Single Internal Mechanical Seal

Proper Torque For Bolts on IC+ Series Pumps

Item	Torque ft-lbs	Pumps Included
Motor Bolts	20	- 140 Frame
	55	180 - 250 Frame
	70	280 Frame
	110	320 Frame
Shaft Collar Bolt(s)	6	- 180 Frame
	15	210 - 250 Frame
	40	280 - 320 Frame
Impeller Nut	15	114 pump
	80	216/216/328/4410

Required Tools

1. Rubber Mallet

2. 5/8" socket - for impeller nut 114 pump
7/8" socket - for impeller nut 216/218/328/4410 pumps

3. 3/8" diameter steel rod - to hold stub shaft

4. Appropriate lubricant

5. 3/16" Allen wrench - shaft collar bolt 140 - 180 frames
1/4" Allen wrench - shaft collar bolt 210-280 frames
5/16" Allen wrench - shaft collar bolts 320 frames

6. Impeller puller / pinch bars (may be necessary)

7. 1/16" Gage for checking impeller gap.

Troubleshooting and Applications

COMMON TROUBLES AND THEIR CAUSES

It is to the user's advantage to be familiar with a systematic procedure to determine reasons and causes for unsatisfactory pump operation. The following list of troubles and causes is intended to assist users in determining the cause of any pumping trouble. Faulty installations can then be corrected and a clear description given the manufacturer if assistance is required. Human judgment should not be relied on to measure operating conditions. Use proper instruments to measure values of pressure, suction lift, speeds, temperature rise of motors, etc. When motor speeds are incorrect, check connections and measure voltage at motor terminals.

1. No liquid delivered
a. Pump and suction line not completely primed
b. Speed too low
c. Required discharge too high
d. Suction lift too high
e. Impeller, piping, or fittings completely plugged up
f. Wrong direction of rotation

2. Not sufficient capacity
a. Air leaks in suction pipe or shaft seal
b. Speed too low
c. Required discharge head too high
d. Suction lift too high or insufficient NPSH available
e. Impeller, piping, or fittings partially plugged
f. Insufficient positive suction head for hot water or other volatile liquids
g. Liquid viscosity too high
h. Mechanical problems - impeller damaged, shaft seal defective
i. Wrong direction of rotation
j. Suction pipe entrance too close to surface of liquid
k. Air pockets in pipe high points

3. Not sufficient pressure
a. Speed too low
b. Mechanical problems - impeller damaged, shaft seal defective
c. Small impeller diameter
d. Air or gas in liquid
e. Wrong direction of rotation
f. Air pockets in pipe high points

4. Pump operates for a while, then quits
a. Leaky suction line
b. Air leaking in through shaft seal
c. Suction lift too high or insufficient NPSH available
d. Air or gas in liquid
e. Suction piping and fittings not completely freed of air during priming
f. Air pockets in pipe high points

5. Pump takes too much power
a. Speed too high
b. Pumping too much water because required head is lower than anticipated
c. Viscosity and/or specific gravity is higher than specified
d. Mechanical problems - binding inside seal from distortion due to piping strains, shaft bent, impeller rubbing casing
e. Wrong direction of rotation

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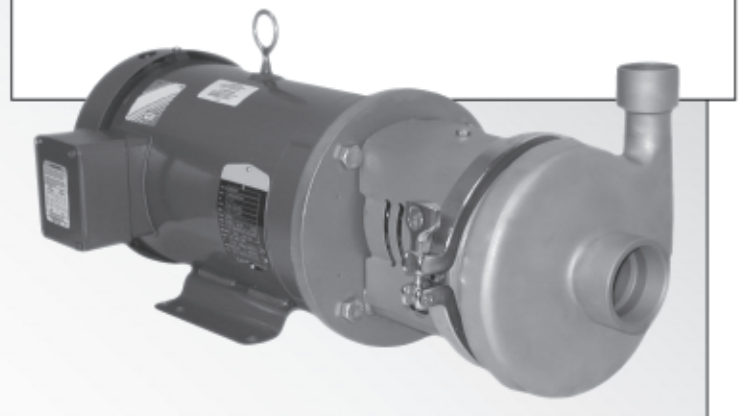
IC+ Series Pumps



INSTRUCTIONS
Your Ampco centrifugal pump is a rugged unit designed to provide years of low cost pumping service. There is a small amount of necessary care required to ensure you of this expected long service. It is recommended that you carefully review the installation and operating sections in this manual.
Every Ampco pump receives a careful running test at the factory to ensure that the head-capacity rating is met in accordance the Hydraulic Institute Standards and to ensure mechanical soundness. Special instructions and advice for unusual conditions, such as corrosive, abrasive, and other problems are too numerous to be included in this general book, but will be the subject of specific discussion on orders or inquires for special applications.

LOCATION
The immediate environment, in which the unit is located, while usually of prime importance to the pump, may determine the enclosure needed for the motor. Ampco can supply several different motor enclosures to meet specific requirements.
The IC+ Series pumps series are supplied with totally enclosed motors as standard. They may be installed where dirt, moisture and mild corrosion are present or in outdoor locations. Washdown duty motors, with epoxy paint or paint free stainless steel, are designed for applications where the motor is frequently subject to washdown to maintain a bacteria-free operating environment. Specialty motors may be required for moist, corrosive, or explosive environments. Motor drain plugs (if not equipped with automatic drains) must be removed periodically to drain accumulated condensation.
Pump units should be located where daily visual inspection is possible and no surrounding structure interferes with ventilating air over or through the motor.
Submerged suction is the most economical and convenient method of priming a pump when installed in such a position that the top of the casing is below the surface of the liquid to be pumped. The liquid will flow by gravity into the pump and displace the air (through the discharge if possible or a vent when available).

INSTALLATION
Begin with a suction line as direct and as simple as possible. The suction line is usually the most sensitive part of the entire pumping system being totally dependent on outside forces to provide liquid flow into the center of the impeller.

Locate the pump as close to the supply of liquid as possible, with short and direct suction piping. Use wide radius elbows to help reduce friction loss. Air pockets due to high sections, concentric reducers, valve bonnets, etc. should be eliminated by installing a suction having a continual rise or at very least a straight horizontal run with an air eliminator near the pump suction entry. To prevent air pockets use eccentric pipe reducers that are mounted in a horizontal position across the top of the pipeline and valves that can be positioned in a plane rather than the normal upright position as an air pocket may exist in the upright valve bonnet.

Above all, remember that until the liquid reaches the leading edges of the rotating impeller vane the pump cannot impart its energy to move the liquid.
If possible, try not to connect an elbow directly to the inlet of the pump. This may cause excessive turbulence and hinder pump performance.

STARTING
The pump must be primed before starting, as the mechanical seal depends on the liquid being pumped for lubrication and cooling. Even a short run to determine direction of rotation without first priming may seriously damage the seal.
The correct direction of rotation is counter-clockwise when viewed from the suction end of the pump. It is recommended to turn the pump by hand before starting the first time to ensure the unit is not binding.

MAINTENANCE
Since long-term breakdown cannot be tolerated in most services, maintenance procedures and a contingency plan must be established in advance to minimize any production loss caused by down time
During building and start-up it is common to use outside personnel. Operating personnel should acquaint themselves with the pump, particularly its running performance. This will aid in establishing a standard for future reference. This manual and other information provided with the pump should be filed for future reference.
All possible performance data should be recorded once the system is functioning properly and stable. Suction and discharge pressure readings, flow rate, seal leakage rate, bearing temperature, noise and vibration levels all provide input to a pump's performance in the system. It is unlikely that all of this data can be measured, but any information gathered can help alert the user of problems with the pump or system.
Operating personnel should know that any changes in the system or the liquid being pumped might have an effect on the pump's performance. It is advisable to also record the fluid temperature, specific gravity, viscosity, liquid concentration,

percent of solid concentration, other additives and properties. A proper maintenance procedure should begin with a file for each pump. All known data relative to the pump, fluid handled and system should be included. Complete records of maintenance and repair costs along with a log of the unit's operating hours should be kept.

In addition, complete pump identification- size, type, operating speed, manufacturer, serial number, model number, and material of construction should be noted.

Maintenance Procedures
Daily Check-possibly the most important inspection will be the daily observation.
1. Seal leakage rate
2. Pressure reading and flow indication
3. Change in operating sound
4. Change in bearing temperature

Semi-Annual Inspection-typically made at 6-month intervals with results noted in pump's maintenance file.
1. Check of mechanical seal assembly
2. Check of bearing lubrication

Annual Inspection-includes Semi-Annual inspection plus:
3. Removal of seal for inspection
4. Bearing Check
5. Check of axis/running clearance of impeller

Contingency Plan
For inspection findings and breakdowns, a contingency plan should be developed. To begin with, an adequate supply of probable replacement parts should be kept on hand.

The minimum recommended spare parts are as follows:
1. Mechanical seal kit
2. Casing Gasket
3. Impeller Key

In addition Ampco recommends
4. Stub Shaft
5. Impeller
5. Impeller Nut

Where service cannot be interrupted, a complete stand-by pump unit fully assembled (and in a by-pass line) is recommended.

DISMANTLE AND REPLACE PARTS AS FOLLOWS :

Before attempting any service on the pump or motor, disconnect or lock out electrical power to the pump motor. If the pump and motor are to be removed as a unit, note the wiring configuration. Use colored or numbered tape to mark the wire connections of the motor and power source, for reconnection.

These instructions are limited to fluid ends only. See other drawings and literature applicable to motors, pedestals, frames, shafts, bearings, etc., if additional repairs are required.

1. Remove casing by removing the casing clamp. There is a choice of (a) first removing the inlet and discharge piping, or (b) sliding the motor and remaining pump parts back and free of the casing without disturbing the piping. A rubber mallet may be necessary to remove the casing.

2. Remove the impeller nut using a 5/8" socket (114) model or 7/8" socket (216, 218, 328, 4410 models) and holding the stub shaft with a 3/8" rod in the predrilled hole. Ease the impeller off the shaft. Pinch bars between the impeller and cover may be required. Be careful not to mar the pump's surface finish. Remove the impeller key.

3. Remove the rotating parts of the mechanical seal by simply pulling them off the shaft. If the rotating seal does not come off the shaft, you may leave it on and it will come off with the backplate. Be very careful not to drop it on the floor when you pull the backplate off.

4. Gently slide the backplate off the pump shaft. 216, 218, 328, and 4410 models require the backplate to be rotated to release the backplate pins.

5. Press the seal's stationary seat with cup or o-ring out of the backplate.

6. Thoroughly clean the seal cavity and shaft and dry with a clean cloth.

The Mechanical seal is the only expendable pump part. It is suggested that the complete mechanical seal, both stationary and rotating members, be replaced whenever dripping or leakage occurs at the shaft, or whenever parts are removed to the point of separating the primary sealing surfaces.

The fluid end is now completely dismantled: Additional procedures are dictated by purpose for which unit was dissembled.

Mechanical Seal Replacement and Reassembly
Please see the table on page 4 for proper identification of all pump components.

Oiling (use food grade lubricants if required) the O.D. of the stub shaft and the I.D. of the seal facilitates this by softening an adhesive film on the seal (Use soap, glycerin, etc. if oil is not permitted i.e. EPDM). Do not use grease, as this would prevent the adhesive film from resetting. Final adherence to the sleeve is essential for shaft, sleeve, and seal to rotate as a unit.

1. Lightly oil bore and finger press stationary seat with gasket or o-ring into this cavity. The seat is fragile. Do not abuse.

2. Slip the backplate and seat over the shaft into its locating bore. On 216, 218, 328, and 4410 models require the backplate to be rotated to engage the backplate pins. Avoid bumping the seat into the shaft.

3. Oil and hand fit (no tools) rotating portion of mechanical seal onto stub shaft. Check direction of seal face, should face the stationary seat. Push the rotating seal against the stationary seal (use the spring if necessary remove the spring after the seal is set to ease the instaltion of other parts).

4. Place the gasket in the end of the stub shaft (a little grease will help hold the gasket in place). Insert the key into the shaft. Install the spring onto rotating seal being careful not to bump the gasket. Slide the impeller onto the shaft over the key. Hand tighten the impeller nut with the gasket installed on the impeller nut.

5. Tighten the impeller nut with a 6 pt socket to the recommended torque (see torques in table on page 5). Check the freedom of parts by hand rotating the impeller.

6. Install a new casing gasket on the shoulder of the backplate. Place the casing in position and secure with the casing clamp. Tighten the clamp. Rotate the impeller by hand again to check for rubbing.

One way to damage a new seal is to run it dry. Be sure the pump is in place and primed before operating.

7. Place the pump back into service and inspect for proper rotation and leaks.

Motor / Pump Shaft Disassembly
Before attempting any service on the pump or motor, disconnect or lock out electrical power to the pump motor. If the pump and motor are to be removed as a unit, note the wiring configuration. Use colored or numbered tape to mark the wire connections of the motor and power source, for reconnection.

1. Begin with pump disassembly as noted previously.

2. Loosen the shaft collar with an Allen wrench (3/16", 1/4", or 3/8": see sizes in table on page 5) so that the stub shaft can be taken off the motor. A rubber mallet may be used to tap the stub shaft if it will not slide off. Be careful not to drop the shaft collar when the stub shaft comes off the motor.

2a. If the stub shaft does not come off, the backplate, impeller, impeller nut gasket, and impeller nut may be assembled onto the shaft to help pull the stub shaft off (make sure that all seal pieces are out of the backplate). A cloth between the backplate and impeller is necessary in this step. Pull on the backplate or gently tap it with a rubber mallet to create enough force to free the stub shaft from the motor.

At this time the motor can be replaced by unbolting the adapter from it and separating the two items.

Motor / Pump Shaft Disassembly
If the pump stub shaft is being replaced, it is recommended that a new shaft collar also be installed.

1. Begin by bolting the adapter onto the motor. Please note correct tightness of all fastening components in the table on page 5.

2. Slide the shaft collar onto the stub shaft and slide the two together onto the motor shaft, keeping the motor keyway in line with one of the slots in the stub shaft. If the collar has an identification groove in it, this will rest against the step in the stub shaft.

3. Line up the slot in the collar with the stub shaft slot and motor keyway gap. Do not tighten the shaft collar yet.
Since the shaft was disassembled, the impeller clearance in the pump may have changed. The impeller must be repositioned to ensure the impeller will not rub and also for proper pump performance. The pump will be assembled without the seal kit in order to do this. The critical impeller gap is the gap between the backplate and the nearest impeller blade to it. The blades may not all be at the same distance due to manufacturing and balance procedures. The gap between the impeller and the backplate should be 1/16".

4. Slide the backplate over the pump shaft and shoulder it against the adapter. On 216, 218, 328, and 4410 models rotate the cover to engage the backplate pins.

5. Install the impeller key, impeller (gaskets need not to be installed at this time). Tighten the impeller nut to secure the assembly.

6. With a rubber mallet, gently tap the impeller nut to drive the stub shaft towards the motor while the checking the gap between the impeller and backplate. This will create the critical impeller gap.

7. When the impeller gap is correct, align the shaft collar slot with the slot in the stub shaft and the motor shaft keyway, and tighten the shaft collar with an torque wrench, (3/16", 1/4", or 3/8" Hex key: see sizes and torques in table on page 5) to secure the shaft position.

8. Remove the impeller nut, gasket, and impeller from the shaft. Now remove the backplate and begin with the seal and pump assembly instructions.v

IC+ PUMPS
INTERNAL SEAL
IC+ Series Pumps

AMPCO PUMPS COMPANY
PARTS BREAKDOWN

DETAIL NO.	REQ. NO.	PART NAME
132	1	SHAFT GUARD CAP SCREW
131	1	SHAFT GUARD
90	1	CASING GASKET
80	1	SINGLE MECHANICAL SEAL
75	1	CASING CLAMP
71B	4	CAP SCREW (MOTOR/ADAPTER)
71	1	ADAPTER
27	1	IMPELLER KEY
26	1	SHAFT COLLAR
25B	1	IMPELLER BACK GASKET

DETAIL NO.	REQ. NO.	PART NAME
25A	1	IMPELLER NUT GASKET
25	1	IMPELLER NUT
19	1	MOTOR
16'	2	DRIVE SCREW
15'	1	NAME PLATE
11	1	IC+ BACKPLATE
6P	1	STUB SHAFT
2P	1	IMPELLER
1	1	CASING

'NOT SHOWN

NOTE: Please be sure to always include pump type, size, and serial number with any reference to above numbers and names.