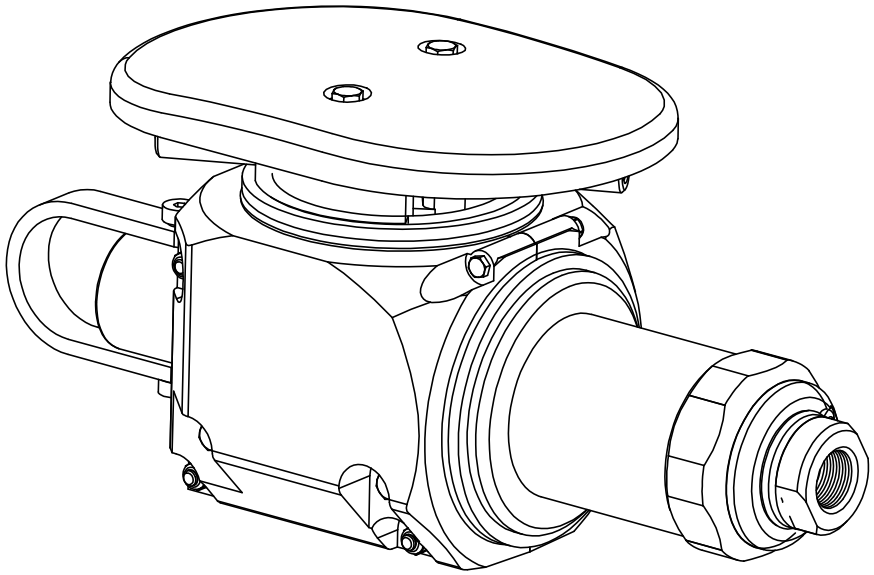
3D SELF ROTATING CLEANING TOOL

HURRICANE

OPERATION AND MAINTENANCE MANUAL



StoneAge™
WATERJET TOOLS

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02/04

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1.0 INTRODUCTION

This manual was prepared to provide the operator with the basic information needed to operate and service this equipment. The operating recommendations in the manual will ensure that you receive satisfactory performance. All operating personnel responsible for the care of this equipment should be familiar with the information in this manual.

If you have any questions or problems with this equipment, please contact the distributor you obtained the product from, or the manufacturer:

StoneAge, Inc.
54 Girard St.
Durango, CO 81303
970-259-2869 Phone 970-259-2868 Fax
www.stoneagetools.com

2.0 SAFETY WARNING

Operations with this equipment can be potentially dangerous if caution is not exercised prior to and during tool use. Please read and follow all of these instructions, in addition to the guidelines in the WJTA Recommended Practices handbook.

2.1 Only competent and trained persons should operate this equipment.
2.2 Do not exceed the maximum operating pressure specified for any component in a system.
2.3 This equipment should always be used with an operator controlled dump mechanism to release the high pressure water.
2.4 The immediate work area should be marked off to keep out untrained persons.
2.5 All personnel in the area should wear eye and hearing protection, as well as other protective clothing in accordance with specific conditions.
2.6 The tool should be securely supported. High thrust is created by waterjets and these forces can become unbalanced if a nozzle should plug.
2.7 Inspect the equipment for visible signs of deterioration, damage, or improper assembly. Do not operate until repaired. Make sure all threaded connections are tight and leak free.
2.8 Check to see that all control functions work properly before going to high pressure.
2.9 If it is necessary to have a person working near the cleaning jets, then it is this person who should have control of the pressure dump mechanism.
2.10 Waterjets can produce a static electricity charge. If the vessel being cleaned contains a combustible liquid or vapor having a risk of ignition, the tool should be properly grounded.

3.0 DESCRIPTION AND OPERATION

The **Hurricane** 3D Head was designed to convey high pressure fluid from a stationary line to a rotating head that cleans in a 3-D pattern. The unit incorporates a built-in viscous fluid governor to control the rotation speed. Jet reaction force propels rotation. The tool can be used for cleaning tanks, vessels, autoclaves and reactor interiors.

The swivel rotates on two axes, with one high pressure seal for each axis. **The Hurricane is capable of working pressures up to 12,000 psi and flow rates of 15 to 80 gpm.** The wide range of flow rates is accommodated by two nozzle arms capable of being set at different angles. The unit is filled with a thick fluid that controls rotation speed. The tool was designed for an operating rotation speed range of 5 to 50 rpm.

There are three important items in keeping the swivel in good working condition. First, always operate within the recommended speed range. Operating at higher rotation speeds is detrimental to the swivel components and will reduce their useful life. Second, keep the main body of the swivel full of viscous fluid. The viscous fluid provides bearing lubrication as well as speed control. An insufficient supply of fluid will cause the swivel to rotate too fast. Water in the viscous fluid will cause a loss of speed control and corrosion of the bearings. Third, blow out all internal water passages (nozzles, weep holes, inlet) with compressed air before storing the tool.

The adjustable nozzle arms (Banjo Nipples) allow the tool to handle different flow rates and pressures. **When the operating conditions of pressure or flow are changed, the Banjo Nipple angles must be adjusted to match the new conditions.** The chart on the following page shows the correct settings for rotation speeds between 20 and 30 rpm. To increase the rotation speed, or if the swivel is not rotating, increase the setting number. If the tool is being run horizontally and will not rotate, the banjo setting should be increased until the tool rotates reliably.

Make sure that the same size jets are used in both Banjo Nipples, and that the nipples are parallel and opposite to each other. The sides of the Banjo Nipples marked TOP should be visible when viewed from above for proper rotation.

Hurricane 3D

Banjo Setting Chart

The Hurricane cleaning tool is a self-rotating unit. The pressure, flow and angle of the Banjo Nipples control the amount of torque supplied to the swivel. **When the operating conditions of pressure and/or flow are changed, the Banjo Nipple Setting must be adjusted to match the new conditions.** The chart shows Banjo Settings that will result in rotation speeds between 20 and 30 rpm. If the swivel is turning slow or not turning, go to a higher number on the Banjo Setting.

PRESSURE, PSI	FLOW RATE, GPM 15	20	25	30	40	50	60	80
12000	#4 .047Ø **9.0**	#5 .057Ø **5.0**	#6.5 .063Ø **4.0**	#8 .069Ø **3.0**	#10 .082Ø **2.0**	#13.5 .090Ø **1.5**	#15 .098Ø **1.5**	#20 .115Ø **1.0**
10000	#5 .052Ø **6.0**	#6.5 .057Ø **4.5**	#8 .069Ø **3.5**	#9 .075Ø **3.0**	#13.5 .082Ø **2.0**	#15 .098Ø **2.0**	#20 .106Ø **1.5**	#27 .125Ø **1.0**
8000	#5 .057Ø **9.0**	#6.5 .063Ø **5.0**	#9 .069Ø **3.5**	#10 .075Ø **3.0**	#13.5 .090Ø **2.5**	#15 .098Ø **2.0**	#20 .115Ø **1.5**	#27 .135Ø **1.0**
6000	#6.5 .063Ø **7.0**	#8 .069Ø **5.5**	#10 .075Ø **5.5**	#13.5 .082Ø **3.0**	#15 .098Ø **2.5**	#20 .106Ø **2.0**	#27 .125Ø **1.5**	#33 .145Ø **1.0**
4000	#8 .069Ø **9.0**	#10 .075Ø **7.0**	#13.5 .082Ø **5.5**	#15 .090Ø **4.0**	#20 .106Ø **2.5**	#27 .125Ø **2.0**	#33 .135Ø **1.5**	#41 .165Ø **1.0**
2000	#10 .082Ø **9.0**	#13.5 .090Ø **9.0**	#15 .098Ø **8.0**	#20 .115Ø **5.0**	#27 .135Ø **3.0**	#33 .155Ø **2.5**	#41 .165Ø **2.0**	

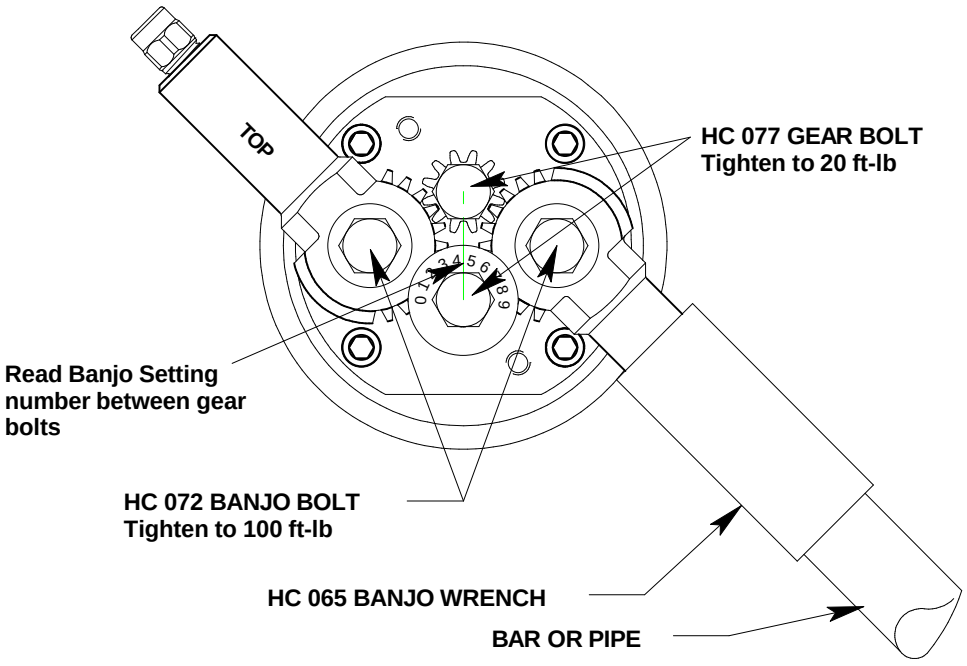
#13.5
.090Ø
9.0

NOZZLE FLOW RATING NUMBER

NOZZLE DIAMETER FOR PRESSURE AND FLOW

BANJO NIPPLE SETTING FOR 20 TO 30 RPM

To adjust the Banjo Nipples, loosen the two Gear Bolts (HC 077) and the two Banjo Bolts (HC 072). Use the Banjo Wrench (HC 065) for leverage. Read the number on the plate that is in line between the two gear bolt heads. Hold the desired setting while tightening the gear bolts and Banjo bolts. It is recommended that you tighten the Gear Bolts to 20 ft-lb and the Banjo Bolts to 100 ft-lb.



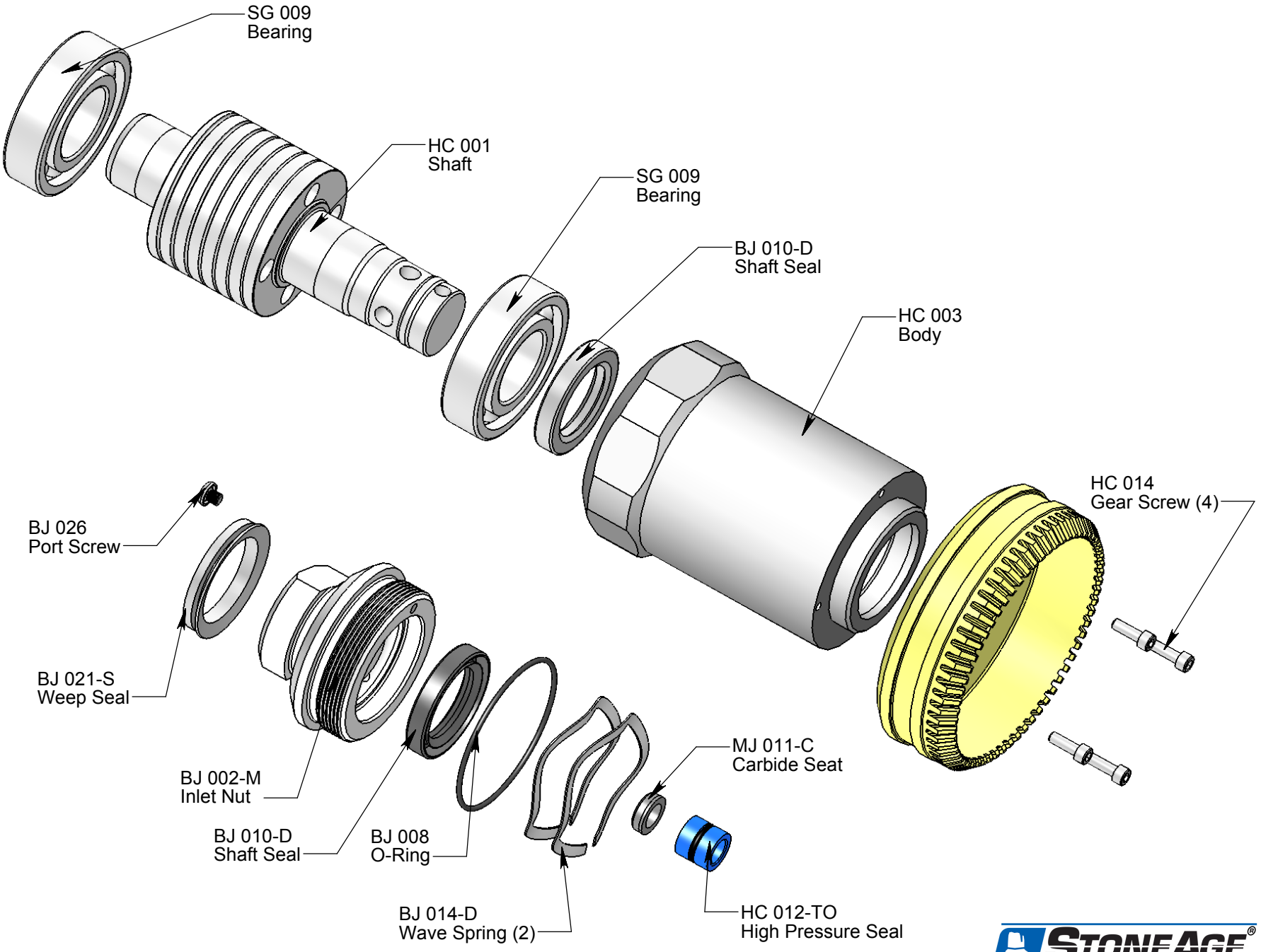
4.0 PARTS LIST

Part #	Description	Qty
BJ 002-M	Inlet Nut	1
BJ 008	O-Ring	1
BJ 010-D	Shaft Seal	4
BJ 014-D	Wave Spring	2
BJ 021-S	Weep Seal	1
BJ 026	Port Screw	1
HC 001	Shaft	1
HC 003	Body	1
HC 006	Retaining Ring	1
HC 007	Bearing Set	1
HC 012-TO	High Pressure Seal	2
HC 014	Gear Screw	4
HC 015	Head Bolt	4
HC 021-B	Bronze 63 T Gear	1
HC 023-B	Bronze 73 T Gear	1
HC 024	Cover Bolt, 3”	2
HC 025	Cover Screw	1
HC 026	Cover Bolt, 3.5”	1
HC 027	Cover	1
HC 028	Cover Seal	2
HC 029	Cover Bolt, 1.25”	4
HC 030	Cross Shaft	1
HC 032	O-Ring, Shaft	4
HC 033	Shaft Pin	2
HC 035	Cross Body	1
HC 040	Angle Block	1
HC 041	Pulling Ring Standoff	1
HC 070	Banjo Head	1
HC 071	Banjo Nipple	2
HC 072	Banjo Bolt	2
HC 074	Banjo O-Ring	4
HC 075	Spur Gear	1
HC 076	Angle Gear	1
HC 077	Gear Bolt	2
HC 079	Standoff	2
HC 090	Pulling Ring	1
HC 109	Cap	1
HC 110	Cap Bolt	2
HC 111	Cap Washer	2
MJ 011-C	Carbide Seat	2
SG 009	Bearing	2

Also available separately:

HC 088	Extension Kit	(Includes items to add extension nipples)
HC 100	Cage Assembly	(Cage for Hurricane)
HC 600	Service Kit	(Includes items needed for maintenance)
HC 602	Seal Kit	(Includes parts needed for one seal change)
HC 610	Overhaul Kit	(Includes parts needed for tool rebuild)
HC 612	Tool Kit	(Includes tools to aid assembly)

HURRICANE MAIN BODY EXPLODED ASSEMBLY DRAWING



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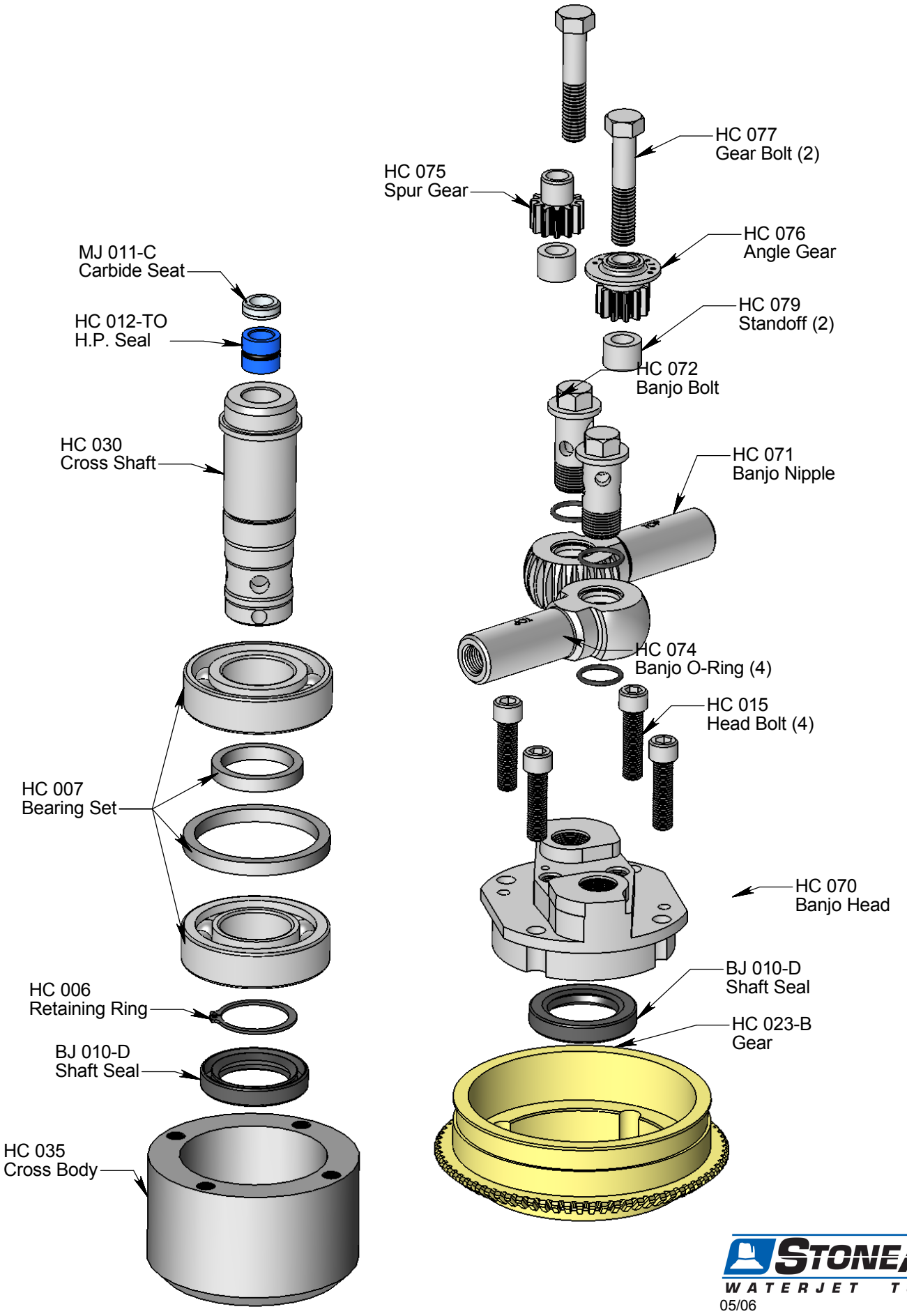
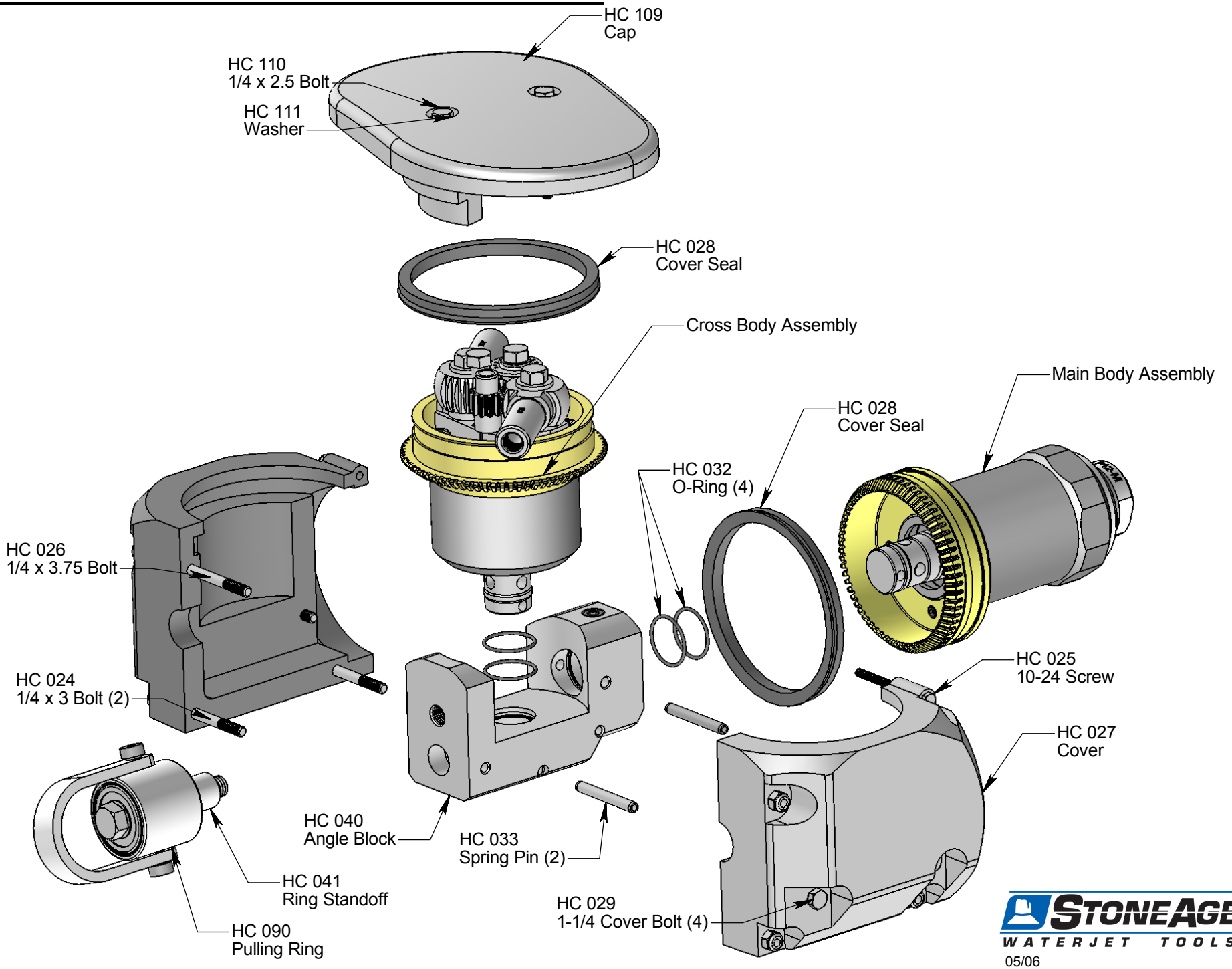
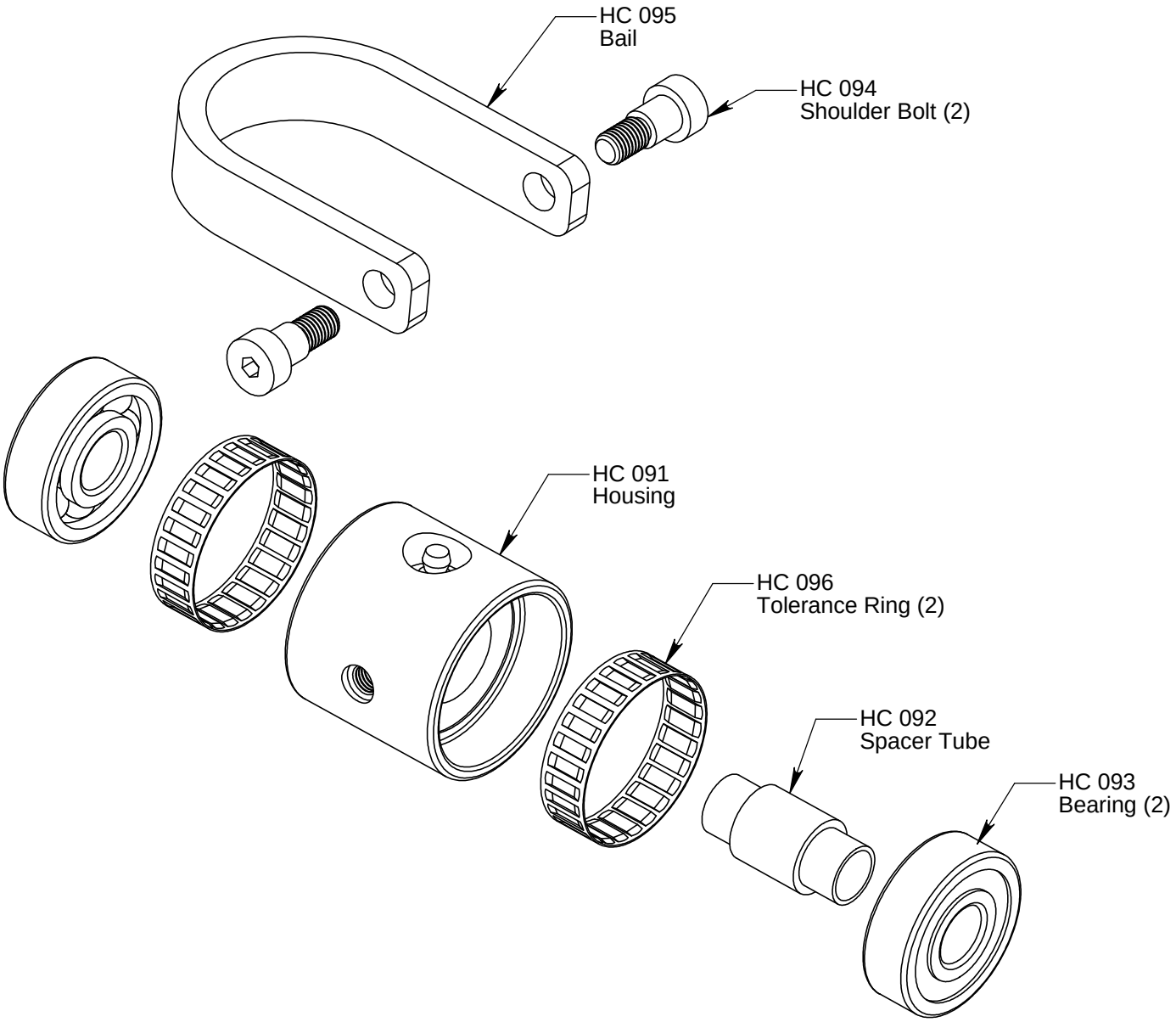
HURRICANE CROSS BODY EXPLODED ASSEMBLY DRAWING



HURRICANE EXPLODED FINAL ASSEMBLY DRAWING



HC 090 PULLING RING EXPLODED ASSEMBLY DRAWING



6.0 HURRICANE HIGH PRESSURE SEAL AND VISCOUS FLUID MAINTENANCE

The Hurricane has 2 high pressure seals. These seals may leak at tap pressure, but should seal at pressures above 1000 psi. Rotation speed is controlled by a thick viscous fluid in the Main Body. Over time, this fluid may be contaminated with water or lost by leakage thru the shaft seals. Loss or contamination of fluid will result in faster, more difficult to control rotation speeds. If the fluid appears contaminated, it should be poured out and replaced.

To service the viscous fluid and access the high pressure seal in the Main Body:

1. Clamp the Body (HC 003) in a vise, by the flats only. Do not excessively tighten the vise.

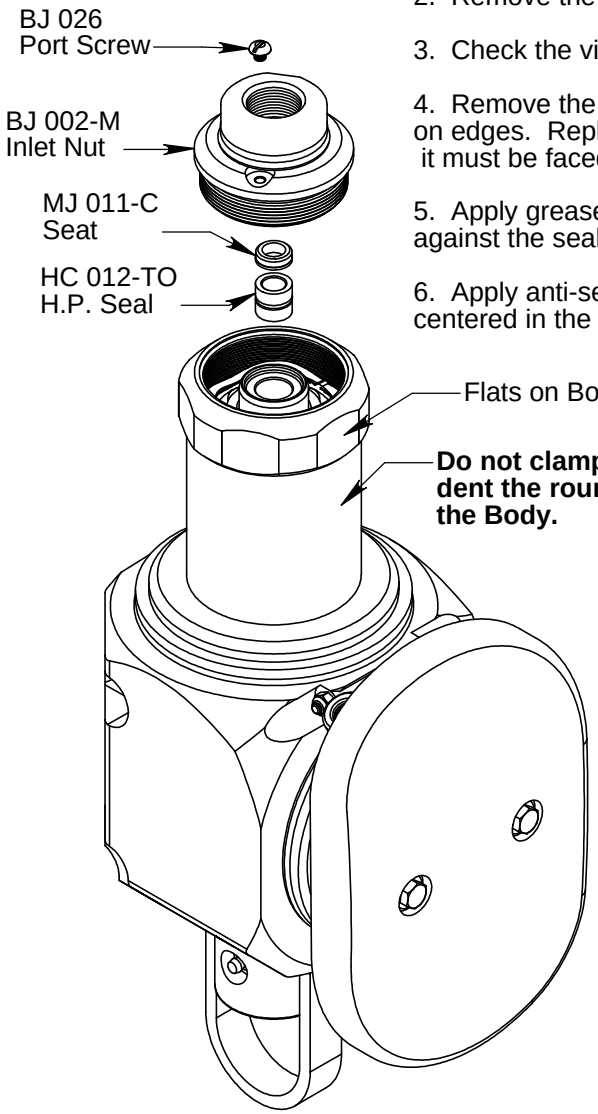
2. Remove the Port Screw (BJ 026), unscrew the Inlet Nut (BJ 002-M) from the Body.

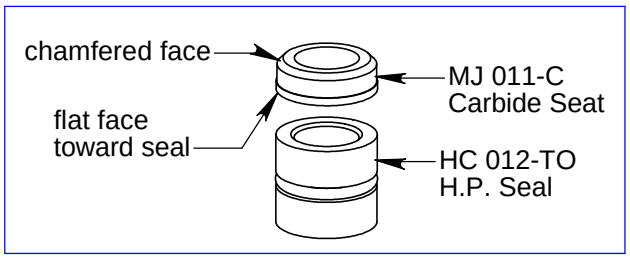
3. Check the viscous fluid level. It should cover the Bearing and Wave Springs. If not, add more.

4. Remove the Carbide Seat (MJ 011-C) and the H.P. Seal (HC 012-TO). Inspect the Seat for chips on edges. Replace if damaged. Inspect the face of the Inlet Nut for dings or pits. If damaged, it must be faced or replaced, otherwise the seal will leak.

5. Apply grease to new H.P. Seal and install in bore. Place the Seat on the Seal with the flat side against the seal. The chamfered side should face toward the Inlet Nut.

6. Apply anti-seize to the threads of the Inlet Nut and thread into Body. Make sure the Seat stays centered in the bore of the Shaft. Tighten the Inlet Nut to 120 to 150 ft-lb. Install the Port Screw (BJ 026).





To service the high pressure seal in the Cross Body:

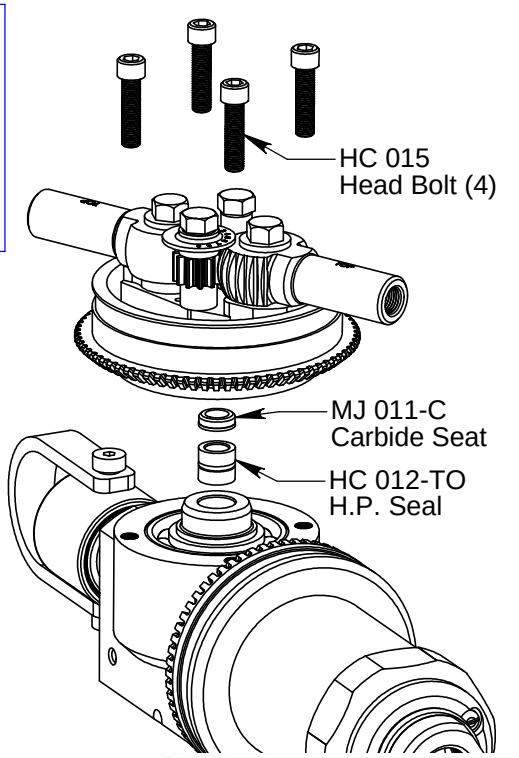
1. Remove the Cap (HC 109) and Cover (HC 027). Clamp the unit by the Cross Body in a vise.

2. Remove the four socket head Bolts (HC 015); lift the Bronze Gear (HC 023) and Banjo Head assembly straight up and off the Cross Body.

3. Remove the Carbide Seat (MJ 011-C) and H.P. Seal (HC 012-TO). Inspect the Seat for chips on edges, replace if damaged. Inspect the face of the Banjo Head for dings or pits. If damaged, it must be faced or replaced.

4. Apply grease to a new H.P. Seal and install in seal bore. Place the Seat on the Seal with the flat face against the seal. The chamfered face of the Seat should face toward the Banjo Head.

5. Install the Banjo Head; make sure the Seat stays centered in seal bore. The Banjo Head with Bronze Gear should sit flush on Cross Body. Install Head Bolts with blue Locktite. Torque to 200 in-lb.



6.1 HURRICANE DISASSEMBLY INSTRUCTIONS

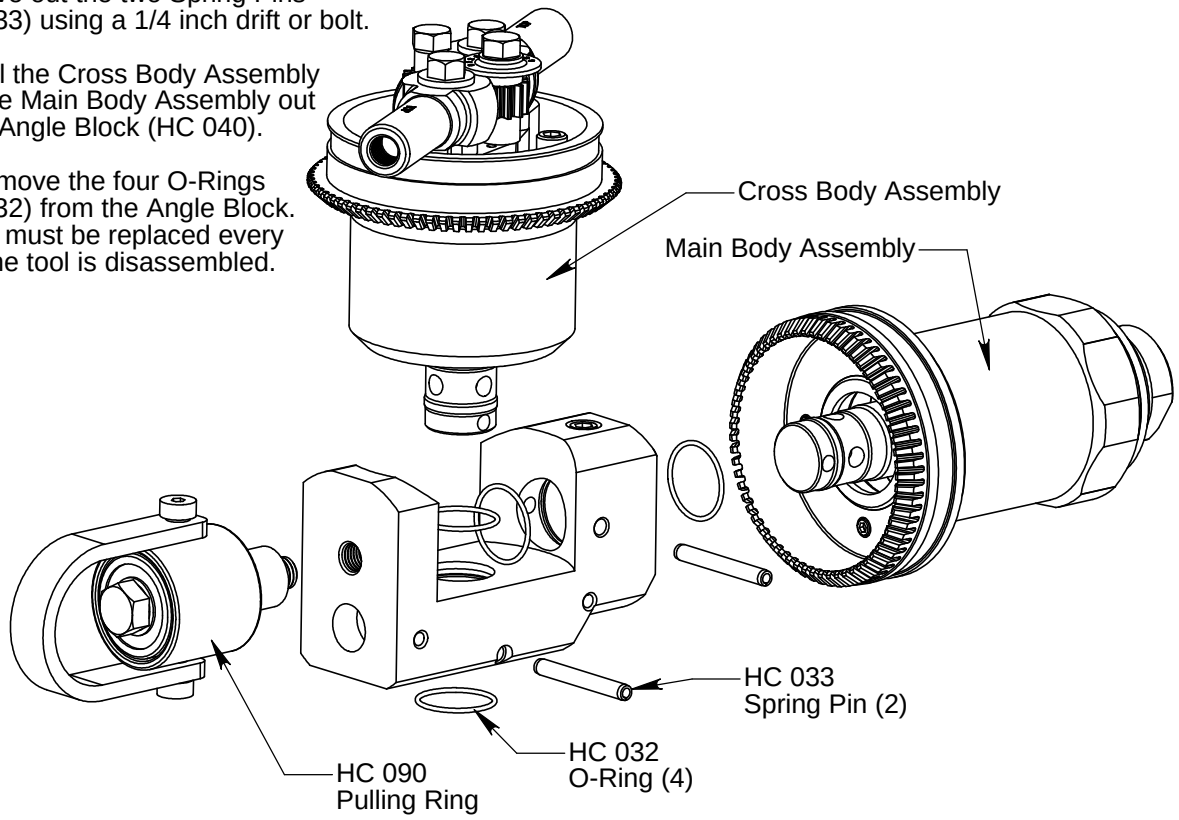
1. Remove the Cover (HC 027), the Cap (HC 109) and the Cover Seals (HC 028).

2. Remove the Pulling Ring (HC 090) if you want to.

3. Drive out the two Spring Pins (HC 033) using a 1/4 inch drift or bolt.

4. Pull the Cross Body Assembly and the Main Body Assembly out of the Angle Block (HC 040).

5. Remove the four O-Rings (HC 032) from the Angle Block. These must be replaced every time the tool is disassembled.

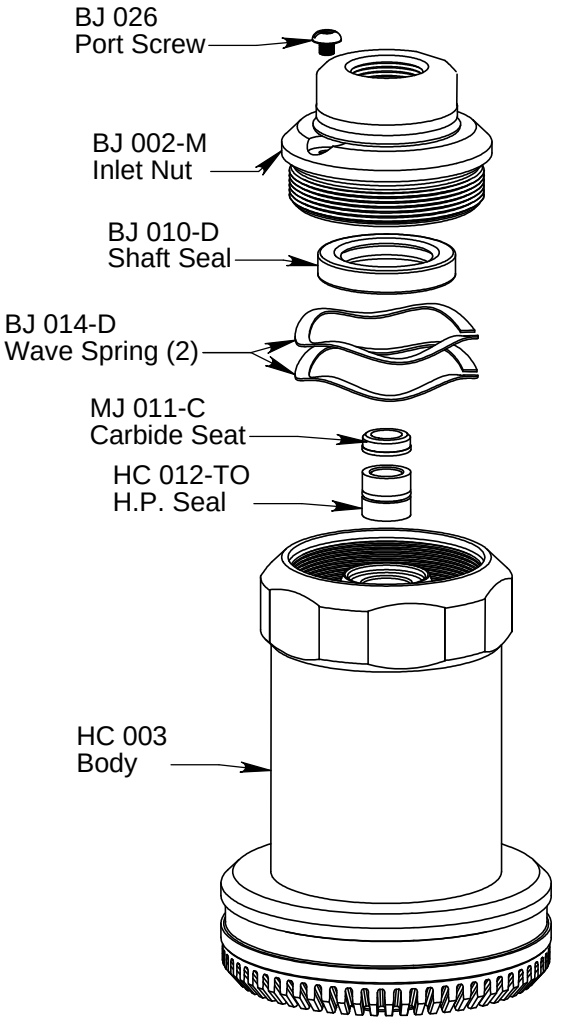


6. Remove the Port Screw (BJ 026) from the Inlet Nut (BJ 002-M).

7. Unscrew the Inlet Nut from the Body (HC 003). Remove the Shaft Seal (BJ 010-D) from the Inlet Nut.

8. Remove the Wave Springs (BJ 014-D).

9. Remove the Carbide Seat (MJ 011-C) and the H.P. Seal (HC 012-TO).

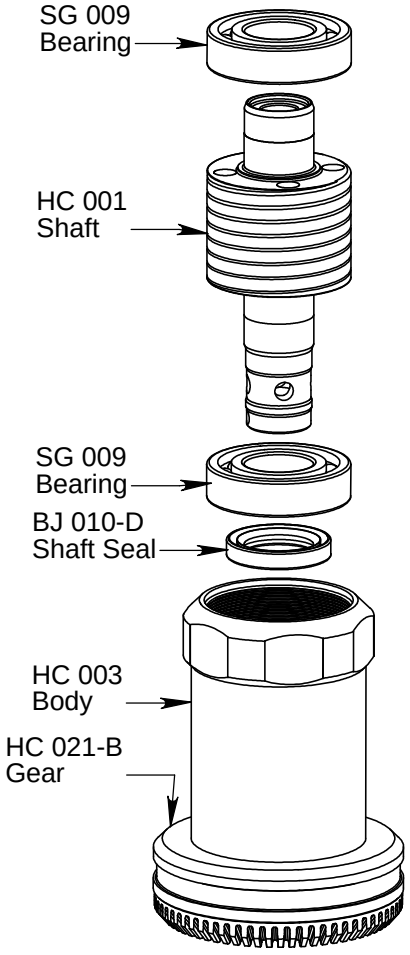


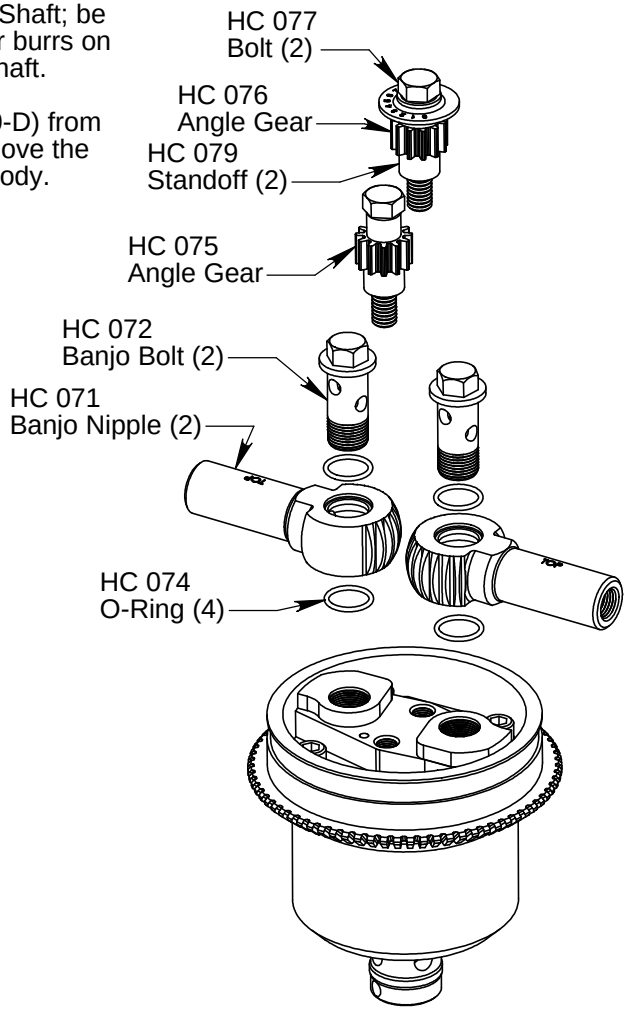
6.1 HURRICANE DISASSEMBLY CONTINUED

10. Push the Shaft (HC 001) with the Bearings (SG 009) out of the Body (HC 003).

11. Remove the Bearings from the Shaft; be very careful not to raise any dings or burrs on the large grooved diameter of the Shaft.

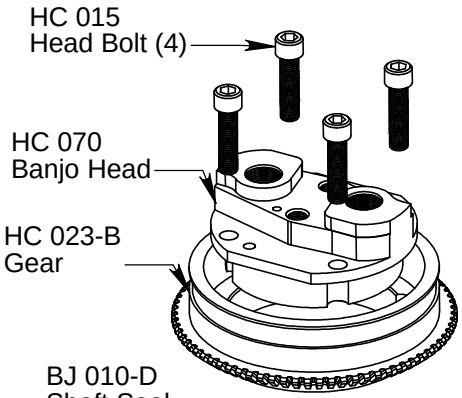
12. Remove the Shaft Seal (BJ 010-D) from the Body. It is not necessary to remove the Bronze Gear (HC 021-B) from the Body.





13. Remove the two Bolts (HC 077), the Angle Gears (HC 075, 076) and the Standoffs (HC 079).

14. Remove the two Banjo Bolts (HC 072), both Banjo Nipples (HC 071) and O-Rings (HC 074).



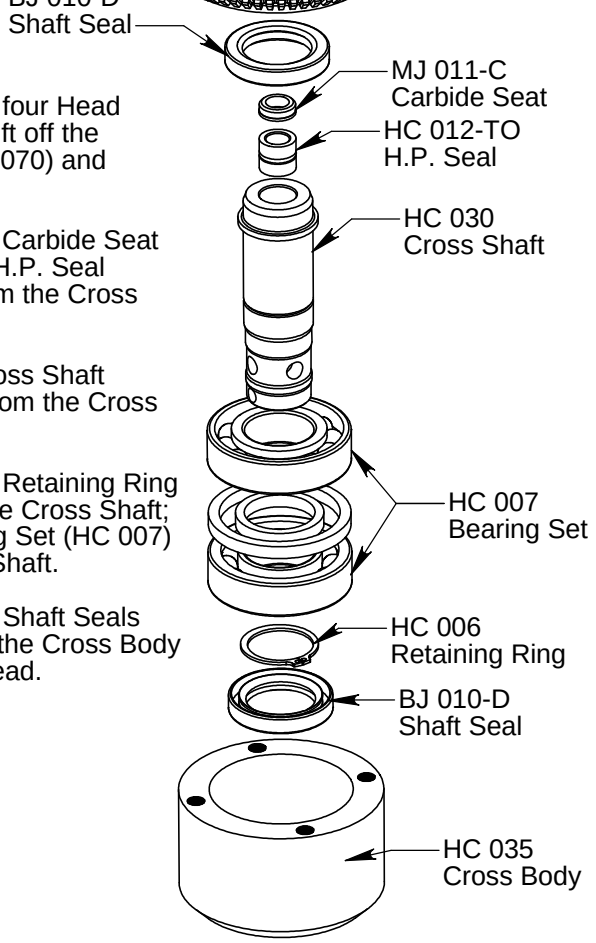
15. Remove the four Head Bolts (HC 015); lift off the Banjo Head (HC 070) and Gear (HC 023).

17. Remove the Carbide Seat (MJ 011-C) and H.P. Seal (HC 012-TO) from the Cross Shaft (HC 030).

18. Push the Cross Shaft (with bearings) from the Cross Body (HC 035).

19. Remove the Retaining Ring (HC 006) from the Cross Shaft; press the Bearing Set (HC 007) off of the Cross Shaft.

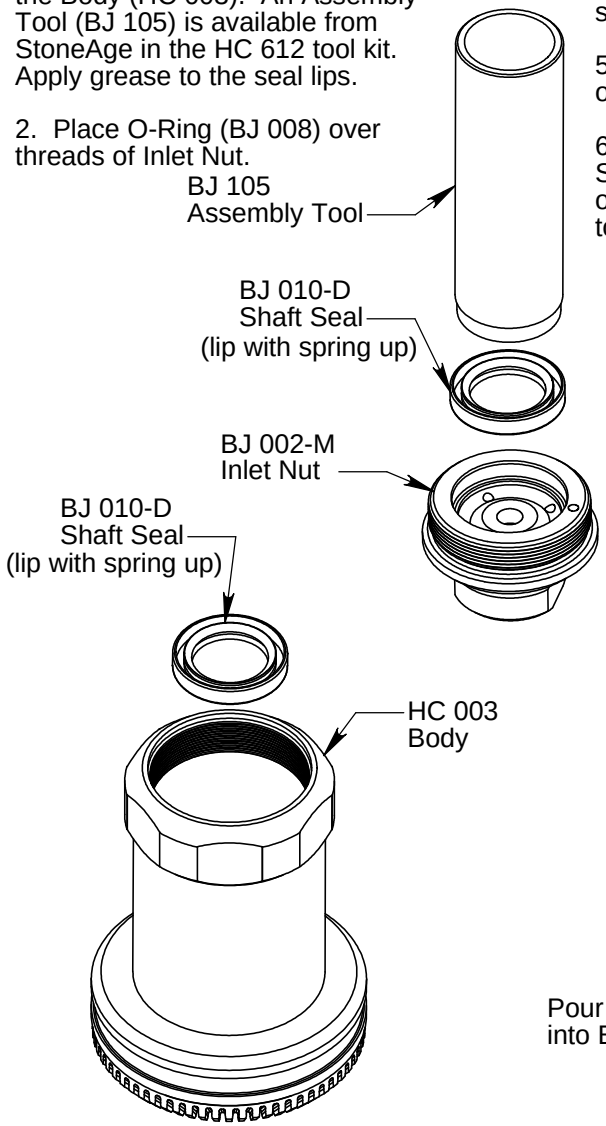
21. Remove the Shaft Seals (BJ 010-D) from the Cross Body and the Banjo Head.



6.2 HURRICANE MAIN BODY ASSEMBLY INSTRUCTIONS

1. Install Shaft Seals (BJ 010-D) into the Inlet Nut (BJ 002-M) and the Body (HC 003). An Assembly Tool (BJ 105) is available from StoneAge in the HC 612 tool kit. Apply grease to the seal lips.

2. Place O-Ring (BJ 008) over threads of Inlet Nut.

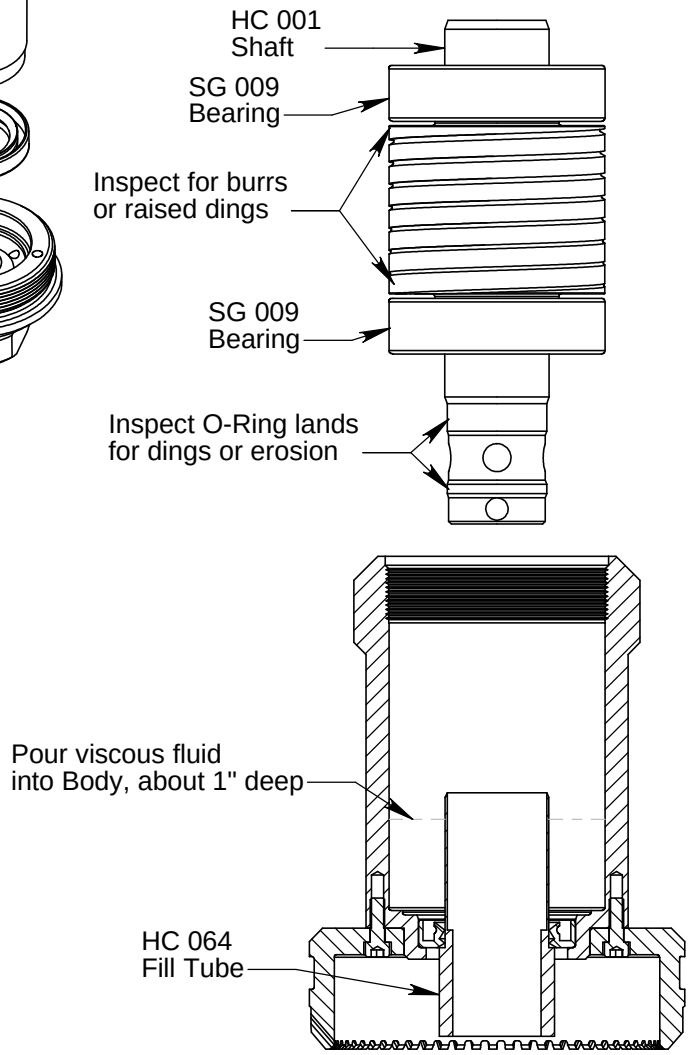


3. Press Bearings (SG 009) onto Shaft (HC 001).

4. Insert Fill Tube (HC 064) through shaft seal in Body, up to the shoulder.

5. Pour viscous fluid into Body, around outside of fill tube, about 1 inch deep.

6. Smear viscous fluid into grooves on Shaft. Slide Shaft with bearings into Body. Let the Shaft push out the fill tube. The viscous fluid should come up to cover the top bearing.



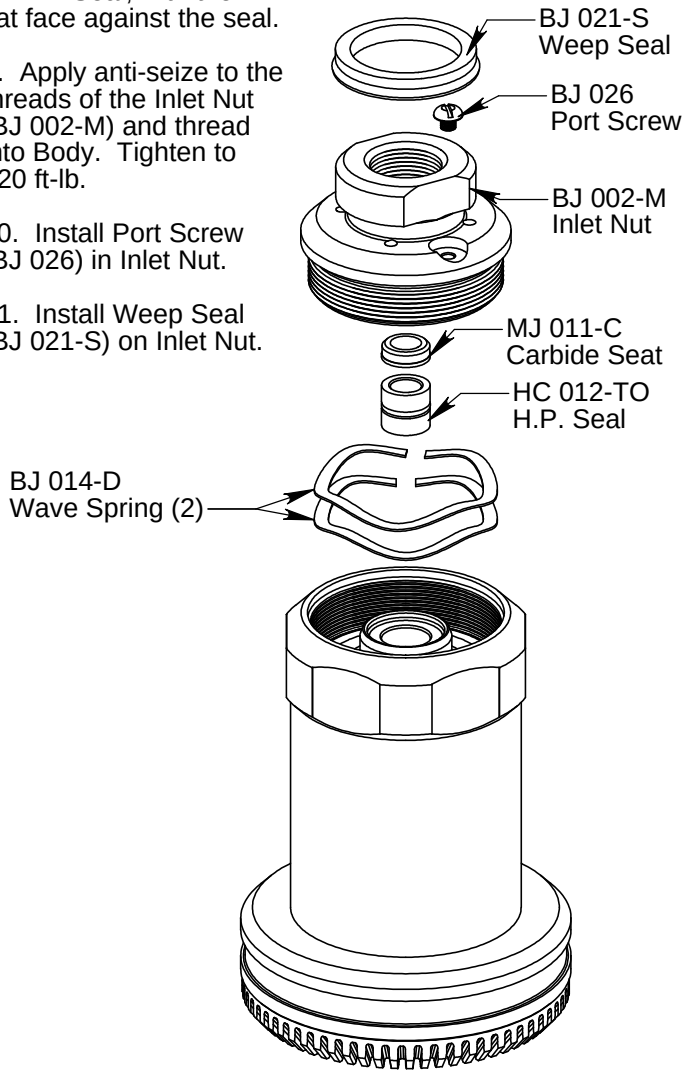
7. Place the two Wave Springs (BJ 014-D) on top of Bearing. Add viscous fluid to cover the wave springs.

8. Apply grease to the H.P. Seal (HC 012-TO) and install in bore of shaft. Place Carbide Seat (MJ 011-C) on top of H.P. Seal, with the flat face against the seal.

9. Apply anti-seize to the threads of the Inlet Nut (BJ 002-M) and thread into Body. Tighten to 120 ft-lb.

10. Install Port Screw (BJ 026) in Inlet Nut.

11. Install Weep Seal (BJ 021-S) on Inlet Nut.



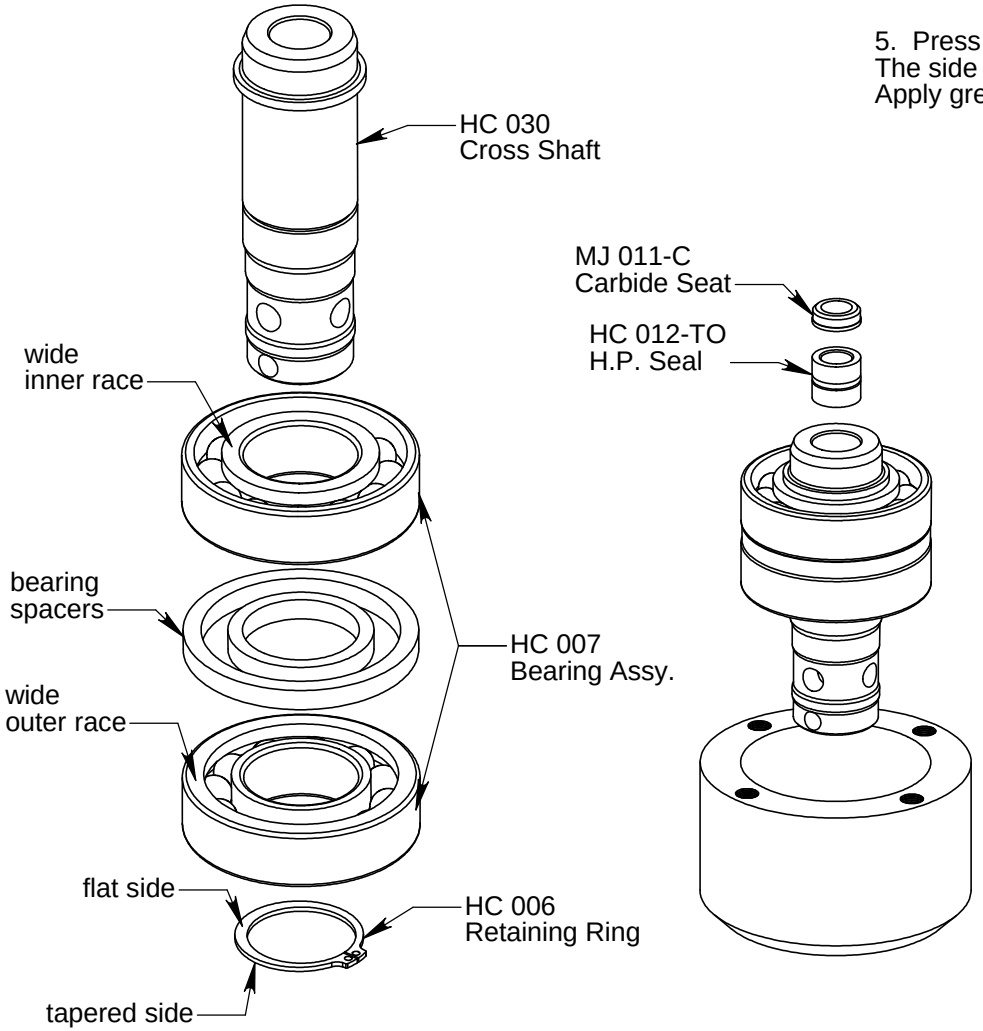
6.2 HURRICANE CROSS BODY ASSEMBLY INSTRUCTIONS

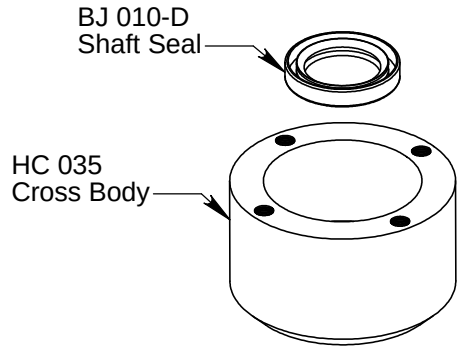
1. Pack Bearings (HC 007) with grease. Press Cross Shaft (HC 030) into first bearing down to shoulder. Note that these are angular contact bearings, and must be installed as shown.

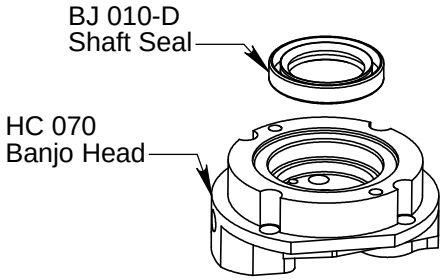
2. Slide on the Bearing Spacers, fill space between with grease.

3. Press on second bearing, oriented as shown.

4. Install tapered Retaining Ring (HC 006) as shown. Note that the Retaining Ring has a tapered side and a flat side. The flat side faces the bearing. Pull the ears of the Retaining Ring together to make sure it is fully seated in groove.







5. Press Shaft Seals (BJ 010-D) into Banjo Head (HC 070) and Cross Body (HC 035). The side of the seals with the spring loaded lip is shown facing up in the illustration. Apply grease to the lips of the seals.

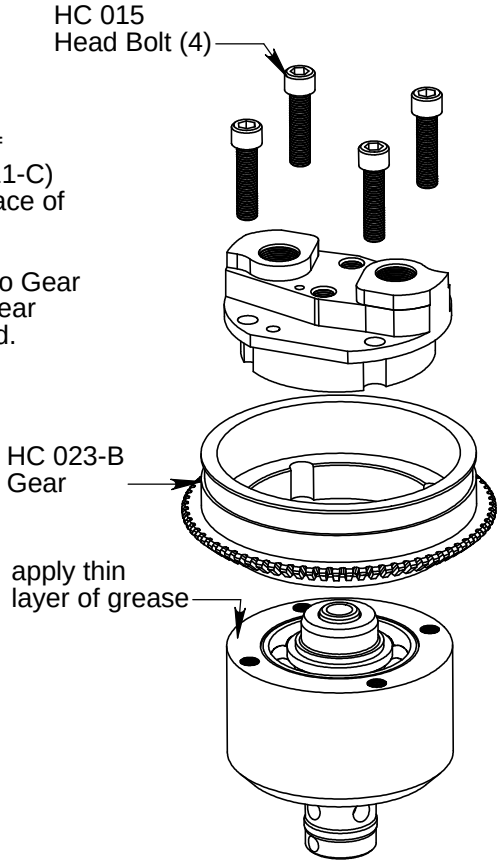
6. Slide Cross Shaft assembly into Cross Body.

7. Apply grease to the H.P. Seal (HC 012-TO) and install in bore of shaft. Place Carbide Seat (MJ 011-C) on top of H.P. Seal, with the flat face of the Seat against the Seal.

8. Push Banjo Head (HC 070) into Gear (HC 023-B); make sure slots in gear align with bolt holes in Banjo Head.

9. Apply a thin layer of grease to the face of Cross Body. Carefully place Banjo Head and Gear on Cross Body; be sure that Carbide Seat stays in bore of shaft.

10. Install the four Head Bolts (HC 015). Blue Loctite is recommended. Tighten to 200 in-lb.



6.2 HURRICANE CROSS BODY ASSEMBLY INSTRUCTIONS CONTINUED

11. Slide one O-Ring (HC 074) onto each Banjo Bolt (HC 072); insert Banjo Bolts thru Banjo Nipples (HC 071). Make sure the side marked TOP will be up when installed on head. Slide second set of O-Rings onto Banjo Bolts up to bottom of Banjo Nipples.

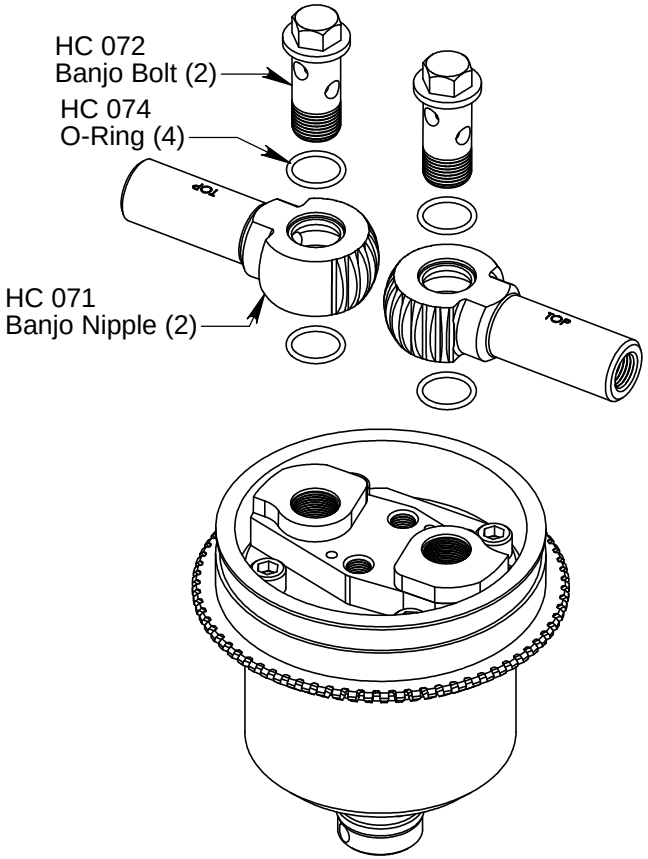
12. Install the two Banjo Bolts and Nipples in the Banjo Head. Do not tighten them yet; point the nipples directly opposite and parallel to each other.

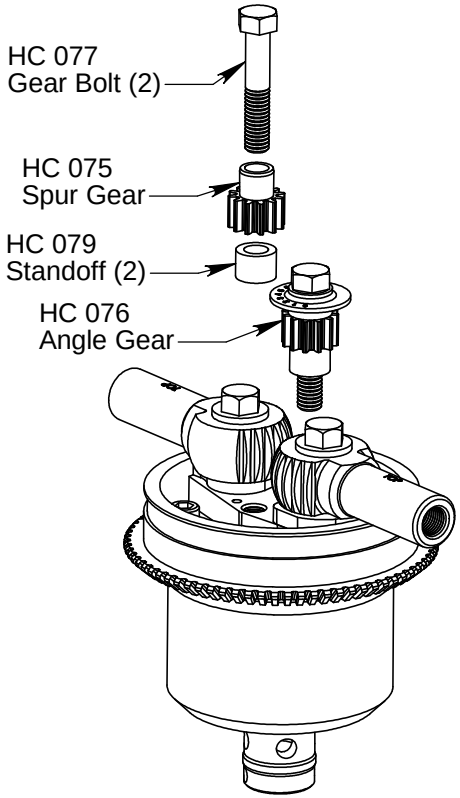
13. Slide Gear Bolts (HC 077) thru Spur Gear (HC 075) and Angle Gear (HC 076); slide on the Standoffs (HC 079). Apply anti-seize to threads of bolts.

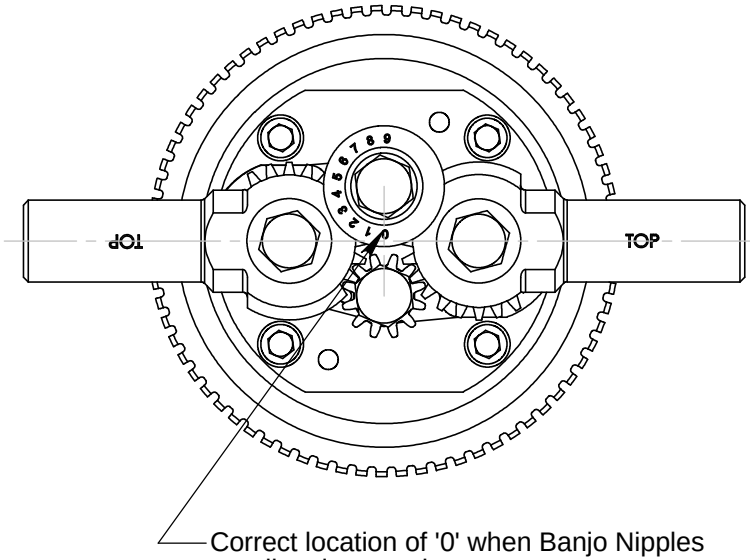
14. Install Spur Gear into Banjo Head, keeping Banjo Nipples parallel and opposite to each other.

15. With the Banjo Nipples parallel and opposite to each other as shown below, install the Angle Gear (HC 076) with the '0' aligned as shown.

16. The Banjo Nipple setting must be set to match the correct pressure and flow as shown in the chart in Section 3.0. They can be set and tightened now or at some other time before operation.



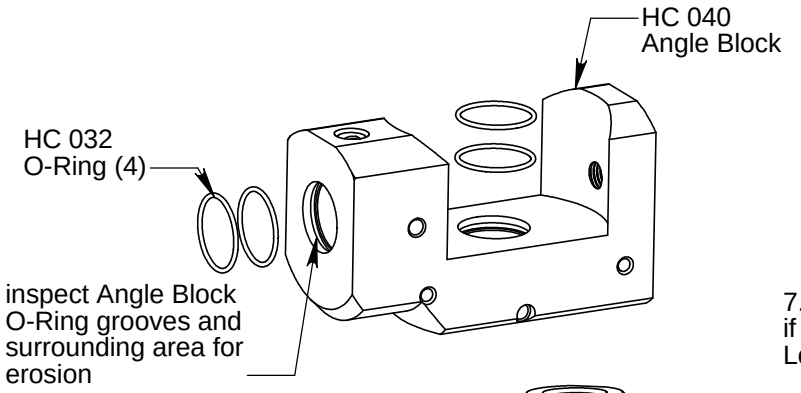




6.2 HURRICANE FINAL ASSEMBLY INSTRUCTIONS

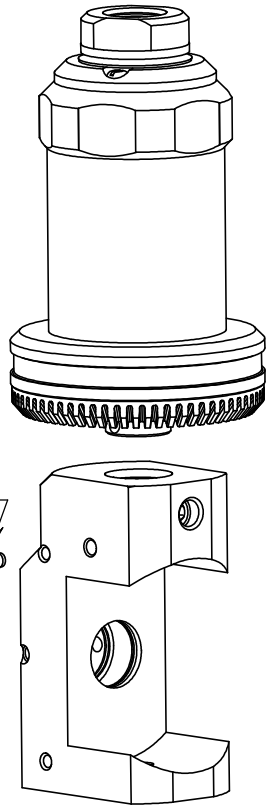
1. Install new O-Rings (HC 032) into the Angle Block (HC 040). Be careful not to cut the O-Rings. (New O-Rings must be installed any time a shaft is removed.)

2. Apply grease to the O-Rings.



3. Orient the pin hole in Shaft of Main Body Assembly with the hole in Angle Block; press Main Body Assembly into Angle Block until pin holes are aligned. Use an ice pick or phillips screwdriver to help align the holes.

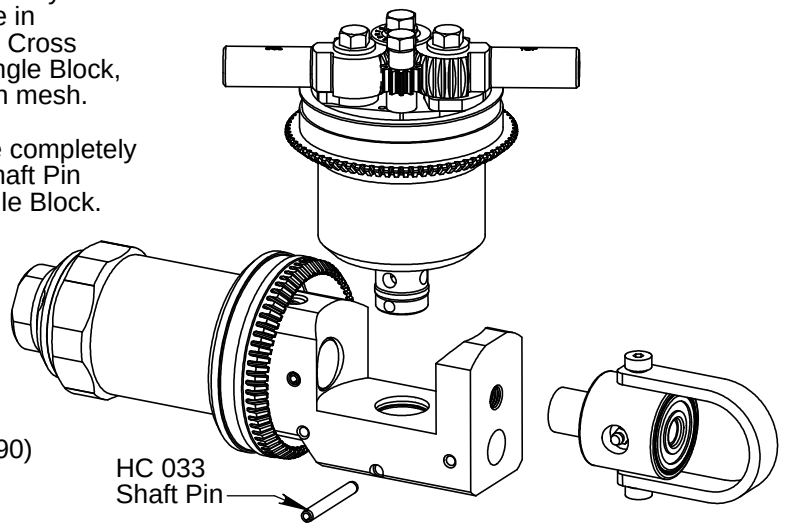
4. When the pin holes in the Angle Block and Shaft are completely aligned, drive the Shaft Pin (HC 033) into the Angle Block until flush.



Note: if the pin is driven into the Shaft without properly aligning holes, the O-Ring land will be damaged and lead to O-Ring failure and erosion of the Shaft and Angle Block.

5. Orient the pin hole in the Shaft of the Cross Body Assembly with the hole in the Angle Block; press Cross Body assembly into Angle Block, making sure gear teeth mesh.

6. When pin holes are completely aligned, drive in the Shaft Pin until flush with the Angle Block.

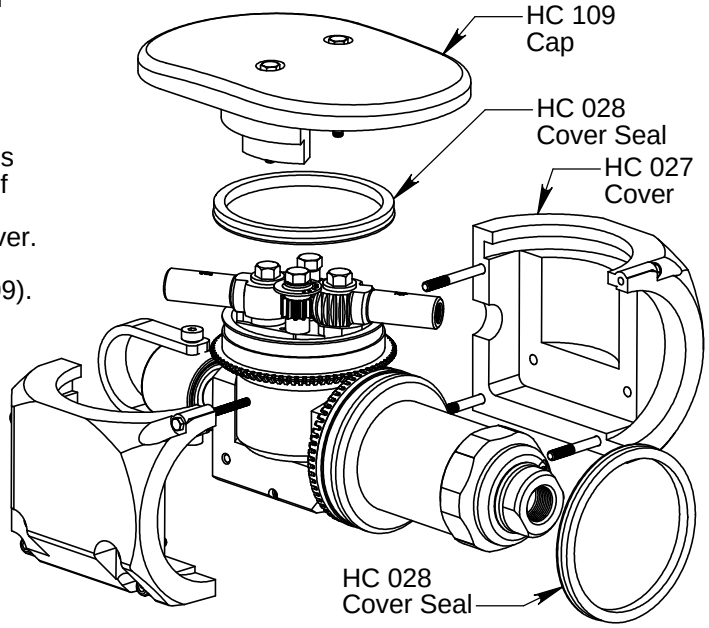


7. Install Pulling Ring (HC 090) if it was removed. Use blue Loctite on threads.

8. Install the Cover (HC 027) halves on assembly. Check that Cover does not rub on gears before and after tightening bolts.

9. Install the Cover Seals (HC 028) into grooves on gears. The lips of the seals should be on the outside of the Cover, not pinched between the gears and cover.

10. Install the Cap (HC 109).



6.3 TROUBLESHOOTING GUIDE

SYMPTOM	PROBLEM	SOLUTION
Leaks out weep holes	Worn H.P. seal	Replace H.P. Seal (HC 012-TO)
	Damaged seat	Replace Seat (MJ 011-C)
	Damaged Inlet Nut	Face or replace Inlet Nut or Banjo Head
Seals wear out quickly	Damaged seat	Replace Seat (MJ 011-C)
	Worn Seal Bore in Shaft	Replace if more than .635 dia.
Will not rotate	Not enough jet torque	Check nozzles for plugging Increase Banjo Setting
	Internal damage	Rotate head by hand, if rough to turn, check bearings
	Improper assembly	Inspect and repair
Water inside tool	Bad H.P. Seal leak	Replace H.P. Seal
	Worn shaft seals	Replace shaft seals
Rotates too fast	Too much torque	Decrease Banjo Setting
	Low or empty Viscous Fluid	Refill viscous fluid
	Water in Viscous Fluid	Clean and refill

7.0 LIMITED WARRANTY

StoneAge, Inc. warrants to the extent herein provided the products of its own manufacture against defects in material and workmanship under normal use and service for which the products were designed for a period of six months after shipment from the factory. If such products should fail through defect in workmanship or material and specific written notice of failure is made within six months after date of shipment from factory, StoneAge, Inc. will either repair or replace any such items, F.O.B. its factory without charge. StoneAge, Inc. shall not be liable for expense incurred in repairs or alterations made outside the factory without the proper and prior authorization. StoneAge, Inc. shall have the option of requiring the return of the defective products to its factory, with transportation charges prepaid, to establish the claim. StoneAge, Inc. shall in no event be held liable for damages or delay resulting from or arising out of defective products nor for consequential damages or otherwise except for repair or replacement of items of defective material or workmanship aforesaid.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR USE AND NEITHER ASSUMES, NOR AUTHORIZES ANY PERSON TO ASSUME FOR STONEAGE, INC. ANY OTHER LIABILITY IN CONNECTION WITH THE SALE OF ITS PRODUCTS. THIS WARRANTY SHALL NOT APPLY TO PRODUCTS OR ANY PARTS THEREOF WHICH HAVE BEEN SUBJECT TO ACCIDENT, NEGLIGENCE, ALTERATION, ABUSE, OR MISUSE. STONEAGE, INC. MAKES NO WARRANTY WHATSOEVER IN RESPECT TO ACCESSORIES, PARTS OR PRODUCTS NOT MANUFACTURED BY STONEAGE, INC.

APPENDIX BJ 048-S VISCOUS FLUID

OSI SPECIALTIES INC — POLYDIMETHYLSILOXANE L-405-12500
MATERIAL SAFETY DATA SHEET Revision: 1.0 9/27/2000
==========
MSDS Safety Information
==========
MSDS Date: 9/27/2000
MSDS Num: 910000000791
Product ID: L-405-12500
Chemical Name: Polydimethylsiloxane(inhibited)
Responsible Party: Mr. Dana Dalrymple
Name: OSI SPECIALTIES INC
Address: ONE AMERICAN LANE
City: GREENWICH CT 06831-2559
Info Phone Number: 304-652-8446
Emergency Phone Number: 800-809-9998; 800-424-9300(CHEMTREC)
Published: Y
==========
Ingredients
==========
Proprietary: NO
Ingredient: POLYDIMETHYLSILOXANE
Ingredient Sequence Number: 01
Percent: <100%
CAS Number: 63148-62-9
Other Recommended Limit: NONE SPECIFIED

Proprietary: NO
Ingredient: PROPRIETARY inhibitors
Ingredient Sequence Number: 02
Percent: <1%
Trade secret
==========
Health Hazards Data
==========
LD50-LC50 Mixture: LD50 (ORAL RAT) IS UNKNOWN
Route Of Entry - Inhalation: NO
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: ACUTE & CHRONIC: NO EVIDENCE OF ADVERSE FROM AVAILABLE INFORMATION.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Signs/Symptoms Of Overexp: No Adverse Effects.
Med Cond Aggravated By Exp: None Specified By Manufacturer.
Emergency/First Aid Proc:
INGESTION: NO EMERGENCY CARE ANTICIPATED.
SKIN:WASH WITH SOAP AND WATER.
INHALATION: NO EMERGENCY CARE ANTICIPATED.
EYES: FLUSH THOROUGHLY WITH WATER FOR SEVERAL MINUTES.
NOTES TO PHYSICIAN: THERE IS NO SPECIFIC ANTIDOTE. TREATMENT OF OVEREXPOSURE SHOULD BE DIRECTED AT THE CONTROL OF SYMPTOMS AND THE CLINICAL CONDITION OF THE PATIENT
==========
Handling and Disposal
==========
==========
Fire and Explosion Hazard Information
==========
Flash Point: 254°C/(490°F)
Extinguishing Media: DO NOT SPRAY A SOLID STREAM OF WATER DIRECTLY INTO BURNING LIQUID.
USE CARBON DIOXIDE, ALCOHOL FOAM, OR DRY CHEMICAL.
Special Fire Fighting Proc: WEAR SELF CONTAINED BREATHING APPARATUS.
CONTAIN RUNOFF.
Unusual Fire And Expl Hazrds: MAY CAUSE FLOATING FIRE HAZARD
==========
Control Measures
==========
Respiratory Protection: NONE EXPECTED TO BE REQUIRED.
Protective Gloves: 4H, BUTYL, NEOPRENE, NITRILE(NBR), PVC COATED
Eye Protection: SAFETY GLASSES
Work Hygienic Practices: OBSERVE GOOD PERSONAL HYGIENE PRACTICES AND RECOMMENDED PROCEDURES. DO NOT WEAR CONTAMINATED CLOTHING OR FOOTWEAR.
Other Protective Equipment: SAFETY SHOWER, EYE BATH
==========

Physical/Chemical Properties
==========
Appearance:
Physical state: Clear to Hazy Liquid
Color: Yellow
Odor: Mild
Other Properties:
Boiling Point: >250°C @STP unless specified below
Melting Point: <-50°C @ STP unless specified below
pH: N/A
Spec Gravity: 0.9738@25°C
Vapor Pres: <1.33hPa (1.00mmHg) @20°C
Vapor Density: Heavier Than Air
Solubility in Water: Insoluble
Evaporation Rate: <1
Flash Point: >254°C / >490°F
Upper Explosion Limit: N/A
Lower Explosion Limit: N/A
Percent Volatile: Not Determined
Molecular Weight: Polymer
==========
Reactivity Data
==========
Stability: Stable
Stability Condition To Avoid: None Known.
Materials To Avoid: Strong oxidizing agents
Hazardous Combustion Products:
Burning Can Produce The Following Combustion Products:
OXIDES OF CARBON, OXIDES OF SILICON, FORMALDEHYDE, CARBON MONOXIDE IS HIGHLY TOXIC IF INHALED;CARBON DIOXIDE IN SUFFICIENT CONCENTRATIONS CAN ACT AS AN ASPHYXIANT.
ACUTE OVEREXPOSURE TO THE PRODUCTS OF COMBUSTION MAY RESULT IN IRRITATION OF THE RESPIRATORY TRACT.
Hazardous Polymerization: Will Not Occur.
Conditions To Avoid Polymerization: None Known.
==========
Toxicological Information
==========
No information relevant to human health hazard evaluation is currently available
==========
Ecological Information
==========
Prevent Runoff
Use Absorbent To Clean Up
==========
MSDS Transport Information
==========
This product is not regulated by the DOT, IMDG, ICAO.
Freight description road: OIL, O/T PETROLEUM, LUBRICATING, NOIBN
==========
Regulatory Information
==========
CERCLA; None
SARA; None
MSL; None
EPA; None
California Prop 65; None
California SCAQMD; VOC=>0.5mmHg@ 104°C / 219.2°F **Not determined**
==========
Other Information
==========
Chemical Inventory
Europe: The ingredients of this mixture are on the EINECS inventory.
United States: The ingredients of this product are listed on the TSCA inventory or are exempt.
==========
HAZCOM Label
==========
Product ID: POLYDIMETHYLSILOXANE L-45-12500
Supplier: Crompton Corporation
Street: One American Lane
City: Greenwich, CT
Zipcode: 06831-2559, USA
Health Emergency Phone: 800-809-9998;800-424-9300(CHEMTREC)
Label Required: Yes
Health Hazard: 0
Flammability: 1
Reactivity: 0
PPE: X
==========

644047-00 MOBILITH SHC PM
MATERIAL SAFETY DATA BULLETIN

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1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: MOBILITH SHC PM
SUPPLIER: EXXONMOBIL OIL CORPORATION
3225 GALLOWS RD.
FAIRFAX, VA 22037
24 - Hour Health and Safety Emergency (call collect): 609-737-4411
24 - Hour Transportation Emergency:
CHEMTREC: 800-424-9300 202-483-7616
LUBES AND FUELS: 281-834-3296
Product and Technical Information:
Lubricants and Specialties: 800-662-4525 800-443-9966
Fuels Products: 800-947-9147
MSDS Fax on Demand: 713-613-3661
MSDS Internet Website: http://www.exxon.com, http://www.mobil.com
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2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAMES AND SYNONYMS: SYN. HYDROCARBONS AND ADDITIVES
GLOBALLY REPORTABLE MSDS INGREDIENTS:
None.
See Section 8 for exposure limits (if applicable).
---
3. HAZARDS IDENTIFICATION

Under normal conditions of use, this product is not considered hazardous according to regulatory guidelines (See section 15).
EMERGENCY OVERVIEW: Light Tan Grease. DOT ERG No. : NA
POTENTIAL HEALTH EFFECTS: Under normal conditions of intended use, this product does not pose a risk to health. Excessive exposure may result in eye, skin or respiratory irritation. For further health effects/toxicological data, see Section 11.
---
4. FIRST AID MEASURES

EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.
SKIN CONTACT: Wash contact areas with soap and water. Remove and clean oil soaked clothing daily and wash affected area.
INJECTION INJURY WARNING: If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.
INHALATION: Remove from further exposure. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with mechanical device or use mouth-to-mouth resuscitation.
INGESTION: Not expected to be a problem. Seek medical attention if discomfort occurs. Do not induce vomiting.
---
5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.
SPECIAL FIRE FIGHTING PROCEDURES: Water or foam may cause frothing.
Use water to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.
SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.
UNUSUAL FIRE AND EXPLOSION HAZARDS: None.
COMBUSTION PRODUCTS: Fumes, smoke, carbon monoxide, sulfur oxides, aldehydes and other decomposition products, in the case of incomplete combustion.
Flash Point C(F): > 204(400) (ESTIMATED FOR OIL, ASTM D-92 (COC)).
Flammable Limits (approx.% vol.in air) - LEL: NE, UEL: NE
NFPA HAZARD ID: Health: 0, Flammability: 1, Reactivity: 0
---
6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES: Report spills/releases as required to appropriate authorities. U.S. Coast Guard and EPA regulations require immediate reporting of spills/releases that could reach any waterway including intermittent dry creeks. Report spill/release to Coast Guard National Response Center toll free number (800)424-8802. In case of accident or road spill notify CHEMTREC (800) 424-9300.
PROCEDURES IF MATERIAL IS RELEASED OR SPILLED:

LAND SPILL: Shut off source taking normal safety precautions. Take measures to minimize the effects on ground water. Recover by pumping or contain spilled material with sand or other suitable absorbent and remove mechanically into containers. If necessary, dispose of adsorbed residues as directed in Section 13.
WATER SPILL: Confine the spill immediately with booms. Warn other ships in the vicinity. Notify port and other relevant authorities. Remove from the surface by skimming or with suitable absorbents. If permitted by regulatory authorities the use of suitable dispersants should be considered where recommended in local oil spill procedures.
ENVIRONMENTAL PRECAUTIONS: Prevent material from entering sewers, water sources or low lying areas; advise the relevant authorities if it has, or if it contaminates soil/vegetation.
PERSONAL PRECAUTIONS: See Section 8

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7. HANDLING AND STORAGE

HANDLING: High pressure injection under the skin may occur due to the rupture of pressurized lines. Always seek medical attention. No special precautions are necessary beyond normal good hygiene practices. See Section 8 for additional personal protection advice when handling this product.
STORAGE: Keep containers closed when not in use. Do not store in open or unlabelled containers. Store away from strong oxidizing agents and combustible materials. Do not store near heat, sparks, flame or strong oxidants.
SPECIAL PRECAUTIONS: Prevent small spills and leakages to avoid slip hazard.
EMPTY CONTAINER WARNING: Empty containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove.
Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

---

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS:
This product does not contain any components which have recognized exposure limits.
VENTILATION: Use adequate ventilation.
RESPIRATORY PROTECTION: No special requirements under ordinary conditions of use and with adequate ventilation.
EYE PROTECTION: Generally eye contact is unlikely with this type material. If eye contact is likely, safety glasses with side shields or chemical type goggles should be worn.
SKIN PROTECTION: If prolonged or repeated skin contact is likely, oil impervious gloves should be worn. Good personal hygiene practices should always be followed.

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9. PHYSICAL AND CHEMICAL PROPERTIES

Typical physical properties are given below. Consult Product Data Sheet for specific details.
APPEARANCE: Grease
COLOR: Light Tan
ODOR: Strong
ODOR THRESHOLD-ppm: NE
pH: NA
BOILING POINT C(F): > 316(600)
DROP POINT C(F): NE
FLASH POINT C(F): > 204(400) (ESTIMATED FOR OIL, ASTM D-92 (COC))
FLAMMABILITY (solids): NE
AUTO FLAMMABILITY C(F): NA
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: < 0.1
VAPOR DENSITY: NE
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 1
SOLUBILITY IN WATER: Negligible
PARTITION COEFFICIENT: > 3.5
VISCOSITY AT 40 C, cSt: > 150.0
VISCOSITY AT 100 C, cSt: > 16.0
POUR POINT C(F): NA
FREEZING POINT C(F): NE
VOLATILE ORGANIC COMPOUND: NE
NOTE: MOST PHYSICAL PROPERTIES FOR OIL COMPONENT.
DMSO EXTRACT, IP-346 (WT.%): <3, for mineral oil only
NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES
FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

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10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Extreme heat and high energy sources of ignition.

INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Product does not decompose at ambient temperatures.
HAZARDOUS POLYMERIZATION: Will not occur.

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11. TOXICOLOGICAL DATA

---ACUTE TOXICOLOGY---
ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). ---Based on testing of similar products and/or the components.
INHALATION TOXICITY (RATS): Practically non-toxic (LC50: greater than 5 mg/l). ---Based on testing of similar products and/or the components. EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). ---Based on testing of similar products and/or the components.
SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). ---Based on testing of similar products and/or the components.
OTHER ACUTE TOXICITY DATA: Although an acute inhalation study was not performed with this product, a variety of mineral oils and synthetic base oils, such as those in this product have been tested. These samples had virtually no effect other than a nonspecific inflammatory response in the lung to the aerosolized mineral oil. The presence of additives in other tested formulations (in approximately the same amounts as in the present formulation) did not alter the observed effects.
---SUBCHRONIC TOXICOLOGY (SUMMARY)---
No significant adverse effects were found in studies using repeated dermal applications of similar formulations to the skin of laboratory animals for 13 weeks at doses significantly higher than those expected during normal industrial exposure. The animals were evaluated extensively for effects of exposure (hematology, serum chemistry, urinalysis, organ weights, microscopic examination of tissues etc.).
---REPRODUCTIVE TOXICOLOGY (SUMMARY)---
No teratogenic effects would be expected from dermal exposure, based on laboratory developmental toxicity studies of major components in this formulation and/or materials of similar composition.
---CHRONIC TOXICOLOGY (SUMMARY)---
Repeated and/or prolonged exposure may cause irritation to the skin, eyes or respiratory tract. For mineral base oils: Base oils in this product are severely solvent refined and/or severely hydrotreated. Chronic mouse skin painting studies of severely treated oils showed no evidence of carcinogenic effects. These results are confirmed on a continuing basis using various screening methods such as Modified Ames Test, IP-346, and/or other analytical methods. For synthetic base oils: The base oils in this product have been tested in the Ames assay and other tests of mutagenicity with negative results. These base oils are not expected to be carcinogenic with chronic dermal exposures.
---SENSITIZATION (SUMMARY)---
Not expected to be sensitizing based on tests of this product, components, or similar products.

---

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE AND EFFECTS:
This environmental assessment was conducted using information on the individual components as no test data was available for this specific formulation.
ECOTOXICITY: The major components in the formulation show no aquatic toxicity at 1000 mg/L loading, therefore long-term adverse effects in the aquatic environment are not expected.
MOBILITY: Not established.
PERSISTENCE AND DEGRADABILITY: This product is expected to be inherently biodegradable, as the principal components have been shown to degrade at slow to moderate rates.
BIOACCUMULATIVE POTENTIAL: Not established.

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13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.
RCRA INFORMATION: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity, or reactivity. The unused product is not formulated with substances covered by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

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14. TRANSPORT INFORMATION

USA DOT: NOT REGULATED BY USA DOT.
RID/ADR: NOT REGULATED BY RID/ADR.
IMO: NOT REGULATED BY IMO.
IATA: NOT REGULATED BY IATA.

---

15. REGULATORY INFORMATION

US OSHA HAZARD COMMUNICATION STANDARD: When used for its intended
purposes, this product is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.
EU Labeling: Product is not dangerous as defined by the European Union
Dangerous Substances/Preparations Directives. EU labeling not required. Governmental Inventory Status: All components comply with TSCA.
U.S. Superfund Amendments and Reauthorization Act (SARA) Title III:
This product contains no "EXTREMELY HAZARDOUS SUBSTANCES".
SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.
This product contains no chemicals subject to the supplier notification requirements of SARA (313) toxic release program.
THIS PRODUCT HAS BEEN AUTHORIZED BY USDA FOR USE UNDER THE FOLLOWING
CATEGORY: This product is acceptable as a lubricant where there is no possibility of food contact (complies with earlier USDA guidelines for H-2 lubricant use).
The following product ingredients are cited on the lists below:
CHEMICAL NAME CAS NUMBER LIST CITATIONS *
---------- ---------- ----------
LITHIUM HYDROXIDE MONOHYDRATE 1310-66-3 22
(0.15%)
LITHIUM-SOAP THICKENER (7.41%) 7620-77-1 22
FATTY ACIDS, C16-22, LITHIUM SALTS 68783-36-8 22
(3.82%)
--- REGULATORY LISTS SEARCHED ---
1=ACGIH ALL 6=IARC 1 11=TSCA 4 16=CA P65 CARC 21=LA RTK
2=ACGIH A1 7=IARC 2A 12=TSCA 5a2 17=CA P65 REPRO 22=MI 293
3=ACGIH A2 8=IARC 2B 13=TSCA 5e 18=CA RTK 23=MN RTK
4=NTP CARC 9=OSHA CARC 14=TSCA 6 19=FL RTK 24=NJ RTK
5=NTP SUS 10=OSHA Z 15=TSCA 12b 20=IL RTK 25=PA RTK
26=RI RTK
* EPA recently added new chemical substances to its TSCA Section 4 test rules.
Please contact the supplier to confirm whether the ingredients in this product currently appear on a TSCA 4 or TSCA 12b list.
Code key:CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive
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16. OTHER INFORMATION

USE: PAPER MACHINE GREASE
NOTE: PRODUCTS OF EXXON MOBIL CORPORATION AND ITS AFFILIATED COMPANIES
ARE NOT FORMULATED TO CONTAIN PCBS.
Health studies have shown that many hydrocarbons pose potential human health risks which may vary from person to person. Information provided on this MSDS reflects intended use. This product should not be used for other applications. In any case, the following advice should be considered:
INDUSTRIAL LABEL
Under normal conditions of intended use, this product does not pose a risk to health. Excessive exposure may result in eye, skin or respiratory irritation. Always observe good hygiene measures. First Aid: Wash skin with soap and water. Flush eyes with water. If overcome by fumes or vapor, remove to fresh air. If ingested do not induce vomiting. If symptoms persist seek medical assistance. Read and understand the MSDS before using this product.
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For Internal Use Only: MHC: 1* 1* 1* 1* 1*, MPPEC: A, TRN: 644047-00,
ELIS: 400422, CMCS97: 971123, REQ: US - MARKETING, SAFE USE: L
EHS Approval Date: 06DEC2001
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Prepared by: ExxonMobil Oil Corporation
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