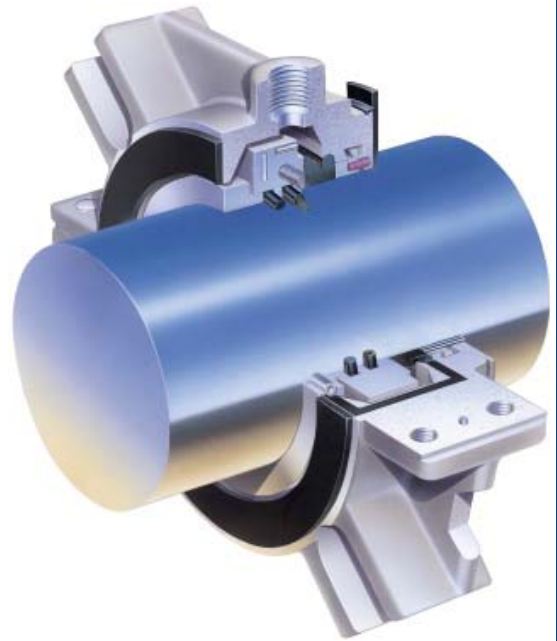
The Flowserve PSS III is the latest Flowserve design that utilizes Chesterton expired patent features for face alignment. The stationary design is not a cartridge seal but a subassembly design where the rotary assembly is in two halves and the gland/stationary assembly is also in two halves.

Elastomers are glued which aid in the integrity of the subassemblies but makes it very difficult to repair the PSS III in the field. To understand the repair complexity, please review the PSS III repair document that can be found with all the other competitive split seal information in the *Chesterton Marketing Library*.

AESSEAL RDS

◆ AESSEAL RDS

- RSD Split Seal developed in early 1990's
- Rotary holder and seal face one piece
 - 316L stainless steel with a chromium oxide plated face
 - Rotary/face & stationary ends are machined & lapped; not split
 - The entire Rotary/face is included in the AESSEAL repair kit
 - Special design for SC/SC face combination
- All O-rings glued
- Does not handle vacuum conditions
- Price mixed compared to the 442 Split Seal – higher & lower for CB/SC vs CB/CH. Ox plated



AESSEAL RDS

The AESSEAL RDS is a very old seal design and still the only AESSEAL split mechanical seal. It is a stationary design, where the rotary component is actually integral with the rotary face component on the standard design. The rotary is constructed of 316L stainless steel and is plated with chromium oxide which serves as the seal face. The standard design does not permit a hard face combination. A special design that has a separate rotary holder and rotary face must be used for a SC/SC face combination.

All O-rings are glued together. The repair kit includes the rotary holder/face component which will add cost to their repair kit. More information on the AESSEAL RDS Seal can be found in the *Chesterton Marketing Library* in the Split Seal Competition folder.

Split Seal Competitive Information

Chesterton has compiled a folder of competitive mechanical seal information that is posted in the *Chesterton Marketing Library*.

The link below will direct you to the competitive folder on the Marketing Library.

[Index of /FILES/Mechanical Seals/Split Seals/Split Seal Competitor Product Information](#) (Left click on link)

9.0 Frequently Asked Questions (FAQ)

1. What is the difference between this new seal and 442 Jumbo Split Seal?

The 442 Jumbo Split Seal is our large stationary split seal design that incorporated 221 Jumbo Split Seal gland component in the design. Enhancements to simplify installation compared to the 221 Jumbo were also integral to this design. Using the 221 gland limited the design scope of the 442 Jumbo. The 442 Jumbo Split Seal also did not incorporate any of the design enhancements that were developed during the 442 redesign. The new 442 Split Seal for large rotating equipment is a true 442 Split Seal that incorporates all of the design elements of the 442 Split Seal and more.

2. Does the new seal handle vacuum as well as pressure?

Yes, the 442 Split Seal in this size range will handle both vacuum and pressure. This seal is rated at 150 Psig (10 bar g) which is 50% higher than both the 221 Jumbo and 442 Jumbo pressure capabilities.

3. Does the new 442 Split Seal have a high pressure option?

The standard 442 Split Seal holder incorporates sets screws, without o-rings, that positively fastens the holder to the shaft and will handle the design parameters of the seal. Set screws of this design do not require o-rings.

4. What do I do if I have a hardened shaft?

Chesterton recommends there should be a 40 Brinell (10 Rockwell C) hardness difference between the shaft and the set screw materials to insure holder engagement. If your application does not give you the required differential, you can dimple the hardened shaft where the set screws engage the shaft to get the necessary engagement. Please consult Chesterton Engineering prior to shaft modification or seal installation on hardened shafts.

5. What can I do if the bolt circle of my rotating equipment does not align with the 442 Split Seal?

An adapter plate is the most cost effective method to adapt the equipment to the seal without modifying the equipment or engineering a custom split seal gland. The new 442 Split Seal has a very compact axial length which will give you more room to incorporate an adapter.

If the application will be using a SpiralTrac™ Environmental Controller, a SpiralTrac split seal adapter can be engineered to fit the seal to the pump or equipment without equipment modification.

6. Does the 442 Split Seal have dry running capabilities?

The new design does indeed have dry running capabilities! In fact, we have tested the new design in our test facilities to optimize dry running capabilities.

7. The new 442 Split Seal design has a pair of stacked springs instead of a single spring. Why?

The finger springs are stacked to allow us more flexibility in adjusting seal face load for applications that require less load. Dry running applications, such as top-entry mixers that run at low shaft speeds, can run dry provided that the face load is reduced. Removing the auxiliary springs will give you a reduced face load typically required. Please consult our Application Engineering group to determine the proper load, seal face materials and

environmental controls required for your specific dry running application.

8. Why doesn't the Spare Parts Kit include finger springs?

The Elgiloy™ finger springs used are very robust and are not prone to spring fatigue. Our extensive testing indicates that springs do not require replacing after every rebuild under most conditions. We have created individual spring kits if replacement springs are required.

9. Why are there two different spring kits? Are the springs different per kit?

The finger springs are identical in each of the two spring kits. The only difference is the spring quantity. One kit has 6 springs and auxiliary springs; the other has 8 of each. The smaller size seals (8 inch to 9 inch, 200 mm to 225 mm) use the 6 spring kit and the larger size seals (9.25 inch to 12 inch, 230 mm to 305 mm) use the 8 spring kit.

10. The 221 Jumbo and 442 Jumbo Split Seal designs used a ball and socket o-ring to seal the equipment shaft and rotary holder. Why did we change to a cut o-ring?

We incorporated the captured o-ring groove design in the new rotary holder that we use with all our other 442 Split Seals. This design holds the cut o-ring in the groove and simplifies aligning the rotary holder on the shaft during installation.

11. The ends of the new cut o-ring are not marked to indicate the correct alignment of this o-ring. How do we know if the o-ring is aligned properly?

We have developed new production methods that allow us to cut this o-ring perfectly square, eliminating the need to align the o-ring ends. It does not matter which end of the two o-ring pieces align. **Please note**, this only applies to this new design and size range. All other 442 Split Seal designs still have the gold mark indicating end alignment.

12. Does the new large size 442 Split Seal require a vacuum spacer for vacuum conditions?

A vacuum spacer is not required for any vacuum conditions the seal may experience. We have extensively tested this design under varied vacuum conditions with and without vacuum spacers and the seal runs favorably without. **Please note**, with large split seals shaft speed is an important consideration when operating under vacuum conditions. Please consult our Application Engineering group to determine vacuum recommendations.

13. What is the availability of duplex stainless steel for the holder and gland assemblies?

Duplex stainless steel materials are available through *Engineered Solutions*. Please contact *Application Engineering* for availability and pricing.

14. We currently have a 221 Jumbo/442 Jumbo Split Seal installed in our application. Will the new 442 Split Seal fit in the same equipment?

If the 221 Jumbo/442 Jumbo was a standard size, the equivalent 442 Split Seal will fit in the same envelope.

10.0 Large Split Seal Specification

Most municipal, regional, state, and federal agencies are required to place bids prior to procuring goods and services. These agencies must draft performance specifications for goods and services to insure they get the desired level of performance for a product and also set out stringent quality requirements indicating the desired level of quality; so that any product which does not meet the desired level of quality may be rejected as *nonresponsive*.

Chesterton has developed a 442 Large Split Mechanical Seal Specification to assist your customers when they need to develop a performance and quality specification for large split seals to insure they receive Chesterton performance and quality!

THIRD GENERATION SPLIT MECHANICAL SEAL SPECIFICATION

Seal Sizes 8.00 inch to 12.00 inch (200 mm to 305 mm)

I. General

- A) All components of the seal shall be split in half including the elastomers, gland, rotary and stationary seal faces and rotary holder. The non-shaft elastomers must incorporate a ball and socket to provide easier handling during installation. No glue is permitted to be applied to the elastomers.
- B) It shall be able to be installed outside of the stuffing box without any equipment disassembly required.
- C) The seal shall be of hydraulically balanced design to provide maximum interchangeability in pump and mixer applications without equipment modification. This design will also reduce heat generation and face wear and minimize power consumption. This design shall seal positive pressure and vacuum without special configuration.
- D) The seal should automatically center the rotating element within the seal gland without having to remove the centering devices to simplify installation.
- E) The stationary seal face shall be mechanically loaded with multiple springs to ensure no leakage when the pump is shut off. The springs shall be isolated from the pumped product in order to eliminate potential corrosion or clogging problems.
- F) Springs will be installed after seal assembly to simplify installation. Spring installation creates required face load for the seal.
- G) The seal can be installed without sleeve or shaft replacement, even if the pump was previously packed. Two flush ports with standard NPT tapped connections shall be provided in the gland.
- H) The rotary holder shall have drive lugs to ensure positive drive of rotating parts.
- I) The rotary holder shall be installed with integral spacing devices to simplify the holder installation.
- J) The gland halves shall have an interlock mechanism to prevent distortion at the gland halves.
- K) The seal shall be capable of sealing 150 psig / 28 inches Hg at 875 RPM.

II. Materials of Construction

- L) The gland and rotary holder shall be 316 stainless steel, to provide superior corrosion protection.
- M) The springs shall be Elgiloy to prevent chloride stress corrosion.
- N) The rotary seal face shall be Reaction Bonded Silicon Carbide.
- O) The stationary seal face shall be carbon or Reaction Bonded Silicon Carbide.
- P) Elastomers shall be FKM, Ethylene Propylene or Aflas.
- Q) Spare parts shall meet all the material requirements of the new seal, and shall include rotary and stationary faces, elastomers, gaskets and fasteners.

III. Packaging

- R) Components shall be factory assembled and placed in an environmentally protected package for safe storage.
- S) An installation procedure with photographs of the installation steps must be packaged with the seal.
- T) The package must be clearly labeled as to the contents to prevent unnecessary handling and storeroom confusion.

IV. Services to be provided at no charge by the seal supplier

- U) Local distributor shall also stock spare parts kits to minimize customer spare parts inventories.
- V) A factory representative shall be on hand during seal installation.
- W) A videotape for training of installation personnel shall be available for viewing.
- X) In-plant mechanical seal seminars shall be available.
- Y) Three other users in the local area of this type of seal shall be provided as references.

V. Guarantees

- Z) A spare parts kit of the same size and materials shall be provided at no charge:
 1. If a properly installed seal frets or scores the equipment shaft or sleeve.
 2. If a seal exhibits defective materials or workmanship and has not been modified or altered.

A spare parts kit shall be supplied at 1/2 the list price: If the seal fails within the first 90 days from installation.