

**Foremost Industries LP
Model 18-120-6363
Cushion Connector**

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Model 18-120-6363 Cushion Connector

Function

Threaded directly into the drive spindle of the rotary gear box, the Foremost Cushion Connector will assist in protecting the rotary drive and mast assemblies against both torsional and axial vibrations / shock loading in moderate and extreme drilling conditions. Disc springs are utilized within the connector assembly to allow for a certain amount of axial movement between the drill stem and the rotary drive. Utilized in a rotary drilling application, the disc springs will accommodate operating loads ranging from 8,000 to 120,000 pounds thus in most cases, this will help to maintain the tri-cone bit in continuous contact with the formation thereby reducing the possibility of fracturing or breaking the carbides in the bit. Urethane drive blocks located within the connector assembly serve to provide 100% transfer of rotary torque from the drive spindle to the drill stem as well as absorb torsional vibration transferred by the bit.

Application

Foremost Cushion Connectors are utilized during rotary drilling applications on mid-range and large blast hole drills, which are utilized in production applications around the world. The opportunity to select from any one of four independent assemblies allows the operations personnel to choose the connector that is most suitable for the drilling application and equipment preferred to perform the drilling. Typical applications would include but not be limited to coal, iron ore, copper, and gold mining operations. In most cases, no modifications are required to the drill. Installation of the connector is made directly into the rotary drive spindle via a threaded connection and usually a saver sub is utilized on the lower end of the connector to make up to the drill stem.

Performance

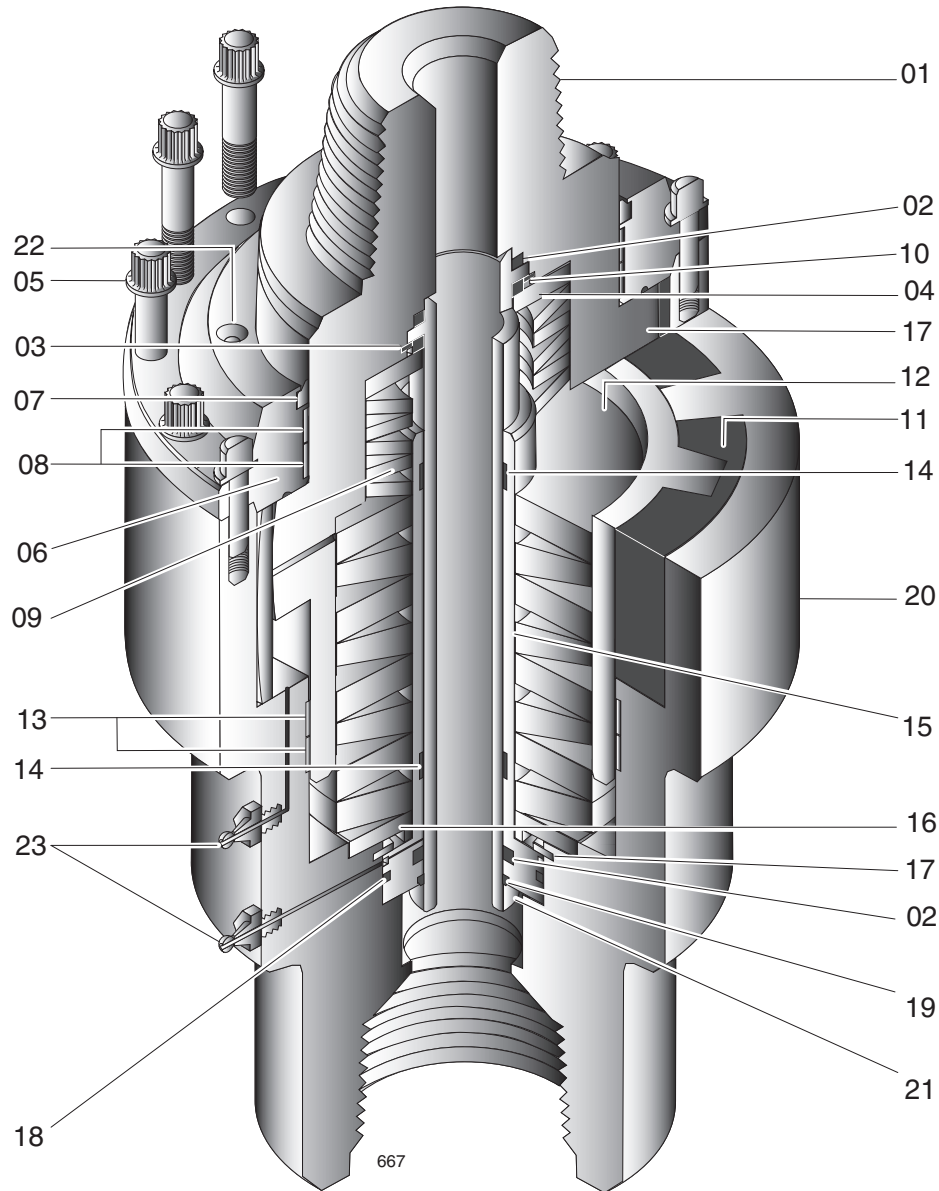
Foremost Cushion Connectors have proven track records in a variety of locations and applications. It is not uncommon to increase drill availability by an average of 15% to 20% and decrease maintenance cost by 25% to 40%. An average return on investment may be as few as 6 to 12 months. Typical replacement of seals and wear items within the connector assembly may be required on an annual basis however the cost is extremely low when compared to other similar products. The results will be reduced drill maintenance, increased drill availability and lower production cost.

Features

- 100% rotary torque transfer capability
- Controlled axial movement
- Alloy steel construction for increased wear life and strength
- Available with standard thread configurations
- Disc springs incorporated for various drill applications
- Replaceable wear parts, seals, guide rings etc.

Benefits

- No H.P. loss between the rotary drive and the drill stem
- Vibration and shock loading is drastically reduced
- Rebuild cost is fractional compared to competitor products
- No modifications are required to the operators drill
- Shock reduction is achieved under all types of drilling conditions
- Repairs and maintenance can be accomplished at the mine site



No.	Drawing #	No. Req'd	Description	No.	Drawing #	No. Req'd	Description
01	20-29-291494	1	Stem	13	W2-11250-1000	2	Guide Ring
02	3750-3750	2	Poly Pack Seal	14	W2-4000-1000	2	Guide Ring
03	16-39-254318	1	Retaining Ring	15	29-29-291495	1	Bushing
04	20-29-291492	1	U Load Plate	16	6363-12	1	L. Load Plate
05	9138-00-3535	24	Cap Screws	17	N5000-600	1	Retaining - Ring
06	363559	1	Cover Plate	18	2-361	1	O-Ring
07	D-11000	1	Wiper Seal	19	D-3750	1	Wiper Seal
08	W2-11250-1000	2	Guide Ring	20	363548	1	Housing
09	200-128-19.3-2.79	5	Disc Springs	21	6363-04	1	Washpipe
10	19-80-290983	1	Spacer	22	5680	1	Relief Valve
11	20-29-294926	4	Drive Block	23	9285-00-0610	1	Grease Fitting
12	250-128-20.3-4.57	8	Disc Springs				

Table 18000-1 Model 18-120-6363-05 Cushion Connector Specifications

Hoist	150,000 lbs.
Pulldown Range	20 to 140,000 lbs.
Torque	30,000 lbft.
Weight	1050 lbs.

Table 18000-2 Model 18-120-6363-05 Cushion Connector Parts List

Item No.	Part No.	No. Req'd	Description
1	20-29-291494	1	Stem
2	3750-3750	2	Poly Pak Seal
3	16-39-254318	1	Retaining Ring
4	20-29-291492	1	Upper Ld. Plate
5	9138-00-3535	24	Cap Screws
6	363559	1	Cover Plate
7	D11000	1	Wiper Seal
8	W2-11250-1000	2	Guide Ring
9	200-128-19.3-2.79	5	Disc Springs
10	19-80-290983	1	Spacer
11	20-29-294926	4	Drive Blocks
12	250-128-20.3-4.57	8	Disc Springs
13	W2-11250-1000	2	Guide Ring
14	W2-4000-1000	2	Guide Rings
15	20-29-291495	1	Bushing
16	6363-12	1	Lower Ld. Plt.
17	N5000-600	1	Retaining Ring
18	#2-361	1	O-Ring
19	D-3750	1	Wiper Ring
20	363548	1	Housing
21	6363-04	1	Washpipe
22	#5680	1	Relief Valve
23	9285-00-0610	2	Grease Fitting
Pt. No.	6363-50	1	Seal Kit (2,3,7,8,10,13,14,17,18,19)

Foremost Cushion Connector Maintenance Schedule

During the final assembly process approximately 1000 grams of synthetic grease was installed in the housing for lubrication of the internal components. This initial lubrication will last several weeks pending the actual drilling operation, conditions and application. If leakage is observed then daily lubrication should begin by the operator.

The preferred lubricant would be synthetic grease however if not available a high temp moly type grease of the same type used to lubricate bearings or other drill components will be acceptable. If using a standard EP2 grease, the cushion sub should be lubricated on a per shift basis. If synthetic is applied the usage can be on a prolonged basis.

The grease fittings are located on the external surface of the housing. Grease can be installed with the sliding spindle in any position. The operator should pump in five to ten strokes of the handle in each fitting to maintain lubrication of the components.

If at any time too much grease is pumped into the body, it will be released through either the pressure relief fitting or past the wiper seal both are located in the top cover plate. Wait a couple of days before beginning the lubrication cycle over again.

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 out around the seal and spindle at the top of the assembly, the cushion sub should be removed immediately from the drill for inspection. A new seal kit will be required.

Under average drilling conditions a preventative maintenance inspection should be performed at three to four month intervals or approximately every 2000 - 2500 hrs.

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

Foremost Cushion Connector Operating Parameters

Rotational Movement

When a new Cushion Connector is put into service there will be no excessive movement in rotation between the top of the connector at the stem and the lower end (housing) of the connector prior to the rotation of the drill steel when the drill spindle is engaged in either forward or reverse position.

When a connector is installed into position between the rotary spindle and the drill steel, it will transfer the rotary torque to the drill string from the spindle drive, this is accomplished through the parts which are integral within the connector housing. The stem which has four drive lugs cast into the body are positioned within drive blocks which are in turn centered between four drive lugs integral within the housing. When rotary torque is applied to the stem from the spindle drive, the torque is transferred through the drive blocks to the housing and then to the drill steel connected by means of the threaded connection. The drive blocks are considered to be replacement parts which will fatigue over time due to the constant pressure being applied to them during the drilling operation and the making up and breaking out of drill steel connections.

The condition of the drive blocks can be determined without disassembling the connector. This can be achieved by following these simple instructions:

1. With the rotary drive in or at its lowest position so you are able to see the connector, slowly rotate the spindle in either forward or reverse direction.
2. Stop the rotation and put a mark vertical on the stem and across the top cover plate of the housing.
3. Slowly rotate the spindle in the opposite direction from previously done prior to marking the position of the stem.
4. Once the backlash has been removed by reversing the direction, you can measure the amount of wear which has taken place. This wear is usually all in the drive blocks, although there may be some on the stem lugs as well.
5. If the measured amount of movement (backlash) exceeds $\frac{1}{2}$ " to $\frac{3}{4}$ " the drive blocks should be replaced as soon as possible.
6. If the unit is due for servicing, this would also be a good time to replace all seals and guide rings.
7. See disassembly and assembly procedures for instructions on rebuilding the connector

Foremost Cushion Connector Operating Parameters

Vertical Movement

During the Cushion Connector assembly process, load plates and specified tolerances are closely monitored to ensure that the correct amount of preload is applied to the spring pack to achieve optimum operating performance of the connectors. The amount of preload can be adjusted up or down by adjusting the thickness of the wear plates within the housing assembly. Once the connector has been operating in the field under normal drilling conditions, the springs will reseal themselves and some of the preload will be lost. As the connector continues to operate, wear will take place between the contacting surfaces of the springs and also on the load plates. When the wear becomes too great there is more opportunity for these parts to damage other components within the connector housing. The following visual check should be used to determine when the connector should come out of service to have a rebuild performed on it due to vertical movement when not under load.

1. With the rotary drive in or at its lowest position so you are able to see the connector, remove all of the weight off the connector by putting the bit on the bottom of the hole.
2. Mark the position of the stem with the cover plate by marking a line part way around the circumference of the chrome portion of the stem where the stem comes out of the cover plate.
3. Lift the rotary drive (no rotation is necessary) until the drill steel starts to come up out of the hole so the weight of the drill string is hanging from the connector housing.
4. Measure the amount of movement between the line you have marked on the stem and the top of the cover plate. If the amount of travel (backlash) exceeds 1" of free movement prior to the drill steel being lifted then the connector should be serviced as soon as possible.
5. See disassembly and assembly procedures for instructions on over hauling the connector.

Foremost Cushion Connector Model 18-120-6363 Inspection and Disassembly Procedure

1. Position the connector in the vertical position (pin up) on a platform.
2. Remove cap screws 24 (Item 05) from the cover plate (Item 06).
3. Install lift nubbin on pin connection of stem (Item 01) and proceed to lift stem out of housing (Item 20).
4. With the stem (Item 01) and the cover plate (Item 06) now removed from the housing, the internal components can now be easily removed for inspection and or replacement.
5. Remove the cover plate from the stem by sliding it over the chrome diameter of the stem.
6. Remove the guide rings (Item 08) and wiper seal (Item 07) from the cover plate
7. Remove the spring pack and the load plates from the housing (Item 04, 09, 12 and 16)
8. Remove the drive blocks (Item 11) from the housing.
9. Remove the retaining ring (Item 17) from the housing.
10. Remove bushing (Item 15) from the housing.
11. Remove spacer ring (Item 10) and the retaining ring (Item 03) from the stem.
12. Remove wash pipe (Item 21) from the stem.
13. Clean all parts including stem and housing and inspect the following parts:
 - a.) Wiper (Item 07), guide rings (2 - Item 08) located in the cover plate.
 - b.) Wear rings (2 - Item 13) located in housing.
 - c.) O-ring seal (Item 18) located in the housing.
 - d.) Seal (Item 02), wiper (Item 19), wear rings (2- Item 14), located in bushing (Item 15).
 - e.) Seal (Item 02) located in the stem.
 - f.) Inspect retaining rings (Item 03 & 17) for wear or fatigue cracks.
 - g.) Inspect drive blocks (Item 11) for wear in the slide area and urethane cushion area.
 - h.) Check disc springs and load plates for excessive wear or fatigue cracks.
 - i.) Replace any necessary components and re-assemble as per the assembly instructions.

Foremost Cushion Connector Model 18-120-6363 Assembly

1. Install o-ring seal (Item 18) and wear rings (Item 13) into housing (Item 20).
2. Install wear rings 2 only (Item 14), seal (Item 2), wiper (Item 19) into bushing (Item 15).
3. Install bushing (Item 15) into location fit of housing. Be careful not to cut o-ring previously installed in housing.
4. Install retaining ring (Item 17) into groove in housing - be sure ring is seated.
5. Install lower load plate (Item 16) over bushing to sit in location fit of housing.
6. Re-stack the large disc springs - 8 only (Item 12) on top of the load plate.
7. Stack the small disc springs - 5 only (Item 09) on top of the large disc springs.
8. Install the upper load plate (Item 04) on top of the smaller diameter springs.
9. Install the drive blocks - 4 only (Item 11) between the lugs of the housing.
10. Install seal (Item 02) into the location fit of the stem. (O-ring side of the seal against the internal shoulder of the location fit within stem.)
11. Install wash pipe (Item 21) into the location fit of the stem (Item 01)
12. Install retaining ring (Item 03) into the groove of the stem, re-seat retaining ring.
13. Install spacer ring (Item 10) over wash pipe into the location fit.
14. Carefully lower the stem assembly into the housing - lugs on the stem to slide into the drive blocks.
15. Install guide rings (2 - Item 08) and wiper (Item 07) into the cover plate (Item 06).
16. Install the cover plate (Item 06) over the stem .
17. When the cover plate is seated on the lugs of the stem, there should be approximately 1/4" (.250) stand-off between the flange and the housing. If the spacing is less than 1/4" it may be necessary to install a thicker upper load plate to compensate for spring deflection.
18. Install and tighten cap screws, alternating screws so as to lower the cover plate evenly into the location fit of the housing. Once the cover plate has contacted the top of the housing, torque the cap screws to 210 ft. lbs.
19. With the assembly now complete, the housing can now be greased. The unit will hold approximately three litres and it can be applied into the top grease fitting located in the housing. To lubricate the seal and wear ring in the bushing, apply grease into the lower grease fitting. We recommend Synthetic however Unirex Moly H grease or equivalent can be used. In the event of over - filling the assembly, the grease will be released through either the pressure relief fitting or the wiper seal both located in the top cover plate.