**Pressure Vessel Assembly Instructions**

1) Measure aluminum tube outer diameter
2) Machine both end caps and only drill pilot holes for all holes shown
3) Weld both end caps onto the aluminum tube and be sure to align the hole patterns on both end caps to be coaxial. Slight variations will be compensated by the hydraulic system, but line up the holes as well as possible, as shown in figure 1 below.

4) Drill and tap holes on end caps to full size. This sub assembly will now be referred to as the pressure vessel.
5) Machine all plates of 8”x1/2” 6061 aluminum and 1”x3/4” 7075 aluminum.
6) Assemble the four frame components of the 7075 aluminum bars
7) Assemble the 8”x1/2” 6061 aluminum plates with the 7075 aluminum bars but do not attach the end plate on the 7075 aluminum bar frame side.
8) Machine and assemble the torque bar, hydraulic cylinders, and hydraulic piston. Be sure to include both o-rings on the piston and to place the 3/8” ball into both divots of the two pistons.

![Diagram of assembly process](image)

9) Orient the housing to a vertical position. Insert the pressure vessel into the partially constructed housing.

![Diagram of housing and pressure vessel](image)

10) Bolt the fixed end cap to the end plate of the housing.
11) Bolt torque bar and hydraulic cylinder assembly to the pressure vessel. Support the pressure vessel from underneath to prevent deforming the vessel from the bending stresses until the last plexiglas sheet is in place.

![Diagram of pressure vessel and assembly](image1)

12) Press fit the bronze bushing into the bore in the remaining end plate. Insert the shoulder bolt through the bushing and add a Belleville washer to the shoulder bolt, as shown in fig. xx.

![Diagram of end plate assembly](image2)
13) Attach the end plate and then the side plexiglas plates to the remaining housing and screw the shoulder bolt into the torque bar. THE HEAD OF THE SHOULDER BOLT OUGHT NOT TO TOUCH THE BUSHING. Add a second Belleville washer only if necessary.

14) Assemble the top MiniTec frame subassembly as shown below. Be absolutely sure that the two ends of the 35” section are coplanar, or the assembly will not construct properly. Orientate the power lock fasteners of the cross beam so they are tightened from the side away from the plate’s position. The plate will be inserted from the open side which is closest on the figure below. Remove two ½”x½” squares from two adjacent corners of the plate. Slide the 24”x24” polycarbonate plate into the grooves of the profile, the notched side will protrude approximately ½” from the subassembly end.
15) Place one 23” section to cover the overhang of the polycarbonate plate from the subassembly. Attach the top frame subassembly to the four 34” sections. Be sure to keep the two threaded ends of the 34” away from the top level. It is recommended that this stage of the construction be completed upside down with the top subassembly on the ground. Add another 23” section to the other end of the frame.

16) Cut the 24”x48” polycarbonate sheet down to 24”x36” and notch all four corners \( \frac{1}{2}” \times \frac{1}{2}” \) to fit the frame as done with two sides of the 24”x24” plate.

17) Place the 24”x36” polycarbonate sheet into the four remaining MiniTec sections. Leave this subassembly on the ground and place the legs down through the powerlock fasteners. Adjust the four MiniTec sections on the ground to fit the legs. Raise the 24”x36” platform to a desired height.

18) Add casters to the four legs and mount the pressure vessel to the frame with the four M8 bolts and M8 square nuts. The vessel will be mounted to the two sections in the middle of the top platform. The completed assembly should resemble the figure below.
19) Machine the pressure gauge mount.
20) Attach associated nylon tube fitting to each hydraulic component according to table yy. Note that a 90° Elbow is placed between the pressure gauge and hydraulic pump so the pressure gauge is centered on the mounting plate.

<table>
<thead>
<tr>
<th>Component</th>
<th>Right-side fitting</th>
<th>Left-side fitting</th>
<th>Top fitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic Pump</td>
<td>¼” NPT 90° Elbow</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pressure Gauge</td>
<td>1/8” NPT 90° Elbow</td>
<td>1/8” NPT Tee</td>
<td>Brass ¼” to 1/8” adapter and pressure gauge</td>
</tr>
<tr>
<td>Torque Valve</td>
<td>¼” NPT adapter</td>
<td>¼” NPT 90° Elbow</td>
<td>-</td>
</tr>
<tr>
<td>Vessel Valve</td>
<td>¼” NPT 90° Elbow</td>
<td>¼” NPT adapter</td>
<td>-</td>
</tr>
<tr>
<td>Vessel End Cap</td>
<td>1/8” extension and 1/8” NPT 90° Elbow</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Close Cylinder</td>
<td>-</td>
<td>1/8” extension and 1/8” NPT tee</td>
<td>-</td>
</tr>
<tr>
<td>Far Cylinder</td>
<td>-</td>
<td>1/8” extension and 1/8” NPT 90° Elbow</td>
<td>-</td>
</tr>
</tbody>
</table>

21) Mount all hydraulics with fittings onto the hydraulics plate. Drill holes to fit the hydraulic layout. The recommended layout of the hydraulics is shown below.

22) Measure and cut nylon tubing to appropriate lengths for each connection. Be sure to leave enough length to be inserted into the tube fittings.
23) Detach hydraulics from the hydraulics plate and insert all of the nylon tubing into the appropriate nylon fitting.
24) Add hydraulic fluid to both cylinders, the pressure vessel, and tubing. Remove all air bubbles.