

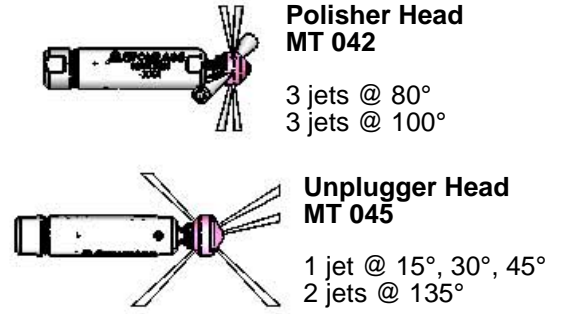
Marten Self-Rotary Tube Nozzle (MT-P8)

US Patents 5,964,414 and 6,059,202

Description:

The **Marten** is a self-rotating high pressure swivel designed for tube and pipe cleaning. It has an outside diameter of 1.25 inches (32 mm). It has a leak free high pressure seal and rotation speed control using a thick viscous fluid that limits the rotation speed to around 1000 rpm. It has a 1/4 NPT inlet connection, and can be used up to 15,000 psi with flow rates up to 25 gpm.

Two standard head designs are available; the **Unplugger** head has three forward jets (15, 30 and 45 degrees) and two back jets (135 degrees). The **Polisher** head has six jets at angles of 85 and 100 degrees. Each head is designed for a specific pressure and flow rate, and must be used at the specified pressure to obtain the proper rotation speed. The nozzle heads are wear items that will need to be replaced after 20 to 60 hours, depending on water filtration.



Operation:

The entire system should be flushed out before installing the Marten on the end of the hose or stinger. The swivels require a clean water supply for reliable operation; filtration of 25 micron or better is recommended for longer head life. Next install the Marten and place it down an open tube while the operating pressure is being set. The high pressure seal may leak at low pressure, but should seal completely at operating pressure. The drilled nozzle head will last between 20 and 60 hours; when the jets become worn the cutting rate goes down and if cleaning plugged tubes the tool will hydraulic more frequently, because the jets are not effectively cutting the material into small pieces anymore.

When using rotating nozzles in plugged tubes, the head must not be forced into the deposit, as this will stop the rotation of the tool and impede the cutting ability. When the tool contacts the deposit, allow it to cut away the material and advance at its own rate. If it stops advancing, pull back slightly on the hose to pull the head slightly away from the deposit, in case it is being stopped from rotating by the deposit. This also allows the angled jets to attack the deposit at different places. The hose should be gradually fed back, allowing time for the jets to do their work. This may need to be repeated if the material is particularly difficult in some spots. When polishing tubes with scale, it is possible to allow the nozzle to pass through the tube at incredibly fast rates (operators have been observed passing through a 50 foot long scaled tube in 10 seconds). Unless the deposit is very easy to remove, this will not completely remove the scale. The operator needs to be trained to feed the nozzle through the tube at a rate sufficient to clean the tube.

Pressure Dump: The most important safety device when flex lancing is the pressure dump mechanism. The operator nearest the nozzle should have control of the dump valve. If multiple operators will be used, each must have his own dump valve.

Hose: The high pressure hose should be as large as possible to minimize the pressure loss thru the hose. The high pressure hose and end fitting should be no larger than the tool to be used on the end of it; if a larger end is used, there is an increased risk of hydraulicking when cleaning plugged tubes.

Stinger: A stinger is a rigid piece of pipe or tubing used between the end of the hose and the nozzle. It is typically 2 feet in length, and is primarily a safety device for hand flex lancing. When using stingers, the operator should be trained not to use it as a pry-bar or to bang on the deposit, particularly with rotating tube nozzles, as they may be broken and at the very least will not rotate while forced against the deposit. The coupling connecting the hose to the stinger should be of the slim-line type, and no larger in diameter than the nozzle body; a larger coupling diameter increases the chances of material catching on the coupling and causing hydraulicking to occur.

Troubleshooting:

Head will not rotate: First try rotating head by hand and see if it feels rough or gritty to turn. If it does, the tool must be disassembled and repaired. If the tool feels okay, check to see if any nozzles are plugged; even if a nozzle is only partially blocked it can keep the head from rotating. The head must be removed from the tool to properly clean them. If none of these are the problem, the jets may be too worn and the head needs to be replaced.

Head spins too fast: Add more fluid; it is best to add a full syringe to flush out the old fluid. This may need to be done as frequently as every 4 hours. If the swivel spins too fast after adding new fluid, check that the head is correct for the operating pressure being used.

Seal Leak: The seal may leak initially up to several thousand psi, but should pop closed as pressure is increased. If operating pressure is reached and the seal is leaking continuously, the high pressure seal and seat may need to be replaced. Refer to the maintenance below. Inspect the shaft end face for damage as well.

Seals wear out quickly: Replace the Seal Holder (MT 020) and the carbide seat (RJ 011-KC).

Maintenance: *Blow out all water with compressed air before storing tool!

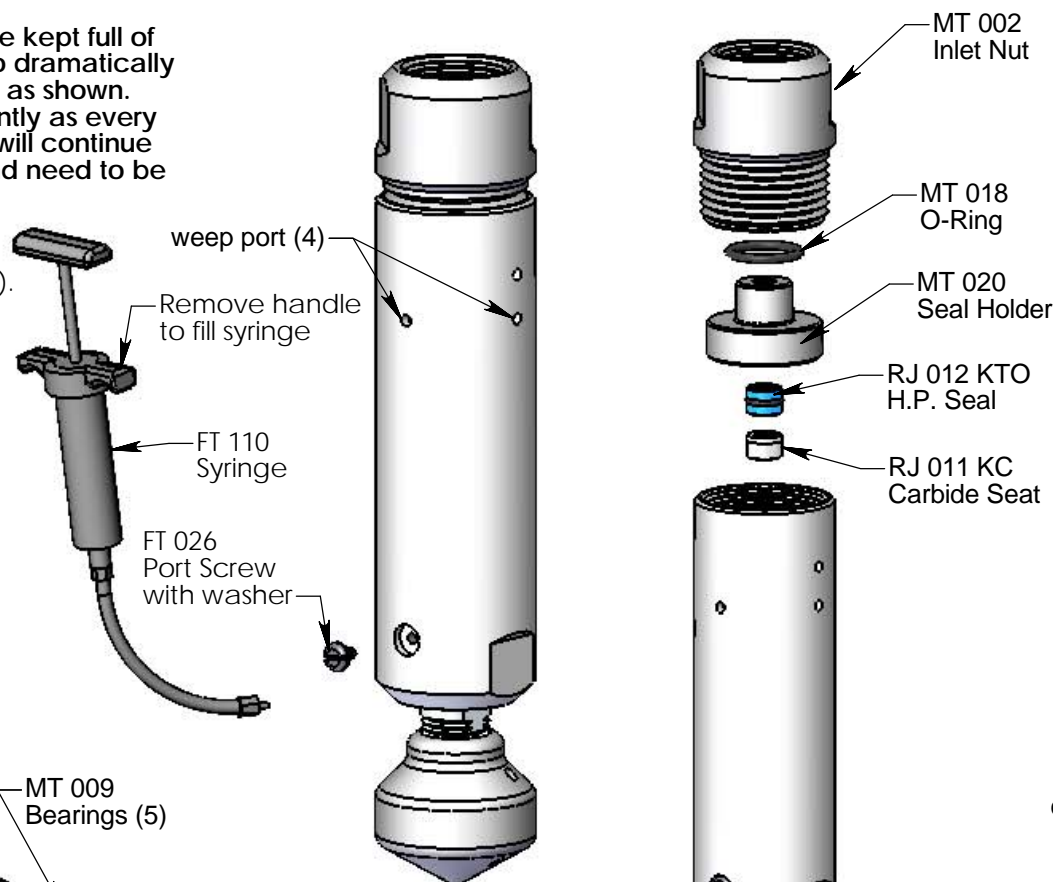
It is very important that the Marten be kept full of viscous fluid. When the tool begins to dramatically speed up, the fluid should be refilled as shown. This may need to be done as frequently as every 10 hours. If this is not done, the tool will continue to speed up until the bearings fail and need to be replaced.

1. Fill syringe with Viscous Fluid (slow). Clamp swivel by flats upright in vise.

2. Remove Port Screw (FT 026).

3. Thread syringe into Marten Body, slowly squeeze a full syringe of fluid into the tool; excess fluid comes out weep ports.

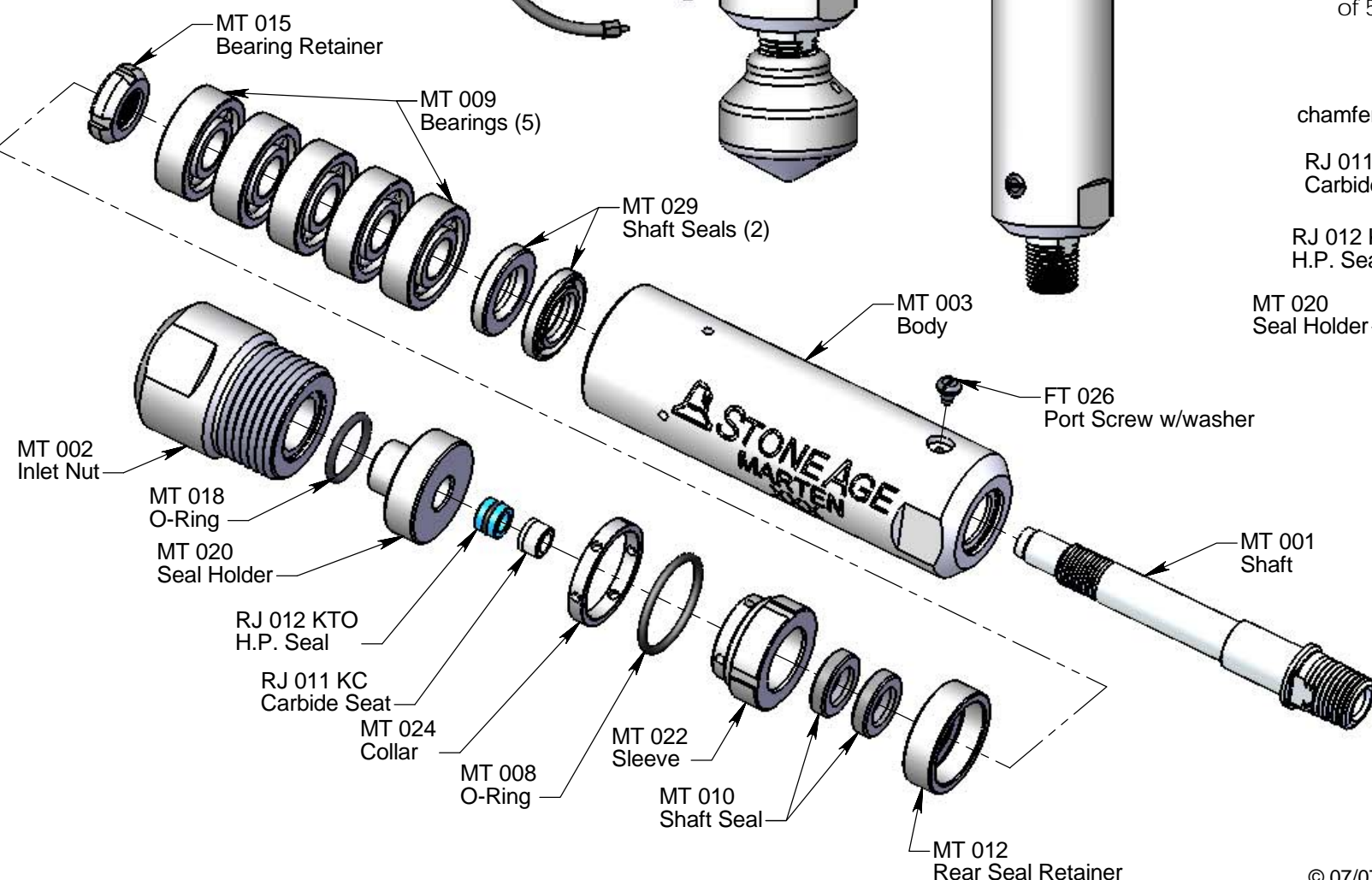
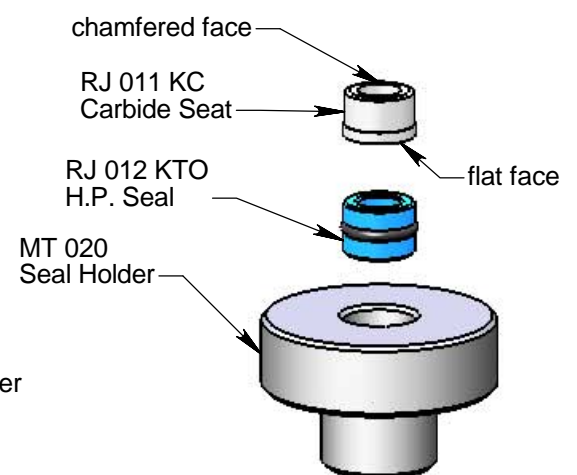
4. Remove syringe and install port screw (Make sure the brass washer is on screw).



To replace High Pressure Seal:

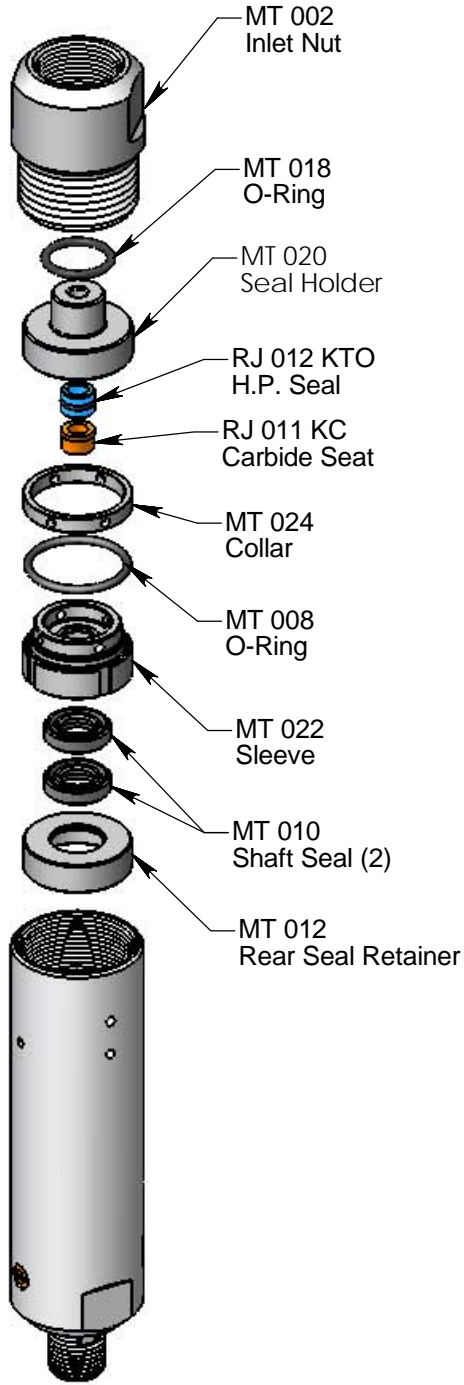
1. Remove the Inlet Nut (MT 002) from the Body.
2. Pull out the Seal Holder (MT 020), O-Ring (MT 018), H.P. Seal (RJ 012 KTO) and Carbide Seat (RJ 011KC).
3. Inspect Carbide Seat for chips or erosion.
4. Apply grease to a new H.P. seal and install in Seal Holder.
5. Apply grease to the flat end of the Carbide Seat, install in Seal Holder with the flat end against the H.P. Seal as shown below.
6. Slide Seal Holder into Body, reinstall O-ring and Inlet Nut. Tighten Inlet Nut with a torque of 50 ft-lb.

Detailed View:

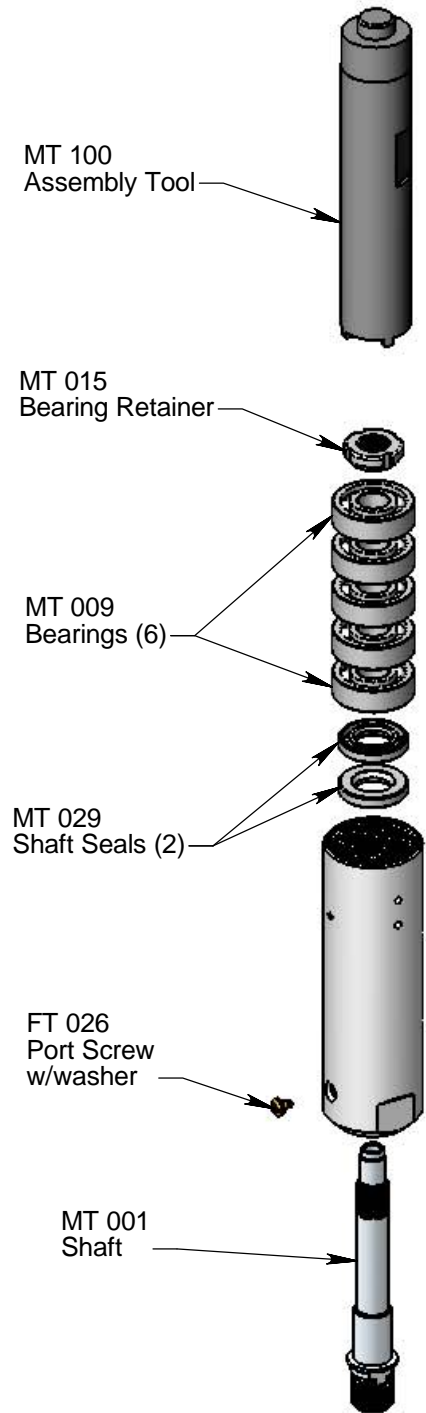


Marten Self-Rotary Tool Nozzle

Disassembly:



1. Unscrew the Inlet Nut (MT 002) from the Body.
2. Pull out the O-Ring (MT 018), Seal Holder (MT 020), H.P. Seal (RJ 012 KTO) and Carbide Seat (RJ 011 KC).
3. Remove Sleeve (MT 022) using snap ring pliers or a bent wire or nail inserted in one of the holes. Be careful not to damage the end of the shaft. The Collar (MT 024), O-Ring (MT 008) and Shaft Seals (MT 010) will come out with it.
4. Remove the Shaft Seals (MT 010) from the Sleeve.
5. Remove the Rear Seal Retainer (MT 012).
6. Remove the Bearing Retainer (MT 015) using the Assembly Tool (MT 100).
7. Pull Shaft (MT 001) out of Body.
8. Push Bearings (MT 009) out of Body using a 7/16 ϕ bolt.
9. Remove Shaft Seals (MT 029) from Body.
10. Remove the Port Screw (FT 026).



Assembly:

1. Press Shaft Seals (MT 029) into Body (one seal at a time) using the Assembly Tool (MT 100). Note orientation of seals.
2. Apply grease to the lips of the seals.
3. Carefully slide Shaft up thru the shaft seals into the Body.

4. Slide the five Bearings (MT 009) into the Body, around the Shaft, until the Shaft threads are showing.
5. Thread the Bearing Retainer (MT 015) onto the Shaft; use the Assembly Tool to tighten to 100 in-lb.
6. Install the Shaft Seals (MT 010) into the Sleeve. The lips of both seals are facing down into the Sleeve in this view.
7. Apply grease to the lips of the seals.
8. Insert the Rear Seal Retainer (MT 012) into the Body; push down against the Bearings.
9. Install the Sleeve (MT 022) into the Body. The Shaft end should just stick up thru the center.
10. Place the O-Ring (MT 008) and the Collar (MT 024) in the groove around the outside of the Sleeve.

11. Install the H.P. Seal (RJ 012 KTO) and the Seat (RJ 011 KC) in the Seal Holder (MT 020) as shown in the Maintenance Section. Remember to apply grease to these parts.
12. Install Seal Holder into Body.
13. Place O-Ring (MT 018) over Seal Holder.
14. Apply anti-seize to threads of Inlet Nut, thread into Body and tighten to 40 ft-lb.
15. Use Syringe to fill Marten with viscous fluid; install Port Screw (FT 026). Refer to the Maintenance Section.

