The Torus™ - 3D Tank Cleaning Tool, up to 22 kpsi (TR-100)

Description:

The **Torus** 3D Tool is designed for cleaning tanks, vessels, autoclaves, ducts and reactor interiors. The tool is capable of working pressures up to 22,000 psi (1500 bar) and flow rates of 17 to 80 gpm. The wide range of flow rates is accommodated by the use of four different manifolds: High Flow (HF), Medium Flow (MF), Low Flow (LF) and Extra Low Flow (XLF). A maintenance-free magnetic brake is used to control rotation speed. Note that rotation speed may increase as the tool warms up to operating temperature. The complete Torus cleaning cycle varies from about 4 to 30 minutes of operating time and 3 to 23 revolutions of the body per minute depending on pressure, flow rate, nozzle diameter and manifold choice. The HP manifold revolves 2.36 times for each body revolution. When used in large vessels, extension arms up to 36 inches long can be used to reduce the jet standoff distance. The Torus can be hung from the high pressure water hose or by the optional pulling ring available for the tool. It is recommended to blow out all internal water passages (nozzles, weep holes, inlet) with compressed air after each use.

WARNING: The Torus contains several high-energy, rare-earth magnets that produce a magnetic field in excess of 10 Gauss. Persons with a pacemaker or other electronic medical device must use extreme caution when handling, or in close proximity to the Torus. It is recommended that a minimum distance of 6 inches (152mm) be maintained at all times between the Torus and any electronic medical devices.

CAUTION: The use of gloves when handling the tool after operation is recommended as the body and cover at the pulling ring end may reach temperatures of up to 160°F depending on operating conditions.

Operation:

Before use, confirm that the installed manifold is the correct configuration to match the operating pressure and flow rate. Failure to use the correct manifold will result in an over-speed condition causing permanent component damage, or a condition in which the tool rotates very slowly or not at all. The chart below shows the correct manifold to use for various pressure and flow combinations. Make absolutely certain that the two nozzles being used are the same size and in good condition, otherwise the Torus may rotate erratically, too fast, or not at all. To use the chart, first select the operating pressure row from the left. Move to the right across the table until you read the flow closest to actual. Located directly under the flow rate is the appropriate manifold type, and located at the top of this column is the appropriate nozzle size. If you know the pressure and nozzle size, select the operating pressure row to the left, and read across the nozzle sizes in the top boxes until you get to the nearest nozzle size. The box where these two intersect will give the appropriate flow rate and manifold type.

PRESSURE, PSI		NOZZLE SIZE																		
		Nozzle Diameter	0.035	0.038	0.042	0.047	0.052	0.057	0.063	0.069	0.075	0.082	0.090	0.098	0.106	0.115	0.125	0.135	0.145	0.155	0.165
		Nozzle #	2	2.5	3	4	5	5.5	6.5	8	10	12	14	16	19	23	27	31	36	41	46
	2,000	FLOW, GPM	SPEED CONTROL IS LIMITED AT 2,000 PSI												26	30	34	39	43	47	51
		MANIFOLD													XLF	XLF	XLF	XLF	XLF	XLF	XLF
	5,000	FLOW, GPM								18	22	26	30	35	41	47	54	61	68	75	
		MANIFOLD								XLF	XLF	XLF	LF	LF	LF	LF	MF	MF	MF	MF	
	10,000	FLOW, GPM				12	15	17	22	26	30	36	42	50	57	66	76				
		MANIFOLD				XLF	XLF	XLF	LF	LF	LF	MF	MF	MF	MF	HF	HF				
	15,000	FLOW, GPM		10	12	15	18	21	27	31	37	44	52	61	70	81					
		MANIFOLD		XLF	XLF	XLF	LF	LF	LF	MF	MF	MF	HF	HF	HF	HF					
	20,000	FLOW, GPM	10	11	13	17	20	24	30	36	42	51	60	70	81						
		MANIFOLD	XLF	XLF	XLF	LF	LF	LF	MF	MF	MF	HF	HF	HF	HF						

Maintenance:

The Torus 3D Tool is simple to operate, but some care is necessary for safe and productive use. Please read and follow all of these recommendations.

HIGH PRESSURE SEAL

The Torus has two high pressure seals, one in the inlet shaft, and one in the cross shaft. These seals are identical; they may leak water at low pressure (under 1000 psi) and will leak water continuously at operating pressure during failure. If water is leaking out of the weep holes closest to the inlet, the inlet seal is damaged. If the water is leaking out of the weep holes furthest from the inlet, the cross-shaft seal is damaged.

LUBRICATION AND STORAGE

It is recommended to remove the cover plate and grease the tool every 500 hours of operation. StoneAge recommends using water resistant grease (StoneAge part number GP 045) but any multi-purpose NLGI 2 grease is acceptable. There are four grease fittings located on the elbow assembly, and one located on the inlet end. If water is present inside of the tool, blow it out with compressed air and replace any damaged seals. It is recommended to blow out all internal water passages (nozzles, weep holes, inlet) with compressed air after each use to maximize the life of internal components.

MAGNETIC BRAKE

The magnetic brake requires no lubrication or maintenance. If a problem is suspected with the magnetic brake assembly, it should be sent to a certified StoneAge repair center for service or replacement. Whenever reinstalling cover plate, check to insure that an adequate amount of heat sink compound is present between brake housing and cover (available from StoneAge as part number TR 282).

FLEXIBLE COUPLING

The flexible coupling consists of clamp collars, hardened pins, and plastic bushings. The plastic bushings should be inspected every 100 hours and replaced if significant wear is found.

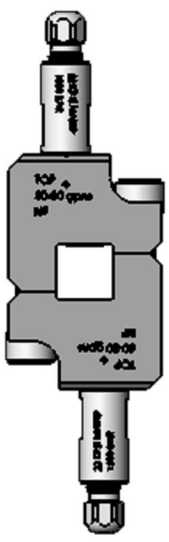
THREADED CONNECTIONS

To avoid galling, use anti-seize lubricant on all threaded connections.

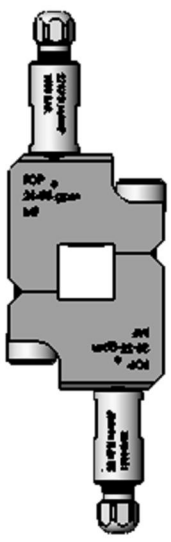
Description:

MANIFOLDS

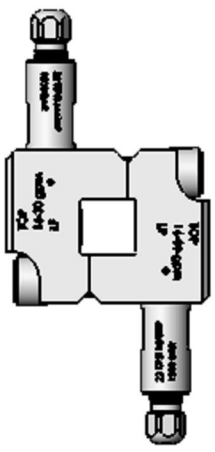
There are four manifolds for the Torus; select the proper version for the operating conditions.



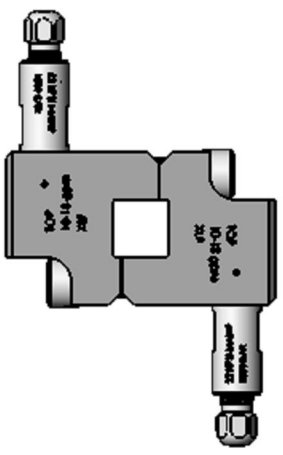
HF 50-80 GPM



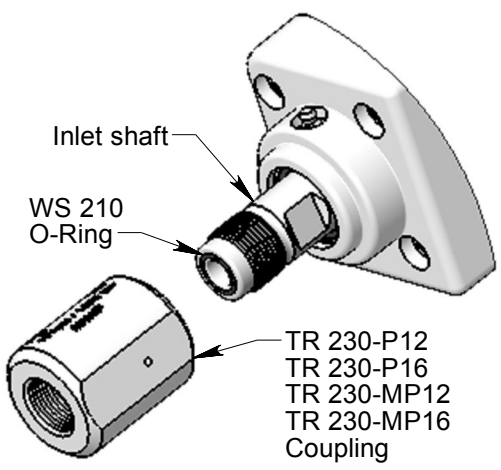
MF 28-55 GPM



LF 16-30 GPM



XLF 10-18 GPM



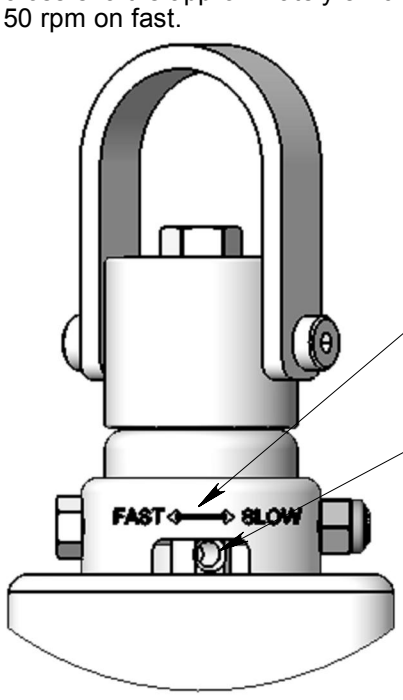
INLET ADAPTERS

The inlet adapters are all female-female couplings. One end is an o-ring face seal that seals to the inlet shaft. The other end is available in 3/4" NPT, 1" NPT, 3/4" medium pressure or 1.0" medium pressure.

SPEED ADJUSTMENT

Note: It is not necessary to remove the Pulling Ring Assy to access the Speed Adjustment Knob.

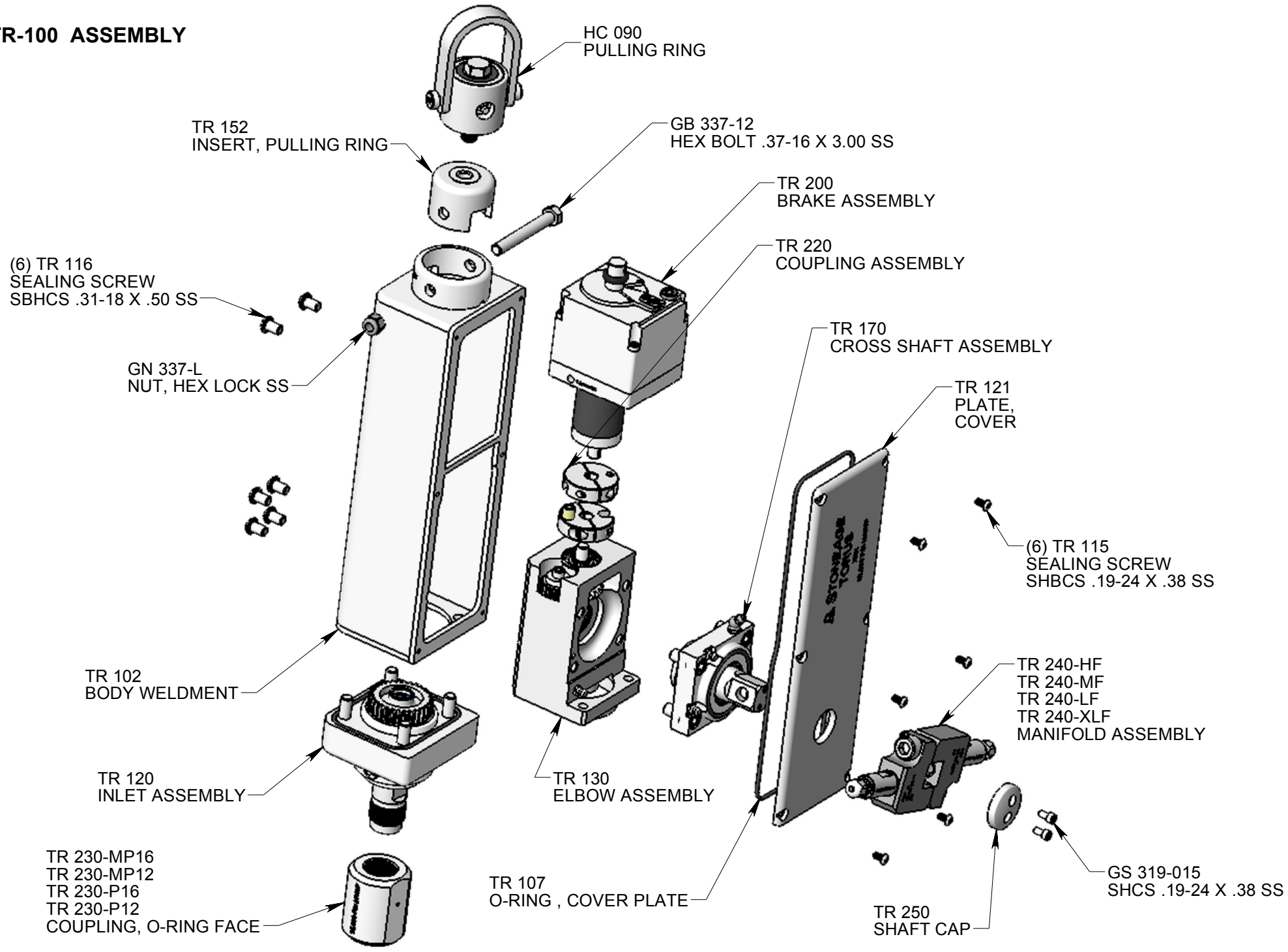
The rotation speed of the Torus may be adjusted using the speed adjustment shaft located under the pulling ring assembly. The shaft may be set at any location between slow and fast. Any suitable tool such as a phillips head screwdriver may be used to adjust the speed by inserting the tool thru the access slot on the housing and into the hole in the shaft. To change from slow to fast, turn the speed adjustment shaft approximately 50° to the left. Marks are engraved on the outside of the body to indicate slow and fast settings. Changing the speed from slow to fast will increase speed by approx. three times (i.e. slow 10 rpm; fast 30 rpm). The rotational speed depends on the torque produced by the operating pressure, flow, and the manifold version. The average operating speed range of the cross-shaft is approximately 8-16 rpm on slow and approximately 25-50 rpm on fast.



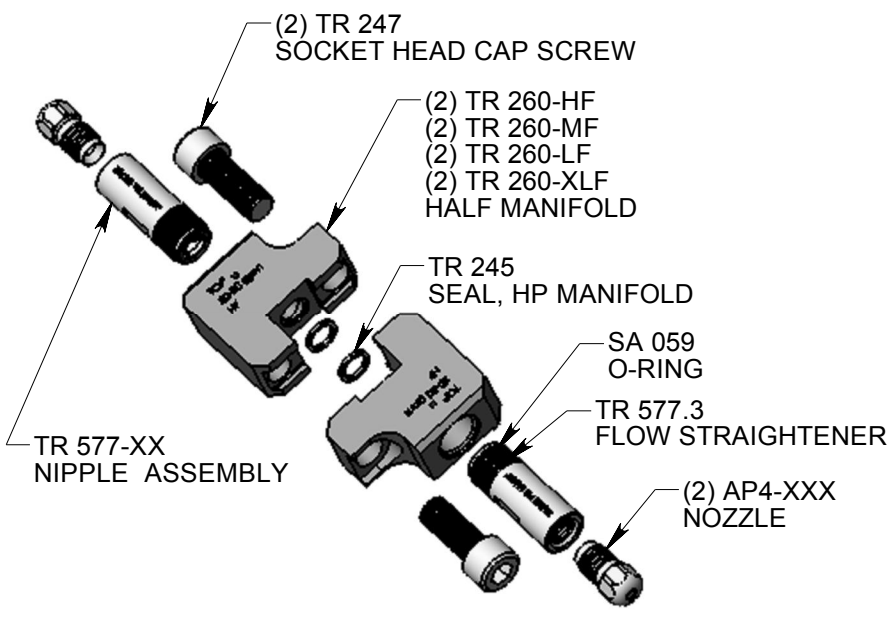
StoneAge® WATERBLAST TOOLS

The Torus™ - 3D Tank CleaningTool

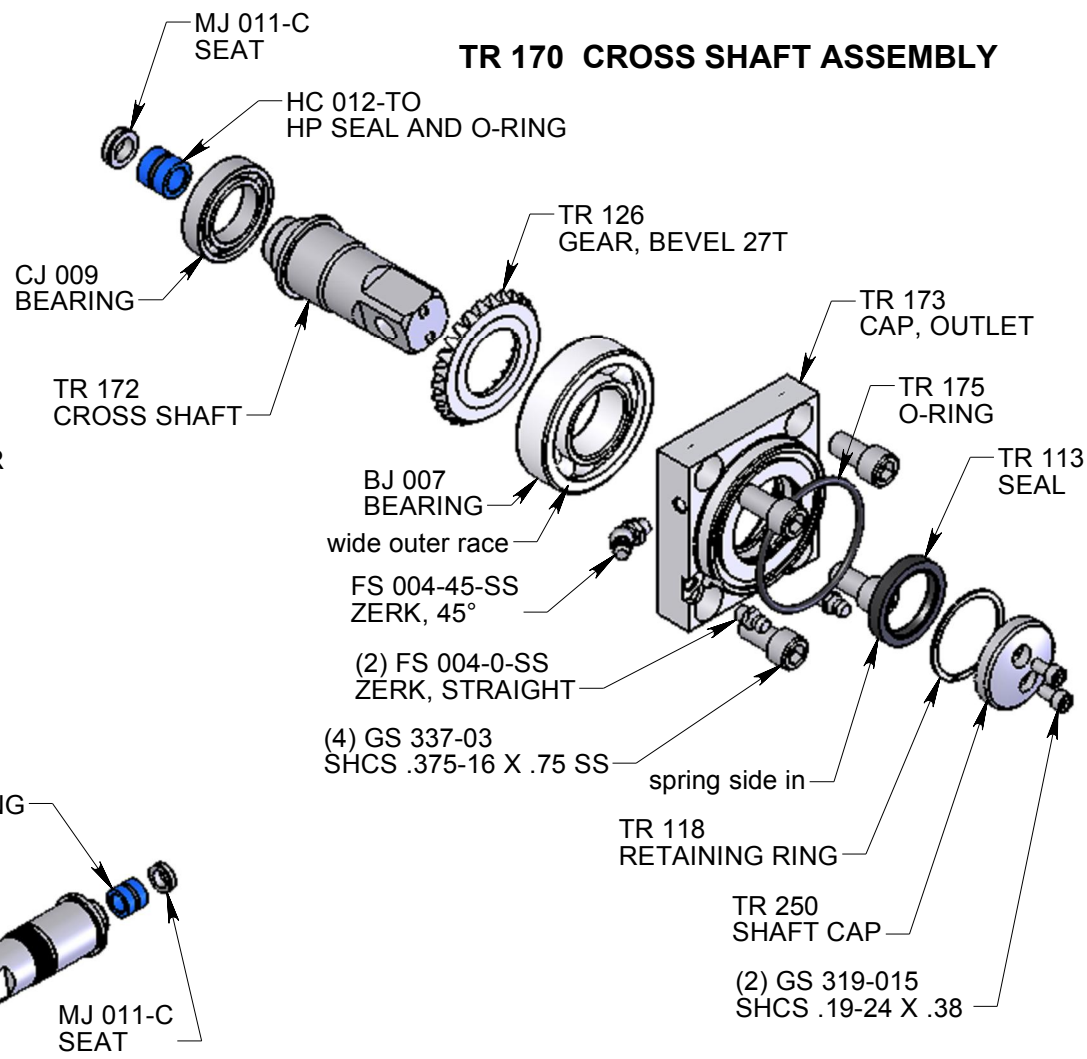
TR-100 ASSEMBLY



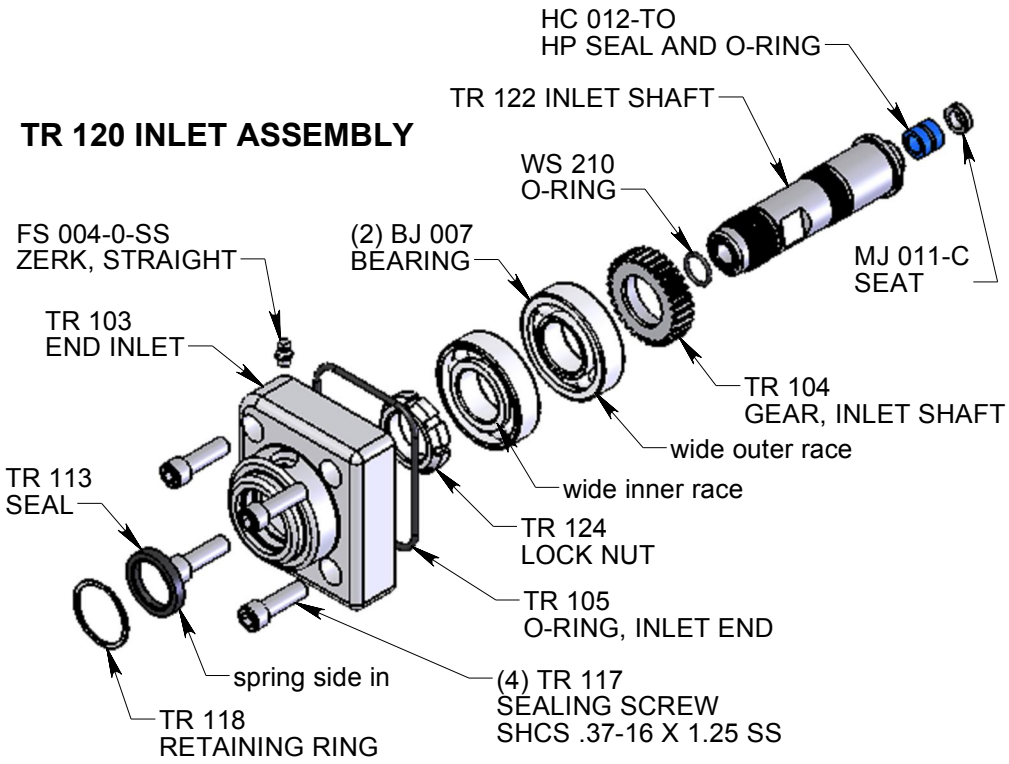
TR 240-XX MANIFOLD ASSEMBLY



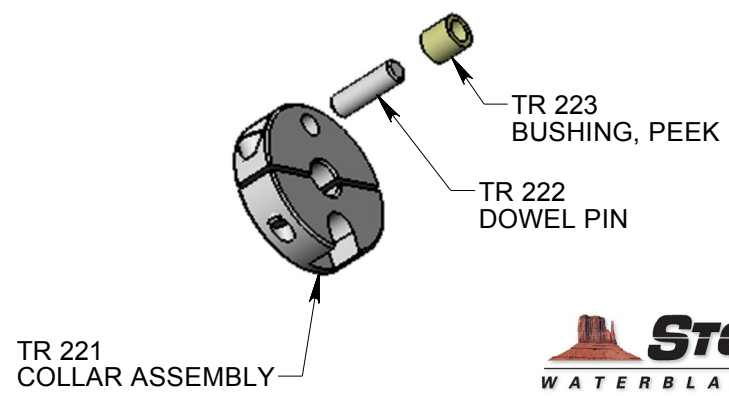
TR 170 CROSS SHAFT ASSEMBLY



TR 120 INLET ASSEMBLY



TR 220 COUPLING ASSEMBLY



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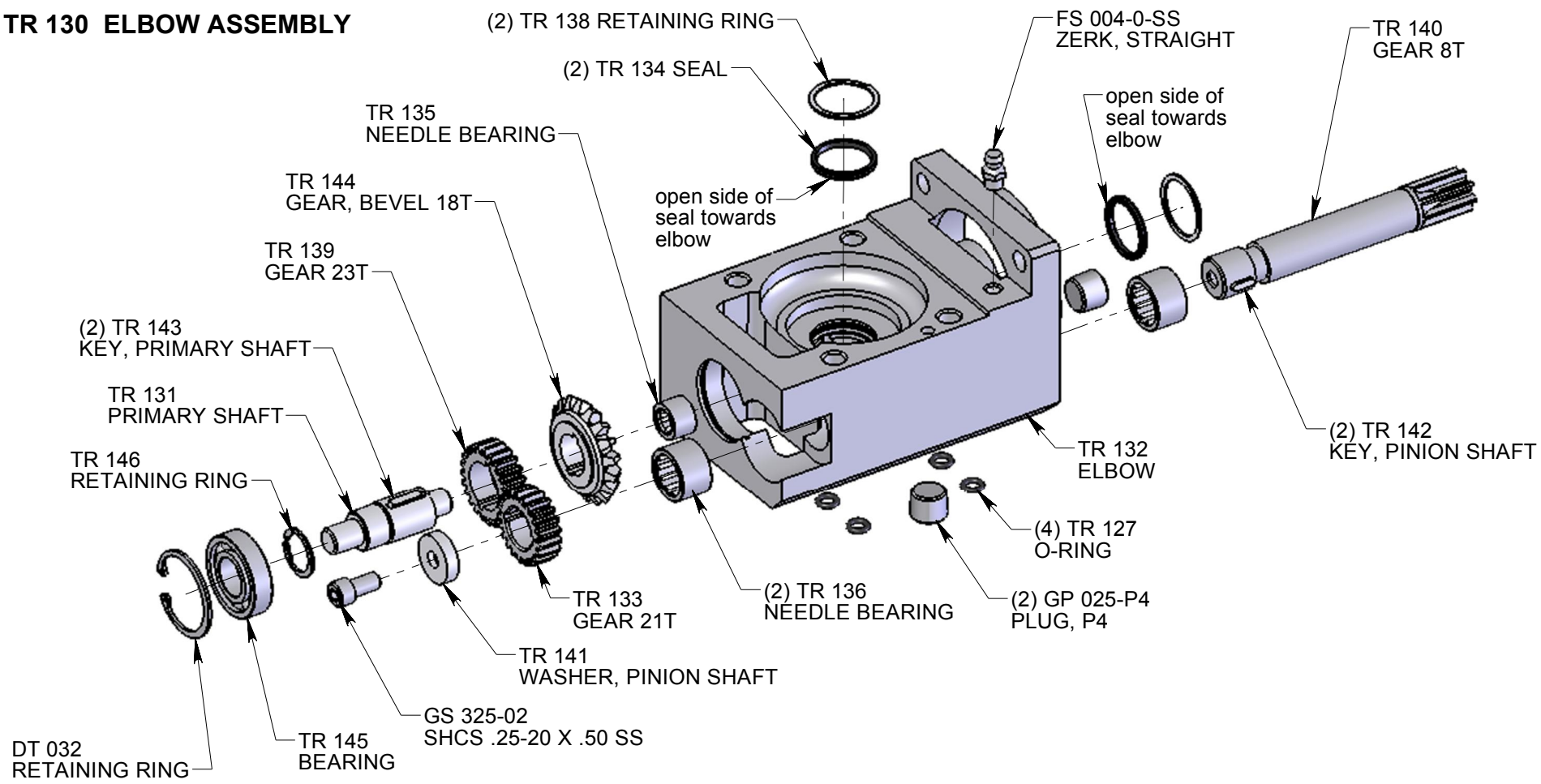
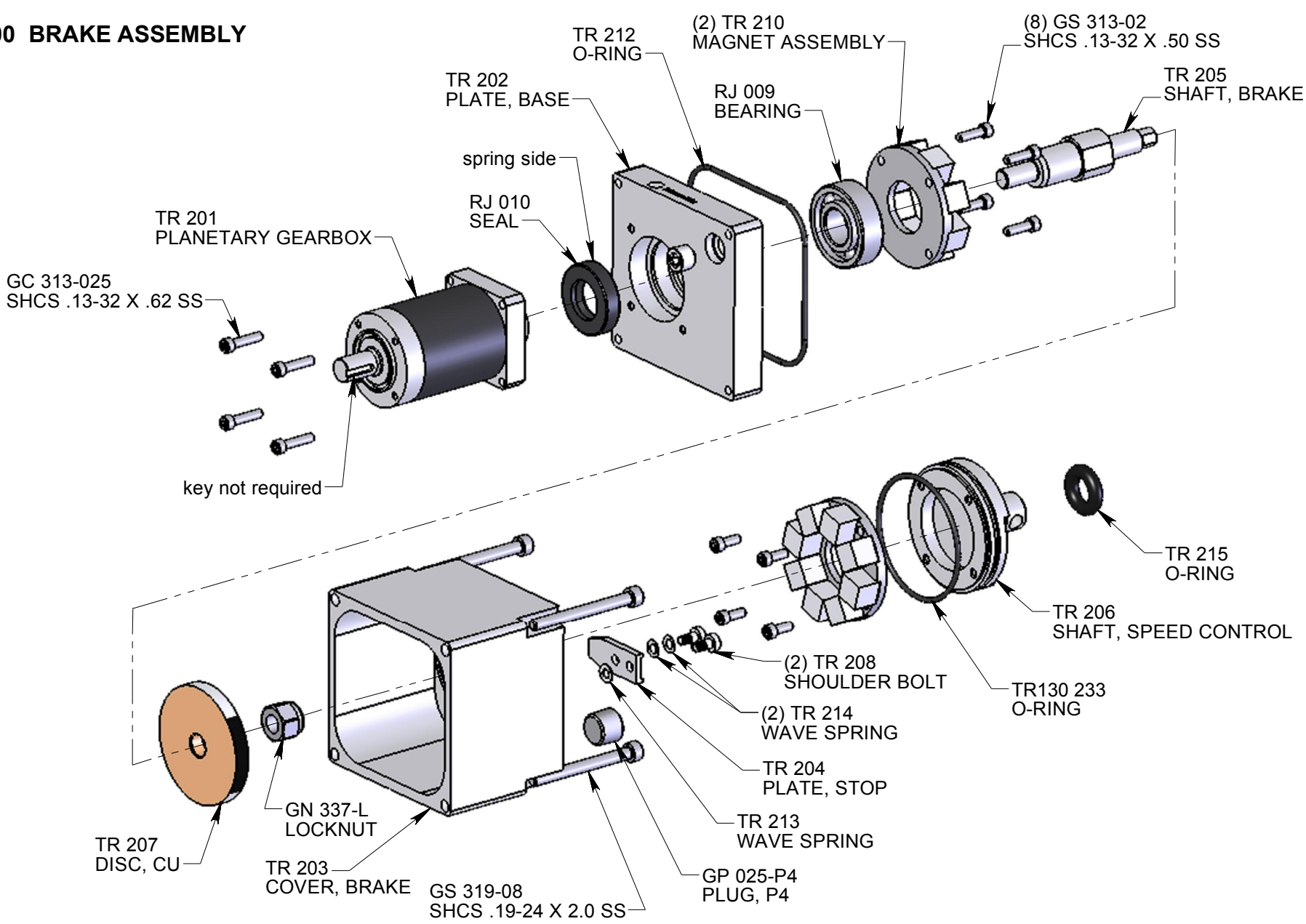
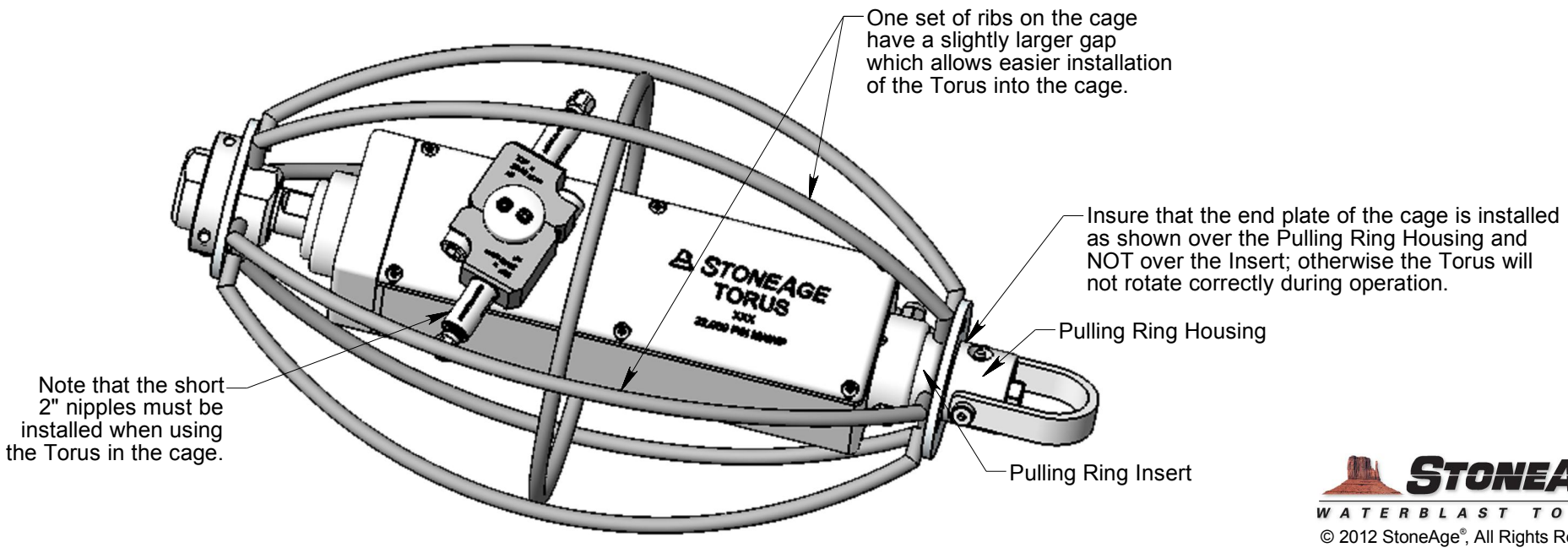
TR 130 ELBOW ASSEMBLY



TR 200 BRAKE ASSEMBLY



TORUS INSTALLATION IN TR 408-SS CAGE



StoneAge WATERBLAST TOOLS

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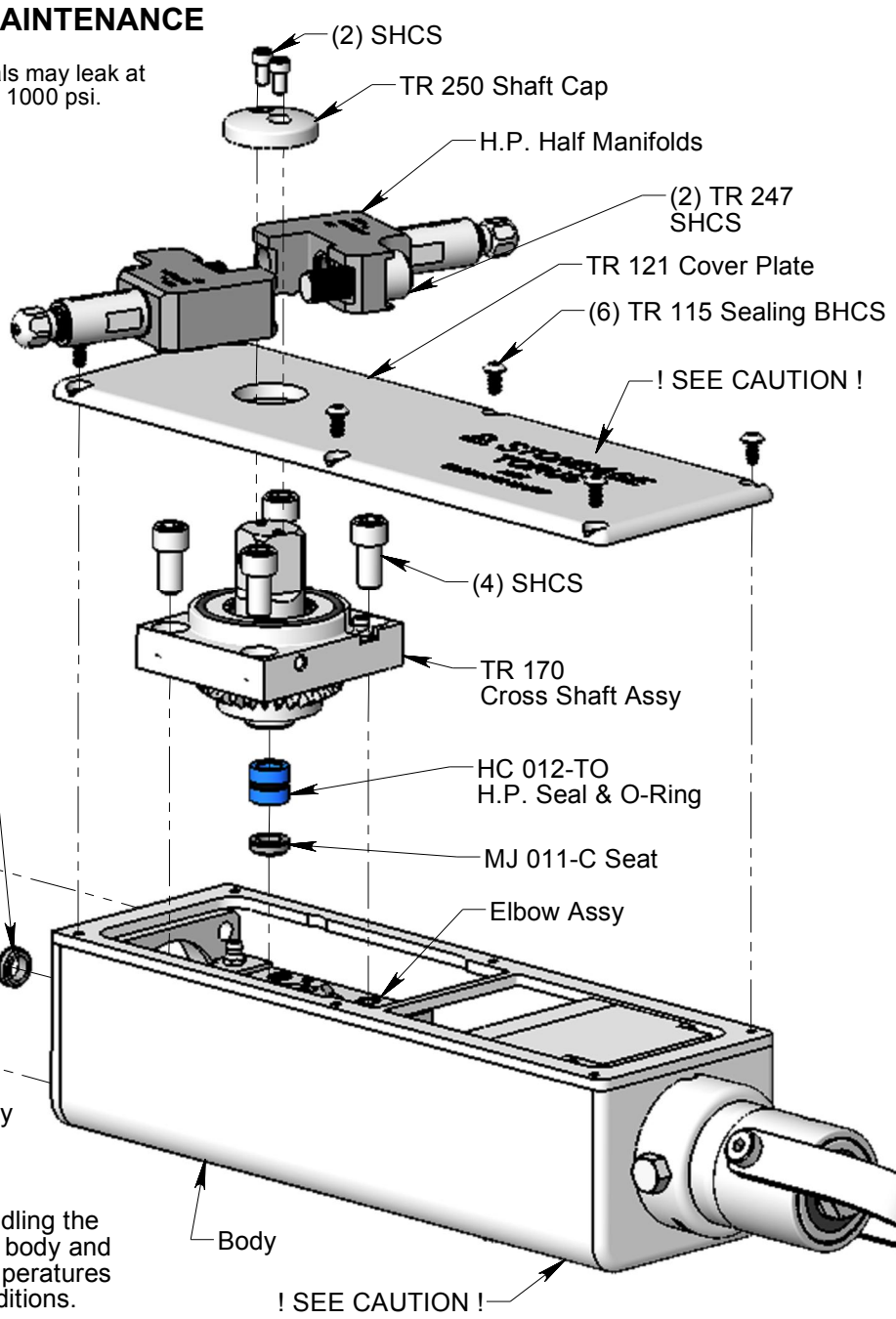
TR-100 HIGH PRESSURE SEAL MAINTENANCE

The Torus has 2 high pressure seals. These seals may leak at tap pressure, but should seal at pressures above 1000 psi.



To access the Inlet Shaft Seal:

1. Remove the (4) Sealing Socket Head Cap Screws holding the Inlet Assy (TR 120) to the Body and the Elbow Assy. The Inlet Assy may then be slid out of the Elbow Assy to gain access to the Seal. The Seal is located in the end of the Inlet Shaft. No more disassembly is required.

! CAUTION !: The use of gloves when handling the tool after operation is recommended as the body and cover at the pulling ring end may reach temperatures of up to 160°F depending on operating conditions.

To access the Torus internals:

1. Remove the (2) Socket Head Cap Screws holding the Shaft Cap (TR 250) in place. Loosen the (2) Socket Head Cap Screws (TR 247) on the High Pressure Half Manifolds & slip the Manifolds off the Cross Shaft.

2. Remove the (6) Sealing Button Head Cap Screws (TR 115) from the Cover Plate (TR 121) and remove the Cover Plate.

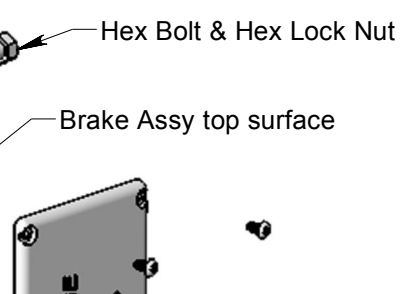
To access the Cross Shaft Seal:

1. Remove the (4) Socket Head Cap Screws that hold the Cross Shaft Assy to the Elbow Assy. Lift the Cross Shaft Assy out of the Main Elbow. The Seal is located in the end of the Cross Shaft. No more disassembly is required.

To maintain H.P. Seat & Seal:

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

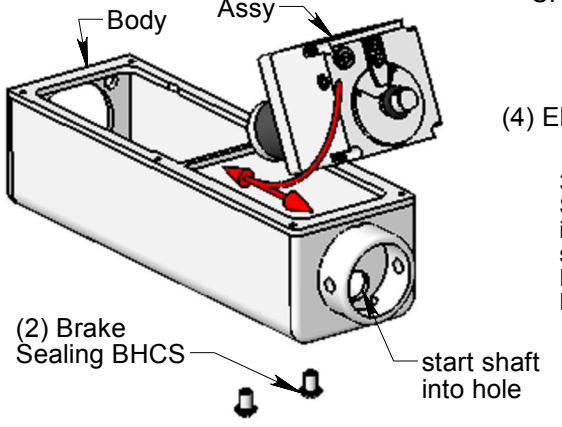
2. Apply grease to new H.P. Seal and install into bore. Place the Seat on the Seal with the flat side against the Seal. The chamfered side should face towards the Elbow Assy.



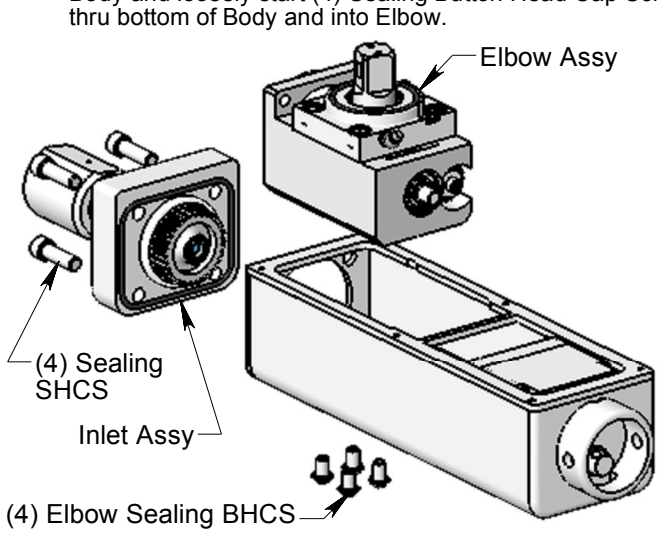
TR-100 ASSEMBLY SEQUENCE & DETAILS

Note: Always use anti-seize lubricant on all threaded connections to prevent galling.

1. Apply heat-conducting grease (StoneAge part number TR 282) to bottom surface of Brake Assy (the surface that will be in contact with the inside bottom of the Body) and insert Brake Assy into Body by first tilting and inserting under web of Body and then sliding forward as shown; use care to insure that the Speed Adjust Knob with O-Ring starts into the hole in the end of the Body while sliding the Assy forward. Loosely start (2) Sealing Button Head Cap Screws thru bottom of Body and into Brake Assy.

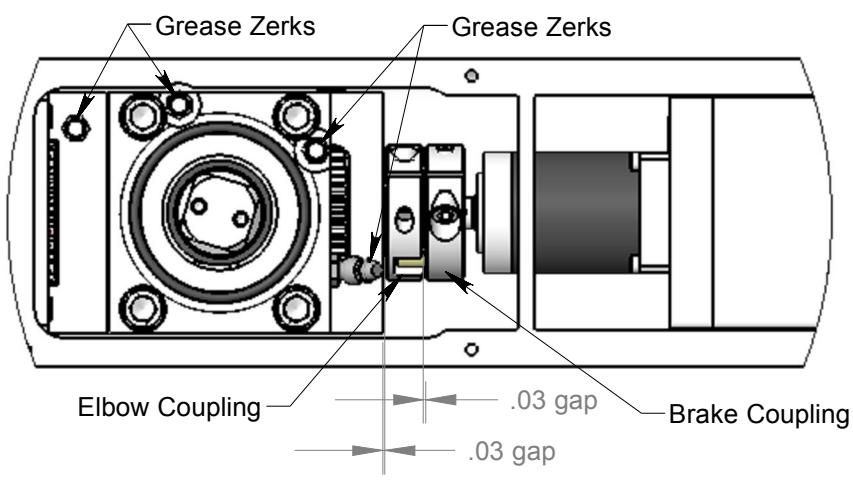


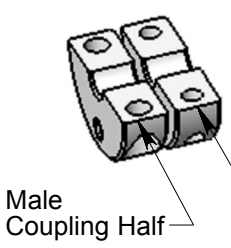
2. Insert Elbow Assy (may include Cross Shaft Assy) into Body and loosely start (4) Sealing Button Head Cap Screws thru bottom of Body and into Elbow.



3. Insert Inlet Assy into end of Body and tighten (4) Sealing Socket Head Cap Screws thru end of Body and into Elbow. Take care to insure O-Ring is properly seated in groove. Next, tighten the (4) Sealing Button Head Cap Screws at the bottom of the Body into the Elbow Assy.

4. Once the Elbow Assy is firmly mounted and the Brake Assy is loosely in place, the (2) Coupling Assys need to be installed. Note that keys are NOT required in the shafts. The easiest way to install the Couplings are to couple (1) Male Half and (1) Female Half together, place a rag in the bottom of the Body cavity under where the couplings are to be, and slip them into place underneath the bottom of the shafts (resting on top of the rag). The rag will help hold them in place and up against the shafts while starting the Socket Head Cap Screws in the opposite pair of Coupling Halves. Note that there should be a .03" gap between the Elbow and the Coupling face abutting the Elbow. Tighten the (2) Elbow Coupling screws evenly to 50 in/lbs. Next, allow a .03" gap between the Elbow Coupling and the Brake Coupling as shown. Tighten the (2) Brake Coupling screws to 50 in/lbs. Finally, tighten the (2) remaining Sealing Button Head Cap Screws holding the Brake Assy to the Body. Also grease the (4) Zerks on the Elbow if necessary.





5. Apply heat-conducting grease (StoneAge part number TR 282) to top surface of Brake Assy and install the Cover Plate using (6) Sealing Button Head Cap Screws. Take care to insure the O-Ring is properly seated in the groove of the Cover Plate.

6. Install the H.P. Manifolds onto the Cross Shaft and hand tighten the (2) large Socket Head Cap Screws.

7. Install the Shaft Cap using (2) small Socket Head Cap Screws and tighten them to 24 in/lbs. Then tighten the (2) large Cap Screws on the H.P. Manifolds to 50 ft/lbs.

8. Finally, install the Pulling Ring Assy onto the Body with the Hex Bolt and Hex Lock Nut.

Note: It is not necessary to remove the Pulling Ring Assy to access the Speed Adjustment Shaft.

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