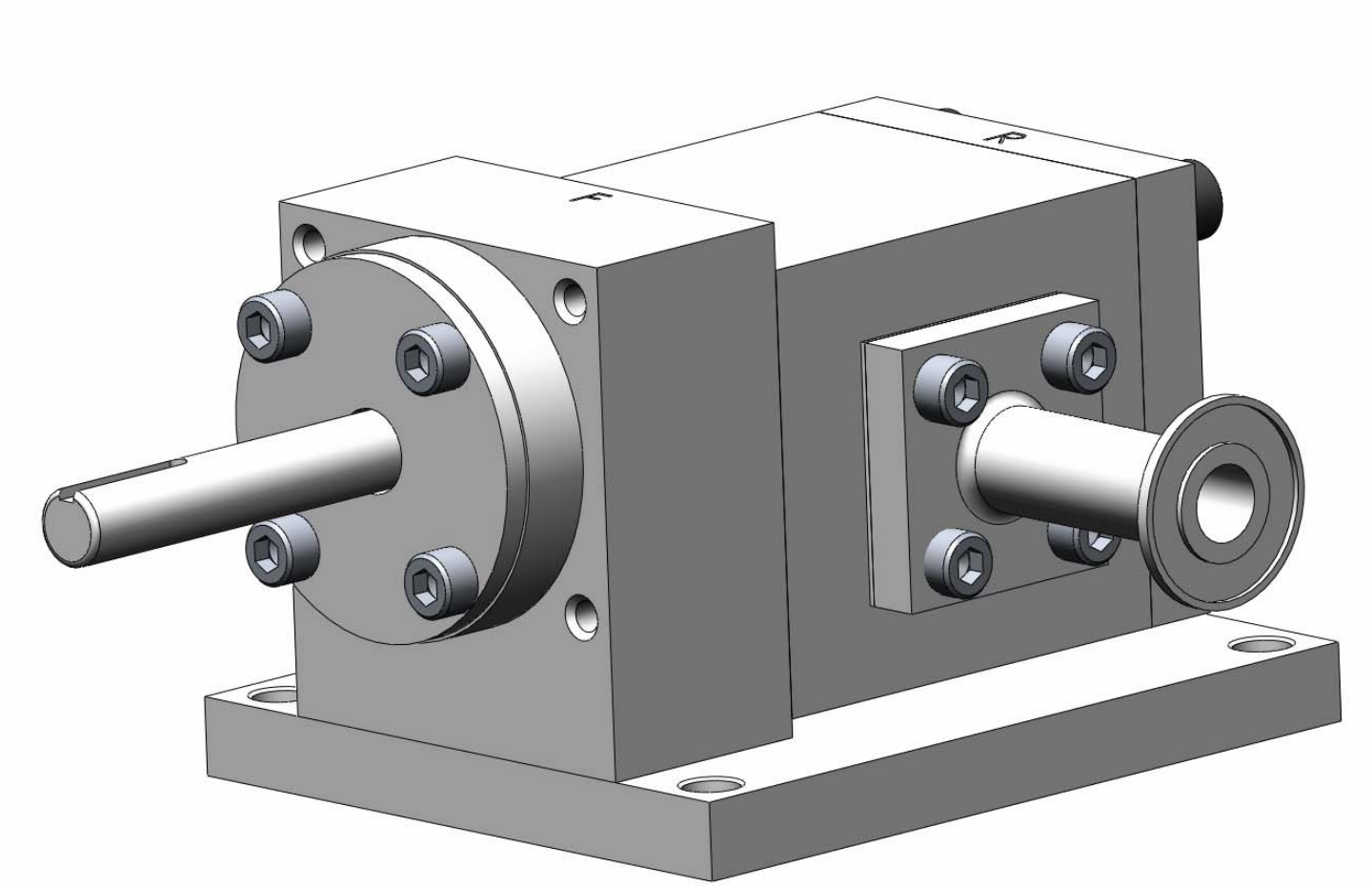
Operation Manual

Northern® NPC Pump Model NPC-1-D100481



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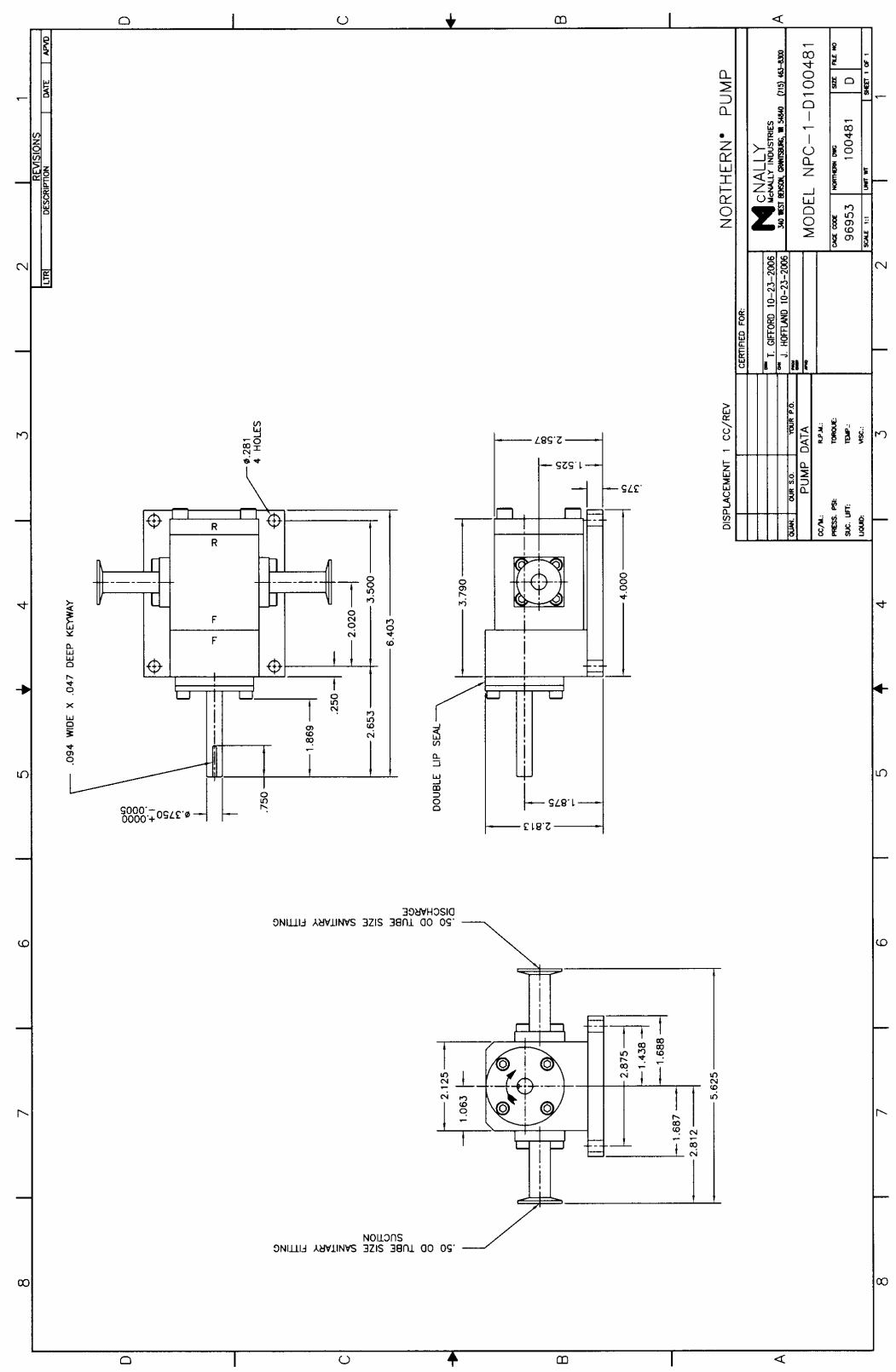
Cautionary Statements

Failure to heed these cautionary statements may result in personal injury and/or damage to equipment.

1. Disable and lock-out the drive system before any work is done to maintain or remove the pump.
2. Fully depressurize the entire system.
3. Close the valve closest to the pump in both the suction and discharge pipe.
4. Wear protective eyewear.
5. When handling corrosive, caustic, toxic, or hazardous liquids, wear protective clothing to prevent contact with skin.
6. Wear protective footwear such as safety shoes.
7. When handling liquids with toxic vapors, wear a properly rated breathing mask.
8. Work area must be properly ventilated.
9. Work area must be properly grounded.
10. Do not work alone.
11. Clean up any spilled liquid immediately.



Outline Drawing

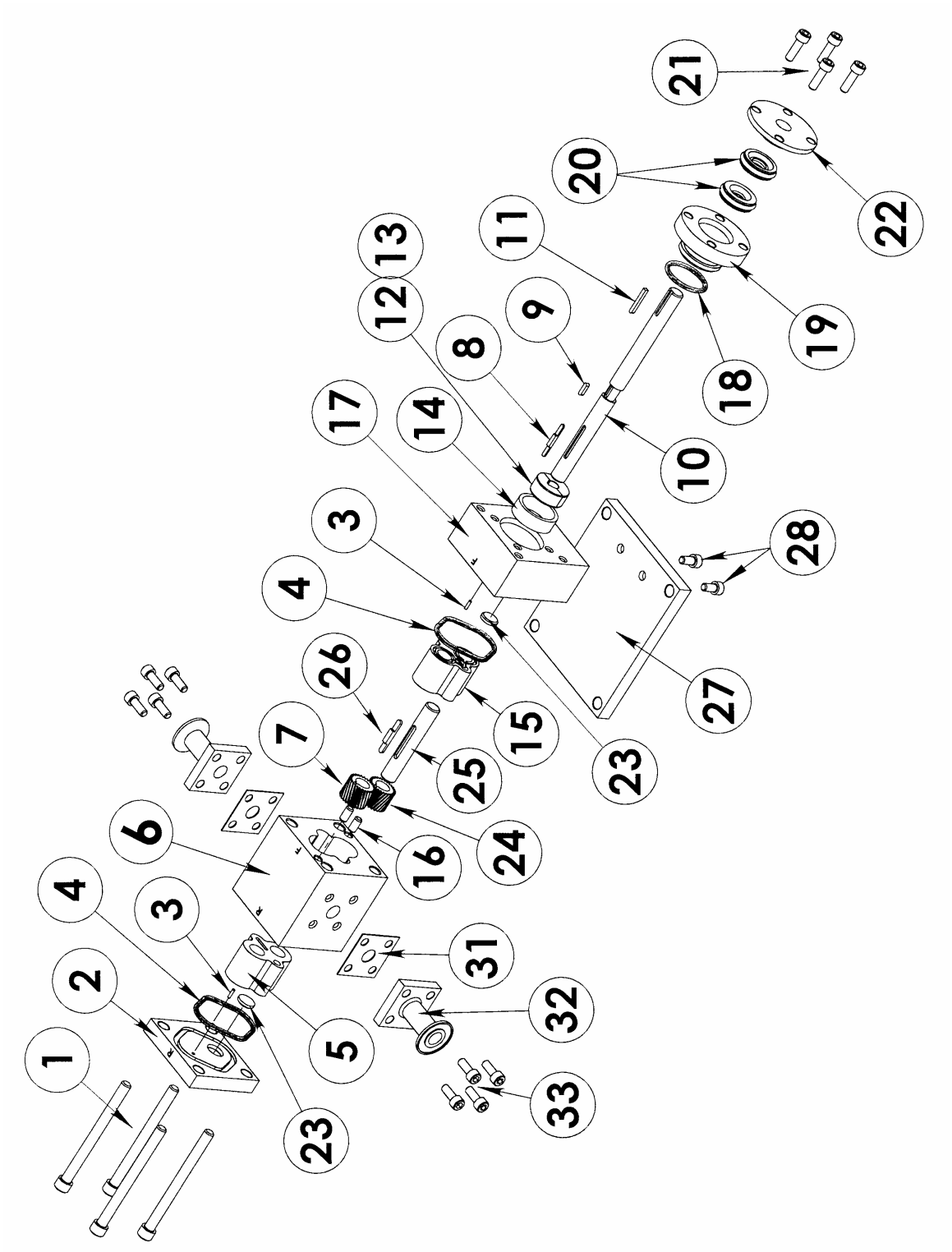

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Figure 1

Installation

1. Install the drive shaft end key (11) into the drive shaft (10) keyway.

2. Install the coupling hub on to the driveshaft. The coupling hub must slide freely on to the drive shaft. If it does not, locate the problem, correct it, and re-install the coupling hub. The coupling hub is normally positioned so that the end of the drive shaft is flush with the solid part of the coupling hub. Tighten the set screw over the drive shaft key snugly, DO NOT OVERTIGHTEN.

3. Install the pump on to the equipment mounting bracket and install the mounting cap screws, finger tight.

4. Assemble the shaft coupling and align the pump and motor shaft in accordance with the requirements of the coupling manufacturer.

5. Tighten the mounting cap screws snugly. DO NOT OVERTIGHTEN. Recheck the coupling alignment. Verify that the coupling hub set screws are properly tightened.

6. Install the suction and discharge port adapters (32), Figure 1, to the pump body with cap screws (33), Figure 1. A Teflon® gasket (31), Figure 1, is used to seal each adapter to the pump body. DO NOT OVERTIGHTEN THE CAP SCREWS.

6. Connect the suction and discharge lines to the port adapters.

7. Open the suction and discharge valves.

8. Operate pump at moderate speed until pump has primed and air is purged from the pump.

Startup

1. Make sure that all guards, electrical grounds, and other safety devices are properly installed.

2. Open the suction and discharge valves.

3. Verify that the drive is set to operate the pump in clockwise rotation when facing the drive shaft end of the pump as shown by the curved arrow on the lower left-hand view of the outline drawing.

4. If the installation has the suction vessel above the pump, vent the air in suction line so that the liquid will flow to the pump before startup.

5. If the installation has the suction vessel below the pump, priming of the pump will be accomplished by:

   A. Putting a small amount of an application compatible liquid into the pump before startup to form a “liquid seal” around the gears.

   B. Keeping the discharge pressure as low as possible during priming.

   C. Eliminating all vacuum leaks in the suction line.

   D. Operating the pump at moderate speed -- 150 – 200 rpm

   E. Minimizing all restrictions to liquid flow in the suction line.

   F. Applying a low pressure -- 5 to 15 psig -- to the suction vessel if needed.

6. Operate pump at moderate speed until pump has primed and air is purged from the pump.

7. Closed liquid supply vessels must be either vented of fitted with a system to maintain the pressure inside the vessel at a constant pressure. Failure to do so will result in high vacuum in the vessel as the liquid is pumped away. At some point, the vacuum may become so high that the pump will no longer perform its intended function.

8. Check all piping for leaks and correct as required.

Operating Limits

Operating the pump outside of the operating limits will result in lower than normal pump life and performance. Your warranty may be voided if the failure is the direct result of operating the pump outside of the operating limits.

1. Maximum discharge pressure: 100 psig
690 kPag

2. Suction conditions:

    A. Maximum Vacuum: 15 inches of mercury
381 mm of mercury

    B. Maximum Pressure: 15 psig
103 kPag

3. Speed range: 5 – 300 rpm

4. Viscosity range: 50 – 20,000 cP

5. Temperature range: -20 °F to +250 °F
-29 °C to +121 °C

Performance Considerations

The Northern Model NPC-1-D100481 pump is designed to provide a very nearly pulseless flow under most operating conditions. The ability of the pump to perform to the user's expectations is related to the operating conditions placed upon the pump. The user should consider the following parameters when using this pump:

1. The volumetric efficiency of the pump is dependent upon the viscosity of the liquid being pumped, suction conditions, discharge pressure, and the pump speed. Volumetric efficiency is improved by increasing the viscosity, minimizing or eliminating suction vacuum, lowering the discharge pressure, and increasing the pump speed.

2. Increased internal clearances in the pump will decrease its performance. As the pump wears, its performance will decrease. Replacing worn parts will restore the pump's performance.

3. Most liquids will have a decreasing viscosity with increasing temperature. The pump's performance will decrease with decreasing liquid viscosity.

4. The pump's internal slippage will be independent of pump speed. Operating at low speed will yield lower volumetric efficiency than operating at high speed.

5. If pulsation in the pump delivery is an issue in the application, operation at low speed will be more likely to yield problems than will operation at high speed.

6. Pumping very high viscosity liquids will require high driving torque. The torque capacity of the drive shaft and keys may be insufficient to transmit the required torque. Consult the factory if operation with high liquid viscosity is necessary.

Lubrication and Preventative Maintenance

The pump is fully lubricated by the pumped liquid. It is capable of being run dry for short periods. However, dry running for extended periods must be avoided.

It is recommended that a very small amount of a liquid compatible with the liquid to be pumped be put into the pump at startup. This will lubricate the pump during the startup period and make the pump much easier to prime.

There is no preventative maintenance routine to follow for this pump as there are no manual adjustments or other actions required for normal operation.

It is required that the coupling be a slip fit on the pump shaft. Do not force the coupling and shaft together.

When attaching the suction and discharge lines to the pump adapters, make sure that the attached lines mate with the pump adapters naturally without being forced into position. Do not expect the pump to accept significant forces from the attached suction and discharge lines.

Trouble Shooting Guide

Problem	Solution
Key will not fit into keyway in drive shaft	Check for burrs and nicks in the keyway and on the key. Remove as required. Measure width of key and keyway, if an interference fit is found, reduce the width of the key.
Motor shaft turns but pump shaft does not	Verify that the coupling has been properly installed with the correct key in each hub. Verify that the set screws are properly tightened in each coupling hub.
Pump will not prime	Check for air leaks in the suction line. Check for correct rotation of the pump shaft -- CW when facing the shaft end of the pump. “Wet” the internals of the pump with the liquid to be pumped to provide a liquid seal in the pumping chamber. Make sure that all suction and discharge line valves are open. Make sure that the suction and discharge lines are free of obstructions.

Problem	Solution
Pump requires too much torque	Make sure that the viscosity of the liquid being pumped is not abnormally high. Check for binding of the pump shaft
Pumped liquid has entrained air	Check for air leaks in suction line. Check for air leaks in the shaft seal.
Flow rate is too low	Make sure that the viscosity of the liquid being pumped is not abnormally low. Make sure that the discharge pressure is not abnormally high. Make sure that there are no air leaks in the suction line. Verify that the rotational speed is correct. Disassemble pump and verify that the internal clearances are within specification.

Removal from Installation

1. Turn off and lock out the drive mechanism.
2. Fully depressurize both the suction and discharge lines to the pump.
3. Close the valve in the suction and discharge lines closest to the pump.
4. Place a pan or other liquid collecting device under the pump to collect the liquid that will drain from the pump and the suction and discharge lines when the suction and discharge lines are disconnected from the pump.
5. Disconnect the suction and discharge lines at the union or flange closest to the pump. Position the removed lines so that liquid is not spilled.
6. Remove the suction and discharge port adapters from the pump. Remove the adapter gaskets.
7. If required, prepare the shaft coupling for disassembly and removal of the pump.
8. Remove the cap screws holding the pump's mounting plate in place.
9. Remove the pump from its mounting.
10. Loosen the setscrew in the coupling hub on the pump's drive shaft and remove it. If it does not slide off easily, use a puller to remove it. Do not drive it off with a hammer of force it off with a pry bar.
11. Clean up any spilled liquid.
12. Recycle or dispose of spilled liquid as approved by owner's regulations.

Parts List

Model NPC-1-100481

Find No.	Nomenclature	Part Number	Qty
1	Cap Screw	100629	4
2	End Plate	100461	1
3	Bearing Insert Dowel Pin	100499	2
4	O-ring	19120128-90	2
5	Rear Bearing Insert	100451	1
6	Cylinder	100460	1
7	Drive Gear, LH	100437	1
8	Drive Gear Key	100497	1
9	Thrust Washer Key	100505	1
10	Drive Shaft	100446	1
11	Drive Shaft End Key	100500	1
12/13	Thrust Washer Set	100477	1
14	Thrust Washer Retaining Ring	100479	1
15	Front Bearing Insert	100450	1
16	Dowel Pin	100498	2
17	Seal Adapter Plate	100482	1
18	O-ring	19120119-90	1
19	Seal Housing	100467	1
20	Lip Seal	100501	2
21	Cap Screw	100630	4
22	Seal Retainer	100468	1
23	Thrust Disk	100506	2
24	Driven Gear, RH	100436	1
25	Driven Shaft	100447	1
26	Driven Shaft Gear Key	100487	1
27	Mounting Plate	100475	1
28	Cap Screw	100634	2
29	Seal Removal Tool	100518	1
30	Seal Installation Tool	100535	1
31	Gasket	100486	2
32	Port Adapter	100491	2
33	Cap Screw	100634	8

Consumable Parts List

Find No.	Nomenclature	Part Number	Qty
4	O-ring	19120128-90	2
18	O-ring	19120119-90	1
20	Lip Seal	100501	2

Recommended Spare Parts List

Model NPC-1-100481

Find No.	Nomenclature	Part Number	Qty
3	Bearing Insert Dowel Pin	100499	2
4	O-ring	19120128-90	2
5	Rear Bearing Insert	100451	1
6	Cylinder	100460	1
7	Drive Gear, LH	100437	1
8	Drive Gear Key	100497	1
9	Thrust Washer Key	100505	1
10	Drive Shaft	100446	1
11	Drive Shaft End Key	100500	1
12/13	Thrust Washer Set	100477	1
14	Thrust Washer Retaining Ring	100479	1
15	Front Bearing Insert	100450	1
18	O-ring	19120119-90	1
20	Lip Seal	100501	2
23	Thrust Disk	100506	2
24	Driven Gear, RH	100436	1
25	Driven Shaft	100447	1
26	Driven Shaft Gear Key	100487	1