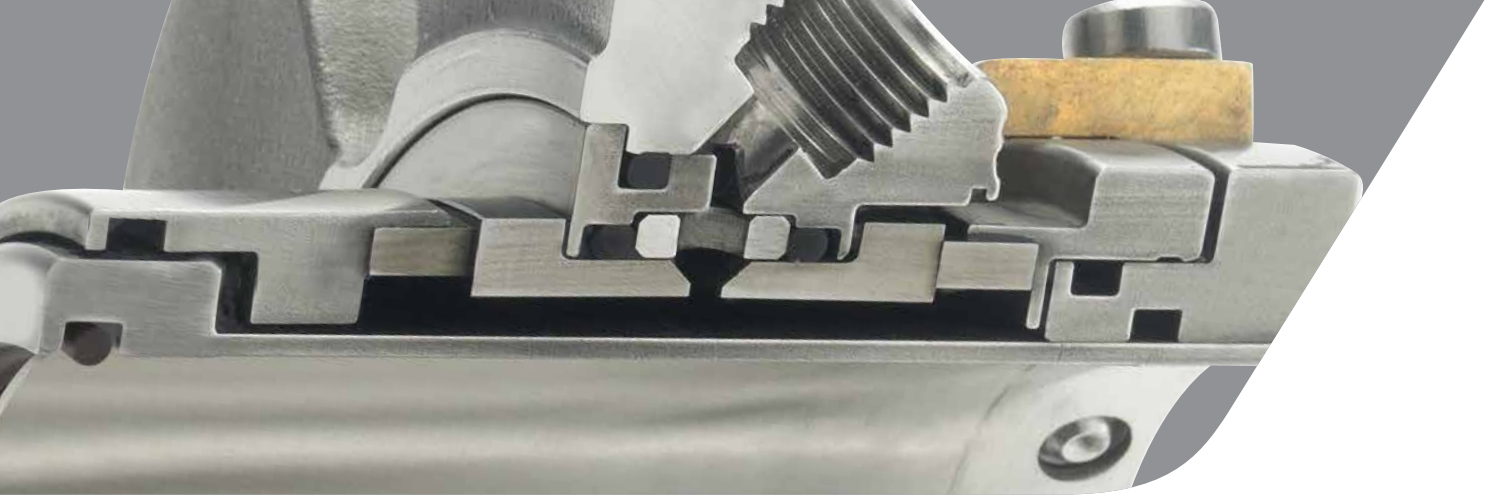


CDSA™

Range of Double Cartridge Mechanical Seals



- Unique self-aligning inboard and outboard seal faces
- Modular construction for maximum adaptability
- Independent seal face design
- Double or tandem seal protection
- Double pressure balanced rotaries



CDSA™ - High Performance Sealing Solution

Containment of hazardous process fluids requires the use of a double seal. Concern over emission control, health and safety issues and adequate back-up protection, intensifies the need for careful specification of the sealing system.

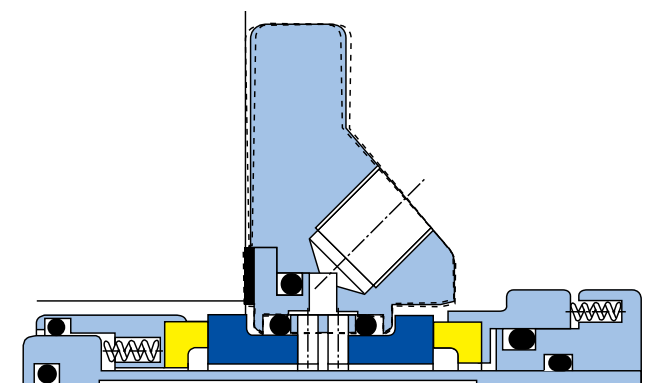
The corrosive nature of some hazardous liquids compounds the problem with the need for exotic “corrosion resistant” metallurgies.

The CDSA™ cartridge double mechanical seal forms the basis of the engineered sealing system. The standard seal unit is 316 Stainless Steel with Carbon, Tungsten Carbide and Silicon Carbide faces, available with Viton®, Aflas®, EPR and Kalrez® elastomers. This fundamental design is changed through modular component options to suit the requirements of the specific application.

Modular Construction

A modular component system is ideal for a flexible engineered approach to each application. Process chemicals have diverse characteristics and one basic seal configuration fails to cover the broad range of possible applications. The need for exotic wetted alloys, various seal face combinations, alternate ‘O’ ring compounds, differential secondary fluid pressures, temperature control and barrier fluid containment systems are some of the design parameters encountered.

Highly corrosive applications aggressively attack Stainless Steel. Corrosion is usually limited to the wetted components; namely the inboard rotary, a portion of the shaft sleeve and a section of the gland. Procurement of exotic alloy seals often results in long lead times and supply delays.



Self Aligning Faces

Proven Design Features

The basic seal incorporates two proven design features that enhance leak-free performance; cartridge construction and self-aligning faces. Cartridge seals are assembled, pre-set at the factory and tested. This method has proven effective in reducing installation errors due to improper setting of spring compression, radial misalignment and damage to the seal faces from excessive handling.

The second proven design feature, self-aligning faces, ensures that both the inboard and outboard faces remain square (90°), to the rotating shaft. The unique “universal joint” concept means each face remains flat across a broad pressure range. Resistance to pin shear stress during operation is achieved with heavy duty radially mounted anti-rotation pins. A spring loaded internal rotary centrifuges solids away from the seal faces, resisting clogging from process fluids with a high solids content.

CDSA™ - Design Features

Performance Documentation

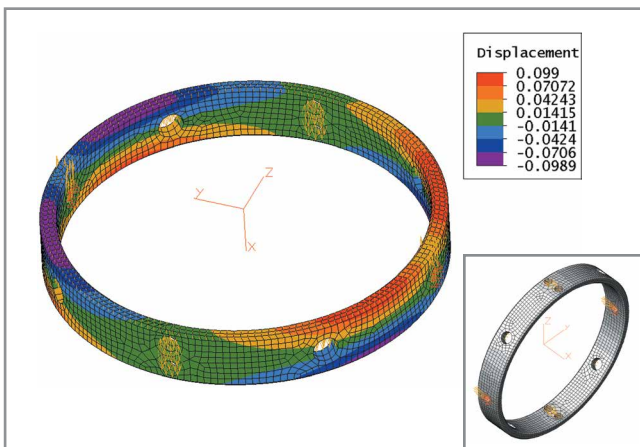
The CDSA™ engineered double seal has been designed with a flexible modular concept, allowing the seal to be adapted to the unique characteristics of each application. This gives you the maximum reliability benefit from our extensive experience.

All cartridge mechanical seals receive an individual serial number, which is etched on the seal during the final hydrostatic pressure test. This facilitates seal-level data monitoring and improved traceability, to help improve application performance over time.

Total adaptability results in maximum control in specifying the correct seal. The CDSA™ provides ultimate flexibility and back-up protection for the hazardous process fluid application.



Advanced seal testing on an API 682 specification test rig



3D Finite Element Analysis review showing displacement of the pivot ring due to the pressure created by the faces and the gland insert.

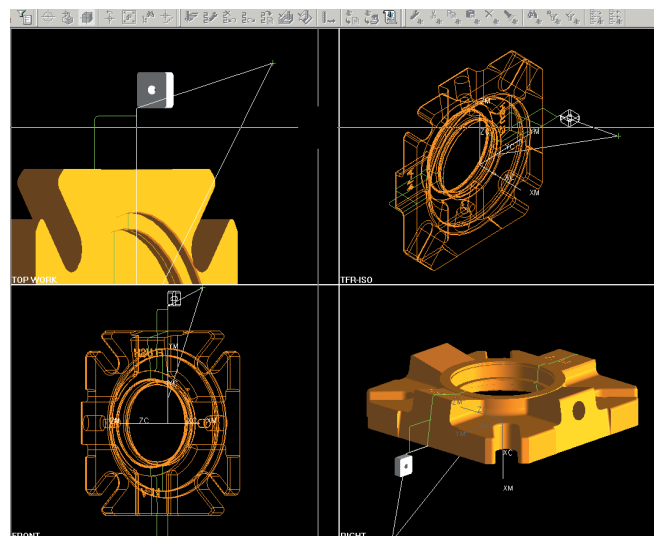
Finite Element Analysis and Design

With the aid of Finite Element Analysis (FEA), AESSEAL® designed a unique “universal joint self-aligning system”. Modelling the effects of temperature, pressure and rotational shear stress were just a few of the considerations. A rigid back-up ring with radially mounted pins behind the stationary provides compensation for angular misalignment, offering higher pressure capabilities and optimum protection against anti-rotation pin shear stress. In addition, the spring loaded rotary centrifuges solids away from the seal face and resists clogging, increasing the effectiveness of the seal in slurries and some abrasives. Faces remain flat, square to the shaft and suspended solids are prevented from crossing the flat seal faces.

AESSEAL® Design and Testing

For every seal developed by AESSEAL®, we use state-of-the-art computational facilities and numerical tools to design and optimize seal performance prior to manufacture and testing.

These tools include Predictive Software Code developed in-house, Finite Element Analysis (FEA) and Computational Fluid Dynamics (CFD). Our numerical tools are used for seal design, performance optimization, special product application and troubleshooting. In combination with an extensive test programme the result is world-leading technology that keeps your equipment running longer.



Integrated CAM Programming

Bi-Metal CDSA™ - Double Cartridge Mechanical Seal

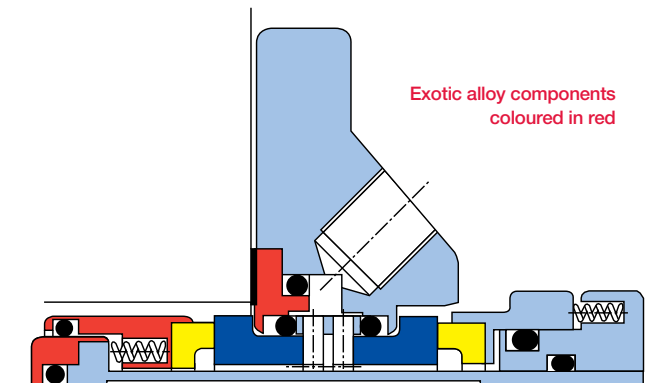
AESSEAL® has designed an innovative “bi-metal” exotic alloy seal. Alloy 20, Alloy 276, Alloy 400 and Titanium grade 2 are inventoried in popular modular wetted component sizes. Any additional commercially available special alloys are made to order. These special alloy parts are fitted to the standard Stainless Steel components. The use of a neutralizing barrier fluid protects the secondary Stainless Steel parts that are not exposed to the process fluid during normal operation.

Availability and flexibility of design meets the special demands of the corrosive fluid containment market.

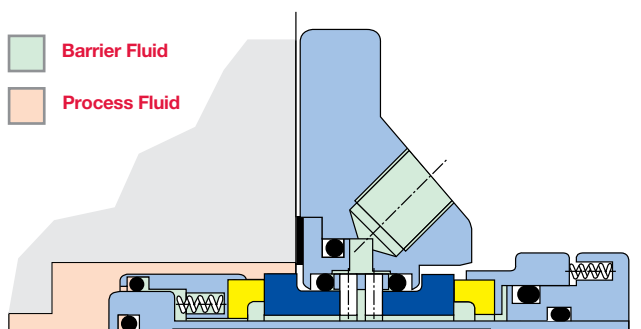
Variations to the seal specification can be accomplished by selecting from many different options. Seal faces are offered in any combination of Silicon Carbide, Tungsten Carbide and Carbon, both inboard and outboard.

Alternate ‘O’ ring compounds in Aflas®, Ethylene Propylene and Kalrez® are available.

The standard CDSA™ design works as a double seal with either a higher or lower barrier fluid pressure differential, when compared to the process fluid pressure.



CDSA™ - Double Cartridge Mechanical Seal



Barrier Fluid

The barrier fluid pressure should not normally be more than 15 psig (1 barg) above the stuffing box pressure.

Higher Pressure Barrier Fluid

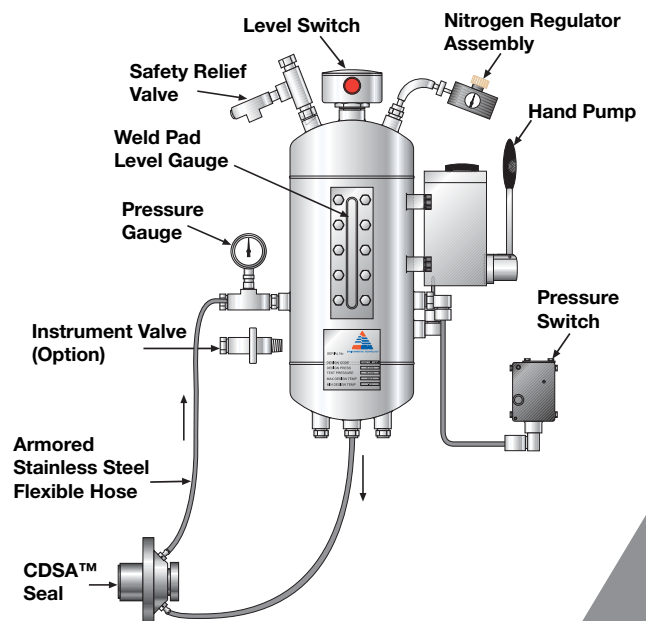
A barrier fluid pressure which is higher than the stuffing box pressure, prevents the pumped product from entering the barrier fluid system and ultimately leaking to atmosphere.

Lower Pressure Barrier Fluid

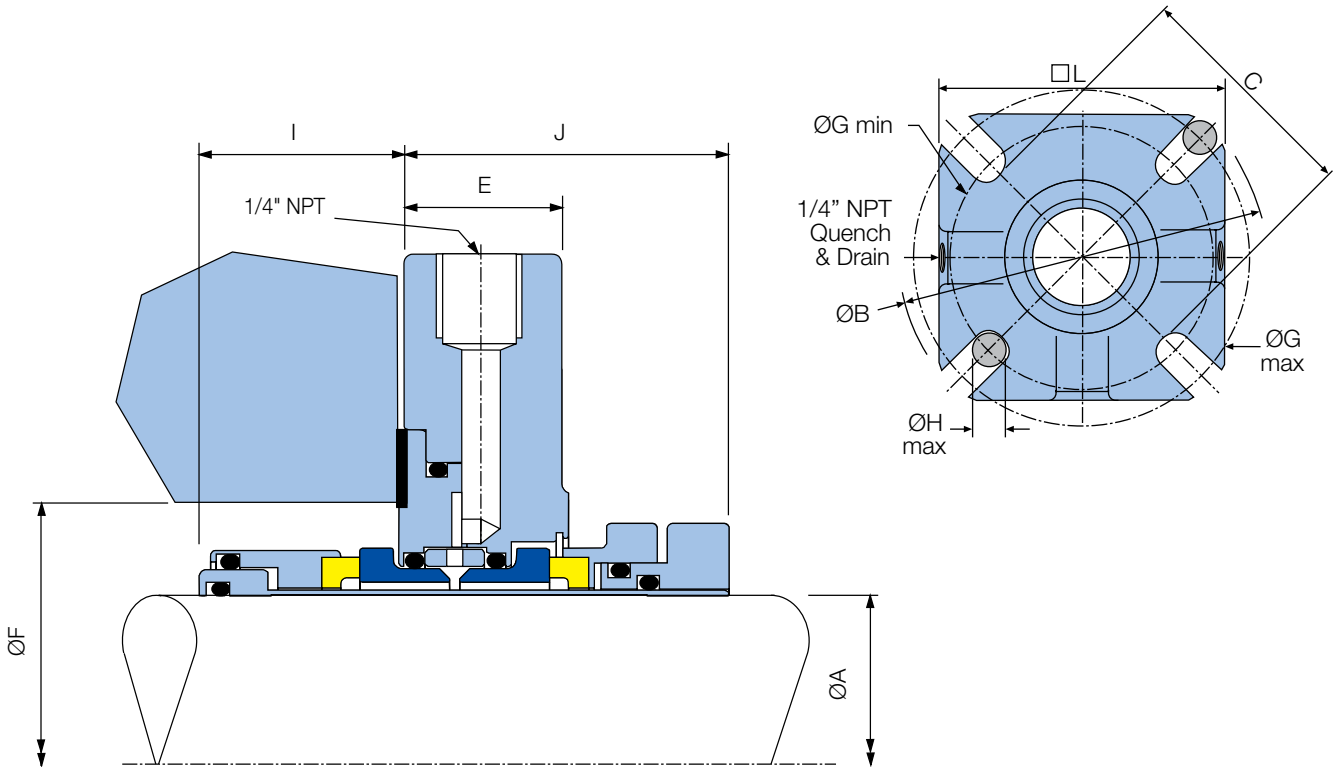
When used at a lower pressure than the stuffing box condition, the barrier fluid can serve as a coolant, provide lubrication for dry running conditions, or help to prevent the build-up of crystallized particles at the internal seal faces.

Back-up Containment System

Convection tanks provide a closed-loop containment system with a pressurized barrier fluid. Tank options with internal cooling coils enhance the temperature control at the seal on critical duties. Use of ASME coded vessels and assistance with layout specifications maximizes back-up protection.



ANSI+ CDSA™ - Gland Designs to suit ANSI+ Pumps



ANSI+ CDSA™ - ANSI+ Gland format Dimensional Information (inches)

| A | B | C | E | F Min | F Max | G Min | G Max | H Max | I | J | □L |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1.125 | 5.000 | 3.188 | 1.000 | 2.625 | 2.850 | 3.750 | 4.250 | 0.500 | 1.250 | 2.000 | 3.990 |
| 1.375 | 5.375 | 3.438 | 1.000 | 2.875 | 3.100 | 4.000 | 4.625 | 0.500 | 1.250 | 2.000 | 4.240 |
| 1.750 | 6.750 | 4.438 | 0.644 | 3.500 | 4.100 | 5.000 | 6.000 | 0.500 | 1.350 | 2.000 | 5.480 |
| 1.875 | 6.750 | 4.438 | 0.644 | 3.625 | 4.100 | 5.000 | 6.000 | 0.500 | 1.350 | 2.000 | 5.480 |
| 2.125 | 7.625 | 4.688 | 0.644 | 3.875 | 4.225 | 5.375 | 6.687 | 0.625 | 1.437 | 2.000 | 6.230 |
| 2.500 | 8.250 | 5.438 | 0.644 | 4.500 | 5.100 | 6.125 | 7.312 | 0.625 | 1.500 | 2.187 | 6.730 |
| 2.625 | 8.250 | 5.438 | 0.644 | 4.625 | 5.100 | 6.125 | 7.312 | 0.625 | 1.500 | 2.187 | 6.730 |
| 2.750 | 8.250 | 5.438 | 0.644 | 4.625 | 5.100 | 6.125 | 7.312 | 0.625 | 1.500 | 2.187 | 6.730 |

Minimum bolt circle based on bolt size shown.

Environmental Control Systems for the CDSA™

In addition to a vast range of mechanical seals, AESSEAL® has a specialized systems division, dedicated to the design and manufacture of a comprehensive range of seal support packages for double mechanical seals. These support systems range from Thermosyphon systems, SWFF-TF™, FLOWTRUE™ and AES-15™ to the fully featured forced circulation system PUMPPAC™ for use on oil and water applications.

SWFF-TF™



FLOWTRUE™



AES-15™



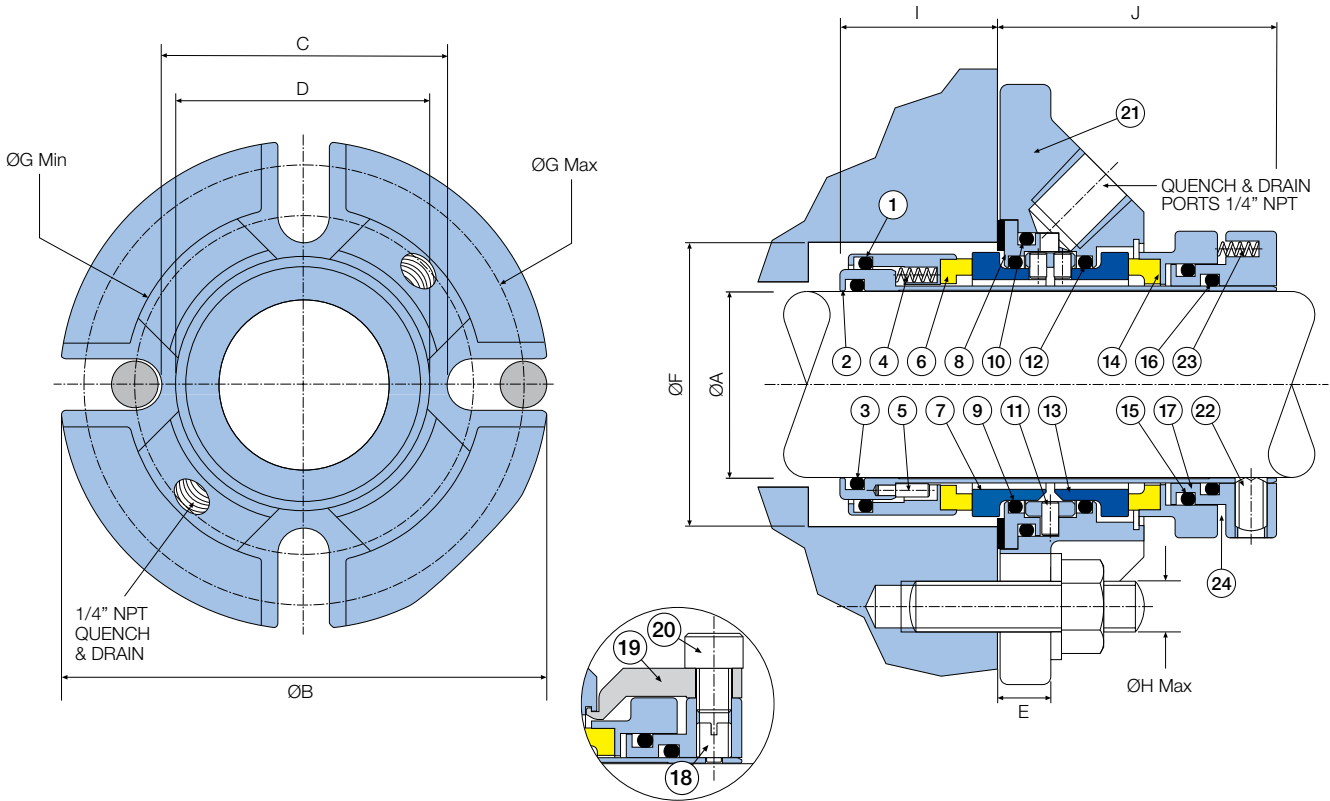
PUMPPAC™



The systems above are compatible with a wide selection of barrier and buffer fluid media. They are supplied pre-assembled with all necessary components and fittings. On site inventory costs are reduced by modular system construction.

CDSA™ Range

Sizes available: 1.000" - 5.000" (24mm - 125mm)



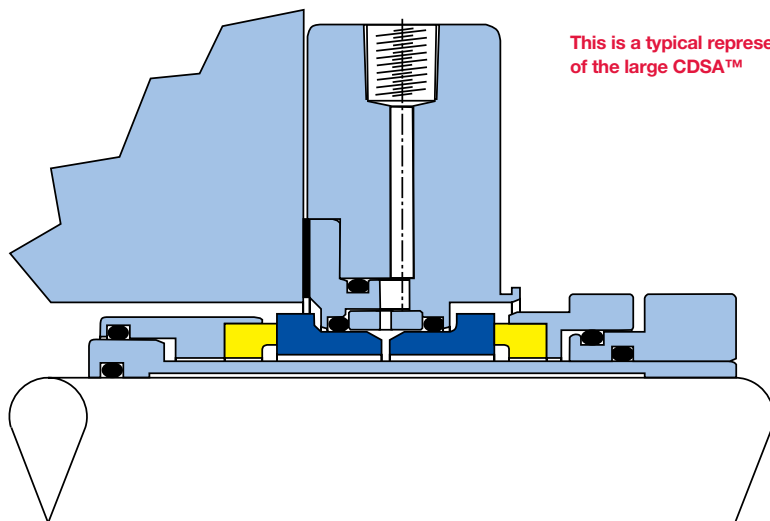
| Item | Description | Material | Item | Description | Material |
|------|--------------------------|---------------------------------|------|-------------------------------|---------------------------------|
| 1 | Rotary O Ring | Viton® / EPR / Kalrez® / Aflas® | 13 | External Stationary Face | SiC / Ceramic** / TC |
| 2 | Sleeve | 316L Stainless Steel | 14 | Rotating Face | 316L SS - Carbon / TC / SiC* |
| 3 | Sleeve O Ring | Viton® / EPR / Kalrez® / Aflas® | 15 | External Rotary O Ring | Viton® / EPR / Kalrez® / Aflas® |
| 4 | Springs | Alloy 276 | 16 | Clamp Ring O Ring | Viton® / EPR / Kalrez® / Aflas® |
| 5 | Rotating Drive Pins | Stainless Steel | 17 | Clamp Ring | 316L Stainless Steel |
| 6 | Rotary Face | 316L SS - Carbon / TC / SiC* | 18 | Anti-Tamper Screws | Stainless Steel |
| 7 | Internal Stationary Face | SiC / Ceramic** / TC | 19 | Centring Clips | Metal |
| 8 | Gland Insert | 316L Stainless Steel | 20 | Clip Screws | Stainless Steel |
| 9 | Internal Stat O Ring | Viton® / EPR / Kalrez® / Aflas® | 21 | Gland | 316 Stainless Steel |
| 10 | Insert O Ring | Viton® / EPR / Kalrez® / Aflas® | 22 | Drive Screws | Stainless Steel |
| 11 | Pivot Ring | 316L Stainless Steel | 23 | Springs | Alloy 276 |
| 12 | External Stat O Ring | Viton® / EPR / Kalrez® / Aflas® | 24 | Rotary Drive Pins (not shown) | Stainless Steel |

*Limited availability above 4.000" (100mm) - contact AESSEAL® for more information
 **Limited availability above 3.000" (75mm) - contact AESSEAL® for more information

Item 5 is an integral part of Item 2
 Item 24 is an integral part of Item 17

Large CDSA™

Sizes available: 5.125" - 12.000" (130mm - 300mm)



This is a typical representation of the large CDSA™

CDSA™ Range - Size Charts

CDSA™ Range - Dimensional Information (inches)

| A | B | C | D | E | ØFMin | ØFMax | ØGMin | ØGMax | ØHMax | I | J |
|----------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1.000 | 4.125 | 2.125 | 1.937 | 0.519 | 1.625 | 1.937 | 2.687 | 3.562 | 1/2 | 1.281 | 2.062 |
| 1.125 | 4.250 | 2.250 | 2.063 | 0.519 | 1.750 | 2.062 | 2.812 | 3.617 | 1/2 | 1.281 | 2.062 |
| 1.250 | 4.375 | 2.375 | 2.187 | 0.519 | 1.875 | 2.187 | 2.937 | 3.812 | 1/2 | 1.281 | 2.062 |
| 1.375 | 4.375 | 2.500 | 2.312 | 0.519 | 2.000 | 2.250 | 3.062 | 3.812 | 1/2 | 1.281 | 2.062 |
| 1.500 | 5.000 | 2.812 | 2.562 | 0.644 | 2.250 | 2.375 | 3.375 | 4.437 | 1/2 | 1.312 | 2.125 |
| 1.625 | 5.000 | 2.812 | 2.562 | 0.644 | 2.375 | 2.500 | 3.375 | 4.437 | 1/2 | 1.312 | 2.125 |
| 1.750 | 5.500 | 3.187 | 2.812 | 0.644 | 2.500 | 2.750 | 3.750 | 4.937 | 1/2 | 1.312 | 2.125 |
| 1.875 | 5.500 | 3.187 | 2.812 | 0.644 | 2.625 | 2.875 | 3.750 | 4.937 | 1/2 | 1.312 | 2.125 |
| 2.000 | 6.000 | 3.562 | 3.063 | 0.644 | 2.750 | 3.000 | 4.125 | 5.437 | 1/2 | 1.380 | 2.125 |
| 2.000-AC | 5.250 | 3.450 | 3.035 | 0.644 | 2.750 | 3.000 | 4.000 | 4.750 | 1/2 | 1.380 | 2.125 |
| 2.125 | 6.000 | 3.562 | 3.063 | 0.644 | 2.875 | 3.125 | 4.125 | 5.437 | 1/2 | 1.380 | 2.125 |
| 2.250 | 6.500 | 3.812 | 3.312 | 0.644 | 3.000 | 3.250 | 4.500 | 5.812 | 5/8 | 1.380 | 2.125 |
| 2.375 | 6.500 | 3.812 | 3.312 | 0.644 | 3.125 | 3.375 | 4.500 | 5.812 | 5/8 | 1.380 | 2.125 |
| 2.500 | 7.000 | 4.312 | 3.812 | 0.769 | 3.375 | 3.625 | 5.000 | 6.312 | 5/8 | 1.500 | 2.375 |
| 2.625 | 7.000 | 4.312 | 3.812 | 0.769 | 3.500 | 3.750 | 5.000 | 6.312 | 5/8 | 1.500 | 2.375 |
| 2.750 | 7.000 | 4.312 | 3.812 | 0.769 | 3.625 | 3.875 | 5.000 | 6.312 | 5/8 | 1.500 | 2.375 |
| 2.875 | 7.500 | 4.937 | 4.250 | 0.769 | 3.750 | 4.125 | 5.625 | 6.812 | 5/8 | 1.500 | 2.375 |
| 3.000 | 7.500 | 4.937 | 4.250 | 0.769 | 3.875 | 4.250 | 5.625 | 6.812 | 5/8 | 1.500 | 2.375 |
| 3.125 | 7.500 | 4.937 | 4.250 | 0.769 | 4.000 | 4.375 | 5.625 | 6.812 | 5/8 | 1.500 | 2.375 |
| 3.250 | 8.000 | 5.312 | 4.625 | 0.769 | 4.125 | 4.500 | 6.125 | 7.187 | 3/4 | 1.500 | 2.375 |
| 3.375 | 8.000 | 5.312 | 4.625 | 0.769 | 4.250 | 4.625 | 6.125 | 7.187 | 3/4 | 1.500 | 2.375 |
| 3.500 | 8.000 | 5.312 | 4.625 | 0.769 | 4.375 | 4.750 | 6.125 | 7.187 | 3/4 | 1.500 | 2.375 |
| 3.625 | 8.500 | 5.937 | 5.000 | 0.769 | 4.500 | 5.000 | 6.750 | 7.687 | 3/4 | 1.500 | 2.375 |
| 3.750 | 8.500 | 5.937 | 5.000 | 0.769 | 4.625 | 5.125 | 6.750 | 7.687 | 3/4 | 1.500 | 2.375 |
| 3.875 | 8.500 | 5.937 | 5.000 | 0.769 | 4.750 | 5.250 | 6.750 | 7.687 | 3/4 | 1.500 | 2.375 |
| 4.000 | 9.000 | 6.625 | 5.375 | 0.769 | 4.875 | 5.500 | 7.437 | 8.187 | 3/4 | 1.500 | 2.375 |
| 4.125 | 9.000 | 6.625 | 5.375 | 0.769 | 5.125 | 5.875 | 7.437 | 8.187 | 3/4 | 1.500 | 2.375 |
| 4.250 | 9.000 | 6.625 | 5.375 | 0.769 | 5.125 | 5.875 | 7.437 | 8.187 | 3/4 | 1.500 | 2.375 |
| 4.375 | 9.500 | 7.000 | 5.750 | 0.769 | 5.375 | 6.250 | 7.812 | 8.687 | 3/4 | 1.500 | 2.375 |
| 4.500 | 9.500 | 7.000 | 5.750 | 0.769 | 5.375 | 6.250 | 7.812 | 8.687 | 3/4 | 1.500 | 2.375 |
| 4.625 | 10.000 | 7.345 | 6.125 | 0.769 | 5.625 | 6.625 | 8.312 | 9.062 | 7/8 | 1.500 | 2.375 |
| 4.750 | 10.000 | 7.345 | 6.125 | 0.769 | 5.625 | 6.625 | 8.312 | 9.062 | 7/8 | 1.500 | 2.375 |
| 4.875 | 10.000 | 7.345 | 6.125 | 0.769 | 5.875 | 6.625 | 8.312 | 9.062 | 7/8 | 1.500 | 2.375 |
| 5.000 | 10.000 | 7.345 | 6.125 | 0.769 | 5.875 | 6.625 | 8.312 | 9.062 | 7/8 | 1.500 | 2.375 |

Seal sizes from 5.125" to 12.000" are designed to suit specific equipment using modular components. Note: Seal sizes 6.125" and above are supplied without a pivot ring. Contact AESSEAL® technical department for dimensional information and availability.

"Factory repair program is available"

"Replacement seal kits are available"

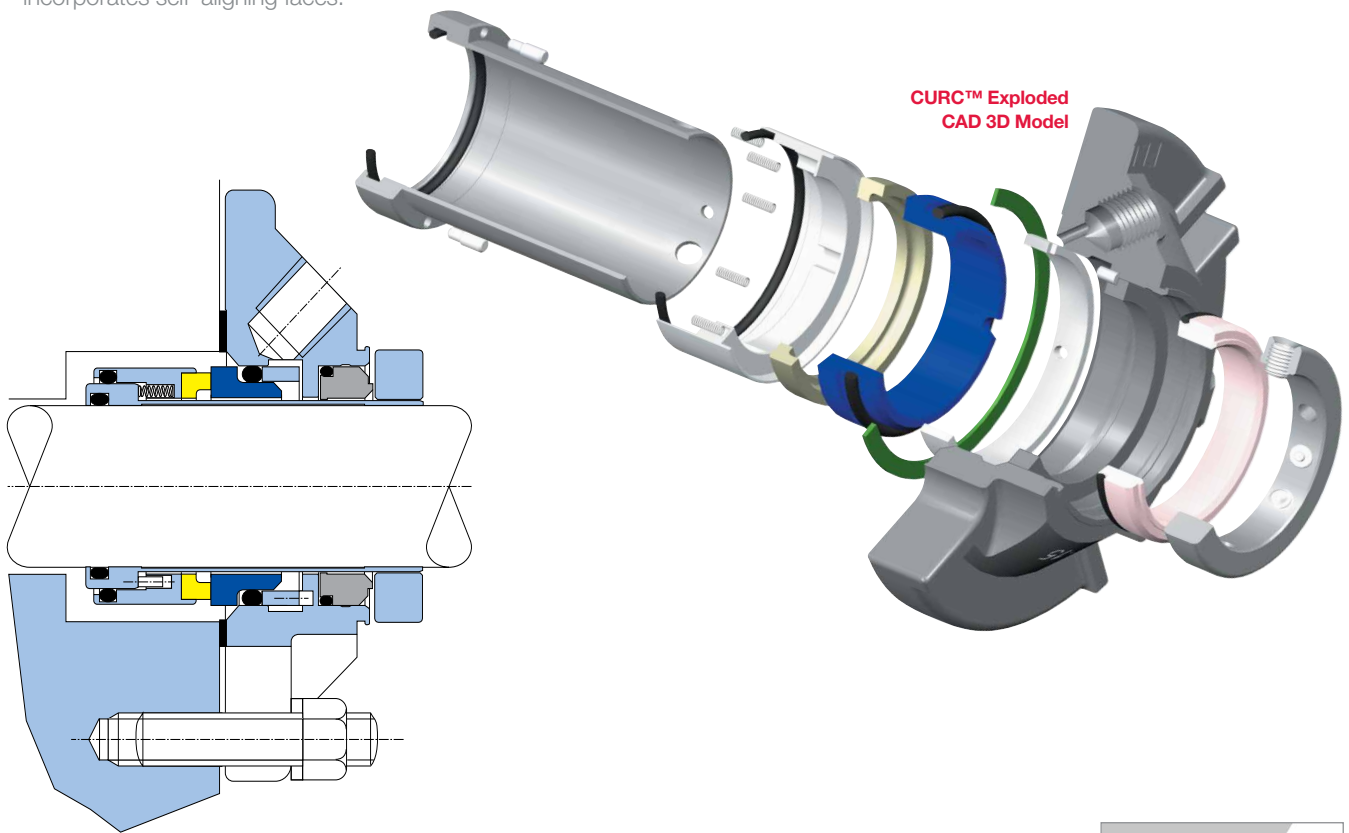
CDSA™ Range - Dimensional Information (mm)

| A | B | C | D | E | ØFMin | ØFMax | ØGMin | ØGMax | ØHMax | I | J |
|-----|-------|-------|-------|------|-------|-------|-------|-------|-------|------|------|
| 24 | 104.8 | 54.0 | 49.2 | 13.2 | 40.0 | 46.0 | 67.0 | 90.5 | 12 | 32.5 | 52.4 |
| 25 | 104.8 | 54.0 | 49.2 | 13.2 | 41.0 | 49.0 | 67.0 | 90.5 | 12 | 32.5 | 52.4 |
| 28 | 108.0 | 57.2 | 52.4 | 13.2 | 44.0 | 52.3 | 70.3 | 93.6 | 12 | 32.5 | 52.4 |
| 30 | 111.0 | 60.4 | 55.6 | 13.2 | 46.0 | 55.5 | 73.5 | 96.8 | 12 | 32.5 | 52.4 |
| 32 | 111.0 | 60.4 | 55.6 | 13.2 | 48.0 | 55.5 | 73.5 | 96.8 | 12 | 32.5 | 52.4 |
| 33 | 111.0 | 60.4 | 55.6 | 13.2 | 49.0 | 55.5 | 73.5 | 96.8 | 12 | 32.5 | 52.4 |
| 35 | 111.0 | 63.5 | 58.8 | 13.2 | 51.0 | 57.5 | 76.6 | 96.8 | 12 | 32.5 | 52.4 |
| 38 | 127.0 | 71.5 | 65.0 | 16.4 | 57.2 | 60.3 | 85.7 | 114.3 | 12 | 33.3 | 54.0 |
| 40 | 127.0 | 71.5 | 65.0 | 16.4 | 58.0 | 60.4 | 85.7 | 114.3 | 12 | 33.3 | 54.0 |
| 43 | 127.0 | 71.5 | 65.0 | 16.4 | 61.0 | 63.5 | 85.7 | 114.3 | 12 | 33.3 | 54.0 |
| 45 | 139.7 | 81.0 | 71.4 | 16.4 | 63.5 | 69.9 | 95.3 | 127.0 | 12 | 33.3 | 54.0 |
| 48 | 139.7 | 81.0 | 71.4 | 16.4 | 66.7 | 73.0 | 95.3 | 127.0 | 12 | 33.3 | 54.0 |
| 50 | 139.7 | 81.0 | 71.4 | 16.4 | 68.0 | 73.0 | 95.3 | 127.0 | 12 | 33.3 | 54.0 |
| 53 | 152.4 | 90.5 | 77.8 | 16.4 | 71.0 | 76.2 | 104.8 | 139.7 | 12 | 35.0 | 54.0 |
| 55 | 152.4 | 90.5 | 77.8 | 16.4 | 74.0 | 79.4 | 104.8 | 139.7 | 12 | 35.0 | 54.0 |
| 58 | 165.1 | 96.8 | 84.1 | 16.4 | 76.2 | 82.5 | 114.3 | 149.2 | 16 | 35.0 | 54.0 |
| 60 | 165.1 | 96.8 | 84.1 | 16.4 | 79.4 | 85.7 | 114.3 | 149.2 | 16 | 35.0 | 54.0 |
| 63 | 177.8 | 109.5 | 96.8 | 19.6 | 85.8 | 92.1 | 127.0 | 160.3 | 16 | 38.1 | 60.3 |
| 65 | 177.8 | 109.5 | 96.8 | 19.6 | 88.9 | 95.3 | 127.0 | 160.3 | 16 | 38.1 | 60.3 |
| 68 | 177.8 | 109.5 | 96.8 | 19.6 | 92.1 | 98.4 | 127.0 | 160.3 | 16 | 38.1 | 60.3 |
| 70 | 177.8 | 109.5 | 96.8 | 19.6 | 92.1 | 98.4 | 127.0 | 160.3 | 16 | 38.1 | 60.3 |
| 75 | 190.5 | 125.4 | 108.0 | 19.6 | 98.5 | 108.0 | 142.9 | 173.0 | 16 | 38.1 | 60.3 |
| 80 | 190.5 | 125.4 | 108.0 | 19.6 | 101.6 | 111.1 | 142.9 | 173.0 | 16 | 38.1 | 60.3 |
| 85 | 203.2 | 135.0 | 117.5 | 19.6 | 108.0 | 117.5 | 155.6 | 182.5 | 20 | 38.1 | 60.3 |
| 90 | 215.9 | 150.8 | 127.0 | 19.6 | 114.3 | 127.0 | 171.5 | 195.2 | 20 | 38.1 | 60.3 |
| 95 | 215.9 | 150.8 | 127.0 | 19.6 | 117.5 | 130.2 | 171.5 | 195.2 | 20 | 38.1 | 60.3 |
| 100 | 228.6 | 168.3 | 136.5 | 19.6 | 123.9 | 139.7 | 189.0 | 208.0 | 20 | 38.1 | 60.3 |
| 105 | 228.6 | 168.3 | 136.5 | 19.6 | 130.1 | 149.2 | 189.0 | 208.0 | 20 | 38.1 | 60.3 |
| 110 | 241.3 | 177.8 | 146.2 | 19.6 | 136.5 | 158.8 | 198.4 | 220.6 | 20 | 38.1 | 60.3 |
| 115 | 254.0 | 186.6 | 155.8 | 19.6 | 142.9 | 168.3 | 211.1 | 230.2 | 22 | 38.1 | 60.3 |
| 120 | 254.0 | 186.6 | 155.8 | 19.6 | 142.9 | 168.3 | 211.1 | 230.2 | 22 | 38.1 | 60.3 |
| 125 | 254.0 | 186.6 | 155.8 | 19.6 | 149.2 | 168.3 | 211.1 | 230.2 | 22 | 38.1 | 60.3 |

Seal sizes from 130mm to 300mm are designed to suit specific equipment using modular components. Note: Seal sizes 155mm and above are supplied without a pivot ring. Contact AESSEAL® technical department for dimensional information and availability.

CURC™ - Single Cartridge Mechanical Seal

The CDSA™ range of double cartridge mechanical seals is designed to complement the CURC™ range of cartridge single mechanical seals. Available from 1.000" to 5.000" (24mm to 125mm) and available in sizes up to 12.000" (300mm). The CURC™ incorporates self-aligning faces.



CURC™ Exploded CAD 3D Model

The CURC™ is available as a CRCO™ which includes a lip seal option. It is also available as a CURE™ which incorporates a secondary seal option to bridge the gap between a single and a double seal. Both CURC™ and CDSA™ products employ modular components, thereby increasing availability and reducing product lead time.

This CURC™ brochure is available by contacting the Marketing Department at marketing@aes seal.com or can be downloaded by visiting our website at www.aes seal.com



For further information and safe operating limits contact our technical specialists at the locations below.



Use double mechanical seals with hazardous products.

Always take safety precautions:

WARNING

- Guard your equipment
- Wear protective clothing

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'Our purpose is to give our customers such exceptional service that they need never consider alternative sources of supply.'



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