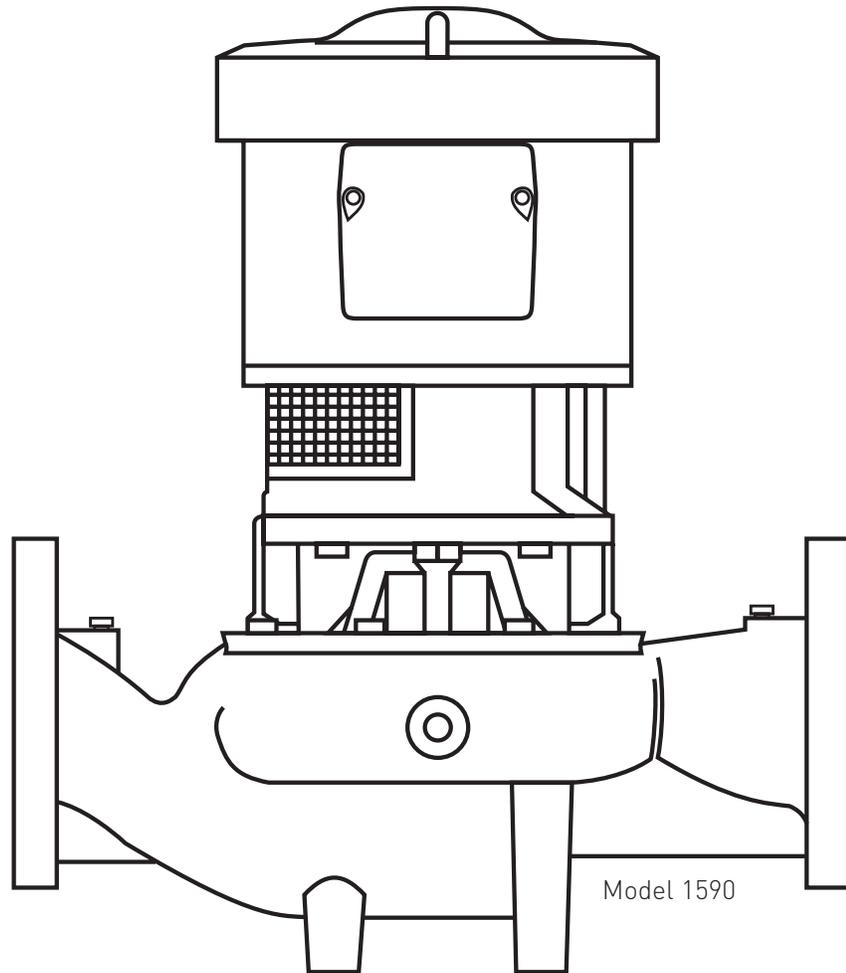




## FAIRBANKS NIJHUIS™



# 1590 AND 1590SC SERIES SINGLE STAGE VERTICAL INLINE PUMP

## INSTRUCTION AND REPAIR MANUAL

NOTE! To the installer: Please make sure you provide this manual to the owner of the equipment or to the responsible party who maintains the system.

**APPLICATIONS:**

The 1590 and 1590SC series is a superior commercial in-line pump based on the Fairbanks Nijhuis 1500/2500 series which has been manufactured and field tested under the severest demands of high temperature condensate service and boiler feed applications for many years. Pumping applications for the 1590 and 1590SC includes hot or chilled water circulation, pressure booster systems, and cooling towers for office buildings, hotels, hospitals, universities and warehouses.

**OPERATIONAL LIMITS:**

Maximum Operating Pressure: 175 psi  
Maximum Operating Temperature: 225°F (107°C)

**ATTENTION: SAFETY WARNINGS:**

Read and understand all warnings before installation or servicing pump.

**CALIFORNIA PROPOSITION 65 WARNING:****WARNING:**

This product and related accessories contain chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

**ELECTRICAL SAFETY:****WARNING: Electrical Shock Hazard**

All electrical connections are to be made by a qualified electrician in accordance with all codes and ordinances. Failure to follow these instructions could result in serious personal injury, death or property damage.

**WARNING: Electrical Overload Hazard**

Ensure all motors have properly sized overload protection. Failure to follow these instructions could result in serious personal injury, death or property damage.

**WARNING: Sudden Start-Up Hazard**

Disconnect and lock out power source before servicing. Failure to follow these instructions could result in serious personal injury, death or property damage.

**HIGH TEMPERATURE SAFETY:****WARNING: Hot Surface Hazard**

If pumping hot water, ensure guards or proper insulation is installed to protect against skin contact to hot piping or pump components. Failure to follow these instructions could result in serious personal injury, death or property damage.

**WARNING: Spraying Water Hazard**

When servicing pump replace all gaskets and seals. Do not reuse old gaskets or seals. Failure to follow these instructions could result in serious personal injury, death or property damage.

**HIGH PRESSURE SAFETY:****WARNING: High Pressure Hazard**

The pump is rated at a maximum of 175 psi (155 psi). Do not exceed this pressure. Install properly sized pressure relief valves in system. Failure to follow these instructions could result in serious personal injury, death or property damage.

**WARNING: Expansion Hazard**

Water expands when heated. Install properly sized thermal expansion tanks and relief valves. Failure to follow these instructions could result in serious personal injury, death or property damage.

## **LOCATION:**

The pump should be installed in a clean, heated and well ventilated area that allows access for inspection, cleaning and proper maintenance. Sufficient space should be provided for installation and removal.

## **INSTALLATION:**

The 1590 and 1590SC pumps must be installed vertically. Install isolating valves on each side of pump so pump maintenance can be performed with out draining the system. Special mounting requirements may be required if the pump is to be mounted near a noise or vibration sensitive area.

A minimum length of straight pipe is required on the suction side of the pump. Five times the pipe diameter is sufficient to allow a smooth entry of water into the pump.

Suction and discharge piping must be in line. Do not use pump casing to force the alignment of the piping. Properly support the piping to provide a rigid support for the pump. Tighten pump flanges evenly to prevent flange cocking and liquid leakage. Do not reuse old gaskets.

## **ELECTRICAL CONNECTIONS:**

### **WARNING: Electrical Shock Hazard**

**All electrical connections are to be made by a qualified electrician in accordance with all codes and ordinances. Failure to follow these instructions could result in serious personal injury, death or property damage.**

### **WARNING: Electrical Overload Hazard**

**Ensure all motors have properly sized overload protection. Failure to follow these instructions could result in serious personal injury, death or property damage.**

### **WARNING: Sudden Start-Up Hazard**

**Disconnect and lockout power source before servicing. Failure to follow these instructions could result in serious personal injury, death or property damage.**

## **START-UP:**

The pump must be filled with water before start-up or the mechanical seal will not be lubricated and will fail. Loosen vent plug on pump casing to ensure all air is vented from casing and the casing is filled with water.

### **WARNING: Hot Surface Hazard**

**If pumping hot water, ensure guards or proper insulation is installed to protect against skin contact to hot piping or pump components. Failure to follow these instructions could result in serious personal injury, death or property damage.**

### **WARNING: Spraying Water Hazard**

**When servicing pump, replace all gaskets and seals. Do not reuse old gaskets or seals. Failure to follow these instructions could result in serious personal injury, death or property damage.**

Avoid all situations where pipe stain may be transferred to the pump casing. Expansion fittings and pipe hangers located close to the pump may be required. Do not force the piping to match the pump suction and discharge flanges. Recut the piping to avoing this situation.

All electrical connections are to be completed by a qualified electrician. Ensure properly sized overload protection is installed.

1. Check that the current supply agrees with the voltage and frequency of the motor nameplate.
2. Check that the motor is wired for correct voltage.
3. Check that thermal overload relays are correct size and set for operation.

## **OPERATING:**

Ensure the system is filled with water and vented prior to pump start up. The pump rotation is clockwise when viewed from the back of the motor. Do not run the pump dry or the mechincal seal will be destroyed.

**TROUBLESHOOTING:****IF MOTOR FAILS TO START:**

1. Wrong voltage, wiring hookup incorrect. Switches not set.
2. Rotating element may be bound due to clog in impeller pipe strain.
3. Tripped thermal overload relay or blown fuses.
4. Starter contacts may be shorted or corroded. Terminal connections may be broken at some point in the circuit.

**LOST PRIME:**

1. Suction pressure too low.
2. Leaks in suction piping connections.
3. High level of air entrainment.

**LOW OR NO WATER FLOW:**

1. Speed may be low; check for low voltage.
2. The impeller may be clogged or damaged or suction and discharge lines partially clogged.
3. Valves may not be fully open.
4. Pump not primed.
5. Suction pressure may be low.
6. Required discharge pressure may be greater than originally anticipated.

**NOISE OR VIBRATION:**

1. Partially clogged impeller resulting in imbalance.
2. Cavitation, net positive suction head available is too low.
3. Pump fully primed.
4. Foundation improperly secured or not strong enough.
5. Piping not anchored securely.
6. Rotating element binding due to damaged shaft, worn bearings or pipe strain.

**MAINTENANCE AND SERVICE TO THE PUMP:**

The 1590 and 1590SC pumps require no regular service other than periodic inspection and occasional cleaning. A periodic inspection must be performed looking for seal leaks indicating the mechanical seal is worn out and any unusual noise or vibration that will indicate other pump components require service/repair. The motor may require lubrication; the motor manufacturer's recommendation should be followed.

**SERVICE:**

Your Fairbanks Nijhuis pump requires no maintenance other than periodic inspection and occasional cleaning.

The intent of inspection is to prevent breakdown, thus obtaining optimum service life. The pump is lubricated by the liquid being pumped and therefore does not require periodic lubrication. The motor, however, may require lubrication, in which case, the motor manufacturer's recommendation should be followed.

**REPAIRS**

This repair manual is broken into three sections. The first section covers the assembly and disassembly of the standard 1590 pumps. The second section covers the replacement of the mechanical seal on the split coupled 1590SC pumps. The third section covers complete split coupled 1590SC pump disassembly. Refer to the exploded pump diagrams for item numbers.

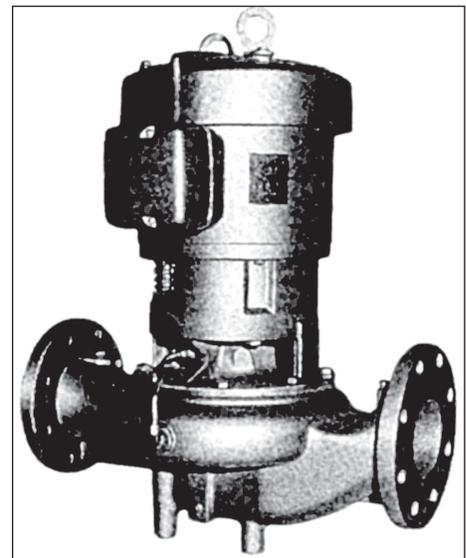


Fig. A. Assembled Unit.



Fig. B. Casing, Gasket and Wearing Ring Removed.

The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it will seldom be necessary to completely disassemble your Fairbanks Nijhuis pump.

The illustrations accompanying the disassembly instructions show the pump at various stages of disassembly. The illustrations are intended to aid in the correct identification of the parts mentioned in the text.

Inspect removed parts at disassembly to determine their reusability. Cracked castings should never be reused. Gaskets should be replaced at reassembly simply as a matter of economy; they are much less expensive to replace routinely than to replace as the need occurs. In general it is economical to return to the manufacturer for repair only to the motor and motor controller.

### DISASSEMBLY:

Disassemble only what is needed to make repairs or to accomplish inspection. Proceed to disassemble the pump as follows:

1. Break electrical connections to prevent any possibility of pump starting during disassembly.
2. Remove plugs (4) from casing (6) to drain pump.
3. Remove all relief, cooling, flushing, or drain lines from the pump, including compression connections (1 and 2) and tubing (3). Break suction and discharge connections only if it is desired to remove casing (6).
4. Remove capscrews (5) and lift pump assembly from casing (6). Remove gasket (8).
5. Unscrew impeller screw (9) and remove washer (9A) taking care not to damage gasket (9B).
6. Slide impeller (11) and impeller key (12) from shaft, again taking care not to damage gasket (10) located behind the impeller. Remove gasket (10).
7. Wearing ring(s) (7 & 16) are pressed into their housings with an interference fit, and must be removed with a puller. New ring(s) should be used for reassembly, since it is likely that during removal this fit will be lost.
8. Impeller wear rings (optional – 14 and 15) are pressed on and must be cut off if replacement is necessary. If they are turned off on a lathe, take care not to cut into the impeller.

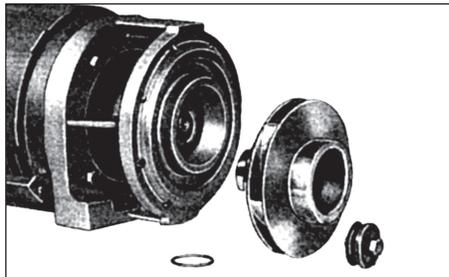


Fig. C. Impeller, O-Ring Removal.

9. Slide sleeve (25) with rotating parts of mechanical seal (27) from the shaft. The sleeve should be carefully cleaned to remove any residue that may be remaining in the seal area. The rubber in the seal (27) may have become partially adhered to the sleeve. The sleeve must also be checked for abrasion or corrosion that can occur when fluid residue penetrates between the seal (27) and the sleeve (25). The sleeve under the seal may be polished lightly to a 32RMS finish before reassembly. Do not reuse a pitted sleeve. Pin (61) may be removed if necessary.

### CAUTION:

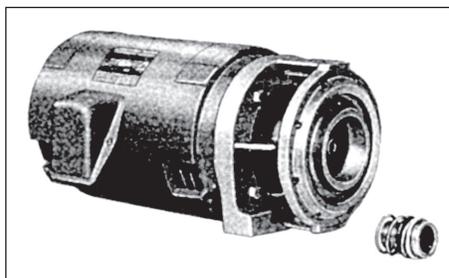


Fig. D. Mechanical Seal Removed.

The mechanical seal (see Figure 1) is a precision product and must be treated as such. During removal, great care must be taken to avoid dropping any part of the seal. Take particular care not to scratch the lapped faces on the washer or the sealing seat. Do not put a seal back into service until the sealing faces of the washer and seat have been lapped or replaced.

10. Unscrew capscrews (32) and remove bracket (35) from the motor.

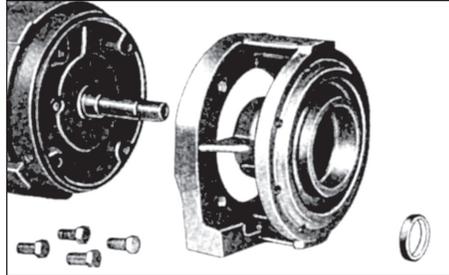


Fig. E. Bracket, Seal Flexible Cup and Stationary Seal Removed.

11. The seal flexible cup and stationary seat should be pressed out of the bracket and the cavity cleaned of all residue. Make sure that the 1/32 inch radius in the seal seat cavity is not damaged during disassembly since a sharp edge can easily cut the flexible cup during reassembly.
12. Remove nameplate (34) and screws (33) only if replacement is needed.

### **REASSEMBLY:**

Reassembly will generally be in reverse order of disassembly. If disassembly was not complete, use only those steps related to your particular repair program.

1. The mechanical seal (27) (see Figure 1) cannot be installed as an assembly. It is necessary to have the seal seat properly in place before the balance of parts can be added. Thoroughly inspect the seal cavity in the bracket for burrs or nicks which could damage the seat of the seal. Apply a film of soap paste or flax soap (do not use oil or grease) to the seal seat and install, taking care to seat it evenly and squarely.

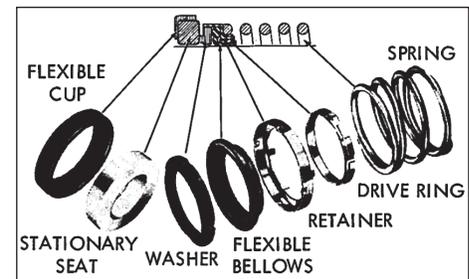


Fig. 1 Mechanical Seal.

NOTE: If it is not possible to insert seat with fingers, place cardboard protecting ring furnished with seal over lapped face of seat and press into place with a piece of tubing having end cut square. The tubing should be slightly larger than the diameter of the shaft. Remove cardboard after seat is firmly in place.

2. Position bracket (35) on the motor and secure with capscrews (32). Tighten screws evenly to assure proper alignment.
3. If nameplate (34) was removed, install and attach with screws (33).
4. Wipe the sealing faces of the seat and seal washer clean. Oil these surfaces with a clean light oil. Lightly oil the shaft sleeve (25). Slide the entire rotating assembly onto the sleeve. The shaft sleeve with the seal rotating assembly on it may now be replaced on the motor shaft. Spring tension will probably prevent the sleeve from remaining in position axially until the impeller is locked against it.
5. Press wearing ring(s) (7 & 16) in casing (6) and bracket (35). Rings should not be hammered into place. Use a press, or clamp the parts in a bench vise, using wooden blocks to protect the rings. It may be necessary to pin or dowel the rings after assembly if the insert or casing has had rings replaced before, since each reassembly can stretch or tear metal and thereby loosen the fits. If the facilities are available, it is good practice to take a very light finish cut or to ream the inside diameter of the casing rings after pressing to restore roundness. When rings are pressed, they may get squeezed out of shape.
6. Place impeller wearing rings (optional – 14 and 15) on impeller (11), using the same care as for the case wearing rings. If the rings are to be trued on a lathe, do not clamp the impeller so tightly that it is permanently distorted.

7. Carefully place gasket (10) on motor end of impeller. Assembly key (12) and impeller (11) to motor shaft. Secure impeller with gasket (9B), washer (9A), and impeller screw (9).
8. Install the four pipe plugs (4) in the pump casing. Position the gasket (8) and casing (6) against the motor bracket and secure with screws (5).
9. Replace all relief, cooling, flushings, or drain lines from the pump including compression connections (1 and 2) and tubing (3). Connect discharge piping and suction piping if required, making sure to install gaskets on the flanged connections. Connect electricity to motor.
10. Read starting instructions before attempting to start pump.

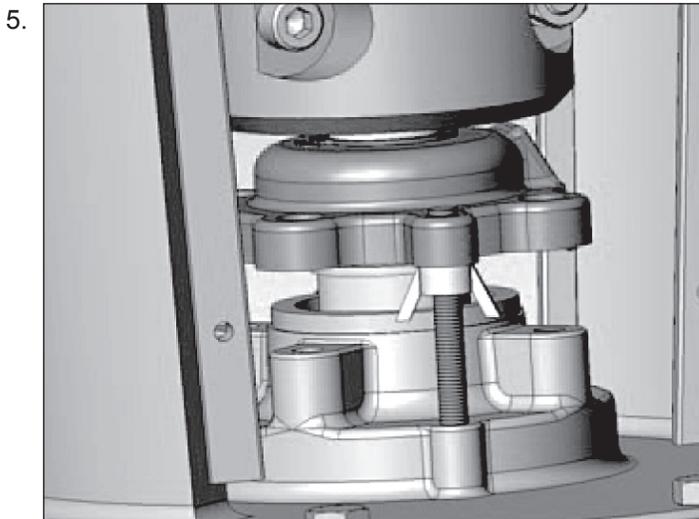
### **1590SC REPAIRS:**

**READ AND UNDERSTAND ALL SAFETY WARNINGS AT THE BEGINNING OF THE MANUAL BEFORE BEGINNING INSTALLATION OR ANY REPAIR WORK.**

The 1590SC portion of the repair manual is broken into two sections. The first section covers the replacement of the mechanical seal. The second section covers complete pump disassembly. Refer to the exploded pump diagram for item numbers.

### **SECTION ONE – REPLACING THE MECHANICAL SEAL**

1. Ensure the electrical power is locked out, the system pressure has been lowered and temperature of the unit is at a safe level.
2. Isolate the pump from the system by closing the valves that should be located on the suction and discharge side of the pump. Loosen one of the pipe plugs (#4) and drain the pump.
3. Remove the coupling guards (#17) by removing the four (per side) retaining bolts (#4). Loosen the feral nuts on the tubing connectors (#1) and remove the gland flushing tubing (#3).
4. Remove the four gland bolts (#55) and, using the two wing nuts (#52), jack the seal gland (#44) upward until the top surface of the seal gland is in firm contact with the bottom of the retaining ring (#41A). With the wing nuts finger tight against the gland, the weight of the shaft (#40) and impeller (#11) can now be supported by the gland and the split coupling can be removed without the shaft dropping.



6. Remove the six socket head coupling bolts (#48) along with the nuts (#50) and lock washer (#49). The two coupling halves (#45) can now be pulled away from the shaft.
7. Remove the two annular (round) keys (#46 & #47) as well as the two linear (square) keys (#53 & #54).
8. Carefully lower the shaft impeller assembly by backing off on the two gland supporting wing nuts until the face of the impeller rests inside the casing.
9. Remove the snap ring (#41A) from the shaft.
10. The gland (with the stationary seat of the mechanical seal pressed internally) can be removed through the gap present between the pump shaft and the motor shaft.

11. Pry the old mechanical seal rotating head (#27) up and off the pump shaft. Remove the stationary seat of the mechanical seal from the gland. Remove the O-ring gasket (#43) from the groove on the bottom of the gland. Clean all surfaces, checking for nicks and sharp edges that may damage the elastomers on the mechanical seal or the gland.

**If the pump is to be fully disassembled, stop at this point and proceed to Step 1 under the section titled “Complete Pump Disassembly”.**

12. To replace the mechanical seal, lubricate the stationary seat bore in the gland with soapy water mixture and press in the seat ensuring it is flat in the bore. Replace the gland O-ring, holding in the groove with a small amount of non-hardening silicon or grease.
13. Lubricate the pump shaft with soapy water and first place the spring retainer over the shaft, followed by the spring and finally the rotating head of the seal.
14. Place the gland down on the shaft and ensure the two jacking holes on the side of the gland are engaged with threaded rod and wing nuts.
15. Replace the external retaining ring making sure it is in the groove of the shaft.
16. Using 1/2 of the split coupling as a guide (the thin groove cut into the top of the coupling identifies the motor side of the coupling), use the wing nuts to raise the shaft (with impeller) upward to align the annular grooves on the coupling with the grooves on the shaft. Place one-half of the motor annular key in the motor shaft groove. Place the linear motor key in the motor shaft. Place the linear pump key in the pump shaft and align the two linear keys so the coupling half fits both motor and pump shaft. Slide in the pump shaft annular key half (additional adjustment of the wing nuts may be necessary as the key to groove fit is close). Place the second pump shaft and motor annular keys in their respective grooves and rotate the key 90 degrees so they stay in place. Place the other half of the split coupling onto the shafts. Replace the 6 socket head cap-screws (3 sockets facing in on one side and 3 facing out on the other side requiring rotating the shaft 180 degrees to tighten the capscrews) and add lock washers and nuts. Adjust the socket head capscrews so the gap between the coupling halves is even. Tighten the socket head cap screws in a crosswise pattern to the torque listed in the table.

<b>Split Coupling Bolt Tightening Torque</b>		
<b>Bolt Size</b>	<b>Hex Socket Size</b>	<b>Torque (ft-lbs)</b>
3/8 inch	5/16	35
1/2 inch	3/8	90

17. Lower the gland by using the wing nuts, replace the four gland bolts and tighten the gland down evenly. After the gland is tightened down, tighten the two wing nuts to the underside of the gland (holding them stationary and preventing them from vibrating).
18. Reinstall the flush tubing. Ensure the coupling rotates freely with no dragging or binding. Replace the coupling guards and refer to the beginning of the manual for start-up instructions.

## **SECTION TWO – COMPLETE PUMP DISASSEMBLY**

1. With the coupling, gland and mechanical seal removed, remove the bolts (#26) and nuts (#31) holding the motor to the bracket (#35). Pull the motor up and away using suitable lifting equipment.
2. Remove the snap ring (#41B) from the shaft (#40).
3. Remove the capscrews (#27) holding the bracket (#35) to the casing (#6). Using suitable lifting equipment, lift the bracket straight up and off the casing and over the shaft. Take care when lifting to ensure a straight lift; the carbon bushing (#42) may be damaged by uneven lifting.
4. Remove the casing gasket (#8) from the casing and bracket.
5. Remove wear rings (#7, #16) from the casing and bracket.
6. Press out the carbon bushing (#42) from the bore inside the bracket (at the base of the packing box). During reassembly the new bushing must be pressed in evenly or it can crack.
7. Pump reassembly is performed in the reverse order.

## **STARTING PUMP AFTER REASSEMBLY**

Do not start pump until all air and vapor has been bled and until making sure that there is liquid in the pump to provide the necessary lubrication. Without the fluid around it, the seal may be ruined in a few seconds of operation. It is possible that the mechanical seal may drip during the first few minutes to one hour of operation.

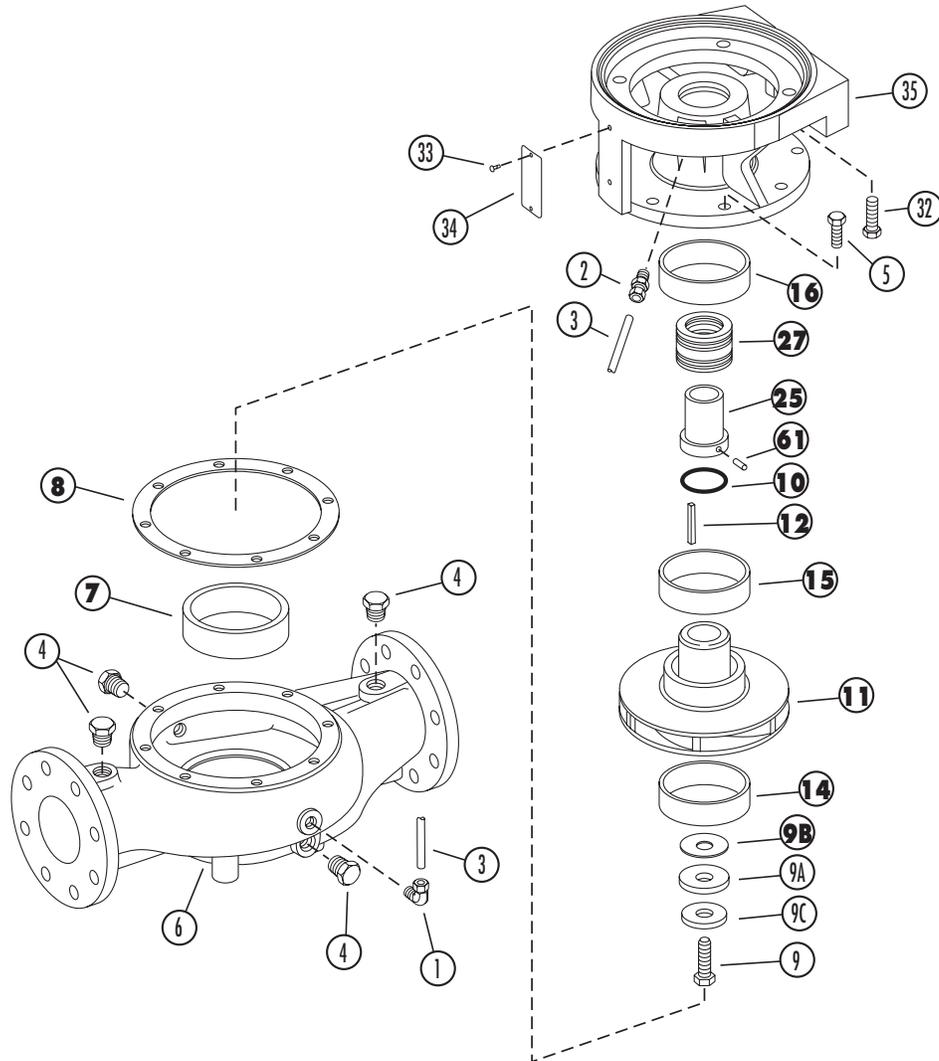


Fig. 2 Model 1590 Exploded View. Boldface numbers indicate recommended spare parts.

#### Model 1590 List of Parts

1. Elbow	8. Gasket	12. Impeller Key	32. Capscrew
2. Connector	9. Impeller Screw	14. Wear Ring	33. Screw
3. Tubing	9A. Washer	15. Wear Ring	34. Nameplate
4. Plug, Pipe	9B. Gasket	16. Wear Ring	35. Bracket
5. Capscrew	9C. Capscrew Seal	25. Sleeve	61. Pin
6. Casing	10. Gasket	27. Seal	
7. Wear Ring	11. Impeller		

#### NOTES:

1. Bronze fitted construction will be furnished as standard unless specified.
2. Refer to factory for special alloys.
3. Fairbanks Nijhuis reserves the right to substitute materials without notice.
4. Piece numbers 14 and 15 are not furnished as standard. When furnished, impeller must be modified.

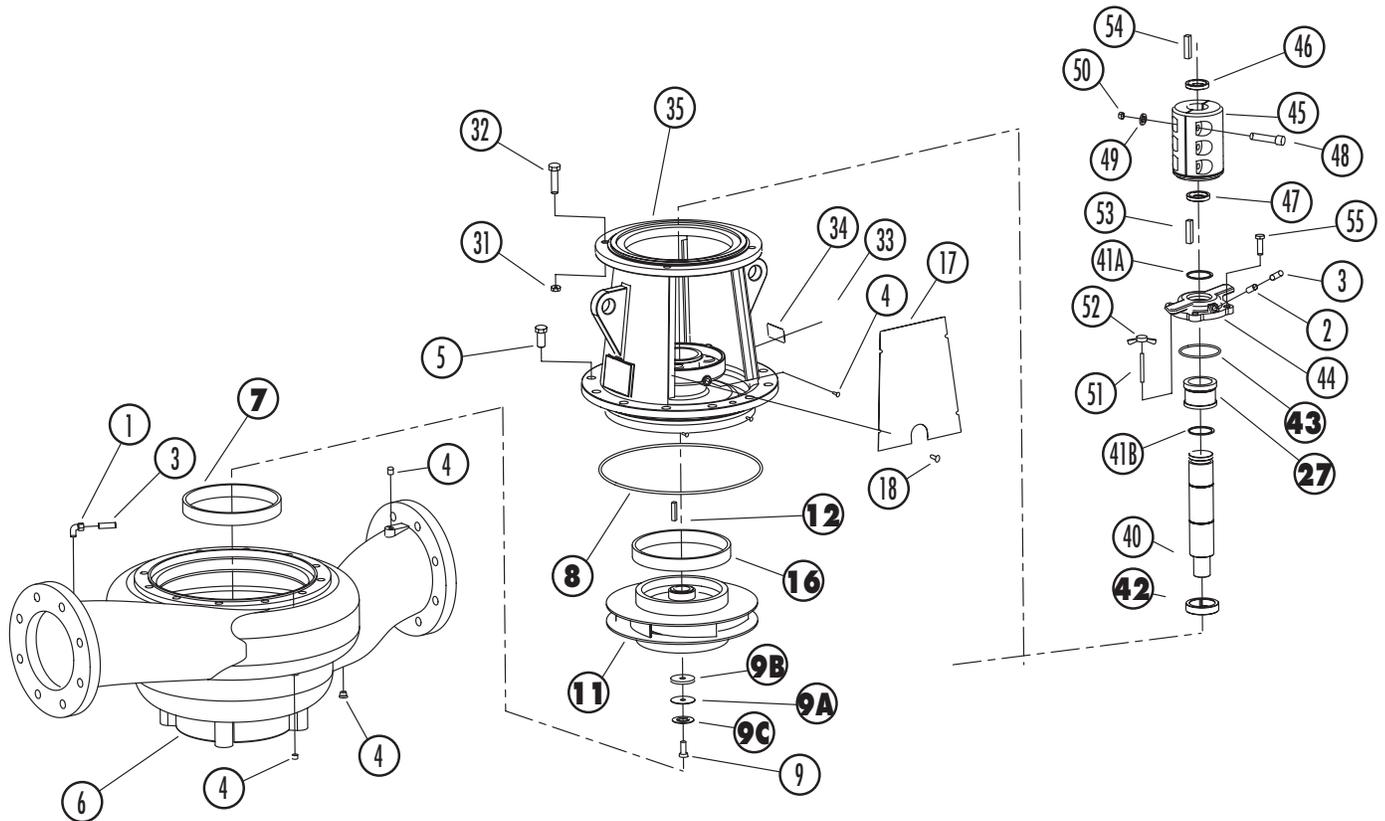


Fig. 3 Model 1590SC Exploded View. Boldface numbers indicate recommended spare parts.

**Model 1590SC List of Parts**

1. Comp. Elbow	9C. Capscrew Seal	31. Hex Nut	45. Split Coupling
2. Comp. Connector	11. Impeller	32. Capscrew	46. Annular Ring
3. Tubing	12. Impeller Key	33. Screw	47. Annular Ring
4. Pipe Plug	14. Impeller Ring	34. Nameplate	48. Capscrew
5. Capscrew	15. Impeller Ring	35. Bracket	49. Lock Washer
6. Casing	(Optional – Not Shown)	40. Shaft	50. Hex Nut
7. Wear Ring	16. Wear Ring	41A. Retaining Ring	51. Stud
8. Gasket / O-Ring	17. Coupling Guard	41B. Retaining Ring	52. Wing Nut
9. Impeller Screw	18. Guard Mounting Screw	42. Throttle Bushing	53. Shaft Key
9A. Washer	27. Seal	43. Gland O-Ring	54. Shaft Key
9B. Gasket		44. Gland	55. Capscrew

**WHEN ORDERING SPARE PARTS ALWAYS INCLUDE THE PUMP TYPE, SIZE, SERIAL NUMBER, AND THE PIECE NUMBER FROM THE EXPLODED VIEW IN THIS MANUAL.**

**ORDER ALL PARTS FROM YOUR LOCAL AUTHORIZED DISTRIBUTOR, FACTORY BRANCH SALES OFFICE OR THE FACTORY AT NORTH AURORA, ILLINOIS.**

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