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Parr Instrument Company

4635-39
Cell Disruption Vessels
Operating Instruction Manual



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Preface

Related Instructions

The following Parr publications are also included to further your understanding of this instrument and its component parts:

No.	Description
201M	Limited Warranty
4635MB	Cell Disruption Vessels Bulletin

Scope

These instructions cover the basic steps to be followed when using any of the several Parr Cell Disruption Vessels. They are intended to be used in conjunction with Parr Bulletin 4635 which describes various applications for these vessels and lists a number of references to technical literature describing procedures in which this type of cell disruption equipment has been used. Replacement parts lists for the 45 mL, 920 mL and 1850 mL vessels are included with these instructions. Parts information for the 1 and 2 gallon vessels can be obtained from the Parr Instrument Company on request.

Applications

These units are designed specifically for use with Parr reactors and pressure vessels and are to be used only with Parr equipment.

Temperature and Pressure Limits

Parr Cell Disruption Vessels are intended to be used at or near ambient room temperature for preparing cell suspensions by the nitrogen decomposition method. Working pressure in these vessels should never exceed 2200 psig, which corresponds to the maximum pressure obtainable from a full nitrogen tank. If higher pressures should accidentally develop, the 920 mL and larger vessels are protected by a safety rupture disc which will burst at approximately 3000 psig, well below the pressure at which any parts of these vessels will fail. The 2200 psig maximum working pressure is purposely set below the 3000 psig range of the pressure gage and rupture disc since the gage works best when it is used below its top limit, and a frangible disc will not be reliable if stressed to more than 70 percent of its burst rating during normal operations.

These vessels are designed to be operated conveniently in an open laboratory without cumbersome closing or holding devices and without the protective screen usually required for high pressure reactors. In the usual cell disruption procedures the non-reactive vessel charge does not introduce a serious explosion or fume hazard. If, however, these vessels are to be used for applications other than cell disruption with nitrogen, the user must give close attention to all factors related to operating safety, including: corrosion problems, fume and exhaust hazards, and the need for a protective barricade.

Opening and Closing Operations

No. 4635 and 4636 Vessels, 920 and 1850 mL

To open the 920 mL and 1850 mL vessels, loosen the cone-pointed thumb screw in the outer band and lower the band to rest on the table. The two ring sections can now be removed and the head with all attached fittings lifted from the cylinder. Handle the head carefully so as not to damage any of the attachments.

Before closing these vessels, make sure that the O-ring head gasket is in good condition and properly positioned on the pilot of the vessel head. If previous usage has stretched the O-ring so that it will not hang onto the head, drop the ring into the gasket groove on the vessel cylinder. Set the cylinder inside the drop band on the table top and slide the head into place. As the head is installed, check to make certain that the dip tube reaches into the inner sample holder if one is used. A drop of water spread around the O-ring will make it easier to slide the head into the cylinder.

Slide the two ring sections into place and raise the band to encircle them. Position the band so that the cone-pointed screw enters the shallow detent drilled into the face of one of the ring sections, then tighten the thumb screw to lock the closure. Always check the band to be sure that it is properly positioned around the ring sections before pressurizing the vessel.

No. 4637 and 4638 Vessels, 1 and 2 gallon

To open the one and two gallon vessels, open the gas release valve to discharge any internal pressure, then loosen the valve to discharge any internal pressure, then loosen the ten caps screws in the split ring sections and raise each screw about three turns to clear the rim on the compression ring. When all screws are clear, slide the two ring sections outward to release the head. The head can now be lifted from the cylinder by grasping the valves with two hands and lifting upward. If the head tends to stick to the cylinder, insert a broad, flat screwdriver into the space between the head and cylinder to break the seal. Handle the head carefully so as not to damage any of the attachments.

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No. 4637 and 4638 Vessels, 1 and 2 gallon (Continued)

Before closing the vessel, examine the head gasket carefully to be sure that it is in good condition. After considerable use some of the Teflon gasket may extrude into a thin, ragged edge around the inside and outside diameters. This does not necessarily mean that the gasket must be replaced, but the extruded portion should be removed with a sharp knife. Examine the mating surfaces on the cylinder and head to be sure they are clean and free from burrs.

To close the vessel, set the head on the cylinder and slide the two ring sections into place. Loosen the cap screws if necessary to clear the rim on the compression ring. Use the wrench furnished with the vessel to apply a firm, hard pull on each screw, working in a criss-cross pattern progressively around the circle. If a torque wrench is available, apply 25 ft-lbs. to each screw. Tighten each screw at least twice to compensate for any gasket flow. If a new gasket is being used for the first time it is advisable to let the vessel stand for fifteen minutes after the initial tightening, then tighten the screws again to compensate for any gasket flow.

No. 4639 Vessel, 45 mL

A firm closure for the small, 45 mL Cell Disruption Vessel is obtained by simply turning a knurled cap until it is hand tight. No wrenches or fixtures are required. An O-ring gasket held in a recess in the vessel head will maintain a tight seal without excessive loading on the screw cap. When closing the vessel, set the head in place and push it down until it rests firmly in the cylinder, then turn the screw cap down by hand to complete the assembly. A drop of water spread on the O-ring will make it easy to slide the head into the cylinder. When opening the vessel, always release any internal gas pressure before attempting to unscrew the cap. Keep the gasket groove and vessel surfaces clean at all times.

Attaching The Filling Connection

The 1831 Nitrogen Filling Connection provides all of the valves and fittings needed to fill a cell disruption vessel from a commercial nitrogen tank equipped with a standard CGA 580 outlet. To attach the filling connection to the gas tank, remove the protective cap from the tank valve and inspect the outlet socket to be sure that it is clean and in good condition. Place the ball end of the filling connection into the socket and tighten the follower nut firmly with a wrench while keeping the delivery hose pointing downward. The connection to the vessel is made by inserting the hose fitting into the adapter on the inlet valve and tightening the knurled nut finger tight. It is not necessary to use pliers or a wrench on this quick disconnect coupling. The gage on the side of the filling connection shows the supply pressure in the nitrogen tank when the tank valve is open, and the valve built into the end of the block controls the flow of gas to the vessel. The small valve pointing downward from the block is used to release the pressure in the filling hose before disconnecting the hose from the vessel.



1831 Nitrogen Filling Connection

Preparing The Vessel Charge

Each operator will determine by experiment the procedure for preparing a cell suspension and for charging the vessel which will produce the best results for his particular material. Detailed instructions given in Parr Bulletin 4635MB will be helpful and should be reviewed before starting to use the apparatus. But in all operations, the user must observe the basic vessel handling and safety precautions given here.

Pressurizing With Nitrogen

Starting with all valves closed and with the hose attached to the vessel inlet valve, proceed as follows: Open the nitrogen tank valve not more than one quarter turn; open the vessel inlet valve one or two turns; then open the filling connection control valve slowly and watch the vessel gage as the pressure rises to the desired level. Close the control valve momentarily and watch the pressure gage to see if the pressure drops significantly as the sample absorbs nitrogen. If so, add nitrogen to maintain the desired pressure level; then close all valves and

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open the dump valve on the underside of the filling connection to release the residual pressure in the filling hose. Now disconnect the hose from the inlet valve and close the dump valve.

Equilibrium

Sufficient time must be allowed for the nitrogen to dissolve and come to equilibrium with the cells. Periods as short as five minutes may be sufficient for small samples while longer times up to thirty minutes may be required for larger samples. Stirring with a magnetic bar placed in the bottom of the vessel will accelerate this process, particularly when working with large samples. Stirring will also hold the cells in a uniform suspension. Since these vessels are made of a non-magnetic stainless steel, the stirring bar can be driven by simply placing the vessel on a magnetic stirring plate. If cooling is required to protect the sample, the vessel can be pre-cooled before it is charged, or ice can be packed around the inner sample holder, or the vessel can be packed in ice or held in a cold room during equilibrium.

Disruption and Collection

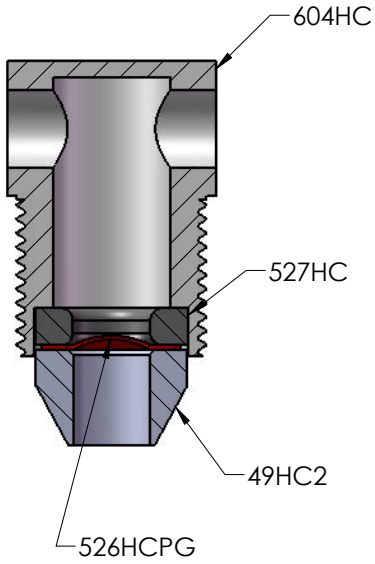
Disruption occurs as the homogenate is released to atmospheric pressure through the discharge valve. A side arm suction flask works well as a receiver, with the delivery tube inserted through a stopper in the neck and the side arm left open to release the nitrogen. The sample does not have to be discharged rapidly to attain maximum disruption since the disruption process occurs on an individual cell basis, independent of the rate at which the cells are released from the high pressure chamber. To prevent splattering in the receiver and freezing in the discharge tube, close the discharge valve after the bulk of the sample has been recovered and release the remaining nitrogen through the inlet valve.

If the vessel pressure drops significantly when discharging a large sample, add nitrogen through the inlet valve to maintain a constant pressure in the vessel during the discharge period. After the sample has been recovered, release the residual nitrogen through the inlet valve. This valve should also be used to release the pressure should it become necessary to abort a test after the vessel has been pressurized. All vessel pressure must be released before attempting to open the cover clamp.

Vessel Maintenance

Keep all parts of the vessel clean and dry when not in use and replace the vessel head gasket or O-ring whenever it shows signs of wear or deterioration. The small 357HC O-ring in the quick disconnect hose fitting will also have to be replaced occasionally.

If it becomes necessary to remove the gage or valves from the vessel head, the tapered threads on these fittings must be coated with Teflon tape, plastic lead or a similar luting material on reassembly to ensure a tight seal.



A888HC Safety Head Assembly

The Safety Rupture Disc

All Parr Cell Disruption Vessels (except the 45 mL model) carry an A888HC safety head assembly to protect the vessel from accidental overpressure. The 526HCPG rupture disc usually installed in this assembly has a burst rating of 3000 psig at room temperature. A metal tag attached to the safety head on each vessel identifies the burst rating for the disc and the construction material from which the disc is made. This tag must remain with the apparatus so that both present and future operators will be aware of the disc rating. When installing a replacement disc, always attach the new tag to the safety head.

When replacing a rupture disc the domed side of the disc must project toward the outlet or discharge port. If there is a choice between a sharp edge and a rounded edge on the 527HC orifice ring which bears against the domed side of the disc, place the rounded edge – not the sharp edge – against the disc. To install the disc, assemble the parts in the proper order as shown on the drawing, holding them upright and inverted with the 49HC2 orifice cone on top, followed by the rupture disc, the 527HC orifice ring and the 604HC body. When all parts are in place, invert the vessel head, insert the parts into the rupture disc socket and tighten the body plug firmly.

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The Safety Rupture Disc (Continued)

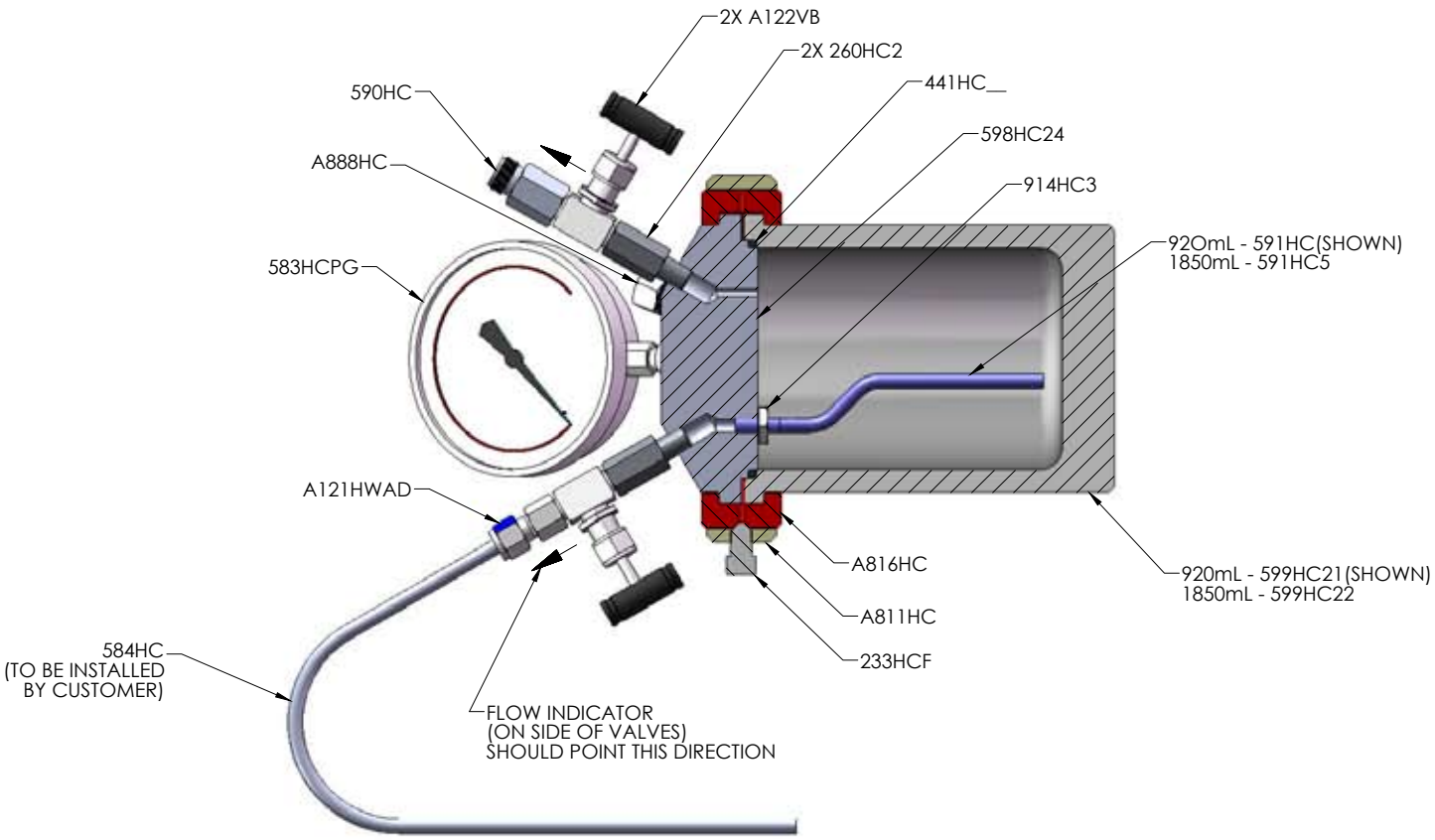
Under normal operating conditions where the pressure applied to a disc never exceeds 70% of the burst rating, there should be little or no deterioration in the ability of the disc to function as intended unless it is affected by corrosion or other external factors. But if the operating pressure should ever exceed 70%, the disc may be weakened. And if the pressure should ever reach 90% of the disc rating, the disc should be replaced as it is most likely that fatigue will have occurred and in subsequent operating cycles the disc may burst at a pressure below its original rating.

The user must assume full responsibility for installing an adequate venting system to remove any toxic, flammable or volatile materials which would be released if the rupture disc should burst, and for protecting the operator or any bystander who may be in the vicinity of the vessel from the loud noise created by a burst. Ear protectors or cotton plugs may be the only way to effectively protect individuals from this noise hazard. Consideration must also be given to any flying particles, disc fragments or reaction materials which might be carried with the discharge. It must be emphasized, as a basic rule, that the discharge port from the rupture disc must always be directed away from all personnel.

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Parts Lists

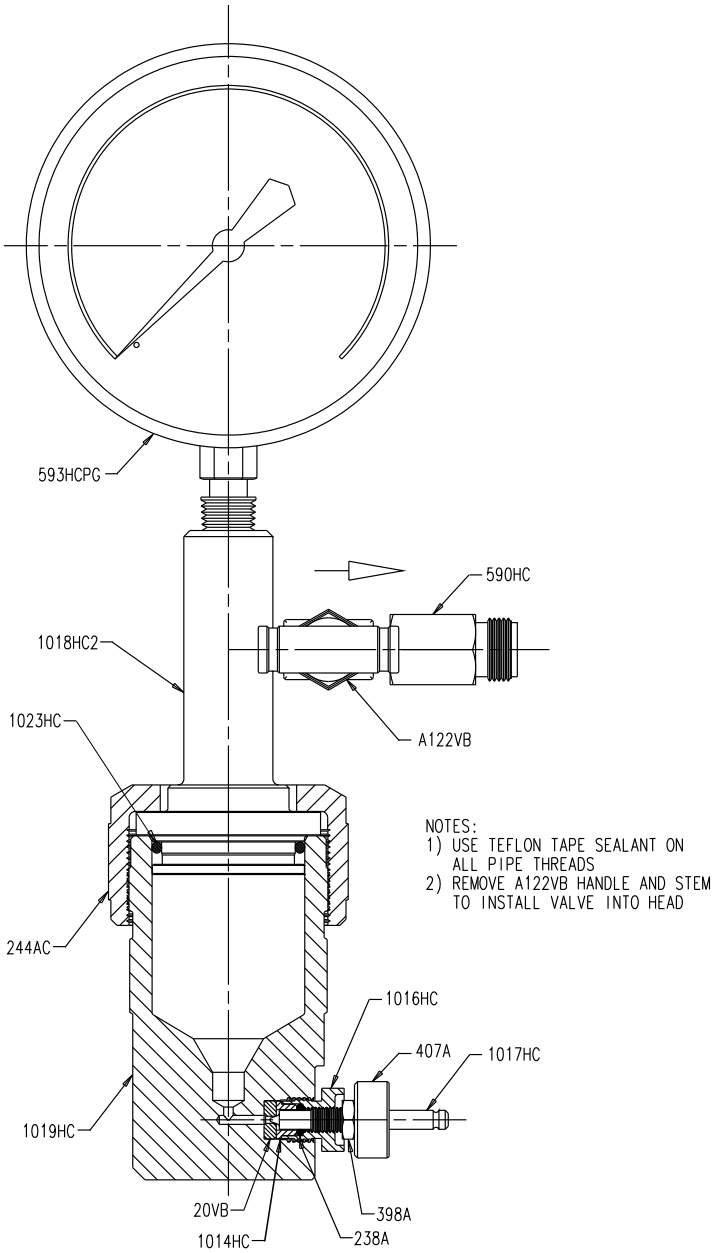
Parts for the 4635 and 4636 Cell Disruption Bombs



Part No.	Description
49HC2	Orifice cone
A121HWAD	Tube connector
A122VB	Needle valve, 1/8" NPT, male
260HC2	Valve extension
441HC	O-ring, Neoprene
526HCPG	Rupture disc, 3000 psi, Inconel
527HC	Orifice ring
584HC	Discharge tube
590HC	Filling connection adapter
591HC	Dip tube with nut, 920 mL
591HC5	Dip tube with nut, 1850 mL
593HCPG	Pressure gage, 3½", 3000 psi
598HC24	Bomb head, bare, T316SS
599HC21	Bomb cylinder, 920 ml, T316SS
599HC22	Bomb cylinder, 1850 ml, T316SS
604HC	Rupture disc nut
A811HC	Drop band
811HCF	Drop band bolt
A816HC	Split ring, pair

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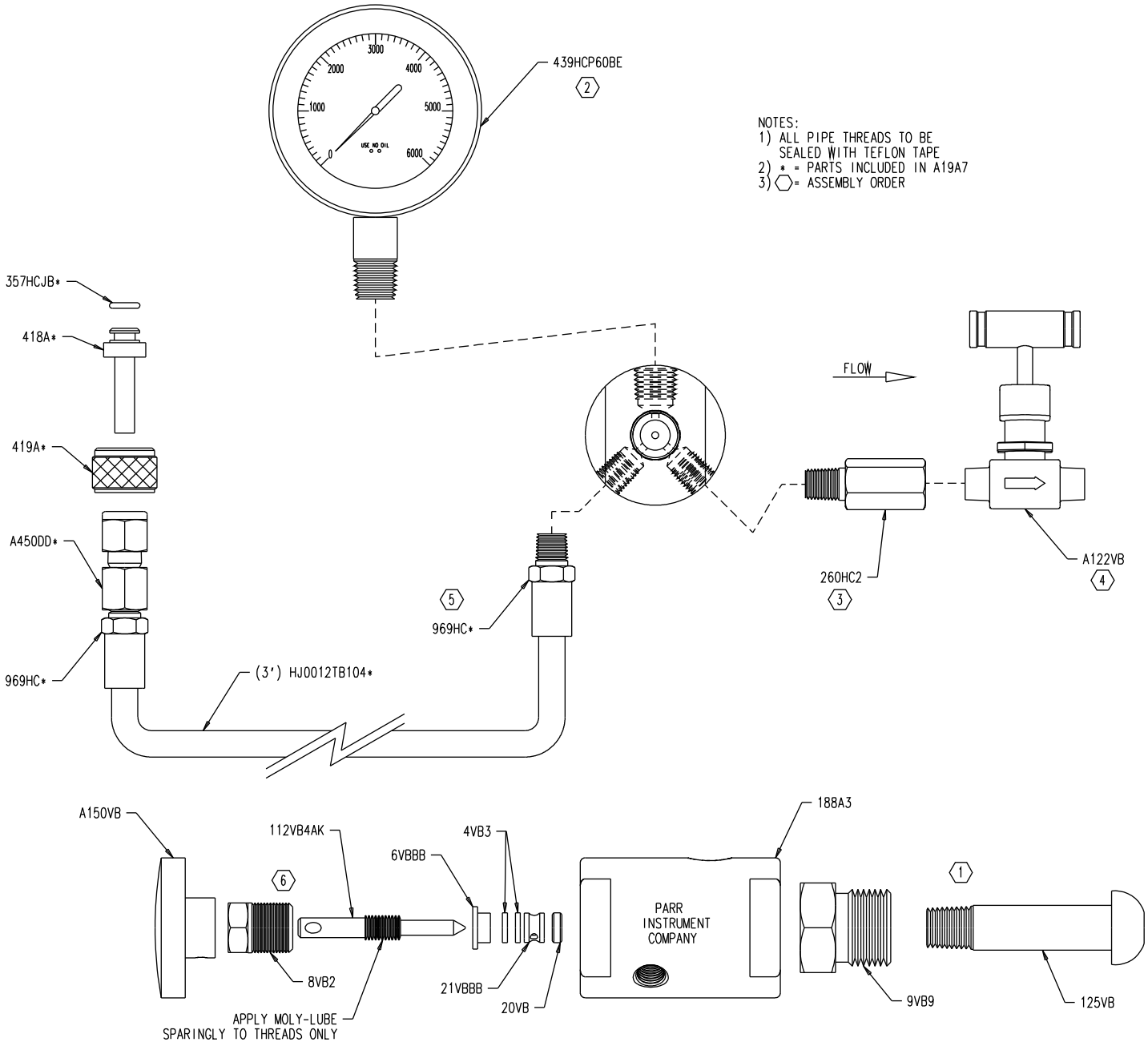
Parts For The 4639 Cell Disruption Bomb



Part No.	Description	Part No.	Description
20VB	Valve seat, Kel-F	590HC	Filling connection adapter
A122VB	Needle valve, 1/8" NPT, male	593HCPG	Pressure gage, 3½", 3000 psi
155VB	Street tee	1014HC	Packing follower
238A	O-ring, Buna-N	1016HC	Compression nut
244AC	Screw cap	1017HC	Valve needle
398A	Lock nut	1018HC	Bomb head, bare, T304SS
407A	Valve knob	1019HC	Bomb cylinder, 45 ml, T304SS
504HCAD	Reducer	1023HC	O-ring, Neoprene

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Parts For The 1831 Nitrogen Filling Connection



Key No.	Part No.	Description	Key No.	Part No.	Description
1	189A	Oxygen gage, 2½", 3000 psi	10	4VB3	Packing ring, Teflon
2	419DD	Plug, ¼" NPT, soc. hd.	11	21VBBB	Lantern ring
3	188A2	Valve body, bare	12	20VB	Valve seat, Kel-F
4	9VB9	Tank union nut, CGA 580	13	357HCJB	O-ring
5	125VB	Tank union stem, CGA 580	14	418A2	Union fitting
6	A150VB	Control knob	15	419A	Union nut, knurled
7	8VB2	Packing nut	16	A19A7	Flexible tube assembly
8	112VB4AK	Valve needle			(Includes Nos. 13, 14, 15)
9	6VBBB	Packing cover	17	A122VBBB	Needle valve, 1/8" NPT, male

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