



# *Installation Instructions*

## ***GCX Series***

Single bellows cartridge seal incorporating graphite secondary seals to meet the demands of the chemical processing industry

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## Description

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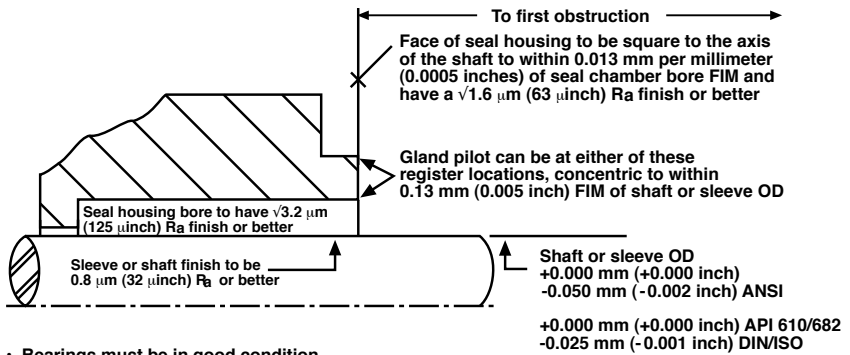
The GCX seal is a cartridge mounted mechanical seal, designed for ease of installation and reliable operation. No seal setting dimensions are required. Removable centering tabs provide proper alignment. The GCX seal is designed for harsh chemical environments where conventional O-ring based seal designs are unsuccessful. Graphite secondary seals are used to provide nearly universal chemical compatibility towards aggressive chemicals. The stationary bellows configuration allows the seal to compensate for inadvertent misalignment of the seal chamber face, and helps to prevent clogging and hang-up of the bellows on the atmospheric side of the seal.

Installation according to the following steps will assure long trouble free life of the seal.

## 1 Equipment Check

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- 1.1 **Follow plant safety regulations** prior to equipment disassembly:
  - **lock out** motor and valves.
  - **wear** designated personal safety equipment.
  - **relieve any pressure** in the system.
  - **consult plant MSDS** files for hazardous material regulations.
- 1.2 **Disassemble equipment** in accordance with equipment manufacturer's instructions to allow access to seal installation area.
- 1.3 **Remove existing mechanical seal and bushing** or compression packing and packing gland.
- 1.4 Make sure the shaft or sleeve and the seal housing face are clean and free of burrs, cuts, dents, or corrosion that might cause leakage past the sleeve gasket or gland gasket. Replace worn shaft or sleeve. Remove sharp edges from keyways and threads.



- Bearings must be in good condition
- Maximum lateral or axial movement of shaft (end play) = 0.25 mm (0.010 inch) FIM
- Maximum shaft runout at face of seal housing = 0.05 mm (0.002 inch) FIM
- Maximum dynamic shaft deflection at seal housing = 0.05 mm (0.002 inch) FIM

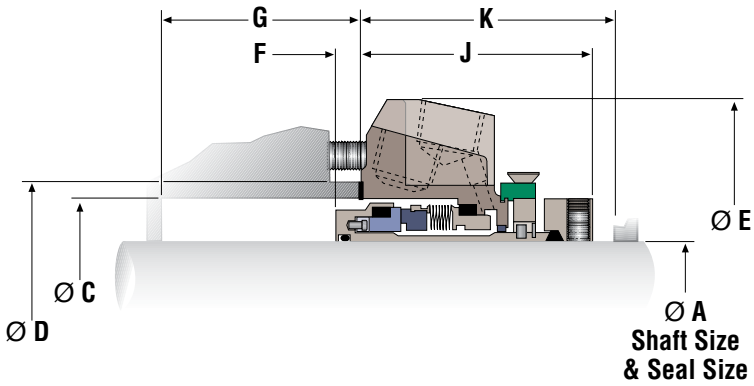
1.5 Check equipment dimensions to ensure that they are within the specifications shown in Figures 1, 2, and 3. Critical dimensions from Figure 2 include:

- Box Bore (dim ØC)
- Box Depth (dim G)
- Distance to First Obstruction (dim K)
- Pump Frame accommodates Gland OD (dim E)

1.6 Check gland bolting to ensure that bolt diameter and bolt circle conform to the dimensions shown in Figure 2 and 3. (dims C & M)

1.7 Handle the GCX with care, it is manufactured to precise tolerances. The sealing faces of the GCX seal are the stationary face and the rotating face. They are lapped flat to within three helium light bands (34.8 millionths of an inch). Keep the seal faces perfectly clean at all times.

**GCX Dimensional Data** in millimeters (inches) - **Standard Bore** Figure 2

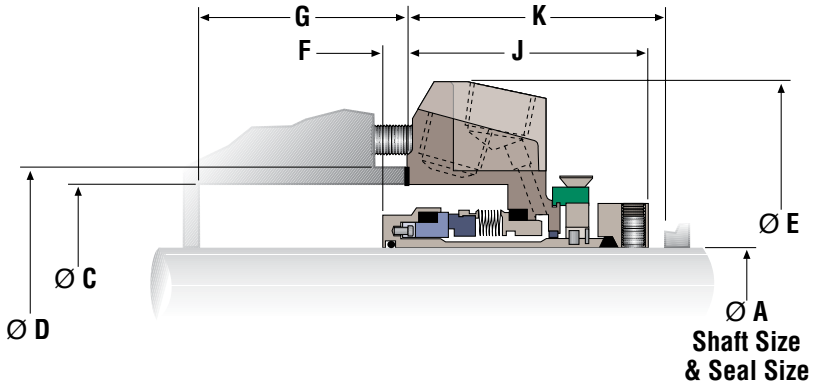


<b>A</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>J</b>	<b>K</b>	<b>L</b>	<b>M</b>	
Shaft & Seal Size	Box Bore Min	Box Bore Max	Gasket OD	Gland OD	Sleeve Penetration	Box Depth Min	Outboard Seal Length	Dist. to Obst Min	Bolt Circle	Bolt Slot Dia.
(1.125)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
33, 35 (1.375)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
44.45 (1.750)	63.5 (2.500)	73.0 (2.875)	80.0 (3.15)	25.5 - 127.0 (4.94 - 5.00)	6.5 (0.256)	8.1 (0.318)	64.3 (2.530)	66.5 (2.620)	98.4 (3.875)	14.3 (0.562)
45, 48 (1.875)	66.7 (2.625)	73.0 (2.875)	80.0 (3.15)	125.5 - 127.0 (4.94 - 5.00)	6.5 (0.256)	8.1 (0.318)	64.1 (2.522)	65.5 (2.580)	98.4 (3.875)	14.3 (0.562)
53 (2.125)	73.0 (2.875)	82.6 (3.250)	89.9 (3.54)	150.9 - 152.4 (5.94 - 6.00)	7.0 (0.275)	8.6 (0.337)	64.3 (2.530)	65.8 (2.590)	112.8 (4.440)	19.1 (0.750)
(2.375)	86.1 (3.388)	95.3 (3.750)	101.2 (3.985)	160.5 - 162.0 (6.32 - 6.38)	7.9 (0.310)	9.4 (0.372)	64.1 (2.522)	66.8 (2.630)	123.8 (4.875)	19.1 (0.750)
Goulds (2.500-)	91.1 (3.587)	92.1 (3.625)	100.1 (3.942)	160.5 - 162.0 (6.32 - 6.38)	16.5 (0.651)	19.2 (0.755)	64.0 (2.521)	66.3 (2.609)	123.8 (4.875)	19.1 (0.750)
IDP (2.500-)	85.7 (3.375)	95.2 (3.750)	100.1 (3.942)	179.3 - 180.8 (7.06 - 7.12)	4.0 (0.158)	5.6 (0.220)	76.6 (3.014)	79.7 (3.139)	155.6 (6.125)	14.2 (0.560)
65 (2.625)	92.1 (3.625)	109.5 (4.312)	117.2 (4.615)	182.6 - 184.2 (7.19 - 7.25)	6.7 (0.264)	8.3 (0.326)	90.1 (3.547)	93.3 (3.672)	142.9 (5.625)	22.2 (0.875)

N/A - The GCX seal is not available in this size configuration

*The images of parts shown in these instructions may differ visually from the actual parts due to manufacturing processes that do not affect the part function or quality.*

**GCX Dimensional Data** in millimeters (inches) - **Enlarged Bore** Figure 3



<b>A</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>J</b>	<b>K</b>	<b>L</b>	<b>M</b>
Shaft & Seal Size	Box Bore Min Max	Gasket OD	Gland OD	Sleeve Penetration	Box Depth Min	Outboard Seal Length	Dist. to Obst Min	Bolt Circle	Bolt Slot Dia.
	53.1 74.0 (1.125) (2.090 2.912)	79.2 (3.120)	112.8 - 114.3 (4.44 - 4.50)	23.9 (0.940)	25.4 (1.000)	49.5 (1.950)	50.3 (1.98)	95.3 (3.750)	11.2 (0.440)
33, 35 (1.375)	63.4 80.3 (2.495 3.162)	85.5 (3.365)	131.8 - 133.4 (5.19 - 5.25)	19.3 (0.760)	20.8 (0.82)	49.5 (1.950)	50.8 (2.000)	101.6 (4.000)	11.2 (0.440)
	88.9 105.5 (1.750) (3.500 4.152)	110.6 (4.355)	163.6 - 165.1 (6.44 - 6.50)	4.2 (0.166)	5.8 (0.228)	66.5 (2.620)	70.3 (2.769)	98.4 (3.875)	14.3 (0.562)
45, 48 (1.875)	92.1 99.2 (3.625 3.907)	104.4 (4.110)	147.8 - 149.4 (5.82 - 5.88)	0.0 (0.000)	0.0 (0.000)	72.5 (2.854)	74.9 (2.947)	127.0 (5.000)	14.3 (0.562)
	53 93.3 117.0 (2.125) (3.870) (4.607)	121.9 (4.800)	176.3 - 177.8 (6.94 - 7.00)	7.0 (0.275)	8.6 (0.337)	64.3 (2.530)	65.8 (2.590)	142.9 (5.625)	19.1 (0.750)
2.375	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Goulds (2.500)	95.2 124.6 (3.750 4.907)	129.9 (5.115)	201.7 - 203.2 (7.94 - 8.00)	12.5 (0.492)	14.0 (0.552)	68.1 (2.680)	71.2 (2.805)	160.4 (6.313)	19.1 (0.750)
IDP (2.500)	95.2 124.6 (3.750 4.907)	129.9 (5.115)	179.3 - 180.8 (7.06 - 7.12)	12.5 (0.492)	14.0 (0.552)	68.1 (2.680)	71.2 (2.805)	155.6 (6.125)	14.3 (0.562)
65 (2.625)	117.5 124.8 (4.625 4.912)	129.9 (5.115)	176.3 - 177.8 (6.94 - 7.00)	0.0 (0.000)	0.0 (0.000)	98.5 (3.879)	101.7 (4.004)	152.4 (6.000)	22.2 (0.875)

N/A - The GCX seal is not available in this size configuration

## 2 GCX Installation

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Note: The GCX seal is shipped with the **sleeve and gland graphite gaskets uninstalled**. These parts must be assembled onto the seal prior to installation of the seal into the pump. **The gaskets are very fragile**; handle with care.

Note: **No seal setting measurements** are needed to install the seal. Instructions are for radially split case end-suction ANSI pumps. Modification of the procedure may be required for other style pumps. Consult your Flowserve Representative.

2.1 **Tools needed** for installation:

- An open end wrench for the gland bolt nuts
- 5/16" open end wrench for the collar bolts
- 3/32" Allen wrench (provided)
- 1/8" Allen wrench (provided)

2.2 Loosen the collar cap screws and **remove the drive collar** from the seal assembly.

2.3 **Install the sleeve gasket** into the drive collar. Do not use any sharp instruments for installation of the gasket. Loosely reattach the collar and gasket assembly to the seal with the collar bolts. See Figure 4.



Figure 4

2.4 **Adhere the gland gasket** to the gland centered on the register. Dabs of silicone grease or a spray adhesive may be used to hold the gasket in place.

2.5 **Lubricate the shaft** or sleeve lightly with silicone lubricant unless otherwise specified.

2.6 Tighten the Centering Tab screws.

2.7 **Install the complete GCX cartridge assembly** onto the shaft or sleeve with the setting devices near the bearing housing. See Figure 5.



Figure 5

2.8 **Install the pump back plate (seal chamber)** and bolt it in place on the bearing frame. See Figure 6.



Figure 6

2.9 **Position the GCX** with the gland tight against the seal chamber face. If equipment conditions allow, position gland with the outlet port or plugged flush port as close to the 12:00 o'clock position as possible. See Sections 3 and 4 for further piping considerations. Otherwise turn the gland so that the vent tap is as close to the 12:00 o'clock position as possible so that the flush piping will clear the bearing frame.

**Caution:** Setting devices should not be removed or loosened before tightening the gland bolts and tightening the set screws to the shaft.

**Tighten the gland nuts** evenly in a diagonal sequence. Do not over tighten the gland nuts, as this can warp seal parts and cause leakage. The suggested GCX gland nut torque values are as follows for seals with these shaft sizes:

20 N-m	(15 ft-lbs)	27 N-m	(20 ft-lbs)
33 mm	(1.125 inch)	53 mm	(2.125 inch)
	to		to
48 mm	(2.000 inch)	65 mm	(2.625 inch)

2.10 **Assemble the pump.** Avoid pipe strain. Align coupling properly.

2.11 With the impeller, shaft, coupling, and bearings in their final operating positions, **tighten the collar bolts** evenly to compress the sleeve gasket. Tighten until the gap between the drive collar and the adjusting collar is 3/32" for sizes 33 - 65 mm (1.000 to 2.500 inch), and 1/8" for the 2.625 inch seal size. This gap can be checked with the supplied Allen wrenches by inserting the wrenches between the collars and matching the width across the flats to the gap. The gap should be even, and all of the collar bolts should be tight. See Figure 7.

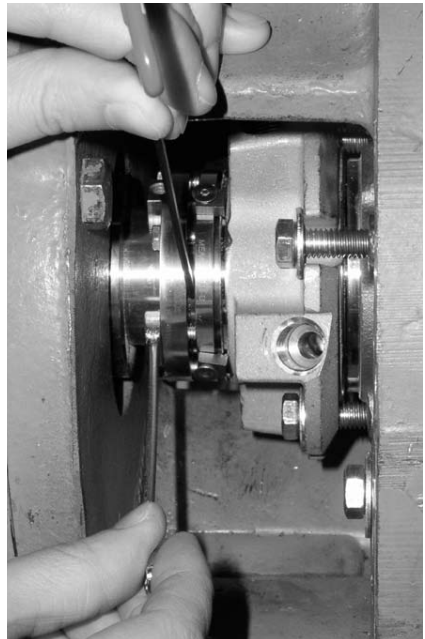


Figure 7



**2.12 Tighten the set screws.** See Figure 8.

Suggested minimum torque values for set screws are as follows:

Shaft Size	Set Screw Size	in-lbs
33 - 53 mm (1.125 - 2.500 inch)	1/4"	5.6 N-m (50 in-lbs)
65 mm (2.625 inch)	5/16"	10.4 N-m (92 in-lbs)

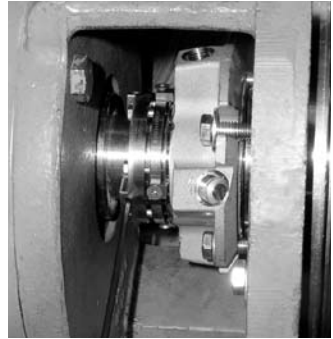


Figure 8

**Note:** If the equipment shaft has a hardness of greater than 84 Rockwell B (162 Brinell), consult your Flowserve Representative for alternate set screw material recommendations.

**2.13 Remove the setting devices**

from the sleeve collar.  
See Figure 9. Save the tabs and fasteners for future use when the pump impeller is reset or when the seal is removed for repairs.

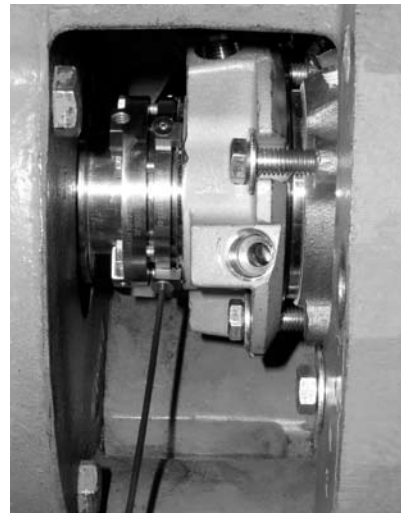


Figure 9

**2.14 Turn the shaft** by hand to ensure unobstructed operation.

**2.15 See Operational Recommendations** before start-up.

### 3 Single Seal Piping and Operational Recommendations

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- 3.1 Install an adequate seal flush system. The GCX requires a clean cool environment for maximum seal life. With a clean cool product, use a bypass flush from the pump discharge (Plan 11) or a bypass flush to the pump suction (Plan 13). With clean hot products use a bypass flush through a cooler (Plan 21). With abrasive products or products that are incompatible with the seal, use a flush from a clean external source (Plan 32). Consult your Flowserve Representative for assistance with choosing the appropriate flush system.
- 3.3 Taps in the gland are quench and drain ports used for fluid quenching, Plan 62. If they are not used, they should be plugged with pipe plugs.
- 3.4 Remove lock outs on pump and valves.
- 3.5 Do not start up the equipment dry to check motor rotation or for any other reason. Open valves to flood pump with product fluid. Ensure that the seal flush system is operating. Vent air from the casing of the pump and the seal chamber before start-up.
- 3.6 Observe the start-up. If the seal runs hot or squeals, check the seal flush system. Shut down the equipment immediately if the seal becomes hot or squeals.

### 4 Operational Recommendations

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- 4.1 **Do not exceed corrosion limits.** The GCX is designed to resist corrosion by most chemicals. However, do not expose the GCX materials of construction to products outside of their corrosion limits. The GCX assembly drawing lists the materials of construction. Consult your Flowserve Representative for chemical resistance recommendations.
- 4.2 **Do not exceed the recommended maximum pressure and speed limits** of 13.8 bar (200 psi) and of 3600 rpm.
- 4.3 **Do not exceed the temperature limit** of 204°C (400°F).
- 4.4 **Do not start up or run the GCX dry.** Process fluid must be in the pump volute at all times during seal operation.

For special problems encountered during installation, contact your nearest Flowserve Sales and Service Representative or Authorized Distributor.

## 5 Repair

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This product is a precision sealing device. The design and dimension tolerances are critical to seal performance. Only parts supplied by Flowserve should be used to repair a seal. To order replacement parts, refer to the part code and B/M number. A spare backup seal should be stocked to reduce repair time.

When seals are returned to Flowserve for repair, **decontaminate the seal assembly** and include an order marked "**Repair or Replace.**" **A signed certificate of decontamination** must be attached.

**A Material Safety Data Sheet (MSDS) must be enclosed** for any product that came in contact with the seal. The seal assembly will be inspected and, if repairable, it will be rebuilt, tested, and returned.



TO REORDER REFER TO  
B/M # \_\_\_\_\_  
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