Jetstream®
Subsidiary of Federal Signal Corporation

MAGJET™ X40

(PN 64635)

PRODUCT INSTRUCTIONS

PI-162

The MagJet™ X40 is a self-powered rotating nozzle that uses two or four replaceable straight-pattern sapphire nozzles. These nozzles rotate at a controlled speed while producing concentrated streams to give you more cleaning power than a fan tip. The MagJet X40 comes equipped with an eddy-current braking system which controls rotation speed for maximum cleaning power and minimum wear. The MagJet X40 rotary seal is housed in an innovative, patented cartridge design which allows quick replacement in the field. The MagJet X40 is rated for 3,000 bar (43,511 psi) maximum working pressure.

Read these instructions thoroughly before installing, connecting, or using the MagJet X40. If any questions remain, call JETSTREAM at (800) 231-8192 or (832) 590-1300. Also read the yellow JETSTREAM SAFETY WARNING pamphlet included with the shipment of your new MagJet X40 and reproduced inside this publication. This product is sold with the understanding that the purchaser agrees to thoroughly train all operators and maintenance personnel in the correct and safe installation, operation and maintenance of the product and to provide adequate supervision of personnel at all times. Retain these instructions for future reference. If this product is resold or otherwise conveyed, purchaser must pass on the instructions to the new user.

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SECTION 1: SAFETY

⚠ DANGER

Incorrect Use of High Pressure Waterblast Equipment May Cause Serious Injury
Read these instructions in their entirety before using any JETSTREAM products.

This information was prepared to aid in the identification of potentially unsafe conditions when using high pressure waterblast equipment. It should be noted that other potential hazards may exist which might have not been mentioned in this brochure.

In all cases, JETSTREAM products are sold with the understanding that the purchaser agrees to thoroughly train all operating and maintenance personnel in the correct and safe installation, operation of maintenance of waterblast equipment and to provide adequate supervision of personnel at all times.

Read the following in its entirety before connecting, operating or repairing equipment. Purchasers and operators also should be familiar with the current version of the “Industry Best Practices for the Use of High Pressure Waterjetting Equipment” published by the Waterjet Technology Association, as well as any applicable OSHA regulations, standards and guidelines.

Should any questions arise concerning safe and proper procedure, contact JETSTREAM prior to the installation or use at (800) 231-8192 or (832) 590-1300.

GENERAL WATERBLAST

1. Use only clear, clean water in high pressure system.

2. Place barricades with warning signs or barricade tape around work area.

3. Outfit all operators with Personal Protective Equipment (PPE). Hard hat with plastic face shield, rainsuit, non-skid knee boots **with metatarsal protection,** gloves, ear protection and body armor rated for operating pressures are considered minimum safety equipment. Proper respiratory protection is required where dangerous fumes or dust is present or created by the waterblasting operation. Follow applicable OSHA regulations, standards and guidelines regarding the use of respiratory protection if harmful fumes or dust is present during, or created by the waterblasting operation.

4. Use products intended for high pressure waterblasting only.

5. No product should be altered without written consent of the manufacturer.

6. Read and follow all manufacturer's instructions prior to using any waterblast product. Contact manufacturer.

7. Thoroughly review alternative methods before initiating any potentially dangerous waterblasting operation. Fully automated, semi-automated, and/or mechanized methods should all be considered first. Contact the applicable waterblasting manufacturers for assistance and recommendations.

8. The operator handling the cleaning device (with nozzle) must always have control of water pressure. A surface cleaning operator should operate a trigger style control gun capable of instantaneously stopping pressure to nozzle. A tube cleaning lance operator should operate a foot gun capable of instantaneously stopping pressure to the lance.

9. Inspect the condition of all components prior to use. Use no items which are in questionable condition.

10. Check the condition of thread connections prior to the make-up of any high pressure connection. Use Teflon tape and anti-seize on male pipe (NPT) thread for sealing purposes. Do not let tape overlap the male pipe thread end. Tape fragments may enter system water stream and clog nozzle's orifices.

Do Not use a component with missing or damaged threads on the high pressure connections.

⚠ CAUTION Use wrench flats (when available) or a properly adjusted smooth jaw plier wrench (JS PN 64119) for tightening components. Avoid using pipe wrench as wrench marks will cause high pressure components to crack and fail.

11. All high pressure hose connections require a hose restraint (whip check), including connection at fluid end discharge.

12. Before attaching a nozzle to the control gun or tube cleaning lance, **operate the pump at low speed to purge** dirt and debris from system. **Dirt and debris can clog nozzle orifice(s) and cause excessive system pressure which could lead to a lance failure.**

13. With nozzle installed, **operate the pump at a low speed (low pressure) for test**. Should system repairs or adjustments be necessary, stop pump and relieve all pressure before making required repairs or adjustments. The pump operator should watch the nozzle operator at all times in case any difficulty arises and it becomes necessary to depressurize system. If the pump operator does not have a clear line of sight to the nozzle operator, it may be necessary to have another employee available to communicate between the nozzle and pump operators.

14. With the system operating properly, **increase pump speed slowly until operating pressure is reached**-and adjusted. Pressure adjustments should always be made slowly. The nozzle operator shall be warned before any pressure adjustment is made by the pump operator. A sudden change in reaction force may cause the nozzle operator to lose balance.

15. Use **minimum pressure required**-for cleaning. Do not exceed the operating pressure of the system's lowest pressure-rated component. All equipment pressure rating markers and warning tags should be left intact.

16. Waterblast operators must be made aware that the **cleaning nozzle's discharge jets(s) can inflict serious body wounds.** Supervisors should demonstrate the potential danger of discharge jet(s) by showing all new operators the effect of a waterjet by cutting a scrap piece of wood such as a 2" x 4".

17. If equipment malfunctions or a system malfunction is suspected, immediately stop cleaning activity and relieve the pressure in the system before attempting any repairs. Always follow the manufacturer's repair instructions.

18. Only trained persons should be authorized to perform any maintenance or repair.

19. Following any repairs, the system should be operated at low pressure for test. Bring equipment up to operating pressure slowly.

20. For shutdown in freezing conditions, even for brief periods, drain water from all components. Prior to starting operations in freezing conditions, the operation of all equipment components must be checked carefully to make sure components are not frozen and can be operated.

21. Store components properly by protecting them from damage when not in use. Be sure all safety warning tags and markers remain intact.

CONTROL GUNS AND DEVICES

1. **Read General Safety** section before connecting or using control guns or control devices.

2. Thoroughly review alternative methods before initiating any potentially dangerous shotgunning or hand lancing operation. Fully automated, semi-automated, and/or mechanized methods should all be considered first. Contact the applicable waterblasting manufacturers for assistance and recommendations.

⚠WARNING As described in the Industry Best Practices for the Use of High Pressure Waterblasting Equipment published by the Waterjet Technology Association, the standard shotgun barrel length shall be a minimum length of 48” to minimize the risk of nozzle discharge accidentally striking the operator’s feet, legs, or body. See Section 11.10.6. The WJTA has recognized that deviations or variances from these best practices may be acceptable under certain circumstances. See Section 2.7. If users believe deviation from this 48” standard is acceptable, they should follow procedures outlined in Section 2.7 to minimize risk to the operator. Among other things, users should ensure that other measures to perform the work have been considered and exhausted, senior safety management and customers have considered and approved the deviation, operators have been properly trained and warned about any increased risk associated with the deviation, and operators are wearing all appropriate PPE, including body armor rated for the operating pressure.

3. Prior to use, thoroughly check control gun or control device for

smooth and proper operation. Control guns and control devices should also be checked for proper operation before each operating shift. Do not use any control gun or control device that has not been checked before your operating shift.

4. A control gun operator using a hand-held gun should position and brace his body for the gun's rearward reaction force before depressing gun trigger. Gun's rearward reaction should be a maximum force of 40 to 50 lbs. (or 1/3 body weight of operator.) The control gun operator should maintain firm, solid footing to counter gun's rearward reaction.

5. The use of a Safety Shroud and a Safety Whip Hose with handheld control guns is strongly recommended for additional operator protection against a burst occurring in the high pressure hose connected to the gun. Use of Hand Grip and Shoulder Stock in hand-held control guns will provide greater operator comfort and safety.

6. Fall protection should be provided when blasting on scaffolding or sloping surface per OSHA guidelines. Do not operate a hand-held gun while standing on slippery surfaces.

7. The control gun operator should always start blasting with a low system pressure and slowly increase blasting pressure. Depress and release control gun trigger/pedal several times at operating pressure to check the control gun's operation before starting cleaning operations.

8. A dump type control gun should always open fully and reduce the system pressure to near zero immediately when its trigger/pedal is released. If this type of control gun does not relieve system pressure immediately or system pressure does not fall below 200 psi when trigger/pedal is released, do not use the control gun.

9. The control gun operator should never pass a control gun to another operator without first stopping the pump and water flow to the control gun. Passing off a control gun without first stopping system waterflow is dangerous because of possible accidental trigger actuation.

10. Do not use a control gun or control device that has malfunctioned or you suspect malfunctioned without having it repaired and/or thoroughly checked for proper operation by a qualified high pressure maintenance mechanic or your supervisor.

11. Do not use a control gun that does not have a trigger guard.

12. Never tie, wedge or clamp a control gun's trigger in the closed position.

13. All electric throttle control cords should be rated for wet conditions. All cord connections and switches should be kept out of water.

14. Any hose used for transporting dump water back to pump should have a large enough diameter and short enough length so that potentially dangerous back pressure is kept low. Protect hose from traffic.

15. Hand-operated control guns should never be used as foot-operated devices.

PRESSURE RELIEF DEVICES

1. Read General Safety section prior to installing Relief Valve and/or Pressure Relief Devices.

2. A waterblast system should include both primary and secondary pressure relief protection:

A. For primary protection a primary rupture disc assembly or spring-loaded relief set at 1.2 times, maximum operating pressure is recommended (i.e. relief valve is set at 12,000 psi if maximum operating pressure is 10,000 psi)

B. For secondary protection a rupture disc assembly containing a manufacturer's approved disc having a burst rating of 1.4 times maximum operating pressure is recommended.

⚠WARNING Only use a rupture disc holder which will NOT permit the use of coins or other objects in place of discs.

3. Relief devices should never be mounted so the discharge could strike personnel.

4. Never install a shut-off valve between the pump and relief device.

5. "Set pressure" must be prominently displayed on all relief devices. Never install or use a relief device unless its "set pressure" is known.

6. Do not attempt to correct a leaking relief valve by increasing spring tension as this will increase its set pressure.

7. Do not use a pressure relief valve as a combination relief and throttling device.

8. Keep relief valve dry during freezing conditions.

NOTE: Pressure relief devices are imperative for the protection of both operator and equipment from dangerous over-pressurization.

HIGH PRESSURE HOSE

1. **Read General Safety** section prior to connecting high pressure hose.

2. Do not use a high pressure hose with a burst rating less that 2.5 time the pressure at which it will operate. 10,000 psi operating pressure high pressure must have a minimum 25,000 psi burst rating. 8,000 psi operating hose must have a minimum 22,000 psi burst rating.

3. Do not use a high pressure hose that has an unknown burst rating or manufacturer's operating pressure rating.

4. Use of a Safety Shroud is strongly recommended for added safety where hose connects to control gun.

5. Use of hose restraint (whip check) is required at all hose connections, including connections at fluid end.

6. Always apply wrench to wrench flats when making threaded connections. Do not apply wrench on the end fitting ferrule (collar).

7. **Remove hose from service if:**

   A. Cover is damaged and reinforcing wires are exposed to rust and corrosion;

   B. Cover is loose, has blisters or bulges;

   C. Hose has been crushed or kinked;

   D. End fitting shows evidence of damage, slippage, or leakage.

   E. Hose has been exposed to pressures greater than 50% of burst rating; or

   F. Hose is three or more years old, regardless of condition.

8. Disconnect, drain, coil and store hose properly after use.

9. Never attempt to repair or recouple high pressure hoses in field. High pressure hose end fittings are the permanently crimped type and can only be properly installed with hydraulic crimping equipment.

NOZZLES

1. **Read General Safety** section.

2. Nozzle flow ratings must be compatible with pump discharge and pump pressure rating. (See Nozzle Flow Rating Chart on page 30.)

3. Use only nozzles with a manufacturer's pressure rating of at least the operating pressure or a burst rating or no less than 3.0 times the

desired operating pressure.

4. Prior to installation, make sure the nozzle has no clogged orifices.

5. Apply 3 - 4 wraps of Teflon tape to male connection threads on the nozzle. Apply anti-seize compound over the sealant tape for additional protection against galling in connection threads. Wrench connection 1 1/2 - 2 turns past hand tight. A minimal thread engagement of four (4) threads should exist on all Jetstream NPT pipe connections.

6. ⚠ **CAUTION** Use wrench flats (when available) or a properly adjusted smooth jaw plier wrench (JS PN 64119) to tighten nozzle. Avoid using pipe wrench as wrench marks will cause nozzles to crack and fail.

7. Blocked orifice(s) can cause excessive system pressure and failure. If orifice(s) appear clogged or partially blocked with dirt or debris, remove nozzle from J-Force and clean immediately.

8. Remove nozzle from service if:

A. Nozzle is split or damaged;

B. Nozzle sidewall is worn by more than 25% at any point;

C. Nozzle's ability to hold pressure is questionable

D. Threads are missing or damaged

HIGH PRESSURE FITTINGS

1. Read General Safety section prior to installing fittings in system.

2. Use non-brass or non-cast iron fittings which are made for high pressure waterblast use.

3. Use only high pressure fittings which are clearly marked with the operating pressure.

4. High pressure fittings should have a known burst rating of not less than 3.0 times system operating pressure. Never use a damaged or corroded fitting or one with damaged or missing threads.

5. Use only high pressure rated fittings and hose in the waterblast system. For 10,000 psi waterblast service all fittings and hose should have a minimum burst rating of 25,000 psi; for 15,000 psi service they should have a minimum burst rating of 37,500 psi; for 20,000 psi service they should have a minimum burst rating of 50,000 psi.

6. Use wrench flats (when available) or a properly adjusted smooth jaw plier wrench (JS PN 64119) to tighten fittings. Avoid using pipe wrench as wrench marks will cause high pressure fittings to crack and fail.

REPLACEMENT PARTS

1. **Read General Safety** section prior to repairing equipment and installing replacement parts.

2. Only trained persons should be authorized to perform maintenance or repairs to equipment.

3. Read and follow all manufacturer's repair instructions. All tool, torque, clearance and lubrication recommendations should be followed.

4. During replacement of any part, inspect mating part for wear and replace if necessary.

5. Do not attempt to install or use a part whose dimensions, clearances, function or use are suspect.

6. Test repaired equipment carefully and thoroughly before putting it into service. Do not put any piece of repaired equipment into service if its performance is questionable. If repaired equipment performance is questionable, call manufacturer of repair parts for assistance.

This section includes information from the yellow JETSTREAM SAFETY WARNING pamphlet (PI-082).

SECTION 2: PRODUCT DESCRIPTION

The MagJet™ surface cleaning nozzle is a self-powered rotating nozzle that uses two or four straight-pattern sapphire nozzles. These nozzles rotate at a controlled speed while producing concentrated streams to give you more cleaning production than a fan tip.

The MagJet has an eddy current magnetic braking system which controls rotational speed for maximum cleaning and minimum wear.

⚠ WARNING This system contains several high-energy, rare-earth magnets that produce a magnetic field. Persons with a pacemaker or other electronic medical device must use extreme caution when handling or in close proximity. It is recommended that a minimum distance of 6 inches (152mm) be maintained at all times between the MagJet and any electronic medical devices.

The MagJet is designed to be completely rebuilt in the field in less than five minutes. It comes standard with an aluminum cover which protects the rotating head and nozzle tips from abrasion to help protect your investment.

⚠ CAUTION The use of gloves is recommended when handling the tool after operation as the body may reach temperatures greater than 200°F.

The MagJet is rated up to 3000 bar (43,511 psi). The maximum working pressure is stamped on the main body of the nozzle.

Product Specifications

Model Name	MagJet X40 (PN 64635)
Maximum Operating Pressure (psi)	44,000
Minimum Operating Pressure (psi)	30,000
Maximum Flow (gpm)	11.0
Maximum Operating Pressure (bar)	3000
Minimum Operating Pressure (bar)	2070
Maximum Flow (l/min)	26.5
Inlet Connection	9/16" HP Female
Speed Range (rpm)	1000 - 2800
Nozzle Types Accepted	UHPX, UHPXD, UHPXi
Diameter (in)	2.25"
Length (in)	9.37"
Weight (lbs)	4.0
Diameter (mm)	57.15
Length (mm)	238.00
Weight (kg)	1.8

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SECTION 3: PREPARATION FOR USE

3.0 BEFORE PUTTING MAGJET X40 INTO SERVICE

NEW MAGJET X40

3.1 Check the MagJet X40 carefully upon removal from its shipping container for damage.

3.2 A new MagJet X40 is shipped assembled with exception of the nozzles. The tool is ready to use upon installation of nozzles per instructions in Section 4: Setup.

3.3 Review nozzle charts in the Appendix to determine proper flow rates for each application.

PREVIOUSLY USED MAGJET X40

Before installing the MagJet X40 onto control gun:

3.4 Inspect all components. The MagJet X40 rotating nozzle head should turn by hand with minimal resistance.

3.5 The MagJet X40 should be inspected and cleaned to ensure that no debris has entered an orifice that could plug the nozzle and over-pressurize the system.

SECTION 4: SETUP

4.0 CONNECTING MAGJET X40

The MagJet X40 must be used with a minimum control gun barrel length of 48 inches to prevent nozzle discharge from accidentally striking the operator's feet, legs, or body.

4.1 Prior to installing the MagJet X40 onto the control gun barrel, engage the pump and depress the control gun trigger to clear any debris from the system.

The MagJet X40 uses a 9/16" HP FML inlet connection. Apply anti-seize compound to the gland threads and cone on the male end of the adapter.

NOTE: Do not use Teflon tape.

Install the MagJet X40 onto the adapter and tighten to 50 lbs. ft.

4.2 NOZZLE INSTALLATION

Before installing the nozzles into the MagJet X40, verify each nozzle is the correct size, and inspect each nozzle to ensure the sapphire orifice is not damaged or missing. Make sure the nozzle orifices are not too small in order to prevent excessive system pressure when the gun's control valve trigger/pedal is depressed. Refer to the charts in Appendix B for the proper flow rate and thrust for your application.

NOTE: The MagJet X40 may be configured with either four nozzles or two nozzles and two plugs. For a given flow, the larger streams obtained by using the two-nozzle configuration may be preferred for some cleaning applications.

1. Use a 5/32" hex key to remove the bolt holding the head cover in place to allow access to the nozzle ports in the head.
2. Apply anti-seize compound to the male threads of the nozzle or plug

(and cone if using UHPX nozzles) and install using an adjustable or 5/16” wrench. Hand tighten to 50 lbs. in.

3. Apply medium strength Loctite to the threads of the bolt and reinstall the head cover. Screw in an torque the bolt to 100 lbs. in.

⚠ WARNING

- A Multi-Gun Valve or similar system must be used when two or more dump gun operators are connected to a single waterblast unit. Each gun operator must have independent control of nozzle pressure at their location.
- Do not exceed flow in chart for operation with specific head, nozzle, and pressure configuration. The MagJet X40 should only be operated in the specified regions of the chart or it will over speed. Over speeding the tool will cause it to heat up and fail bearings and magnets.

SECTION 5: OPERATION

⚠ IMPORTANT Water cleanliness is very important. A filter no larger than 10 microns should be used on the water supply inlet.

5.1 Use only thoroughly trained operators to perform cleaning operations with the MagJet X40.

5.2 Do not connect multiple dump type control guns together to a single high pressure water source without the use of a Multi-Gun Valve (MGV) to make each gun operator independent of the other operators. Call Jetstream for assistance if two or more dump type control guns must be used in the waterblast system.

5.3 The gun operator must be made aware that the MagJet X40 nozzle's discharge jet(s) can inflict serious body wounds.

5.4 Carefully inspect the gun for damage or missing parts. Make sure all components work smoothly and freely.

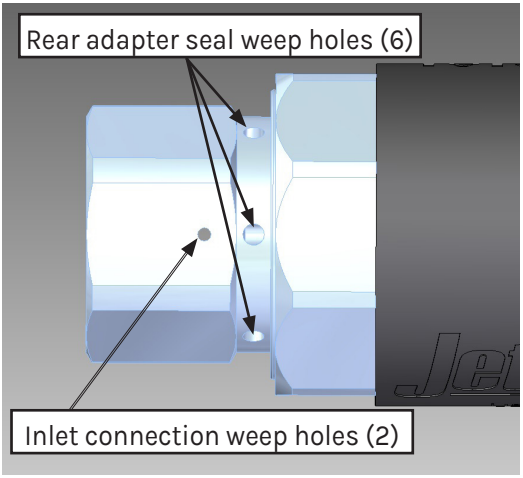
5.5 Place barricades with warning signs or barricade tape around work area. This includes the waterblast unit and all high pressure hoses.

5.6 The gun operator must be outfitted with safety apparel. The minimum: hard hat with plastic face shield, rainsuit, steel toe non-skid boots, shin and foot guards and non-slip gloves.

5.7 Before starting to blast, check for correct barrel length (48"). Get into blasting position with the gun. Move the gun around to make sure the blast nozzle cannot cross any part of the legs, feet or body. Check gun for smooth and proper operation. DO NOT use the gun or MagJet X40 if it has not been cleaned and inspected before the start of the working shift.

With the pump running, begin blasting at 40K psi with the gun held in a horizontal position and no target close by.

While the nozzle is operating, visually check the nozzle head for correct rotation speed and watch the weep holes located at the rear of the body. A single drip from one of the six weep holes located around the rear adapter once every 5-10 seconds is not cause for concern. But a constant stream requires a cartridge replacement. Any drips from the two rearmost weep holes indicates a leak at the inlet connection.



If a leak persists even after a cartridge replacement, the main shaft female cone may be damaged and require replacement. (A new cartridge may drip and will require a high pressure cycle - on/off a few times - to get the cartridge shaft to seat to the main shaft. If this does not stop the leak, use a small tool to push on the rear of the cartridge shaft to press the small shaft into the main shaft.) See Section 7.0, Troubleshooting, for more information.

5.8 Protect the control gun in freezing conditions. Stop using the gun if any low temperature operational problems occur. Drain the gun and remove its cartridge if it is not in use in freezing conditions.

SECTION 6: SERVICE

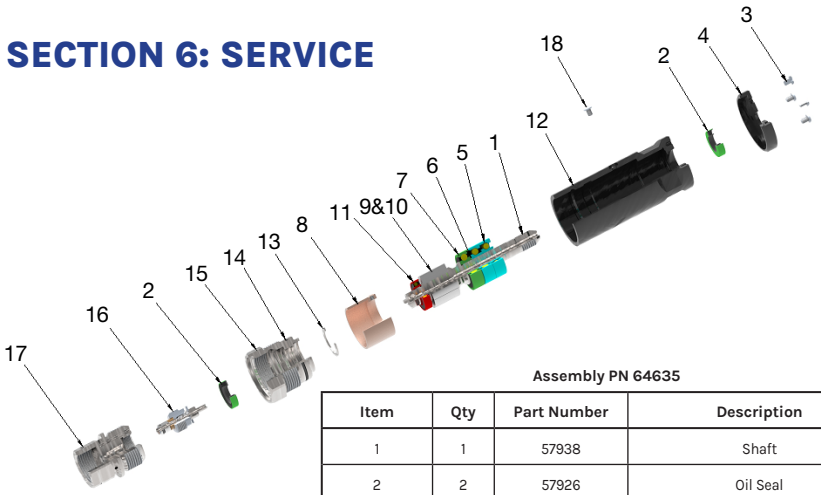


Figure A

Assembly PN 64635

Item	Qty	Part Number	Description
1	1	57938	Shaft
2	2	57926	Oil Seal
3	4	64637	Capscrew, #8-32
4	1	64638	Front Cover
5	2	57933	Angular Contact Bearings
6	1	64992	Shim. Spring Steel
7	1	64991	Deep Groove Ball Bearing
8	1	57937	Current Sleeve
9	4	65005N	North Magnet
10	4	65005S	South Magnet
11	1	57928	Pilot Bearing
12	1	64636	Main Housing
13	1	57931	Wave Spring
14	1	57935	O-ring, 1-1/2 ID
15	1	57918	Pilot Bearing Retainer
16a-16d*	1	57911	Seal Cartridge
16a	1	57910	Retainer
16b	2	57924	Pin
16c	1	58208	Mandrel
16d.1-16d.5*	1	65445	Seal Kit
16d.1	1	27052	O-ring
16d.2	1	57909	Bushing
16d.3	1	57923	Retaining Ring
16d.4	1	58140	H.P. Seal
16d.5	1	58922	Washer
17	1	57916	Seal Cartridge Housing
18	1	66982	Capscrew, #8-32, Security

NOTE: Part numbers and descriptions are subject to change without notice.
*Parts breakdown for seal cartridge and seal kit can be seen in Appendix B

6.0 MAGJET X40 MAINTENANCE

6.1 REPLACING THE SEAL CARTRIDGE (PN 57911)

⚠ CAUTION The use of gloves is recommended when handling the tool after operation as the body may reach temperatures greater than 200°F.

1. Unscrew and remove the Seal Cartridge Housing (PN 57916) from the Pilot Bearing Retainer (PN 57918).
2. Unscrew the Seal Cartridge Retainer (PN 57910) from the Seal Cartridge Housing (PN 57916).
3. When the Seal Cartridge Retainer (PN 57910) is fully unscrewed, pull it out of the Seal Cartridge Housing (PN 57916) to remove the Seal Cartridge Assembly (PN 57911).
4. Before install the new Seal Cartridge Assembly (PN 57911), apply nickel anti-seize compound to the Seal Cartridge Retainer (PN 57910) thread and o-ring Lubricant to the o-ring on the plastic seal of the Seal Cartridge Assembly (PN 57911).
5. Push the new Seal Cartridge Assembly (PN 57911) into the Seal Cartridge Housing (PN 57916) and begin threading the Seal Cartridge Retainer (PN 57910) into the Seal Cartridge Housing (PN 57916) by hand.
6. Tighten and torque the Seal Cartridge Retainer (PN 57910) to approximately 40 lbs. ft.
7. Thread the Seal Cartridge Housing (PN 57916) back into the Pilot Bearing Retainer (PN 57918) and tighten with a wrench. Rotate the head assembly as the Seal Cartridge Housing is being screwed into the Pilot Bearing Retainer to ensure that the anti-rotation pins in the mandrel of the seal cartridge do not bind with the anti-rotation tabs at the end of the shaft.

See YouTube for videos showing the MagJet X40.

YouTube https://www.youtube.com/user/JetstreamWaterblast

SECTION 7: TROUBLESHOOTING

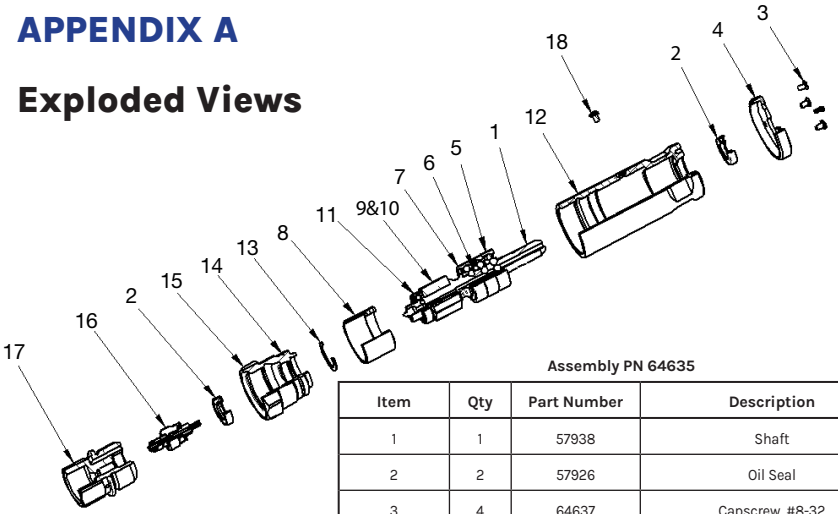
7.0 MAGJET X40 TROUBLESHOOTING

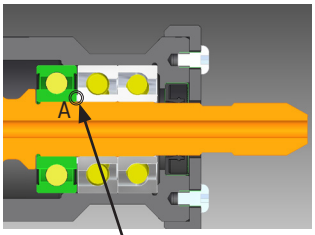
Problem	Remedy
The nozzle leaks from all weep holes of the seal housing.	**Note:** Pressure is required to push the seal cartridge mandrel into the shaft to create a seal, so some leakage at low pressure is normal and expected. During operation, some leakage from the bottom weep holes of the seal housing is normal during the life of the seal cartridge. If a stream of water is leaking continuously from all of the weep holes of the seal housing, including the top hole, the seal cartridge should be removed for inspection. There are several potential causes if leakage is noted from all weep holes: • Loose cartridge nut: Excessive leakage will occur if the seal cartridge was not torqued properly during installation and comes loose during operation. Reinstall the seal cartridge and torque to 40 lb-in. • High-pressure seal failure: Inspect the plastic seal of the seal cartridge. If the inner diameter of the plastic seal is severely jetted at the front where it seats into the bronze backup bushing, the seal has failed. Replace the seal cartridge. • Damaged mandrel tip and cone in shaft: Inspect the tip of the mandrel for damage from jetting. If damage has only occurred to the tip of the mandrel, but not to the conical mating surface in the shaft, replacing the seal cartridge may correct the problem. If the shaft is damaged and will not seal with a new mandrel, the tool will need to be rebuilt with a new mandrel. This may occur as a result of normal wear at the end of the life of the tool as a result of many seal cartridge changes, or as a result of extended operation with a loose seal cartridge that leads to jetting between the mandrel and shaft.

Problem	Remedy
The nozzle head will not spin, or spins inconsistently.	Possible causes: • Nozzle orifices sized incorrectly: Ensure that the nozzle orifices are sized correctly. If the orifices are too small for a given operating pressure, the orifices may not generate enough torque to rotate the nozzle head. • Failed Seal Cartridge: If the nozzle has been operating normally, but stops spinning, inspect the seal cartridge. At the end of the life of the seal cartridge, material from the plastic seal can sometimes flow between the mandrel and bushing and prevent the mandrel from spinning. • Damage to the bearings or other internal mechanical damage: If any scraping or mechanical interference is noted, the nozzle will need to be disassembled and inspected. The tool may need to be rebuilt with a new shaft if severe damage is found. • Angular contact bearing installed backward.
Excessive vibration	Possible causes: • Nozzle orifice sizes not balanced: Nozzles should be installed in pairs with the nozzle on the opposite side of the head the same size. • Nozzle orifice is blown out or clogged: If one or more of the nozzle orifices is damaged or obstructed, excessive vibration may occur from the resulting imbalance.
Nozzle head spins too fast	• Nozzle orifices sized incorrectly: Ensure that the nozzle orifices are sized correctly. If the orifices are too large for a given operating pressure, the head will spin too fast and can damage the seal cartridge, magnets, and bearings. • Magnets damaged: when the tool has been run at excess speed, the heat generated can damage the magnetic braking system, causing the tool to further over speed.

APPENDIX A

Exploded Views





Note direction of angular contact bearings

DETAIL A

Shim (PN 64992) must be installed here

Figure B

Assembly PN 64635

Item	Qty	Part Number	Description
1	1	57938	Shaft
2	2	57926	Oil Seal
3	4	64637	Capscrew, #8-32
4	1	64638	Front Cover
5	2	57933	Angular Contact Bearings
6	1	64992	Shim. Spring Steel
7	1	64991	Deep Groove Ball Bearing
8	1	57937	Current Sleeve
9	4	65005N	North Magnet
10	4	65005S	South Magnet
11	1	57928	Pilot Bearing
12	1	64636	Main Housing
13	1	57931	Wave Spring
14	1	57935	O-ring, 1-1/2 ID
15	1	57918	Pilot Bearing Retainer
16a-16d*	1	57911	Seal Cartridge
16a	1	57910	Retainer
16b	2	57924	Pin
16c	1	58208	Mandrel
16d.1-16d.5*	1	65445	Seal Kit
16d.1	1	27052	O-ring
16d.2	1	57909	Bushing
16d.3	1	57923	Retaining Ring
16d.4	1	58140	H.P. Seal
16d.5	1	58922	Washer
17	1	57916	Seal Cartridge Housing
18	1	66982	Capscrew, #8-32, Security

NOTE: Part numbers and descriptions are subject to change without notice.
*Parts breakdown for seal cartridge and seal kit can be seen in Appendix B

Parts Placement

MagJet X40 available in hard case kit form:

- PN 65306 MAGJET T3 STARTER KIT
- PN 66236 MAGJET T4 STARTER KIT
- PN 65308 MAGJET T5 STARTER KIT
- PN 66237 MAGJET T6 STARTER KIT
- PN 65307 MAGJET T3/T5 PREMIUM KIT
- PN 66238 MAGJET T4/T6 PREMIUM KIT

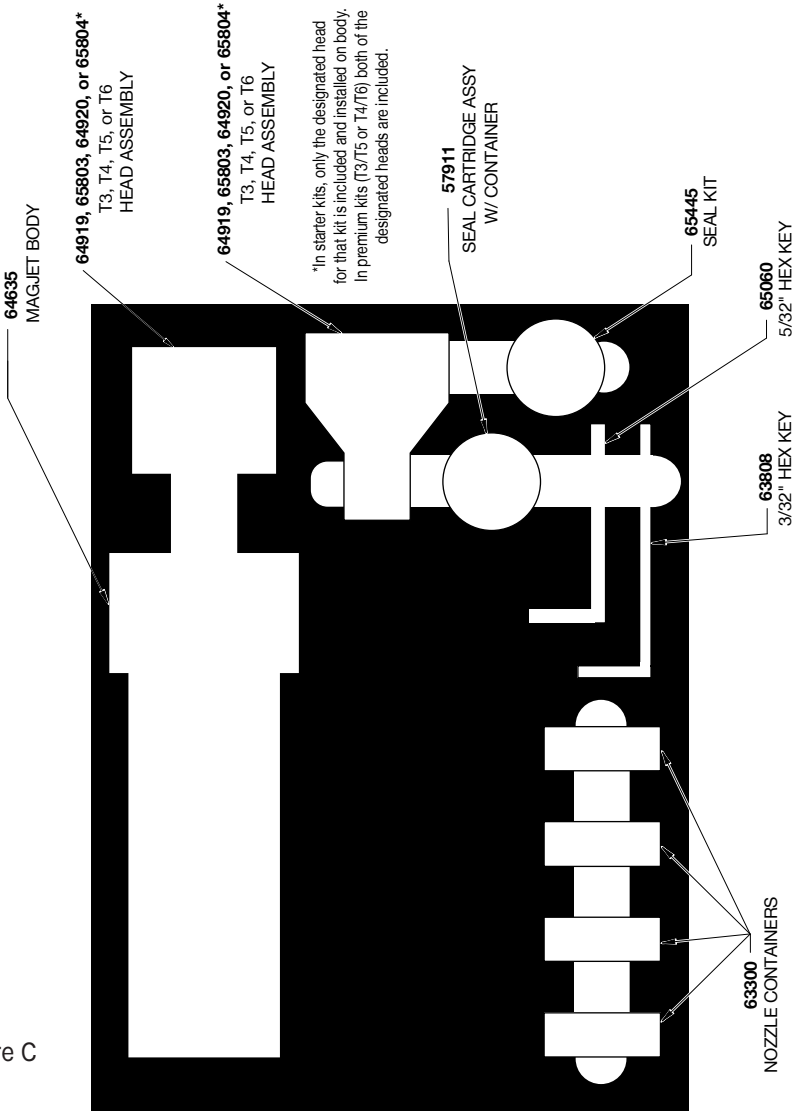


Figure C

APPENDIX B

Accessories

UHPX / UHPXi / UHPXD Nozzle

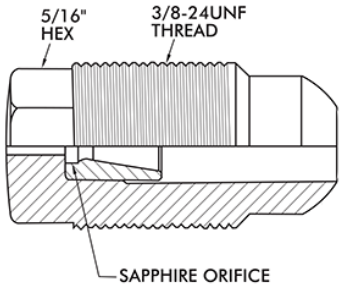


Figure D

- High-productivity sapphire nozzles designed for the MagJet X40.
- Tapered orifice retainer reduces turbulence and provides a cohesive, aggressive waterjet.
- Sapphire orifices are more durable than carbide.
- UHPX have a 5/16” external hex and UHPXi have a 5/32” internal hex. **Note:** UHPXi nozzles are not flush.
- Plug PN UHPXi-PLUG
- UHPXD are premium synthetic diamond nozzles lasting up to 10x longer than sapphire orifices.

Head Assemblies

Figure E

- Multiple head assemblies are available so that the desired rotation speed can be maintained across a wide range of flow rates.
- The provided flow charts may be used to help determine which head is most appropriate for a given pressure and flow.

Seal Cartridge/Seal Kit

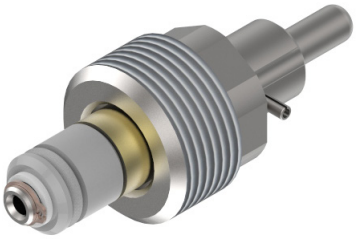
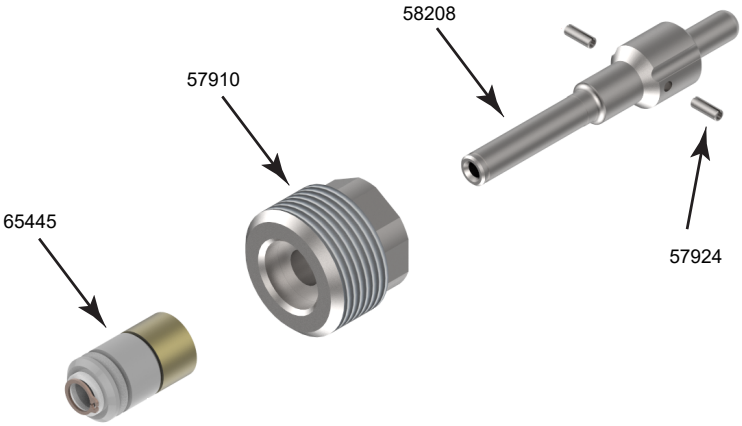
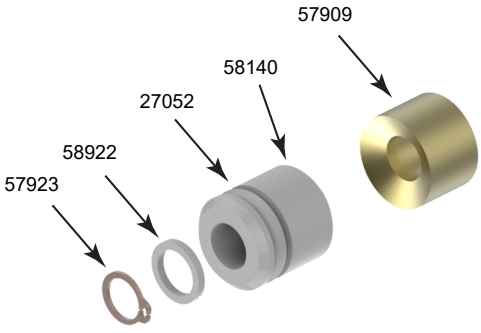


Figure F

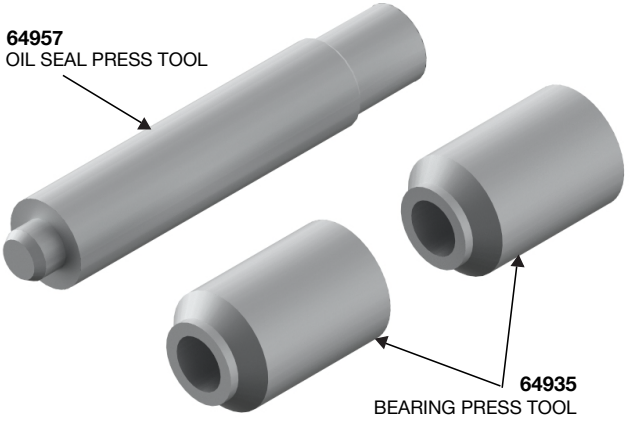
- The patented seal cartridge (PN 57911) is designed to facilitate quick seal changes without special tools or small parts that are easy to lose.



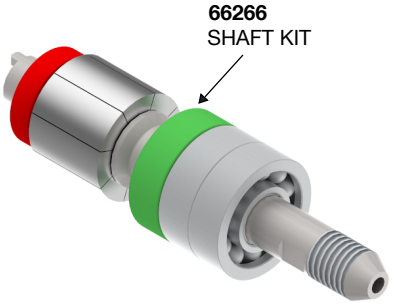
- An interim solution is available to replace only the seal kit (PN 65445) portion of the seal cartridge. If replacing only the seal kit still results in leakage, full seal cartridge may need to be replaced.

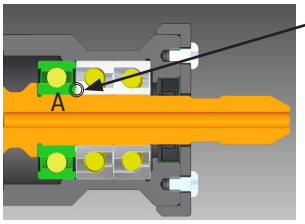


Tool Kit



Shaft Kit





Note direction of angular contact bearings

DETAIL A

Shim (PN 64992) must be installed here

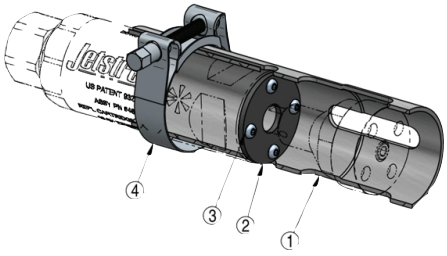
- Additional contents (not shown):

Qty	PN	Description
1	66982	T-15 Security Torx Sealing Screw
1	66983	T-15 Security Torx L-Key Wrench

Aluminum External Guard Kit (PN 67082)

- Provides additional protection to reduce wear of the head assembly and body
- Kit contains:

Item	Qty	Description
1	1	Aluminum Guard
2	1	Seal Cover
3	4	#8-32 Cover Screws
4	1	Retaining Clamp



APPENDIX C

Flow Charts

NOTE: Select nozzles from the following charts by choosing operating pressure, desired flow, and two or four-nozzle operation.

Orifice Size (in.)	T1 Head (PN 66881)																	
	4 UHPx Nozzles										2 UHPx Nozzles, 2 Plugs							
	30000	2068	40000	2757	43511	3000	30000	2068	40000	2757	43511	3000						
	psi	bar	psi	bar	psi	bar	psi	bar	psi	bar	psi	bar						
	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm						
.019"					5.98	22.64												
.020"			6.35	24.04	6.63	25.10												
.021"			7.01	26.54	7.31	27.67												
.022"			7.69	29.11	8.02	30.36												
.023"	7.28	27.56	8.40	31.80	8.76	33.16												
.024"	7.92	29.98	9.15	34.64	9.54	36.11												
.025"	8.60	32.55	9.93	37.59	10.35	39.18												
.026"	9.30	35.20	10.74	40.66														
.027"	10.03	37.97											6.04	22.86				
.028"	10.79	40.84											6.23	23.58	6.49	24.57		
.029"	11.57	43.80											6.68	25.29	6.97	26.38		
.030"	12.38	46.86											7.15	27.07	7.46	28.24		
.031"													7.63	28.88	7.96	30.13		
.032"							7.04	26.65	8.13	30.78	8.48	32.10						
.033"							7.49	28.35	8.65	32.74	9.02	34.14						
.034"							7.95	30.09	9.18	34.75	9.58	36.26						
.035"							8.43	31.91	9.73	36.83	10.15	38.42						
.036"							8.91	33.73	10.29	38.95								
.037"							9.42	35.66	10.87	41.15								
.038"							9.93	37.59										
.039"							10.46	39.60										
.040"							11.01	41.68										
.041"							11.56	43.76										
.042"							12.13	45.92										
.043"							12.72	48.15										

Orifice Size (in.)	T2 Head (PN 66261)												T3 Head (PN 64919)											
	4 UHPx Nozzles						2 UHPx Nozzles, 2 Plugs						4 UHPx Nozzles						2 UHPx Nozzles, 2 Plugs					
	30000 psi	2068 bar	40000 psi	2757 bar	43511 psi	3000 bar	30000 psi	2068 bar	40000 psi	2757 bar	43511 psi	3000 bar	30000 psi	2068 bar	40000 psi	2757 bar	43511 psi	3000 bar	30000 psi	2068 bar	40000 psi	2757 bar	43511 psi	3000 bar
	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm
.016"															4.08	15.44	4.26	16.13						
.017"					4.80	18.17									4.61	17.45	4.80	18.17						
.018"			5.16	19.53	5.38	20.37									5.16	19.53	5.38	20.37						
.019"			5.74	21.73	5.99	22.67							4.97	18.81	5.74	21.73	5.99	22.67						
.020"	5.50	20.82	6.35	24.04	6.63	25.10							5.50	20.82	6.35	24.04	6.63	25.10						
.021"	6.06	22.94	6.99	26.46	7.29	27.60							6.06	22.94	6.99	26.46								
.022"	6.64	25.14	7.66	29.00	7.99	30.25							6.64	25.14									4.03	15.26
.023"	7.24	27.41	8.36	31.65									7.24	27.41							4.22	15.97	4.40	16.66
.024"	7.86	29.75									4.79	18.13	7.86	29.75							4.59	17.37	4.79	18.13
.025"	8.51	32.21							4.98	18.85	5.19	19.65									4.98	18.85	5.19	19.65
.026"	9.18	34.75							5.38	20.37	5.61	21.24							4.66	17.64	5.38	20.37	5.61	21.24
.027"	9.87	37.36							5.80	21.96	6.05	22.90							5.02	19.00	5.80	21.96	6.05	22.90
.028"									6.23	23.58	6.50	24.61							5.39	20.40	6.23	23.58	6.50	24.61
.029"							5.78	21.88	6.67	25.25	6.96	26.35							5.78	21.88	6.67	25.25		
.030"							6.18	23.39	7.13	26.99	7.44	28.16							6.18	23.39	7.13	26.99		
.031"							6.59	24.95	7.61	28.81	7.94	30.06							6.59	24.95				
.032"							7.01	26.54	8.10	30.66	8.44	31.95							7.01	26.54				
.033"							7.44	28.16											7.44	28.16				
.034"							7.89	29.87											7.89	29.87				
.035"							8.35	31.61																
.036"							8.81	33.35																
.037"							9.29	35.17																
.038"							9.77	36.98																
.039"							10.27	38.88																

Orifice Size (in.)	T4 Head (PN 65803)												T5 Head (PN 64920)											
	4 UHPx Nozzles						2 UHPx Nozzles, 2 Plugs						4 UHPx Nozzles						2 UHPx Nozzles, 2 Plugs					
	30000 psi	2068 bar	40000 psi	2757 bar	43511 psi	3000 bar	30000 psi	2068 bar	40000 psi	2757 bar	43511 psi	3000 bar	30000 psi	2068 bar	40000 psi	2757 bar	43511 psi	3000 bar	30000 psi	2068 bar	40000 psi	2757 bar	43511 psi	3000 bar
	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm
.013"																	2.82	10.67						
.014"					3.27	12.38									3.13	11.85	3.27	12.38						
.015"			3.59	13.59	3.75	14.20									3.59	13.59	3.75	14.20						
.016"			4.08	15.44	4.26	16.13							3.54	13.40	4.08	15.44	4.26	16.13						
.017"	3.99	15.10	4.61	17.45	4.80	18.17							3.99	15.10	4.61	17.45	4.80	18.17						
.018"	4.47	16.92	5.16	19.53	5.38	20.37							4.47	16.92	5.16	19.53								
.019"	4.97	18.81	5.74	21.73									4.97	18.81									3.01	11.39
.020"	5.50	20.82									3.33	12.61	5.50	20.82							3.19	12.08	3.33	12.61
.021"	6.06	22.94							3.52	13.32	3.67	13.89	6.06	22.94							3.52	13.32	3.67	13.89
.022"	6.64	25.14							3.86	14.61	4.03	15.26							3.34	12.64	3.86	14.61	4.03	15.26
.023"	7.24	27.41							4.22	15.97	4.40	16.66							3.65	13.82	4.22	15.97	4.40	16.66
.024"							3.98	15.07	4.59	17.37	4.79	18.13							3.98	15.07	4.59	17.37	4.79	18.13
.025"							4.31	16.32	4.98	18.85	5.19	19.65							4.31	16.32	4.98	18.85		
.026"							4.66	17.64	5.38	20.37	5.61	21.24							4.66	17.64	5.38	20.37		
.027"							5.02	19.00	5.80	21.96									5.02	19.00				
.028"							5.39	20.40	6.23	23.58									5.39	20.40				
.029"							5.78	21.88											5.78	21.88				
.030"							6.18	23.39											6.18	23.39				
.031"							6.59	24.95																
.032"							7.01	26.54																

Orifice Size (in.)	T6 Head (PN 65804)												T7 Head (PN 66259)											
	4 UHPx Nozzles						2 UHPx Nozzles, 2 Plugs						4 UHPx Nozzles						2 UHPx Nozzles, 2 Plugs					
	30000 psi	2068 bar	40000 psi	2757 bar	43511 psi	3000 bar	30000 psi	2068 bar	40000 psi	2757 bar	43511 psi	3000 bar	30000 psi	2068 bar	40000 psi	2757 bar	43511 psi	3000 bar	30000 psi	2068 bar	40000 psi	2757 bar	43511 psi	3000 bar
	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm	lpm
.012"																	2.40	9.08						
.013"			2.70	10.22	2.82	10.67									2.70	10.22	2.82	10.67						
.014"			3.13	11.85	3.27	12.38							2.71	10.26	3.13	11.85	3.27	12.38						
.015"	3.11	11.77	3.59	13.59	3.75	14.20							3.11	11.77	3.59	13.59	3.75	14.20						
.016"	3.54	13.40	4.08	15.44	4.26	16.13							3.54	13.40	4.08	15.44								
.017"	3.99	15.10	4.61	17.45									3.99	15.10									2.41	9.12
.018"	4.47	16.92							2.59	9.80	2.70	10.22	4.47	16.92							2.59	9.80	2.70	10.22
.019"	4.97	18.81							2.88	10.90	3.01	11.39	4.97	18.81							2.88	10.90	3.01	11.39
.020"									3.19	12.08	3.33	12.61							2.77	10.49	3.19	12.08	3.33	12.61
.021"							3.05	11.55	3.52	13.32	3.67	13.89							3.05	11.55	3.52	13.32	3.67	13.89
.022"							3.34	12.64	3.86	14.61	4.03	15.26							3.34	12.64	3.86	14.61	4.03	15.26
.023"							3.65	13.82	4.22	15.97	4.40	16.66							3.65	13.82	4.22	15.97		
.024"							3.98	15.07	4.59	17.37									3.98	15.07				
.025"							4.31	16.32											4.31	16.32				
.026"							4.66	17.64											4.66	17.64				
.027"							5.02	19.00																
.028"							5.39	20.40																

WARRANTY

Limited Warranty. Each Waterblast Unit, Bareshaft Pump, and Fluid End manufactured by Jetstream is warranted against defects in material and workmanship for a period of 12 months or 1,000 hours, provided it is used in a normal and reasonable manner and in accordance with all operating instructions. If sold to an end user, the applicable warranty period commences from the date of delivery to the end user. If used for rental purposes, the applicable warranty period commences from the date of delivery to the party holding the equipment available for rent. This limited warranty may be enforced by any subsequent transferee during the warranty period. This limited warranty is the sole and exclusive warranty given by Jetstream.

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The Jetstream Limited Warranty shall NOT apply to (and Jetstream shall NOT be responsible for):

1. Major components or trade accessories that have a separate warranty from their original manufacturer, such as, but not limited to: diesel engines, electric motors, electronic soft starter and/or across the line starter panels, axles, PTO's, clutch packs, high pressure gauges, high pressure hoses, flex lances, etc.

2. Normal adjustments and maintenance services.

3. Normal wear parts such as, but not limited to: oil, clutches, belts, filters, packing, cartridges, univalves, face seals, diffusers, gland nut bushings, plungers, nozzles, rupture disks, etc.

4. Failures resulting from the machine being operated in a

manner or for a purpose not recommended by Jetstream including failures or malfunctions resulting from corrosion, misapplication, overpressurization, inadequate pump suction conditions, improper water quality, improper maintenance, or misuse.

5. Repairs, modifications or alterations which in Jetstream's sole judgment, have adversely affected the machine's stability, operation or reliability as originally designed and manufactured.

6. Items subject to misuse, negligence, accident or improper maintenance.

NOTE The use of any part other than ones approved by Jetstream may invalidate this warranty. Jetstream reserves the right to determine, in its sole discretion, if the use of non-approved parts invalidates the warranty. Nothing contained in this warranty shall make Jetstream liable for loss, injury, or damage of any kind to any person or entity resulting from any defect or failure in the machine or part.

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This warranty is in lieu of all other obligations or liabilities, contractual and otherwise, on the part of Jetstream. For the avoidance of doubt, Jetstream shall not be liable for any indirect, special, incidental or consequential damages, including, but not limited to, loss of use or lost profits. Jetstream makes no representation that the unit has the capacity to perform any functions other than as contained in Jetstream's written literature, catalogs or specifications accompanying delivery of the machine. No person or affiliated company representative is authorized to alter the terms of this warranty, to give any other warranties or to assume any other liability on behalf of Jetstream in connection with the sale, servicing or repair of any machine manufactured by Jetstream. Any legal action based hereon must be commenced within eighteen (18) months of the event or facts giving rise to such action.

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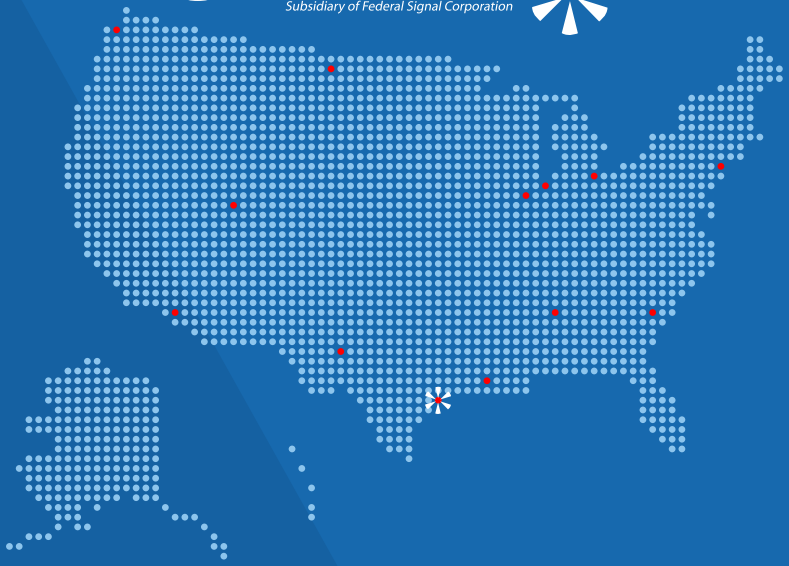

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