Rupture Disc (RD) Tubing String Testing (TST) Bypass Valve

A TST VALVE PROVIDING AUTOMATIC FILL FEATURE AND BYPASS FOR STINGING INTO PRODUCTION PACKERS

OVERVIEW

The rupture disc (RD) tubing string testing (TST) bypass valve is a full-opening valve used to pressure test the workstring while running in the hole. The tool is normally operated after it is stung into a permanent packer or after a retrievable packer is set. This tool also has a bypass below the flapper that enables the tool string to be “stung in” to a production packer. To operate the tool, annulus pressure is applied, rupturing the RD, moving the mandrel up, closing the bypass ports, and locking the flapper open.

The TST valve consists of:

» Flapper valve and spring
» RD section
» Bypass ports.

FEATURES AND BENEFITS

» Flapper valve requires only 4 psi (0.3 bar) to open.
» Workstring can be pressure tested as many times as required as it is run in the hole.
» The air chamber section consists of a RD case and RD, available for a wide range of pressure applications. The RD bursts at a predetermined pressure, enabling the mandrel to move up, pushing the flapper valve open, and closing a set of bypass ports.
» The bypass section is at the bottom of the tool and consists of a set of ports and a ported mandrel. When the RD bursts, the mandrel moves up, closing off the ports and communication between the annulus and the tool string.
» Valve can also be used for pipe flexing.

OPERATION

The valve is normally set to operate at a pressure of approximately 1,000 psi (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 bypass ports enable the tool to auto-fill when tripping in as well as helping ensure pressure test pressure above the flapper cannot be transmitted to any tools below. The tool has internal shear pins that hold the mandrel in place while running in the hole. 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 open when annulus pressure is applied to rupture the RD, moving the mandrel up and pushing the flapper open while closing the bypass ports. The tool is then fully open and able to maintain tool inside diameter (ID) to annulus differential.
## 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>Absolute Pressure¹ psi (bar)</th>
<th>Differential Pressure² psi (bar)</th>
<th>Tensile Load³ lb (kg)</th>
<th>Service Temperature °F (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 ¼*</td>
<td>5.27* (13.37)</td>
<td>2.25 (5.72)</td>
<td>66.83 (169.75)</td>
<td>3 7/8 CAS</td>
<td>24,000** (1655)</td>
<td>15,000 (1034)</td>
<td>400,000 (181,437)</td>
<td>450 (232)</td>
</tr>
</tbody>
</table>

Notes:
1 Absolute pressure is hydrostatic pressure plus applied pressure
2 Differential pressure is the difference in pressure between the casing annulus and the tool ID.
3 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.
* Tool is also available in 5-in. OD with replacement RD case.
** Absolute pressure with 5-in. OD RD case is 16,500 psi (1138 bar).
» Meets NACE MR0175 requirements (>175°F / 79°C).
» These ratings are guidelines only. Refer to the equipment data book for individual equipment specifications.

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