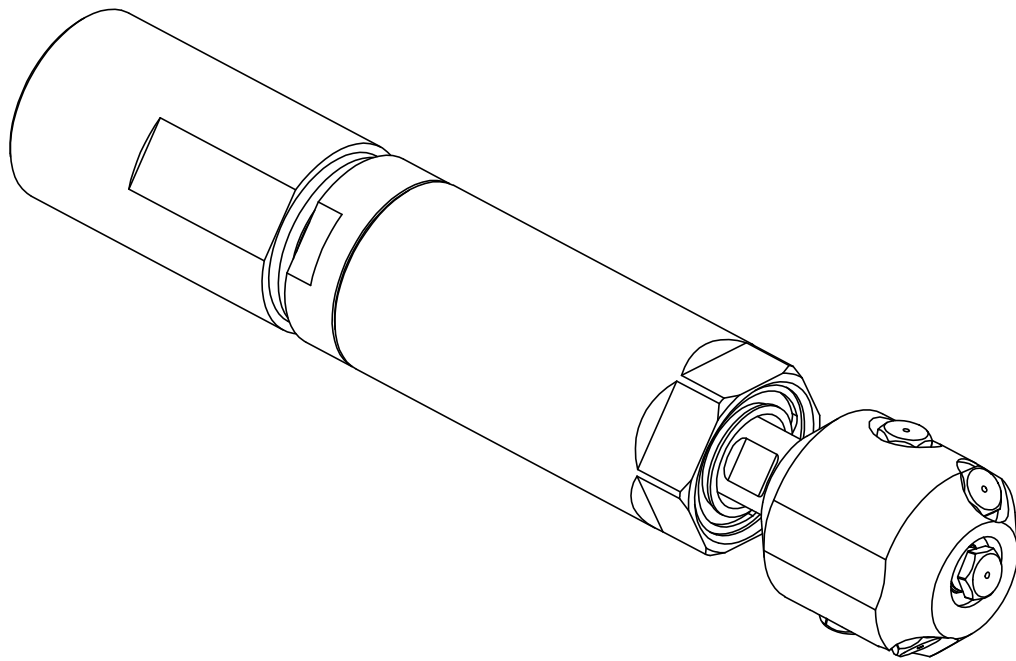


DTV 2D Self Rotating Nozzle

For Downhole Applications

OPERATION AND MAINTENANCE MANUAL



54 Girard St. Durango, Colorado 81303
www.stoneagetools.com

(970) 259-2869 Phone (970) 259-2868 Fax
sales@stoneagetools.com

09/03

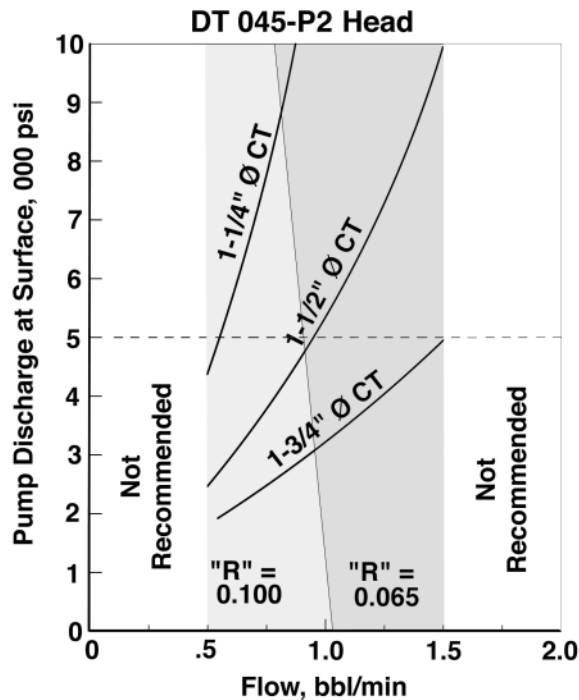
DTV Self-Rotating Downhole Nozzle

For Coil Tubing Operations - 1-1/4, 1-1/2, or 1-3/4 in. CT

- Rugged, compact design
- Simple maintenance
- Replaceable nozzle tips
- Controlled, rotating jets
- Fluoro-elastomeric seals for temperature & chemical resistance
- Up to 1.5 bpm
- 316L Stainless steel construction

Removes

- Calcium carbonate scale
- Barium sulphate scale
- Water scale
- Corrosion products
- Asphaltine plugs
- Paraffin plugs
- Hydrate plugs
- Failed linings



Jetting

CT Ø OD in.	Pressure psi	Flow bbl/min	AP2 ID in.	Offset "R"	10° Jet
1-1/4"	4,380	0.50	.068	.100	Yes
1-1/4"	7,750	0.75	.087	.100	Yes
1-1/4"	5,200	0.50	.068	.100	No
1-1/4"	8,420	0.75	.087	.100	No
1-1/2"	2,470	0.50	.068	.100	Yes
1-1/2"	3,470	0.75	.087	.100	Yes
1-1/2"	5,500	1.00	.094	.065	Yes
1-1/2"	7,500	1.25	.109	.065	Yes
1-1/2"	9,950	1.50	.125	.065	Yes
1-1/2"	2,120	0.40	.068	.100	No
1-1/2"	3,140	0.65	.087	.100	No
1-1/2"	4,500	0.90	.094	.065	No
1-1/2"	6,370	1.15	.109	.065	No
1-1/2"	8,080	1.35	.125	.065	No
1-3/4"	1,930	0.50	.068	.100	Yes
1-3/4"	2,220	0.75	.087	.100	Yes
1-3/4"	3,300	1.00	.094	.065	Yes
1-3/4"	4,050	1.25	.109	.065	Yes
1-3/4"	4,970	1.50	.125	.065	Yes
1-3/4"	1,780	0.40	.068	.100	No
1-3/4"	2,200	0.65	.087	.100	No
1-3/4"	3,400	0.90	.094	.065	No
1-3/4"	3,740	1.10	.109	.065	No
1-3/4"	4,550	1.35	.125	.065	No

Specifications

Model	DTV-P	DTV-M
Outside Diameter, in	1-5/8	1-5/8
, cm	4.1	4.1
Overall Length, in	6.8	8.5
, cm	17	22
Weight, lb	3.0	3.3
, kg	1.40	1.50
Inlet Port	3/4 npt	1 AMMT
Outlet Shaft	3/8 npt	3/8 npt
Max. Pressure	10 Kpsi	690 bar
Flow Range	.4-1.5 bpm	60-240 l/min
Flow Rating	3.0	3.0
Pressure Drop @ 1 bpm	200 psi	13.5 bar
Rotation Speed	100-300 rpm	



Durango, Colorado Phone 970-259-2869
www.stoneagetools.com FAX 970-259-2868

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	A. Viscous Fluid Material Safety Data Sheet

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 The immediate work area should be marked off to keep out untrained persons.
- 2.4 All personnel in the area should wear eye and hearing protection, as well as other protective clothing in accordance with specific conditions.
- 2.5 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.
- 2.6 The tool should be securely supported. Strong reaction forces are created by waterjets and these forces can become unbalanced if a nozzle should plug.
- 2.7 Check to see that all control functions work properly before going to high pressure.
- 2.8 If it is necessary to have a person work near the cleaning jets, this person should have control of a pressure dump mechanism.

3.0 DESCRIPTION

The **DTV** is a self-rotating swivel powered by jet reaction force. The powerful rotating jets cover a large area for efficient cleaning. A thick viscous fluid fills the swivel and acts as a governor to control the rotation speed as well as providing bearing lubrication. The swivel is made from 316L stainless steel, and is very rugged and compact.

The swivel is a straight flow-thru design with a single high pressure seal. It is capable of working pressures up to 10,000 psi and flow rates up to 1.5 bpm. The measured flow capacity is $C_v = 3.0$ which is used to calculate pressure loss thru the tool. At 1 bpm, the pressure loss is 180 psi, while at 1.5 bpm the pressure loss is 440 psi.

There are two technical limitations that affect these tools- providing the correct amount of torque to rotate the tool yet staying within the capability of the viscous fluid governor, and preventing overheating.

Jet Torque: The head is rotated by jet reaction force combined with a radial offset of the jet. The torque generated by the jet reaction force is balanced by the viscous fluid governor to prevent overspeed. The tool will operate reliably over a range of +/- 25% of the design torque for a given head. If operated at flows or pressures greater than original specifications, the head will rotate too fast causing damage to the seals and bearings. It is necessary to supply heads with several different offsets in order to operate over a wide range of conditions.

Preventing Overheating: Viscous fluid braking performance depends on viscosity of the fluid, so braking is reduced at the elevated temperatures typically found in downhole applications. In normal operation, the water flow thru the tool helps to cool the tool. If water flow is interrupted while the tool is downhole, the tool will be damaged by the high temperature. Therefore, some water flow to cool the tool is necessary at all times.

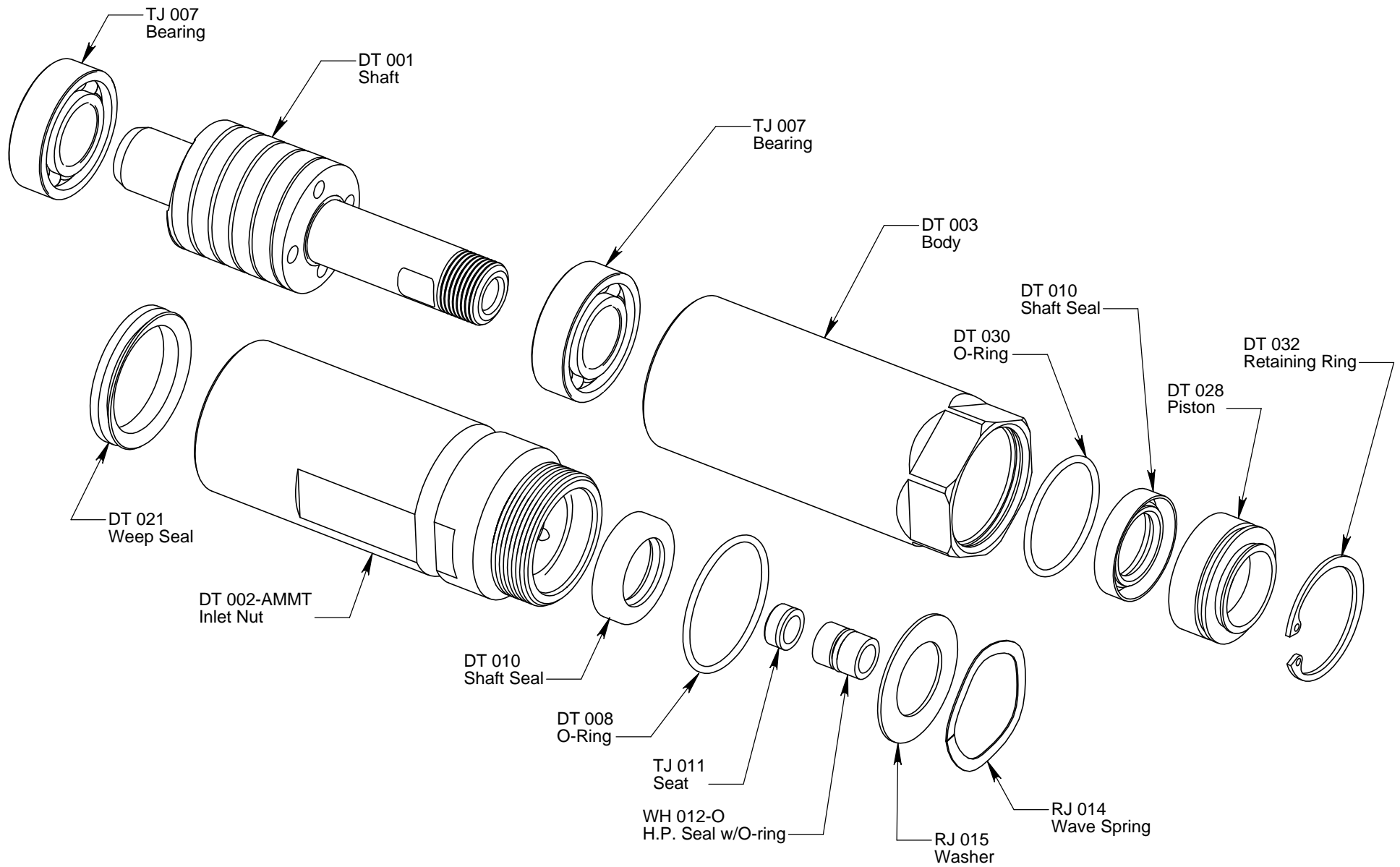
4.0 PARTS LIST

<u>Part #</u>	<u>Description</u>	<u>Qty</u>
BJ 048-S	Viscous Fluid, Slow	1
DT 001	Shaft	1
DT 002-AMMT	Inlet Nut	1
DT 003	Body	1
DT 008	O-Ring	1
DT 010	Shaft Seal	2
DT 021	Weep Seal	1
DT 028	Piston	1
DT 030	O-Ring	1
DT 032	Retaining Ring	1
RJ 014	Wave Spring	1
RJ 015-S	Washer	1
TJ 007	Bearing	2
TJ 011	Seat	1
WH 012-O	H.P. Seal with O-Ring	1

Also available separately:

DT 600-S	Service Kit	(Includes items needed for maintenance)
DT 602	Seal Kit	(Includes parts needed for one seal change)
DT 610-S	Overhaul Kit	(Includes parts needed for tool rebuild)
DT 612	Tool Kit	(Includes tools to aid assembly)

5.0 DTV EXPLODED ASSEMBLY DRAWING



3.0 HIGH PRESSURE SEAL MAINTENANCE

The high pressure seal (WH 012-O) and brass seat (TJ 011) should be replaced if the tool is continuously leaking from the Weep Seal (DT 021). Intermittent leaks may occur, usually at low pressures. Only if the leak is continuous at or near operating pressure should the seal be replaced.

When replacing the high pressure seal, the viscous fluid should be checked for level and contamination. If the fluid appears badly contaminated by water or is black in color, the shaft should be removed, parts should be cleaned and the viscous fluid replaced. If the fluid does not look bad, fluid may be added if needed.

1. Remove the Inlet Nut (DT 002-AMMT) from the Body (DT 003). Always hold and clamp on the flats of the body, never on the round portion.

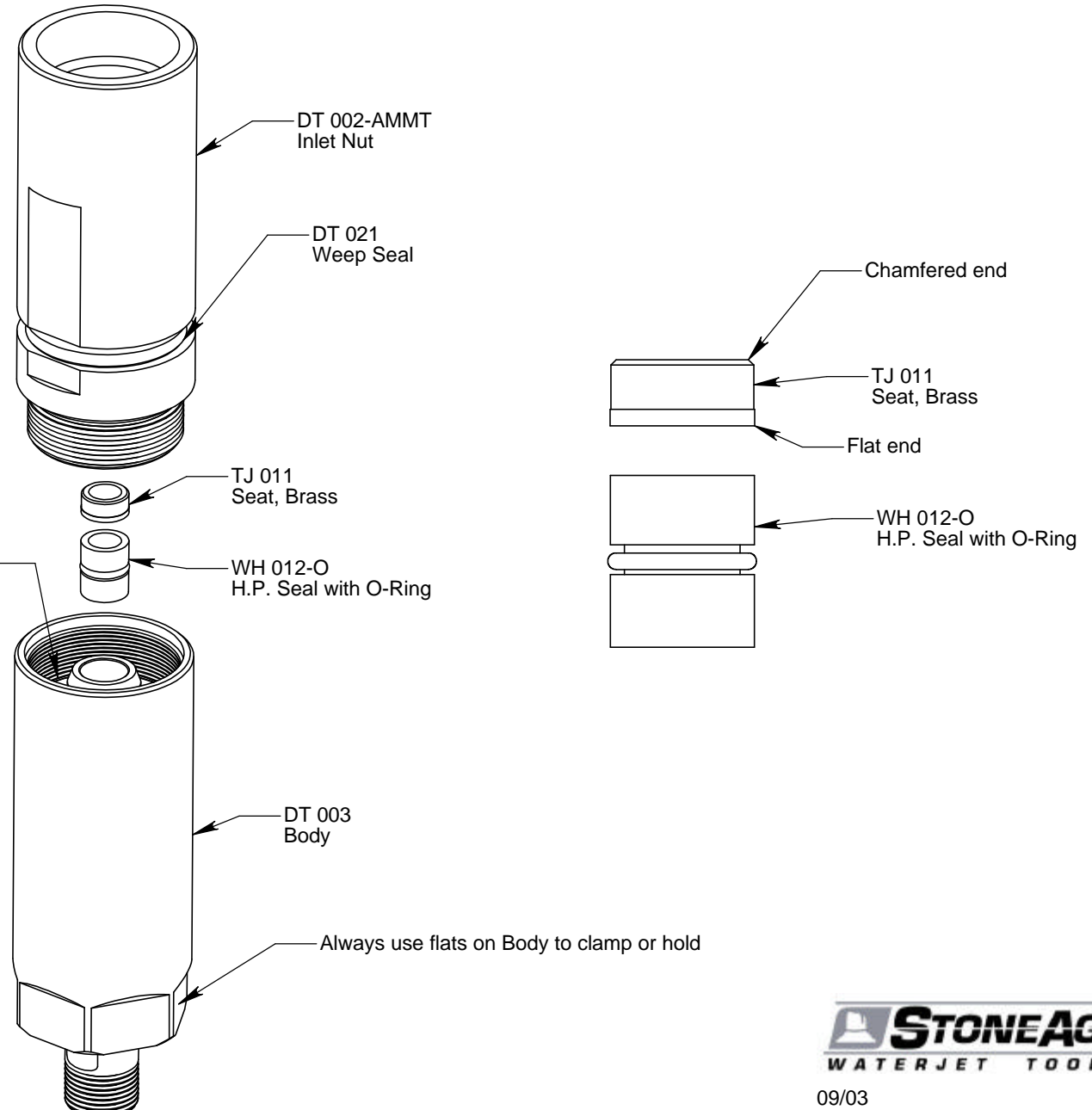
2. Remove the Seat (TJ 011) and the H.P. Seal (WH 012-O) from the bore of the Shaft.

3. Apply grease to the outside of a new H.P. Seal and install in bore of shaft. Do not push the seal all the way down.

4. Install a new Seat, with the chamfered end up and the flat end toward the seal. Push the seat in just far enough to be caught in the bore of the shaft.

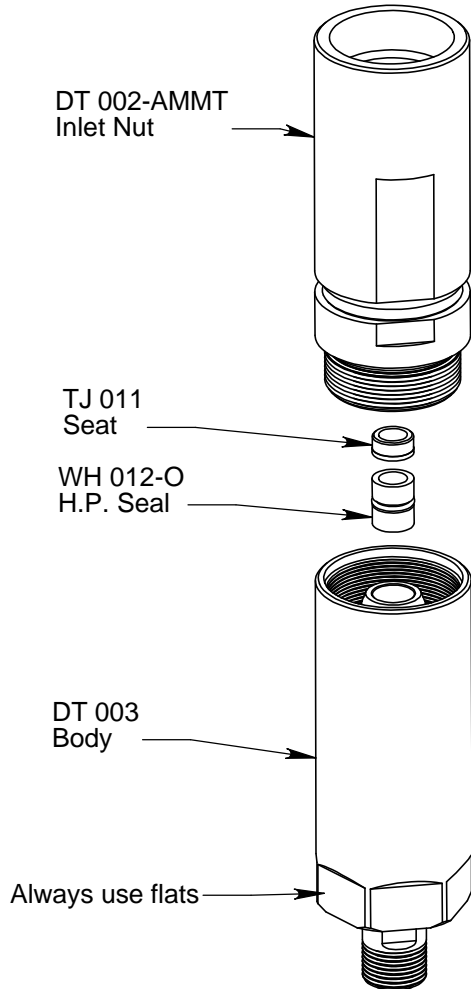
5. Apply anti-seize to the threads of the Inlet Nut and thread into Body, making sure the Seat stays in the bore of the shaft.

Viscous Fluid level should be above the wave spring and washer



6.1 DIV DISASSEMBLY

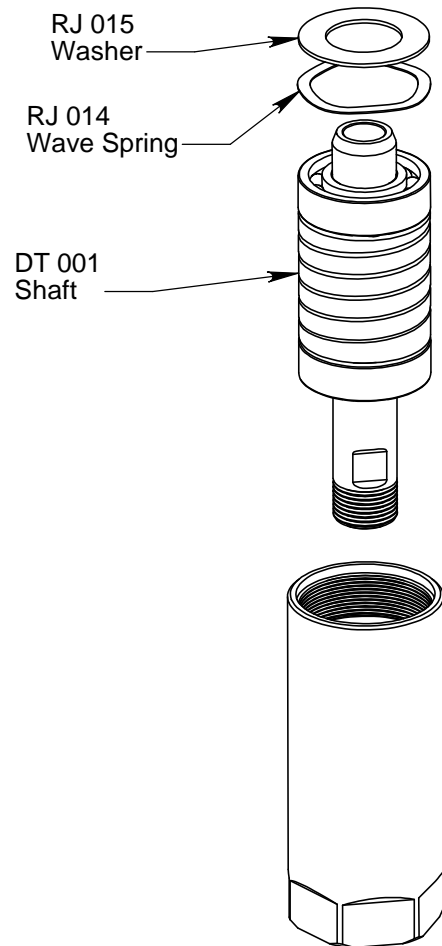
1. Unscrew the Inlet Nut (DT 002-AMMT) from the Body (DT 003). Always hold Body by flats, never on the round portion.
2. Remove the Seat (TJ 011) and H.P. Seal (WH 012-O) from the bore of the shaft.



3. Remove the Washer (RJ 015) and the Wave Spring (RJ 014) from the Body.

4. Push the Shaft (DT 001) with Bearings out of the Body.

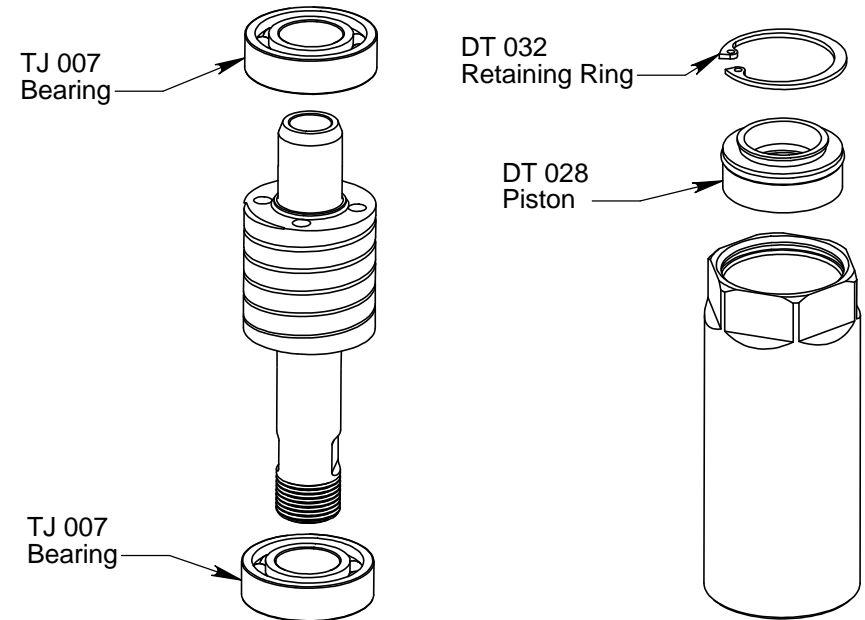
5. The Bearings (TJ 007) should be carefully removed from the Shaft (They are a light press fit.)



6. Remove the Retaining Ring (DT 032) and the Piston (DT 028) from the Body.

7. Inspect the Shaft Seals (DT 010) in the Piston and the Inlet Nut for damage. Remove and replace these if needed.

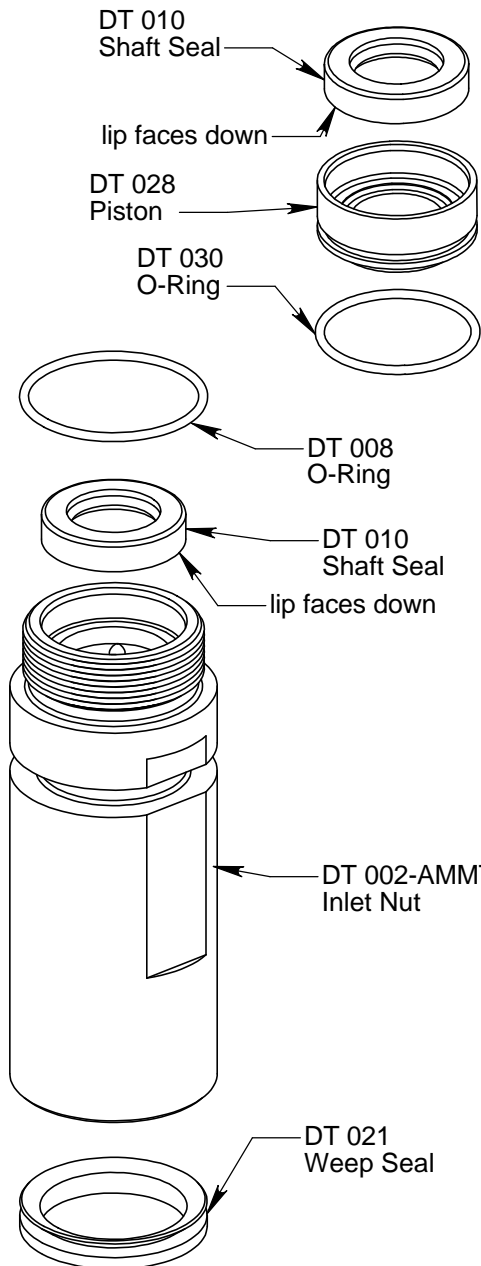
8. Inspect the O-Rings (DT 030 and DT 008) on the Piston and the Inlet Nut for cuts or damage; replace if needed.



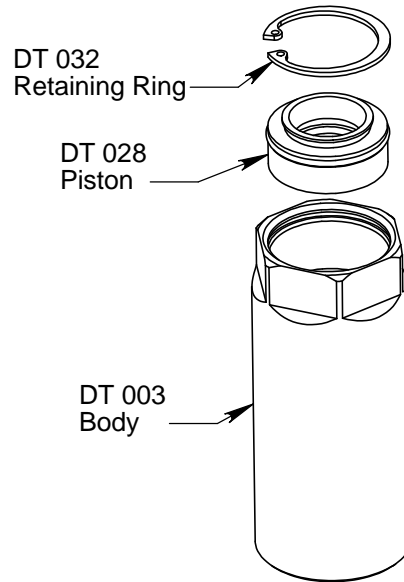
6.2 DTV ASSEMBLY INSTRUCTIONS

1. If the Shaft Seals (DT 010) are being replaced, install new ones in the Inlet Nut and the Piston as shown.

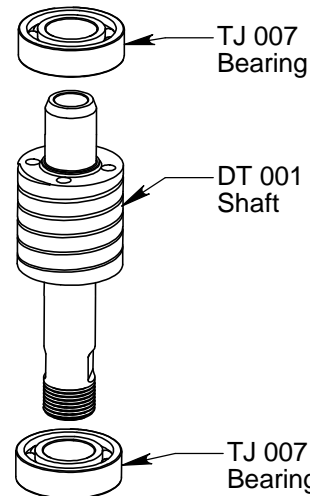
2. Install O-Rings (DT 008 and DT 030) on the Piston and Inlet Nut. Install the Weep Seal (DT 021) on the Inlet Nut.



3. Apply grease to the O-Ring on the Piston and push Piston into the Body, just past the retaining ring groove. Install Retaining Ring (DT 032).

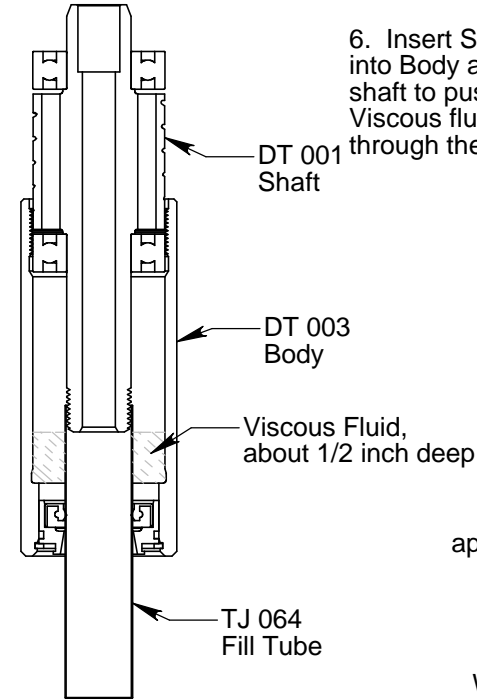


4. Press Bearings (TJ 007) onto the Shaft (DT 001).

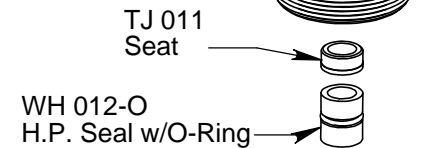


5. Insert Fill Tube (TJ 064) thru shaft seal in piston; pour viscous fluid (BJ 048-S) around fill tube about 1/2 inch deep.

6. Insert Shaft with bearings into Body and fill tube; allow shaft to push fill tube out of body. Viscous fluid should come up through the bearings.



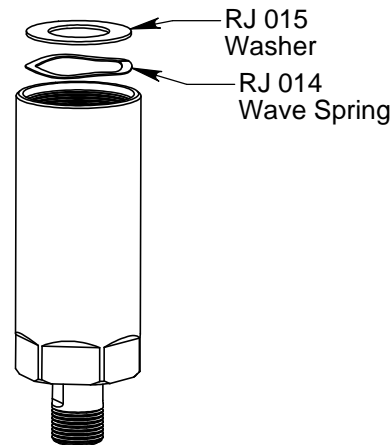
apply anti-seize



7. Install Wave Spring (RJ 014) and Washer (RJ 015) in the correct order. The viscous fluid level should cover these; if not, add more.

8. Install H.P. Seal (WH 012-O) and Seat (TJ 011) as shown in Section 6.0.

9. Apply anti-seize to threads of Inlet Nut and thread into Body.



6.3 TROUBLESHOOTING GUIDE

<u>SYMPTOM</u>	<u>PROBLEM</u>	<u>SOLUTION</u>
Leaks out weep holes	Worn H.P. seal Eroded seat Damaged inlet nut face	Replace H.P. Seal (WH 012) Replace Seat (TJ 011) Face or replace inlet nut
Seals wear out quickly	Worn seat Worn shaft bore	Replace if <.432" dia. Replace if bore >.444" dia.
Will not rotate	Not enough jet torque Internal damage Improper assembly	Check nozzles for plugging or wear Rotate head by hand, if rough to turn, check bearings Inspect and repair
Water inside tool	Bad H.P. Seal leak Worn shaft seals	Replace H.P. Seal Replace shaft seals

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: 91000000791
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
=====