



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

BLN-52198  
November 2012



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# FOREWORD

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 - E Series 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 Customer Service Department at (217) 728-2581.

## 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 21 for part names and descriptions. A complete exploded view and item number list of the HGM-E motor is on page 20.

## 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 parts with hydraulic oil and grease rubber parts with clean petroleum jelly.

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

## General Description

Hydro-Gear HGM-E 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 oil flow and given pressure the displacement (size of motor) determines the speed and torque. 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.

The distributor valve is driven synchronously by the internal gear through a cardan shaft ensuring that the individual chambers of the motor are filled and emptied precisely without losses. The distributor valve in the HGM-E motor is in the form of a disc valve on the output shaft. The cardan shaft rotates the disc valve and transfers mechanical energy from the gearwheel to the output shaft. The hydraulic forces are equalized by the balance plate.

## TOOLS

### REQUIRED TOOLS

Flat Blade Screw Driver (2)

Torque Wrench

Mandrel

Rubber or Neoprene Mallet

Blind Bearing Puller

13 mm Socket (15E)

16 mm Socket (18E)

Seal Hook

## TORQUES

### REQUIRED TORQUE VALUES

Item	Description	Torque	Operation
1	Castellated nut	160 - 210 ft-lbs [217 - 284 Nm]	Brake Drum Assembly
25	HGM-15E Series Screw, Hex head, (M8 X 110MM)	300 - 380 lb-in [35 - 40 Nm]	HGM-15E Series End Cover
25	HGM-15E Series Screw, Hex head, (M10 X 110MM)	660 - 720 lb-in [75 - 80 Nm]	HGM-15E Series End Cover
25	HGM-18E Series Screw, Hex head, (M8 X 130MM)	310- 354 lb-in [35 - 40 Nm]	HGM-18E Series End Cover
25	HGM-18E Series Screw, Hex head, (M10 X 130MM)	660 - 720 lb-in [75 - 80 Nm]	HGM-18E Series End Cover
29	Bolt 5/16 – 18 x .75 SHCS	180 - 240 in-lbs [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

Refer to Figure 1 and 2

## Disassembly

1. Remove the cotter pin (30).
2. Remove the castellated nut (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/hub assembly (27).
4. Remove the four bolts (29) securing the brake assembly (28) to the HGM-E motor.
5. Remove the brake assembly. See figure 2.

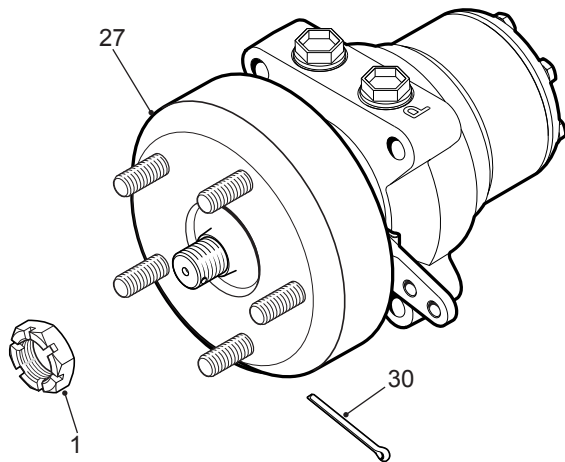


Figure 1, Drum Assembly

## Inspection

1. Inspect the studs on drum (27) for wear and/or damage. Replace if necessary.
2. Inspect the brake assembly (28), i.e., the brake shoes for wear and/or damage.

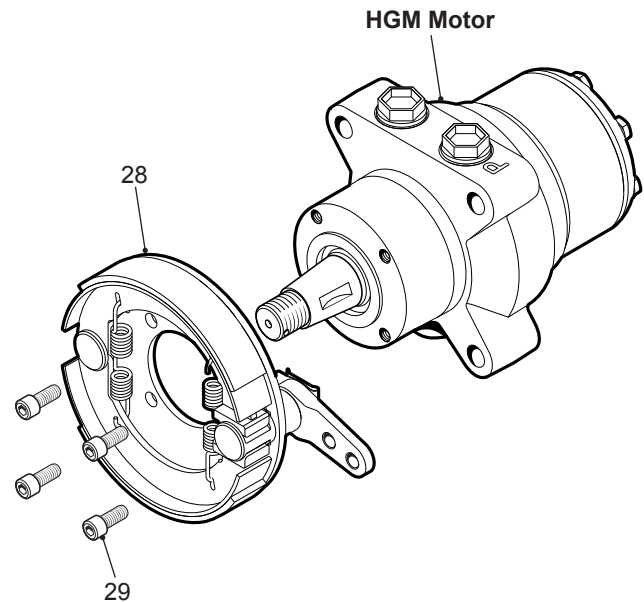


Figure 2, Brake Assembly

## END COVER

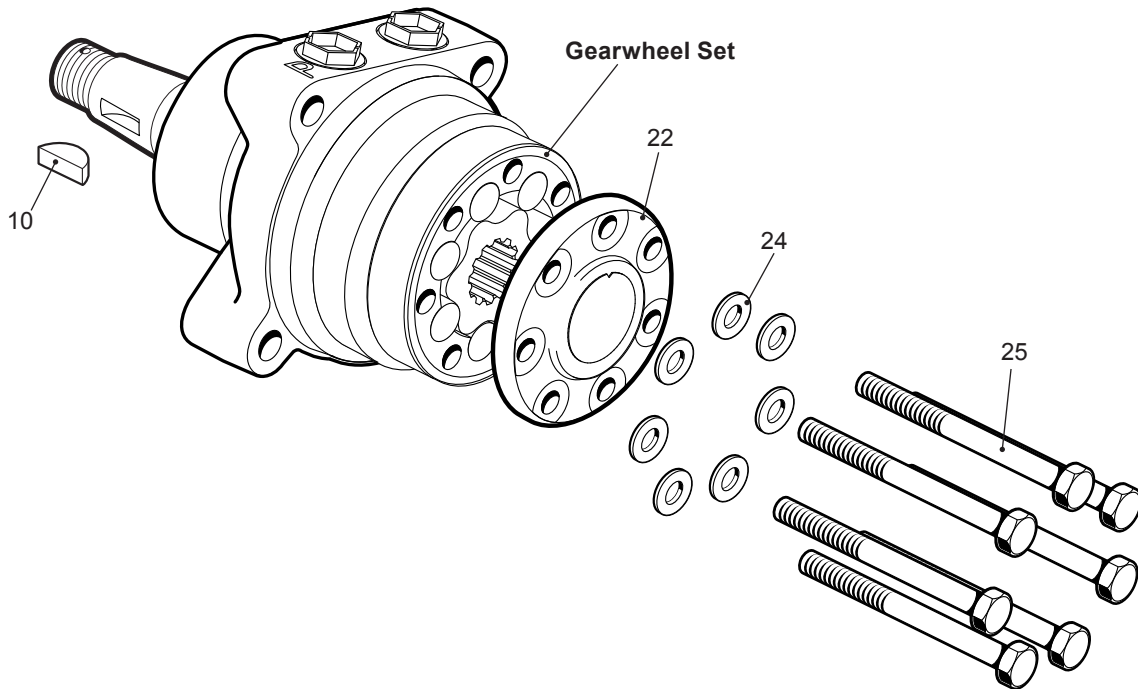
*Refer to Figure 3*

### Disassembly

1. If removing the motor shaft, remove the woodruff key (10) at this point.
2. Place the motor with the end cover up for disassembly.
3. Mark the orientation of the end cover (22) and gearwheel set (21).
4. Remove the seven end cover screws (25).
5. Remove the seven end cover washers (24) and discard.
6. Remove the end cover (22) — by sliding the end cover (22) sideways, off the gear-wheel set. The end cover may be difficult to remove due to oil film causing it to stick.

### Inspection

1. Inspect for wear or damage.
2. Inspect screws (25) – threads, for wear or damage.
3. Inspect woodruff key (10) for wear or damage.



**Figure 3, End Cover**



# GEARWHEEL SET

Refer to Figure 4

## Disassembly

1. Remove the screws (25), the washers (24) and the end cover (22). See page 5.
2. Remove the O-ring (20) and discard.
3. Remove the gearwheel set (21).

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

4. Remove the second O-ring (20) and discard.
5. Dismantle the gear wheel set for inspection. When removing the inner gearwheel, notice the recess without teeth and its orientation for reassembly.

## Inspection

1. Inspect for wear or damage.

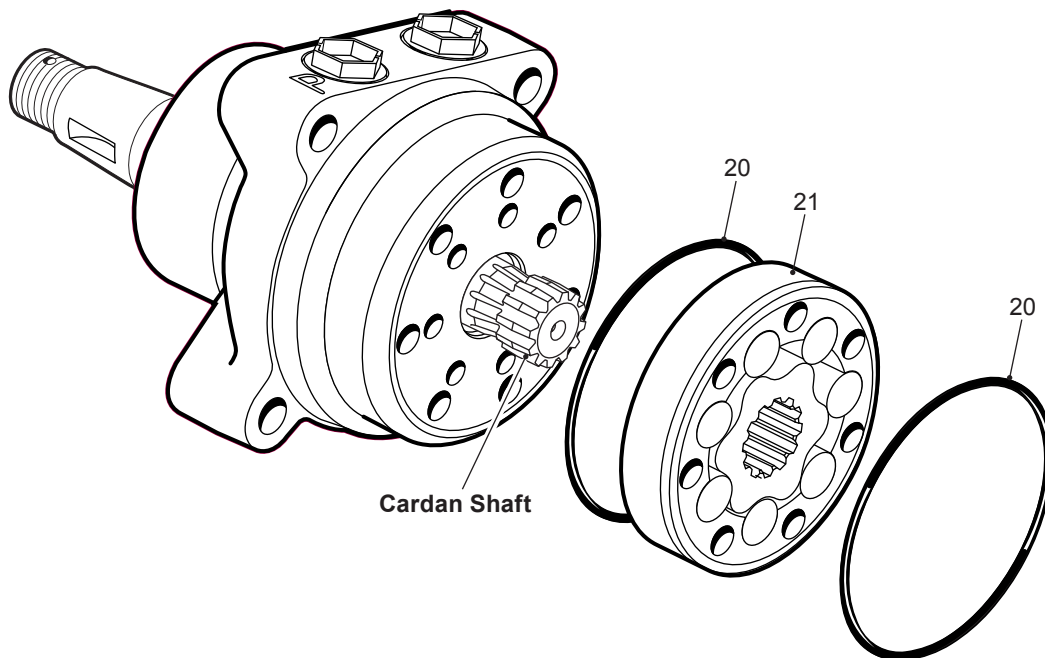


Figure 4, Gear Wheel Set

# CARDAN SHAFT

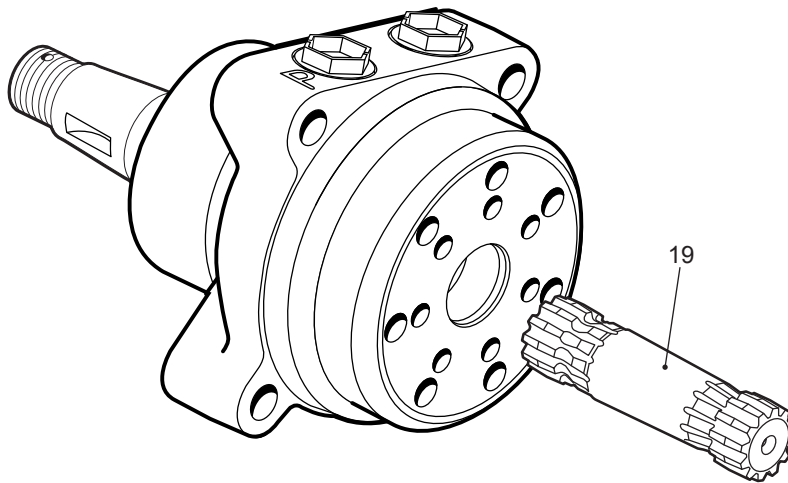
*Refer to Figure 5*

## Disassembly

1. Remove the screws (25), the washers (24), the end cover (22), the O-rings (20) and the gearwheel set (21). See Pages 5 and 6.
2. Remove the cardan shaft (19).
3. Take note of the difference in each end (length and shape of splines).

## Inspection

1. Check for wear and/or damage to the individual splines on the cardan shaft (19).



**Figure 5, Cardan Shaft**

# DISTRIBUTOR PLATE

Refer to Figure 6

## Disassembly

1. Remove the screws (25), the washers (24), the end cover (22), the O-rings (20), the gearwheel set (21) and the cardan shaft (19). See pages 5, 6 and 7.
2. Remove the distributor plate (18), and the radial needle bearing (16). *Note:* The radial needle bearing (16) is pressed into the distributor plate (18) and does not typically require removal.

**NOTE:** The needles may fall out of the needle bearing (16) during dismantling and can be retrieved for re-use.

## Inspection

1. Inspect for wear or damage.

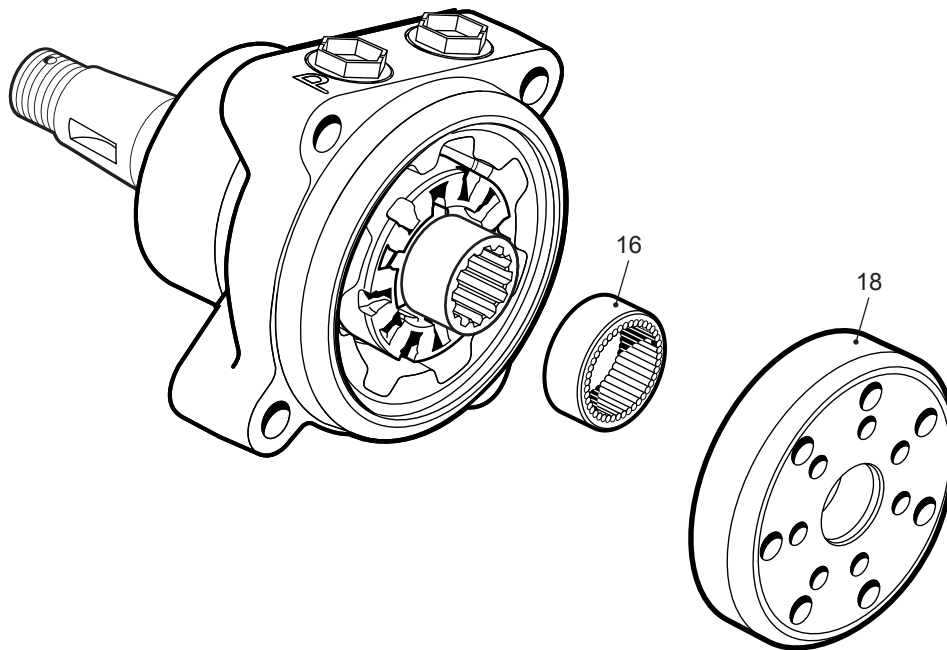


Figure 6, Distributor Plate

## DISC VALVE

Refer to Figure 7

### Disassembly

1. Remove the screws (25), the washers (24), the end cover (22), the O-rings (20), the gearwheel set (21), the cardan shaft (19), the distributor plate (18), the bearing race (17), the radial needle bearing (16) and the distributor plate (18). See pages 5 – 8.
2. Remove the disc valve (15). Note the length of the keys in the I.D. of the disc valve.

### Inspection

1. Inspect for wear or damage.

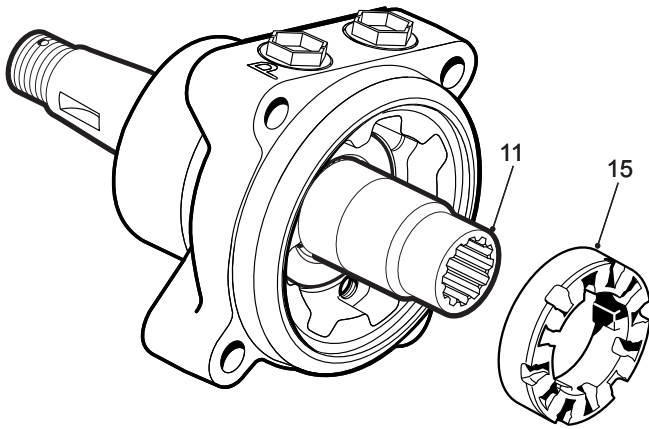


Figure 7, Disc Valve

## MOTOR SHAFT

Refer to Figure 8

### Disassembly

1. Remove the screws (25), the washers (24), the end cover (22), the O-rings (20), the gearwheel set (21), the cardan shaft (19), the distributor plate (18), the bearing race (17), the radial needle bearing (16), the distributor plate (18) and the disc valve (15).
2. Remove the woodruff key, if installed. See item (10), page 5.
3. With motor housing secure in a holding tool, press out the motor shaft (11).

**NOTE:** The needles may fall out of the needle bearing (9) when motor shaft (11) is removed. Retrieve for re-use.

### Inspection

1. Inspect for wear or damage.

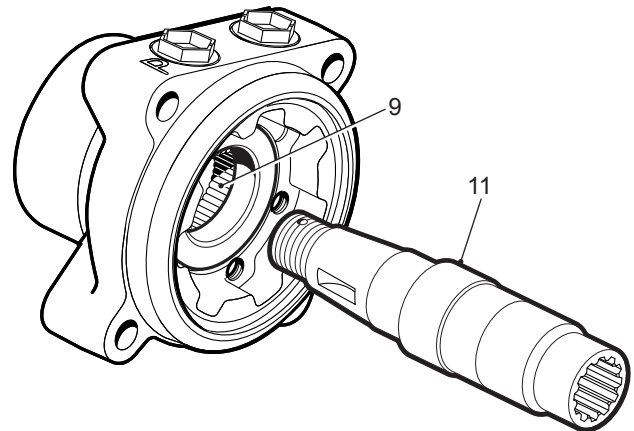


Figure 8, Motor Shaft

# BALANCE PLATE

Refer to Figure 9

## Disassembly

1. Remove the screws (25), the washers (24), the end cover (22), the O-rings (20), the gearwheel set (21), the cardan shaft (19), the distributor plate (18), the bearing race (17), the radial needle bearing (16), the disc valve (15) and the tapered shaft (11).
2. Remove the balance plate (14).
3. Remove the O-ring (12) and discard.
4. Remove the spring washer (13).
5. Remove the O-ring (5) and discard.

## Inspection

1. Inspect for wear or damage.

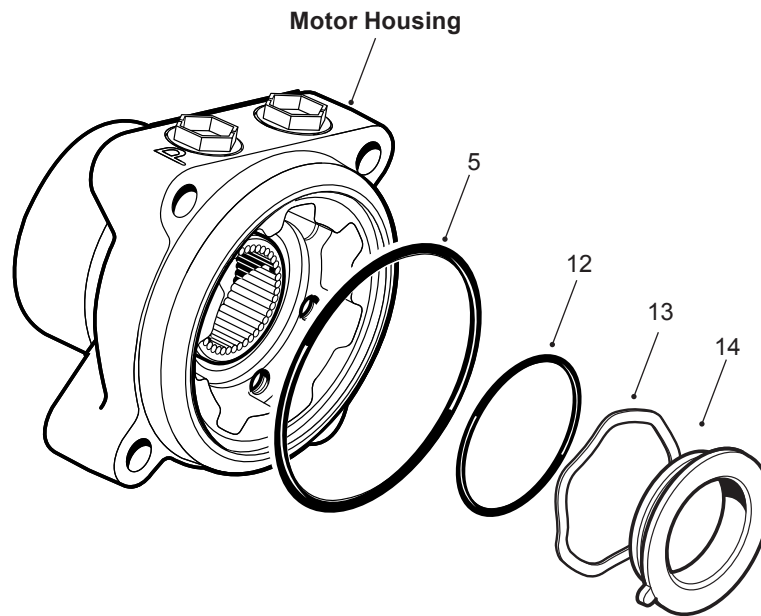


Figure 9, Balance Plate

# BEARINGS AND SEALS

Refer to Figure 10

## Disassembly

1. Remove the screws (25), the washers (24), the end cover (22), the O-rings (20), the gearwheel set (21), the cardan shaft (19), the distributor plate (18), the bearing race (17), the radial needle bearing (16), the disc valve (15), the tapered shaft (11) and the balance plate (14). See pages 5 – 10.
2. Apply grease to the radial needle bearing (9) to hold needle bearings in place.
3. Flip the unit over to remove the dust seal (3).
4. Using a flat blade screwdriver, gently lever the dust seal (3) from the motor housing and discard.
5. Flip the unit back over to remove the radial needle bearing (9). A blind bearing puller must be used to remove the radial needle bearing (9) from the motor housing.
6. Remove the axial needle bearing (8) and the 2 bearing races (7).
7. Using a small flat blade screwdriver, remove the shaft seal (6) from the bearing housing and discard. Insert the screwdriver into the axle end of the motor housing and pry/push the seal back into the housing until it can be extracted from the inside of the motor housing.

## Inspection

1. Inspect for wear or damage.

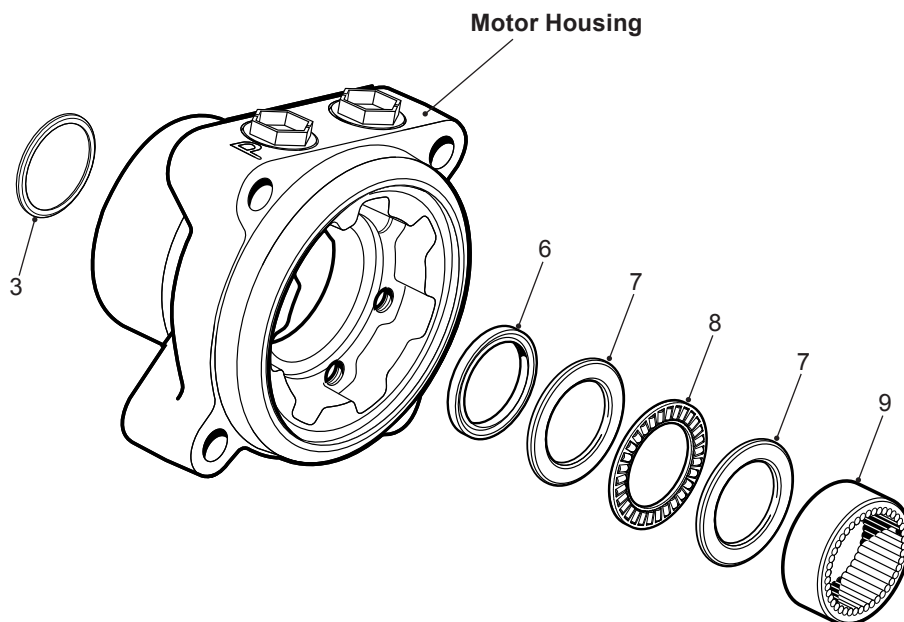


Figure 10, Axial Bearing and Seal

# BEARINGS AND SEALS

Refer to Figure 1

## Assembly

1. Before assembly, lubricate all parts with clean oil and grease rubber parts with clean petroleum jelly.
2. Using a mandrel, press new seal (6) into motor housing. Seal should go in with metal side facing the motor shaft end of the housing and the cupped side facing toward the interior of the housing.
3. Install the 2 bearing races (7) as depicted, (one on each side of the axial needle bearing) and the axial needle bearing (8).
4. Install the radial needle bearing (9) into the housing — press into place using a mandrel.

**NOTE:** Hold the needle bearings in place by applying a light coating of grease to the outer ring and to the needle bearings.

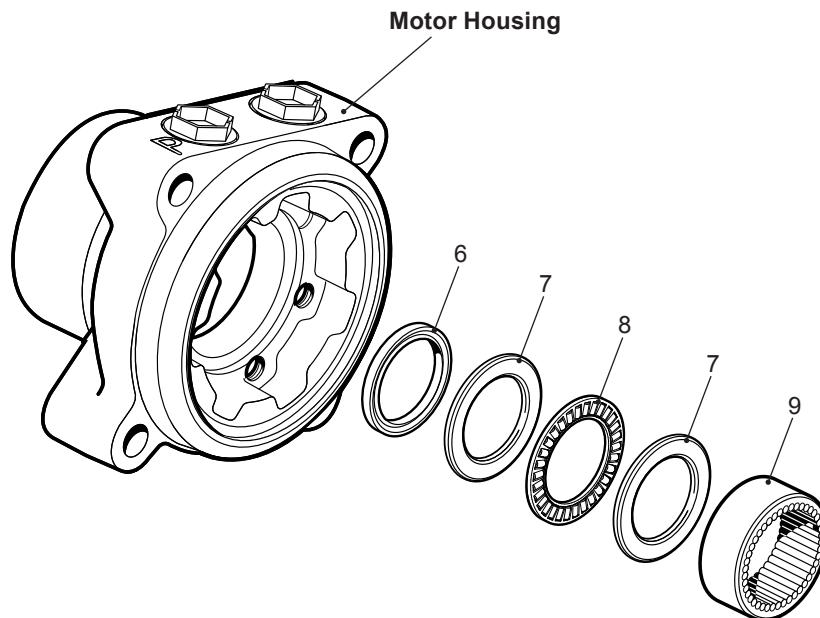


Figure 1, Axial Bearing and Seal

## MOTOR SHAFT

Refer to Figure 2

### Assembly

1. Carefully insert the shaft (11) through the motor housing.

**NOTE:** Care should be taken when inserting motor shaft (11) through motor housing. Use a mandrel or bullet over shaft end to prevent keyway from cutting seal.

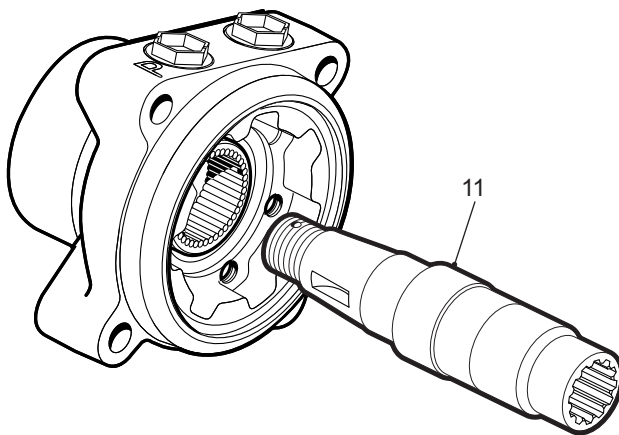


Figure 2, Motor Shaft

## BALANCE PLATE

Refer to Figure 3

### Assembly

1. Before assembly, lubricate all parts with clean oil and grease rubber parts with clean petroleum jelly.
2. Place the O-ring (5) in the motor housing O-ring recess.
3. Insert O-ring (12) into the recess on the balance plate (14) and lubricate with grease. Place the spring washer (13) on the balance plate. Place balance plate lightly in position so that it engages.

**NOTE:** Take care not to damage O-rings during installation.

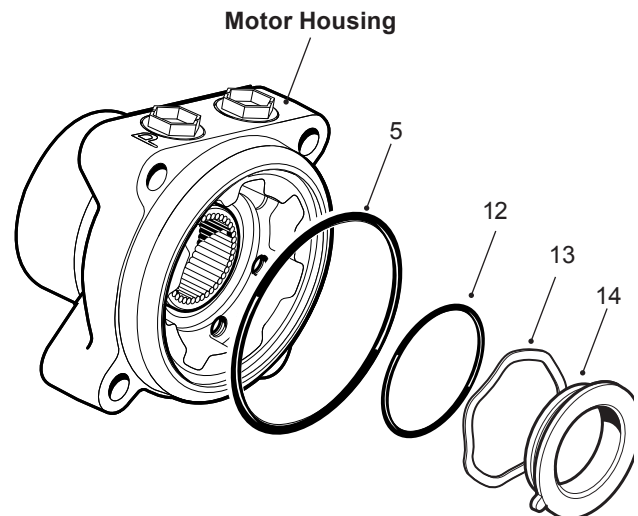


Figure 3, Balance Plate



## DISC VALVE

Refer to Figure 4

### Assembly

1. Before assembly, lubricate all parts with clean oil.
2. Place disc valve (15) on the motor shaft (11) with channels upwards so that the long tab on the disc valve engages with the slot in the shaft.

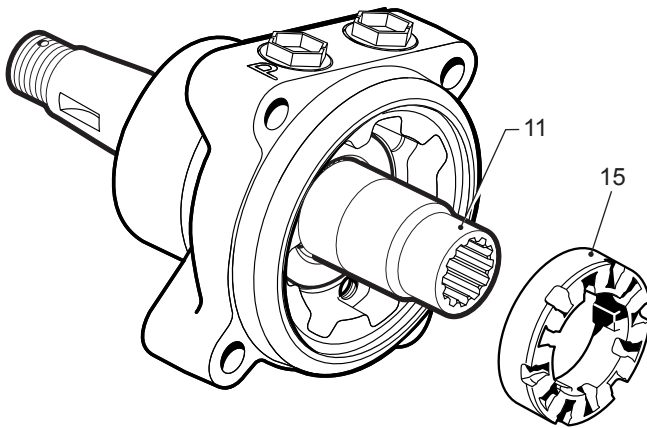


Figure 4, Disc Valve

## CARDAN SHAFT

Refer to Figure 5

### Assembly

1. Before assembly, lubricate all parts with clean oil.
2. Note the difference in spline length on the cardan shaft (19). Fit the cardan shaft with the long spline end into the axle output shaft (11). After installation mark the top of the cardan shaft spline that lies adjacent to the long tab in the disc valve (15). See Fig. 5a

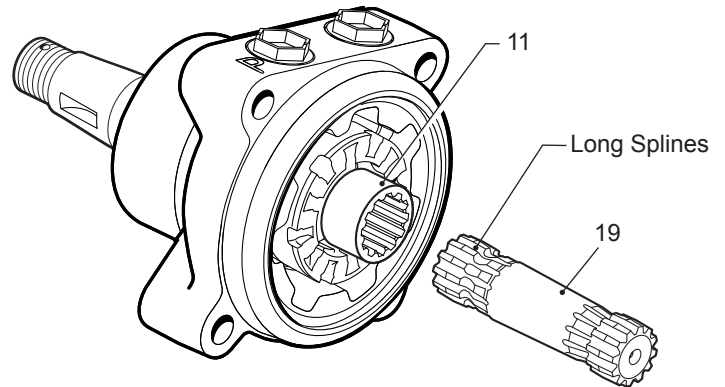


Figure 5, Cardan Shaft

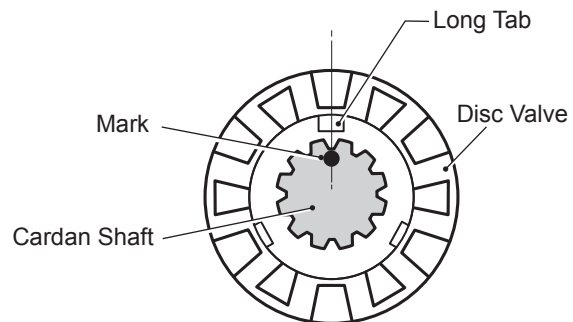


Figure 5a, Cardan Shaft Installation

# DISTRIBUTOR PLATE

Refer to Figure 6

## Assembly

1. Before assembly, lubricate all parts with clean oil.
2. If removed, press the needle bearing (16) into the distributor plate (18).

**NOTE:** Hold the needle bearings in place by applying a light coating of grease to the outer ring and to the needle bearings.

3. Place the distributor plate (18) on the motor housing so that the shaft enters the bearing (16). Press the distributor plate (18) until it stops on the housing and line up the screw holes.

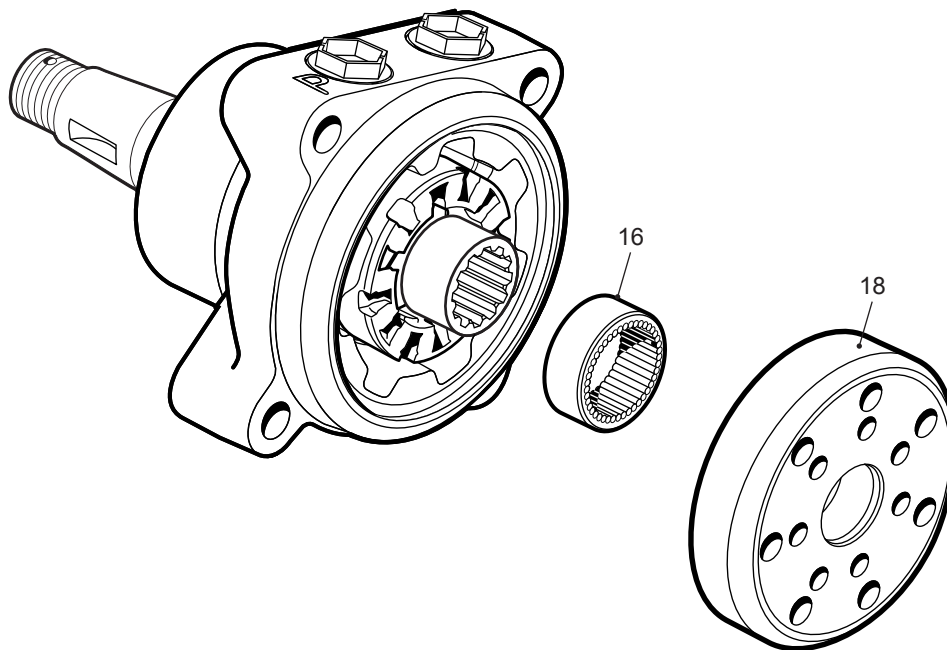


Figure 6, Distributor Plate

# GEARWHEEL SET

Refer to Figure 7

## Assembly

1. Before assembly, lubricate all parts with clean oil and grease rubber parts with clean petroleum jelly.
2. Place the O-rings (20) (greased) in the gearwheel (21) O-ring recesses. If there is a recess on one end of the inner gearwheel, position and fit the gearwheel set with the recessed splines toward the motor housing (4).
3. Reference the motor ID tag to determine the rotation of the motor.

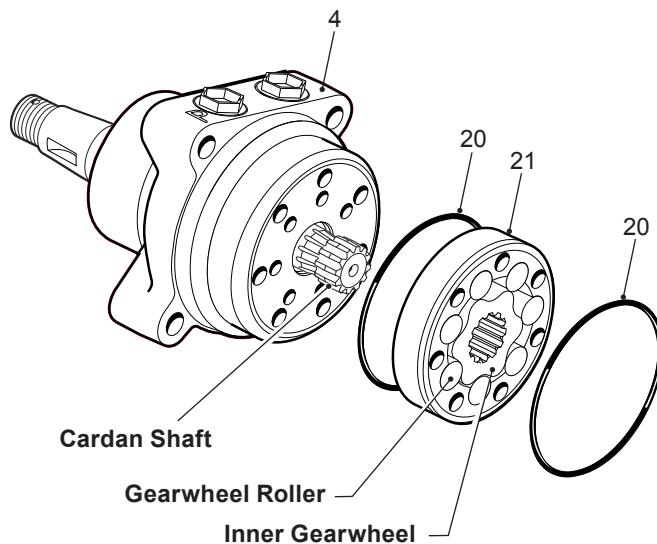
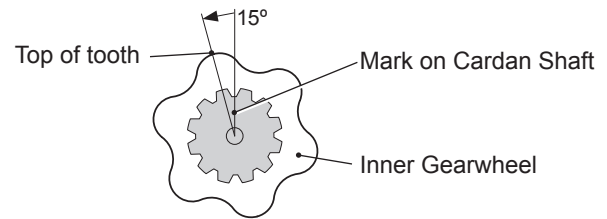


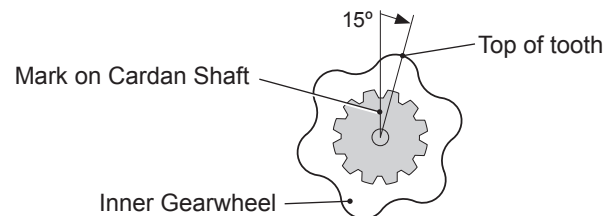
Figure 7, Gear Wheel Set

### ***Clockwise rotation:***



4. Fit the gearwheel set (21) on the cardan shaft so that the top of the tooth in the external teeth of the gearwheel is vertically over the mark on the cardan shaft. Turn the gearwheel set counterclockwise until the cardan shaft and internal gearwheel slips over and engages the splines (15°). Turn the external gearwheel rim to line up the screw holes.

### ***Counterclockwise rotation:***



Fit the gearwheel set (21) on the cardan shaft so that the top of the tooth in the external teeth of the gearwheel is vertically over the mark on the cardan shaft. Turn the gearwheel set clockwise until the cardan shaft and internal gearwheel slips over and engages the splines (15°). Turn the gearwheel rim to line up the screw holes.

## END COVER

Refer to Figure 8

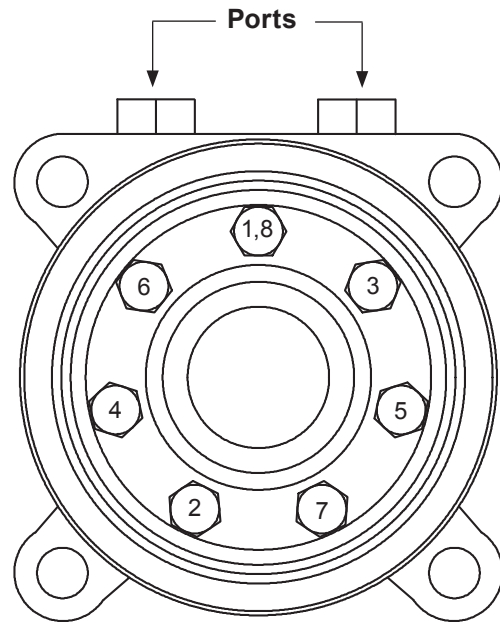
### Assembly

1. Before assembly, lubricate all parts with clean oil and grease rubber parts with clean petroleum jelly.
2. Using new washers (24), reassemble all parts in the reverse order of disassembly.

**CAUTION:** Take care to align the holes of the end cover (22) with those of the gear wheel set before inserting the screws (25).

3. When tightening the screws (25), refer to the table on page 3 for the required torque values. Also refer to the torque sequence illustration on the right for the proper tightening sequence.

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



End Cover Screw Torque Sequence

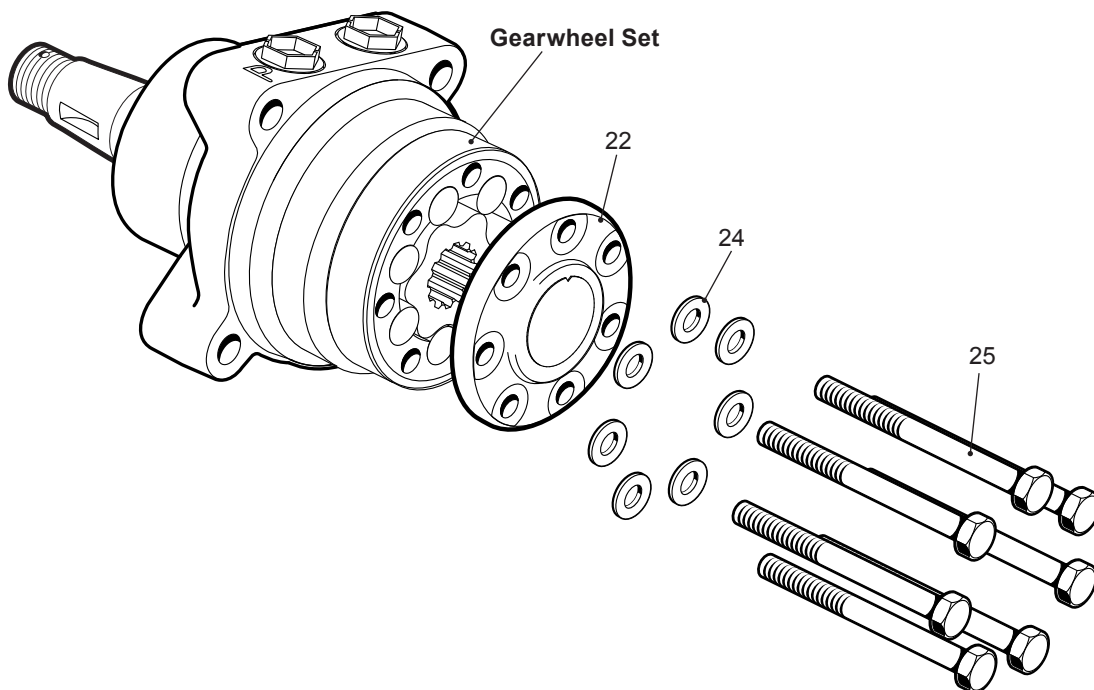


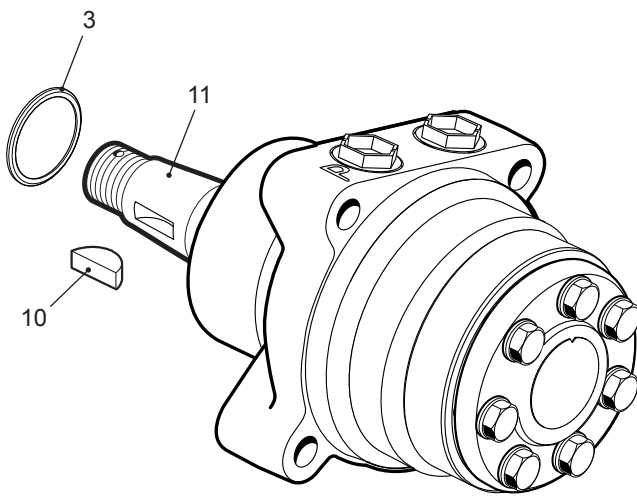
Figure 8, End Cover

## DUST COVER AND WOODRUFF KEY

*Refer to Figure 9*

### Assembly

1. Using a rubber or neoprene mallet and mandrel, install a new dust seal (3) into the bearing housing.
2. Install the woodruff key (10) onto the motor shaft (11).



**Figure 9, Dust Cover and Woodruff Key**

## BRAKE AND DRUM

Refer to Figures 10, 11

### Assembly

1. Mount the brake assembly (28) onto the HGM Motor by aligning four holes on the brake with those on the HGM motor.
2. Install the four screws (29) and tighten, refer to the table on page 3 for the required torque values.
3. Mount drum assembly (27) onto brake assembly (28).

**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. Install the castellated nut (1). Torque castellated nut as required in table on page 3.
5. Install the cotter pin (30).

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

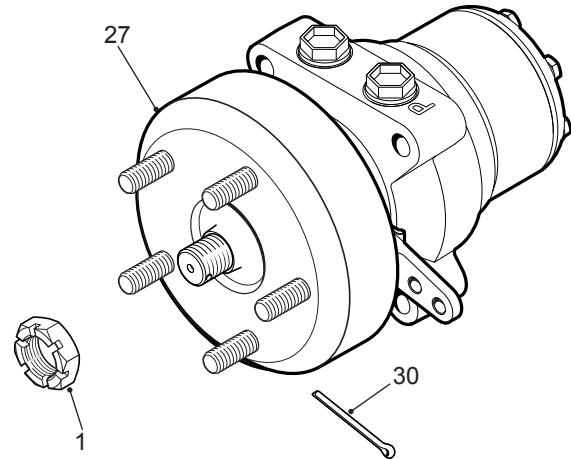


Figure 11, Drum Assembly

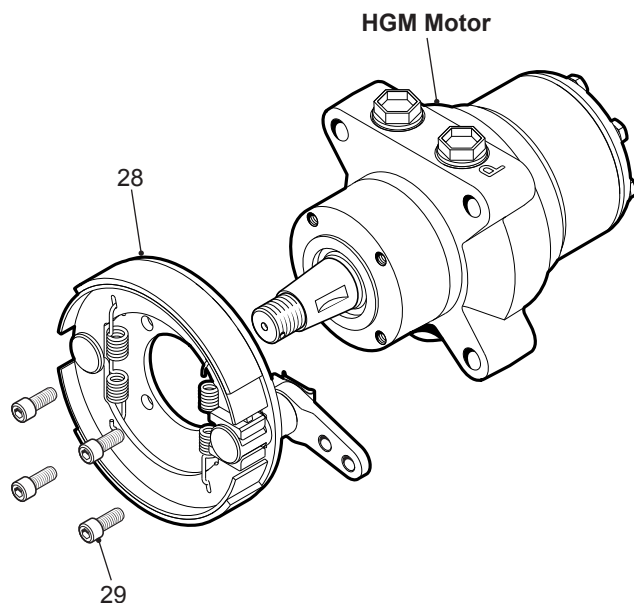
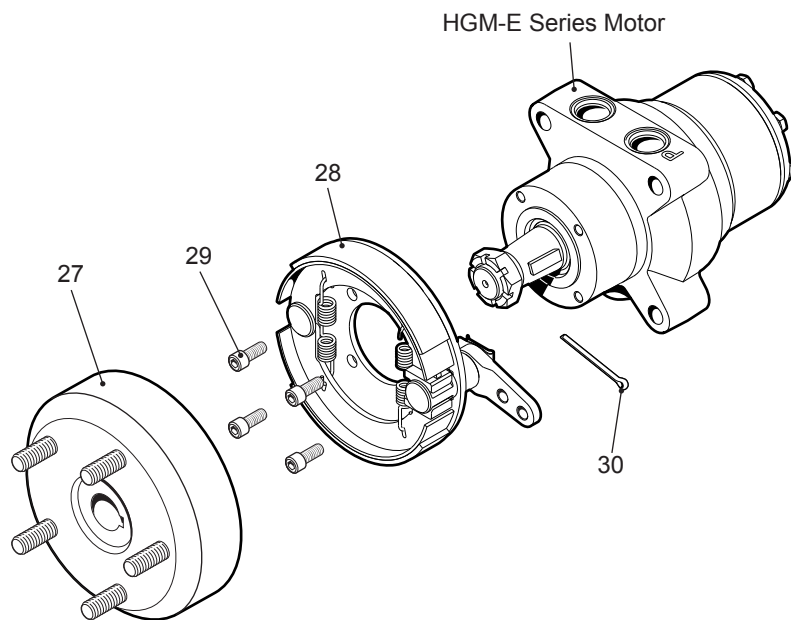
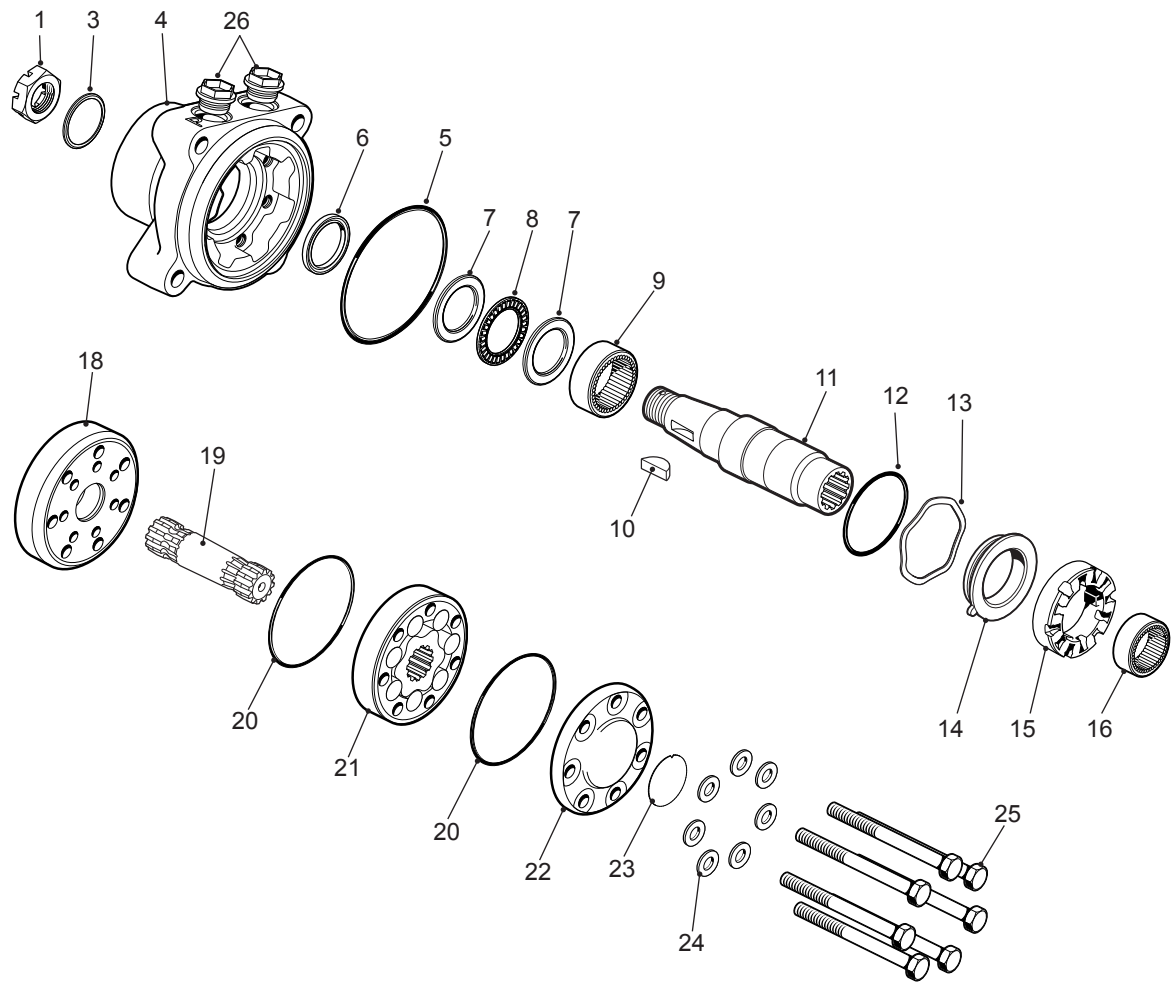


Figure 10, Brake Assembly

# HGM – E SERIES EXPLODED VIEW



## HGM – E PARTS LIST

Item	Description	Quantity
1	Castellated nut	1
3	Dust seal ring	1
4	Housing	1
5	O-ring	1
6	Shaft seal	1
7	Bearing race	2
8	Axial needle bearing	1
9	Radial needle bearing	1
10	Woodruff key	1
11	Shaft tapered	1
12	O-ring	1
13	Spring washer	1
14	Balance plate	1
15	Disc valve	1
16	Radial needle bearing	1
18	Distributor plate	1
19	Cardan shaft	1
20	O-ring	2
21	Gearwheel set	1
22	End cover	1
23	Name plate	1
24	Washer	7
25	Screws	7
26	Plugs	2
27	HGB drum assembly	1
28	HGB brake assembly	1
29	Bolt	4
30	Pin, cotter	1







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