### Drill Pipe Performance Characteristics Sheet

#### PTECH Drilling Tubulars, LLC

**Patent:** 9,885,214  
**Pipe Size and Weight:** 4 HWDP  
**Pipe Grade:**  
**Range:** 2  
**Tool Joint:** 4 15/16 X 2 9/16 PTECH39+

**Revision 3 9/29/2020**

#### Pipe Body

<table>
<thead>
<tr>
<th></th>
<th>New-API</th>
<th>New-95%RBW</th>
<th>Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD (in)</td>
<td>4.000</td>
<td>4.000</td>
<td>3.738</td>
</tr>
<tr>
<td>Wall Thickness (in)</td>
<td>0.656</td>
<td>0.705</td>
<td>0.525</td>
</tr>
<tr>
<td>ID (in)</td>
<td>2.688</td>
<td>2.590</td>
<td>2.688</td>
</tr>
<tr>
<td>Calculated Plain End weights (lbs/ft)</td>
<td>23.417</td>
<td>24.803</td>
<td>17.999</td>
</tr>
</tbody>
</table>

**Note:** Premium properties are calculated based on uniform OD and wall thickness.

- Cross sectional area pipe body (in²) | 6.892 | 7.299 | 5.297
- Cross sectional area OD (in²) | 12.566 | 12.566 | 10.972
- Cross sectional area ID (in²) | 5.675 | 5.267 | 5.675
- Section Modulus (in³) | 5.002 | 5.179 | 3.755
- Polar Section Modulus (in³) | 10.004 | 10.359 | 7.509

#### Tool Joint

**PTECH39+**

<table>
<thead>
<tr>
<th></th>
<th>OD (in)</th>
<th>ID (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 15/16</td>
<td>2 9/16</td>
<td></td>
</tr>
</tbody>
</table>

**Tool Joint with a Material Yield Strength of 110000 psi**

- Pin Tong length (in) | 24
- Box Tong length (in) | 24
- Torsional Yield Strength (ft-lbs) | 35,160 | 40,400
- 80% Torsional Strength (ft-lbs) | 21,200 | 21,900 | 15,900
- Pressure Capacity (psi) | 15,785 | 16,969 | 14,432
- Collapse Capacity (psi) | 15,081 | 15,974 | 13,277

**Balance OD (in)** | 4.955
**Tensile Strength (lbs)** | 654,000

**Tool Joint/Drill pipe torsional ratio**
- New pipe | 1.33
- 95% New pipe | 1.28
- Prem pipe | 1.77

**Min OD for premium class (in)** | 4.626

Minimum make-up is based on shoulder separation caused by bending.

#### Drill Pipe Assembly with PTECH+ Tool Joint

<table>
<thead>
<tr>
<th></th>
<th>API Adjusted weight (kg/m)(lbs/ft)</th>
<th>95% Adjusted weight (kg/m)(lbs/ft)</th>
<th>Approximate length (M)(ft)</th>
<th>Fluid Displacement Cu/M)(gal/ft)</th>
<th>Fluid Capacity (Cu/M)(gal/ft)</th>
<th>Drift Size (mm)(in)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>39.82</td>
<td>26.75</td>
<td>9.60</td>
<td>0.00508</td>
<td>0.409</td>
<td>61.90</td>
</tr>
</tbody>
</table>

**Note:** These calculations are based on new pipe with nominal wall

- Based on Bending Stress (psi) at Pipe OD | 9,683
- Radius of Curvature (R) (ft) (@ OD of pipe) | 516.4
- BUR (dogleg) deg/100 ft. | 11.1

This Performance Sheet was generated by Nels Wickander.

9/29/2020
TORQUE TENSION COMBINED LOAD CURVE

For PTECH39+ 4 15/16 X 2 9/16 Tool Joint with a Material Strength of 110000 psi, using a Coefficient of Friction factor of 0.08 and a Safety Factor of 1.0. On Pipe: 4 HWDP Premium Class.

![Graph showing combined load curve with labels for Pin Yield, Shoulder Separation, and Pipe Torque.]
PTECH39+ 4 15/16 X 2 9/16 TOOL JOINT OD WEAR CURVE

<table>
<thead>
<tr>
<th>Tool Joint Box OD (in.)</th>
<th>Torsional Strength (ft-lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 5,000 10,000 15,000 20,000 25,000 30,000 35,000 40,000</td>
<td></td>
</tr>
</tbody>
</table>

- OD
- PTECH39+ with 2 9/16 ID
- Recommended Make-up Torque
- 80% 4.000 HWDP Prem

THIS TECHNICAL DATA IS FOR REFERENCE ONLY. PTECH Drilling Tubulars, LLC.

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