Bolt Tensioning Technology for Wind Turbines
WTB Series

Fully aware of the difficulties associated with wind turbine blade tensioning, the new TorcUP WTB Series is a purpose designed range of hydraulic bolt tensioning tools to suit most wind turbine bolting applications. All WTB Tensioning tools have the capacity to achieve the specified proof load requirements as detailed in EN ISO 898-1:1999 and ASTM A490M for grade 10.9 Bolts. These feature packed tensioners have been designed with rapid tensioning in mind and offer a safe, reliable and consistent method to simultaneously tension many bolts.

Main Wind Turbine Bolted Applications for WTB Series

- Rear Main Bearing
- Nacelle Frame
- Nacelle/Yaw Bearing
- Blade to Bearing
- Bearing to Hub
- Front Main Bearing
- Intermediate Tower Bolting

Swivel movement ensures versatility

Due to the very limited space available in many blade bolt compartments and to help where many tensioners are connected together every WTB tensioner has the option of a 360° swivel connection. This 360° swivel operation allows the hydraulic hoses to be positioned in the best possible position to allow open access to the tensioning tools.

Geared Nut Run-Down

The inclusion of a gear nut run-down mechanism offers a very rapid and consistent way of seating the hexagon nuts during the tensioning procedure. A common 1/2” square drive hand torque wrench can be used to rapidly seat the nuts to the required 14.75 ft.lbs (Max) torque.

Important Safety Information

At the heart of all TorcUP WTB tensioners is the Puller. Manufactured from high grade space material and carefully designed to give the maximum possible life. All TorcUP WTB tensioners have a feature that ensures the tool fails safely in the event of a puller failure.

WT-Slip

To ensure the nut rotation gearbox is not over torqued, TorcUP can supply an optional slip wrench WT-Slip, preset to an optimum 14.75 ft.lbs torque.
‘Best Fit’

WTB Tensioners are profile cut at the base to ensure they fit onto as many applications as possible. The interchangeable profile cut spacer at the base of the tool gives the tensioner the flexibility to be used on many different applications. The replaceable Spacer is also a good maintenance feature allowing “swap out” of a damaged tensioner base.

Automatic Tensioner Reset

To increase speed all WTB tensioners are fitted with a spring mechanism that automatically resets the tensioner once the pressure has been released to zero. The tensioner is then automatically ready to tension the next bolt, no operator intervention is required.

“Snap-Down” Nut Drive.

Again to increase speed all WTB tensioners are fitted with a spring loaded device that automatically engages the tensioner drive socket with the hexagon nut. The operation is completely transparent to the operator and no time is wasted aligning the tensioner with the nut.

Specially Designed Tools

TorcUP can supply bespoke special Bolt Tensioning Tools for instances where standard tools are not suitable. Contact TorcUP for more information.

WTB Series - Low Height

Maximum Working Pressure = 19580psi

<table>
<thead>
<tr>
<th>Id#</th>
<th>Bolt Diameter</th>
<th>Stud Protrusion (mm)</th>
<th>Max Stroke</th>
<th>Maximum Load</th>
<th>Hydraulic Pressure Area</th>
<th>Dia A</th>
<th>Height B</th>
<th>D</th>
<th>Weight</th>
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<tbody>
<tr>
<td>WTBLH36</td>
<td>M36</td>
<td>71-91</td>
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**WTF Series**

The new WTF is a purpose designed range of hydraulic bolt tensioning tools designed to suit most wind turbine foundation bolting applications. The WTF tensioning tools can be supplied to suit many different All Thread Bars and the more conventionally ISO metric and Imperial Unified Thread forms. These feature packed tensioners have been designed with rapid tensioning in mind and offer a safe, reliable and consistent method to simultaneously tension many Foundation bolts. The TorcUP WTF range of tensioning tools have been fully site evaluated in the wind energy industry.

**25mm (1”) Ram stroke for ‘One Pull’ Tensioning**

Due to the unusual length of foundation bolts and the methods used to anchor the bolts into the foundation structure, it is usual to experience relatively large amount of bolt extension during foundation bolt tensioning. For this reason it is very important that the bolt tensioning tool used has plenty of piston/ram stroke capacity. The WTF range of tensioners offer up to 25mm piston/ram stroke capability for “one Pull” uninterrupted tensioning. Shorter Stroke foundation tensioners are available from TorcUP to be used where bar protrusion is limited.

**Wind Turbine Foundation/Base Bolting**

**Geared Nut run-down**

TorcUP offer a gear nut run-down mechanism which provides a very rapid and consistent way of seating the foundation hexagon nuts during the tensioning procedure. A common 1/2” Square drive hand torque wrench can be used to rapidly seat the nuts to the recommended 30Nm (max) torque. Alternatively TorcUP offer the same foundation tensioning tools but with manual nut run-down.

**Important Safety Information**

Many competitive wind turbine tensioners rely on the operator to continually monitor the stroke of the tensioning tool. Over extending the maximum piston stroke can lead to early seal failure or internal damage to the tool. *All TorcUP WTB tensioners have a feature that physically prevents piston overstroke.*
Suitable Load Capacity for Grade 75ksi & 150ksi
All Thread Foundation Bolts.
Variable Bar Diameter, Variable Bar Protrusion

Versatile.
The amount of thread protruding from a foundation bolt nut can vary significantly from turbine to turbine. To overcome this variation the WTF Bolt tensioning tool is available in both short and long stroke variations. An elliptical WTF tool is also available for use when clearance between the bolt and tower wall is restricted.

Long Stud Protrusion Models
When the amount of stud protrusion allows, the long stroke tensioner is ideally suited, offering a 25mm uninterrupted bolt pull.

Short Stud Protrusion Models
When the stud protrusion is limited, the long stroke tensioners may not be suitable, in this instance a short stroke WTF tensioner is available.

Automatic Tensioner Reset
Again to increase speed all WTF tensioners are fitted with a spring mechanism that automatically resets the tensioner once the pressure has been released to zero. The tensioner is then ready to tension the next bolt, no operator intervention is required.

WTF Series - 75ksi - All Thread Bar

<table>
<thead>
<tr>
<th>Tool Ident</th>
<th>Foundation Bolt Type</th>
<th>Gear Box</th>
<th>Stud Protrusion (In)</th>
<th>Max Stroke</th>
<th>Maximum Load</th>
<th>Hydraulic Pressure Area</th>
<th>Dia A</th>
<th>Height B</th>
<th>D</th>
<th>Weight</th>
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<tbody>
<tr>
<td>WTF-8041</td>
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<td>3500.72 4.33</td>
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<tr>
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WTF Series - 150ksi - All Thread Bar

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<th>Foundation Bolt Type</th>
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<th>Max Stroke</th>
<th>Maximum Load</th>
<th>Hydraulic Pressure Area</th>
<th>Dia A</th>
<th>Height B</th>
<th>D</th>
<th>Weight</th>
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<tbody>
<tr>
<td>WTF-8342</td>
<td>Grade 150ksi All Thread</td>
<td>Y</td>
<td>10.630 10.827</td>
<td>0.98</td>
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<td>171405</td>
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Typical Tensioner Bolting Area’s on a Wind Turbine.
TorcUP offer a complete range of wind turbine bolt tensioning tools. Due to the variations in wind turbine designs and manufacture, special and modified tensioner solutions are available from TorcUP. Below are details of typical bolting areas on a generic wind turbine.

1. Rear Main Bearing
2. Nacelle Frame
3. Nacelle / Yaw Bearing
4. Main Shaft to Hub
5. Blade to Bearing
6. Front Main Bearing
7. Tower Bolting
8. Foundation Bolting

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WTP3
Wind Turbine Bolt Tensioning Electric Driven Pump Unit

The TorcUP WTP3 is a self contained electric driven high pressure hydraulic pump unit that can generate pressures of up to 1600 bar. The unit is a perfect match with the wind turbine range of bolt tensioning tools from TorcUP. One of the major features of the WTP3 Pump unit is the ability to totally remote control the pump from the controller hand grip. The WTP3 unit is designed to work in adverse environmental conditions, to ensure its durability the unit is certified to IP-56.

External Dimensions
- Length = 15.75 In
- Width = 11.02 In
- Height = 22.44 In
- Weight (Empty) = 81.54 lb
- Weight (Full) = 91.9 lb

Oil Capacity
- Total Oil Capacity = 1.24 Gal
- Usable Oil Capacity = 0.449 Gal

Pressure
- Max Pressure = 23206 psi
  (Available in higher pressure configurations)

Oil Flow
- Max Flow at Low Pressure (below 11603 psi) = 0.06604 Gal/min
- Max Flow at High Pressure (over 11603 psi) = 0.01611 Gal/min

Controller Hand Grip
Ergonomic hand remote controller
Controlling functions:
- Start Up
- Pressure Rise
- Unit Stop
- Pressure Relief
- Emergency Pressure Relief Button.

Optionally available with hydraulic pressure display.

WTP3 - Available Power Supplies
230v - 50 Hz
115v - 60 Hz

Contact TorcUP to discuss alternative electrical configurations.