




## Enclosed Tooth Clutches

### 5HPSP-E Series

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.

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	<div data-bbox="620 569 915 621"> <b>DANGER</b></div> <p>Read this manual carefully before installation and operation. Follow Nexen's instructions and integrate this unit into your system with care. This unit should be installed, operated and maintained by qualified personnel <b>ONLY</b>. Improper installation can damage your system, cause injury or death. Comply with all applicable codes.</p>	
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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.

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**ISO 9001 Certified**


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## GENERAL SPECIFICATIONS


Specifications	
Torque	Up to 1350 Nm (12000 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 13.6 kg (30 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.



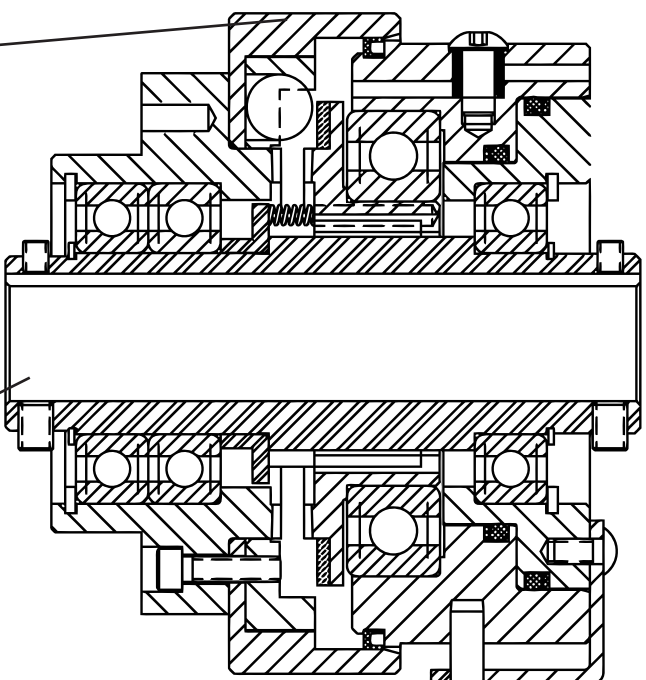
**CAUTION**

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



**CAUTION**

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



## INTRODUCTION

Nexen 5HPSP-E Single Position Tooth Clutches are designed for applications where exact timing to two components is required..

Tooth clutches are normally engaged when stationary. In certain circumstances, such as low RPM, tooth clutches can be engaged at differential speeds up to 150 RPM. The allowable engagement speed depends on the rotational inertia of the mass being accelerated and the air pressure applied.

If the tooth clutch is to be engaged in other than static conditions, solve the following "Differential Speed" formula to make sure the application's speed is within the limits of the selected clutch.

### DIFFERENTIAL SPEED FORMULA

Use the Differential Speed Formula to find the allowable engagement speed (**N**) at a specific air pressure setting (**P**) with a given inertia load (**WK<sup>2</sup>**). This formula expresses the relationship of the variables involved that effect the impact of the face teeth during engagement. Tooth damage can occur when tooth velocity and air pressure settings are too high (i.e. a smaller clutch has a lower tooth velocity at any given RPM and a small clutch has less driver inertia).

$$N = \frac{V(10^4)}{(P-22)\sqrt{WK^2}}$$

Where **N** = Differential RPM Limit Clutch  
**V** = Constant for Clutch (See Table 1)  
**P** = Operational Pressure P.S.I.  
**WK<sup>2</sup>** = referred Inertia lb. • ft<sup>2</sup>

**EXAMPLE:** The required differential engagement speed using a Model 5H45P-E clutch at 60 psi is 150 RPM. (Clutch rotating at 1250, machine component at 1100). The referred inertia is 3 lb. • ft<sup>2</sup>. The differential RPM limit for the clutch is:

$$N = \frac{1.4(10^4)}{(60-22)\sqrt{3}} = 213 \text{ RPM}$$



150 RPM is within the limit of the 5H45P-E operating at 60 psi with a load of 3 lb. • ft<sup>2</sup>.

**TABLE 1**  
**Constants for Clutches**

CLUTCH	CONSTANT (V)	CLUTCH	CONSTANT (V)
5H30PSP-E	2.10	5H45PSP-E	1.40
5H35PSP-E	1.80	5H50PSP-E	1.26
5H40PSP-E	1.57	5H60PSP-E	1.05

NOTE: Formula does not estimate:

1. RPM which prevents ratcheting.
2. Acceleration time.
3. Tooth stress after engagement.

	 <b>CAUTION</b>
	<p><b>If differential speed exceeds the clutch limitations, ratcheting of the teeth can occur that will shorten clutch life.</b></p>

## INSTALLATION

Nexen 5HPSP-E Series clutches have a drive flange with two bearings, a pilot diameter, and tapped holes for mounting a pulley, sprocket, or the Nexen Clutch Coupling (Refer to Sales Brochure L-20208) (See Table 2 for recommended tightening torques).

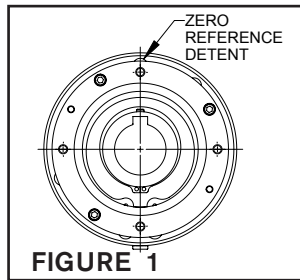
**TABLE 2**

MODEL	TORQUE
5H30PSP-E	13 ft-lbs [17.6 Nm]
5H35PSP-E	13 ft-lbs [17.6 Nm]
5H40PSP-E	13 ft-lbs [17.6 Nm]
5H45PSP-E	13 ft-lbs [17.6 Nm]
5H50PSP-E	48 ft-lbs [65 Nm]
5H60PSP-E	48 ft-lbs [65 Nm]

NOTE: Nexen recommends using a red anaerobic thread locking compound on Pilot Mounting Bolts.

### Single Position Tooth Clutch Synchronization

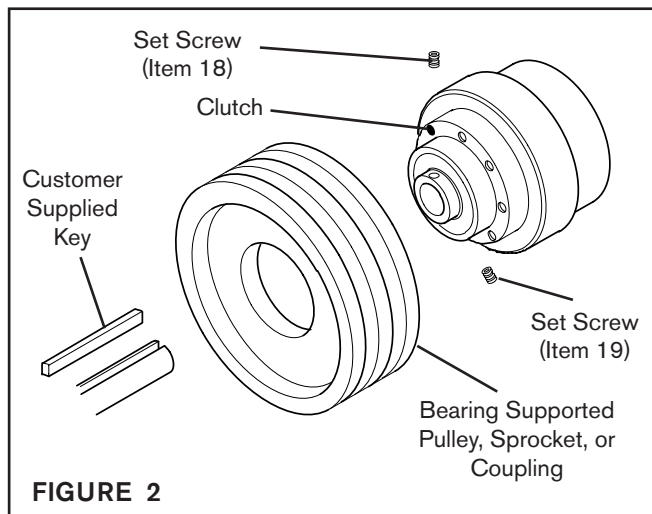
The clutch keyway and one mounting hole are aligned to orient the clutch for single positioning as shown in Fig. 1. The clutch face teeth engage in one location when the clutch is activated.



### CAUTION

Do not connect the Clutch in-line without using the Nexen Flexible Coupling. The internal construction of the 5H Tooth Clutches will not allow misalignment tolerances. (Refer to Sales Literature L-20208).

NOTE: Nexen's 5HPSP-E is shaft mounted using a customer supplied full length key.



### Refer to Figure 2.

1. Install Nexen Clutch Coupling , Bearing Supported Pulley, Sprocket, or Gear (Table 2).
2. Insert customer supplied key into shaft.
3. Slide Clutch onto shaft and customer supplied key.

NOTE: Whenever possible, arrange the input drive to the clutch through the drive flange to prevent clutch bearings from rotating unnecessarily.

4. Using Set Screws (Item 18 & 19), secure Clutch to Shaft.
5. Tighten Set Screws (Item 18 & 19) to recommended torque (See Table 3).

**TABLE 3**

### Recommended Tightening Torque (Item 18 & 19).

MODEL	TORQUE (Item 18)	TORQUE (Item 19)
5H30PSP-E	21 in-lbs [2.4 Nm]	61 in-lbs [6.9 Nm]
5H35PSP-E	21 in-lbs [2.4 Nm]	61 in-lbs [6.9 Nm]
5H40PSP-E	21 in-lbs [2.4 Nm]	61 in-lbs [6.9 Nm]
5H45PSP-E	21 in-lbs [2.4 Nm]	61 in-lbs [6.9 Nm]
5H50PSP-E	21 in-lbs [2.4 Nm]	61 in-lbs [6.9 Nm]
5H60PSP-E	21 in-lbs [2.4 Nm]	61 in-lbs [6.9 Nm]

NOTE: Align air inlet port to the six o'clock down position to allow condensation to drain out of the exhaust port.

In severe use applications, the clutch may tend to move axially along the shaft. To prevent this axial movement, confine the clutch between shoulders, clamp collars, or insert spring pins through the shaft.

Mounting positions of Tooth Clutches may be horizontal or vertical. Nexen recommends that the Drive Flange faces up to enhance the spring return when mounting tooth clutches in the vertical position.

## 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.

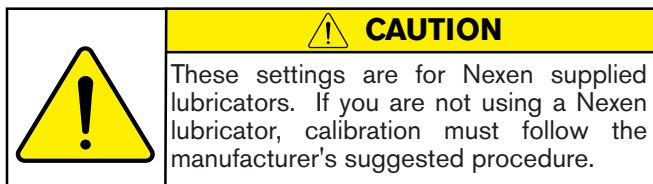
However, some customers prefer to use an air line lubricator, which injects oil into the pressurized air, forcing an oil mist into the air chamber. This is acceptable, but care must be taken to ensure once an air mist lubrication system is used, it is continually used over the life of the product as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



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.

## SPLINE

Although the Spline has been lubricated at the factory with a high temperature, anti-seize lubricating compound, Nexen recommends periodic lubrication of this component to insure smooth clutch engagement and disengagement.

NOTE: Clutch must be disassembled to lubricate Spline (See Parts Replacement section for disassembly instructions).


## FACE TEETH

Lubricate Drive Flange Assembly Face Teeth, and Drive Ring (Item 17) with "NEVER-SEEZ"® or equivalent whenever visual inspection shows a need for lubrication. For breakaway applications, Nexen recommends a continual drip or mist lubrication of the Face Teeth.

## AIR CONNECTIONS

Although Nexen 5HPSP-E Enclosed Tooth Clutches are air actuated with a maximum operating air pressure of 80 PSI, use only enough air pressure to deliver ample torque for the application. Operating air pressures over 80 PSI will eventually cause bearing and seal damage.

Due to bearing seal drag, the cylinder/piston assembly will rotate, resulting in hose breakage when clutch is engaged. Resting the hose against a support mounted parallel to the clutch centerline stops this rotation.



**CAUTION**

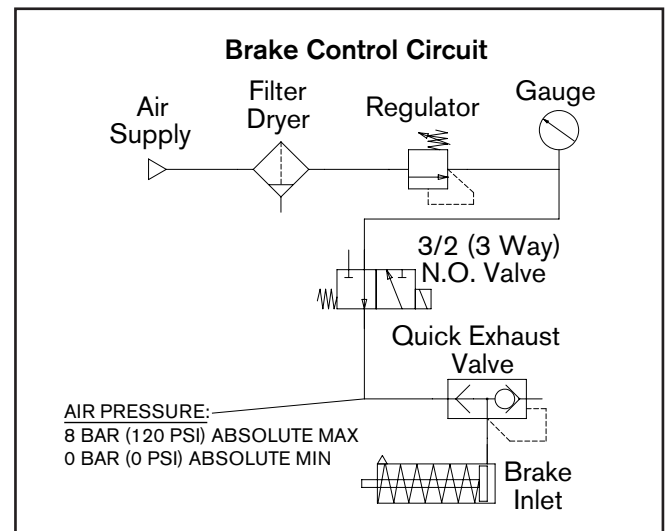
Rigid pipe or tubing when connected directly to the clutch will prevent proper actuation of the clutch. Use only flexible hose or tubing when making air line connections to clutch.

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.

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.




## OPERATION




**WARNING**

Never exceed maximum operating speeds listed for your product. (See Table 4).



**CAUTION**

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



**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".

TABLE 4

Size	Max RPM
5H30PSP-E	1650
5H35PSP-E	1350
5H40PSP-E	1350
5H45PSP-E	1200
5H50PSP-E	1100
5H60PSP-E	1000



## TROUBLESHOOTING

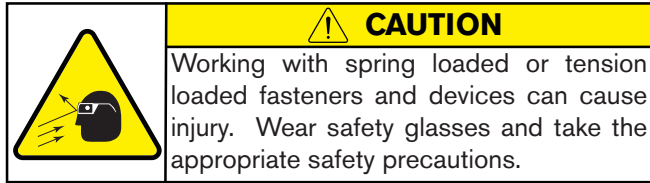
PROBLEM	PROBABLE CAUSE	SOLUTION
Failure to Engage	Control Valve malfunction or low air pressure.	Check system for air leaks or replace Control Valve.
	Lack of lubrication on Hub Spline or in Air Chamber	Lubricate Hub Spline and check Air Chamber Lubrication.
	Using rigid pipe or tubing for air line connections.	Use flexible pipe or tubing for air line connections.
	Use of a rigid inline coupling mounted directly to the Drive Flange.	Use Nexen's Flexible Clutch Coupling.
Failure to Disengage	Lack of lubrication on Hub Spline or in Air Chamber.	Lubricate Hub Spline and check Air Chamber Lubrication.
	Unexhausted air due to Control Valve malfunction.	Replace Control Valve.
	Broken Return Springs.	Replace Return Springs.
	Use of a rigid inline coupling mounted directly to the Drive Flange	Use Nexen's Flexible Clutch Coupling.
Tooth Wear or Clicking Sound	Excessive engagement RPM or unintentional disengagement due to torque overload.	Contact Nexen for Clutch specifications.
Bearing Failure	Limit air pressure to 80 psi. Excessive air pressure increases the thrust load on the Bearings.	
	Stay within the maximum specified speed limits as specified in the "Air Champ" Catalog.	
	Use Nexen's Flexible Clutch Coupling for inline applications. <b>Do not connect a rigid coupling directly to the Drive Flange.</b>	
	Avoid applying excessive overhung loads to Pilot Mount Clutches. Wide pulleys or sprockets which extend beyond the end of the clutch will increase the radial load and reduce bearing life.	

## PARTS REPLACEMENT

### DISASSEMBLY

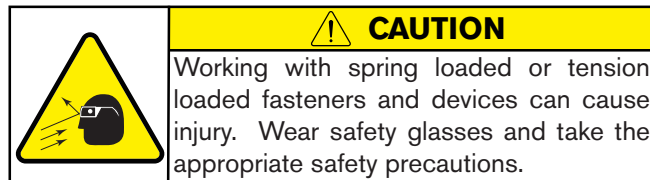
Refer to Figures 3 & 4.

1. Remove Set Screws (Item 18 & 19).



2. Remove Retaining Ring (Item 14).
3. Fully supporting lip of Drive Flange Assembly (Item 10), press Hub (Item 1), and Piston/Cylinder Assembly out of Drive Flange Assembly.
4. Remove Rotary Seal (Item 4).
5. Remove Retaining Ring (Item 14).
6. Fully supporting Cylinder/Piston Assembly, press Hub (Item 1) out of Cylinder/Piston Assembly.
7. Remove Compression Springs (Item 8) and Spring Pin Stiffeners (Item 24).

### BEARING REPLACEMENT (Item 12) Drive Flange Assembly (Items 17 & 10)

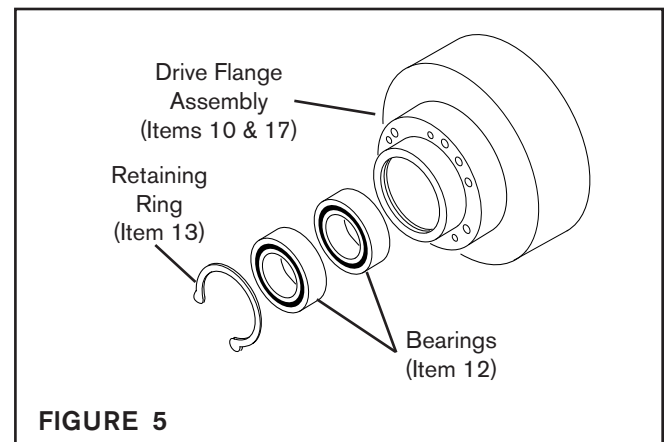
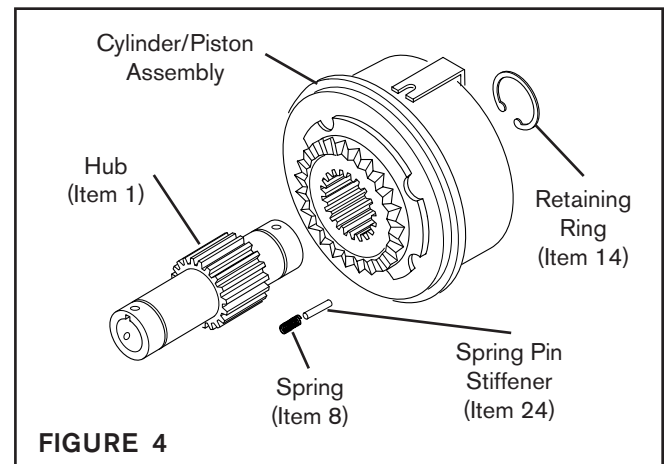
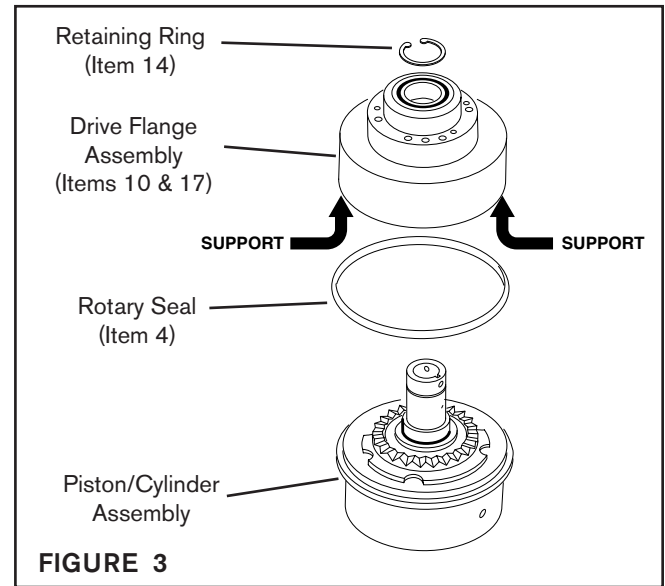


Refer to Figure 5.

1. Remove Retaining Ring (Item 13).
2. Press Bearings (Item 12) out of Drive Flange Assembly (Items 17 & 10).
3. Clean bore of Drive Flange with fresh safety solvent.
4. Apply Loctite® 680 to O.D. of new Bearings, and press new Bearings into Drive Flange Assembly (Item 17).

NOTE: When installing new Bearings, carefully align Bearing O.D. with Drive Flange Bore to prevent Bearing misalignment.

5. Install Retaining Ring (Item 13).



## PARTS REPLACEMENT (continued)

### BEARINGS (Items 11 & 12)

#### Cylinder/Piston Assembly

Refer to Figures 6 - 9.

1. Remove Drive Flange (Item 22).
2. Separate Piston (Item 3) from Cylinder (Item 2).
3. Press Bearing (Item 11) out of Cylinder (Item 2).
4. Clean bore of Cylinder (Item 2) with fresh safety solvent.
5. Apply Loctite® 680 to O.D. of new Bearing (Item 11) and press Bearing into Cylinder (Item 2).

NOTE: When installing new Bearing, carefully align Bearing O.D. with bore of Cylinder to prevent bearing misalignment.



#### CAUTION

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

6. Remove Retaining Ring (Item 13) from Piston (Item 3).
7. Press Bearing (Item 12) out of Piston (Item 3).
8. Clean bore of Piston (Item 3) with fresh safety solvent.
9. Apply Loctite® 680 to O.D. of new Bearing (Item 12) and press Bearing into Piston (Item 3).

NOTE: When installing new Bearing, carefully align Bearing O.D. with bore of Piston to prevent bearing misalignment.

10. Install Retaining Ring (Item 13).

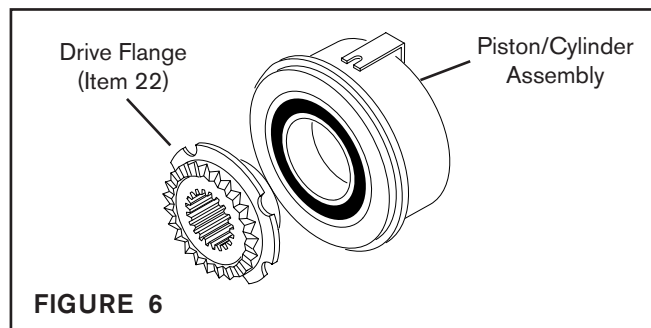


FIGURE 6

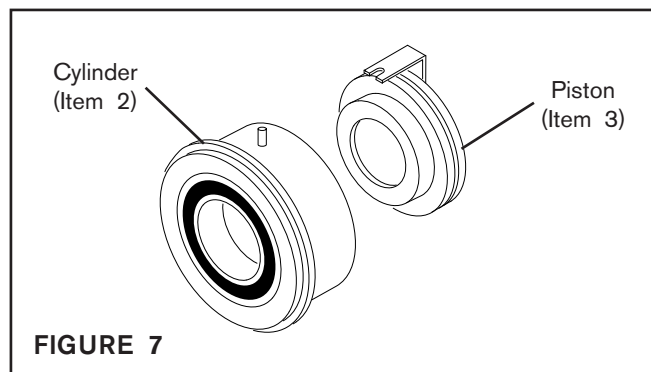


FIGURE 7

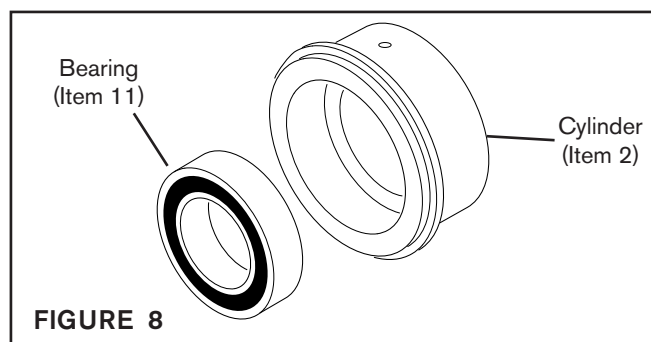


FIGURE 8

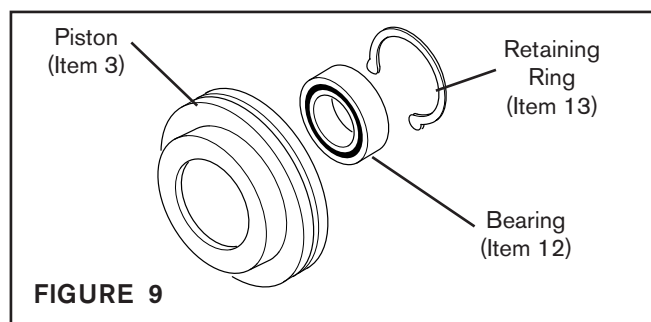


FIGURE 9

## REASSEMBLY

Refer to Figures 10 - 14.

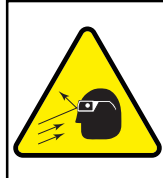
1. Coat O-Ring contact surfaces of Piston (Item 3) and Cylinder (Item 2) with a thin film of O-Ring lubricant.
2. Coat O-Rings (Items 15 & 16) with a thin film of O-Ring lubricant.
3. Install O-Rings (Items 15 & 16) and Back-up rings (Items 20 & 21) on Piston (Item 3) and Cylinder (Item 2).

NOTE: When installing new O-Rings and Back-up Rings, make sure curved surface of Back-up Ring matches surface of O-Ring. Back-up Rings must be installed on the non-pressurized side of the O-Rings.

4. Press Piston (Item 3) into Cylinder (Item 2).

NOTE: Use caution when pressing Piston into Cylinder to avoid damaging O-Rings.

5. Slide Drive Flange into Cylinder Bearing (Item 11).
6. Install Spring Stiffener Pins into Drive Flange.
7. Install Compression Springs (Item 8) over Spring Stiffener Pins.
8. Coat Hub Spline Teeth (Item 1) with 'NEVER-SEEZ'®.
9. Slide Hub (Item 1) into Drive Flange.



### CAUTION

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

10. Install Retaining Ring (Item 14).
11. Install Rotary Seal (Item 4) into groove in Cylinder.

NOTE: Back of Rotary Seal must be installed facing Drive Flange Assembly end of Tooth Clutch.

12. Slide Drive Flange Assembly (Item 17) onto Cylinder/Piston Assembly.

NOTE: Use caution when sliding Drive Flange Assembly onto Cylinder/Piston Assembly to avoid damage to Rotary Seal.

13. Install Retaining Ring (Item 14).

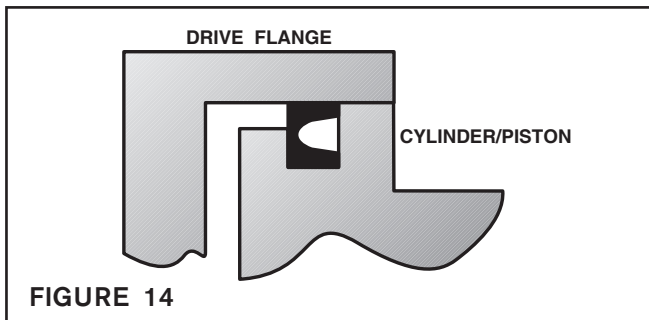


FIGURE 14

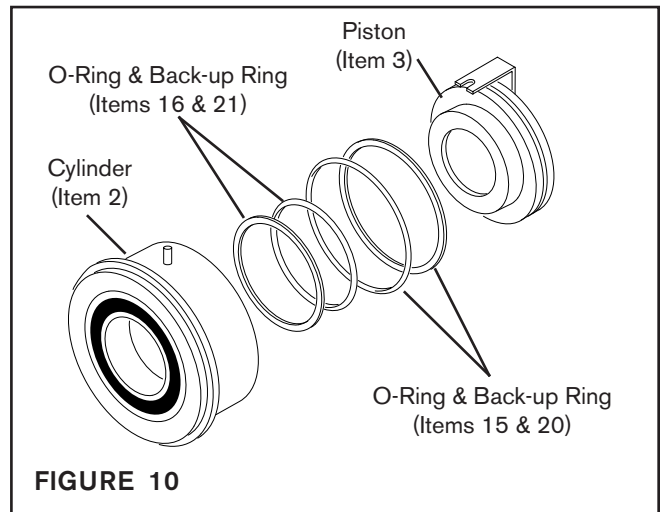


FIGURE 10

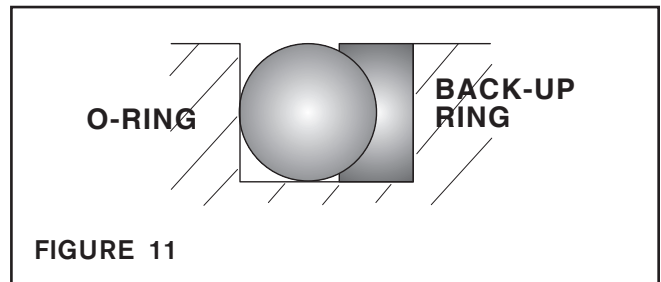


FIGURE 11

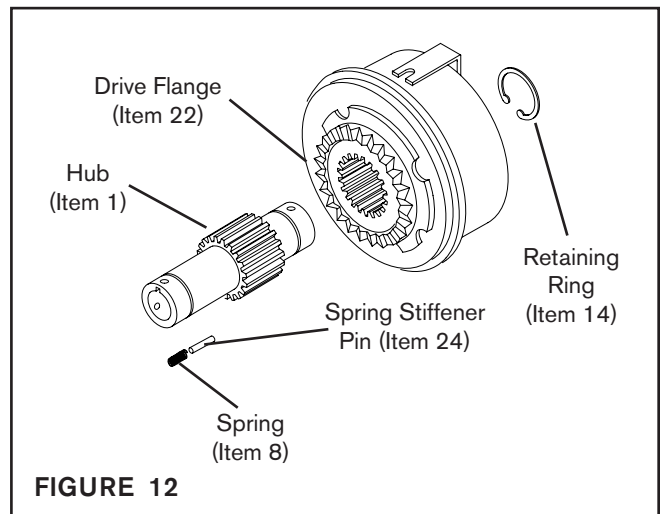


FIGURE 12

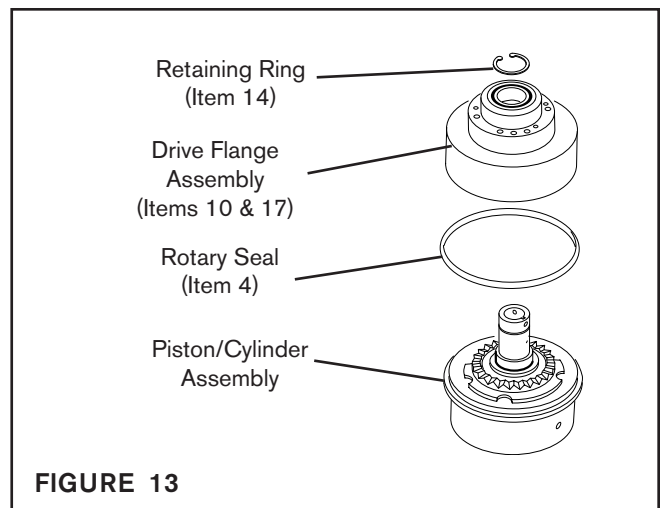


FIGURE 13

## REPAIR KITS

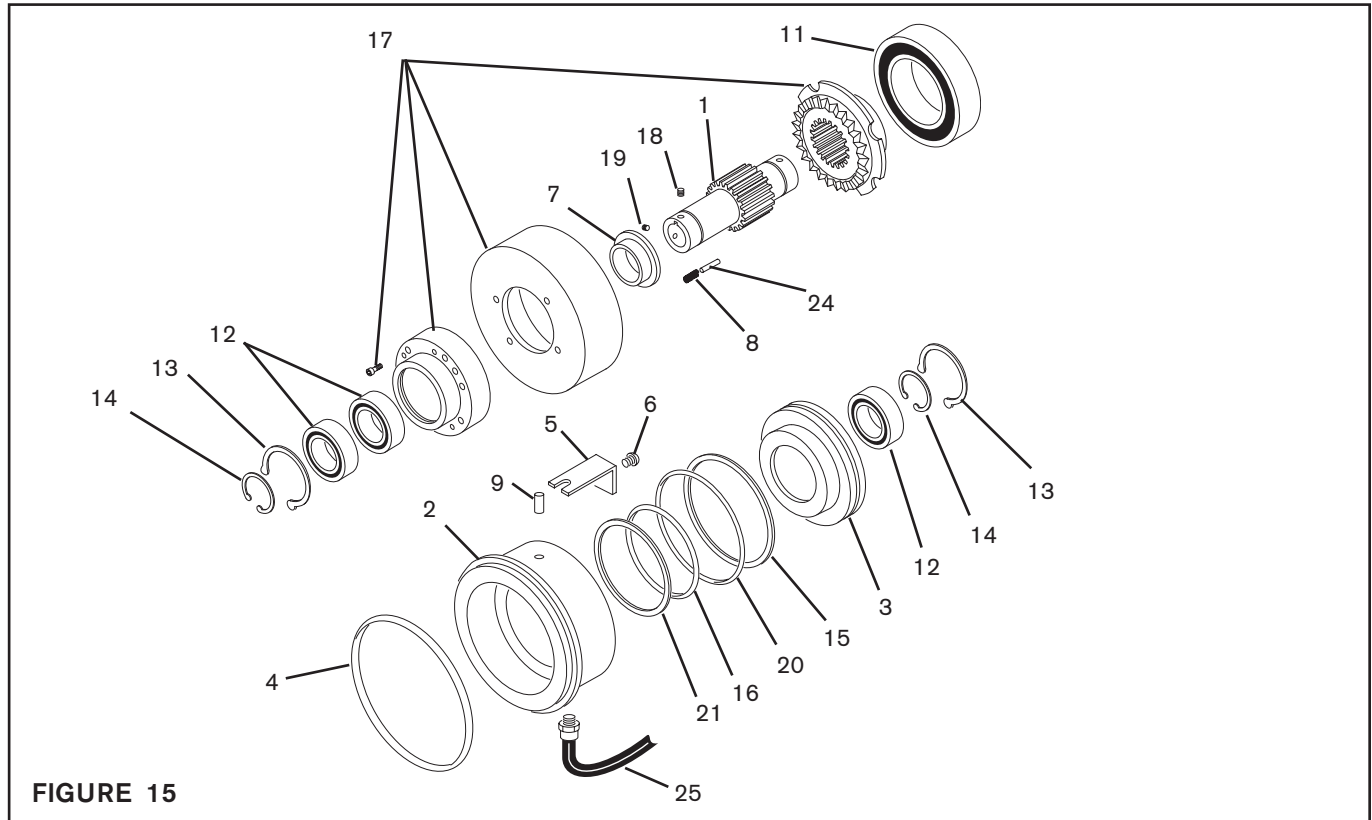
MODEL	KIT NO.	MODEL	KIT NO.
5H30PSP-E	913009	5H45PSP-E	913039
5H36PSP-E	913019	5H50PSP-E	913049
5H40PSP-E	913029	5H60PSP-E	913059

## REPLACEMENT PARTS

The Item or “Balloon” Number for all Nexen Products is used for part identification on all Product Parts List, Product Price List, 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.

## REPLACEMENT PARTS (continued)



ITEM	DESCRIPTION	QUANTITY					
		5H30PSP-E	5H35PSP-E	5H40PSP-E	5H45PSP-E	5H50PSP-E	5H60PSP-E
1	Hub	1	1	1	1	1	1
2	Cylinder	1	1	1	1	1	1
3	Piston	1	1	1	1	1	1
4	Rotary Seal	1	1	1	1	1	1
5	Anti-Rotation Clip	1	1	1	1	1	1
6	Button Head Cap Screw	2	2	2	2	2	2
7	Backing Plate	1	1	1	1	1	1
8 <sup>1</sup>	Compression Spring	6	10	12	13	15	18
11 <sup>1</sup>	Ball Bearing	1	1	1	1	1	1
12 <sup>1</sup>	Ball Bearing	3	3	3	3	3	3
13	Retaining Ring (Int.)	2	2	2	2	2	2
14	Retaining Ring (Ext.)	2	2	2	2	2	2
15 <sup>1</sup>	O-Ring Seal (Large)	1	1	1	1	1	1
16 <sup>1</sup>	O-Ring Seal (Small)	1	1	1	1	1	1
17	Drive Flange Assembly	1	1	1	1	1	1
	Socket Head Cap Screw (Included in 17)	3	3	3	3	3	3
	Drive Flange (Included in 17)	1	1	1	1	1	1
	Enclosure (Included in 17)	1	1	1	1	1	1
	Drive Ring (Included in 17)	1	1	1	1	1	1
	Balls (Included in 17)	5	5	5	5	5	5
	Ball Carrier (Included in 17)	1	1	1	1	1	1
18	Set Screw (190-24)	2	2	2	2	2	2
19	Set Screw (250-20)	4	4	4	4	4	4
20 <sup>1</sup>	Back-Up Ring (Large)	1	1	1	1	1	1
21 <sup>1</sup>	Back-Up Ring (Small)	1	1	1	1	1	1
24	Spring Stiffener Pin	6	10	12	13	15	18
25	Air Line	1	1	1	1	1	1

<sup>1</sup> Denotes Repair Kit Item.

## 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.

### Limitation on Nexen's Liability

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.

### Inspection

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.

**nexen**<sup>®</sup>

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