FLOWSERVE

Repair Instructions

ISC2

Dual pusher seal



Experience In Motion

1 Nomenclature

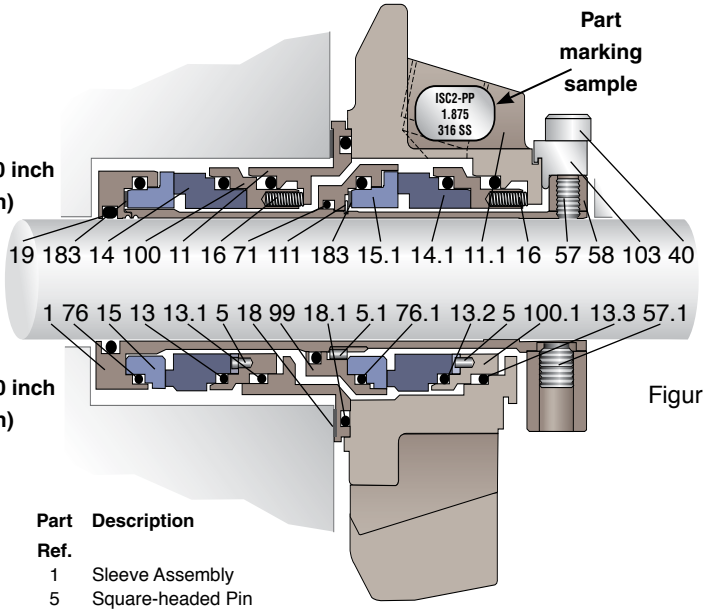


Figure 1

Part Ref.	Description
1	Sleeve Assembly
5	Square-headed Pin
5.1	Drive Pin
11	Inner Gland
11.1	Outer Gland
13	Inboard Seat Gasket O-ring
13.1	Inboard Seat Gasket O-ring
13.2	Outboard Seat Gasket O-ring
13.3	Outboard Seat Gasket O-ring
14	Inboard Stationary Face
14.1	Outboard Stationary Face
15	Inboard Rotating Face
15.1	Outboard Rotating Face
16	Springs
18	Gland Gasket
18.1	Inner Gland O-ring
19	Sleeve Gasket O-ring
40	Cap Screw
57	Cup-point Set Screw
57.1	Quarter-dog Set Screw
58	Drive Collar
71	Rotating Face Support O-ring
76	Inboard Rotating Face O-ring
76.1	Outboard Rotating Face O-ring
99	Rotating Face Support
100	Inboard Stationary Face Support
100.1	Outboard Stationary Face Support
103	Setting Device
111	Snap Ring
183	Vibration Dampener

Part references in this document are denoted in square parenthesis, e.g. [15]

Refer to the Bill of Material for proper placement of material-specific components.

Notes for all seal sizes:

- Inboard and outboard stationary faces [14] and [14.1] are interchangeable.
- Inboard and outboard rotating faces [15] and [15.1] are interchangeable.
- Inboard and outboard stationary face supports [100] and [100.1] are interchangeable.
- O-rings [13], [13.1], [13.2], [13.3], [76] and [76.1] are interchangeable.

2 Disassembly

When disassembling the seal, inspect for conditions which may have caused the seal to be removed from service. If seal was removed due to premature failure, determine what conditions caused that failure and correct any problems prior to returning the repaired seal to service. For assistance with seal failure analysis, please contact your Flowserve representative.

3 Repair or Replace Guide

Seal parts that are always replaced

- Inboard and outboard stationary faces [14] and [14.1]
- Inboard and outboard rotating faces [15] and [15.1]
- Springs [16]
- Square-headed pin [5]
- Rotating face support drive pin [5.1], sizes > 2.750 inch (70 mm)
- Inboard and outboard stationary face supports [100] and [100.1]
- All O-rings [13], [13.1], [13.2], [13.3], [76], [76.1], [71], [18.1] and [19]
- Gland gasket [18]
- Vibration dampeners [183]
- Snap ring [111], sizes ≤ 2.750 inch (70 mm)
- Setting devices [103] and cap screws [40]
- Cup-point [57] and quarter-dog set screws [57.1]

Seal parts that are reconditionable

- Inner gland [11]
- Outer gland [11.1]
- Sleeve assembly [1]
- Rotating face support [99]
- Drive collar [58]

4 Inspection and Reconditioning

There are certain critical areas of each part where special attention should be paid to the condition. If any of the listed areas show signs of wear, corrosion or other defects that cannot be removed without affecting the dimensional size of the surfaces by more than 0.001 - 0.002 inch [0.025 - 0.05 mm], then the respective part should be replaced. If grit blasting is performed, polish the O-ring surfaces to achieve the required surface finish [see critical area listings for finish requirements]. If any parts require machining to correct damage, please contact your Flowserve representative for dimensional requirements, or for any other questions regarding repair.

4.1 **Outer gland assembly** [11.1] see Figures 2a and 2b.

A Stationary face O-ring surfaces - Inspect for wear, nicks, scratches or corrosion. Required surface finish: 63 RMS

B Gasket surface - Remove the old gasket and clean the gasket surface. Inspect for nicks, scratches or corrosion.

C Pipe ports and lifting holes - Inspect for damaged threads or corrosion. Re-tap as necessary.

D Drive pins - Inspect for wear or corrosion. Note: sizes above 2.750 inch (70 mm) do not have pins in the gland.

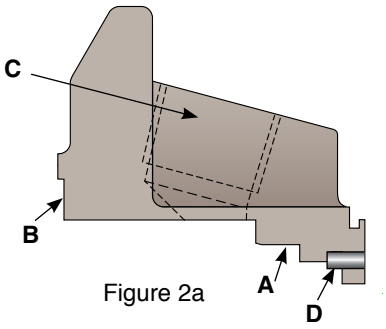


Figure 2a

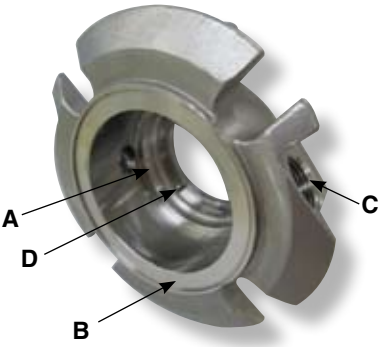


Figure 2b

4.2 **Sleeve assembly** [1] see Figures 3 and 4.

A O-ring surfaces - Inspect for wear, nicks, scratches or corrosion. Required surface finish: 63 RMS.

B Drive flats - Inspect for wear or corrosion.

C Drive end roundness - No greater than 0.001 inch (0.025 mm) TIR (Total Indicated Reading) at point C.

D Inspect ID of sleeve at weld point for corrosion, sizes ≤ 2.750 inch (70 mm).

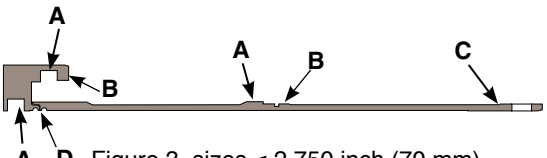
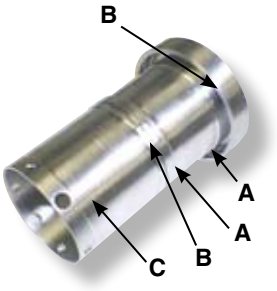


Figure 3, sizes ≤ 2.750 inch (70 mm)



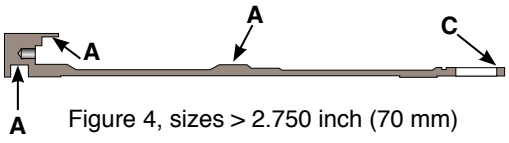
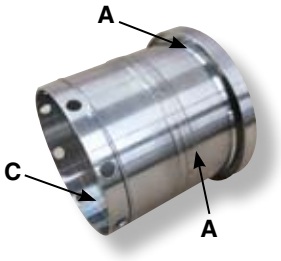


Figure 4, sizes > 2.750 inch (70 mm)



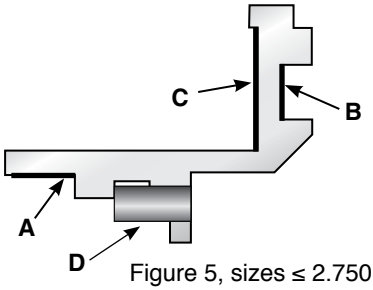
4.3 **Inner gland** [11] see Figures 5 and 6.

A Dynamic O-ring surface - Inspect for wear, fretting, nicks, scratches or corrosion. Required surface finish: 32 RMS

B Gland O-ring surface - Inspect for wear, nicks, scratches or corrosion. Required surface finish: 63 RMS.

C Gasket surface - Remove old gasket and clean surface. Inspect for nicks, scratches or corrosion.

D Drive pins - Inspect for wear or corrosion. Note: sizes > 2.750 inch (70 mm) do not have pins in the gland.



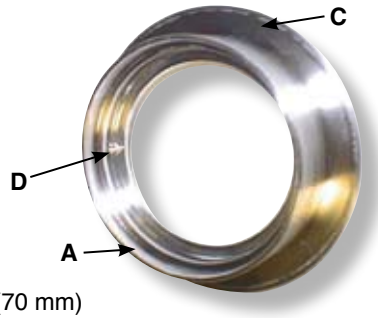
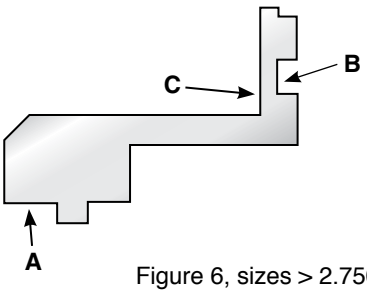


Figure 5, sizes ≤ 2.750 inch (70 mm)



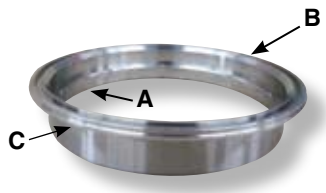


Figure 6, sizes > 2.750 inch (70 mm)

4.4 **Rotating face support** [99] see Figures 7 and 8.

A O-ring surfaces - Inspect for wear, nicks, scratches or corrosion. Required surface finish: 63 RMS.

B Pumping vanes - Inspect for wear, damage or corrosion.

C Drive flats or pin holes - Inspect for wear, indentation or corrosion.

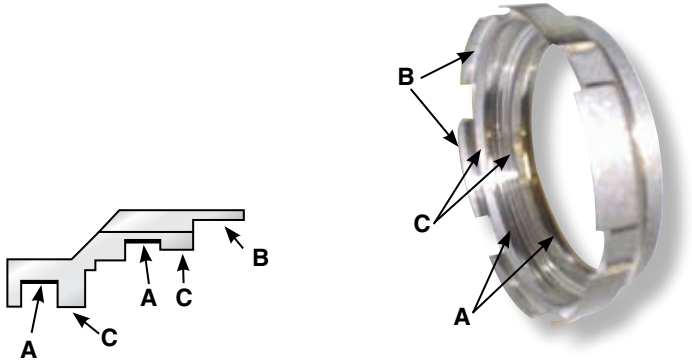


Figure 7, sizes ≤ 2.750 inch (70 mm)

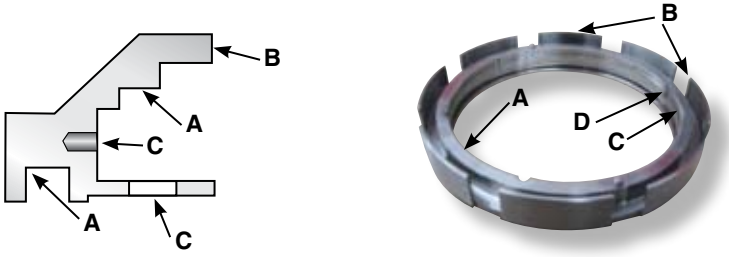


Figure 8, sizes > 2.750 inch (70 mm)

4.5 **Drive collar** [58] see Figure 9.

A Threaded holes - Inspect for thread damage and re-tap as necessary.

B ID bore roundness - No greater than 0.002 inch (0.05 mm) TIR.

C Set screws - Replace cup-point and quarter-dog set screws with those included with the repair kit. Make sure the same threaded holes are used.

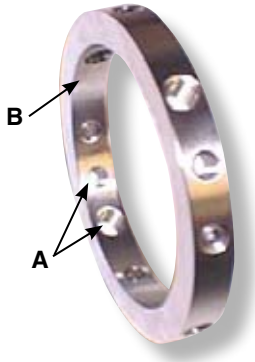


Figure 9

5 Seal Assembly Preparation

Tools Needed:

- Sizes ≤ 2.750": 3/16", 1/8" hex key wrenches
- Sizes > 2.750": 1/8", 3/16" and/or 7/32" hex key wrenches
- Sizes ≤ 65 mm: 3 mm hex key wrench
- Sizes > 65 mm: 5 mm hex key wrench for standard bore
- Sizes > 65 mm: 6 mm hex key wrench for enlarged bore
- Silicone grease (included in repair kit)
- Ethyl alcohol and clean, lint-free towel for cleaning seal faces
- Needle nose pliers or tweezers

6 Seal Assembly Instructions

Some assembly steps include blind fits of pins and drive flats. Mark the locations of the pins or drive flats with a felt tip marker, or align the feature with another visible feature on the seal to assist with assembly. All seal faces should be cleaned with ethyl alcohol prior to placing the faces together at each respective step in the assembly process.

6.1 Arrange O-rings by diametrical size. There are four sizes total: quantity 1 of the largest size O-ring [18.1]; quantity 6 of the 2nd largest size O-ring [13], [13.1], [13.2], [13.3], [76], and [76.1]; quantity 1 of the 2nd smallest size O-ring [19]; and quantity 1 of the smallest size O-ring [71]. Prior to installing each O-ring at its respective step, lightly lubricate with silicone grease and stretch slightly.



Figure 10

6.2 Place the sleeve assembly [1] on the work surface with the drive end [set screw holes] positioned upward.

For sizes ≤ 2.750 inch (70 mm) install the vibration dampener [183] into the back counterbore of the sleeve assembly [1]. See Figure 10.

For sizes > 2.750 inch (70 mm) install the square-headed pin [5] into the hole on the counterbore of the sleeve assembly. Cut a 0.25 inch (6 mm) slot in the vibration dampener [183]. See Figure 11. Install into the sleeve assembly [1] with the slot positioned where the drive pin is located.



Figure 11

6.3 Select rotating face O-ring [76] and stretch slightly. Lightly lubricate the O-ring and install it into the sleeve assembly [1]. See Figure 12.



Figure 12

6.4 Select rotating face [15] and lightly lubricate the O-ring surface. Install the rotating face [15] into the sleeve assembly [1]. **Use hand pressure only.** See Figure 13.

For sizes ≤ 2.750 inch (70 mm) ensure that the flats on the rotating face are aligned with the flats on the sleeve.

For sizes > 2.750 inch (70 mm) ensure that the drive slots on the rotating face are aligned with the square-headed drive pin in the sleeve.



Figure 13

6.5 **Check for proper seating of the rotating face by measuring from the back of the sleeve assembly to the face of the rotating face with a caliper or micrometer. Measure in 3 equally spaced locations; measurement variations should not exceed 0.005 inch (0.127 mm).**



Figure 14

6.6 Clean the sealing face of the rotating face [15] to remove any dirt, dust, fingerprints or any other residue using alcohol on a clean cloth or tissue.

6.7 Select O-ring [13] and lightly lubricate it. Install the O-ring onto the stationary face [14]. See Figure 14.



Figure 15

6.8 Select the stationary face support [100] and the square-headed pins [5]. Dab silicone grease on the tip of each pin before inserting into the stationary face support to assist keeping the pins in place. See Figure 15.

6.9 Install the stationary face support [100] onto the stationary face [14], maintaining alignment of the pins in the stationary face support with the slots in the stationary face [14]. Inspect for proper pin engagement. See Figure 16. Note: for ease of installing the stationary face support, a light coating of silicone grease may be applied to the O-ring bore.



Figure 16

6.10 Dab one end of the springs [16] in silicone grease and insert the greased end into the holes in the stationary face support [100]. See Figure 17. Silicone grease helps hold the springs in place but careful handling remains essential.



Figure 17

6.11 Clean the sealing face of the stationary face [14] to remove any dirt, dust, fingerprints or any other residue using alcohol on a clean cloth or tissue.

6.12 Install the stationary face support assembly face down onto the sleeve assembly as shown in Figure 18. Lightly lubricate the area where the stationary face O-ring [13.1] contacts the stationary face support [100].



Figure 18

6.13 Before installing any O-rings in either the inner gland [11] or stationary face support assembly, assemble the two by aligning the pins and the pin slots. Mark both parts in line with a marker or pencil, one on the inner gland [11] OD close to the stationary face support OD and one on the stationary face support [100]. This will provide an alignment guide to the pins during assembly of the seal.



Figure 19

6.14 Select stationary face support O-ring [13.1], stretch slightly and lightly lubricate. Lightly lubricate the area in the inner gland [11] where the O-ring contacts. Install the O-ring into the inner gland [11] as shown in Figure 19.



Figure 20

6.15 Install the inner gland [11] onto the sleeve assembly. See Figure 20. During the installation, ensure that the drive pins in the gland line up with the slots in the stationary face support by aligning the marks from step 6.13.

Caution: Do not rotate the inner gland during installation. This may cause the springs [16] to buckle. Verify the pins are aligned by exercising the inner gland.



Figure 21

6.16 Select inner gland O-ring [18.1] and place it into the O-ring groove located on the inner gland [11]. See Figure 21.

6.17 Select rotating face support O-ring [71], stretch slightly and lightly lubricate. Install the O-ring into the ID groove in the rotating face support [99]. See Figure 22.



Figure 22

6.18 Align the flats on the rotating face support [99] with the flats on the sleeve assembly. Push the rotating face support down until it seats squarely against the shoulder on the sleeve. See Figure 23.



Figure 23

6.19 For sizes ≤ 2.750 inch (70 mm) install the snap ring [111] onto the sleeve assembly into the sleeve groove beneath the rotating face support.

Note: Fully seating the rotating face support [99] on the sleeve assembly [1] will require compressing the springs of the inner seal by pressing down on the inner gland [11.1]. Make sure the snap ring is fully engaged in the groove in the sleeve. See Figure 24.



Figure 24

For sizes > 2.750 inch (70 mm) rotate the flats of the rotating face support [99] in the groove of the sleeve [1]. There are 2 different types of pins used to lock the rotating face support to the sleeve assembly: a button-head pin and a straight pin. If a button-head pin [5.1] is used, align the slot in the rotating face support with the radial hole in the sleeve. Insert the button-head pin into this hole. If straight axial pins [5.1] are used, rotate the rotating face support to align the 2 slots on the sleeve with the 2 slots on the inner diameter of the rotating face support until they form holes. Insert the straight pins [5.1] into these holes. See Figure 25.



Figure 25

6.20 Repeat steps 6.2 through 6.14 to assemble the outboard rotating face [15.1], outboard rotating face O-ring [76.1], and outboard vibration dampener [183] into the sleeve/rotating face support assembly and outboard stationary face support assembly [14.1], [100.1], [5], [16], [13.2], [13.3] into the gland assembly [11.1].

6.21 Place the outer gland assembly face down onto the sleeve assembly. See Figure 26. During the installation, be careful to align the pins with their target slots.

Caution: Do not rotate the gland assembly during installation. This may cause the springs [16] to buckle. Verify the pins are aligned with the slots by exercising the gland.



Figure 26

6.22 Thread set screws [57] and quarter-dog set screws [57.1] in proper, equally spaced locations in the drive collar [58]. Note: some sizes > 2.750 inch (70 mm) do not utilize quarter-dog set screws.

6.23 Install the drive collar [58] onto the sleeve assembly and rotate carefully until the set screws and quarter-dog set screws line up with their respective holes in the sleeve.

6.24 Install setting devices [103] and cap screws [40] onto the drive collar [58], engaging with the gland [11]. See Figure 27.



Figure 27

6.25 Compress the collar to be even with the end of the sleeve assembly. This will also compress the gland and inner gland simultaneously. While holding the collar in compression, tighten the quarter-dog set screws [57.1] into the holes in the sleeve until snug. If the seal does not contain quarter-dog set screws then tighten the set screws [57] into the sleeve [1]. See Figure 28.

Caution: Over tightening will cause distortion of the sleeve assembly [1]. Check integrity of the sleeve with a plug of the appropriate size to ensure no distortion has occurred.



Figure 28

6.26 Install the sleeve O-ring [19] into the ID groove of the sleeve assembly. See Figure 29.

6.27 The cartridge seal assembly is now ready for testing.



Figure 29

6.28 Adhere the gland gasket [18] to the inner gland gasket surface with a spray adhesive such as 3M Super 77®. See Figure 30.

6.29 Permanently mark the seal type ISC2-PP, seal size and gland ring material clearly on the gland surface. See Figure 1 for placement location.



Figure 30

ISC2-PP **1.875** **316 SS**	**ISC2-PP** **M060** **C-276**
Example inch marking	Example metric marking

FLOWSERVE®

TO REORDER REFER TO
B/M #_____
F.O. _____

7 Static Testing

The ISC2 dual rotating bellows seal may be static tested at pressures up to 300 psi [20.6 bar] prior to installation on the equipment. Flowserve manufacturing typically tests the ISC2 at 25 psig [1.7 bar]. To static test the seal, bolt it to a single seal test barrel or to the equipment. Secure the cup-point set screws to the stub shaft or equipment shaft to prevent deformation of the setting devices due to axial loads. The seal can be pressurized through the tangential flush port. If the seal does not pass, according to QP-B.28, the static pressure test, disassemble the seal and inspect for O-ring damage, as this is the most common cause of static test failure.

8 Installation

For installation instructions, reference FIS190eng ISC2 Series.

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