



Models:

AccuValve On/Off Valve

A2 Cutting Head

DiaLine Cutting head



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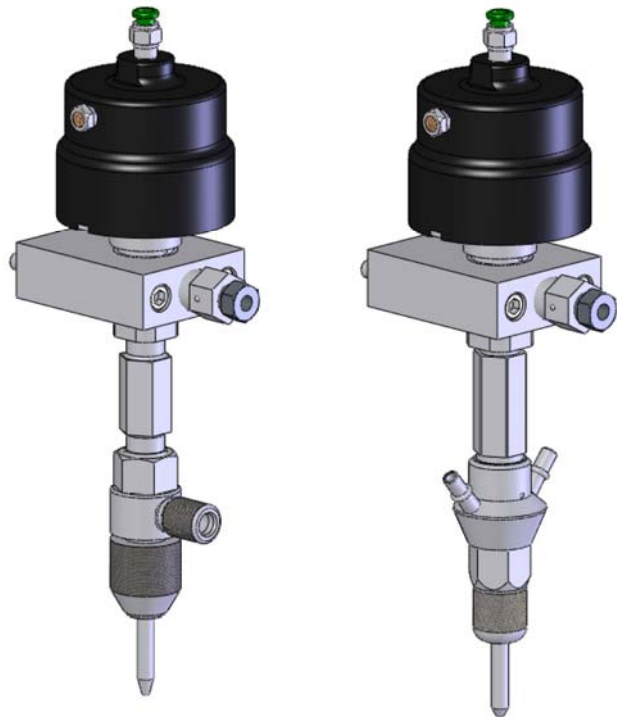
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1 Introduction

This manual describes the installation, use and maintenance of the AccuValve with the Accustream cutting heads. The valve is designed for flexible production in either pure water or abrasive waterjet cutting applications. The DiaLine head is available for use with either .281 or .300 OD nozzles while the A2 head accepts .300 OD nozzles. Both cutting heads contain a quick disconnect nozzle nut which can be hand tightened for the removal and adjustment of the nozzle.

AccuStream, Inc. reserves the right to change any product specification or information herein without notice.



AccuValve with the *DiaLine* cutting head.

AccuValve with the *A2* cutting head

Diamond Warranty

Accustream products are guaranteed to function properly. If there are any start-up problems, contact Accustream to resolve the issue.

Accustream diamond orifice assemblies come with a 500 hour limited warranty against manufacturer defect. Damage caused by contamination is not covered. To avoid in-line contaminants from damaging the diamond orifice assemblies, Accustream suggests using a thimble filter assembly.

Contact Information and Customer & Technical Service

At AccuStream, your purchase is only the beginning of our commitment to help you succeed. We believe that what happens after the sale is just as important as what happens before.

Customer Service Representatives are available to take your calls Monday through Friday 7:00 AM to 5:00 PM CST. If you need service after-hours AccuStream is also on-call 24 hours a day, 7 days a week to ensure your system is up and running around-the-clock.

For more information, please call Customer Service toll-free at **866-566-7099**.



2 Safety

2.1 Operation and Maintenance Safety

Failure to wear proper safety gear can result in personal injury or death. Safety shoes, hardhat, hearing protection and other personal protective equipment are strongly recommended.



High-pressure waterjet can cause eye injury. Wear eye protection when operating or working near the machine.



Wear ear protection when operating or working near the machine to reduce the risk of hearing loss.



Airborne contaminants or suspended particles may exist when cutting certain materials. Wear respiratory protection when these conditions are present.



WARNING

- Before starting any service or maintenance, to the valve and/or cutting heads ALL water pressure must be removed from the system.
 - Isolate the water pressure from the on/off valve by dumping the pump pressure or ***closing*** the manual isolation valve.
-
- Read the instructions in all sections of this manual before performing any maintenance on the valve. Important information is contained throughout this manual to minimize hazards and wear on the machine.
 - Use the proper tools required for specific procedures. When special tools are called for, make sure to use them because they are specifically designed to make the job easier and prevent damage to the equipment.
 - Remove all tools from the work area before starting the machine.



High Pressure Water System Safety

Never work on any high-pressure component or loosen any high pressure fittings without first bleeding the system to ensure that there is no high pressure water present. Follow all instructions and safety recommendations in this manual.



WARNING

Always avoid contact with the stream of water. Seek immediate surgical attention if you come in contact with any high pressure stream of fluid.

- Do not come in contact with the high pressure water. HP water can penetrate any part of the human body and cause severe infection or death if not treated properly. Seek immediate surgical attention if you come in contact with any high pressure stream of fluid.
- Do not try to repair a leak in an HP water fitting when the system is pressurized. A leak at a sealing surface can cause a hazardous spray of water. Shut off the motor and double check the HP water pressure is relieved down the drain before servicing any high-pressure plumbing.
- Plumbing supports and guides must be used for all HP tubing exiting the pump. Failure to do so can introduce excessive bending stress and fatigue through vibration causing a premature failure of the plumbing, and heighten the risk of personal injury due to an unexpected rupture.
- Always use two wrenches when tightening or loosening HP connections: one for the gland nut and one for the fitting. Using one wrench only will introduce excessive bending stress to the plumbing causing premature failure.
- Always use high-pressure piping that is rated for the pressures you will be operating with. This pump is capable of outputting 60,000 psi of water.
- Make sure all connections are properly tightened after performing service or maintenance.
- Keep hands and body away from pinholes and nozzles, which eject fluids under high pressure.
- Never check for hydraulic leaks with your hand: use a piece of cardboard or other material.
- Do not expose skin to a pressurized leak.
- Wear appropriate protective equipment including heavy gloves and safety glasses.
- Do not attempt to tighten or loosen any mechanical connection unless the machine is powered OFF and all system pressure has been relieved.



3 Inlet Cutting Water Requirements

The inlet water should have a pH of **6 to 8** and be clear, odorless, and free of biological materials.

The water quality should be analyzed to insure the incoming water will not have and adverse affect on the waterjet system.

The water quality analysis should measure for:

- pH
- Silica Content
- Total Dissolved Solids (TDS)

Most systems just need water softening to pre-treat the inlet cutting water. Poor water quality may require other types of treatments to remove the high levels of TDS. One approach is to have the local water conditioning company provide de-ionizing (DI) tanks on an exchange basis, or install a reverse osmosis (RO) system. The RO approach is best for high gallon-per-day users.

Water Treatment Guidelines:

High Quality Water	TDS < 50 ppm	No treatment required
Good Quality Water	50 ppm < TDS < 150 ppm	Soften only
Medium Quality Water	150 ppm < TDS < 250 ppm	Soften or TDS removal
Poor Quality Water	TDS > 250 ppm Silica > 15 ppm	TDS removal

NOTE: Do not treat to 0.5 ppm or less: Water of this high of purity is overly aggressive and will damage stainless steel components.



4 AccuValve On/Off Valve

The *Accustream On/Off Valve* (AccuValve) is an ultra high-pressure valve used to control the flow of water for waterjet cutting applications.

The On/Off valve is a normally closed (air to open, spring closed) valve that can be direct mounted to the cutting head for water or abrasivejet cutting see Mounting Collar (below), or it can be remote mounted with separate plumbing from the valve to the cutting head. The valve can also be remotely mounted on the cutting head.

4.1 Specifications

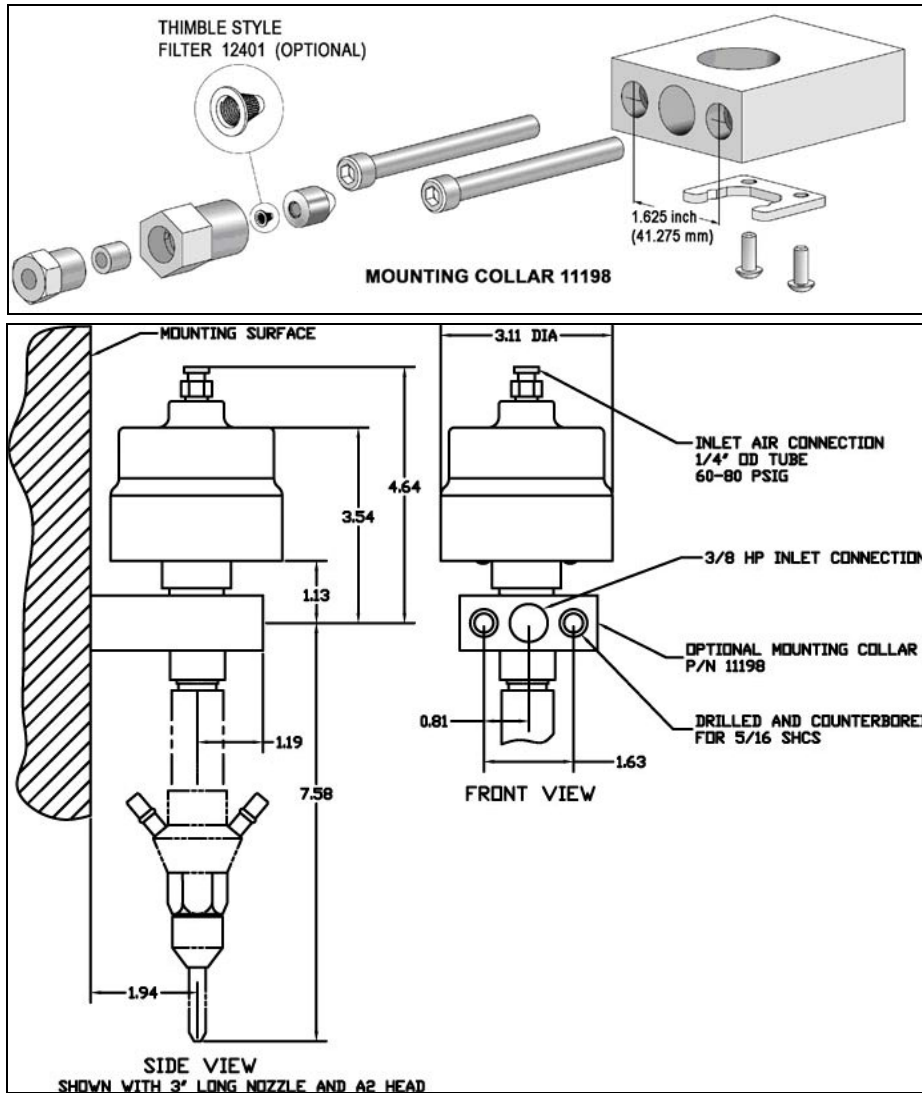
Fluid pressure	
Operating pressure	60,000 psi water max
Actuator Air Pressure	60-80 psi to open
Weight	
Valve Only	2.5 pounds
Valve w/Mntg Collar and Abrasive Head	5.5 pounds
Size	
Valve Only	3.1" dia x 5"
Valve with Abrasive Head	3.1" dia x 11.6"



4.2 Mounting Collar

Mounting Collar Installation

The AccuValve is normally mounted with the mounting collar assembly **11198** (shown below) using the 1/4" HP inlet connection. The *Thimble Filter* comes standard with the *Dialine* assembly. This filter can be purchased separately. Other mounting options are also available.



1. To install the mounting collar, transfer, drill and tap two 5/16-18UNC holes into the Z-axis faceplate.
NOTE: For proper alignment, the mounting holes must be 1.625 in. (41.275 mm) from center of holes apart. See illustration (above).
2. With the *adapter* and *seat* removed from the valve body, slide the valve body down into the collar and align the high-pressure water inlet hole with the collar.



3. Align the bottom of the seal *weep hole* with the top of the mounting collar. Carefully thread and tighten the inlet fitting into the side of the valve body.
NOTE: Make sure that the mating cones are properly aligned before torquing the connection.
4. Connect the inlet water connection to the inlet adapter. This connection is normally made with ¼" OD x .083 ID 60,000 psi rated stainless steel tubing. Tighten all high-pressure connections with a two wrench technique.
5. Connect regulated air pressure to the valve actuator.
6. Set the air pressure to **70 psi**. The valve actuator should be controlled with a 3-way solenoid valve. When the solenoid valve is energized, the actuator will pressurize and the actuator should exhaust when the solenoid valve is de-energized.
NOTE: When installing a new valve it is best to flush the lines at low pressure with the adapter and seat out of the valve body. This step is optional.
7. Put AccuGoop at the seat hole and on the mating surfaces. With water pressure off, turn on the actuator. This removes spring force from the needle.
8. Thread the adapter with the seat on top into the valve body. Tighten the adapter to the valve body with two wrenches.
9. Turn the actuator off, this will seat the needle into the seat.
10. Turn on the pump or open up the manual isolation valve to apply high-pressure water to the valve.
11. Flush the lines by actuating the on/off valve with brief pulses. After five to ten pulses, the lines should be flushed and free of contamination.

The cutting head can now be installed onto the adapter. See the Accustream cutting head manual.

4.3 Valve Body Maintenance

The valve consists of two parts; the actuator and the high-pressure valve area. The actuator can go for extended periods without service. The high-pressure valve components require service more frequently.

Valve Body Components

The needle, needle bearing, valve seal, and seat are the working parts of the high-pressure valve. These parts can be replaced either as a kit or individually as leaks occur.

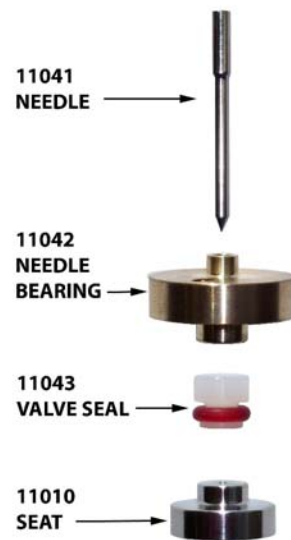
The AccuStream ON/OFF valve repair kit #11328 should contain the following parts.

11010-SEAT, 11041-NEEDLE, 11043-VALVE SEAL, 11042-NEEDLE GUIDE.

When to Install New Valve Components

- Replace the needle and seat when the nozzle tip is dripping.
- Install a new seal when the top weep hole in the valve body is dripping.
- Replace the Needle Guide when the fit between the guide and needle is loose. A worn guide ID may cause seals to fail due to ID extrusion.

*Dripping from the inlet water connection usually indicates that the connection is not tight enough.



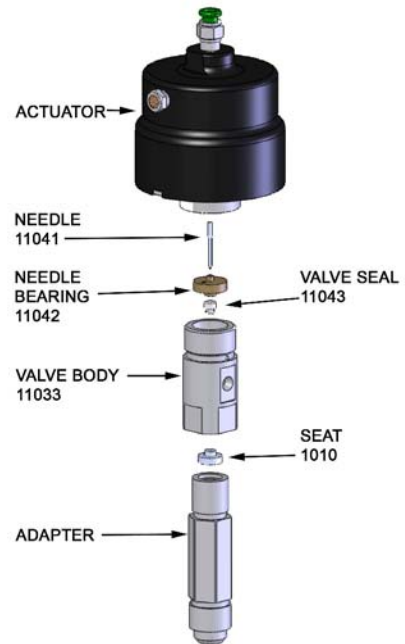


Removing the valve body components.

1. Isolate the water pressure from the **ON/OFF** valve by dumping the pump pressure or *closing* the manual isolation valve.
2. Turn the actuator **ON** and verify that there is **NO** water pressure.
3. With the actuator pressurized with air, **unthread** the adapter from the bottom of the valve body and remove the seat from the bottom.
4. Turn the air to the actuator **OFF** and **REMOVE** the airline from the top of the actuator.
5. **Unthread** the actuator from the top of the valve body.
6. With the valve body still in the mounting collar, **remove** the seal components by using the *seal removal tool 11205* and push up through the bottom of the valve body.
7. Thoroughly wash out the interior of the Valve Body before replacing components.
NOTE: The needle guide ID may have build-up of seal material at the bottom of the .093 dia section. After extensive use, this build-up may stop the needle from closing. If the Guide ID is going to be re-used, it must be cleaned. A .093 drill bit can be used, to manually remove this material.

Installing new valve body components.

1. Place the needle bearing over the needle with the needle going through the vent hole side.
2. Place the valve seal with the o-ring side out over the end of the needle.
3. Lubricate the o-ring on the valve seal and insert into the top of the valve body until the needle guide is flush to the top of the bore.
4. Thread (hand tighten) the actuator onto the top of the valve body. Reattach air to the actuator and turn actuator air pressure on to pull the needle valve up.
5. Apply AccuGoop to the surfaces at the top of seat and to the surface of the seat where the needle seats.
6. Place the seat into the pilot diameter at the top of the adapter and thread the adapter into the bottom of the valve. Torque the adapter to the valve using the two-wrench technique.
7. Turn off the air to the actuator.
8. Reapply high-pressure water to the valve and check for leaks.
9. Apply water pressure to the valve assembly to verify there are no leaks. Before installing the Cutting Head quickly cycle the Valve on and off a few times to purge all contaminants. Reinstall the Cutting Head and commence cutting.



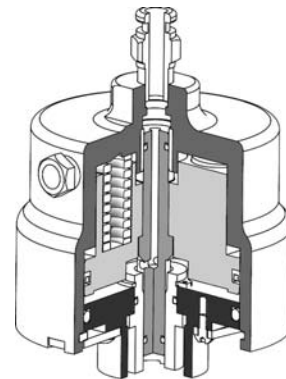


4.4 Actuator Maintenance

The actuator is not a regularly serviced item. It is recommended, that the actuator be disassembled **annually**. The actuator should be thoroughly cleaned and all the internal parts inspected for wear.

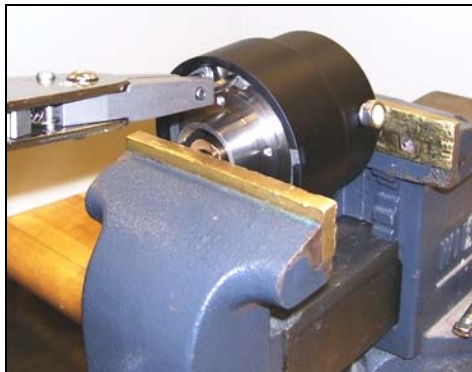
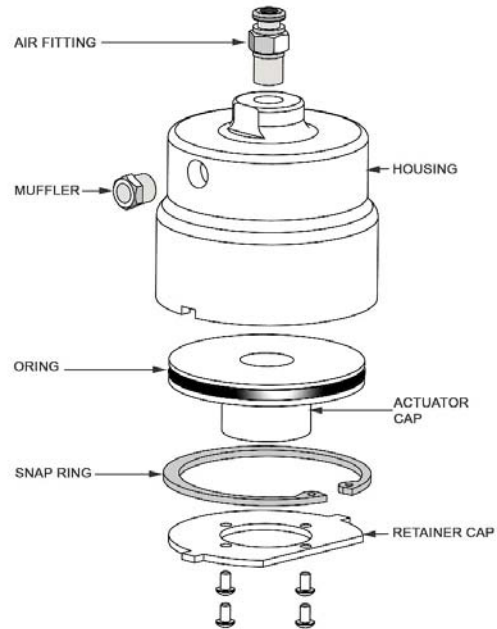
If the actuator does not appear to be functioning properly, first check the actuator for air leaks. There should never be air leaking from the bottom area of the actuator. With the jet on there should be no air leaking from the exhaust vent. Air leaks indicate that **o-rings** need to be replaced.

Over time, abrasives can accumulate inside the housing. The o-rings, will show wear and the springs may lose some of their force. Replace all worn parts: springs, exhaust vent, piston seal and o-rings.

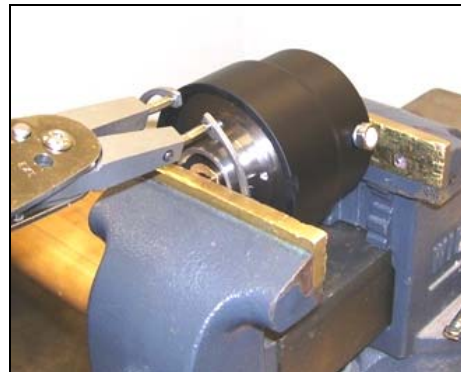


Actuator Housing Disassembly

1. Remove the air fitting from the top of the actuator.
 2. Remove the Retainer cap from the bottom of the actuator.
 3. Place the actuator in a large vise and tighten the vise just enough to apply slight compression to the actuator springs.
 4. Use a locking type snap ring pliers to close (compress) the retaining ring that secures the Actuator Cap into the Housing.
 5. Carefully open the vise while verifying that the Cap is coming free from the Housing.
- NOTE:** The actuator contains high force springs and should be serviced with caution!



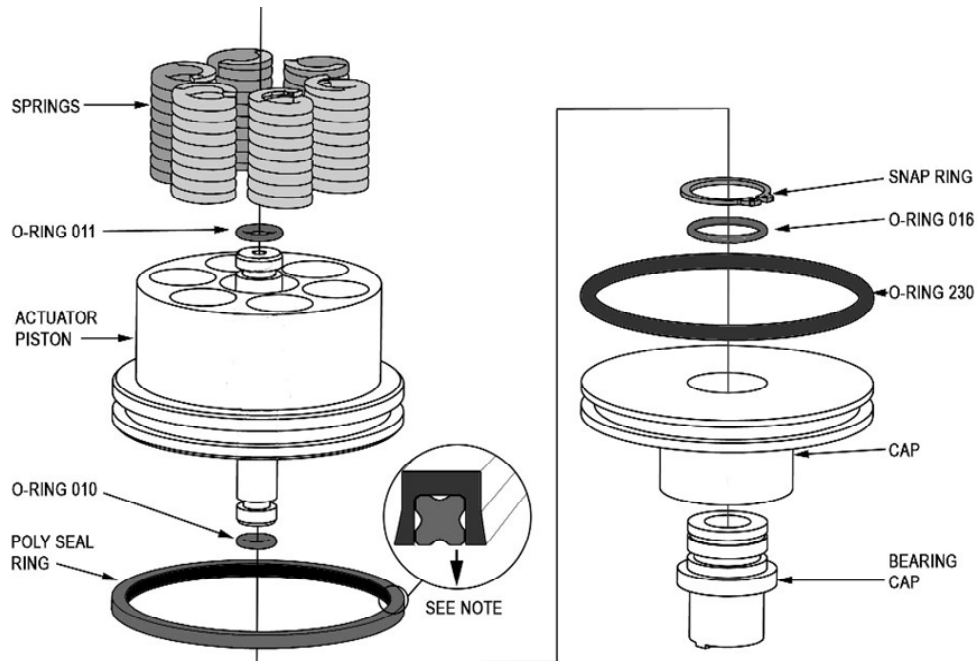
Valve in vise



Snap-ring removed



Actuator Housing Reassembly



Use the AccuValve Actuator rebuild kit.

1. Inspect and apply o-ring grease to the outside of all o-rings
2. Install the new O-rings on both ends of the shaft. Make note of the O-ring sizes and their location.
3. Install the Poly seal ring on the actuator piston with the *lip* on the seal facing in the right direction
4. Install the O-ring on the bearing cap
5. After inspecting and cleaning, replace at least: exhaust vent, two O-rings on the Actuator Shaft, 1 lip seal on Piston OD, and all six springs.
NOTE: The Poly Seal ring should be oriented on the piston so that the lip side of the seal is facing down toward the air cylinder area of the actuator.
6. Align the Retainer Cap tabs with the slots in the Housing.
7. Place the assembled parts with the **Retaining ring** in place, into a vise to hold the assembly together.
8. Tighten the vise until the outer diameter of the cap just aligns with the inner groove on the housing.
9. Squeeze the retaining ring with the snap ring pliers and insert the ring inside the groove in the housing body.
10. Release the retaining ring and let the ring snap into the groove.
11. Work the vise in and out slightly to ensure that the retaining ring is, seated securely.
12. Loosen the vise and remove the actuator.
13. Reattach the retainer cap to the bottom of the actuator.



Cutting Heads

The AccuValve may be used with either the DiaLine or A2 cutting head. The other options available include the carbide and rubber splashguards, water nuts, alternative adapters, ruby and diamond orifices, and many different nozzle sizes. Consult the Valve/Head option drawing for specific part numbers.

The key to effective operation is eliminating contamination above the orifice. Proper flushing and rinsing will maximize orifice life. Areas upstream from the orifice should be flushed and washed with water to eliminate any particles that can damage the orifices.

Caution: Verify that there is no water pressure in the valve before making any changes to the valve or its components.

4.5 DiaLine Cutting Head

The **DiaLine Cutting Head** is normally used with diamond orifices for improved cutting performance and superior life. Ruby orifices are also available. A new feature of the DiaLine cutting head is that the diamond orifice and mixing chamber are replaceable. The *Nozzle Nut* provides an additional alignment to the nozzle and helps in the removal of the nozzle if it is broken.

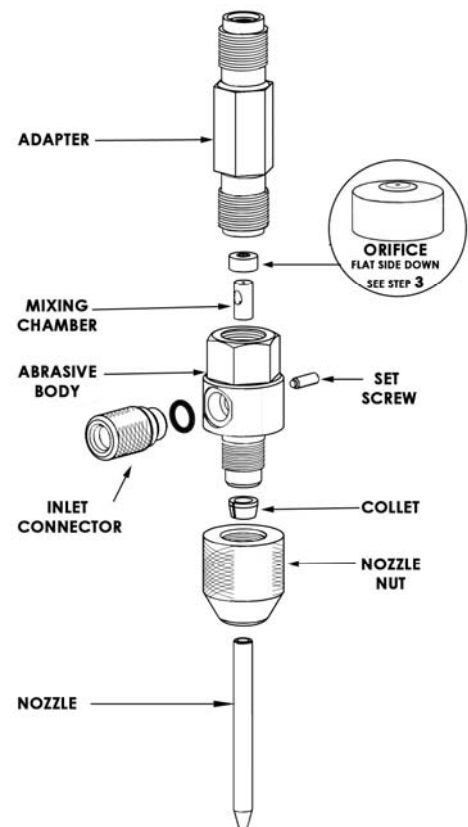
Installing the DiaLine Head

NOTE: Always use AccuGoop on metal-to-metal mating surfaces such as threads and the orifice retainer-adapter contact area.

1. Make sure that the top of the head and bottom of the adapter are clean, washed out if necessary.
2. Apply a light coat of HP lubricant such as AccuGoop to the bottom face and threads of the adapter.
3. Install the *Orifice Retainer* flat side down into the cutting head body. The top of the retainer has a slight conical shape and holds the jewel orifice. This side should still be visible after installing the orifice retainer.

NOTE: Installing the Orifice the wrong way will damage the orifice.

4. Thread the DiaLine head onto the bottom of the adapter and torque to seal.
5. Use 3/8" OD x 1/4" ID hose or tube for feeding abrasive into the head. Push the hose into the connector until it bottoms. The hose may feel tight and it may be necessary to put a light lubricant on the OD at its end.
6. Loosen the nozzle nut and slide the nozzle up until it bottoms-out in the abrasive body then re-tighten the nozzle nut.





Replacing the Mixing Chamber

The Mixing Chamber may require replacement after extended use. When the hole through the mixing chamber exceeds **.090** it should be replaced.

Removing the worn mixing chamber.

1. Remove the DiaLine Head from the Adapter.
2. Remove the orifice retainer, inlet connector, nozzle nut, and collet from the body. Unthread the setscrew by a few turns that holds the mixing chamber.
3. Push the mixing chamber up and out the top of the body with a **.250** dia. pin.

Installing the new mixing chamber.

1. The mixing chamber must be installed with the top of the chamber flush to the top of the bore.
2. Place the orifice retainer in the bore with the **cone side up** and hold it down with a finger.
3. Slide the new mixing chamber into the body up from the bottom until it is touching the bottom of the orifice retainer and align the abrasive inlet hole of the chamber with the inlet hole of the abrasive body.
4. Tighten the set screw to secure the mixing chamber.
5. Reassemble the DiaLine head and thread the head back on the adapter.

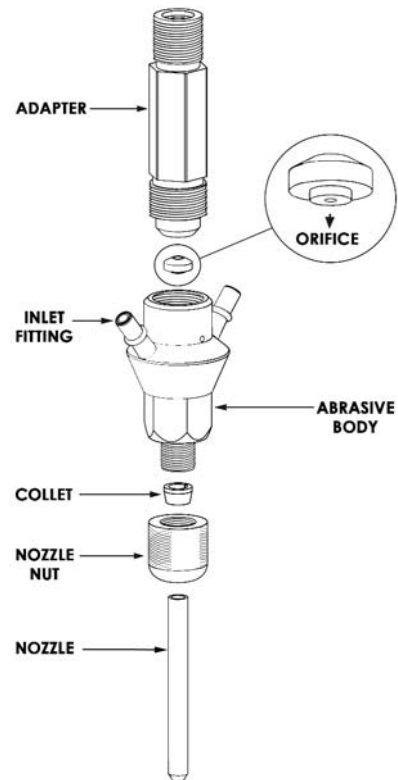
4.6 A2 Cutting head

The **A2 Cutting head** has two abrasive inlets to allow a connection to the head from either side depending on the system setup and configuration. A **nut** and **plastic collet** hold the nozzle in location.

Ruby orifices and **long life diamond orifices** are available. Diamond orifices include a *carbide wear disc* to protect the bottom of the orifice from abrasive wear.

Installing the A2 Cutting Head

1. Make sure that the top of the cutting head and the bottom of the adapter are clean, wash out if necessary.
2. Apply a light coat of HP lubricant such as AccuGoop to the bottom face and threads of the adapter.
3. Install the orifice retainer with the stepped diameter side down (cone side up) into the cutting head body.
4. Thread the A2 head onto the bottom of the adapter and torque to seal.
5. Use a 1/4" ID hose for feeding abrasive into the head. Push the hose onto one of the abrasive body *inlet fittings* until it is secured past the *ridge*. The other fitting must have a plastic cap installed.
6. Loosen the nozzle nut, slide the nozzle up until it bottoms-out in the abrasive body, and tighten the nozzle nut.





4.7 Replaceable Parts

Nozzle

The nozzle inner diameter wears from the top down. Nozzle life is a function of the orifice size used, quantity and type of abrasive used, and operating pressure. In the A2 head, it is recommended to rotate the nozzle 120 degrees each 8 hours of operation to even the wear on the inside of the nozzle. A list of readily available nozzles, are given below:

Orifice

The most commonly used orifices are, made from either clear or red *sapphire* (ruby). Ruby orifices are economical and can be used for a reasonable period providing the water quality is good. When a sapphire or ruby orifice shows a bad stream it is usually caused by small microscopic chips at the hole and it should be discarded and replaced. Using blown orifices may wear out the area of the abrasive body where the abrasive mixes with the water stream. *Diamond* orifices are also available if longer life is necessary. When diamond orifices give a bad stream they can often be fixed by cleaning them in an ultrasonic cleaner.

Handling:

The diamond orifice assembly is held in a precision pilot cavity. Sometimes the diamond orifice may stick inside the abrasive head. Stuck orifices can be removed from the head by blowing shop air in the *side abrasive inlet port*.

Filtration:

The 12533 Thimble Filter in-line filter, (optional) is strongly recommended to protect the orifice from *larger* particulates in the water. The assembly threads into the valve body just above the head and helps to protect the orifice from any damage. If in-line filters are not used it is imperative that the high-pressure lines be purged after any work on the pump or HP plumbing.

Clearing Plugged Nozzles

Plugged nozzles can be cleared by turning the nozzle upside down and carefully loading it up into the head and turning the jet on and off.

Adapter (Nozzle Tube)

After repeated use, the bottom surface of the adapter where it seals against the orifice retainer may become damaged. Applying AccuGoop to the top of the retainer will reduce or eliminate this problem.

Exterior abrasion

Repeated piercing can damage parts exposed to the bounce-back of the jet. A rubber shield that can slide onto the nozzle can be used for protection. These rubber shields can be purchased from Accustream or they can be cut out with the waterjet. There are two optional wear shields available. Part number 11361 is a rubber only guard and 11362 has a carbide faceplate applied to the rubber shield for extreme wear situations.



Waterjet/Abrasivejet Stream

The appearance of the waterjet stream will help show the condition of the nozzle and orifice. This will have an effect on the quality of the cuts. A good *water only* stream looks like a “stretched fishing line” along the first inch of its length.



Good Abrasivejet Stream



Good Waterjet Stream

Optimal Cutting Parameters

Orifice size

The most commonly used *orifice* sizes for water only are .005” and .006”. The most common orifice sizes for abrasive are .010 and .014. As a rule, the starting nozzle to orifice ratio should be 3 to 1.

Example: A .010” orifice should have a .030” ID nozzle. The following table gives the most commonly used nozzle combinations with their abrasive usage.

Nozzle and orifice combinations

Orifice	Nozzle	Abrasive (pounds/min)	Abrasive Mesh
.007	.020	.25	120 – 220
.009	.030	.4 - .6	80 – 120
.010	.030	.5 - .75	80 – 120
.013	.040	1.0 – 1.25	60 – 80
.014	.040	1.1 – 1.35	60 – 80
.015	.040	1.25 – 1.5	60 - 80

Typical combinations by pump size

Horsepower	Qty Heads	Orifice/Nozzle
30	1	.010/.030
30	2	.006 water
50	1	.014/.040
50	2	.010/.030
75	2	.013/.040
75	3	.010/.030
100	2	.014/.040
100	4	.010/.030
150	3	.014/.040
150	6	.010/.030

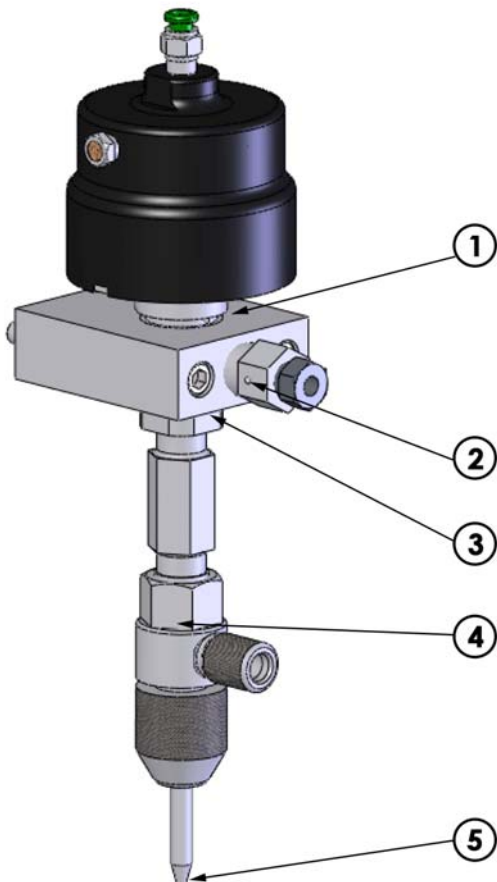


4.8 Troubleshooting

Cutting Head

Problem	Solution
Orifices do not last at least 20 hours	Not flushing thoroughly when changing orifice
	Bad water quality
	Blown in-line filter upstream
Nozzle Life too short or not wearing round	In the A2 head rotate nozzle 120° every shift or 8 hours
	Using too much abrasive.
	Running with worn orifice.
Abrasive not drawing into head properly	Vacuum leak, check inlet tube connection
	Smaller combinations such as .007/.020 may need to have the nozzle lowered about ¼" to induce more vacuum
Can't unplug nozzle	Put nozzle upside down in head and cycle jet on/off

Leak Points (Causes and Solutions)



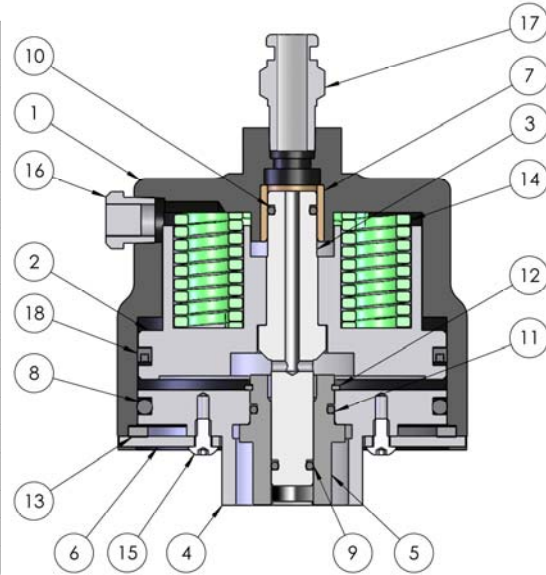
Item	Problem	Solution
1	Seal Weep hole.	Replace Valve Seal kit.
2	Inlet Weep hole.	Tighten inlet fitting.
3	Leakage at bottom of valve body.	Tighten adapter to valve body or tighten inlet fitting in collar.
4	Head Weep hole.	Tighten Head to Adapter.
5	Dripping Nozzle when valve closes.	Needle and Seat are worn and need new valve kit.



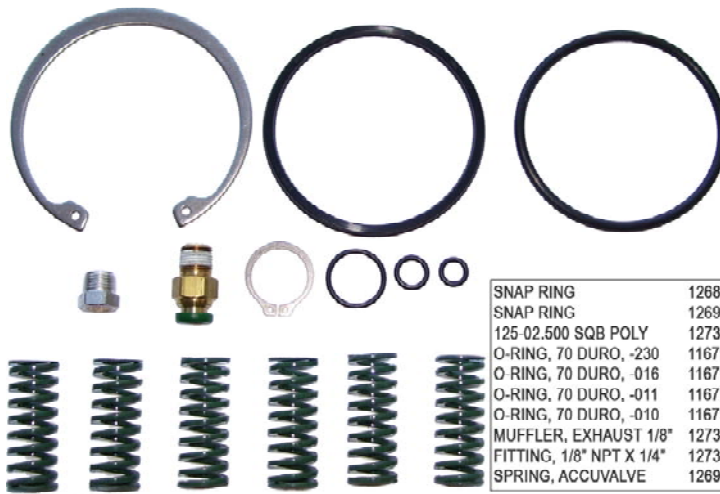
5 Drawings and Parts Lists

Actuator Assembly 12828

ITEM NO.	PART NUMBER	DESCRIPTION	Default/QTY.
1	11212	ACTUATOR HOUSING, ACCUVALVE	1
2	11213	ACTUATOR PISTON, ACCUVALVE	1
3	11029	ACCUVALVE SHAFT	1
4	11214	ACTUATOR CAP, ACCUVALVE	1
5	11034	BEARING CAP, ACCUVALVE	1
6	11211	RETAINER CAP, ACCUVALVE	1
7	12241	BEARING, ACTUATOR	1
8	11679-230	O-RING, 70 DURO, -230	1
9	11679-010	O-RING, 70 DURO, -010	1
10	11679-011	O-RING, 70 DURO, -011	1
11	11679-016	O-RING, 70 DURO, -016	1
12	91590A128_grv	SNAP RING	1
13	91580A265_grv	SNAP RING	1
14	12691	SPRING, ACCUVALVE	6
15	SBHCSCREW 0.138-32x0.25-HX-N	SOCKET BUTTON HEAD CAP SCREW, #6-32UNC X .25 LG	4
16	12735	MUFFLER, EXHAUST 1/8"	1
17	12736	FITTING, 1/8" NPT X 1/4" TUBE	1
18	12737	125-02.500-SQB POLY SEAL	1



Accuvalve Actuator Rebuild Kit 12686



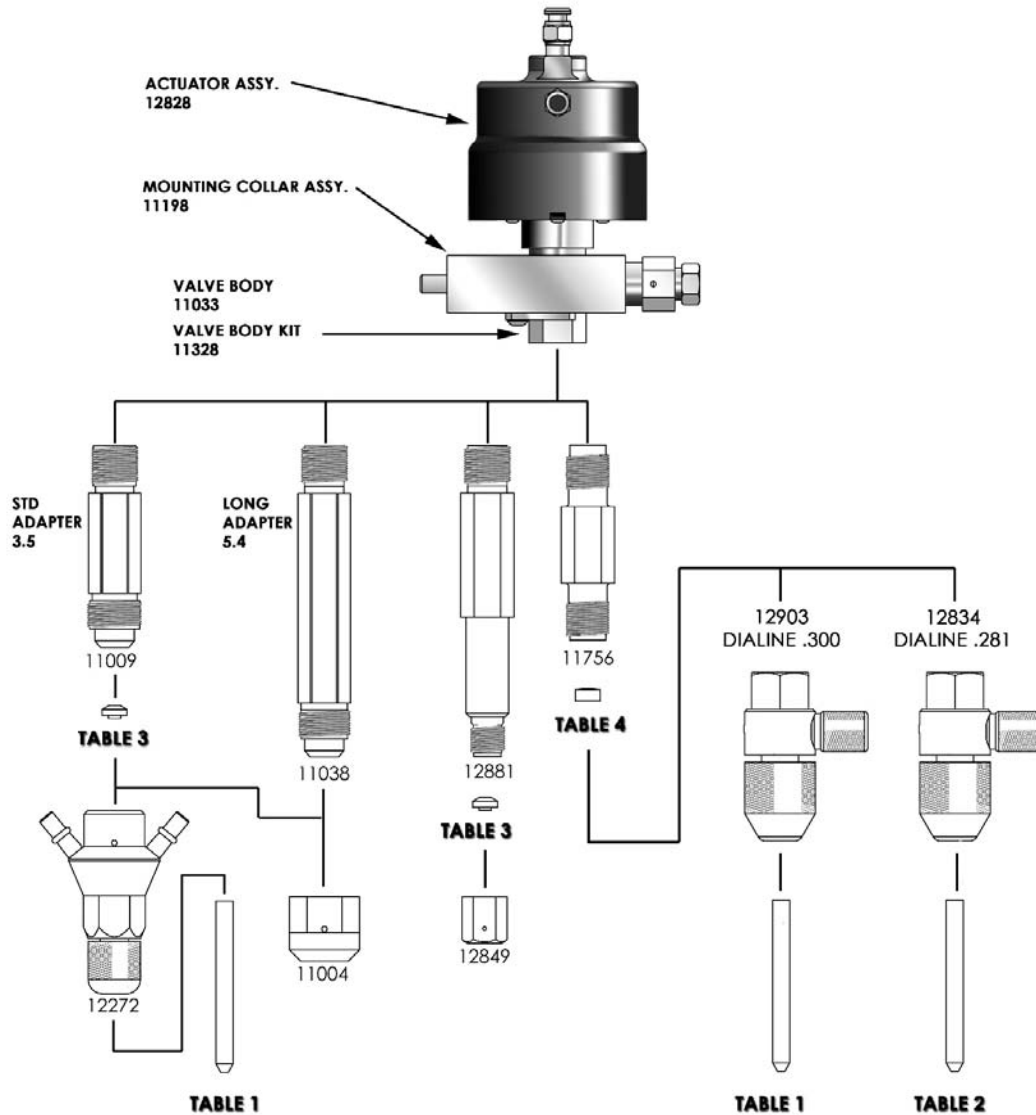


TABLE 1	
.300 Roctec 100 Long Life Nozzles	
11040-030	.300 x.030 x 3.000
11040-035	.300 x.035 x 3.000
11040-040	.300 x.040 x 3.000
11040-0304	.300 x.030 x 4.000
11040-0404	.300 x.040 x 4.000
11040-045	.300 x.045 x 3.000
.300 Roctec 500 Long Life Nozzles	
11040-020	.300 x.020 x 2.000
TABLE 2	
.281 Roctec 100 Long Life Nozzles	
11219-030	.281 x .030 x 3.000
11219-040	.281 x .040 x 3.000
11219-0304	.281 x .030 x 4.000
11219-0404	.281 x .040 x 4.000
.281 Roctec 500 Long Life Nozzles	
11277-020	.281 x .020 x 2.000
11277-030	.281 x .030 x 3.000
11277-040	.281 x .040 x 3.000
11277-0304	.281 x .030 x 4.000
11277-0304	.281 x .030 x 3.000
11277-0404	.281 x .040 x 4.000
TABLE 3	
AccuStream Standard Orifice	
11007-XXX	Ruby Orifice (Sizes .004-.018)
11007DA-XXX	Diamond Abrasive Orifice
11007D-XXX	Diamond (Water Only) Orifice
TABLE 4	
AccuStream Dialine Orifice	
12835-xxx	Ruby Orifice
12749-xxx	Diamond Orifice



AccuStream Cutting Systems