**DISASSEMBLY PROCEDURE**

1. **De-Pressurize the line**
   Always check, never take it for granted that the line has been de-pressurized. Proceed with caution since pressurization can re-occur for many reasons.

2. **Slacken nuts but DO NOT remove the nuts from the bolts - then slacken clamp segments**
   Gradually undo the nuts until just loose. If clamp segments remain bound onto hubs, then BOTH segments must be slackened by hitting the inner face of the clamp lugs with a suitable soft-faced hammer.

3. **Repeat slackening procedure**
   Further loosen nuts and re-sacken BOTH clamp segments until the maximum nut travel (2x) shown below is reached (ref Table 2). This should release sealing contact and any residual pressure will then be released through the joint. DO NOT remove nuts.

4. **Check clamps are slack and free to rotate and/or rock about hubs**
   Do not proceed until any discharge ceases ensure that hubs are apart, sealing is free to move AND clamps are slack, free to rotate or rock. NOTE - If pressure is still in the line, the seating might remain seated, making the joint tight even though it is part disassembled. ONLY when all components are loose and clamps are free to move can disassembly be completed. If the components are not free to move DO NOT CONTINUE - contact your supervisor.

5. **Always ask yourself - “What if ... ?”**
   - What if, the connection is still under pressure, am I or others in danger, and if so how?
   - What if, there is still gas or fluid in the line?
   - What if, the sling snaps or the load swings in my direction?
   - What if, the piping springs upon release? (Piping spring may also prevent free rotation of clamps around the hubs).

6. **Protect parts for re-assembly**
   - Apply anti-corrosion coating to hub seat area.
   - Fit protective caps.
   - If sealing is to be re-used, inspect seal surfaces. If OK store safely for re-use; damaged sealings shall be discarded.

---

**ASSEMBLY - DISASSEMBLY POCKET GUIDE**

Australia (Perth) +61 8 9324 3880
Brazil (Rio De Janeiro) +55 11 2176 2300
Malaysia (Kuala Lumpur) +603 8723 3689
Norway (Drammen) +47 32 20 93 00
UK (Aberdeen) +44 1224 775 242
UK (Port Talbot) +44 1639 822 555
USA (Houston) +1 713 979 4444

© 2016 Freudenberg Oil & Gas Technologies. All rights reserved. Vector TECHLOK® is a registered trademark of FOGT.

www.fogt.com

VECTORS TECHLOK® CLAMP CONNECTOR

INNOVATING TOGETHER
ASSEMBLY PROCEDURE

1. Inspect components prior to assembly
   Hub and sealing tapered surfaces MUST be clean and free from foreign matter. Damaged or corroded seats must be rectified. Damaged sealings MUST be discarded, and replaced with new ones.

2. Verify seating material
   The correct size and material type of sealing MUST be fitted (see Table 1). Sealing material is marked on ribs (as shown). Colour coding DOES NOT APPLY!

3. Lubricate
   Usually sealings are coated which acts as lubricant during installation. If required light oil or MoS2 spray can be used on hub seating surface but not on sealing. Take care that no solid particles are present in the lubricant.

4. Check seating standoff
   The sealing should rock slightly against hub face. Tilt the sealing in the seat and measure stand-off gap (as shown). Stand-off dimensions given in Table 3.

5. Align Hubs
   Hubs should be aligned so that sealing can be installed between hubs. DO NOT attempt to correctly mis-aligned piping by clamping force alone. Piping pulling forces should only be released when clamp is fully assembled.

6. Assemble components
   Install sealing into the hubs, and assemble clamp around the hubs. Lubricant applied to the hub/clamp contact area will aid assembly. The stud-bolts should be fitted ensuring that spherically faced nuts locate into spherical seats of the clamp. Lubrication with MoS2 (or similar) of nut faces and bolt threads is recommended (Table 2).

7. Tighten bolts in uniform manner
   Bolting should be uniformly tightened to torque values shown in Table 2, keeping spacing between clamp halves to suit environmental conditions. Usually sealings are coated which acts as lubricant during installation. If required light oil or MoS2 spray can be used on hub seating surface but not on sealing. Take care that no solid particles are present in the lubricant.

8. Completed assembly
   Complete Vector Techlok® assembly requires two conditions: 1) Hubs must be completely face to face with the rib of the sealing where standard hubs are used and completely face to face with each other where recessed hubs are used. 2) Bolts are made up to the correct torque.

FABRICATION – “Attention to Detail”

1. Ensure good alignment – easy assembly
   **IMPORTANT:** During fabrication, fully tighten connectors (face to face) for each section of piping. DO NOT leave connectors loose for “final assembly” - otherwise sealing stand-off will introduce piping mis-alignment. When cutting pipe, allow for sealing rib thickness as shown (not applicable for recessed hubs). If in doubt, assemble components to verify.

2. Respect & protect sealing surfaces
   - **AVOID DAMAGE to sealings from galling, swarf, etc.**
   - **Protecting seal seating areas (see Table 1).**
   - Apply anti-corrosion protection where necessary and re-fit caps.

3. Corrosion protection
   - **Apply anti-corrosion protection where necessary and re-fit caps.**
   - Usually sealings are coated which acts as lubricant during installation. If required light oil or MoS2 spray can be used on hub seating surface but not on sealing. Take care that no solid particles are present in the lubricant.

**TABLE 1 : SEALING MATERIAL GUIDELINES**

<table>
<thead>
<tr>
<th>Sealing Material Type</th>
<th>Low Alloy</th>
<th>Stainless</th>
<th>6Mo Stainless</th>
<th>High Strength Stainless</th>
<th>Duplex &amp; Super Duplex</th>
<th>Nickel Alloy</th>
</tr>
</thead>
<tbody>
<tr>
<td>HUB MATERIAL</td>
<td>AISI 4130</td>
<td>AISI 3140</td>
<td>A182 F316</td>
<td>A182 F44 (717)</td>
<td>A182 F65</td>
<td>Alloy 718</td>
</tr>
<tr>
<td>MARKING DATA</td>
<td>(Machinery Grade)</td>
<td>(Machinery Grade)</td>
<td>(Machinery Grade)</td>
<td>(Machinery Grade)</td>
<td>(Machinery Grade)</td>
<td>(Machinery Grade)</td>
</tr>
<tr>
<td>Carbon / Low alloy steel</td>
<td>A694 F52, F60, F65, A530 LF2</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
</tr>
<tr>
<td>as above + Alloy 625 inty</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
</tr>
<tr>
<td>Duplex &amp; Super Duplex</td>
<td>A182 F51, F53, F55, F61</td>
<td>(2)</td>
<td>(2)</td>
<td>(2)</td>
<td>(2)</td>
<td>(2)</td>
</tr>
<tr>
<td>Nickel Alloy</td>
<td>Alloy 625, 80/80S, Cu + Cladding</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
</tr>
</tbody>
</table>

**TABLE 2 : TECHLOK BOLTING AND ASSEMBLY DATA**

<table>
<thead>
<tr>
<th>Clamp Size</th>
<th>Standard Bolt Dls</th>
<th>Bolt Preload Note 1</th>
<th>Bolt Torque (Ft-lbs/1000 Nm)</th>
<th>Notes</th>
<th>ZK</th>
<th>GR Standard</th>
<th>GR Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>ins</td>
<td>Lbf</td>
<td>KN</td>
<td>Ft-lbs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/8 in</td>
<td>0.500</td>
<td>11.2</td>
<td>12.7</td>
<td>1.2</td>
<td>1</td>
<td>1510</td>
<td></td>
</tr>
<tr>
<td>1/4 in</td>
<td>0.625</td>
<td>14.4</td>
<td>16.7</td>
<td>1.4</td>
<td>2</td>
<td>14GR</td>
<td></td>
</tr>
<tr>
<td>3/8 in</td>
<td>0.750</td>
<td>17.7</td>
<td>20.7</td>
<td>1.7</td>
<td>3</td>
<td>12GR</td>
<td></td>
</tr>
<tr>
<td>1/2 in</td>
<td>0.875</td>
<td>21.0</td>
<td>24.0</td>
<td>2.0</td>
<td>4</td>
<td>10GR</td>
<td></td>
</tr>
<tr>
<td>5/8 in</td>
<td>1.000</td>
<td>24.5</td>
<td>28.0</td>
<td>2.3</td>
<td>5</td>
<td>8GR</td>
<td></td>
</tr>
<tr>
<td>3/4 in</td>
<td>1.250</td>
<td>30.0</td>
<td>34.0</td>
<td>2.8</td>
<td>6</td>
<td>6GR</td>
<td></td>
</tr>
<tr>
<td>1 in</td>
<td>1.500</td>
<td>36.0</td>
<td>40.0</td>
<td>3.4</td>
<td>7</td>
<td>5GR</td>
<td></td>
</tr>
<tr>
<td>1 1/4 in</td>
<td>1.750</td>
<td>43.0</td>
<td>47.0</td>
<td>4.0</td>
<td>8</td>
<td>4GR</td>
<td></td>
</tr>
<tr>
<td>1 1/2 in</td>
<td>2.000</td>
<td>51.0</td>
<td>55.0</td>
<td>4.6</td>
<td>9</td>
<td>3GR</td>
<td></td>
</tr>
<tr>
<td>2 in</td>
<td>2.250</td>
<td>60.0</td>
<td>65.0</td>
<td>5.5</td>
<td>10</td>
<td>2GR</td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 3 : SEALING STANDOFF**

<table>
<thead>
<tr>
<th>Size</th>
<th>Minimum Standoff 'Tilted' for reuse</th>
<th>Minimum Standoff 'Tilted' for reuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8 in</td>
<td>0.075</td>
<td>0.075</td>
</tr>
<tr>
<td>1/4 in</td>
<td>0.105</td>
<td>0.105</td>
</tr>
<tr>
<td>3/8 in</td>
<td>0.150</td>
<td>0.150</td>
</tr>
<tr>
<td>1/2 in</td>
<td>0.200</td>
<td>0.200</td>
</tr>
<tr>
<td>5/8 in</td>
<td>0.250</td>
<td>0.250</td>
</tr>
<tr>
<td>3/4 in</td>
<td>0.300</td>
<td>0.300</td>
</tr>
<tr>
<td>1 in</td>
<td>0.375</td>
<td>0.375</td>
</tr>
</tbody>
</table>

Notes:
1. Basic (minimum) values shown shall be used for piping systems up to 600 lb, blind closures and applications using Stainless Steel clamps.
2. Different friction coefficients will be required to calculate the torque values to be adjusted.
3. For 900 lb systems and above, increase bolt torque/preload by 1.5.
4. For 900 lb to 1500 lb systems, increase bolt torque/preload by 1.5; for (1600 lb incl. 5x) systems and above increase bolt torque/preload by 2.
5. Increased bolt torques/preloads in points 3 & 4 above for Low Alloy steel clamps with 307/316 bolts (Stainless Steel). Do not use Stainless Steel clamps.
6. Exceeding the bolt loads detailed above may cause clamp/hub distortions. If correct make-up is not achieved (i.e. unable to correct mis-alignment), then seek assistance as other measures may be needed to assist with the assembly.

**COLOUR CODING**

- **STOP:** Avoid this material selection!
- **USE WITH CAUTION:** Check specification or seek metallurgical advice (see notes)
- **GO:** Good material selection

**TABLE 1 : SEALING MATERIAL GUIDELINES**

<table>
<thead>
<tr>
<th>Sealing Material Type</th>
<th>Low Alloy</th>
<th>Stainless</th>
<th>6Mo Stainless</th>
<th>High Strength Stainless</th>
<th>Duplex &amp; Super Duplex</th>
<th>Nickel Alloy</th>
</tr>
</thead>
<tbody>
<tr>
<td>HUB MATERIAL</td>
<td>AISI 4130</td>
<td>AISI 3140</td>
<td>A182 F316</td>
<td>A182 F44 (717/4H)</td>
<td>A182 F65</td>
<td>Alloy 718</td>
</tr>
<tr>
<td>MARKING DATA</td>
<td>(Machinery Grade)</td>
<td>(Machinery Grade)</td>
<td>(Machinery Grade)</td>
<td>(Machinery Grade)</td>
<td>(Machinery Grade)</td>
<td>(Machinery Grade)</td>
</tr>
<tr>
<td>Carbon / Low alloy steel</td>
<td>A694 F52, F60, F65, A530 LF2</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
</tr>
<tr>
<td>as above + Alloy 625 inty</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
</tr>
<tr>
<td>Duplex &amp; Super Duplex</td>
<td>A182 F51, F53, F55, F61</td>
<td>(2)</td>
<td>(2)</td>
<td>(2)</td>
<td>(2)</td>
<td>(2)</td>
</tr>
<tr>
<td>Nickel Alloy</td>
<td>Alloy 625, 80/80S, Cu + Cladding</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
<td>(6)</td>
</tr>
</tbody>
</table>

Notes:
1. Corrosion resistance lower than Hub
2. Not recommended for sour service
3. Not recommended for produced or injected seawater
4. Not recommended for cryogenic service below -100°C
5. Not recommended for service below -50°C
6. For H2S service refer to NACE MR0175