DT Family of Valves

The DT family of valves incorporate a combination of design features to provide solutions required to address a number of oilfield drilling functions where conventional designs have significant reliability issues.

- A flapper design of valve allows pump through capability without intervention
- A curved flapper design maximises throughbore for any particular housing thickness
- A compression closing spring design improves reliability over torsion spring closure
- An integral pivot within the flapper design enhances strength and reliability of the flapper mechanism
- Elastomer technology on the valve seat gives durability and reliability in low differential pressure sealing situations
- A positive latching lock open sleeve allows safe passage of wireline through the valve
- Manufactured and tested in compliance with API Specification 7NRV 2006 - Specification for Drill String Non-Return Valves
- Certified by DNVGL to be in compliance with DNVGL-OS-E101
### DT Safety Valve Specification Standard Service (AISI 4145)

<table>
<thead>
<tr>
<th></th>
<th>DT Surface Flapper Safety Valve</th>
<th>DT Downhole Flapper Safety Valve</th>
<th>DT Coring Flapper Safety Valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Press.</td>
<td>15,000 psi</td>
<td>7,500 psi</td>
<td>7,500 psi</td>
</tr>
<tr>
<td>Below Valve</td>
<td>1034.2 bar</td>
<td>517.1 bar</td>
<td>517.1 bar</td>
</tr>
<tr>
<td>Internal Press.</td>
<td>15,000 psi</td>
<td>7,500 psi</td>
<td>7,500 psi</td>
</tr>
<tr>
<td>Body</td>
<td>1034.2 bar</td>
<td>517.1 bar</td>
<td>517.1 bar</td>
</tr>
<tr>
<td>External Press.</td>
<td>15,000 psi</td>
<td>7,500 psi</td>
<td>7,500 psi</td>
</tr>
<tr>
<td>(collapse)</td>
<td>1034.2 bar</td>
<td>517.1 bar</td>
<td>517.1 bar</td>
</tr>
<tr>
<td>Tensile Yield</td>
<td>7,500 psi</td>
<td>403,300 kg</td>
<td>403,300 kg</td>
</tr>
<tr>
<td></td>
<td>517.1 bar</td>
<td>2924 mm</td>
<td>2924 mm</td>
</tr>
<tr>
<td>Torsional Yield</td>
<td>67,500 ft-lbs</td>
<td>40,500 ft-lbs</td>
<td>40,500 ft-lbs</td>
</tr>
<tr>
<td></td>
<td>91,500 Nm</td>
<td>54,900 Nm</td>
<td>54,900 Nm</td>
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<tr>
<td>Tool OD</td>
<td>7.0”</td>
<td>177.8 mm</td>
<td>177.8 mm</td>
</tr>
<tr>
<td>Tool ID</td>
<td>2.75”</td>
<td>69.85 mm</td>
<td>111.76 mm</td>
</tr>
<tr>
<td>Sleeve ID</td>
<td>2.25”</td>
<td>57.15 mm</td>
<td>99.31 mm</td>
</tr>
<tr>
<td>Eff. Length</td>
<td>108”</td>
<td>115.125”</td>
<td>2924 mm</td>
</tr>
<tr>
<td>w. Lock Open Sleeve</td>
<td>2,743.2 mm</td>
<td>2924 mm</td>
<td>2924 mm</td>
</tr>
<tr>
<td>Eff. Length</td>
<td>66.5”</td>
<td>74.125”</td>
<td>1883 mm</td>
</tr>
<tr>
<td>w/o Lock Open Sleeve</td>
<td>1,689.1 mm</td>
<td>1883 mm</td>
<td>1883 mm</td>
</tr>
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</table>

### DT Safety Valve Specification H2S Service (AISI 4140)

<table>
<thead>
<tr>
<th></th>
<th>DT Surface Flapper Safety Valve</th>
<th>DT Downhole Flapper Safety Valve</th>
<th>DT Coring Flapper Safety Valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Press.</td>
<td>15,000 psi</td>
<td>7,500 psi</td>
<td>7,500 psi</td>
</tr>
<tr>
<td>Below Valve</td>
<td>1034.2 bar</td>
<td>517.1 bar</td>
<td>517.1 bar</td>
</tr>
<tr>
<td>Internal Press.</td>
<td>15,000 psi</td>
<td>7,500 psi</td>
<td>7,500 psi</td>
</tr>
<tr>
<td>Body</td>
<td>1034.2 bar</td>
<td>517.1 bar</td>
<td>517.1 bar</td>
</tr>
<tr>
<td>External Press.</td>
<td>15,000 psi</td>
<td>7,500 psi</td>
<td>7,500 psi</td>
</tr>
<tr>
<td>(collaps)</td>
<td>1034.2 bar</td>
<td>517.1 bar</td>
<td>517.1 bar</td>
</tr>
<tr>
<td>Tensile Yield</td>
<td>1,150,300 lbs</td>
<td>592,800 lbs</td>
<td>592,800 lbs</td>
</tr>
<tr>
<td></td>
<td>521,700 kg</td>
<td>268,900 kg</td>
<td>268,900 kg</td>
</tr>
<tr>
<td>Torsional Yield</td>
<td>48,000 ft-lbs</td>
<td>27,000 ft-lbs</td>
<td>27,000 ft-lbs</td>
</tr>
<tr>
<td></td>
<td>65,000 Nm</td>
<td>36,600 Nm</td>
<td>36,600 Nm</td>
</tr>
<tr>
<td>Tool OD</td>
<td>7.0”</td>
<td>177.8 mm</td>
<td>177.8 mm</td>
</tr>
<tr>
<td>Tool ID</td>
<td>2.25”</td>
<td>57.15 mm</td>
<td>111.76 mm</td>
</tr>
<tr>
<td>Sleeve ID</td>
<td>1.75”</td>
<td>44.45 mm</td>
<td>99.31 mm</td>
</tr>
<tr>
<td>Eff. Length</td>
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<td>115.125”</td>
<td>2924 mm</td>
</tr>
<tr>
<td>w. Lock Open Sleeve</td>
<td>2822.75 mm</td>
<td>2924 mm</td>
<td>2924 mm</td>
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<tr>
<td>Eff. Length</td>
<td>68.875”</td>
<td>74.125”</td>
<td>1883 mm</td>
</tr>
<tr>
<td>w/o Lock Open Sleeve</td>
<td>1,749.43 mm</td>
<td>1883 mm</td>
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</table>

**Note:** Pending Testing
DT Surface Flapper Safety Valve (DT SFSV)

Conventional drilling full opening (ball type) safety valves are run in drilling stands to allow shutoff of backflow in the drillstring typically while drilling HPHT wells. As closure of the ball valve requires manual intervention, either three separate valves are run in a stand of drillpipe or a single valve on a drilling single is used and the well drilled in singles. The DT SFSV design is fully tested to a working pressure of 15,000psi external to internal as well as below the flapper and for the body test allowing use below the BOPs without compromising well control integrity. In addition, the flapper design requires no manual intervention to close the valve reducing personnel exposure in well control situations and allows drilling with only one valve at the bottom of the drilling stand.

The DT SFSV utilises a curved flapper to optimise wall thickness while still retaining a throughbore of sufficient size to run wireline tools for stuck pipe situations with a lock open sleeve installed. The valve is intended primarily for use as a drilling safety valve on high pressure high temperature wells in a 'drilling stand' environment. A single valve is used at the bottom of the drilling stand allowing mud to be circulated for drilling but preventing backflow up the drillstring in the event of a drillstring leak or failure. The unique features of valve design allow an external to internal test pressure rating of 22,500psi and a working pressure rating of 15,000psi allowing the valve to be run below the blow out preventers on the rig during drilling operations without compromising the well control pressure rating of the well system. In addition the DT SFSV has a body working pressure rating of 15,000psi (22,500 psi test) and can be supplied with a solid flapper with working pressure rating (below flapper) of 15,000psi (22,500 psi test) or with a ported flapper to prevent high backflow but still monitor pressures in the wellbore below the valve. The valve can however also be used downhole as required as a conventional NRV with or without lock open sleeve capability.

DT Downhole Flapper Safety Valve (DT DFSV)

Conventional downhole Non Return Valves were originally designed to prevent backflow in the drillstring when shutting down drillstring circulation to prevent motor damage or bit nozzle plugging with drilling debris. As drilling techniques have developed and particularly with the advent of underbalanced and managed pressure drilling techniques the demands on these valves have increased such that now they are required to reliably hold pressure from below to allow connections at surface to be made. Reliability of conventional valves has proved an issue in terms of low pressure differential sealing, tool washout and return spring damage leading to significant non-productive drilling time in some cases compromising the drilling and reservoir objectives.

The DT DFSV utilises a curved flapper to optimise wall thickness while still retaining a throughbore of sufficient size to run wireline tools with a lock open sleeve installed while minimising flow velocities and associated body and seal erosion through the valve. The valve is intended primarily for use as a drilling downhole non return valve where the valve not only has to prevent backflow but is required to retain a pressure differential (for example in Managed Pressure Drilling or Underbalanced Drilling situations). Elastomer technology is used to ensure a pressure seal at low differential pressures with the valve design preventing seal washout. The unique features of valve design allow an external to internal working pressure rating of 7,500psi. In addition, the DT DFSV has a body working pressure.
rating of 7,500psi and can be supplied with a solid flapper with working pressure rating (below flapper) of 7,500psi or with a ported flapper to prevent high backflow but still monitor pressures in the wellbore below the valve. The valve is available in both standard and sour (H2S) service.

**DT Coring Flapper Safety Valve (DT CFSV)**

The DT CFSV utilises a curved flapper to optimise wall thickness while still retaining a throughbore of sufficient size to run and pull wireline retrievable core barrels through the tool with a retrievable lock open sleeve installed on the wireline string while minimising flow velocities and associated body and seal erosion through the valve. The valve is intended primarily for use as a coring downhole non return valve where the valve not only has to prevent backflow but is required to retain a pressure differential (for example in Managed Pressure Drilling or Underbalanced Drilling situations) where wireline retrievable core barrels need to be removed from the well when a statically underbalanced drilling fluid is being used. Elastomer technology is used to ensure a pressure seal at low differential pressures with the valve design preventing seal washout. The unique features of valve design allow an external to internal working pressure rating of 7,500psi (5,000psi H2S). In addition the DT CFSV has a body working pressure rating of 7,500psi (5,000psi H2S) and is supplied with a solid flapper with working pressure rating (below flapper) of 7,500psi (5,000psi H2S).