

Foremost Industries Model PD6-2 Floating Cushion Sub

Table of Contents

| | |
|---|-------|
| Model PD6-2 Features and Benefits | Pg. 2 |
| Model PD6-2 Specifications / Parts List | Pg. 3 |
| Model PD6-2 Maintenance Schedule | Pg. 4 |
| Model PD6-2 Operating Parameters | Pg. 5 |
| Model PD6-2 Rebuilding Procedure | Pg. 6 |
| Model PD6-2 Assembly Schematic | Pg. 7 |

Floating Cushion Sub Model PD6 - 2

The Floating Cushion Sub Model PD6-2 is designed to be installed on rotary drills below the top drive as a shock absorbing, thread saving and maintenance reduction device. It is available with all the popular thread configurations for drill pipe and steel up to and including six (6") diameters.

The telescopic action of the piston permits the drill operator to rapidly make-up and breakout threaded connections with minimal axial loading and no thread damage. In tension or compression, the transmission of axial vibrations created by the bit or D.T.H. hammer are minimized.

Features

- Minimum maintenance required
- 100% transmission of torque and breakout forces
- No air restriction through the body
- Field rebuildable with an inexpensive seal and cushion kit
- No modifications to drill required

Benefits

- Combines the benefit of a shock dampener with a floating spindle
- Telescopic action reduced thread damage during multi-pass drilling operations
- Reduces shock transmission to the rotary gearbox, promoting longer bearing life and reduced maintenance
- No loss of H.P. to the drill string or bit, positive displacement

Model PD6-2 Floating Cushion Sub General Specifications

| | |
|-----------|-------------------------------|
| Hoist | 125,000 lbs. Proof load |
| Pulldown | 125,000 lbs. Std. Cushion |
| Torque | 12,000 lbs. / ft. |
| Extension | O.A.L. extended 18.75 inches |
| Retracted | O.A.L. retracted 18.00 inches |
| Weight | 165 lbs. |

Model PD6-2 Floating Cushion Sub Parts List

| Item No. | Part No. | No. Req'd | Description |
|----------|--------------|-----------|--|
| 1 | 19-80-291841 | 1 | Upper Cap |
| 2 | 9138-00-3525 | 10 | Cap Screws |
| 3 | PD6-2-3 | 1 | Upper Cushion |
| 4 | PD6-2-4 | 1 | Spacer Ring |
| 5 | PD6-2-5 | 1 | Lower Cushion |
| 6 | PD6-2-6 | 1 | Retaining Ring |
| 7 | 9285-00-0610 | 1 | Grease Fitting |
| 8 | PD6-2-8 | 1 | Body |
| 9 | 19-80-291842 | 1 | Lower Cap |
| 10 | 14-18-280798 | 1 | Wear Ring |
| 11 | PD6-2-11 | 1 | Scraper Ring |
| 12 | PD6-2-12 | 1 | Piston |
| 12** | PD6-2-12-01 | 1 | Extended Piston |
| 13 | PD6-2-13 | 10 | Drive Pins |
| 14 | PD6-2-14 | 1 | Washpipe |
| 15 | 3104721 | 10 | Cap Screws (Modified) |
| 16 | PD6-2-16 | 3 | Seals |
| 17 | PD6-2-17 | 1 | Wear Ring |
| 18 | 9678-00-0280 | 20 | Lockwashers |
| 19 | 339594 | 1 | Locating Pin |
| Pt. No. | PD6-2-30 | 1 | Seal Kit (4, 6, 10, 11, 16, 17, 19) |
| Pt. No. | PD6-2-31 | 1 | Seal & Cushion Kit (3, 4, 5, 6, 10, 11, 16, 17, 19) |

Foremost Floating Cushion Sub Model PD6-2 Maintenance Schedule

During the final assembly process at the factory, the floating cushion sub had one cartridge or approximately 400 grams of grease installed into the housing for lubrication of the internal components. This initial lubrication, under average operating conditions will last approximately one (1) week.

After this period, the cushion sub should be lubricated on a daily basis. The lubricant can be a general purpose grease of the same type used to lubricate bearings or other drill components.

The grease fitting is located in the approximate center position of the main body. Grease should be installed when the sliding spindle is in the retracted or up position. The operator should pump in five to ten strokes of the handle to maintain lubrication of the components.

If at any time the sliding spindle will not retract or extend from the housing, there could be too much grease in the body cavity. If this happens, remove the grease fitting and cycle the spindle up and down a couple of times to remove excess grease and then re-install the fitting into the body. Wait a couple of days before beginning the lubrication cycle again and reduce the amount of grease being used.

It will be necessary to periodically change the seals and wear rings in the assembly. The frequency of this maintenance will depend upon the drilling application and the amount of lubrication the unit receives during its operating cycle. If at any time during the drilling operation, air or fluids are being blown past the seals on the lower end of the body, the cushion sub should be removed immediately from the drill to have a new seal kit installed.

Under average drilling conditions a preventative maintenance inspection should be performed at six month intervals or approximately every 2500 hours.

Under no circumstances should any welding or wrenching be done on the chrome surface of the spindle.

Floating Cushion Sub Operating Parameters Model PD6 - 2

Function

The Floating Cushion Sub Model PD6-2 was developed primarily to allow a limited amount of axial travel between the drill string and the rotary drive while making up and breaking out threaded connections and also to reduce shock and vibration induced by the rotary bit or DTH hammer bit. Typically the pin up, box down threaded configuration machined into the upper cap and piston will suit most drills and drill string combinations without any modifications to the drill.

The spline drive system that transfers the torque from the rotary spindle by means of drive pins provides 100% displacement to the drill string and the bit. Located within the housing cavity are upper and lower cushions that absorb the shock displaced into the piston from the drill string when the piston is at either the upper or lower limits of its stroke within the housing. Drilling fluids and or air are isolated from the housing by means of a washpipe and seal arrangement that prevent corrosion from taking place on the internal components.

The severity of the drilling application will determine the cycle time in which the cushion sub will be required to have a rebuild performed. The following are some visual indicators as to when the cushion sub should be removed from service and a rebuild performed:

1. If air or drilling fluid is being blown out around the wiper seal at the lower end of the assembly around the piston. (cause - leaking seal at the washpipe)
2. If the piston seems to have more extension than when the cushion sub was originally installed on the drill.
(when new, the chrome section on the piston when fully extended will protrude approximately 2" below the lower cap -- if this length exceeds 3" - the lower cushion should be replaced as soon as possible)
3. Backlash in the piston and housing between the time the rotary spindle starts to rotate and the drill steel starts to rotate.
(the splines in the piston and the housing will eventually start to wear due to the torsional pressure being applied during the drilling process from the bit and also from making up and breaking out of threads - when the free play exceeds 1/2" (.500) - the piston and or body may need to be replaced) To check this mark a position on the piston and the lower cap parallel with each other, rotate the drive in the opposite direction and measure the distance now between the lines.

Procedure for Rebuilding Model PD6-2 Floating Cushion Sub

Disassembly

1. Clamp the Cushion Sub in a horizontal position.
2. Remove Cap Screws (10) from the Lower Cap. (Item #9)
3. Remove Lower Cap from the Body. (Item #8)
4. Remove Lower Cushion (Item #5) from the Body.
5. Using a lift nubbin, pull the Piston (Item #12) out of the Body.
6. Remove Upper Cushion (Item #3) from the Body.
7. To remove the Washpipe, (Item #14), first remove Spacer. (Item #4)
8. Using Snap Ring pliers, remove Retaining Ring .(Item #6)
9. Remove Washpipe from the Upper Cap.
10. Remove Seal from the Upper Cap.
11. Remove Seals and Guide Rings from Piston and Lower Cap
12. Clean all parts with cleaning fluid and inspect for wear - deburr any parts and remove sharp edges prior to assembly.
13. Seals, Guide Rings and Cushions can be replaced by purchasing a Seal and Cushion Kit Part # PD6-2- 31 (Item #3,4,5,6,10,11,16,17,19)

Assembly

1. Place one Seal (Item#16) in the seal location fit of the Upper Cap (Item #1)
The o-ring of the seal against the shoulder of the fit.
2. Insert the Washpipe (Item #14) in the location fit.
3. Install the Retaining Ring into the groove. (be sure it is properly seated)
4. Install Spacer over the Washpipe to seat in the location fit.
5. Install the Upper Cushion over the Washpipe.
6. Install the Piston after replacing the seals and guide ring.
7. Lubricate the drive pins and body (recommend Unirex Moly H grease or equivalent)
8. Install Lower Cushion (Item #5) into the Body until it is seated on the Drive Pins.
9. Install the Lower Cap (Item #9) into the location fit of the Body (line up bolt holes)
10. Install Hi-Collar Lockwashers on the cap screws and install into the Lower Cap.
The cap screws provided can be brought up to a torque of 210 ft. lbs.

Note: The Upper Cap (Item #1) need not be removed to rebuild the Cushion Sub, however, it would be advisable to re-torque the cap screws to 210 ft. lbs for safety reasons.

ASSEMBLY SCHEMATIC
 TABLE 12000-2

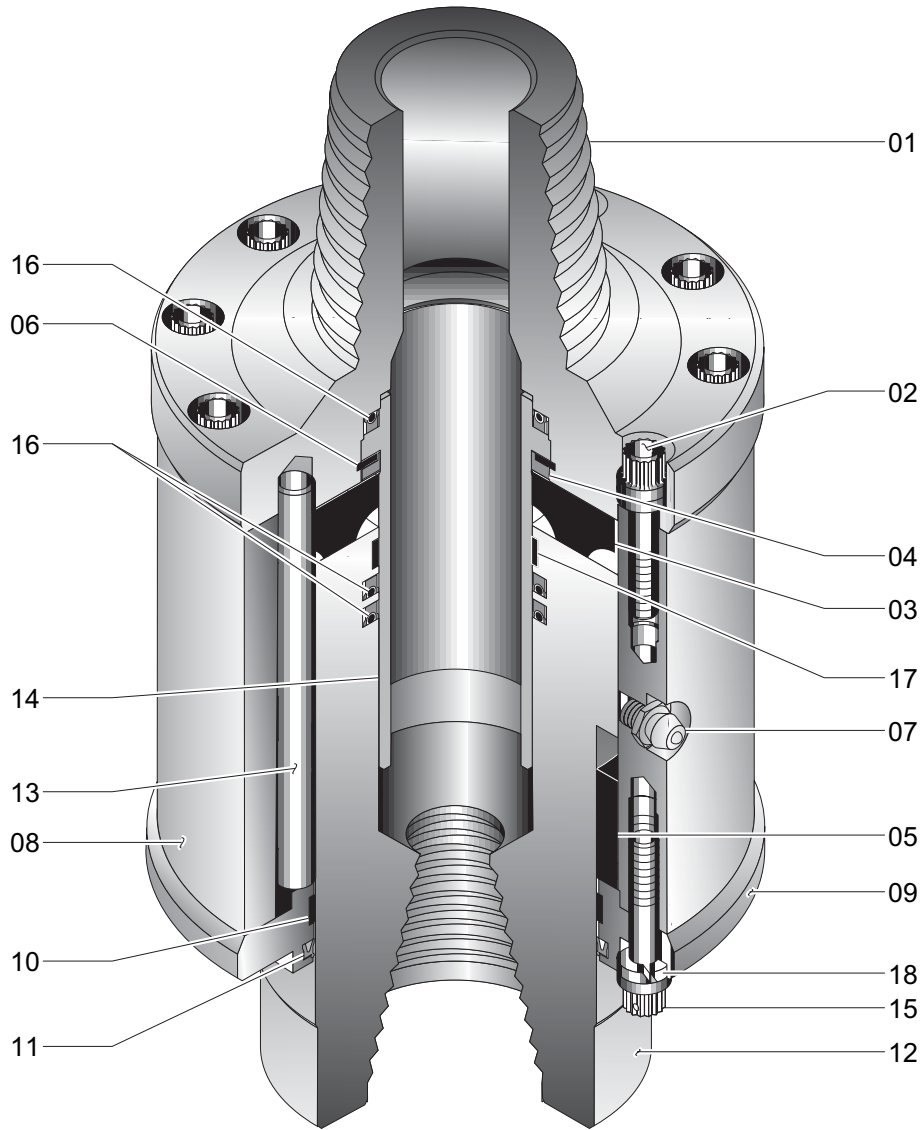


Table 1:

| Item # | Part # | Description | Item # | Part # | Description |
|--------|--------------|----------------|--------|--------------|---|
| 01 | PD6-2-1 | Upper Cap | 13 | PD6-2-13 | Drive Pins |
| 02 | 9138-00-3525 | Cap Screw | 14 | PD6-2-14 | Washpipe |
| 03 | PD6-2-3 | Upper Cushion | 15 | 310421 | Cap Screws (Modified) |
| 04 | PD6-2-4 | Spacer Ring | 16 | PD6-2-16 | Poly Paks Seals |
| 05 | PD6-2-5 | Lower Cushion | 17 | PD6-2-17 | Wear Ring |
| 06 | PD6-2-6 | Retaining Ring | 18 | 9678-00-0280 | Lock Washers |
| 07 | 9285-00-0610 | Grease Zerk | | | |
| 08 | PD6-2-8 | Body | | PD6-2-30 | Seal Kit (Includes Items 04,06,10,11,16,17) |
| 09 | PD6-2-9 | Lower Cap | | | |
| 10 | 14-18-280798 | Wear Ring | | | |
| 11 | PD6-2-11 | Wiper Ring | | PD6-2-31 | Seal Kit (Includes Items 03,04,05,06,10,11,16,17) |
| 12 | PD6-2-12 | Piston | | | |