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1.0 Introduction

Application

This Technical Data Sheet is intended to give guidance on using the Titan Prop for building refurbishment work such as needling or similar.

It is also designed to provide information of sufficient content and detail as to enable engineers, competent in structural analysis & structural steelwork design to safely design structures incorporating the Titan Prop.

Design Codes

The Titan Prop is a modular system primarily for use in temporary works and as such complies with the following codes:


Safe Working Loads

Values provided for the Titan equipment have been obtained through testing and calculations based on the safe stresses from BS8118 with a minimum factor of safety of 2.0 applied.

Product Use

For the handling and use of the Titan Prop, please refer to the following relevant sections and user guide.
2.1 Titan Legs and Jacks

2.1.1 Details

The Titan leg is available in one basic size. It has 4 continuous vertical slots to allow ledger frames and different accessories to be fitted quickly and securely at the optimum height. They are made from extruded Aluminium (grade Al Mg Si 1 F31) with a profile as shown below. Titan screw jacks can be fitted at the bottom of each leg, offering vertical adjustment of 1.2m. In addition to this a 500mm extension can be connected to the leg headplate to provide an even wider range of heights.

Note: Length of Size 2 Leg includes headplate and iflon disc

### Part No. | Description | Length (mm) | Weight (kg)
--- | --- | --- | ---
TI-LEG-2 | Size 2 Leg | 1700-2900 | 18.0
TI-LEGEXT-0.5M | 500 Leg Ext. | 500 | 4.3
N/A | Screw Jack | 1600 | 10.4

2.1.2 Section Properties

| | Cross Sectional Area, A (cm²) | Moment of Inertia, I (cm⁴) | Section Modulus, Z (cm³) | Weight (kg/m) |
--- | --- | --- | --- | ---
Extruded Profile | 16.275 | 224 | 40.7 | 4.395
Adjustable Jack | 15.57 | 77.0 | 22.1 | 10.4

Titan Screw Jack Dia = 74.5mm
Titan Leg Size 2 c/w Jack

Headplate

Baseplate

Profile
2.1.3 Load Capacity - Dead Shoring

In some temporary work situations, the structure to be vertically supported, will have the means to support any horizontal loads which may occur during the analysis of the load conditions.

It is assumed, therefore, in the graphs below in this section, that the supported structure is restrained from horizontal movement and does not rely on lateral restraint from the Titan structure. The allowable leg load is determined by the floor to structure height, the number of Ledger frames, if any, and the Jack extensions.

A) Check Overall Prop Length

![TITAN LEG GRAPH]

**Note:**

1. Ledger frames to be fixed in the optimum position. Maximum distance between frames not to exceed 2.0m between top and bottom chords of Ledger frames. This rule also applies on floor to soffit heights greater than 11.0m.

2. On the higher propping heights an additional level of Ledger frames may be required for ease of erection and stability.

3. Minimum height to base ratio = 3:1

4. Scaffold must not be used as a substitute for ledger frames when restraining dead shoring props.

**Key:**

- Single Prop
- 1 No. Level of Ledger Frames in Height
- 2 No. Level of Ledger Frames in Height
- 3 No. Level of Ledger Frames in Height

B) ALSO - Check Adjustable Jack Extension

![TITAN JACK GRAPH]
2.1.4 Load Capacities - Axial and Bending Capacity

Where any horizontal loads occur that are not resisted by the structure being supported, then tube and fitting bracing will be required to transfer those loads to the ground.

In these cases the temporary vertical Titan Props will need horizontal capacity to stabilise them. This must be via scaffold tube bracing or raking props being fixed to the vertical Titan legs. Titan Ledger frames must not be used for this purpose. They are for restraining dead shoring props only.

The scaffold tube bracing should be designed with its normal parameters in mind, where the slip value of any coupler will be 6.25kN parallel to the scaffold tube.

The slip value of the Titan Half Coupler tying plate, parallel to the Titan leg, is 5kN.

Double Bracing:

Where a Titan Prop is not restrained at its ends from rotating on its own axis, then scaffold bracing must be fitted to both sides of the prop. This is to avoid bending effects in the scaffold couplers.

Resistance to rotation on the prop axis can be via the connection to a header beam, needle beam or base fixings. Note that the main prop body and the inner threaded portion have the freedom to rotate independently.

The resistance to rotation must be greater than the applied moment due to the eccentricity of the load from the scaffold bracing. If in doubt, use bracing on both sides.

Note: Mabey Hire are assessing the scaffold to prop connections in further detail and hope to remove the requirement to fit bracing to both sides of the props.
**Design Method:**

Scaffold tube should only be used to resist horizontal loads and must not be used as a prop restraint system. The Titan Prop axial strut capacity should be assessed without presence of scaffold bracing. The scaffold can be designed afterwards to resist any horizontal loads as described on page 6.

The graph below gives the Allowable Horizontal Load capacity of the Titan Leg body in relation to its Safe Axial Load and the height of Titan Leg cantilevered above or below the horizontal bracing.

The effective length of the Titan leg above the brace is taken at 2xL (the distance from the brace).

![Graph showing Allowable Horizontal Load capacity](image)

**Note:**

Scaffold bracing shown. Table also applies where a raker is used.
The Titan Screw Jack also has its capacity limits when applying horizontal loads through the system, basically dependant on its extension. The effective length of the adjustable base is 2 x height from the base plate to the brace at the base of the Titan Leg body.

Note:
In both graphs, above and on page 7, the maximum horizontal load shown is 6.25kN which corresponds to the slip value given to a scaffold tube connection to the Titan leg.

The vertical slip capacity of the scaffold clip to the Titan leg is 5 kN.

2.1.5 Elastic Shortening

Based on a Youngs Modulus of 68500 N/mm² for Aluminium.

The extruded section of the Titan Leg, 1610mm long, under full load of 100kN will shorten by 1.4mm.

The Titan Screw Jack extended to 1280mm under 40kN will shorten by 0.5mm, and extended to 775mm under 100kN will shorten by 0.7mm.
2.2 Titan RSK Push Pull Props

2.2.1 Details

The Titan RSK Push Pull Prop is available in 2 basic sizes constructed from steel and has an external diameter of 70mm. It has a left handed thread (black) and a right handed thread (galvanised), enabling the user to easily orientate the Push Pull Props so that adjustment can be made by rotating all props in the same direction. It can be attached, using an RSK Pin to either a Titan Swivel End or A Titan Swivel Shoe. See section 2.2.3 for details.

**Titan RSK No. 3 Push Pull Prop (1.80m - 3.20m)**

Part Number: TI-PP03

**Titan RSK No. 4 Push Pull Prop (2.60m - 4.00m)**

Part Number: TI-PP04

<table>
<thead>
<tr>
<th>Part Number</th>
<th>RSK3</th>
<th>RSK3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TI-PP03</td>
<td>TI-PP04</td>
</tr>
<tr>
<td>Pin to Pin Adjustment (m)*</td>
<td>1.80 – 3.20</td>
<td>2.60 – 4.00</td>
</tr>
<tr>
<td>Perm. Axial Load on Compression (kN)</td>
<td>Varies – See Chart Below</td>
<td></td>
</tr>
<tr>
<td>Perm. Axial Load on Tension (kN)</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Weight Approx (kg)</td>
<td>19.0</td>
<td>23.0</td>
</tr>
</tbody>
</table>

*Range of length refers to end of screw pin centres.

2.2.2 Load Capacity

The Titan Swivel End can be attached directly to the ends of the Needle beam, System 160 prop unit or Mass 25 and Mass 50 grillage beams and props, giving an Allowable Maximum Axial Load in the Titan RSK Push Pull Prop of 40kN. Refer to the Titan RSK Push Pull prop chart to determine the allowable axial load for its length.
2.2.2 Load Capacity Cont’d

The Titan RSK Push Pull Props tied into the Titan Leg will cause bending in the leg each side of the Titan RSK Push Pull Prop position. The allowable working vertical resistance of the connection between the Titan leg and the Titan RSK Push Pull Prop is 5.0 kN, but can be increased to 7.5 kN with the addition of a check clamp above and/or below the Titan Swivel shoe.

2.2.3 End Details

Titan Swivel Shoe for RSK

A Titan Swivel Shoe with pin (TI-RSKPIN) can be used to connect an Titan RSK Push Pull Prop to a Titan Leg or Titan Extension. The Swivel Shoe is fixed at 2No. positions to the Titan Leg using a Titan T-Clamp and Titan T-bolt. To provide a ground level fixing a single suitable M24 bolt can be used subject to fixing conditions.

Part Number = TI-SS
Weight = 1.4 kg

Titan Swivel End

A Titan Swivel End with pin (TI-RSKPIN) can be used to connect a Titan RSK Push Pull Prop to a needle beam, S160 Soldier, Mass 25 and Mass 50 grillage/prop ends or a Titan Leg using the appropriate fixings. (Refer to bolt application table in Section 5.0)

Part Number = TI-SWIEND
Weight = 4.2 kg

GENERAL RULES

1) The length of the brace (push-pull prop) should be identical to the height of the element
2) Each element must be supported by a minimum of two braces
3) If the swivel end is connected to the element at a single point, the brace should be at an angle of less than 45° to avoid additional offset forces
4) If several TITAN RSK props are used (e.g. along a wallform), it is recommended that all threads have the same direction
2.3 Titan Ledger Frames

2.3.1 Details

The Ledger frame available to Mabey Hire, at present, centres the Titan Legs at 900mm. The frame is connected between 2No. Titan Legs using the integral 6No. T-Bolt connections. They are made from extruded Aluminium section, properties are given below. (T-Bolts are built into the frames and do not require listing separately)

```
<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Prop Ctrs (mm)</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TI-LF-0.9</td>
<td>Titan Ledger Frame</td>
<td>900</td>
<td>7.5</td>
</tr>
</tbody>
</table>
```

```
<table>
<thead>
<tr>
<th>Extruded Profile</th>
<th>Area, A (cm²)</th>
<th>Inertia, I (cm⁴)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Iₓ</td>
</tr>
<tr>
<td></td>
<td>5.26</td>
<td>1.47</td>
</tr>
</tbody>
</table>
```

2.3.2 Use of Ledger Frames

Refer to section 2.1.3 for the vertical load capacity of the Titan Leg with Titan Ledger frames in various height configurations when horizontal loads are supported by an existing structure.

The Ledger frame MUST NOT be used in situations where lateral loads are to be resisted.
2.4 Ancillary Items and Fittings

Titan Half Coupler Tying Plate
Used when connecting a scaffold tube to a Titan leg.

**Part Number:** TI-1/2COUP-PLATE
**Weight:** 1.60 kg
**Max Slip Load:** 2.5 kN/bolt
**Max Slip Load in coupler:** 6.25 kN

Titan T-Bolt
To be used to connect to the Titan Swivel Shoe to the Titan Leg.

**Part Number:** TI-TBOLT
**Weight:** 0.1 kg
**Max Slip Load:** 2.5 kN
**Max Pull Out Load:** 6.5 kN

Titan Leg Spanner
Used to release the Titan Screw Jack when the Titan leg is under loading.

**Part Number:** TI-SPANNER
**Weight:** 4.35 kg

Titan Clamp
Used for connecting the Titan Swivel Shoe to the Titan legs. Can also be used as check clamps.

**Part Number:** TI-CLAMP
**Weight:** 0.2 kg
**Max Slip Load:** 2.5 kN
**Max Pull Out Load:** 6.5 kN

RSK Pin
Connects the Titan Swivel End or the Titan Swivel Shoe to the RSK Push Pull Prop.

**Part Number:** TI-RSKPIN
**Weight:** 0.2 kg

Titan Connector Bracket
Use in pairs for connecting headplate to headplate instead of using 4no. M12 x 40 bolt and nuts. Provides full capacity connection between leg and 500mm extension.

**Part Number:** TI-CONBRKT
**Weight:** 0.8 kg

Titan Jack Swivel Coupler
Used for connecting scaffold tube to a Titan Screw Jack.

**Part Number:** TI-SC
**Weight:** 1.75 kg
**SWL:** 6.25 kN

Titan Connector Plate
Used for connecting the Titan leg to a variety of MH Needle beams, MH S160 Soldiers.

**Part Number:** TI-CONPLATE
**Overall Length:** 300mm
**Overall Width:** 170mm
**Thickness:** 10mm
**Weight:** 1.4 kg

Titan Needle Clamp and Titan System 160 Clamp
Used for connecting the Titan Connector plate to MH Needle beams and MH System 160 Soldiers.

**System 160 Clamp weight:** 0.5
**Needle Clamp weight:** 0.9 kg
3.0 Typical Connection Details

**Typical Headplate Connection**

Titan Headplate to Headplate fixing using M12 x 40 bolts and nuts.

**Titan Connector Bracket**

Titan Headplate to Headplate fixing using Titan Connector Brackets.

**Typical Titan Spanner Use**

Use a Titan Spanner to adjust the jack when the leg is subjected to load.

---

**Headplate to Titan Connector Plate Assembly**

MH Needle Beam / S160 Soldier

Titan Connector Plate fixed to Titan size 2 or Leg Extension using M12 CSK bolts.

**Baseplate to Titan Connector Plate Assembly**

MH Needle Beam

Titan Connector Plate fixed to Titan Jack using M12 CSK bolts.

---

**Titan Swivel End attaching to Titan RSK push pull props**

Titan RSK Push Pull Prop fixed directly to the end of a needle beam using a Titan Swivel End. The same pin (TI-RSKPIN) that connects the Titan Swivel shoe to the Titan RSK is used to connect the Titan Swivel End to the Titan RSK Push Pull Prop.

**Titan Swivel Shoe for RSK attached to Titan RSK push pull props**

Titan RSK Push Pull Prop fixed to a leg using a Titan Swivel shoe with 1No. T-bolt + nut and 1No. T-clamp. This type of connection relies on friction where high loads are being applied it may be necessary to add check clamps above or below the Swivel shoe.
### Typical Ledger Frame Connection

Titan Ledger Frame (TI-LF-0.9)  
Spring loaded T-Bolts for easy assembly with no loose parts

Titan Leg (TI-LEG-2)  
Ledger Frame forms around leg preventing any misalignment and ensures legs are erect plumb

**Typical Connection Detail**
<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Weight (Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TI-LEG-2</td>
<td>Titan Leg Size 2 c/w Jack</td>
<td>18.0</td>
</tr>
<tr>
<td>TI-LEGEXT-0.5M</td>
<td>Titan Leg Extension 0.5m</td>
<td>4.3</td>
</tr>
<tr>
<td>N/A</td>
<td>Titan Screw Jack</td>
<td>10.4</td>
</tr>
<tr>
<td>TI-LF-0.9</td>
<td>Titan Ledger Frame 0.9m</td>
<td>7.5</td>
</tr>
<tr>
<td>TI-1/2COUP-PLATE</td>
<td>Titan Half Coupler Tying Plate</td>
<td>1.6</td>
</tr>
<tr>
<td>TI-SC</td>
<td>Titan Jack Swivel Coupler</td>
<td>1.8</td>
</tr>
<tr>
<td>TI-TBOLT</td>
<td>Titan T-Bolt</td>
<td>0.1</td>
</tr>
<tr>
<td>TI-CLAMP</td>
<td>Titan Clamp</td>
<td>0.2</td>
</tr>
<tr>
<td>TI-SWIEND</td>
<td>Titan Swivel End</td>
<td>4.2</td>
</tr>
<tr>
<td>TI-SS</td>
<td>Titan Swivel Shoe for RSK</td>
<td>1.4</td>
</tr>
<tr>
<td>TI-CONBRKT</td>
<td>Titan Connector Bracket</td>
<td>0.8</td>
</tr>
<tr>
<td>TI-CONPLATE</td>
<td>Titan Connector Plate</td>
<td>1.4</td>
</tr>
<tr>
<td>TI-NCLAMP</td>
<td>Titan Needle Clamp</td>
<td>0.9</td>
</tr>
<tr>
<td>TI-160CLAMP</td>
<td>Titan System 160 Clamp</td>
<td>0.5</td>
</tr>
<tr>
<td>TI-SPANNER</td>
<td>Titan Leg Spanner</td>
<td>4.4</td>
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<tr>
<td>LIN-CW12</td>
<td>Lindaptor C-Clips</td>
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</tr>
<tr>
<td>TI-RSKPIN</td>
<td>RSK Push Pull Prop Pin</td>
<td>0.2</td>
</tr>
<tr>
<td>TI-PP03</td>
<td>Titan RSK No. 3 Push Pull Prop</td>
<td>19.0</td>
</tr>
<tr>
<td>TI-PP04</td>
<td>Titan RSK No. 4 Push Pull Prop</td>
<td>23.0</td>
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</tbody>
</table>
### 5.0 Bolt Application Table

<table>
<thead>
<tr>
<th>Connection Type</th>
<th>Bolt Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titan Connector Plate (TI-CONPLACE)</td>
<td>to Titan Leg Size 2 (TI-LEG-2) 0.5m Extension (TI-LEGEXT-0.5m) 2No. M12 x 40 CSK Bolt, Nut and Washer</td>
</tr>
<tr>
<td>Titan Leg Size 2 (TI-LEG-2)</td>
<td>to 0.5m Extension (TI-LEGEXT-0.5m) 2No. TI-CONBRKT or 4No. M12 x 40 Bolt, Nut and Washer</td>
</tr>
<tr>
<td>Titan Needle Clamp (TI-NCLAMP)</td>
<td>to Titan Connector Plate (TI-CONPLACE) 2No. M12 x 65 Bolt, Nut and Washer + 8No. Lindaptor C-Clips (LIN-CW12) if used on leg baseplate</td>
</tr>
<tr>
<td>Titan System 160 Clamp (TI-160 CLAMP)</td>
<td>to Titan Connector Plate (TI-CONPLACE) 2No. M12 x 65 Bolt, Nut and Washer + 8No. Lindaptor C-Clips (LIN-CW12) if used on leg baseplate</td>
</tr>
<tr>
<td>Titan Swivel Shoe (TI-SS)</td>
<td>to Titan Leg Size 2 (TI-LEG-2) 0.5m Extension (TI-LEGEXT-0.5m) 1No. TI-TBOLT and 1No. Ti-Clamp</td>
</tr>
<tr>
<td>Titan RSK Push Pull Prop (TI-PP03)</td>
<td>to Titan Swivel Shoe (TI-SS) Titan Swivel End (TI-SWIEND) 1No. TI-RSKPIN</td>
</tr>
<tr>
<td>Titan RSK Push Pull Prop (TI-PP04)</td>
<td></td>
</tr>
</tbody>
</table>

**NB:** All bolts are Grade 8.8, Washers to be ordered separately & used under the Nut only, unless stated otherwise by Mabey Engineers.