Tubing String Testing (TST) Valve

PROVIDES TUBING TESTING CAPABILITY WITH AUTOMATIC FILL OF THE WORKSTRING

OVERVIEW

The tubing string testing (TST) valve is a full-opening valve used to pressure-test the workstring while running in the hole. The valve is operated after it is stung into a permanent packer or after a retrievable packer is set. The TST valve requires a differential pressure between the annulus and the tubing to shear. The TST valve can also be used for pipe flexing if it is run below an annulus pressure-responsive circulating valve.

The TST valve consists of:

» flapper valve and spring
» shear pin section
» locking dogs

FEATURES AND BENEFITS

» Flapper valve requires only 4 psi to open.
» Testing string can be pressure-tested as many times as required as it is run in the hole.
» Valve shear rating can be pre-determined at 500 psi increments.
» Valve can also be used for pipe flexing.

OPERATION

The valve is normally set to operate at a pressure at approximately 1,000psi (69 bar) above well hydrostatic at the tool. This enables the tool to be run in and operated when pressuring up on the first annulus pressure cycle. The workstring can be pressure-tested as many times as required as it is run in the hole. While the workstring is stationary, a spring keeps the flapper valve closed. After the workstring pressure test is complete, the tool is sheared when annulus pressure is applied to the predetermined shear pin rating. The shear rating can be adjusted in 500 psi increments to shear from 500 to 6,000 psi differential. When the pins shear, the mandrel moves up and pushes the flapper open, allowing the locking dogs to engage. The tool is then fully open. The tool works on differential pressure between annulus and tubing. Failure to shear initially on application of annulus pressure is not critical. The process of drawing the well down also creates a pressure differential that helps the tool shear. When used for pipe flexing, the TST valve is run below an annulus pressure-responsive circulating valve, such as the RD circulating valve. The string is pressured up against the flapper valve as many times as required. The circulating valve is sheared after flexing operations are complete, and the workstring is pulled out dry.
## Equipment Specifications

<table>
<thead>
<tr>
<th>Nominal Tool Size in.</th>
<th>Outer Diameter in. (cm)</th>
<th>Inner Diameter in. (cm)</th>
<th>Makeup Length in. (cm)</th>
<th>End Connections</th>
<th>Differential Pressure¹ psi (bar)</th>
<th>Tensile Load² lb (kg)</th>
<th>Service Temperature °F (°C)</th>
<th>H₂ Service³</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3.06 (9.91)</td>
<td>1.00 (2.54)</td>
<td>54.00 (137.16)</td>
<td>2 1/4 CAS</td>
<td>15,000 (1034)</td>
<td>153,000 (69,400)</td>
<td>450 (232)</td>
<td>SG175</td>
</tr>
<tr>
<td>3 7/8</td>
<td>3.90 (9.91)</td>
<td>1.80 (4.57)</td>
<td>44.67 (113.46)</td>
<td>2 7/8 CAS</td>
<td>15,000 (1034)</td>
<td>249,000 (112,946)</td>
<td>450 (232)</td>
<td>SG175</td>
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<tr>
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<td>5.03 (12.78)</td>
<td>2.28 (5.79)</td>
<td>48.00 (121.92)</td>
<td>3 7/8 CAS</td>
<td>15,000 (1034)</td>
<td>415,957 (188,678)</td>
<td>450 (232)</td>
<td>SG175</td>
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<tr>
<td>5</td>
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<td>2.28 (5.79)</td>
<td>51.20 (130.05)</td>
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<td>15,000 (1034)</td>
<td>369,100 (167,424)</td>
<td>450 (232)</td>
<td>SG</td>
</tr>
</tbody>
</table>

Notes:

1. Differential pressure is the difference in pressure between the casing annulus and the tool ID.
2. The values of tensile, burst, and collapse strength are calculated with new tool conditions, Lame’s formulas with Von-Mise’s Distortion Energy Theory for burst and collapse strength, and stress area calculations for tensile strength.
   » These ratings are guidelines only. Refer to the equipment data book for individual equipment specifications.

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