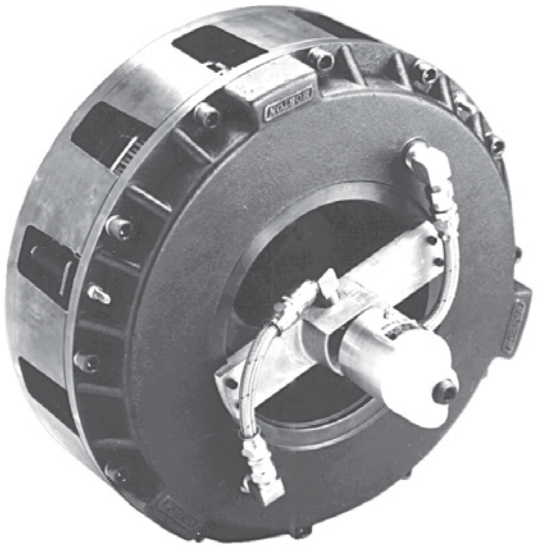
nexen

# AIR CHAMP® PRODUCTS

User Manual



# DFE and QFE

## Models 1150, 1650, 2200, and 2500

CE

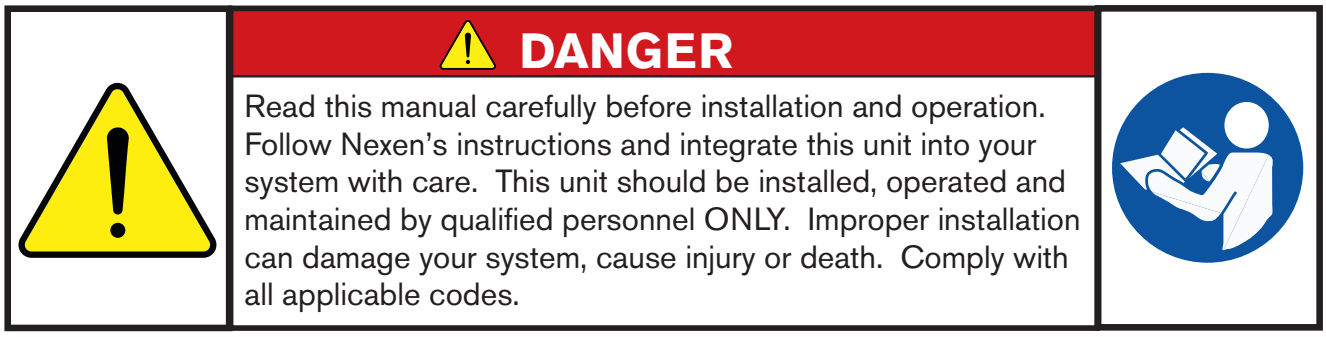
RoHS compliant

FORM NO. L-20021-G-1214

In accordance with Nexen's established policy of constant product improvement, the specifications contained in this manual are subject to change without notice. Technical data listed in this manual are based on the latest information available at the time of printing and are also subject to change without notice.

Technical Support: 800-843-7445
(651) 484-5900

www.nexengroup.com




This document is the original, non-translated, version.

Conformity Declaration: In accordance with Appendix II B of CE Machinery Directive (2006/42/EC):

A Declaration of Incorporation of Partly Completed Machinery evaluation for the applicable EU directives was carried out for this product in accordance with the Machinery Directive. The declaration of incorporation is set out in writing in a separate document and can be requested if required.

This machinery is incomplete and must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the applicable provisions of the Directive.

Nexen Group, Inc.
560 Oak Grove Parkway
Vadnais Heights, Minnesota 55127

**ISO 9001 Certified**

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## GENERAL SPECIFICATIONS

| Specifications | |
|---|---|
| Torque | DFE: Up to 17060 Nm (151000 in-lbs)<br>QFE: Up to 34120 Nm (302000 in-lbs) |
| Actuation Pressure | 1 - 5.5 bar (14.5 - 80 psi) |
| Service Temperature | 4.5 - 104 C (40 - 220 F) |
| Approximate Weight | Up to 358 kg (790 lbs) |

## GENERAL SAFETY PRECAUTIONS

**⚠ CAUTION**

Use lifting aids and proper lifting techniques when installing, removing, or placing this product in service.

**⚠ CAUTION**

Use appropriate guarding for moving components. Failure to guard could result in serious bodily injury.

**⚠ CAUTION**

Watch for sharp features when interacting with this product. The parts have complex shapes and machined edges.

**⚠ CAUTION**

This product has possible pinch points. Care should be taken when interacting with this product.

**⚠ WARNING**

Ensure proper guarding of the product is used. Nexen recommends the machine builder design guarding in compliance with OSHA 29 CFR 1910 “Occupational Safety and Health Hazards”.

**⚠ WARNING**

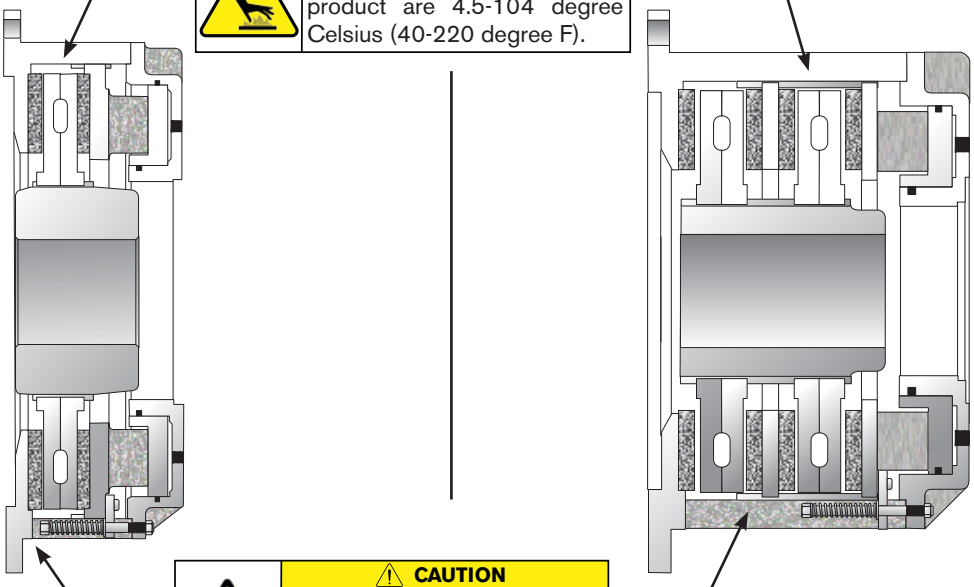
This product is capable of emitting a spark if misused, therefore it is not recommended for use in any explosive environment.

DFE

QFE

**⚠ CAUTION**

The temperature limits for the product are 4.5-104 degree Celsius (40-220 degree F).



**⚠ CAUTION**

This product has possible pinch points. Care should be taken when interacting with this product.

## INTRODUCTION

Nexen's pneumatically actuated Dual Faced Elements (DFE) and Quad Faced Elements (QFE) are used as a clutch or brake. These elements are intended for horizontal mounting only. The clutch is shaft mounted and the brake is either shaft end mounted or through shaft mounted.

The DFE or QFE, and Air Union Bracket are sold separately.

## INSTALLATION- BRAKE

NOTE: The DFE and QFE Elements are partially assembled at the factory. Separate the Elements into sub-assemblies before installation.

**DFE**

**Refer to Figures 1 & 2.**

1. Provide a piloting flange and 5/8-11 tapped holes to a non-rotating surface of the machine.

   NOTE: Control perpendicularity between the machine shaft and the mounting surface of the Housing (Item 2) as the cap screws are tightened. Use a dial indicator for measurements and the machine surfaces of the housing posts as a reference surface. Perpendicularity should be less than 0.015" [0.381 mm].

2. Using customer supplied cap screws, secure the Housing (Item 2) to the non-rotating part of the machine.

3. Tighten the customer supplied cap screws to 233 Ft. Lbs. [315.90 Nm] torque.

4. Install a customer supplied key into the shaft; then, slide the Hub (Item 1) onto the shaft.

   NOTE: The axial location of the Hub (Item 1) is critical to the proper operation of the DFE–BRAKE. Refer to Table 1 and Figure 2 for correct Hub location.

5. Using a customer supplied set screw, secure the Hub (Item 1) to the machine shaft.

6. Coat the teeth of the Hub (Item 1) with Never-Seez®.

7. Slide the Disc Assembly (Item 4) onto the Hub (Item 1).

   NOTE: On DFE 1650 and DFE 2200 the Piston and Pressure Plate are one item.

8. Assemble the Cylinder (Item 5), Piston (Item 6), and Pressure Plate (Item 7) to the Housing (Item 2).

9. Using the Cap Screws (Item 14) and Lockwashers (Item 20), secure the Cylinder (Item 5) to the Housing (Item 2).

10. Alternately and evenly tighten the Cap Screws (Item 14) to 119 Ft. lbs. [161.34 Nm] torque.

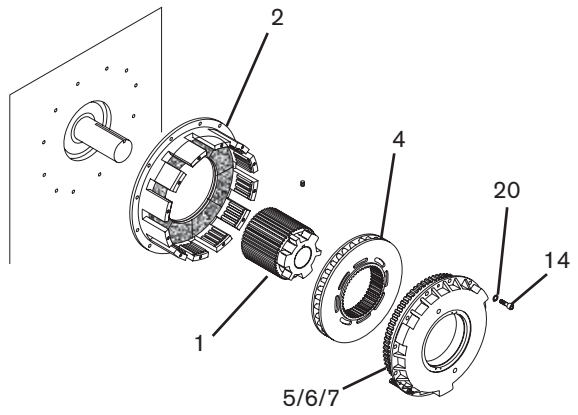



**FIGURE 1**

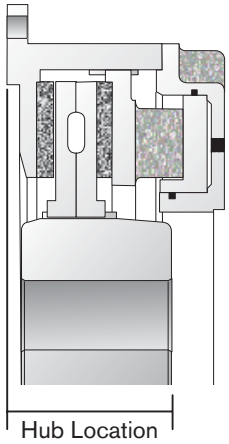



**FIGURE 2**

**TABLE 1**

| DFE HUB LOCATION | |
|---|---|
| **MODEL** | **HUB LOCATION** |
| DFE-1150 | 4.375" [111.125 mm] |
| DFE-1650 | 5.0781" [128.907 mm] |
| DFE-2200 | 6.312" [160.324mm] |
| DFE-2500 | 6.250" [158.750 mm] |

### QFE

**Refer to Figures 3 & 4.**

1. Provide a piloting flange and 5/8-11 tapped holes to a non-rotating surface of the machine.

   NOTE: Control perpendicularity between the machine shaft and the mounting surface of the Housing (Item 2) as the cap screws are tightened. Use a dial indicator for measurements and the machine surfaces of the housing posts as a reference surface. Perpendicularity should be less than 0.015" [0.381 mm].

2. Using customer supplied cap screws, secure the Housing (Item 2) to the non-rotating part of the machine.

3. Tighten the customer supplied cap screws to 233 Ft. Lbs. [315.90 Nm] torque.

4. Install a customer supplied key into the shaft; then, slide the Hub (Item 1) onto the shaft.

   NOTE: The axial location of the Hub (Item 1) is critical to the proper operation of the QFE–BRAKE. Refer to Table 2 and Figure 4 for correct Hub location.

5. Using a customer supplied set screw, secure the Hub (Item 1) to the machine shaft.

6. Coat the teeth of the Hub (Item 1) with Never-Seez®.

7. Slide the first Disc Assembly (Item 4) onto the Hub (Item 1).

8. Slide the Facing Plate (Item 24) onto the Hub (Item 1).

9. Slide the second Disc Assembly (Item 4) onto the Hub (Item 1).

   NOTE: On QFE 1650 and QFE 2200 the Piston and Pressure Plate are one item.

10. Assemble the Cylinder (Item 5), Piston (Item 6), and Pressure Plate (Item 7) to the Housing (Item 2).

11. Using the Cap Screws (Item 14) and Lockwashers (Item 20), secure the Cylinder (Item 5) to the Housing (Item 2).

12. Alternately and evenly tighten the Cap Screws (Item 14) to 119 ft. lbs. [161.34 Nm] torque.

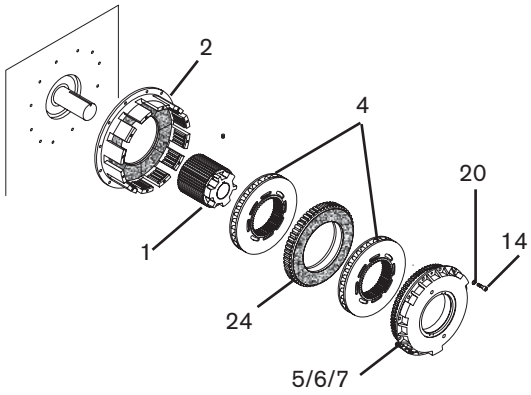



**FIGURE 3**

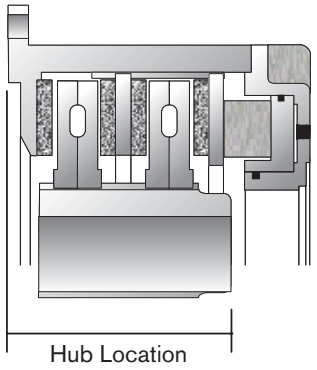



**FIGURE 4**

**TABLE 2**

| QFE HUB LOCATION | |
|---|---|
| **MODEL** | **HUB LOCATION** |
| QFE-1150 | 6.781" [172.237 mm] |
| QFE-1650 | 7.740" [196.596 mm] |
| QFE-2200 | 8.937" [266.999 mm] |
| QFE-2500 | 8.968" [277.787 mm] |

## INSTALLATION- CLUTCH

NOTE: The DFE and QFE Elements are partially assembled at the factory. Separate the Elements into sub-assemblies before installation.

**DFE**

**Refer to Figures 5 & 6.**

NOTE: Control perpendicularity between the machine shaft and the mounting surface of the Housing (Item 2) as the cap screws are tightened. Use a dial indicator for measurements and the machine surfaces of the housing posts as a reference surface. Perpendicularity should be less than 0.015" [0.381 mm].

1. Using customer supplied cap screws, secure the Housing (Item 2) to the bearing supported sheave or sprocket.

2. Tighten the customer supplied cap screws to 233 Ft. Lbs. [315.90 Nm] torque.

3. Install a customer supplied key into the shaft; then, slide the Hub (Item 1) onto the shaft.

   NOTE: The axial location of the Hub (Item 1) is critical to the proper operation of the DFE–CLUTCH. Refer to Table 3 and Figure 6 for correct Hub location.

4. Using a customer supplied set screw, secure the Hub (Item 1) to the machine shaft.

5. Coat the teeth of the Hub (Item 1) with Never-Seez®.

6. Slide the Disc Assembly (Item 4) onto the Hub (Item 1).

   NOTE: On DFE 1650 and DFE 2200 the Piston and Pressure Plate are one item.

7. Assemble the Cylinder (Item 5), Piston (Item 6), and Pressure Plate (Item 7) to the Housing (Item 2).

8. Using the Cap Screws (Item 14) and Lockwashers (Item 20), secure the Cylinder (Item 5) to the Housing (Item 2).

9. Alternately and evenly tighten the Cap Screws (Item 14) to 119 Ft. lbs. [161.34 Nm] torque.

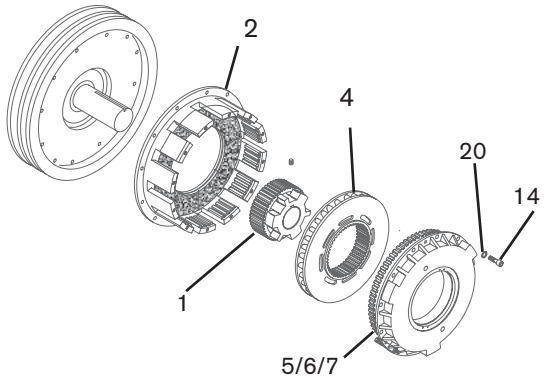



**FIGURE 5**

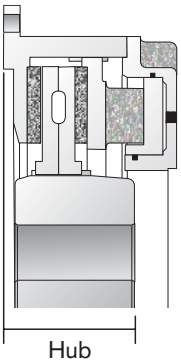



**FIGURE 6**

**TABLE 3**

| DFE HUB LOCATION | |
|---|---|
| **MODEL** | **HUB LOCATION** |
| DFE-1150 | 4.375" [111.125 mm] |
| DFE-1650 | 5.0781" [128.907 mm] |
| DFE-2200 | 6.312" [160.324mm] |
| DFE-2500 | 6.250" [158.750 mm] |

**QFE**

**Refer to Figure 7 & 8.**

NOTE: Control perpendicularity between the machine shaft and the mounting surface of the Housing (Item 2) as the cap screws are tightened. Use a dial indicator for measurements and the machine surfaces of the housing posts as a reference surface. Perpendicularity should be less than 0.015" [0.381 mm].

1. Using customer supplied cap screws, secure the Housing (Item 2) to the bearing supported sheave or sprocket.

2. Tighten the customer supplied cap screws to 233 Ft. Lbs. [315.90 Nm] torque.

3. Install a customer supplied key into the shaft; then, slide the Hub (Item 1) onto the shaft.

   NOTE: The axial location of the Hub (Item 1) is critical to the proper operation of the QFE–CLUTCH. Refer to Table 4 and Figure 8 for correct Hub location.

4. Using a customer supplied set screw, secure the Hub (Item 1) to the machine shaft.

5. Coat the teeth of the Hub (Item 1) with Never-Seez®.

6. Slide the first Disc Assembly (Item 4) onto the Hub (Item 1).

7. Slide the Facing Plate (Item 24) onto the Hub (Item 1).

8. Slide the second Disc Assembly (Item 4) onto the Hub (Item 1).

   NOTE: On QFE 1650 and QFE 2200 the Piston and Pressure Plate are one item.

9. Assemble the Cylinder (Item 5), Piston (Item 6), and Pressure Plate (Item 7) to the Housing (Item 2).

10. Using the Cap Screws (Item 14) and Lockwashers (Item 20), secure the Cylinder (Item 5) to the Housing (Item 2).

11. Alternately and evenly tighten the Cap Screws (Item 14) to 119 Ft. lbs. [161.34 Nm] torque.

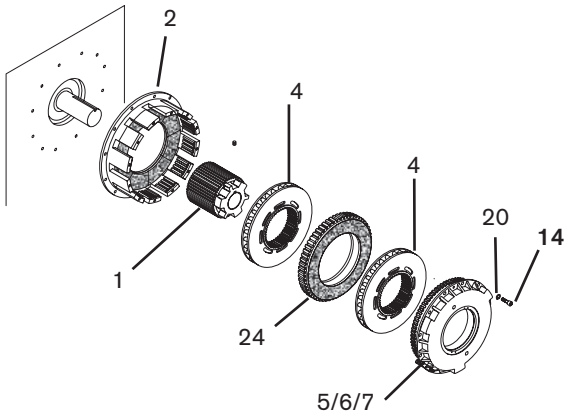



**FIGURE 7**

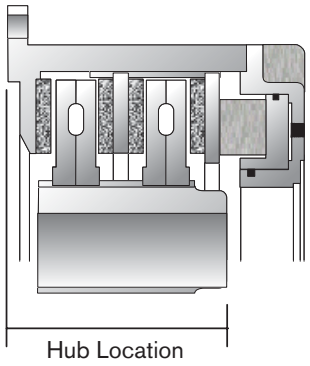



**FIGURE 8**

**TABLE 4**

| QFE HUB LOCATION | |
|---|---|
| **MODEL** | **HUB LOCATION** |
| QFE-1150 | 6.781" [172.237 mm] |
| QFE-1650 | 7.740" [196.596 mm] |
| QFE-2200 | 8.937" [266.999 mm] |
| QFE-2500 | 8.968" [277.787 mm] |

## LUBRICATION

**NOTE**

**Nexen pneumatically actuated devices require clean, pressure regulated air for maximum performance and life. All seals in Nexen Pneumatically operated devices are lubricated for life and do not require additional lubrication.**

**However, some customers prefer to use an air line lubricator, which injects oil into the pressurized air, forcing an oil mist into the air chamber. This is acceptable, but care must be taken to ensure once an air mist lubrication system is used, it is continually used over the life of the product as the oil mist may wash free the factory installed lubrication.**

**Locate the lubricator above and within ten feet of the product, and use low viscosity oil such as SAE-10.**

**Synthetic lubricants are not recommended.**

**Nexen product's bearings are shielded and pre-lubricated, and require no further lubrication.**

### LUBRICATOR DRIP RATE SETTINGS

**⚠ CAUTION**

These settings are for Nexen supplied lubricators. If you are not using a Nexen lubricator, calibration must follow the manufacturer's suggested procedure.

1. Close and disconnect the air line from the unit.
2. Turn the Lubricator Adjustment Knob counterclockwise three complete turns.
3. Open the air line.
4. Close the air line to the unit when a drop of oil forms in the Lubricator Sight Gage.
5. Connect the air line to the unit.
6. Turn the Lubricator Adjustment Knob clockwise until closed.
7. Turn the Lubricator Adjustment Knob counterclockwise one-third turn.
8. Open the air line to the unit.

### ROTARY AIR UNION LUBRICATION

Rotary air unions have an oil reservoir. This reservoir must be re-filled monthly under normal operation, or weekly under high speed operation. Use 4 to 5 drops of high quality motor oil only.

## AIR CONNECTIONS

All Nexen pneumatically actuated devices require clean and dry air, which meet or exceeds ISO 8573.1:2001 Class 4.4.3 quality.

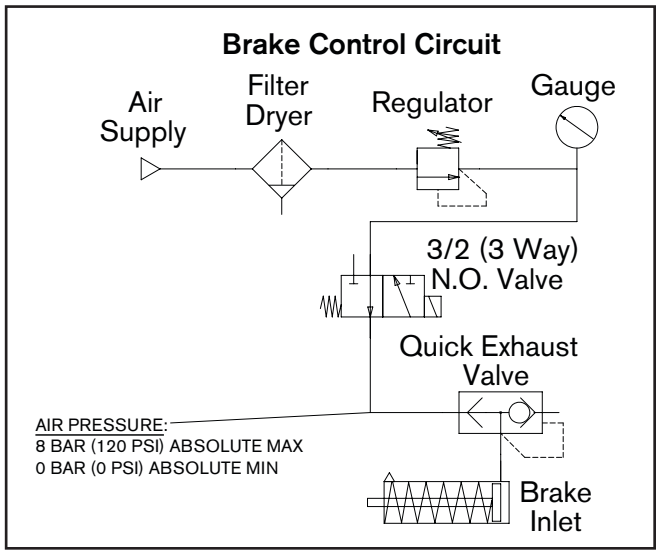
**NOTE**

**For quick response, Nexen recommends a quick exhaust valve and short air lines between the Control Valves and the product. Align the air inlet ports to a down position to allow condensation to drain out of the air chambers of the product.**

**⚠ CAUTION**

Low air pressure will cause slippage and overheating. Excessive air pressure will cause abrupt starts and stops, reducing product life.

The following is a common air supply scheme used with this product. This is an example and not an all-inclusive list. All air circuits to be used with this product must be designed following ISO 4414 guidelines.



## AIR CONNECTIONS (continued)

### BRAKE

**Refer to Figure 9.**

1. Apply pipe sealant to the two Elbow Fittings (Item 26); then, install two Elbow Fittings into the air inlet holes located at 180$^0$ in the Cylinder (Item 5).

2. Install the two Hose Assemblies (Item 25) into a customer supplied Tee Fitting.

3. Connect the two Hose Assemblies (Item 25) to the two Elbow Fittings (Item 26) installed in the Cylinder (Item 5).

4. Connect an air line from the air supply directly to the Tee Fitting.

   NOTE: The Hose Assemblies must be routed as shown. Do not use rigid pipe or tubing for air lines.

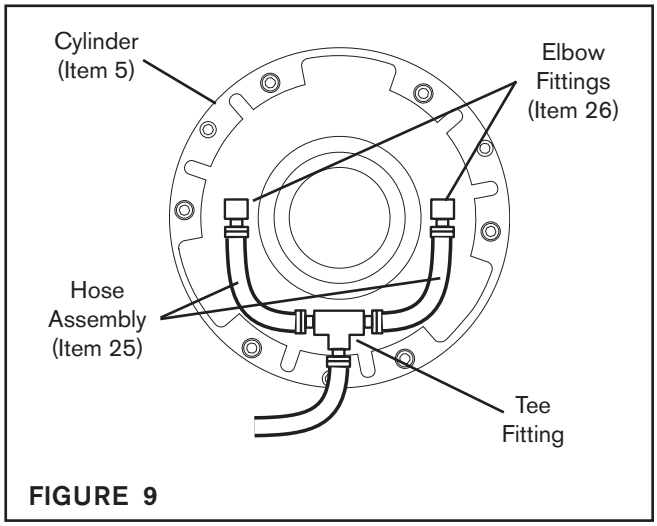



**FIGURE 9**

### CLUTCH

**Refer to Figure 10.**

1. If the Rotary Air Union (Item 23) and Rotary Air Union Bracket (Item 21) are not assembled, apply pipe sealant to the threads of the Rotary Air Union and screw the rotary Air Union into the Rotary air Union Bracket.

2. Apply a drop of Loctite® 242 to the threads of the four Socket Head Cap Screws (Item 22) provided with the Rotary Air Union (Item 23) and the Rotary Air Union Bracket (Item 21); then, secure the Rotary Air Union Bracket to the Cylinder (Item 5).

3. Tighten the four Socket head Cap Screws (Item 22) to 5.5 Ft. Lbs. [7.45 Nm] torque.

4. Apply pipe sealant to the threads of the Elbow Fittings (Item 26); then, install the Elbow Fittings into the Rotary Air Union (Item 23) and the Cylinder (Item 5).

5. Connect the two Hose Assemblies (Item 25) to the four Elbow Fittings (Item 26).

6. Connect the Hose Assemblies (Item 25) to the Rotary Air Union.

   NOTE: The Hose Assemblies must be routed as shown (See Figure 10). Do not use rigid pipe or tubing for air lines.

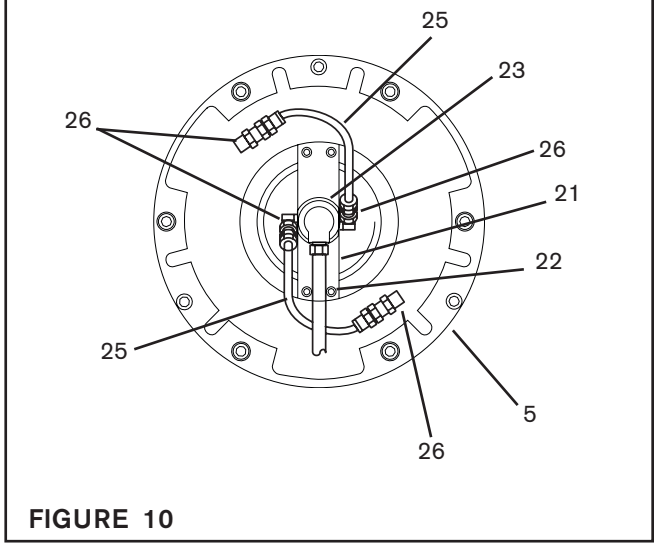



**FIGURE 10**

**⚠ WARNING**

Never exceed maximum operating speeds listed for your product. (See Table 6).

**⚠ CAUTION**

Never exceed life of facing material. Facing life depends on the volume of material and the total energy over the life of the unit. Expected life (in hrs) can be found by: Time=Volume/(Power*Wear Rate).

**⚠ WARNING**

Ensure proper guarding of the product is used. Nexen recommends the machine builder design guarding in compliance with OSHA 29 CFR 1910 “Occupational Safety and Health Hazards”.

1. Before placing the DFE or QFE into operation verify that all Cap Screws are tightened to the recommended torque (See Table 5).

2. Periodically inspect all air line connections to make sure that they are securely tightened.

3. Inspect the Friction Facings for wear and replace them when they are approximately 0.312" [7.924 mm] thick.

**⚠ CAUTION**

The temperature limits for this product line are 4.5-104 Degree Celsius (40-220 Degree F).

**TABLE 5**

| RECOMMENDED TIGHTENING TORQUES | |
|---|---|
| Housing Cap Screw | 233 ft. lbs. [315.90 Nm] |
| Cap Screw (Item 9) | 13 ft. lbs. [17.62 Nm] |
| Cap Screw (Item 14) | 119 ft. lbs. [161.34 Nm] |
| Cap Screw (Item 22) | 5.5 ft. lbs. [7.45Nm] |

**TABLE 6**

| MAXIMUM RECOMMENDED OPERATING SPEEDS | | |
|---|---|---|
| MODELS/ DFE and QFE | DISC | HOUSING/ CYLINDER |
| 1150 | 2200 RPM | 1600 RPM |
| 1650 | 1500 RPM | 1200 RPM |
| 2200 | 1100 RPM | 900 RPM |
| 2500 | 1000 RPM | 800 RPM |

## TROUBLESHOOTING

| SYMPTOM | PROBABLE CAUSE | SOLUTION |
|---|---|---|
| Failure to disengage. | Unexhausted air due to a control valve malfunction. | Replace the control valve. |
| | Rigid pipe or tubing used for air lines. | Use flexible tubing for air lines. |
| | Weak or broken Compression Springs. | Replace the Compression Springs. |
| Failure to engage. | Air not getting to the DFE or QFE due to a control valve malfunction. | Replace the control valve. |
| | Friction lock due to a lack of lubrication in the air chamber. | Check the air line lubricator. |
| Loss of torque. | Worn or contaminated Friction Facings. | Replace the Friction Facings. |

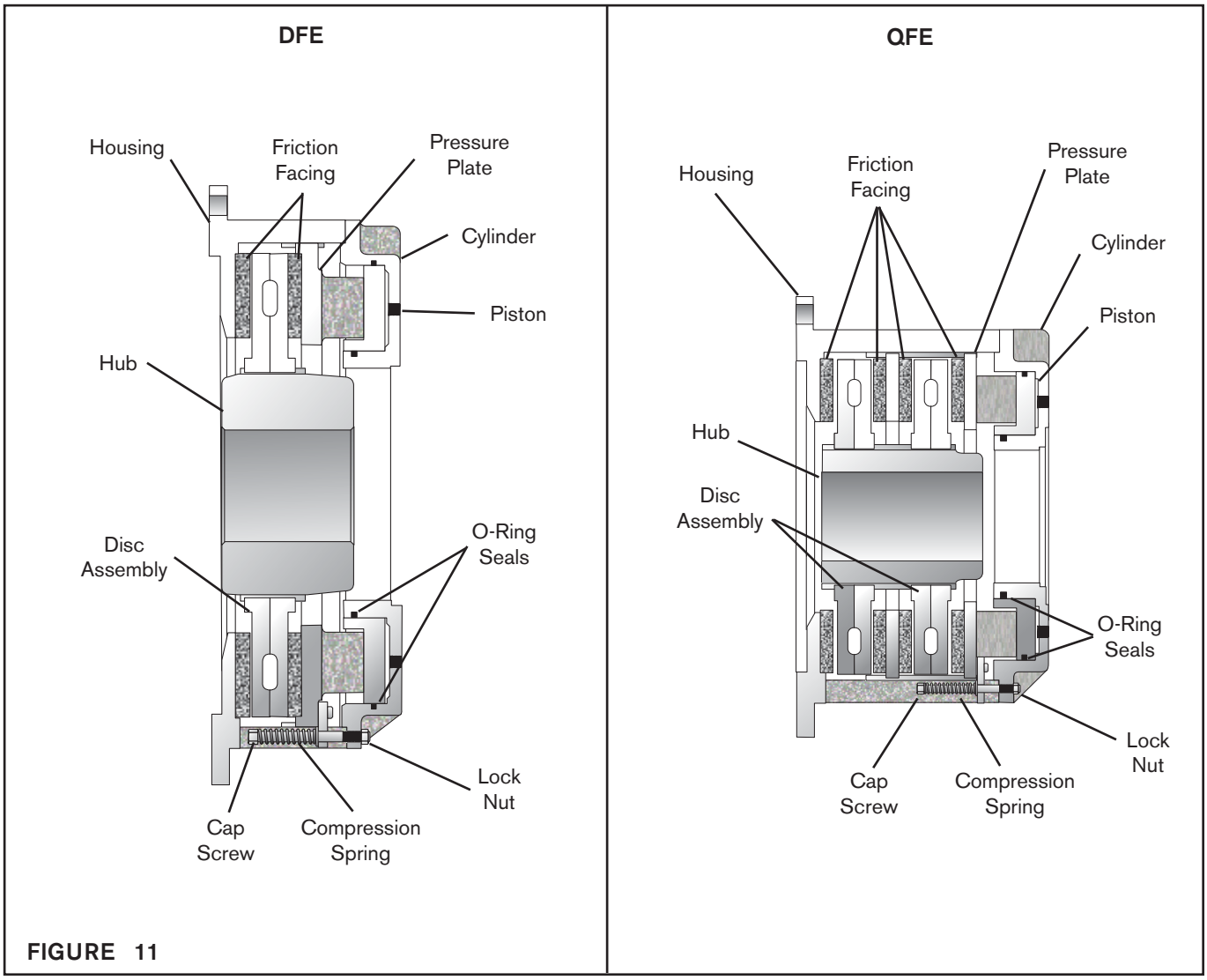



**FIGURE 11**

## PARTS REPLACEMENT

### FRICTION FACING, COMPRESSION SPRING, AND O-Ring SEAL REPLACEMENT- DFE

NOTE: The DFE does not have to be removed from the motor shaft to replace the Friction Facings and O-Ring Seals.

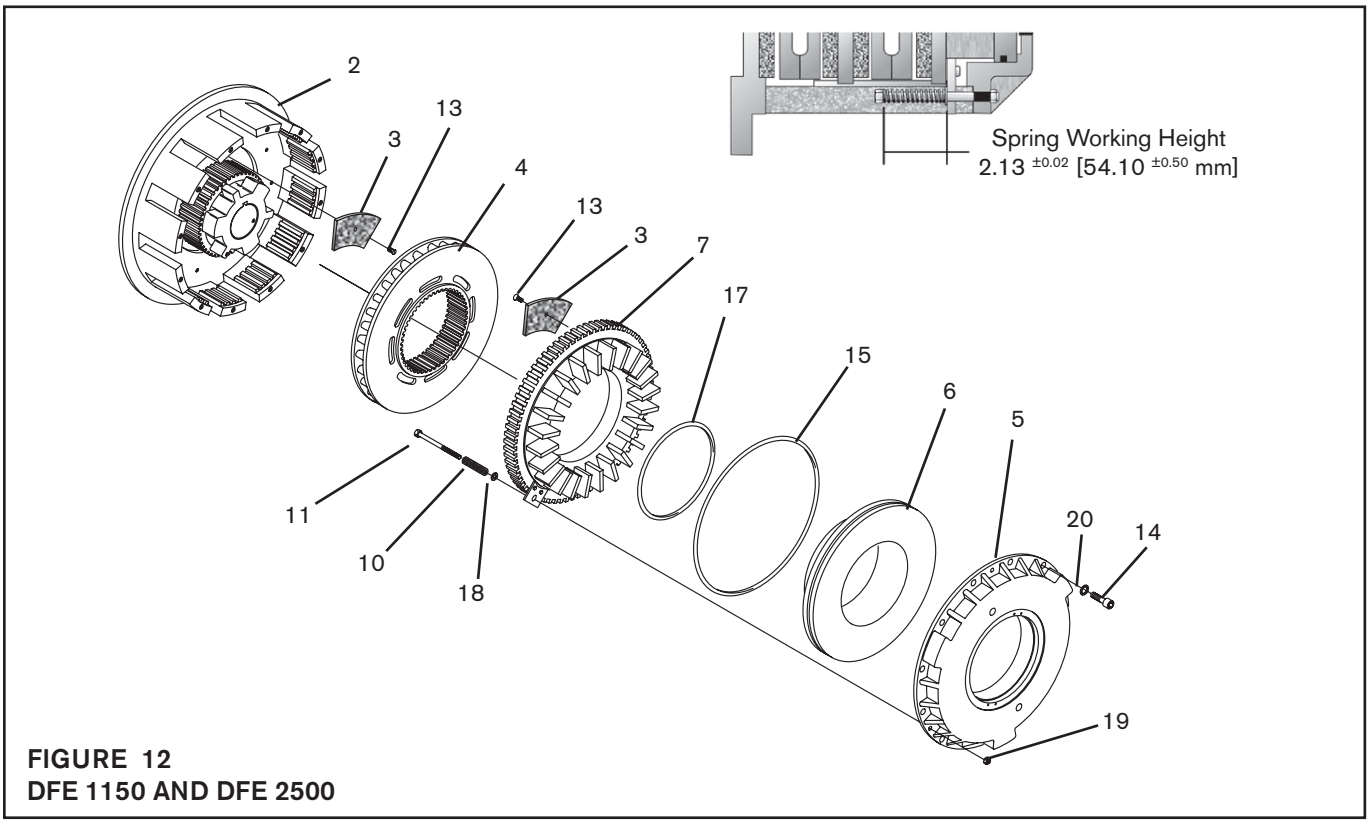



**FIGURE 12**
**DFE 1150 AND DFE 2500**

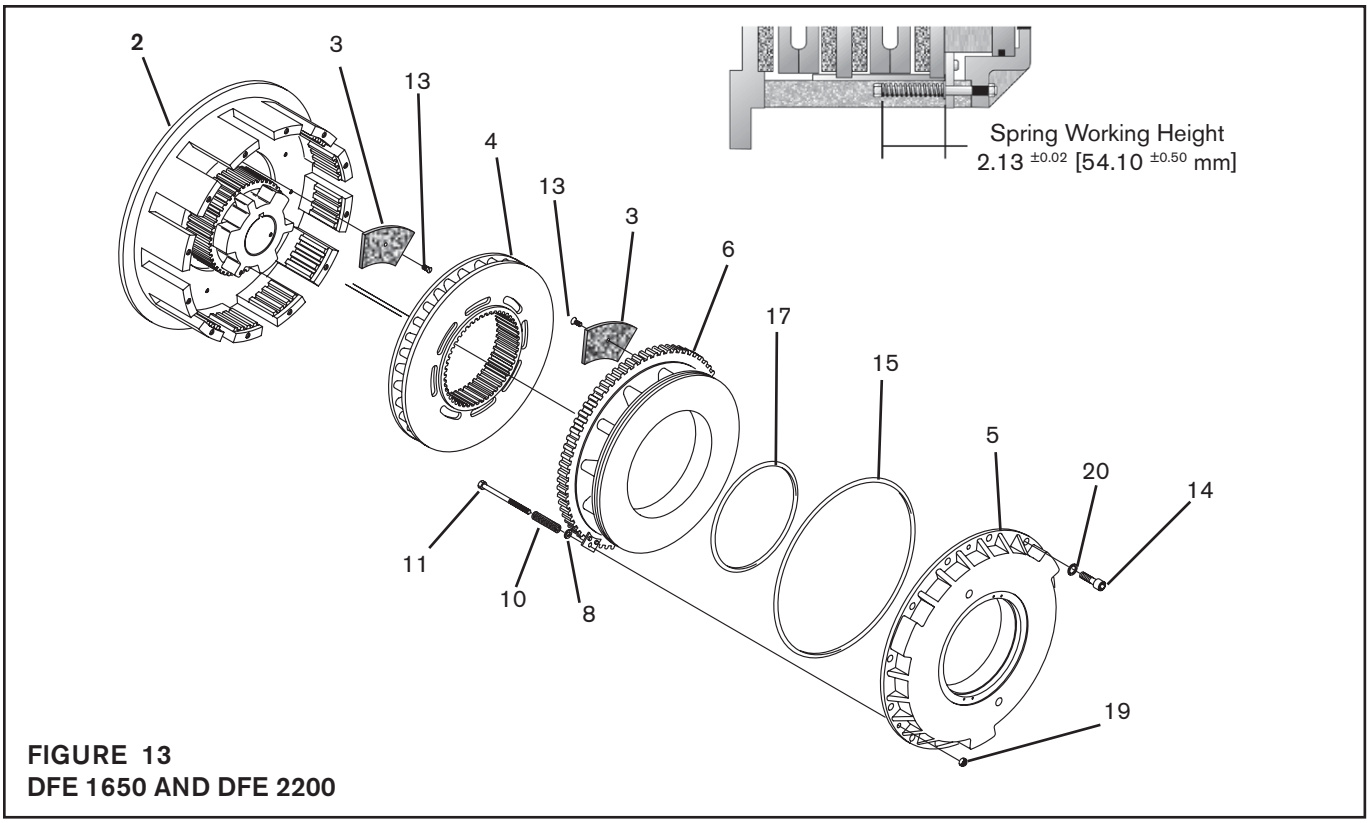



**FIGURE 13**
**DFE 1650 AND DFE 2200**

**Refer to Figure 12 or 13.**

1. Disconnect the air supply from the DFE.

**⚠ CAUTION**

Working with spring loaded or tension loaded fasteners and devices can cause injury. Wear safety glasses and take the appropriate safety precautions.

2. Remove the Lock Nuts (Item 19): then, remove the Cap Screws (Item 11), Compression Springs (Item 10), and Washers (Item 18).

3. Remove the Socket Head Cap Screws (Item 14) and Lockwashers (Item 20).

4. Remove the Cylinder (Item 5).

   NOTE: Applying low air pressure aids in the separation of the Cylinder (Item 5) from the Piston (Item 6) and Pressure Plate (Item 7).

   NOTE: On DFE Models 1650 and 2200 the Pressure Plate and Piston are one unit (Item 6).

5. Slide the Piston (Item 6) and Pressure Plate (Item 7) out of the Housing (Item 5).

6. Slide the Disc Assembly (Item 4) out of the Housing (Item 5).

7. Remove the old Machine Screws (Item 13) and the old Friction Facings (Item 3) from the Housing (Item 2), Disc Assembly (Item 4), and Pressure Plate (Item 7 on DFE 1150 and DFE 2500, or Item 6 on DFE 1650 and 2200).

8. Using new Machine Screws (Item 13), install the new Friction Facings (Item 3) onto the Housing (Item 2), Disc Assembly (Item 4), and Pressure Plate (Item 7 on DFE 1150 and DFE 2500, or Item 6 on DFE 1650 and DFE 2200).

9. Tighten the new Machine Screws (Item 3) to 16 Ft. Lbs. [21.59 Nm] torque.

10. Slide the Disc Assembly (Item 4) back into the Housing (Item 2).

11. Remove the old O-Ring Seals (Items 15 and 17) from the Piston (Item 6 on DFE 1150 and 2500) and Pressure Plate (Item 7 on DFE 1150 and 2500) or the Piston/Pressure Plate (Item 6) on DFE 1650 and 2200).

12. Coat the new O-Ring Seals (Items 15 and 17) with fresh O-Ring lubricant; then, install the new O-Ring Seals into the Piston (Item 6) and Pressure Plate (Item 7) or Piston/Pressure Plate (Item 6).

13. Slide the Piston (Item 6) and Pressure Plate (Item 7) or Piston/Pressure Plate (Item 6) back into the Cylinder (Item 5).

14. Slide new Compression Springs (Item 10) and Washers (Item 18) onto the Cap Screws (Item 11); then install the Cap Screws, Compression Springs, and Washers into the Cylinder, Piston, and Pressure Plate.

15. Install the Lock Nuts (Item 19); then tighten the Lock Nuts until a spring working height of 2.13" [54.10 mm] is achieved.

16. Slide the Cylinder, Piston, and Pressure Plate back into the Housing.

17. Apply a drop of Loctite 242 to the threads of the Cap Screws (Item 14); then, using the Cap Screws and Lockwashers (Item 20, secure the Cylinder, Piston, and Pressure Plate to the Housing.

18. Alternately and evenly tighten the Cap Screws (Item 14) to 110 Ft. Lbs. [148.43 Nm] torque

## PARTS REPLACEMENT

### FRICTION FACING, COMPRESSION SPRING, AND O-Ring SEAL REPLACEMENT- QFE

NOTE: The QFE does not have to be removed from the motor shaft to replace the Friction Facings and O-Ring Seals.

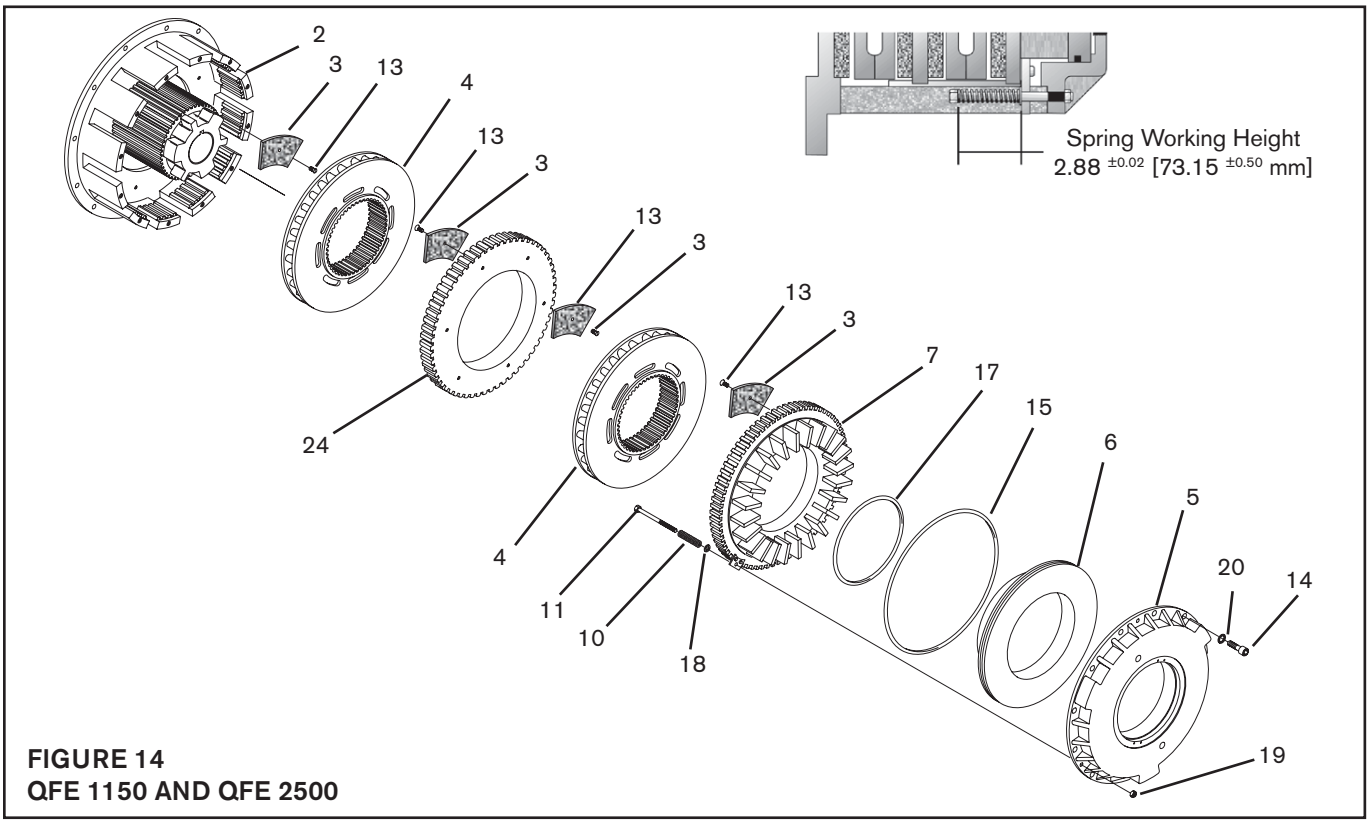



**FIGURE 14**
**QFE 1150 AND QFE 2500**

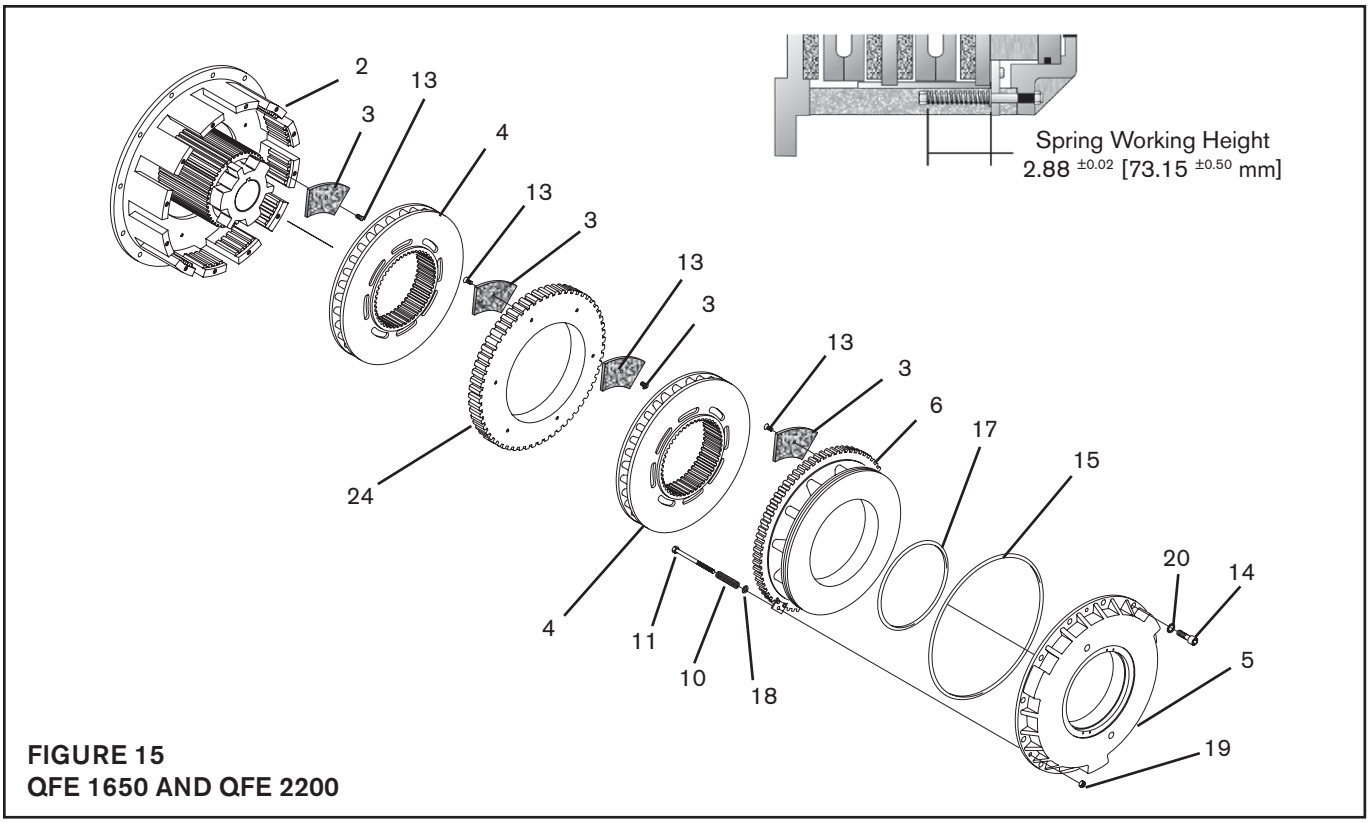



**FIGURE 15**
**QFE 1650 AND QFE 2200**

## PARTS REPLACEMENT (continued)

**Refer to Figure 14 or 15.**

1. Disconnect the air supply from the QFE.

**⚠ CAUTION**

Working with spring loaded or tension loaded fasteners and devices can cause injury. Wear safety glasses and take the appropriate safety precautions.

2. Remove the Lock Nuts (Item 19): then, remove the Cap Screws (Item 11), Compression Springs (Item 10), and Washers (Item 18).
3. Remove the Socket Head Cap Screws (Item 14) and Lockwashers (Item 20).
4. Remove the Cylinder (Item 5).

   NOTE: Applying low air pressure aids in the separation of the Cylinder (Item 5) from the Piston (Item 6) and Pressure Plate (Item 7).

   NOTE: On QFE Models 1650 and 2200 the Pressure Plate and Piston are one unit (Item 6).

5. Slide the Piston (Item 6) and Pressure Plate (Item 7) out of the Housing (Item 5).
6. Slide the first Disc Assembly (Item 4) out of the Housing (Item 5).
7. Slide the Facing Plate (Item 24) out of the Housing (Item 2).
8. Slide the second Disc Assembly (Item 4) out of the Housing (Item 5).
9. Remove the old Machine Screws (Item 13) and the old Friction Facings (Item 3) from the Housing (Item 2), Facing Plate (Item 24), and Pressure Plate (Item 7 on QFE 1150 and QFE 2500, or Item 6 on QFE 1650 and QFE 2200).
10. Using new Machine Screws (Item 13), install the new Friction Facings (Item 3) onto the Housing (Item 2), Facing Plate (Item 24), and Pressure Plate (Item 7 on QFE 1150 and QFE 2500, or Item 6 on QFE 1650 and QFE 2200).
11. Tighten the new Machine Screws (Item 3) to 16 Ft. Lbs. [21.59 Nm] torque.
12. Slide the second Disc Assembly (Item 4) removed back into the Housing (Item 2).
13. Slide the Facing Plate (Item 24) back into the Housing (Item 2).
14. Slide the first Disc Assembly (Item 4) removed back into the Housing (Item 2).
15. Remove the old O-Ring Seals (Items 15 and 17) from the Piston (Item 6 on QFE 1150 and 2500) and Pressure Plate (Item 7 on QFE 1150 and 2500) or the Piston/Pressure Plate (Item 6) on QFE 1650 and 2200).
16. Coat the new O-Ring Seals (Items 15 and 17) with fresh O-Ring lubricant; then, install the new O-Ring Seals into the Piston (Item 6) and Pressure Plate (Item 7) or Piston/Pressure Plate (Item 6).
17. Slide the Piston (Item 6) and Pressure Plate (Item 7) or Piston/Pressure Plate (Item 6) back into the Cylinder (Item 5).
18. Slide new Compression Springs (Item 10) and Washers (Item 18) onto the Cap Screws (Item 11); then install the Cap Screws, Compression Springs, and Washers into the Cylinder, Piston, and Pressure Plate.
19. Install the Lock Nuts (Item 19); then tighten the Lock Nuts until a springs working height of 2.13" [54.10 mm] is achieved.
20. Install the Lock Nuts (Item 19); then tighten the Lock Nuts until a springs working height of 2.13" [54.10 mm] is achieved.
21. Slide the Cylinder, Piston, and Pressure Plate back into the Housing.
22. Apply a drop of Loctite 242®to the threads of the Cap Screws (Item 14); then, using the Cap Screws and Lockwashers (item 20, secure the Cylinder, Piston, and Pressure Plate to the Housing.
23. Alternately and evenly tighten the Cap Screws (Item 14) to 110 Ft. Lbs. [148.43 Nm] torque.

## REPLACEMENT PARTS

The item or balloon number for all Nexen products is used for part identification on all product parts lists, product price lists, unit assembly drawings, bills of materials, and instruction manuals.

When ordering replacement parts, specify model designation, item number, part description, and quantity. Purchase replacement parts through your local Nexen Distributor.

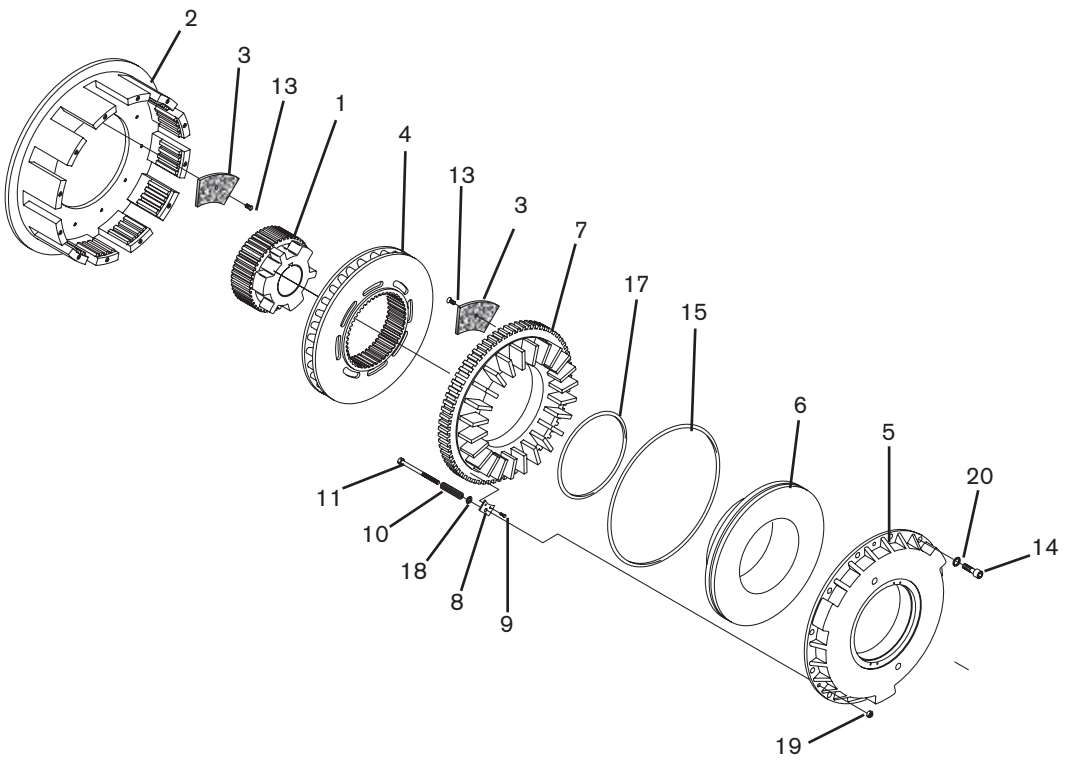



FIGURE 16

**DFE 1150**

| ITEM | DESCRIPTION | QTY |
|---|---|---|
| 1[3] | Hub | 1 |
| 2[3] | Housing | 1 |
| 3[2] | Friction Facing | 12 |
| 4 | Disc Assembly | 1 |
| 5 | Cylinder | 1 |
| 6 | Piston | 1 |
| 7 | Pressure Plate | 1 |
| 8 | Bracket | 3 |
| 9 | Cap Screw | 6 |
| 10[1,3] | Compression Spring | 3 |
| 11[3] | Cap Screw | 3 |
| 13[2] | Machine Screw | 24 |
| 14 | Cap Screw | 6 |
| 15[1] | O-Ring Seal | 1 |
| 16 | Pin (Not Shown) | 1 |
| 17[1] | O-Ring Seal | 1 |
| 18 | Washer | 3 |
| 19 | Lock Nut | 3 |
| 20 | Lockwasher | 6 |

[1] Denotes Repair Kit item
Repair Kit Product No. 964016
[2] Denotes Facing Kit item.
Facing Kit Product No. 964028
[3] Specify DFE or QFE when ordering these items.

**DFE 2500**

| ITEM | DESCRIPTION | QTY |
|---|---|---|
| 1[3] | Hub | 1 |
| 2[3] | Housing | 1 |
| 3[2] | Friction Facing | 12 |
| 4 | Disc Assembly | 1 |
| 5 | Cylinder | 1 |
| 6 | Piston | 1 |
| 7 | Pressure Plate | 1 |
| 8 | Bracket | 6 |
| 9 | Cap Screw | 12 |
| 10[1,3] | Compression Spring | 6 |
| 11[3] | Cap Screw | 6 |
| 13[2] | Machine Screw | 24 |
| 14 | Cap Screw | 12 |
| 15[1] | O-Ring Seal | 1 |
| 16 | Pin (Not Shown) | 1 |
| 17[1] | O-Ring Seal | 1 |
| 18 | Washer | 6 |
| 19 | Lock Nut | 6 |
| 20 | Lockwasher | 12 |

[1] Denotes Repair Kit item
Repair Kit Product No. 964025
[2] Denotes Facing Kit item.
Facing Kit Product No. 964037
[3] Specify DFE or QFE when ordering these items.

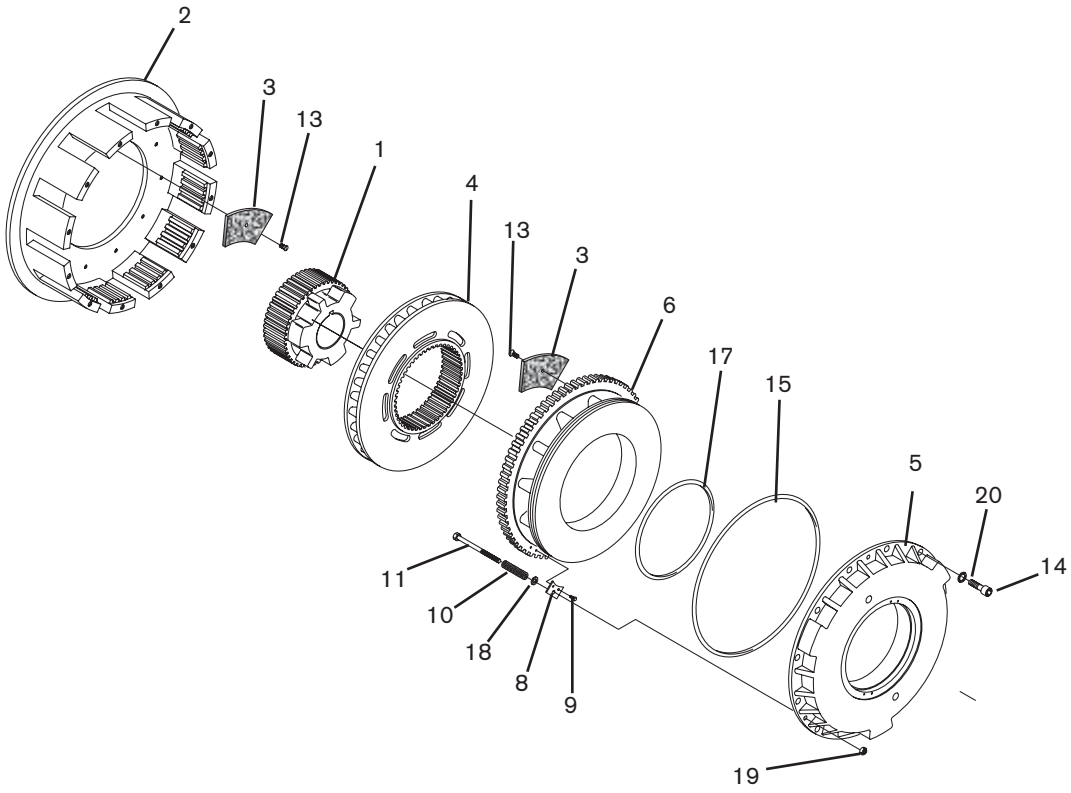



FIGURE 17

**DFE 1650**

| ITEM | DESCRIPTION | QTY |
|---|---|---|
| 1[3] | Hub | 1 |
| 2[3] | Housing | 1 |
| 3[2] | Friction Facing | 12 |
| 4 | Disc Assembly | 1 |
| 5 | Cylinder | 1 |
| 6 | Piston/Pressure Plate | 1 |
| 8 | Bracket | 3 |
| 9 | Cap Screw | 6 |
| 10[1,3] | Compression Spring | 3 |
| 11[3] | Cap Screw | 3 |
| 13[2] | Machine Screw | 24 |
| 14 | Cap Screw | 6 |
| 15[1] | O-Ring Seal | 1 |
| 16 | Pin (Not Shown) | 1 |
| 17[1] | O-Ring Seal | 1 |
| 18 | Washer | 3 |
| 19 | Lock Nut | 3 |
| 20 | Lockwasher | 6 |

[1] Denotes Repair Kit item.
Repair Kit Product No. 964019
[2] Denotes Facing Kit item.
Facing Kit Product No. 964031
[3] Specify DFE or QFE when ordering these items.

**DFE 2200**

| ITEM | DESCRIPTION | QTY |
|---|---|---|
| 1[3] | Hub | 1 |
| 2[3] | Housing | 1 |
| 3[2] | Friction Facing | 12 |
| 4 | Disc Assembly | 1 |
| 5 | Cylinder | 1 |
| 6 | Piston/Pressure Plate | 1 |
| 8 | Bracket | 6 |
| 9 | Cap Screw | 12 |
| 10[1,3] | Compression Spring | 6 |
| 11[3] | Cap Screw | 6 |
| 13[2] | Machine Screw | 24 |
| 14 | Cap Screw | 12 |
| 15[1] | O-Ring Seal | 1 |
| 16 | Pin (Not Shown) | 1 |
| 17[1] | O-Ring Seal | 1 |
| 18 | Washer | 6 |
| 19 | Lock Nut | 6 |
| 20 | Lockwasher | 12 |

[1] Denotes Repair Kit item.
Repair Kit Product No. 964022
[2] Denotes Facing Kit item.
Facing Kit Product No. 964034
[3] Specify DFE or QFE when ordering these items.

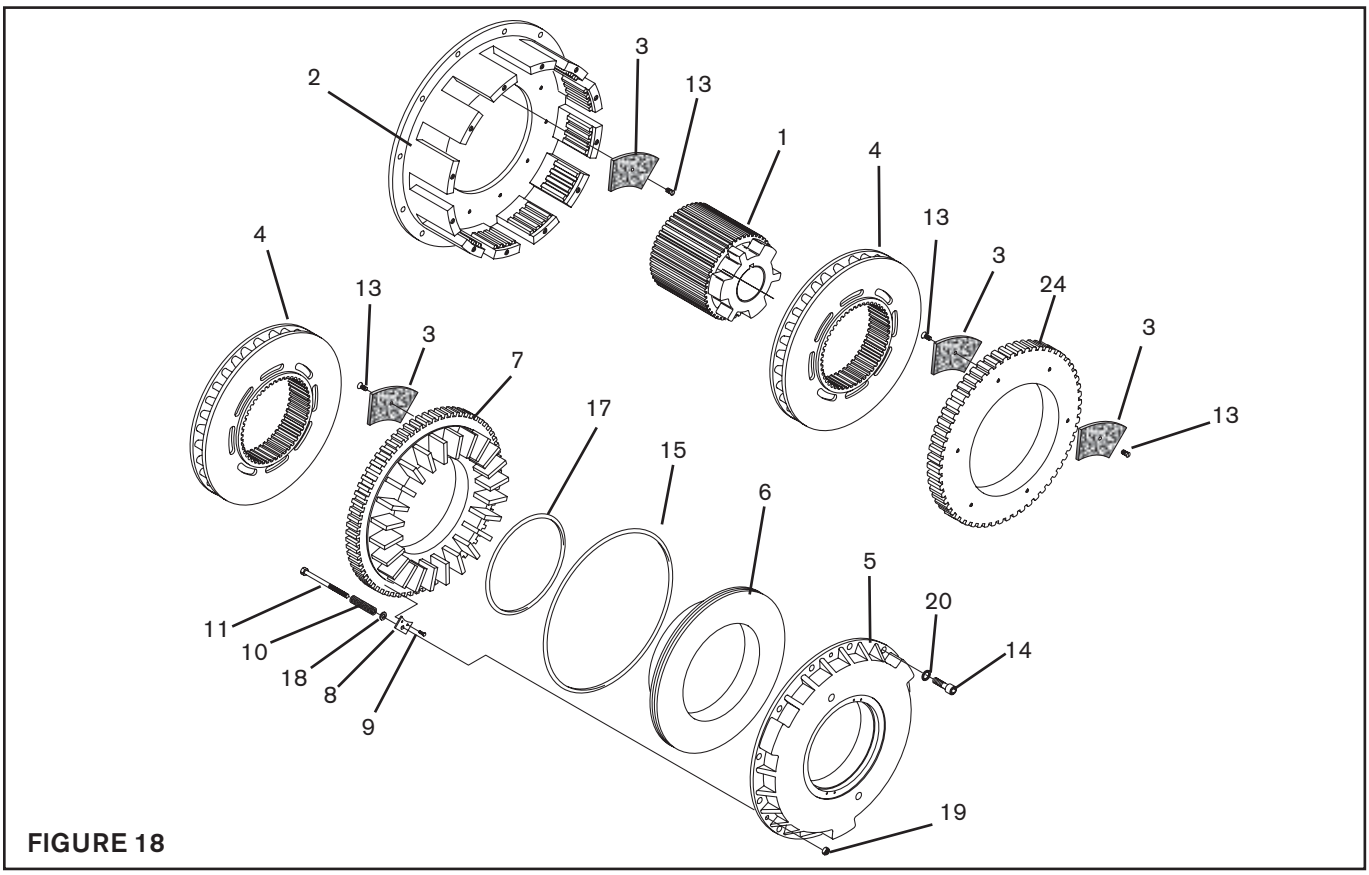



FIGURE 18

**QFE 1150**

| ITEM | DESCRIPTION | QTY |
|---|---|---|
| 1[3] | Hub | 1 |
| 2[3] | Housing | 1 |
| 3[2] | Friction Facing | 24 |
| 4 | Disc Assembly | 2 |
| 5 | Cylinder | 1 |
| 6 | Piston | 1 |
| 7 | Pressure Plate | 1 |
| 8 | Bracket | 3 |
| 9 | Cap Screw | 6 |
| 10[1,3] | Compression Spring | 3 |
| 11[3] | Cap Screw | 3 |
| 13[2] | Machine Screw | 48 |
| 14 | Cap Screw | 6 |
| 15[1] | O-Ring Seal | 1 |
| 16 | Pin (Not Shown) | 1 |
| 17[1] | O-Ring Seal | 1 |
| 18 | Washer | 3 |
| 19 | Lock Nut | 3 |
| 20 | Lockwasher | 6 |
| 24 | Facing Plate | 1 |

[1] Denotes Repair Kit item.
Repair Kit Product No. 964088
[2] Denotes Facing Kit item.
Facing Kit Product No. 964028 (2 Required).
[3] Specify DFE or QFE when ordering these items.

**QFE 2500**

| ITEM | DESCRIPTION | QTY |
|---|---|---|
| 1[3] | Hub | 1 |
| 2[3] | Housing | 1 |
| 3[2] | Friction Facing | 24 |
| 4 | Disc Assembly | 1 |
| 5 | Cylinder | 1 |
| 6 | Piston | 1 |
| 7 | Pressure Plate | 1 |
| 8 | Bracket | 6 |
| 9 | Cap Screw | 12 |
| 10[1,3] | Compression Spring | 6 |
| 11[3] | Cap Screw | 6 |
| 13[2] | Machine Screw | 48 |
| 14 | Cap Screw | 12 |
| 15[1] | O-Ring Seal | 1 |
| 16 | Pin (Not Shown) | 1 |
| 17[1] | O-Ring Seal | 1 |
| 18 | Washer | 6 |
| 19 | Lock Nut | 6 |
| 20 | Lockwasher | 12 |
| 24 | Facing Plate | 1 |

[1] Denotes Repair Kit item.
Repair Kit Product No. 964025
[2] Denotes Facing Kit item.
Facing Kit Product No. 964037 (2 required).
[3] Specify DFE or QFE when ordering these items.

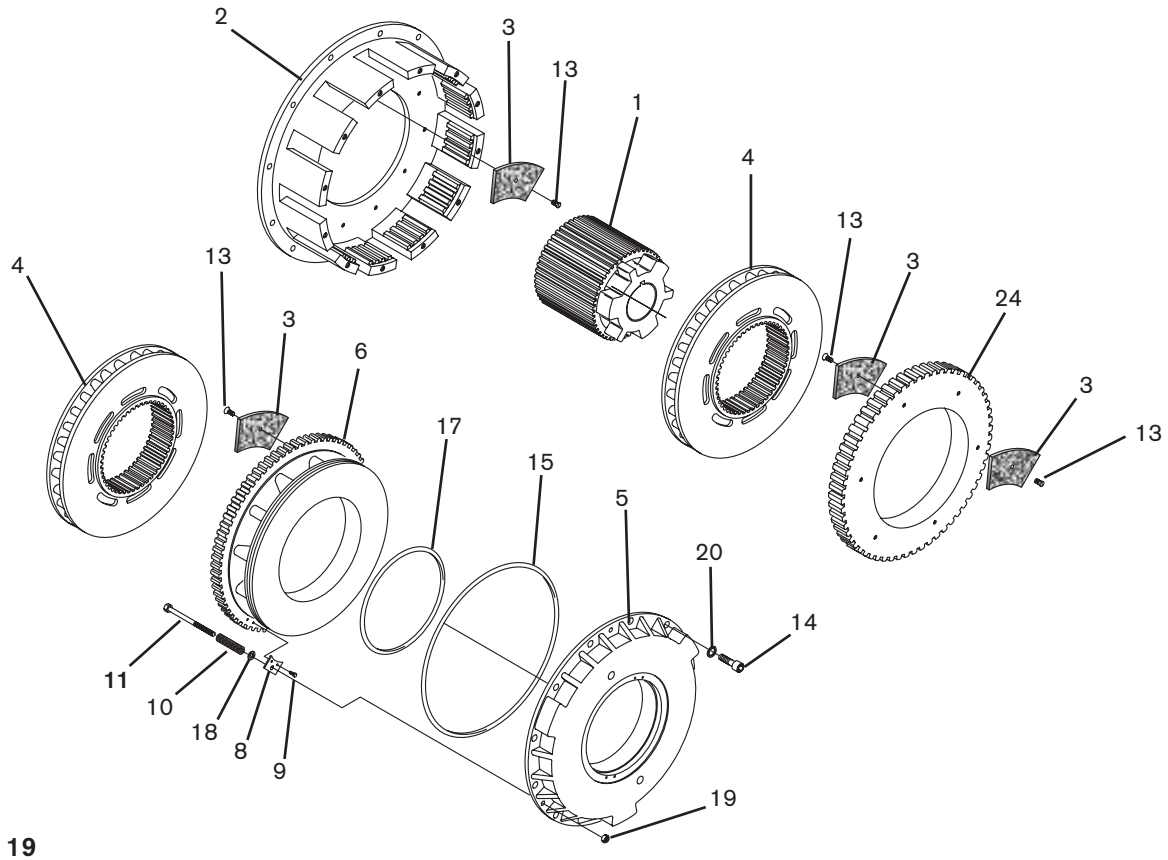



FIGURE 19

**QFE 1650**

| ITEM | DESCRIPTION | QTY |
|---|---|---|
| 1[3] | Hub | 1 |
| 2[3] | Housing | 1 |
| 3[2] | Friction Facing | 24 |
| 4 | Disc Assembly | 2 |
| 5 | Cylinder | 1 |
| 6 | Piston/Pressure Plate | 1 |
| 8 | Bracket | 3 |
| 9 | Cap Screw | 3 |
| 10[1,3] | Compression Spring | 3 |
| 11[3] | Cap Screw | 3 |
| 13[2] | Machine Screw | 48 |
| 14 | Cap Screw | 12 |
| 15[1] | O-Ring Seal | 1 |
| 17[1] | O-Ring Seal | 1 |
| 18 | Washer | 3 |
| 19 | Lock Nut | 3 |
| 20 | Lockwasher | 12 |

[1] Denotes Repair Kit item.
Repair Kit Product No. 964091.
[2] Denotes Facing Kit item.
Facing Kit Product No. 964031 (2 Required).
[3] Specify DFE or QFE when ordering these items.

**QFE 2200**

| ITEM | DESCRIPTION | QTY |
|---|---|---|
| 1[3] | Hub | 1 |
| 2[3] | Housing | 1 |
| 3[2] | Friction Facing | 24 |
| 4 | Disc Assembly | 2 |
| 5 | Cylinder | 1 |
| 6 | Piston/Pressure Plate | 1 |
| 8 | Bracket | 6 |
| 9 | Cap Screw | 12 |
| 10[1,3] | Compression Spring | 6 |
| 11[3] | Cap Screw | 6 |
| 13[2] | Machine Screw | 48 |
| 14 | Cap Screw | 12 |
| 15[1] | O-Ring Seal | 1 |
| 17[1] | O-Ring Seal | 1 |
| 18 | Washer | 6 |
| 19 | Lock Nut | 6 |
| 20 | Lockwasher | 12 |

[1] Denotes Repair Kit item.
Repair Kit Product No. 964094.
[2] Denotes Facing Kit item.
Facing Kit Product No. 964034 (2 Required).
[3] Specify DFE or QFE when ordering these items.

## ROTARY AIR UNION

| ITEM | DESCRIPTION | QTY |
|---|---|---|
| 21 | Rotary Air Union Bracket | 1 |
| 22 | Cap Screw | 4 |
| 23 | Rotary Air Union | 1 |
| 25 | Hose Assembly (Not Shown) | 2 |
| 26 | Elbow Fitting (Not Shown) | 4 |

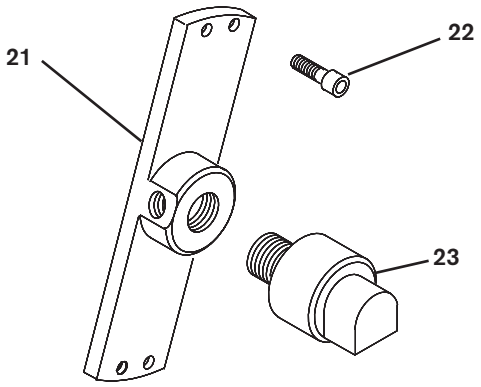



FIGURE 20

## WARRANTY

**Warranties**
Nexen warrants that the Products will (a) be free from any defects in material or workmanship for a period of 12 months from the date of shipment, and (b) will meet and perform in accordance with the specifications in any engineering drawing specifically for the Product that is in Nexen's current product catalogue, or that is accessible at the Nexen website, or that is attached to this Quotation and that specifically refers to this Quotation by its number, subject in all cases to any limitations and exclusions set out in the drawing. NEXEN MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND ALL IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. This warranty applies only if: (a) the Product has been installed, used and maintained in accordance with any applicable Nexen installation or maintenance manual for the Product; (b) the alleged defect is not attributable to normal wear and tear; (c) the Product has not been altered, misused or used for purposes other than those for which it was intended; and (d) Buyer has given written notice of the alleged defect to Nexen, and delivered the allegedly defective Product to Nexen, within one year of the date of shipment.

**Exclusive Remedy**
The exclusive remedy for the Buyer for any breach of any warranties provided in connection with this agreement will be, at the election of Nexen: (a) repair or replacement with new, serviceably used, or reconditioned parts or products; or (b) issuance of credit in the amount of the purchase price paid to Nexen by the Buyer for the Products.

**Agent's Authority**
Buyer agrees that no agent, employee or representative of Nexen has authority to bind Nexen to any affirmation, representation, or warranty concerning the Products other than those warranties expressly set forth herein.

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TO THE EXTENT PERMITTED BY LAW NEXEN SHALL HAVE NO LIABILITY TO BUYER OR ANY OTHER PERSON FOR INCIDENTAL DAMAGES, SPECIAL DAMAGES, CONSEQUENTIAL DAMAGES OR OTHER DAMAGES OF ANY KIND OR NATURE WHATSOEVER, WHETHER ARISING OUT OF BREACH OF WARRANTY OR OTHER BREACH OF CONTRACT, NEGLIGENCE OR OTHER TORT, OR OTHERWISE, EVEN IF NEXEN SHALL HAVE BEEN ADVISED OF THE POSSIBILITY OR LIKELIHOOD OF SUCH POTENTIAL LOSS OR DAMAGE. For all of the purposes hereof, the term "consequential damages" shall include lost profits, penalties, delay damages, liquidated damages or other damages and liabilities which Buyer shall be obligated to pay or which Buyer may incur based upon, related to or arising out of its contracts with its customers or other third parties. In no event shall Nexen be liable for any amount of damages in excess of amounts paid by Buyer for Products or services as to which a breach of contract has been determined to exist. The parties expressly agree that the price for the Products and the services was determined in consideration of the limitation on damages set forth herein and such limitation has been specifically bargained for and constitutes an agreed allocation of risk which shall survive the determination of any court of competent jurisdiction that any remedy herein fails of its essential purpose.

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Buyer shall inspect all shipments of Products upon arrival and shall notify Nexen in writing, of any shortages or other failures to conform to these terms and conditions which are reasonably discoverable upon arrival without opening any carton or box in which the Products are contained. Such notice shall be sent within 14 days following arrival. All notifications shall be accompanied by packing slips, inspection reports and other documents necessary to support Buyer's claims. In addition to the foregoing obligations, in the event that Buyer receives Products that Buyer did not order, Buyer shall return the erroneously shipped Products to Nexen within thirty (30) days of the date of the invoice for such Products; Nexen will pay reasonable freight charges for the timely return of the erroneously shipped Products, and issue a credit to Buyer for the returned Products at the price Buyer paid for them, including any shipping expenses that Nexen charged Buyer. All shortages, overages and nonconformities not reported to Nexen as required by this section will be deemed waived.

**Limitation on Actions**
No action, regardless of form, arising out of any transaction to which these terms and conditions are applicable may be brought by the Buyer more than one year after the cause of action has accrued.

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Nexen Group, Inc.
560 Oak Grove Parkway
Vadnais Heights, MN 55127

800.843.7445
Fax: 651.286.1099
www.nexengroup.com

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