

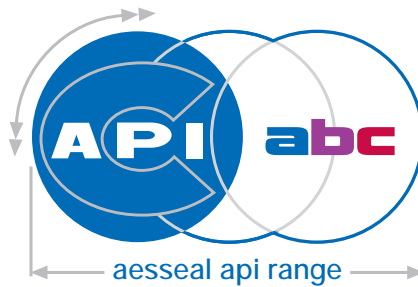
PART OF A FAMILY OF
PRODUCTS AWARDED
THE QUEENS AWARD
FOR ENTERPRISE:
INNOVATION 2004



ENVIRONMENTAL TECHNOLOGY

CAPI™ 610 & 682 Single Seals

API 610 Version 9 & API 682 Certified
Cartridge Mechanical Seal Range



- PATENTED DESIGN FEATURES
- ROTARY AND STATIONARY
PUSHER SEAL DESIGNS
- ROTARY AND STATIONARY
BELLOWS SEAL DESIGNS
- FLOATING BUSH AS STANDARD
(OPTIONAL SEGMENTAL BUSH)
- MODULAR DESIGN
- HYDRAULICALLY BALANCED
SEAL FACES

Company Overview

Growing environmental awareness, changing consumer behaviour and more aggressive competition mean that both new and traditional markets are demanding ideas, innovative products and above all service.

This API mechanical seal and systems development is the result of a global strategy to expand the AESSEAL® product range which will allow further penetration into new markets and offer a more complete service to existing customers.

At the core of this strategy is the improvement of existing products and design excellence which has helped us achieve superior product performance.



AESSEAL plc, Mill Close, UK.



AESSEAL Inc. Knoxville USA.



AESSEAL Pty Ltd. South Africa



AESSEAL China Ltd.

AESSEAL® has 56 branches worldwide including headquarters in Europe, North America, South Africa and the Far East.



Worldwide Representation

Growth in excess of 25% per annum has allowed AESSEAL® to become the only major new international entrant to the mechanical seals industry in the last twenty years.

AESSEAL® now have a direct presence in every major market, with over 56 branches and more than 150 distributors selling to 83 different countries worldwide.

API Industry Introduction

The American Petroleum Institute is the primary trade association representing the oil and natural gas industry in the United States.

The latest API specifications set strict standards for the design and supply of mechanical seals. This rotating equipment standard is adopted by most refinery, petrochemical and offshore platforms around the world.

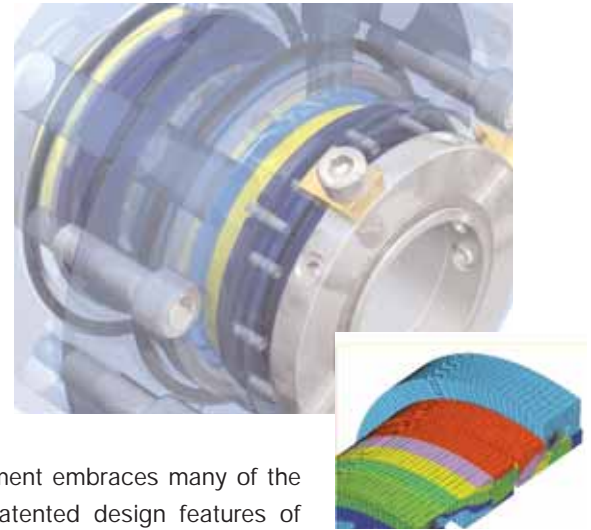
AESSEAL® made a strategic decision to enter this market in 1999. For further information on the full AESSEAL® API product range see "A Guide to API Seal and System Design" reference L-UK/US-APISEALS.



API 682 & 610 Version 8 Seal Development

Design

After spending over two million pounds (\$3M, E3.6M) in product development and inventory, 2002 saw the official launch of the AESSEAL® API cartridge mechanical seal range. The AESSEAL® patented Cartridge (CAPI™) range is designed to cover API 682 and 610 version 9 applications. Designed totally in house, with the latest computer aided design and engineering practices, usual product development times were significantly reduced. The range of seals was created with the aid of Finite Element Analysis (FEA) which helped to predict how the seal would perform under various conditions. Creating most of the product development electronically, instead of physically, reduced the time taken to finalise the design. It also meant fewer costly physical prototypes were needed which also saved time and money.



The API development embraces many of the innovative and patented design features of existing, service proven, AESSEAL® products.



Computer controlled unmanned API 682 test facilities at AESSEAL plc UK Headquarters.

Testing

Computer simulation is very effective in testing performance but all AESSEAL® mechanical seals still have to undergo thorough physical testing in a range of arduous environments. Testing to API 682 standards also ensures seals are qualified to run in some of the most arduous API applications. Tests were conducted on two test rigs which are capable of testing to API 682 requirements. The first rig (API 1) is capable of testing seals in hot water up to 200°C (392°F) and the second (API 2) tests seals in hot oil up to 260°C (500°F).

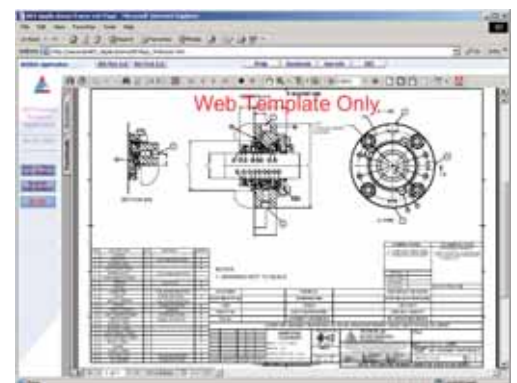
CAPI™ 682 Seals on www.aesseal.com - selecting your seal on the internet

The AESSEAL® CAPI™ 610 & 682 range of mechanical seals can be selected on line at the AESSEAL® website. There are two different methods of doing this as follows:

1. Selection by Seal Type: This section will lead the user to select an API type and available AESSEAL® API seals. This is useful if the user knows what API seal they want to use for their application / or they want to replace a currently used AESSEAL® API seal for their application.

2. Selection by API Type: This section is generated to allow the user to follow API's standard procedures to select an appropriate seal and sealing system for their application. It is recommended to use this section if you do not know what standard API seals and plans are suitable for your application.

Both methods allow the user to select the exact specification of the seal and then create a new general assembly drawing of it. For more information visit www.aesseal.com and click on the Applications link on the top bar. Once inside the applications section of the website follow the instructions.



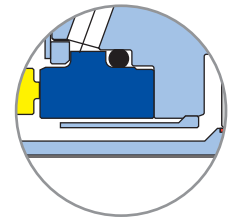
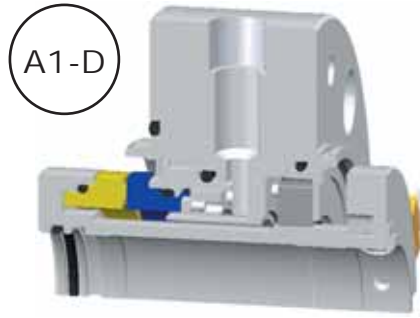
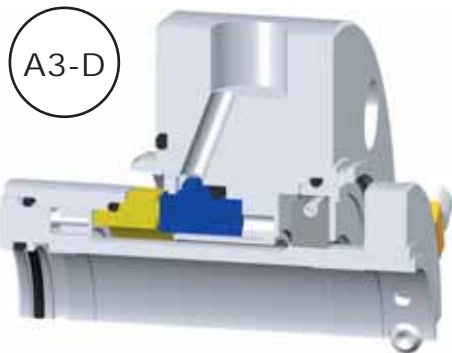
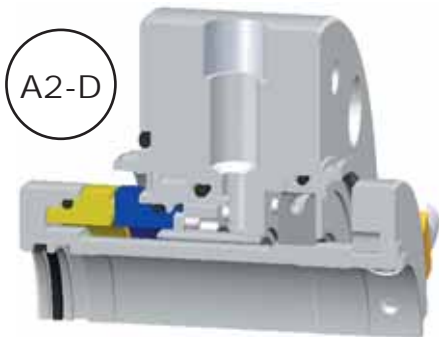
Above: API mechanical seal selection from the AESSEAL website allows the user to generate a General Assembly drawing by inputting different variables.

Modularity - better by design



Modularity

One of the most innovative features of the new AESSEAL® CAPI™ 682 range is that one modular design is the basis for over twenty different seal types. This means a minimum range of components can be used to create a maximum amount of assembly configurations for all API applications. This helps with logistics, reduces delivery time and leads to the most competitive pricing in the industry.



Deflector Option

ALL AESSEAL® CAPI™ 610 & 682 designs are available with an optional deflector.

Type A Variants

Offered in either a Rotary (A3) or Stationary (A1 and A2) configuration, CAPI™ 610 & 682 Type A pusher seals incorporate many beneficial and optional design features.

This enables the user to configure the seal design to suit their application.

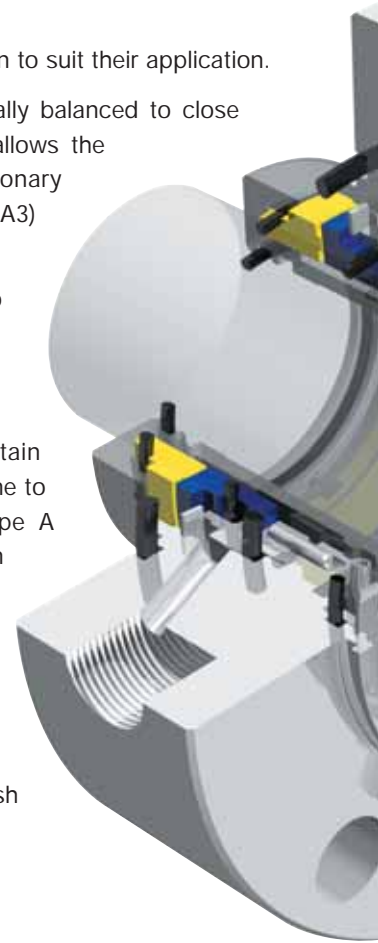
All CAPI™ 610 & 682 seal faces are hydraulically balanced to close under process pressure. The modular design allows the selection of either a pressure balanced stationary (Types A1 and A2) or restrained stationary (Type A3) design.

All designs allow a Deflector (-D) to be added to the seal assembly, thereby directing the barrier media to the inboard seal faces where it is needed the most.

It is commonly recognized that in certain applications, a fixed restriction bush can be prone to damage. As standard, CAPI™ 610 & 682 Type A pusher seals are offered with a solid carbon floating restriction bush.

Alternatively, for more arduous barrier applications, Type A pusher seals are offered with a segmental throttle bush and hard plated sleeve.

All Type A seals are offered with a multi-port flush for improved cooling performance.



AESSEAL® recognize the fact that many users in API associated industries, operate a wide variety of rotating equipment configurations. Such equipment has probably been commissioned over the last few decades, by a range of original equipment manufacturers.

Even with an exacting API 682 mechanical seal specification, customer on-site preference, physical equipment restrictions and even plant worldwide location, dictates what type of mechanical seal configuration is installed.

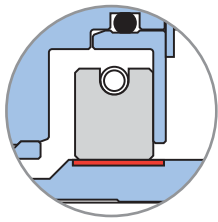
The AESSEAL® API Type A, B and C single seal range offer the user an unprecedented range of API engineered sealing solutions to suit ALL application requirements.

The modular design allows the user to select the right solution for their application, without being unduly penalized with either extortionate seal prices or long delivery times.

Design Feature	A1	A1-D	A2	A2-D
Rotary Seal				
Stationary Seal	•	•	•	•
Multi Spring Pusher Seal	•	•	•	•
Bellows Seal				
Deflector		•		•
Segmental Bush			•	•
Restrained Stationary				
Multi-port Flush	•	•	•	•
*API 682 Spec. Designation	1CW-FL		1CW-FL	

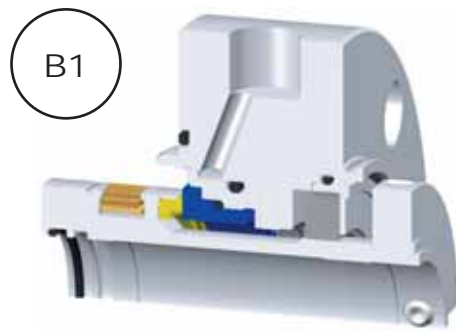
*The CAPI™ 610 & 682 is offered with either a floating plain bush or a segmental throttle bush and hard plated sleeve.

**The A3 seals are designed and made to order only (8 - 10 week lead time).



Segmental Bush

With the exception of the A1 and B1 designs all seals are supplied with a segmental throttle bush as standard.



B1

Type B & C Variants

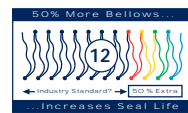
In accordance with the API 682 specification, the AESSEAL® CAPI™ Type B seal range is offered as a rotating metal bellows design.

The engineered modularity ensures Type B seals are also available with a variety of options, including restrained or pressure balanced stationary seat, deflector and a segmental throttle bush.

Again in accordance with the specification, CAPI™ Type C seals are offered as a stationary metal bellows design.

Type C designs are commonly used on high temperature applications, therefore all elastomers have been replaced with graphite rings.

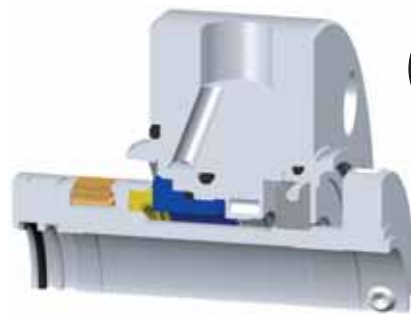
Furthermore, the deflector, segmental bush and hard plated sleeve are offered as standard (C2) since Type C seals commonly require a steam barrier system.



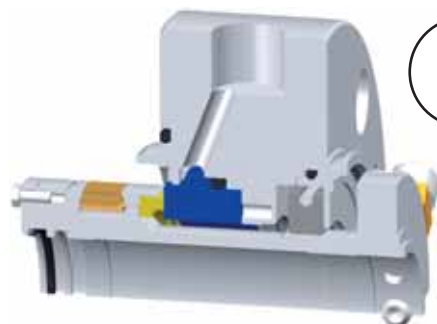
Bellows Design

12 Bellows Convolutions - Many (not all) mechanical seal suppliers produce edge welded metal bellows with an 8 convolute stack. AESSEAL® produces a 12 convolute bellows as standard. With more convolutions the less stress there is on each convolute in the bellows stack. **Maximum convolutions means maximum seal life.**

The AESSEAL® CAPI™ 610 & 682 range of seals utilize the proven standard technology of the modular AESSEAL® bellows seal range. Note: Alloy 718 bellows are made to order only.



B2



B3

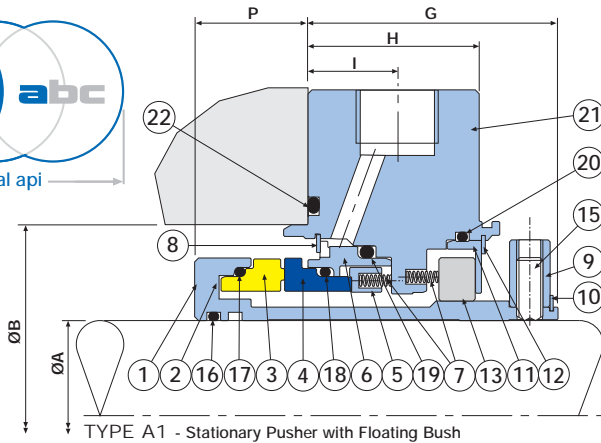
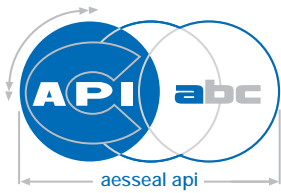
CAPI™ 610 & 682 Seal Type									
**A3	**A3-D	B1	B1-D	B2	B2-D	B3	B3-D	C2	
•	•	•	•	•	•	•	•	•	
•	•							•	
		•	•	•	•	•	•	•	
•	•			•	•	•	•	•	
•	•			•	•	•	•	•	
•	•	•	•	•	•	•	•	•	
1CW-FL		1CW-FL		1CW-FL		1CW-FL		1CW-FL	

* floating segmented bush. 1CW-FX = Fixed bush option is not available. (lead time).

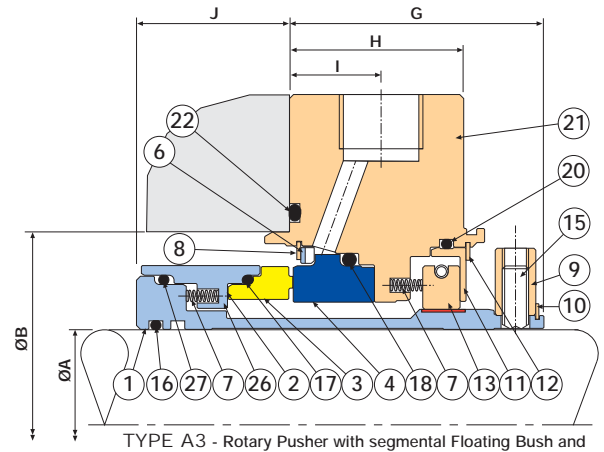
Seal Face Drive

The AESSEAL® CAPI™ 610 & 682 range of mechanical seals include a patented seal face drive design. This reduces the possibility of seal face cracking in arduous conditions.

Modularity

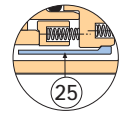
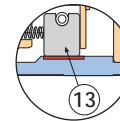
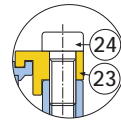
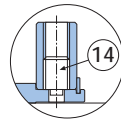


TYPE A1 - Stationary Pusher with Floating Bush



TYPE A3 - Rotary Pusher with segmental Floating Bush and mechanically restrained stationary

ITEM	DESCRIPTION	MATERIAL
1	Sleeve	316L Stainless Steel
2	Drive Pin	316 Stainless Steel
3	Rotary Face	Ant. Carbon - RB SIC
4	Stationary Face	SIC
5	Spring Plate	316L Stainless Steel
6	Stat Holder/Flow Ring	316L Stainless Steel
7	Springs	Alloy 276
8	Circlip	316L Stainless Steel
9	Clamp Ring	316L Stainless Steel
10	Circlip	Stainless Steel
11	Spool Carrier	316L Stainless Steel
12	Circlip	Stainless Steel
13	Throttle Bush	Carbon
14	Anti Tamper Screw	Stainless Steel
15	Drive Screw	Nickel Plated Carbon Steel
16	Sleeve O Ring	Viton® - EPR® - Kalrez® - Aflas®
17	Rotary O Ring	Viton® - EPR® - Kalrez® - Aflas®
18	Stationary O Ring	Viton® - EPR® - Kalrez® - Aflas®
19	Stat Holder O Ring	Viton® - EPR® - Kalrez® - Aflas®
20	Spool O Ring	Viton® - EPR® - Kalrez® - Aflas®
21	Gland	316L Stainless Steel
22	Gland O Ring	Viton® - EPR® - Kalrez® - Aflas®
23	Setting Clip	Phosphor Bronze
24	Clip Screw	Stainless Steel
25	Deflector (-D variants)	316L Stainless Steel
26	Rotary Holder	316L Stainless Steel
27	Rotary Holder O Ring	Viton® - EPR® - Kalrez® - Aflas®

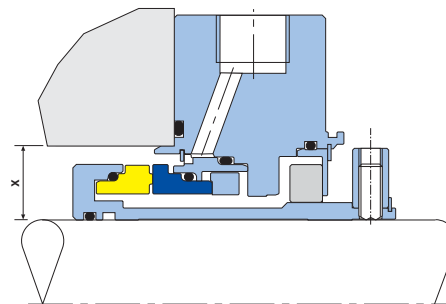


Segmented Bush Option

Deflector Option

A3 designs:
8-10 week
lead time.

API 610 Version 7 Modularity



Seal Size	x (minimum)
<2.250" (57mm)	= 0.875" (22mm)
>2.250" - 3.250" (57-82mm)	= 1.000" (25.4mm)
>3.250" (82mm)	= 1.125" (28.5mm)

The highly modular AESSEAL® CAPI™ 682 seal range is also modular to API 610 Version 7 specification. API 610 v7 pumps have a smaller radial cross section to that of API 610 v9 and API 682.

The table below is a GUIDE ONLY and illustrates the minimum radial cross section for API 601 v7 pumps.

CAPI™ 682 & API 610 Version 8 Dimensional Information

The API 682 specification indicates full seal dimensional details for metric shaft sizes only. The CAPI™ 610 & 682 metric dimension table below conforms to both API 682 and API 610 v9 specifications in their entirety.

Since the inboard and outboard lengths of the seal are not defined by the API specification, these could change for each manufacturer.

For the above reason, CAPI™ 610 & 682 glands are NOT inventoried as standard. The gland dimensions are shown to provide a guide to the sizes that AES wish to offer. THESE ARE SUBJECT TO CHANGE DEPENDING ON THE OEM EQUIPMENT DIMENSIONS.

Full dimensional information for imperial shaft sizes are not detailed.

Contact AESSEAL® Technical Department for all API imperial shaft enquiries.

Product availability key

= Planned inventory items, subject to demand.

= Typically 2 - 4 week lead time.

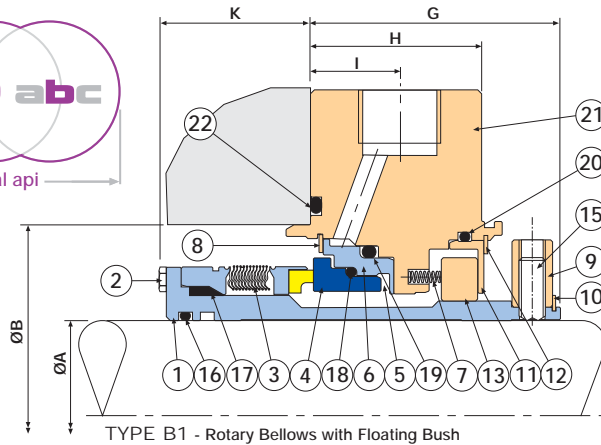
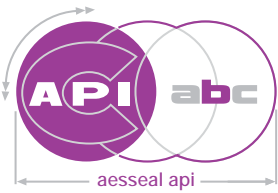
= Made to order only. Lead time 6+ weeks

CAPI™ 610 & 682 Metric size chart

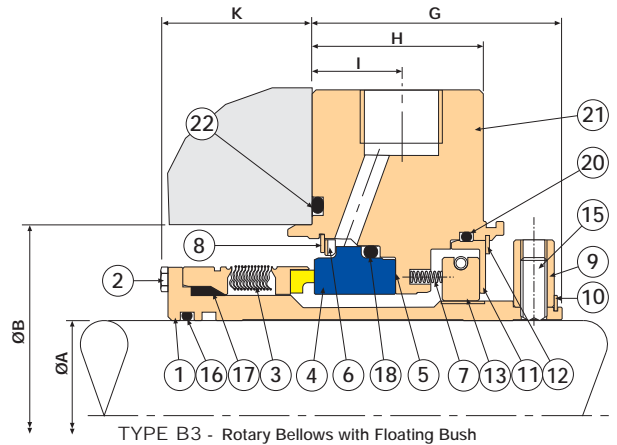
Seal Size	ØA	ØB	ØC	ⓓ*	ⓔE	ⓕF*	G	H	I	J	K	L	M	ØN	P	ⓐ*
20mm	20.0	70.0	130.0	3/8" NPT	M12	1/2" NPT	65.0	44.5	23.4	40.0	35.0	62.0	80.0	105.0	30.0	3/8" NPT
30mm	30.0	80.0	140.0	3/8" NPT	M12	1/2" NPT	65.0	44.5	23.4	40.0	40.0	62.0	80.0	115.0	30.0	3/8" NPT
40mm	40.0	90.0	150.0	3/8" NPT	M12	1/2" NPT	65.0	44.5	23.4	40.0	40.0	62.0	80.0	125.0	30.0	3/8" NPT
50mm	50.0	100.0	170.0	3/8" NPT	M16	1/2" NPT	65.0	44.5	23.4	40.0	40.0	62.0	80.0	140.0	30.0	3/8" NPT
60mm	60.0	120.0	190.0	3/8" NPT	M16	1/2" NPT	65.0	44.5	23.4	40.0	47.0	70.0	80.0	160.0	30.0	3/8" NPT
70mm	70.0	130.0	200.0	3/8" NPT	M16	1/2" NPT	65.0	44.5	23.4	42.0	49.0	72.0	80.0	170.0	30.0	3/8" NPT
80mm	80.0	140.0	210.0	3/8" NPT	M16	1/2" NPT	70.0	44.5	23.4	42.0	49.0	72.0	87.0	180.0	30.0	3/8" NPT
90mm	90.0	160.0	240.0	3/8" NPT	M20	1/2" NPT	70.0	44.5	23.4	42.0	49.0	72.0	87.0	205.0	30.0	3/8" NPT
100mm	100.0	170.0	250.0	3/8" NPT	M20	1/2" NPT	70.0	44.5	23.4	42.0	49.0	72.0	87.0	215.0	30.0	3/8" NPT
110mm	110.0	180.0	260.0	3/8" NPT	M20	1/2" NPT	70.0	44.5	23.4	42.0	49.0	72.0	87.0	225.0	30.0	3/8" NPT

NOTE-
All A3 and B3 designs are on a 8-10 week lead time.

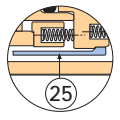
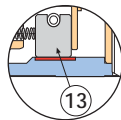
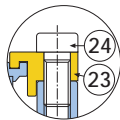
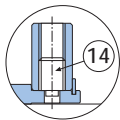
*Ports can be designed to customer requirements



TYPE B1 - Rotary Bellows with Floating Bush



TYPE B3 - Rotary Bellows with Floating Bush and mechanically restrained stationary



Segmented Bush Option

Deflector Option

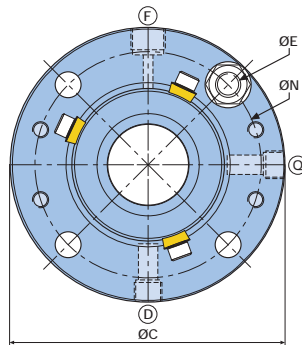
B3 designs:
8-10 week
lead time.

ITEM	DESCRIPTION	MATERIAL
1	Sleeve	316L Stainless Steel
2	Rotary Drive Screws	316 Stainless Steel
3	Rotary Bellows Unit	SHS - HHH - SAC - S7C / Ant. Carbon - RB SiC
4	Stationary Face	SiC
5	Anti Rotation Pins	316L Stainless Steel
6	Stat Holder/Flow Ring	316L Stainless Steel
7	Springs	Alloy 276
8	Circlip	316L Stainless Steel
9	Clamp Ring	316L Stainless Steel
10	Circlip	Stainless Steel
11	Spool Carrier	316L Stainless Steel
12	Circlip	Stainless Steel
13	Throttle Bush	Carbon
14	Anti Tamper Screw	Stainless Steel
15	Drive Screw	Nickel Plated Carbon Steel
16	Sleeve O Ring	Viton® - EPR® - Kalrez® - Aflas®
17	Rotary Wedge	Graphite
18	Stationary O Ring	Viton® - EPR® - Kalrez® - Aflas®
19	Stationary Holder O Ring	Viton® - EPR® - Kalrez® - Aflas®
20	Spool O Ring	Viton® - EPR® - Kalrez® - Aflas®
21	Gland	316L Stainless Steel
22	Gland O Ring	Viton® - EPR® - Kalrez® - Aflas®
23	Setting Clip	Phosphor Bronze
24	Clip Screw	Stainless Steel
25	Deflector (-D variants)	316L Stainless Steel

Further Information

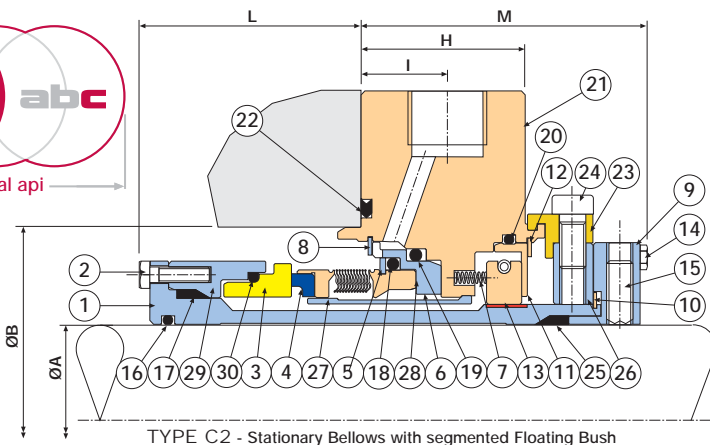
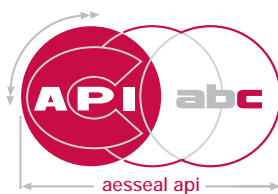
All parts lists show wetted components in 316L stainless steel. Other metallurgies such as DIN 1.4462 and Alloy 255 are available on request.

Specific CAPI™ 682 designs are available to suit certain OEM pieces of rotating equipment. Log on to www.aesseal.com and review the "applications - partners section" to find out more about this developing range.



AVAILABLE BELLOWS METALLURGIES

SHS	Stainless / Alloy 276 / Stainless
HHH	Alloy 276 / 276 / 276
SAC	Stainless / AM350 / Alloy 42
S7C	Stainless / Alloy 718 / Alloy 42
* Alloy 718 Metal Bellows are made to order only.	



TYPE C2 - Stationary Bellows with segmented Floating Bush

Type B, but more particularly Type C seals are generally employed for high temperature duties. An alternative to sealing high temperatures is to reduce the temperature with an appropriate API system plan.

AESSEAL® offer API plan 23 "bolt-on" adaptations for ALL Type B and Type C designs. It should be noted that the AESSEAL® patented bi-directional plan 23 pumping scroll must be used in conjunction with an appropriate AESSEAL® adapter plate.

ITEM	DESCRIPTION	MATERIAL
1	Sleeve	316L Stainless Steel
2	Rotary Drive Screws	316 Stainless Steel
3	Rotary Face	SiC
4	Stationary Bellows Unit	SHS - HHH - SAC - S7C / Ant. Carbon - RB SiC
5	Retaining Ring	316L Stainless Steel
6	Stationary Holder	316L Stainless Steel
7	Springs	Alloy 276
8	Circlip	316L Stainless Steel
9	Clamp Ring	316L Stainless Steel
10	Circlip	Stainless Steel
11	Spool Carrier	316L Stainless Steel
12	Circlip	Stainless Steel
13	Throttle Bush	Carbon
14	Clamp Screws	Stainless Steel
15	Drive Screw	Nickel Plated Carbon Steel
16	Sleeve O Ring	Viton® - EPR® - Kalrez® - Aflas®
17	Rotary Wedge	Graphite
18	Stationary Wedge	Graphite
19	Stat Holder Wedge	Graphite
20	Spool O Ring	Viton® - EPR® - Kalrez® - Aflas®
21	Gland	316L Stainless Steel
22	Gland Gasket	316L Graphite
23	Setting Clip	Phosphor Bronze
24	Clip Screw	Stainless Steel
25	Shaft Wedge	Graphite
26	Clamp Back Up Ring	316L Stainless Steel
27	Deflector	316L Stainless Steel
28	Stationary Bellows Screws	316 Stainless Steel
29	Rotary Holder	Alloy 42
30	Wedge	Graphite

API Seal Support Systems

It would be inappropriate to produce an industry leading range of seals only to be let down by the quality of seal support systems. For these reasons, AESSEAL® has designed a range of Lloyds certified, API seal support systems which work in harmony with the CAPI™ 610 & 682 seal range.

They are also based around the modular principle of the AES-15™ and AES-28™, vessels which can be adapted to suit on site specifications using a range of add-on instrumentation packages. For more information on the options available order the API systems brochure. This and other brochures can be ordered from marketing@aes seal.com or downloaded from our website at www.aes seal.com.



CAPI™ 610 & 682 Dual

As well as the CAPI™ 610 & 682 dual range there is also a CAPI™ 610 & 682 dual range available. Based around the same modular technology the dual range it consists of many rotary and stationary pusher and bellows designs with hydraulically balanced seal faces.



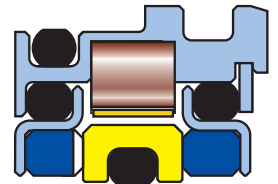
For more information or to download this brochure contact marketing@aes seal.com or visit www.aes seal.com.



API Bearing Protectors

The MagTecta OM™ is designed specifically for oil mist recirculation, the modern API compliant and environmentally friendly option to lubricate bearings.

For more information or to download this brochure contact marketing@aes seal.com or visit www.aes seal.com.



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INVESTOR IN PEOPLE



USE DOUBLE MECHANICAL SEALS WITH HAZARDOUS PRODUCTS. ALWAYS TAKE SAFETY PRECAUTIONS:

- GUARD YOUR EQUIPMENT
- WEAR PROTECTIVE CLOTHING



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