



# **HGM-C LSHT Wheel Motor Service and Repair Manual**

**BLN-52690  
January 2018**

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# Forward

Headquartered in Sullivan, Illinois, Hydro-Gear® is a world leader in the design, manufacture, and service of quality hydrostatic transaxles for the lawn and garden industry. The mission of our company is to be recognized by our customers and the industry as a world-class supplier and the quality leader in everything we do.

This Service and Repair Manual is designed to provide information useful in servicing and troubleshooting the Hydro-Gear HGM - C motor.

It is necessary, and a good shop practice, that your service area be equipped with the proper tools and the mechanics be supplied the latest information available. All repair procedures illustrated in this guide are suggested, but preferred methods of repair.

Internal repair procedures require that the motor be removed from the vehicle.

This is not a certification, test or study guide for a certification test. If a technician is interested in certification, they should contact an agent representing OPEESA (Outdoor Power Equipment and Engine Service Association) at (860) 767-1770 or their Hydro-Gear Central Service Distributor. Many distributors will be hosting certification testing. These study guides will cover most of the products and manufacturers in our industry.

For more information about Hydro-Gear or our products, please contact your Central Service Distributor, or call our Technical Service Department at (217) 728-2581.

# How to Use This Manual

## How to Use This Manual

Each subassembly illustrated in this manual is illustrated with an exploded view showing the parts involved. The **item reference numbers in each illustration are for assembly instructions only**. See page 18 for part names and descriptions. A complete exploded view and item number list of the HGM - C motor is on page 18.

## General Instructions

Cleanliness is a primary means of assuring satisfactory life on repaired units. Thoroughly clean all exposed surfaces prior to any type of maintenance. Clean all parts carefully with low aromatic kerosene.

As with any precision equipment, all parts must be kept free of foreign material and chemicals.

Protect all exposed sealing surfaces and open cavities from damage and foreign material. The external surfaces should be cleaned before beginning any repairs.

Upon removal, it is recommended that seal and O-rings be replaced. Before assembly, lubricate all metal parts with hydraulic oil and lightly grease rubber parts with petroleum jelly.

Parts requiring replacement must be replaced from the appropriate kits identified in the Items Listing, found at the end of this manual. Use only original Hydro-Gear® replacement parts found in BLN-51427 (CD).

## General Description

Hydro-Gear HGM-C wheel motors convert hydraulic energy (pressure and oil flow) into mechanical energy (torque and speed). Hydro-Gear wheel motors are of a fixed displacement LSHT design. For a given displacement (size of motor) the speed is determined by the oil flow rate and the torque is determined by the pressure differential.

The operating principle of the motor is based on an internal gearwheel that moves about an eccentric, while rotating and advancing on the rollers in the external gearwheel.

As oil flow enters the working port it is directed through internal cavities to ports in the bore of the housing to valving slots on the output shaft through the distributor plate to drive the gear-wheel set. The cardan shaft rotates and transfers mechanical energy from the gearwheel to the output shaft.

**“All fluids and cleaning materials should be handled and disposed of according to local, state, and federal regulations.”**

**Note: “Any and all Hydro-Gear components removed and replaced during service are recyclable.”**

## TOOLS

### REQUIRED TOOLS

Flat Blade Screw Driver (2)

Torque Wrench

Rubber or Neoprene Mallet

13mm Wrench

Snap Ring Removal Tool

3.5mm Screw tap

Hydraulic Press

## TORQUES

### REQUIRED TORQUE VALUES

| Item | Description                    | Torque                               | Operation           |
|------|--------------------------------|--------------------------------------|---------------------|
| 1    | Castellated nut                | 160 - 210 ft-lbs<br>[217 - 284 Nm]   | Brake Drum Assembly |
| 22   | Screw, Hex head 1/4-20 x 1.25" | 354 in-lbs [40 Nm]                   | End Cover           |
| 29   | Bolt, 5/16-18 x .75 SHCS       | 180 - 240 in-lbs<br>[20.3 - 27.1 Nm] | Brake Assembly      |

*As a general rule, use the low end of the torque specification on fasteners when reassembling the unit.*

# DRUM & BRAKE ASSEMBLY

## Disassembly

1. Remove the cotter pin. See *figure 1*.
2. Remove the castellated nut (1). See *figure 1*.

**NOTE:** If the drum assembly or hub assembly is removed from the axle shaft, the drum/hub assembly must be discarded and replaced with a new assembly.

3. Remove the drum assembly. See *figure 1*.
4. Remove the four bolts (29) securing the brake assembly to the HGM motor. See *figure 2*.
5. Remove the brake assembly. See *figure 2*.

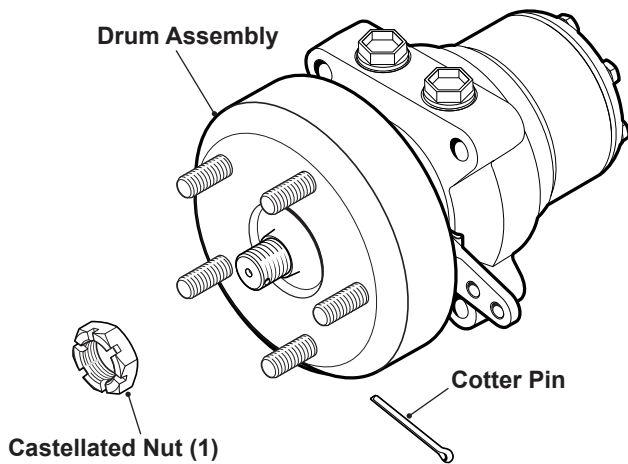


Figure 1, Drum Assembly

## Inspection

1. Inspect the studs on drum for wear and/or damage. Replace if necessary.
2. Inspect the brake assembly, i.e., the brake shoes for wear and/or damage.

## Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. When tightening the fasteners, refer to the table on page 3 for the required torque values.

**NOTE:** As a general rule, use the low end of the torque specification on fasteners when reassembling the unit.

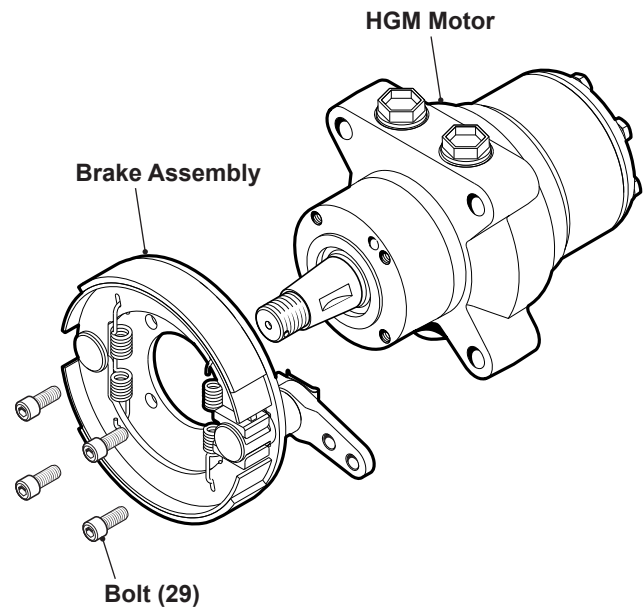


Figure 2, Brake Assembly

## SERVICE PREPARATION

1. To ensure correct alignment and location during reassembly of motor parts, provide a “V” shaped identification mark. *See figure 3.*
2. Remove the castellated nut (1). *See figure 4.*
3. Remove the woodruff key (6) and the plastic plugs or fittings (8), if installed. *See figure 4.* Drain oil from the motor.
4. Remove the retaining ring (2). *See figure 5.*
5. Place the HGM-C motor into a holding tool. *See figure 6.*

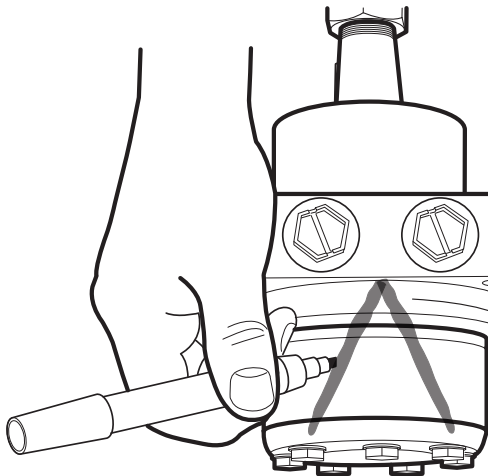


Figure 3, Identification Mark

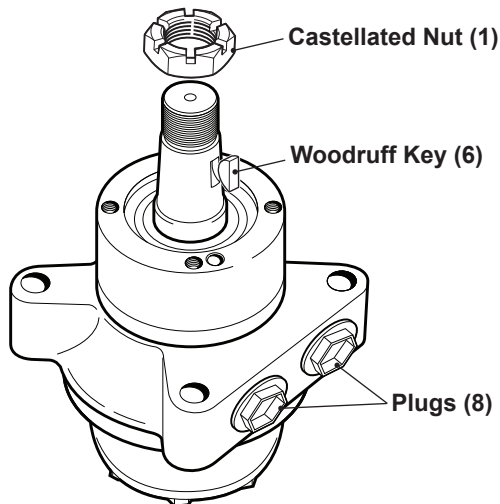


Figure 4, Nut, Woodruff Key and Plugs

## Inspection

1. Inspect woodruff key (6) for wear or damage.

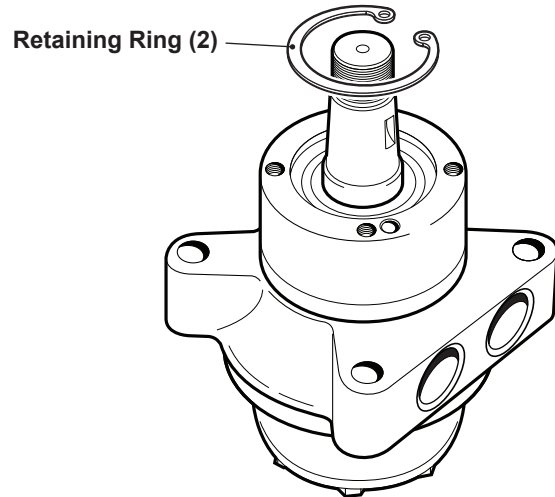


Figure 5, Retaining Ring

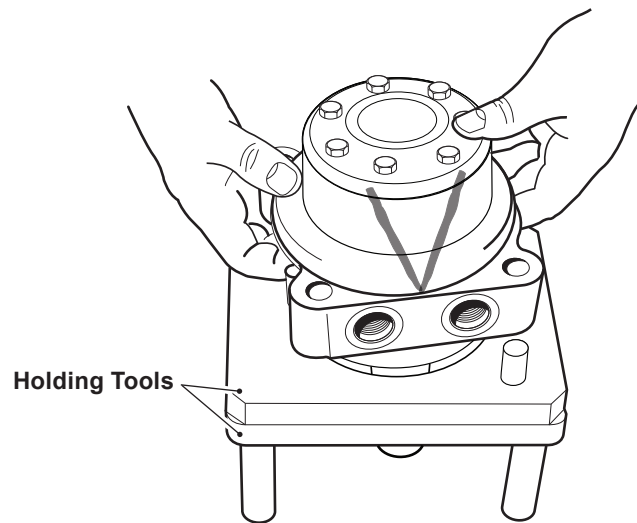


Figure 6, Service position

## END COVER

### Disassembly

1. Remove castellated nut (1), woodruff key (6), plastic plugs (8), and retaining ring (2). See page 5.
2. Using a 13mm wrench — remove the seven screws (22). See figure 7.
3. Remove the seven washers (23) and discard.
4. Remove the end cover (19) by sliding the end cover sideways, off the gearwheel set. See figure 8.

### Inspection

1. Inspect for wear or damage.
2. Inspect screws (22) – threads, for wear or damage.

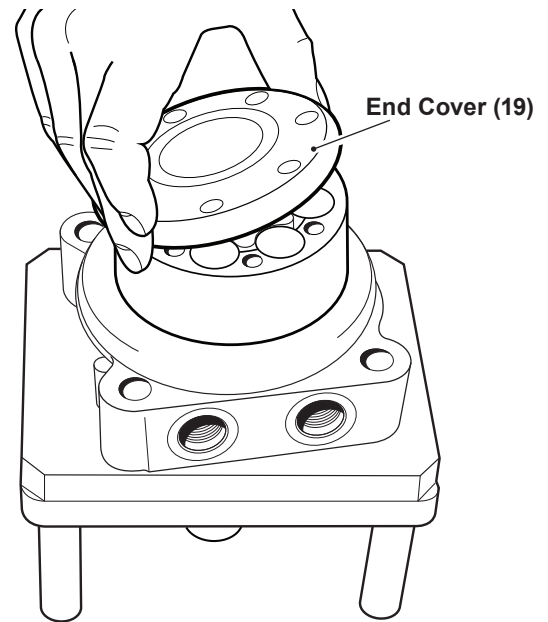


Figure 8, End Cover

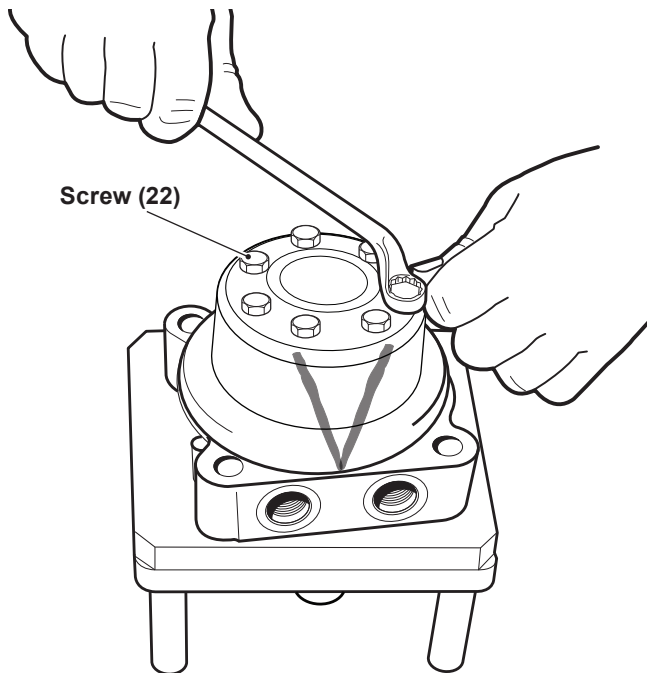


Figure 7, Screws



## GEARWHEEL SET

### Disassembly

1. Remove castellated nut (1), woodruff key (6), plastic plugs (8), retaining ring (2), seven screws (22), seven washers (23), and the end cover (19). See pages 5 and 6.
2. Remove the O-ring (18) and gearwheel set (17). Discard O-ring (18). See figure 9.

**Note:** *Placing fingers underneath gearwheel set will help keep parts from falling out.*

3. Remove second O-ring (16), under gearwheel set, and discard.
4. Dismantle the gearwheel set for inspection if contamination or damage is suspected.

### Inspection

1. Inspect for wear or damage.

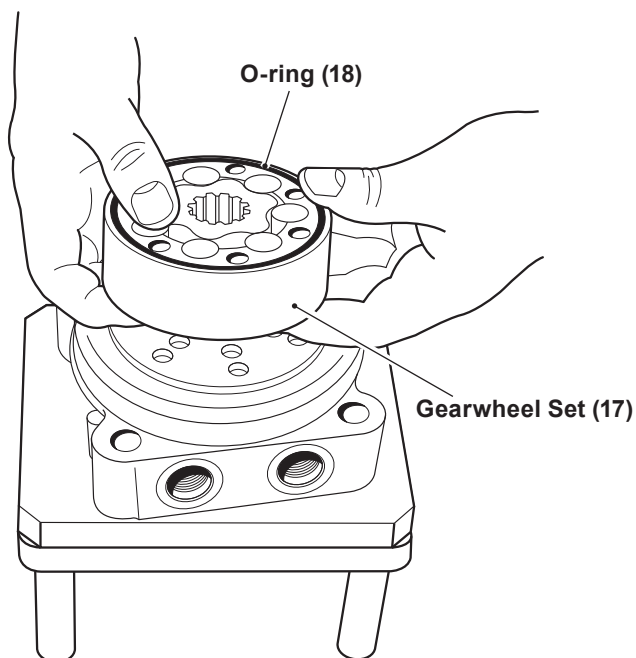


Figure 9, Gearwheel Set

## CARDAN SHAFT

### Disassembly

1. Remove castellated nut (1), woodruff key (6), plastic plugs (8), retaining ring (2), seven screws (22), seven washers (23), end cover (19), and the gearwheel set (17) with O-rings (16, 18). See figure 4 - 7.
2. Remove the cardan shaft (15). See figure 10.

### Inspection

1. Check for wear and/or damage to the individual splines on the cardan shaft (15).

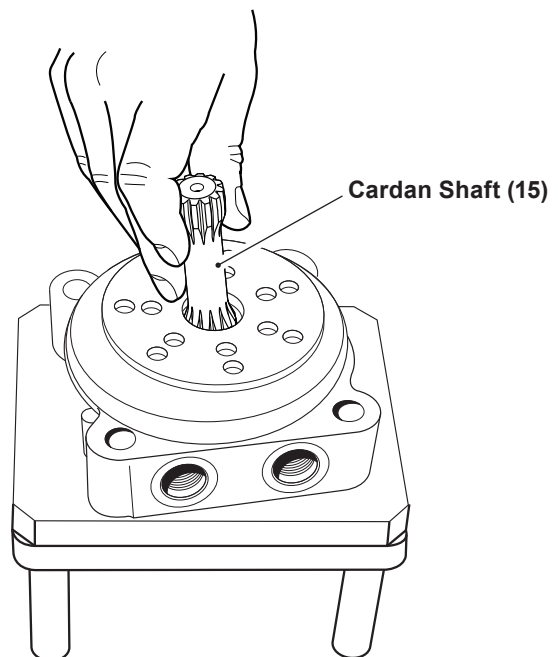


Figure 10, Cardan Shaft

## DISTRIBUTOR PLATE

### Disassembly

1. Remove castellated nut (1), woodruff key (6), plastic plugs (8), retaining ring (2), seven screws (22), seven washers (23), end cover (19), the gearwheel set (17) with O-rings (16, 18), and cardan shaft (15). See pages 4 - 7.
2. Remove the distributor plate (14).
3. Remove and discard the O-ring (13). See figure 11.

### Inspection

1. Inspect for wear or damage.

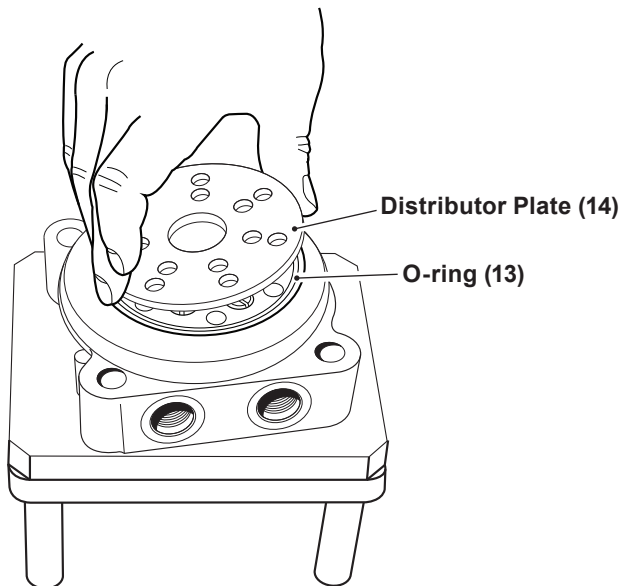


Figure 11, Distributor Plate

## OUTPUT SHAFT

### Disassembly

1. Remove castellated nut (1), woodruff key (6), plastic plugs (8), retaining ring (2), seven screws (22), seven washers (23), end cover (19), the gearwheel set (17) with O-rings (16, 18), cardan shaft (15), distributor plate (14), and O-ring (13). See pages 4 - 8.
2. Place the motor in a hydraulic press — replace the cardan shaft (15) and press out the output shaft (7). See figure 12.

### Inspection

1. Inspect for wear or damage.

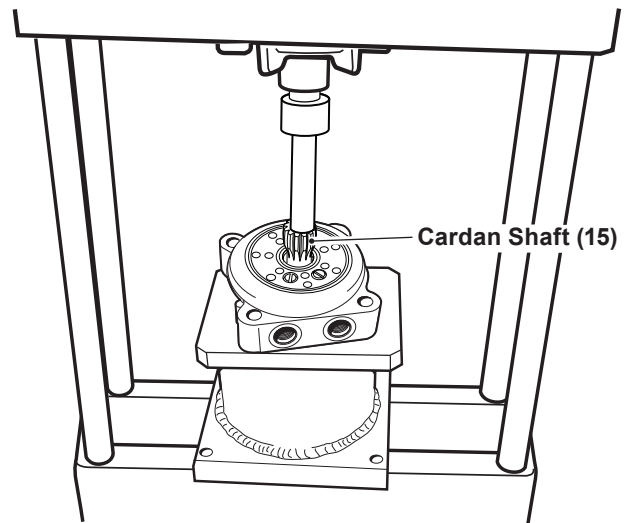


Figure 12, Output Shaft

## SHAFT SEAL

### Disassembly

1. Remove castellated nut (1), woodruff key (6), plastic plugs (8), retaining ring (2), seven screws (22), seven washers (23), end cover (19), gearwheel set (17) with O-rings (16, 18), cardan shaft (15), distributor plate (14), O-ring (13), and the output shaft (7). See pages 4 - 8.
2. Using a holding tool, press ball bearing (3), washer (4), and shaft seal (5) off the output shaft (7). See figure 13.

### Inspection

1. Inspect for wear or damage.

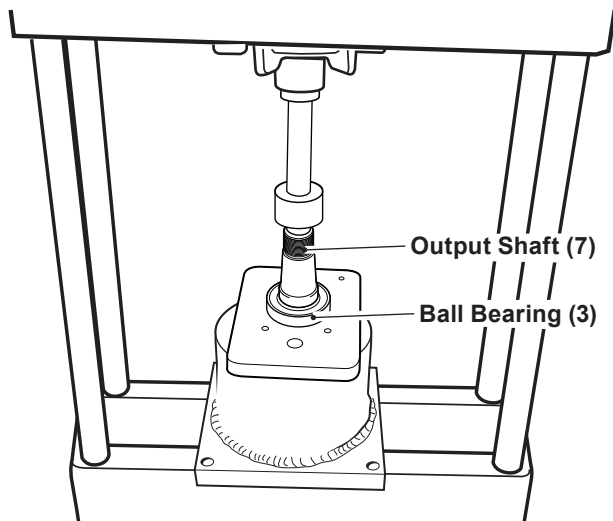


Figure 13, Output Shaft Seal

## NEEDLE BEARING

### Disassembly

1. Remove castellated nut (1), woodruff key (6), plastic plugs (8), retaining ring (2), seven screws (22), seven washers (23), end cover (19), gearwheel set (17) with O-rings (16, 18), cardan shaft (15), distributor plate (14), O-ring (13), output shaft (7) and the shaft seal. See pages 4 - 9.
2. Remove the needle bearing (12) with a pressing tool. See figure 14.

**Note:** The needles may fall out of the needle bearing (12) during dismantling and can be retrieved for re-use.

### Inspection

1. Inspect for wear or damage.

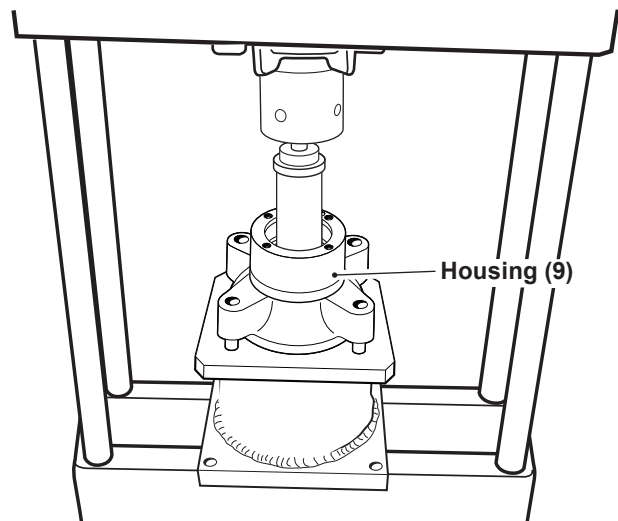


Figure 14, Needle Bearing

# CHECK VALVES

## Disassembly

1. Remove castellated nut (1), woodruff key (6), plastic plugs (8), retaining ring (2), seven screws (22), seven washers (23), end cover (19), gearwheel set (17) with O-rings (16, 18), cardan shaft (15), distributor plate (14), O-ring (13), output shaft (7) needle bearing (12), And, from the output shaft — remove ball bearing (3), washer (4), and output shaft seal (5). See *pages 4 - 9*.
2. Remove the check valves (11) with a ground 3.5mm screw tap. See *figure 15*. The check valves are pressed in and can be removed by pulling on the tap.

## Inspection

1. Inspect for wear or damage.

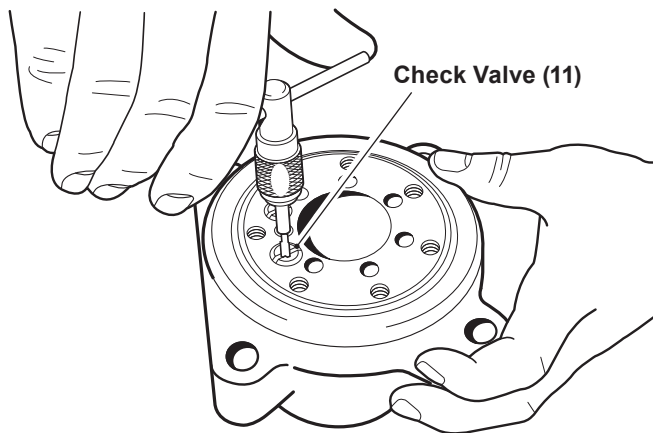


Figure 15, Check Valves

# BALL BEARING

## Assembly

**Note:** Before assembly, lubricate all parts with hydraulic oil and grease rubber parts with clean petroleum jelly.

1. Place the bullet on the output shaft (7) and mount the output shaft seal (5). See figure 1.
2. Remove the bullet and mount the washer (4). See figure 2.
3. Place the ball bearing (3) onto output shaft (7) and press into position. See figure 3.

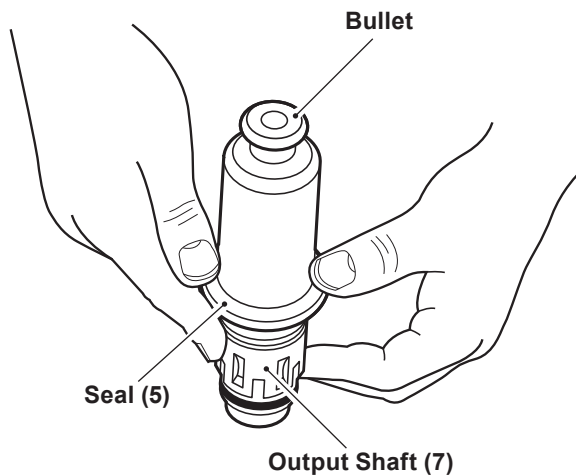


Figure 1, Bullet/Output Shaft Seal

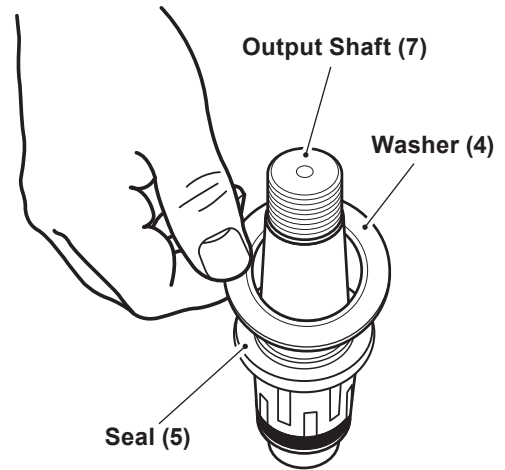


Figure 2, Washer

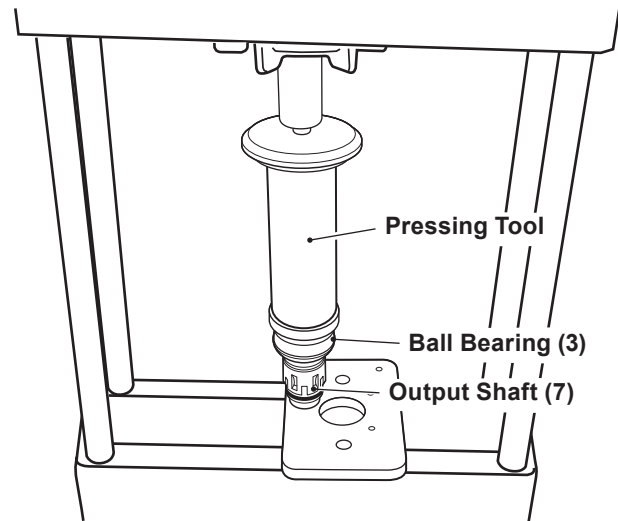


Figure 3, Ball Bearing/Press Tool

## CHECK VALVES

### Assembly

1. Mount seal (5), washer (4), and ball bearing (3) onto output shaft (7). See page 11.
2. Place the motor housing (9), with holding fixture into hydraulic press. See figure 4.
3. Install the two check valves (11) into their bores. See figure 5.
4. Seat the check valves (11) by lightly tapping with a rubber hammer. See figure 5.

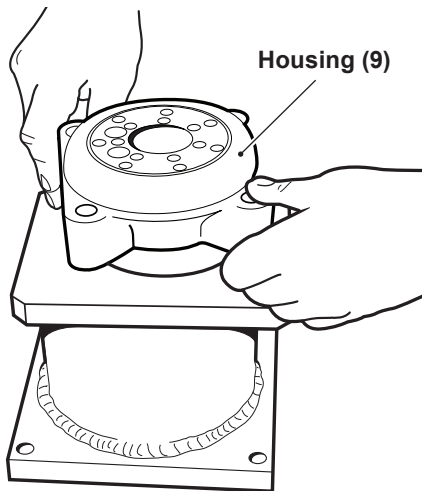


Figure 4, Service Position

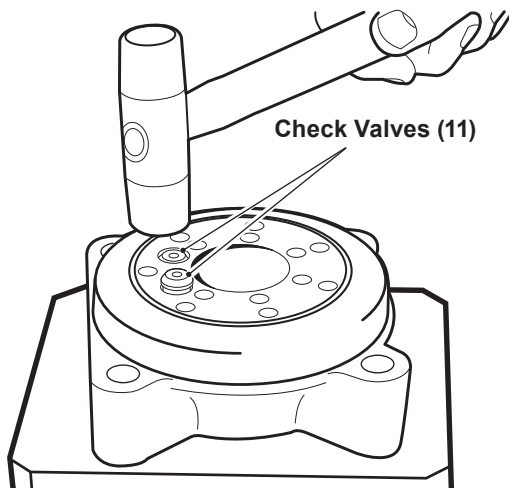


Figure 5, Check Valve

## NEEDLE BEARING

### Assembly

1. Mount seal (5), washer (4), and ball bearing (3) onto output shaft (7). See page 11.
2. Install the check valves (11).
3. Place the needle bearing (12) into motor housing (9), then; press into position. See figure 6.

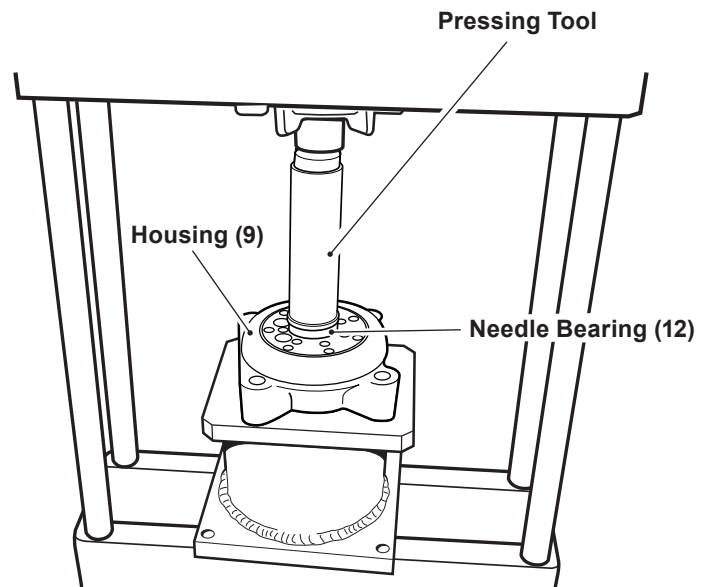


Figure 6, Needle Bearing

# OUTPUT SHAFT

## Assembly

1. Mount seal (5), washer (4), and ball bearing (3) onto output shaft (7). *See page 11.*
2. Install check valves (11), and needle bearing (12). *See page 12.*
3. Rotate the motor housing (9) so that the front (output shaft end) is pointing upward. *See figure 7.*
4. The rear of the output shaft (7) must be marked before fitted into motor housing (9). The mark must be positioned vertically above a commutation slot leading up to the front annular channel. *See figure 8.*
5. Grease the journals with hydraulic oil.
6. Position output shaft (7) over motor housing (9) and carefully lower into the motor housing (9). Press the output shaft with ball bearing, washer and seal into motor housing. *See figure 9.*

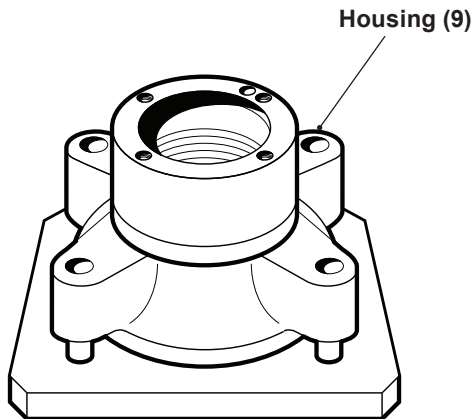


Figure 7, Motor Housing

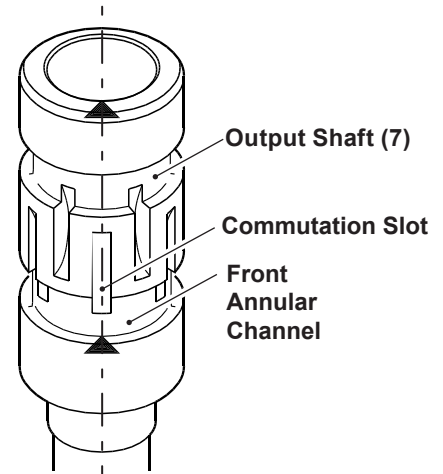


Figure 8, Output Shaft

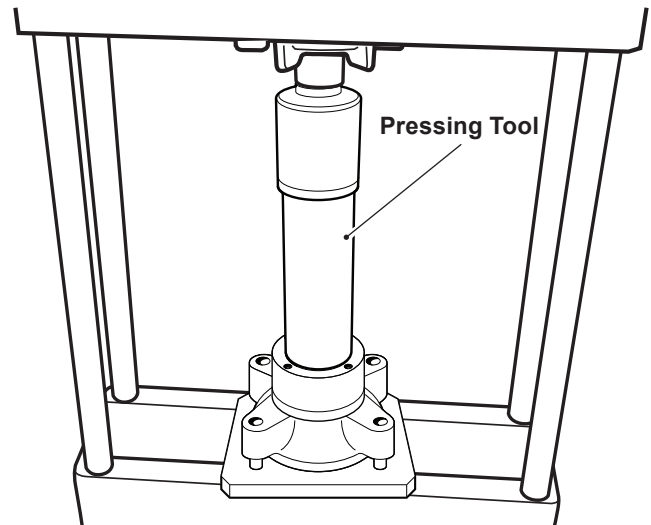


Figure 9, Output Shaft/Press Tool

## RETAINING RING

### Assembly

1. Mount seal (5), washer (4), and ball bearing (3) onto output shaft (7). See page 11.
2. Install check valves (11), needle bearing (12) and output shaft assembly. See pages 12 - 13.
3. Mount the retaining ring (2). See figure 10.

**Note:** Make sure that the retaining ring is fully engaged in motor housing groove.

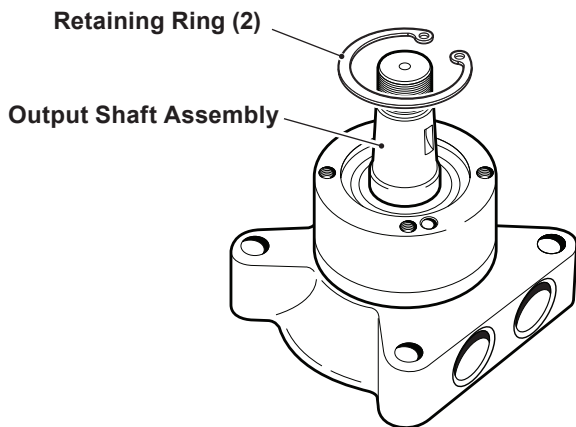


Figure 10, Retaining Ring

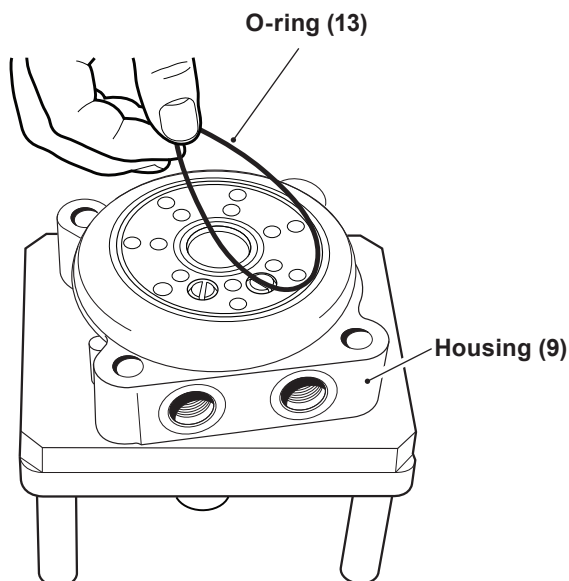


Figure 11, O-ring/Cardan Shaft

## CARDAN SHAFT

### Assembly

1. Mount seal (5), washer (4), and ball bearing (3) onto output shaft (7). See page 11.
2. Install check valves (11), needle bearing (12), output shaft assembly and retaining ring (2). See pages 12 - 14.
3. Turn motor housing (9) so that its rear end is upwards and install a new O-ring (13). See figure 11.
4. Guide the cardan shaft (15) down into the motor housing and into the output shaft assembly. See figure 12. In case of different spline lengths turn the cardan shaft to ensure the long spline end is fitted in the output shaft.
5. Transfer marking from output shaft to cardan shaft. See figure 12.

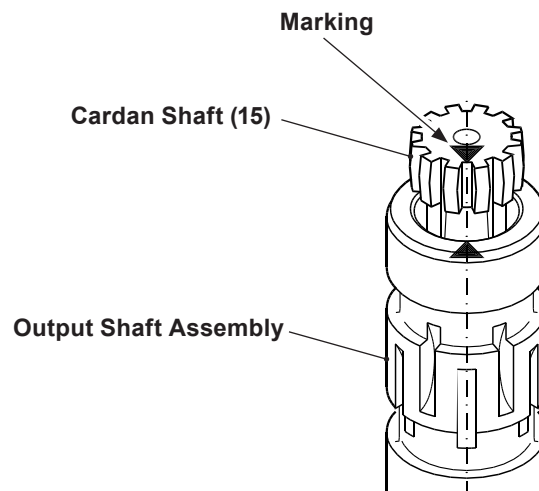


Figure 12, Cardan Shaft Marks  
(Motor housing not shown)



## DISTRIBUTOR PLATE

### Assembly

1. Mount seal (5), washer (4), and ball bearing (3) onto output shaft (7). *See page 11.*
2. Install check valves (11), needle bearing (12), output shaft assembly, retaining ring (2), and O-ring (13). *See pages 12 - 14.*
3. Turn the distributor plate (14) so that the slots are against the motor housing (9) and indentation in the distributor plate is pointing to port surface. *See figure 13.*

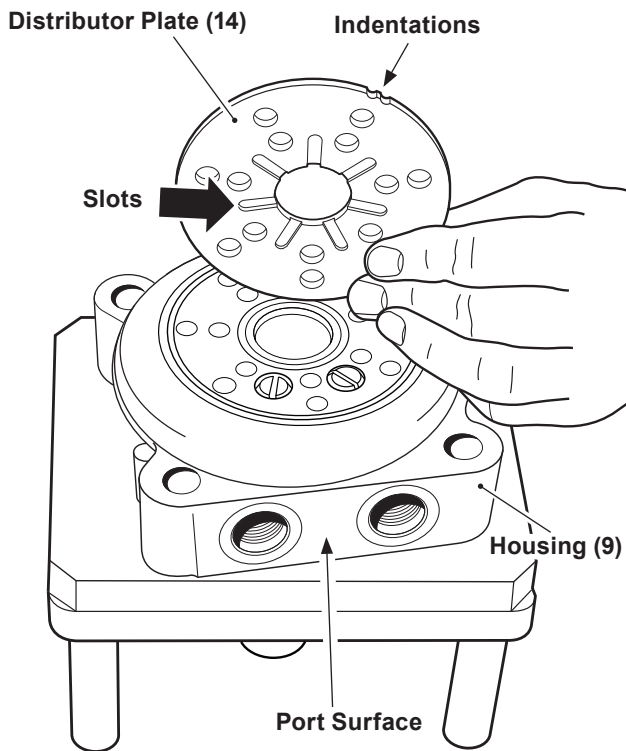


Figure 13, Distributor Plate

## GEARWHEEL SET

### Assembly

1. Mount seal (5), washer (4), and ball bearing (3) onto output shaft (7). *See page 11.*
2. Install check valves (11), needle bearing (12), output shaft assembly, retaining ring (2), O-ring (13), and distributor plate (14). *See pages 12 - 15.*
3. Place *new* O-rings (16, 18) in the O-ring grooves of the gearwheel set (17). *See figure 14.*

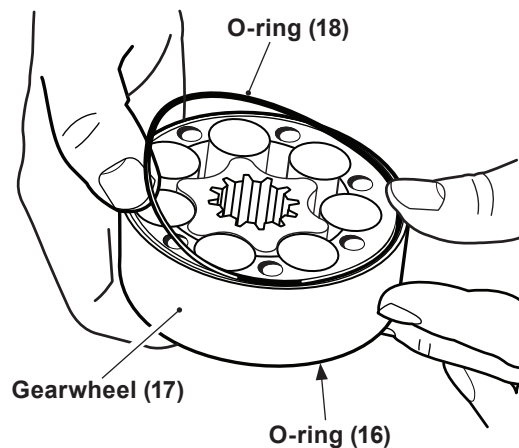


Figure 14, Gearwheel Set/O-ring

## GEARWHEEL SET *(continued)*

### Assembly

4. In gearwheel set (17) with non-through splines place the gearwheel set (17) with the recess in the spline hole facing down towards the motor housing (9).
5. Fit the gearwheel set (17) on the cardan shaft (15) so that the top of the tooth in the external teeth of the gearwheel is vertically over the mark on the cardan shaft.
6. Turn the gearwheel set (17) counter clock-wise until the cardan shaft (15) and the internal gearwheel slips over and engages the splines.
7. Turn the gearwheel rim to line up the screw holes. *See figure 15.* Alignment marks made before disassembly should line up.

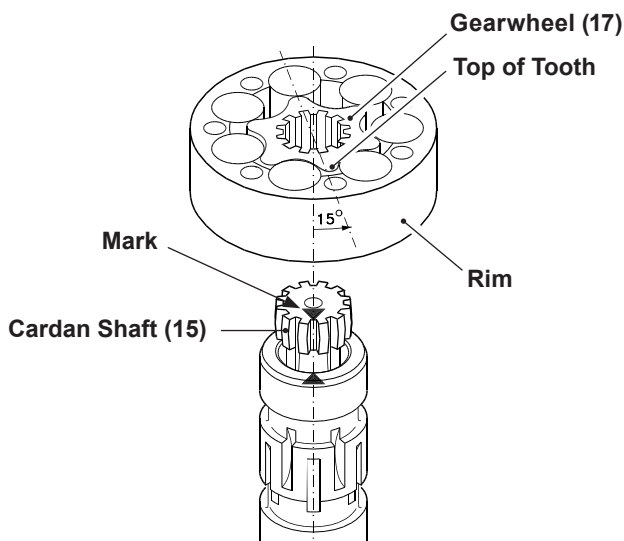


Figure 15, Gearwheel Set

## END COVER

### Assembly

1. Install the end cover (19). *See figure 16.* Align markings.
2. Install *new* washers (23) onto the end cover screws (22). *See figure 17.*

**Note:** When tightening the screws, refer to the table on page 3 for the required torque values. Also refer to figure 18 for the proper torque sequence.

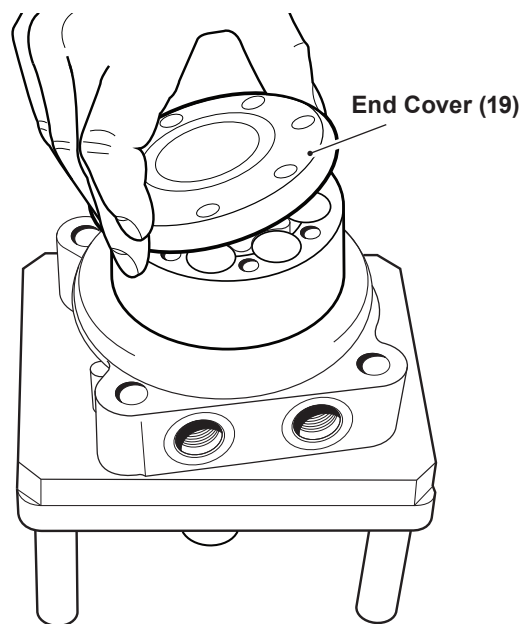


Figure 16, End Cover

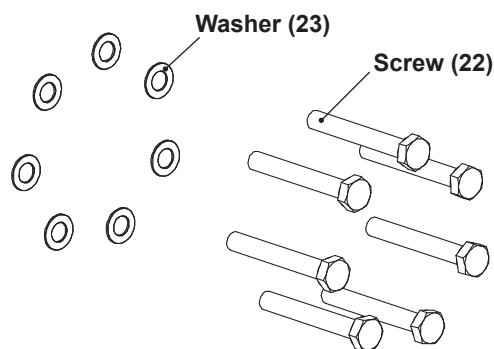


Figure 17, Washers & Screws

## END COVER *(continued)*

### Assembly

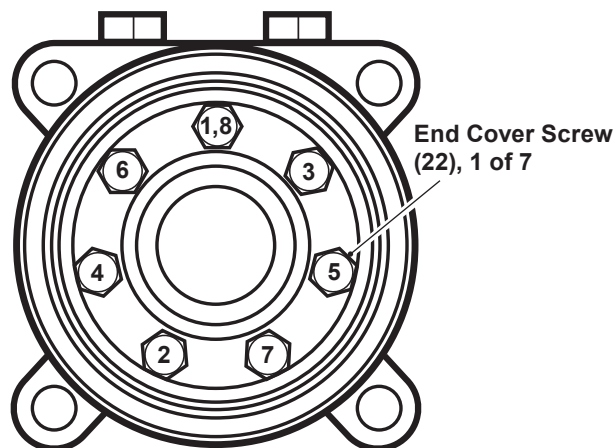


Figure 18, Torque Sequence

### Assembly

3. Install the woodruff key (6), nut (1) and plastic plugs or fittings (8). See figure 19.

**NOTE:** If the drum assembly or hub assembly is removed from the axle shaft, the drum/hub assembly must be discarded and replaced with a new assembly.

4. Refer to page 4 for brake/hub installation instructions.

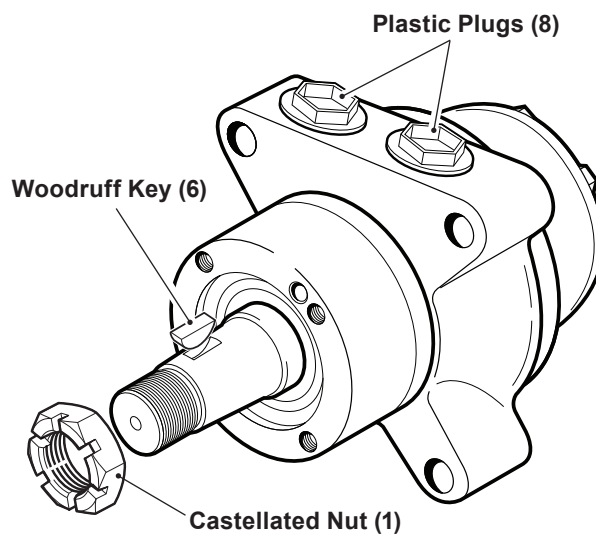
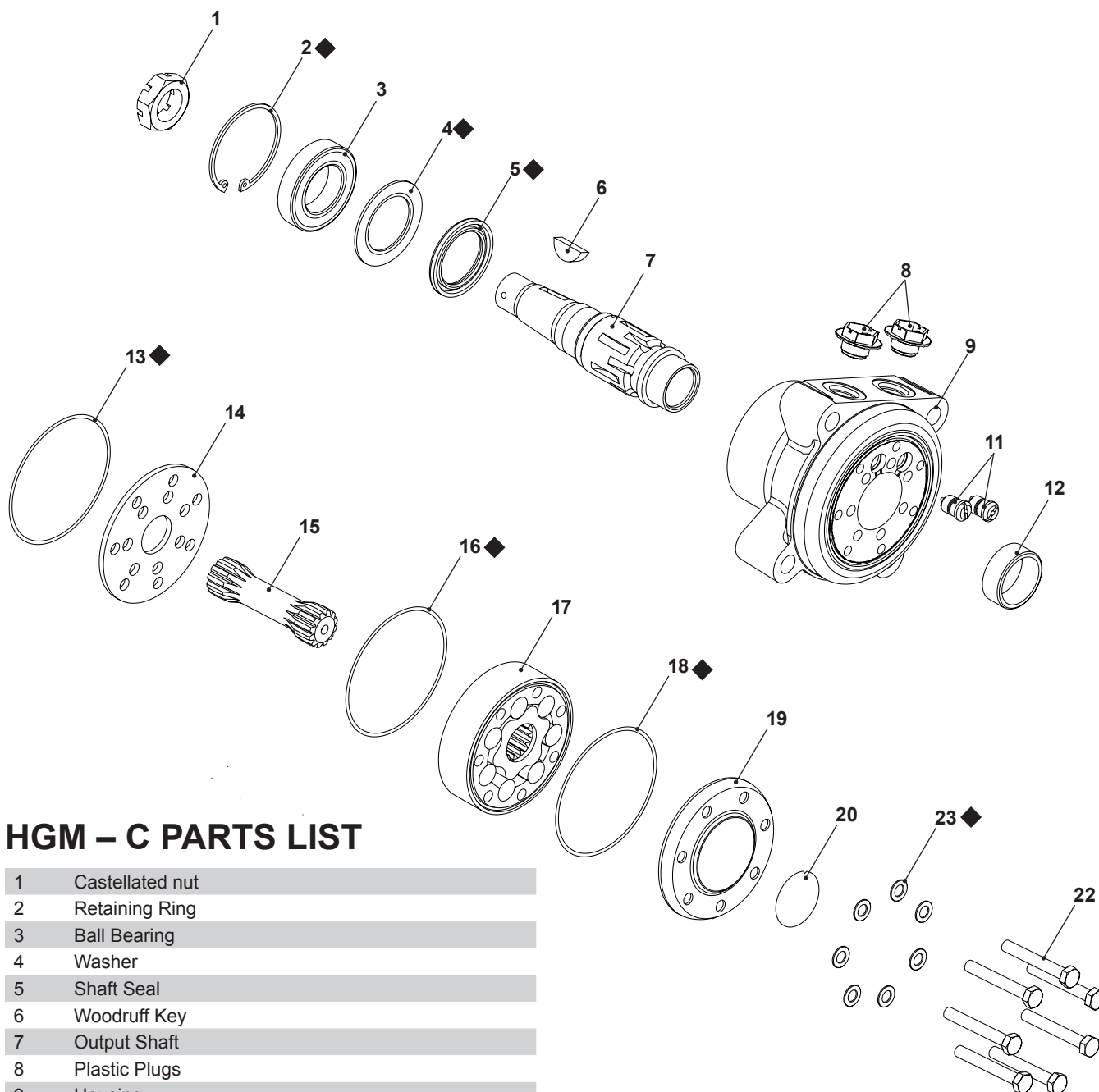


Figure 19, Final Assembly

# Exploded View



## HGM – C PARTS LIST

|     |                   |
|-----|-------------------|
| 1   | Castellated nut   |
| 2   | Retaining Ring    |
| 3   | Ball Bearing      |
| 4   | Washer            |
| 5   | Shaft Seal        |
| 6   | Woodruff Key      |
| 7   | Output Shaft      |
| 8   | Plastic Plugs     |
| 9   | Housing           |
| 11  | Check Valve       |
| 12  | Needle Bearing    |
| 13  | O-ring            |
| 14  | Distributor plate |
| 15  | Cardan Shaft      |
| 16  | O-ring            |
| 17  | Gearwheel set     |
| 18  | O-ring            |
| 19  | End Cover         |
| 20  | Label             |
| 22  | Screw             |
| 23  | Washer            |
| 200 | Seal Kit          |

200 Seal Kit  
 ◆ Contained in seal kit

# NOTES

## This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.





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Rev. P4

