



# *Installation Instructions*

## ***Pac-Seal™ Type 21 and Type 31***

Mechanical Shaft Seal

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## Description

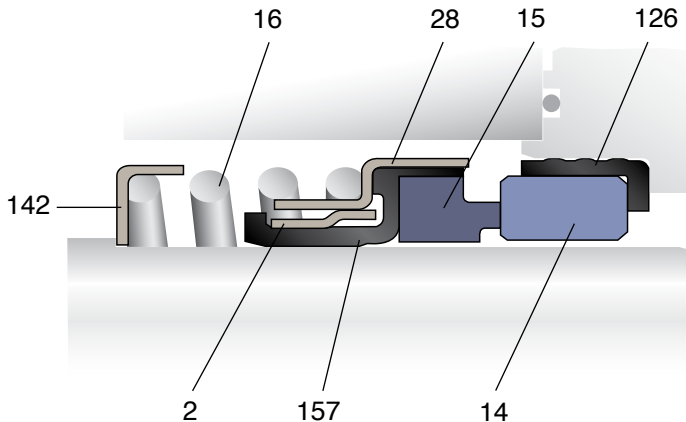
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Pac-Seal Types 21 and 31 feature uniquely designed crimped heads and hex-torque drive systems that provide a solid engineered advantage over other seal types. The Type 31 is the Pac-Seal designation for the Type 21 seal with hard face combination. Generally these are reserved for severe duty applications, in the Type 21 design envelope. Both Types 21 and 31 are available in double seal configurations and balanced versions.

### Type 21 and Type 31 Nomenclature

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Figure 1



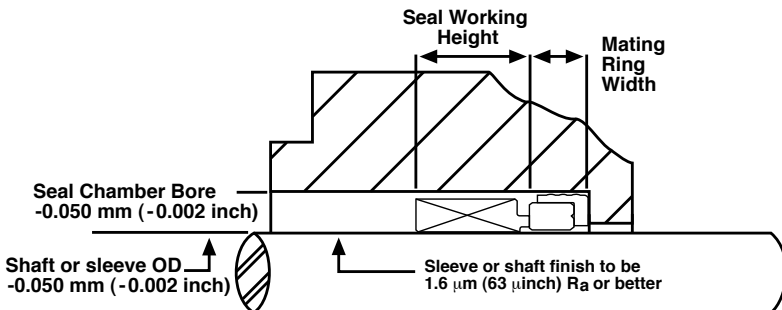
Part Reference	Description
2	Seal Drive/Drive Band
14	Stationary Face/Mating Ring
15	Rotating Face/Primary Ring
16	Spring
28	Shell
126	Gasket/Elastomer Cup/Cup Gasket
142	Retainer/Spring Retainer
157	Bellows Diaphragm/ Elastomer Bellows

# 1 Equipment Check

- 1.1 Follow plant safety regulations prior to equipment disassembly including, but not limited to, the following:
  - 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 pump in accordance with equipment manufacturer's instructions and remove sealing arrangement.
- 1.3 Check Seal documentation for seal design and materials of construction.
- 1.4 Check shaft or pump sleeve outer diameter (OD), seal working height, mating ring width, and seal chamber bore to ensure they are dimensionally within the tolerances shown on the seal assembly drawing. See Figure 2.

## Seal Chamber Requirements

Figure 2



- Bearings must be in good condition
- Maximum lateral or axial movement of shaft (end play) =  $0.25 \text{ mm}$  ( $0.010 \text{ inch}$ ) FIM
- Maximum shaft runout at face of seal housing =  $0.05 \text{ mm}$  ( $0.002 \text{ inch}$ ) FIM
- Maximum dynamic shaft deflection at seal housing =  $0.05 \text{ mm}$  ( $0.002 \text{ inch}$ ) FIM
- Verify proper shaft and bore lead in chamfers are present and within specifications. Difficulty and damage can be observed during seal installation without proper lead in chamfers.

- 1.5 Thoroughly inspect and clean the seal chamber and shaft or pump sleeve. Inspect for corrosion or any defects. Remove all burrs, cuts, dents or defects that might damage gaskets or allow a leak path. Replace worn shaft or pump sleeve.
- 1.6 Check equipment requirements as described in Figure 2. Any measurement different than what is allowed must be brought within specifications.
- 1.7 Handle the seal with care; it is manufactured to precise tolerances. The seal faces are of special importance and should be kept perfectly clean at all times.

## 2 Type 21 and Type 31 Installation

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- 2.1 Lubricate the shaft or sleeve lightly. Use a water-based lubricant (Pac-Ease recommended). If Pac-Ease is not available use a solution of liquid dish soap in water as lubricant. **Note:** Never use grease or oil as an installation lubricant. Oil used to lubricate the elastomer bellows/cup gasket will significantly reduce the friction drive or anti-rotation capability of the component.
- 2.2 Lubricate the outer diameter (OD) of the stationary elastomer cup gasket or O-ring with Pac-Ease.
- 2.3 Press the stationary seal seat firmly into counter bore ensuring it is bottomed out and squared to the shaft. This can be hand-pressed or machine-pressed into place taking care to protect the sealing face from direct contact with any metal object. Use a piece of plastic between the face and the press or a plastic installation tool when using a press to install the seat. Additional care must be taken during the stationary seat assembly to assure the O-ring or cup gasket is not cut.

- 2.4 Lubricate inner diameter (ID) of the rotating seal head elastomer bellows with Pac-Ease. **Note:** For smaller diameter seals it may be easier to lubricate the shaft.
  
- 2.5 Clean both rotating and stationary seal faces with a lint free rag and isopropyl alcohol. **Note:** Any oil, grease, assembly lubricant, fingerprints, or other residue from the installation process can cause the seal to leak.
  
- 2.6 Slide the rotating seal head by hand along the shaft to a completely parallel contact with the stationary seat. Apply pressure to the back of the metal shell and elastomer bellows. Applying pressure to both metal shell and elastomer bellows is important to minimize stretching of bellows on the shaft relative to rotating seal head. Avoid extreme installation pressure or hammering of the seal.
  - 2.6.1 For back-first installations apply pressure to the outer diameter of the seal. Whenever possible even pressure should be applied to the outer diameter of the seal face, bellows, and outer shell to provide proper installation. Care should be taken not to apply pressure directly to the sealing surface of the seal face to avoid any possible damage. Press the assembly until the back side of the spring (or spring retainer if applicable) is flush and parallel to the equipment. Clean both rotating and stationary seal faces with a lint free rag and isopropyl alcohol. **Note:** Any oil or grease on the seal faces may cause the seal to leak.
  
- 2.7 Install spring and spring retainer (if applicable) over shoulder of metal outer shell. Make sure spring correctly engages shoulder of seal head and impeller shoulder or spring shaft retainer.

### **3 Type 21 and Type 31 Operational Recommendations**

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- 3.1 Remove lock outs on equipment and valves.
- 3.2 Do not start up the pump dry to check motor rotation or for any other reason. Open valves to flood pump with product fluid. Vent air from the casing of the pump and the seal chamber before start-up.
- 3.3 Observe the start-up. If the seal runs hot or squeals do not allow the pump to run for any extended time.
- 3.4 The seal is designed to resist corrosion through proper material selection. Do not expose the seal materials of construction to products outside of their corrosion limits. Consult Flowserve for chemical resistance recommendations.
- 3.5 Do not exceed pressure and speed limits established for the seal.
- 3.6 Do not exceed the temperature limits of the seal based on the materials of construction.





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