

Tentec Bolt Load Software 2010

Beta Version

The screenshot displays the Tentec Bolt Load Software 2010 interface. At the top, the project name is 'Saipem' and the equipment is 'OPTIMUS 6'. The main window is divided into several sections:

- Table:** A table listing bolt specifications with columns for ID, SIZE, 1, 2, Bolt Dia, and various material/grade codes.
- Joint Inspector:** A panel on the right showing details for a 12 x 2500 ANSI flange, including identification, specification, and characteristics like TPI, Num Bolts, and Clamp Length.
- Bolt Characteristics:** A panel showing material (BS-4882 - B7m), yield strength (550N/mm²), and tensile stress area (3512.11mm²).
- Tensioning Tool:** A panel showing tool identification (C10-06), pressure area, and working pressure.
- Tensioning Sequence:** A table showing the sequence of tensioning passes, including pressure and torque values.
- 3D Model:** A central 3D model of a yellow bolted flange assembly.
- Residual Bolt Stress:** A panel showing a residual stress value of 50000 Lb/in².

This screenshot shows the same software interface but with a graph of Bolt Stress (lbs/in²) versus Time (T0, T1, T2, T3). The graph displays the tensioning process, showing the initial load (T0), the retained load (T2), and the pressure stress paths (A and B). The legend indicates that T0 is the unloaded bolt, T1 is the initial load, and T2 is the retained load. The graph shows a peak stress of approximately 80,000 lbs/in² at T1, which then drops to a retained load of approximately 60,000 lbs/in² at T2.

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Tentec are an innovative designer of special purpose bolt tensioning equipment with a high level of focus on quality. The company have accreditation to:- ISO 9001, ISO 14001 & ISO 18001

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Minimum System Requirements

Operating system: Windows XP with Service Pack 2 (32-bit edition only), Windows Vista (32-bit or 64-bit editions), Windows 7 Beta (32-bit or 64-bit editions), or Windows Server 2008.

Processor: 1 GHz or higher for Windows Vista; 800 MHz or higher for Windows XP

Memory: 128 MB of RAM (256 MB or more recommended) for Windows XP; 512 MB for Windows Vista

Resolution: Minimum 1024 x 768

Introduction

The Tentec Bolt Load Software is a purpose designed software package, that allows rapid creation of necessary documentation for topside and subsea bolt tensioning projects. The package was designed with the philosophy of minimal input, maximum output. Documentation for multiple bolted joint projects can be created very quickly with minimal operator input. The software package contains data for the following standard bolted flanges.

ANSI B16.5
MSS-SP44
Norsok L-005 issue2

Notes:

Tentec Bolt Load Software is currently in beta.

It contains data for the Subsea Optimus 6, Optimus 5 & Topside CTST Range of Tentec Bolt Tensioning Tools.

It is possible to replace the Tentec Logo on the documentation that the software produces in order to brand the documentation to another company.

It is not possible to brand the software to another company

We would hope that our partners that use the beta version of the software help us by making suggestions and reporting any problems they encounter with the software.

It has been developed completely in-house by Tentec and as such we have the ability to implement changes and add features.

Due to its beta status the software will fail to work at the end of each month and will require the latest version to be downloaded and installed, this is to ensure our partners are using the latest version.

There is currently no input of flange material, it is assumed that adequate strength flange materials are being used. Stainless Steel 316 flanges are not to be tensioned with the recommended bolt stresses.

The following flange materials or equivalents are suitable for the recommended bolt stresses.

ASTM A105
ASTM A182 Grades F65
ASTM A182 Grade F60
ASTM A182 Grade F52
ASTM A182 Grade F50
ASTM A182 Grade F51
ASTM A350 Grade LF2
ASTM A350 Grade LF3
ASTM A694 Grade F52
ASTM A694 Grade F60
ASTM A694 Grade F65

Standard ANSI B16.5 Flanges manufactured from material with yield strength equal to or greater than 247N/mm² (35840lbs/in²)

ANSI B16.5 Flange specification does not implicitly specify a minimum target bolt stress. The software will suggest recommended target bolt stress values for these flanges. The recommended values are based on the experience of Tentec Limited and are used without any guarantee or liability to Tentec Limited. The recommended bolt stress values assume that flange material yield strength is equal to or greater than 247N/mm² (35840lbs/in²).

DO NOT USE THE RECOMMENDED ANSI B16.5 BOLT STRESS VALUES FOR FLANGES MANUFACTURED WITH MATERIAL YIELD STRENGTH LESS THAN 247N/mm² (35840lbs/in²)

The data produced by this software is only applicable when using Tentec Bolt Tensioning tools.

Flange Service Temperature range for the recommended bolt stress values are -101°C to +200°C. Or as limited by the piping class specifications or the the bolt minimum or maximum temperature specification. Do not use the recommended bolt stress values outside of this range of temperature.

Paul Egginton
Engineering Director

Tentec Limited
August 2009

The Main Screen

Project List

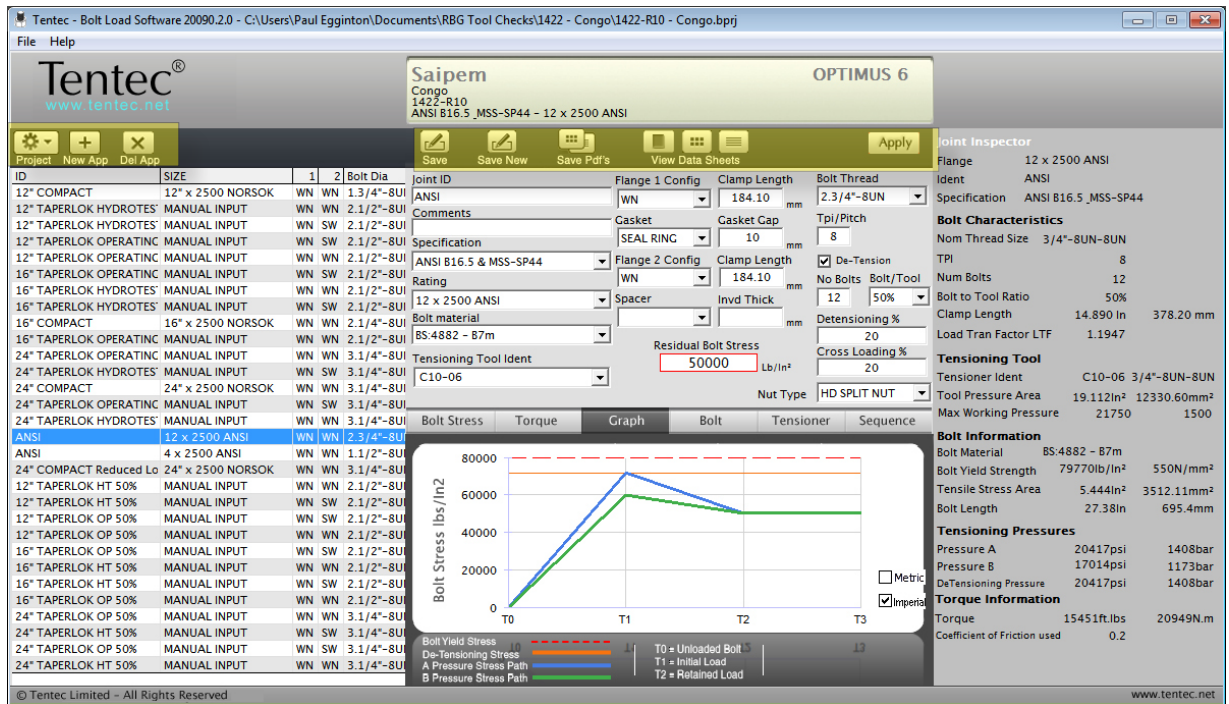
This area lists the bolted joint applications that make up the project. Individual applications can be selected and edited.

The screenshot displays the main interface of the Tentec Bolt Load Software. At the top, the application title is 'Tentec - Bolt Load Software 20090.2.0'. The central panel is titled 'Saipem' and shows project details: 'Congo', '1422-R10', and 'ANSI B16.5 MSS-SP44 - 12 x 2500 ANSI'. The 'OPTIMUS 6' tool range is selected. The left sidebar contains a 'Project List' table with columns for ID, SIZE, 1, and 2 Bolt Dia. The right sidebar is the 'Joint Inspector', showing various parameters like Flange (12 x 2500 ANSI), Bolt Thread (2.3/4"-8UN), and Bolt Characteristics (Nom Thread Size 3/4"-8UN-8UN, Num Bolts 12, etc.). The 'Graph' tab is active, showing a plot of Bolt Stress (lbs/in²) over time (T0, T1, T2, T3). The plot includes curves for Bolt Yield Stress, De-Tensioning Stress, and Pressure Stress Paths. The Residual Bolt Stress is set to 50000 Lb/in², and the Nut Type is HD SPLIT NUT.

Header Screen

This area gives details of the current selected applications and the global project header information. This area also displays the current selected Tentec tool range.

This screenshot is identical to the one above, showing the 'Header Screen' view of the software. It displays the same project list, configuration panel for 'Saipem', and the 'Joint Inspector' with the 'Graph' tab active, showing the Bolt Stress vs. Time graph and various project parameters.



Application Tool Bar


This area is the main control tool bar.





Project - Global project header information can be set up


Add App - A new blank application can be created.

Del App - Applications from the Project List can be deleted

 Save - Overwrites the currently selected application in the Project list with the current information shown in the application definition area

 Save New - Saves a new application entry in the Project List area with the current information in the application definition area.

 Save PDF's - Generates a summary document and a multi-page application document. (PDF Format)

 View - Allows the user to view the summary and application documents


 Apply - Used to update the data in the application definition area

Project Tool Bar

This area is above the project list.



 Project - Global project header information can be set up

 Add App - A new blank application can be created.

 Del App - Applications from the Project List can be deleted

Application Definition Area

This area is where the current bolted joint application is defined.

The screenshot displays the 'Application Definition Area' in the Tentec Bolt Load Software. The main window shows the 'Saipem' project configuration for 'Congo 1422-R10'. The 'Application Definition Area' is the central part of the interface where joint parameters are set. It includes a table of joint specifications, a configuration panel for joint ID, specifications, and materials, and a graph showing Bolt Stress (lbs/in²) vs. Sequence (T0 to T3).

ID	SIZE	1	2	Bolt Dia
12" COMPACT	12" x 2500 NORSOK	WN	WN	1.3/4"-8U
12" TAPERLOK HYDROTES	MANUAL INPUT	WN	WN	2.1/2"-8U
12" TAPERLOK HYDROTES	MANUAL INPUT	WN	SW	2.1/2"-8U
12" TAPERLOK OPERATING	MANUAL INPUT	WN	WN	2.1/2"-8U
12" TAPERLOK OPERATING	MANUAL INPUT	WN	SW	2.1/2"-8U
16" TAPERLOK HYDROTES	MANUAL INPUT	WN	WN	2.1/2"-8U
16" TAPERLOK HYDROTES	MANUAL INPUT	WN	SW	2.1/2"-8U
16" COMPACT	16" x 2500 NORSOK	WN	WN	2.1/4"-8U
16" TAPERLOK OPERATING	MANUAL INPUT	WN	WN	2.1/2"-8U
16" TAPERLOK OPERATING	MANUAL INPUT	WN	SW	2.1/2"-8U
24" TAPERLOK OPERATING	MANUAL INPUT	WN	WN	3.1/4"-8U
24" TAPERLOK HYDROTES	MANUAL INPUT	WN	SW	3.1/4"-8U
24" COMPACT	24" x 2500 NORSOK	WN	WN	3.1/4"-8U
24" TAPERLOK OPERATING	MANUAL INPUT	WN	WN	3.1/4"-8U
24" TAPERLOK HYDROTES	MANUAL INPUT	WN	WN	3.1/4"-8U

The configuration panel shows the following settings:

- Joint ID: ANSI
- Flange 1 Config: WN
- Clamp Length: 184.10 mm
- Bolt Thread: 2.3/4"-8UN
- Gasket: SEAL RING
- Gasket Gap: 10 mm
- Tpi/Pitch: 8
- Flange 2 Config: WN
- Clamp Length: 184.10 mm
- No Bolts: 12
- Bolt/Tool: 50%
- Spacer: WN
- Invd Thick: mm
- Detensioning %: 20
- Cross Loading %: 20
- Residual Bolt Stress: 50000 Lb/in²
- Nut Type: HD SPLIT NUT

The graph shows Bolt Stress (lbs/in²) vs. Sequence (T0 to T3). The stress starts at T0 (Unloaded Bolt), rises to T1 (Initial Load), and then levels off at T2 (Retained Load) and T3. The legend indicates: Bolt Yield Stress (red dashed line), De-Tensioning Stress (blue dashed line), A Pressure Stress Path (green solid line), and B Pressure Stress Path (blue solid line).

Joint Inspector

This area is where the current bolted joint application is displayed.

The screenshot displays the 'Joint Inspector' area in the Tentec Bolt Load Software. The main window shows the 'Saipem' project configuration for 'Congo 1422-R10'. The 'Joint Inspector' panel is highlighted, showing detailed joint information, bolt characteristics, and tensiometer data.

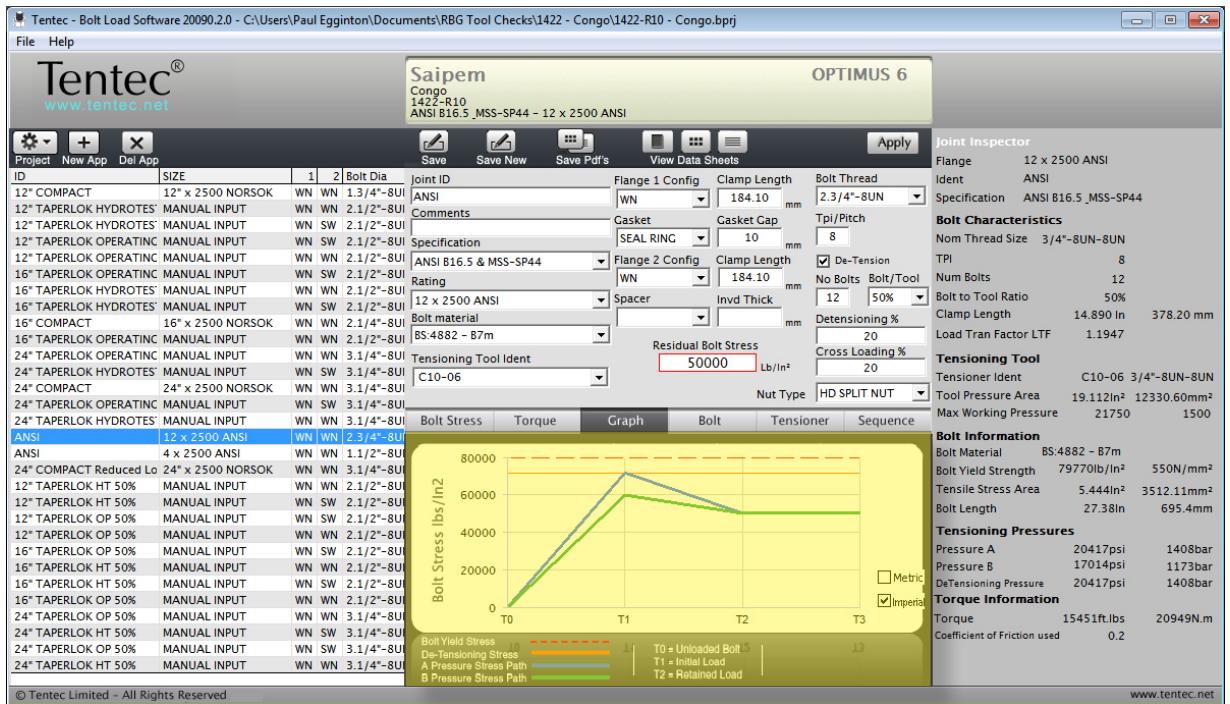
The configuration panel shows the following settings:

- Joint ID: ANSI
- Flange 1 Config: WN
- Clamp Length: 184.10 mm
- Bolt Thread: 2.3/4"-8UN
- Gasket: SEAL RING
- Gasket Gap: 10 mm
- Tpi/Pitch: 8
- Flange 2 Config: WN
- Clamp Length: 184.10 mm
- No Bolts: 12
- Bolt/Tool: 50%
- Spacer: WN
- Invd Thick: mm
- Detensioning %: 20
- Cross Loading %: 20
- Residual Bolt Stress: 50000 Lb/in²
- Nut Type: HD SPLIT NUT

The graph shows Bolt Stress (lbs/in²) vs. Sequence (T0 to T3). The stress starts at T0 (Unloaded Bolt), rises to T1 (Initial Load), and then levels off at T2 (Retained Load) and T3. The legend indicates: Bolt Yield Stress (red dashed line), De-Tensioning Stress (blue dashed line), A Pressure Stress Path (green solid line), and B Pressure Stress Path (blue solid line).

The 'Joint Inspector' panel displays the following information:

- Flange: 12 x 2500 ANSI
- Ident: ANSI
- Specification: ANSI B16.5_MSS-SP44
- Bolt Characteristics**
 - Nom Thread Size: 3/4"-8UN-8UN
 - TPI: 8
 - Num Bolts: 12
 - Bolt to Tool Ratio: 50%
 - Clamp Length: 14.890 In 378.20 mm
 - Load Tran Factor LTF: 1.1947
- Tensioning Tool**
 - Tensioner Ident: C10-06 3/4"-8UN-8UN
 - Tool Pressure Area: 19.112in² 12330.60mm²
 - Max Working Pressure: 21750 1500
- Bolt Information**
 - Bolt Material: BS-4882 - 87m
 - Bolt Yield Strength: 79770lb/in² 550N/mm²
 - Tensile Stress Area: 5.444in² 3512.11mm²
 - Bolt Length: 27.38In 695.4mm
- Tensioning Pressures**
 - Pressure A: 20417psi 1408bar
 - Pressure B: 17014psi 1173bar
 - DeTensioning Pressure: 20417psi 1408bar
- Torque Information**
 - Torque: 15451ft.lbs 20949N.m
 - Coefficient of Friction used: 0.2



information Tab Bar

This area is where categorised information for the current application is displayed.

The are 6 tabs.

Bolt Stress

Torque

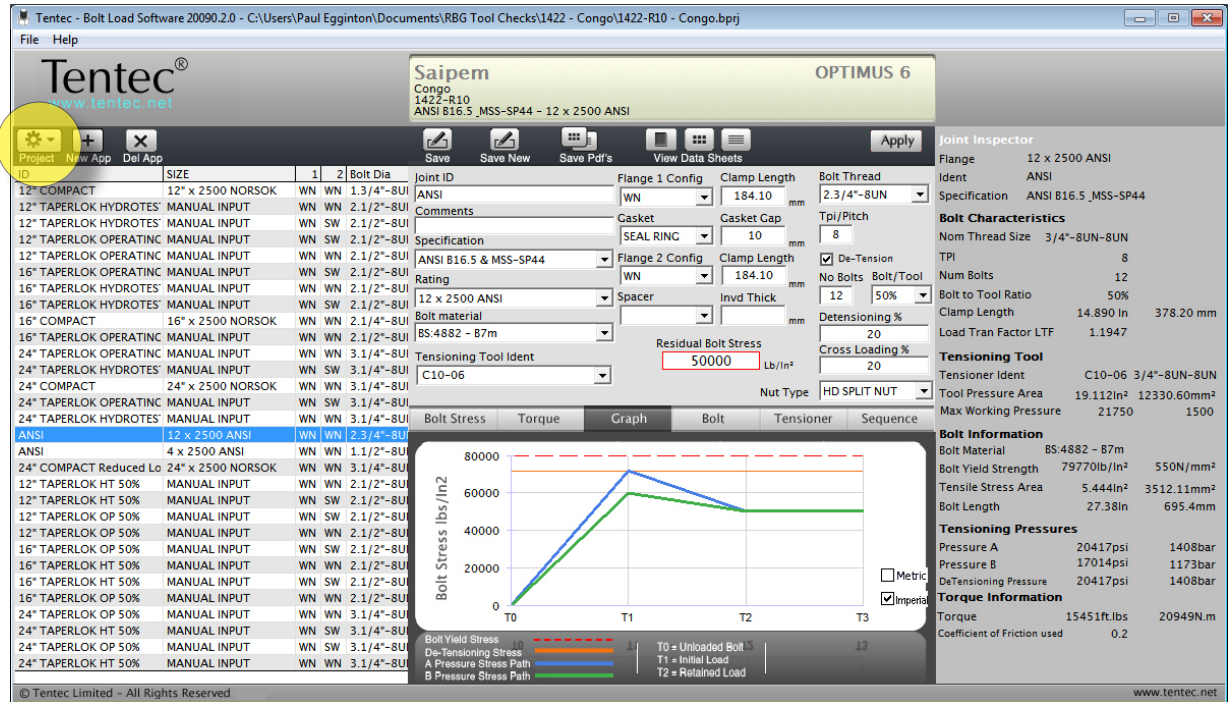
Load Graph

Bolt

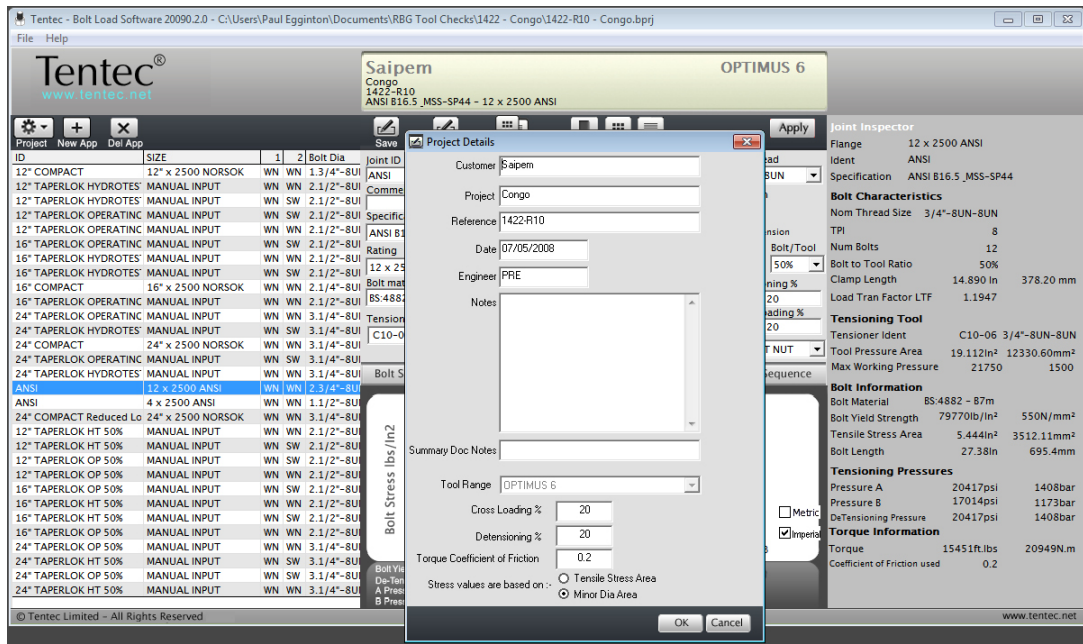
Tool

Sequence

Setting up a Project.



Selecting the Projects button in the Tool Bar opens up the project definition window



Project Definition Window

Here the user sets up the global project information, which appears on the application documentation

- Customer
- Project Name
- Reference No
- Date
- Engineer
- Notes
- Summary Documentation Notes

Tool Range - Select the relevant range of Tentec tools to use on all applications in the project.

Only a single range of tools per project can be selected. It is not possible to change the selected range of tools to use once a project contains an application.

Tool Ranges Available

- Optimus 5 Subsea Tool Range
- Optimus 6 Subsea Tool Range
- CTST Topside Range

Cross Loading %

Here you can set the % factor that defines the global difference between the first and second pass tool pressures when using a 50% or 25% tool to bolt ratio. *(It is possible to define a different factor on each application by altering the cross loading % in the application definition area)*

Default = 20%

Detensioning %

Here you can set the % factor that defines the global detensioning pressure. The detensioning pressure is set at the residual bolt load value and a + or - % will set up a deviation from the residual bolt load base value.

Torque Coefficient Friction Factor

Defines the global friction value to be used on all torque load conversions.

(It is possible to define a different friction factor on each application by altering the friction factor in the Information Tab Bar select Torque Tab)

Default = 0.12

Stress areas are based on:-

Defines if the bolt stress is calculated using the Bolt Tensile Stress Area or Bolt Minor Diameter Area. (The software defaults to Tensile Stress Area)

Setting up your first application

A A free form cell that allows the user to give a unique name to the bolted joint

B Defines the flange specification (note the use of the manual input mode is detailed later in this document, this part of the document only refers to the choice of ANSI Flanges, API Flanges or Norsok Flanges)

C Defines the flange rating.

D Defines the bolt material for the application

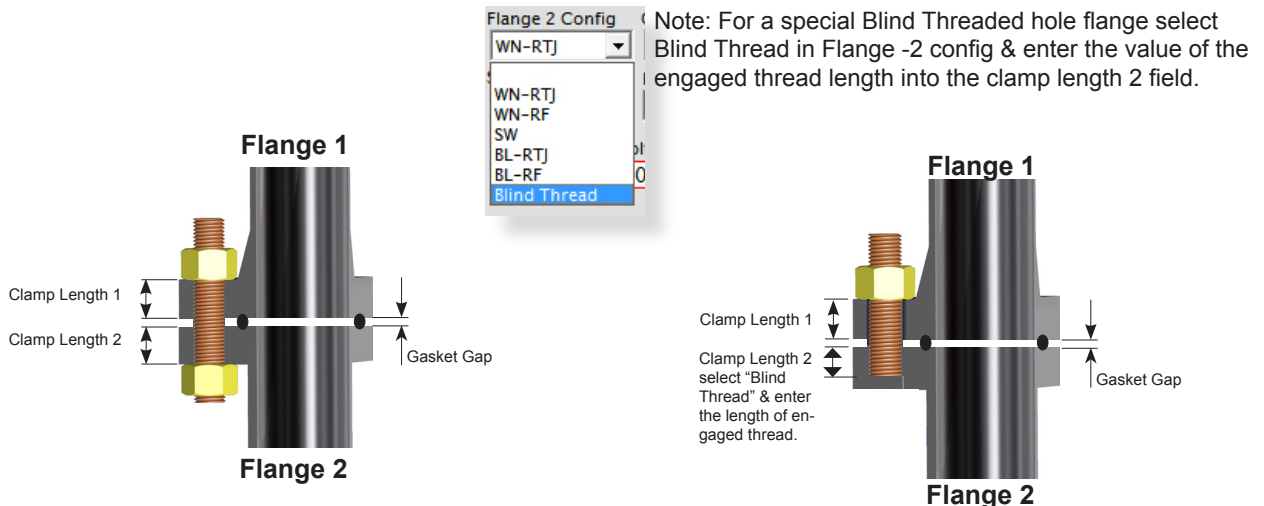
E Selects the appropriate Tentec tool for the application

F Allows the user to apply a comment to the application that appears on the individual application documents

G Defines the configuration of the flange 1 configuration and enters the thickness of the flange at **H**
In the case of a special thickness flange being used the flange thickness can be edited.

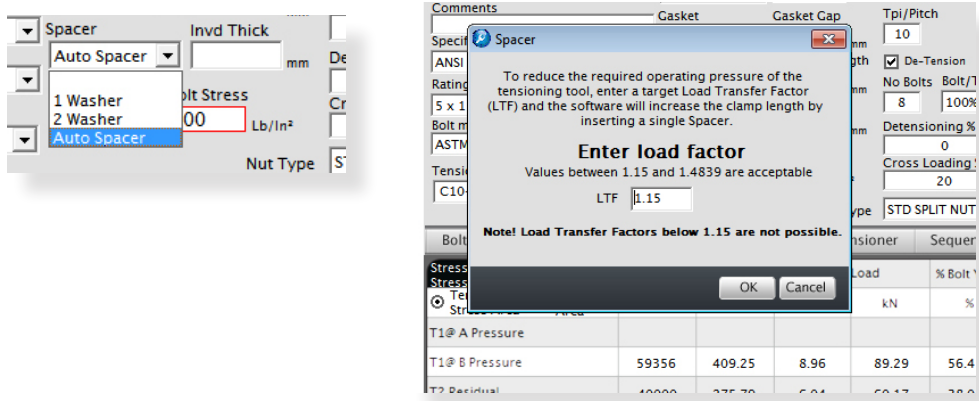
I Defines the Gasket gap between the 2 mating flanges. This value can be edited.

J Defines the configuration of the flange 2 configuration and enters the thickness of the flange at **K**
In the case of a special thickness flange being used the flange thickness can be edited.



L In some cases an application may be fitted with washers below the joints application hexagon nuts. Enter the washer thickness here **M**
 It is possible to define a single washer, 2 washers or a single spacer.

Selecting “Auto Spacer” from the Spacer drop down menu, allows the software to calculate a suitable spacer thickness based on a target Load Transfer Factor (Note the lowest LTF when using bolt tensoning tools is 1.15). The software will not allow a target load transfer factor that is greater than the current LTF.

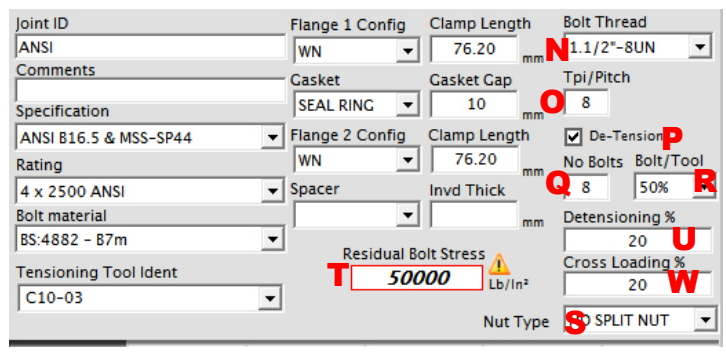


N This cell defines the suitable Bolt diameter for the selected flange. It defaults to an Inch imperial thread but can be changed to a metric bolt thread.

O This cell defines either the pitch (metric threads) or the Threads per Inch - TPI (imperial threads) The defaults are:-
 Imperial threads - 8UN threads except UNC threads below 1” diameter
 MetricThreads - ISO Course pitch series.
 It is possible to edit the Pitch/TPI value if the applications calls for different thread forms.

P This cell defines if a maximum detensioning pressure is detailed on the application documents. (Refer to the note at the bottom of the summary document regarding the use of max detensioning pressures.)

The maximum detensioning pressure defaults to a value equal to the 2nd pass tool pressure B. This can be edited on a global basis in the project definition window. To edit the detensioning pressure, per application, apply a plus or a negative % deviation value to cell **U** 0% gives a detensioning pressure = Pressure B, first pass pressure.



Q Defines the number of bolts on the selected flange

R Defines the Tensioning method. the choices are

- 100% bolt to tool ratio
- 50% bolt to tool ratio
- 25% bolt to tool ratio
- Torque Only

100% Tensioning is the most efficient form of tensioning and only needs a single pass pressure.

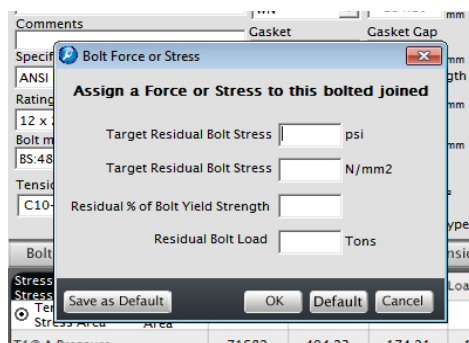
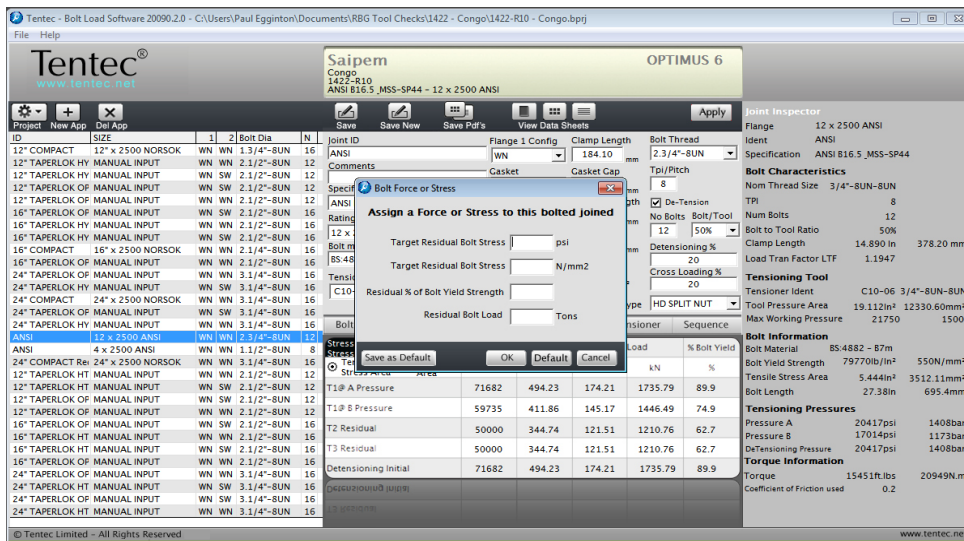
50% & 25% Tensioning uses 2 pressure passes, the first pressure pass is higher than the second pressure by a factor that is defined in cell **W** and globally in the project definition window.

Due to this elevated first pass pressure the pressure value can sometimes exceed the max working pressure of the tool, in those instances it may be necessary to revert to 100% tensioning mode to avoid using the elevated A Pressure. The software will not allow you to save the application to the project if the tool working pressures exceed the maximum working pressure of the tool, in this instance it will offer you a choice of either down rating the target bolt stress to a level within the capacity of the selected tool or to adjust the application parameters.

Be aware that if you down rate the recommended residual bolt stress the application will not be tensioned in accordance with API or Norsok specifications. ANSI Flanges do not specify recommended residual bolt stresses.

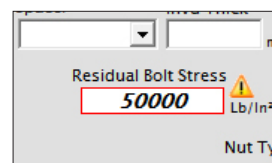
S Recommended Reaction Nut Type. The software recommends the type of reaction nut to use and is dependent on the flange bolt loading requirements. This cell only appears if the selected tool range is Optimus 6.

T Residual Bolt Stress, here is where the software recommends the residual bolt stress, it can be overwritten by clicking on the cell which opens up a edit window



- Bolt load can be defined in terms of either.
- Target Residual Bolt Stress (psi) (lbs/in²)
 - Target Residual Bolt Stress (N/mm²).
 - Residual % of Bolt Yield (%)
 - Residual Bolt Load (Tons)

The edit window allows the user to overwrite the recommended bolt load or bolt stress in a variety of formats.



Once the default recommended bolt stress is edited a yellow exclamation icon appears next to the value and the value is italicized. Clicking on the icon restores the default recommended bolt stress

Information Tab Bar


The information tab bar consists of 6 Tabs labeled

- Bolt Stress
- Torque
- Load Graph
- Bolt
- Tool
- Sequence

Bolt Stress Tab

Bolt Stress	Torque	Graph	Bolt	Tensioner	Sequence	
Stresses based on Bolt Tensile Stress Area						
<input checked="" type="radio"/> Tensile Stress Area <input type="radio"/> Minor Dia Area		lbs/in ²	N/mm ²	Tons	kN	%
T1@ A Pressure	71682	494.23	174.21	1735.79	89.9	
T1@ B Pressure	59735	411.86	145.17	1446.49	74.9	
T2 Residual	50000	344.74	121.51	1210.76	62.7	
T3 Residual	50000	344.74	121.51	1210.76	62.7	
Detensioning Initial	71682	494.23	174.21	1735.79	89.9	

Displays Bolt Stress, Bolt Load and % Bolt Yield over a 3 stage time period.

Bolt Stress	Torque	Graph	Bolt	Tensioner	Sequence	
Stresses based on Bolt Tensile Stress Area						
<input checked="" type="radio"/> Tensile Stress Area <input type="radio"/> Minor Dia Area		lbs/in ²	N/mm ²	Tons	kN	%
T1@ A Pressure	78850	543.65	191.63	1909.37	98.8 	
T1@ B Pressure	65709	453.05	159.69	1591.14	82.4	
T2 Residual	55000	379.21	133.66	1331.83	68.9	
T3 Residual	55000	379.21	133.66	1331.83	68.9	
Detensioning Initial	78850	543.65	191.63	1909.37	98.8	

Warning indicators will appear if the % bolt yield exceeds 95% of bolt yield. It is Tentec policy not to exceed 95% of the bolt yield strength.

Bolt Stress	Torque	Graph
Stresses based on Bolt Tensile Stress Area		
<input checked="" type="radio"/> Tensile Stress Area <input type="radio"/> Minor Dia Area		lbs/in ²
T1@ A Pressure	78850	
T1@ B Pressure	65709	
T2 Residual		

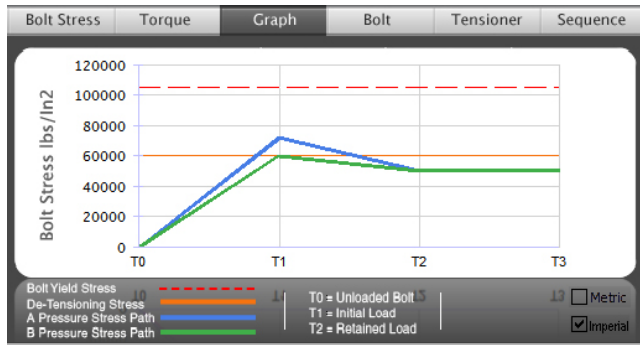
This tab also allows the user to switch between using bolt tensile stress area and bolt minor area to calculate bolt stress. When switching a new bolt load is calculated based on the type of bolt area chosen.

Torque Tab

Bolt Stress	Torque	Graph	Bolt	Tensioner	Sequence
Torque Details					
Torque Value		1532N.m	N.m	1130ft.lbs	ft.lbs
Coefficient of Friction μ		0.12			

This tab displays the torque value to achieve the residual bolt load based on the displayed coefficients of friction. The global coefficient of friction value can be edited in the project definition window. Changing the coefficient value in the Torque Tab only changes it for the current application.

Stress Graph Tab



This tab displays the predicted bolt stress path over a 3 point time period.

T0 = Unstressed bolt
 T1 = Initial bolt stress A pressure
 T1 = Initial bolt stress B pressure
 T2 = Final residual bolt stress

The Red line indicates the yield strength of the bolt
 The yellow line indicates the maximum detensioning stress.

Units can be switched between Metric and Imperial.

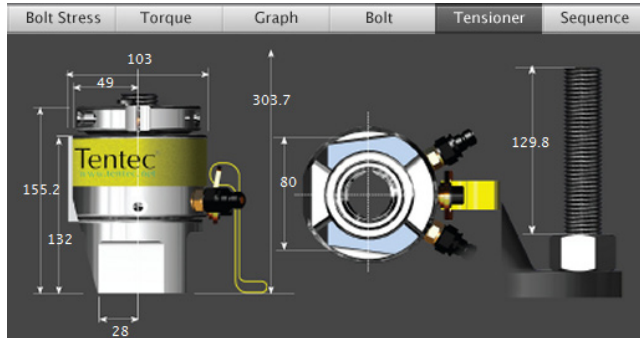
Bolt Tab

Bolt Information				
Bolt Material	ASTM A193 - B7			
Nom Bolt Diameter	1.3/8"			
# Number	20			
Bolt Yield Strength	105152	lb/in ²	725	N/mm ²
Tensile Stress Area	1.242	in ²	801.55	mm ²
Bolt Length	15.50	in	393.8	mm

This tab displays the bolt detail
 No edit is available from this Tab

The Bolt Length value is based on the Tentec tool range chosen in the Project Definition Window.

Tool Tab



This tab displays the recommended Tensioning Tool

No edit is available from this Tab

The Bolt Length value is based on the Tentec tool range chosen in the project definition window.

When a special tensioner is chosen, this tab will be disabled.

Sequence Tab

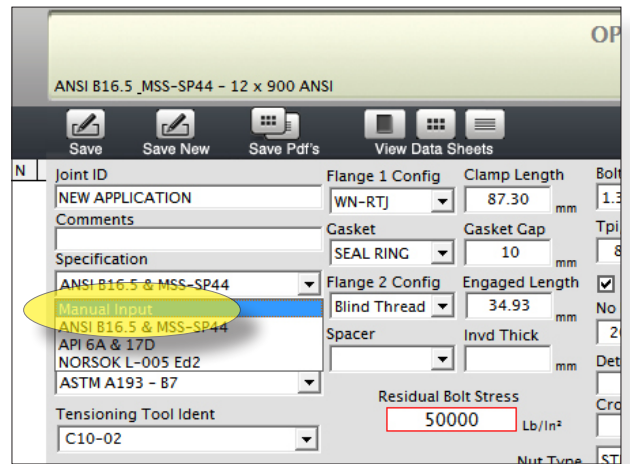
Tensioning Sequence			
Pass	Tensioner	Bolt #	Applied Pressure
			psi bar
Pass 1	1	20330	1402
Pass 2	3	20330	1402
Pass 3	2	16942	1168
Pass 4	4	16942	1168
Checking Pass			
Pass 1	1	16942	1168
Pass 1	1	16942	1168

This tab displays the recommended tensioning sequence.

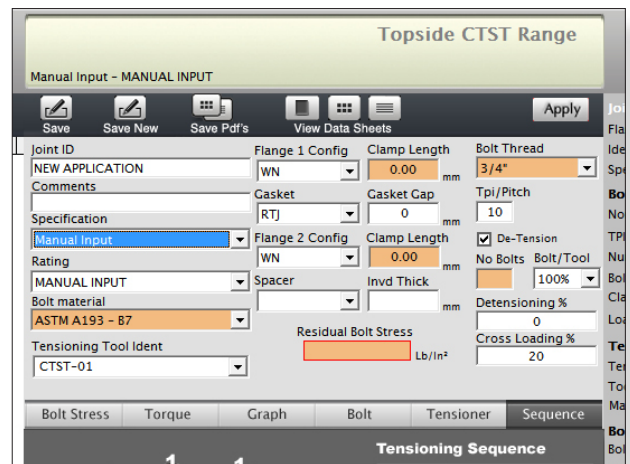
Manual Input Mode

Manual Input mode can be chosen from the Specification dropdown menu.

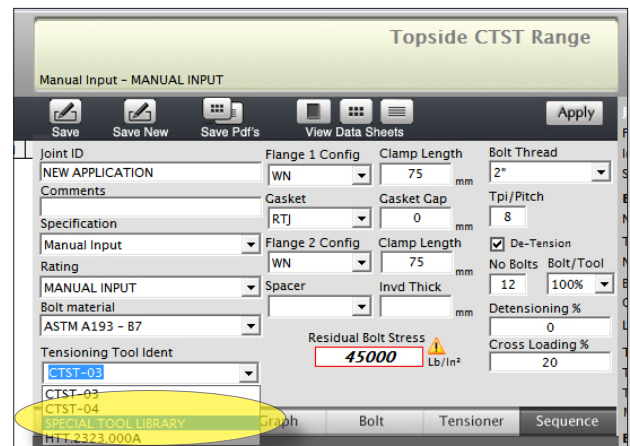
Manual input mode is used when non standard flanges are to be tensioned or torque tightened.





All 6 orange fields in the application definition area are to be completed first before the Joint Inspector displays the results. It is recommended that the bolt thread is selected first. Once the thread is selected the software will suggest tensioning tools in the tensioning tool ident menu.

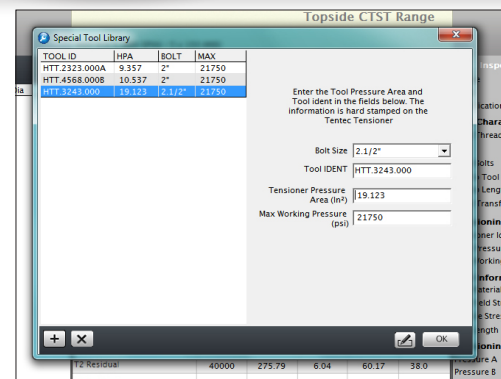


The tensioning tool ident menu will display all tools available for the selected bolt size, these include the standard tools from the particular Tentec tool range selected plus any user defined tensioning tools. A user defined tool can be defined by selecting “Special tool library” from the File/Special Tools Library menu.



Here special tools can be added to your library of tools. Once defined the tool will be available from the Tensioning Tool Ident cell for selection in manual mode whenever you choose the appropriate bolt size. To add a new tool to the library click the add button  and enter the required tensioner details. To edit a special tool, select the tool in the list and select the edit button  a new window will open up, enter the special tool details. Click OK to leave the special tools library.

In manual input mode the software will not recommend a residual bolt stress.



File Menu

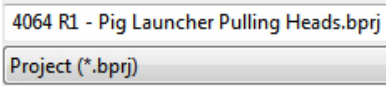
New Project

Clears the existing project, creates a new blank project and opens up the project definition window.

Load Project

Save Project

The software will attempt to build a name for the project file. The name is built from the following variables from the project definition window.



Reference: in this case 4064 R1

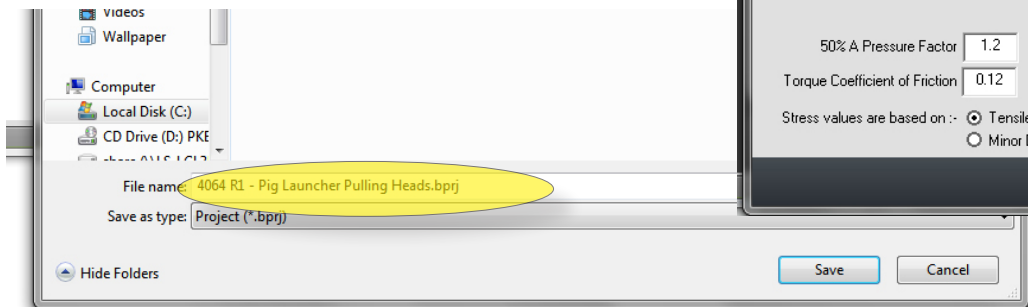
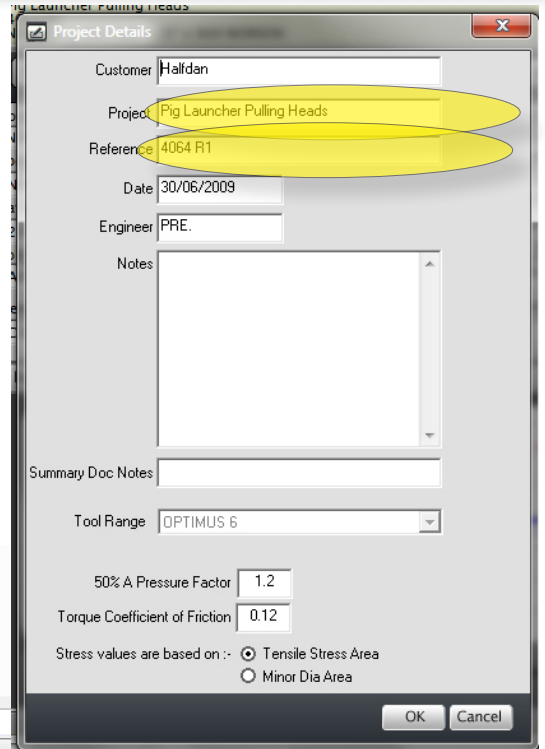
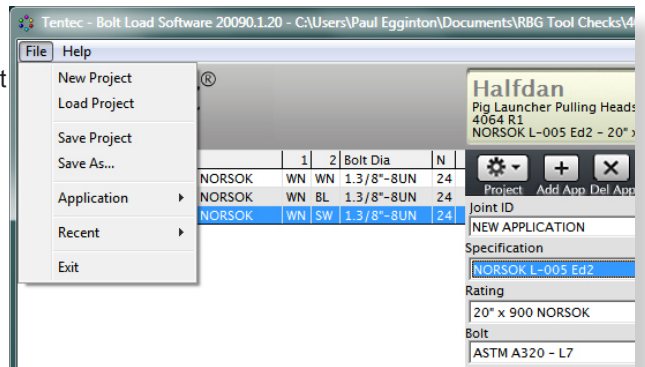
Note R1 represents "Revision1" can be used as a simple revision counter.

Project: Pig Launcher Pulling Heads

The summation of the two variables makes the project file name.

Note:

Similar file names are created for the report PDF Files.



Application

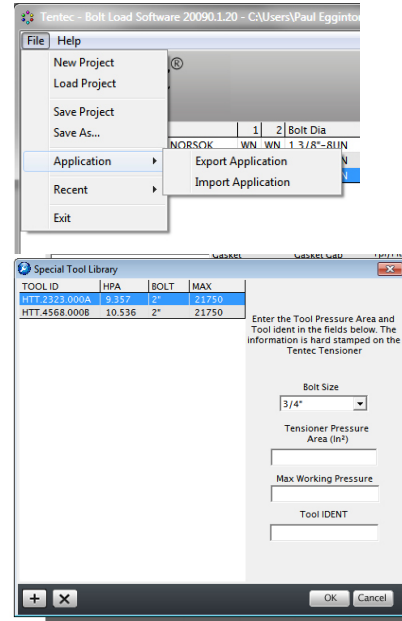
Use the application menu to export then to import an individual application to another project file.

Recent

Displays the recent project files

Special Tools Library.

Here define a special tool, that can be used on manual input applications.



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To change the image copy a 220 x 110px bitmap file to the software installation folder, the file should be named logo.bmp

Summary Report

Customer	Halfdan											
Project	Pig Launcher Pulling Heads											
Project Reference	4064 R1											
Date and Engineer	30/06/2009 PRE.											

Subsea Tensioning Summary




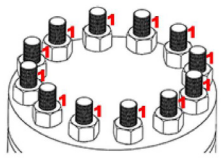
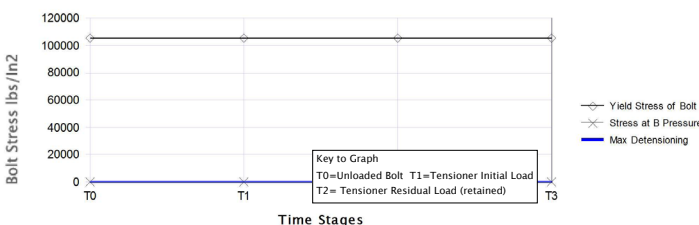
Bolted Joint Description	Flange Spec	Flange Type		Bolt Dia	No Bolts	Bolt Material	Residual Target Bolt Stress		Tool Ident	100% Tensioning		50% Tensioning				Detensioning		Torque Values				Bolt Length	Reaction Nut Type Spacer / Washer Req	
		S.1	S.2				lbs/in ²	N/mm ²		1st Pass		2nd Pass		Max Pressure	Yield	Nm	Ft/Lbs	u	mm					
										psi	bar	psi	bar							psi	bar			%
NEW APPLICATION 20" x 900 NORSOK	NORSOK L-005 E42	WN	WN	1.3/8"-8UN	24	ASTM A320 - L7	50000	344.74	C10-02	14578	1005					14578	1005	56.0	1532	1130	0.12	431.7	SPT	N
NEW APPLICATION 20" x 900 NORSOK	NORSOK L-005 E42	WN	BL	1.3/8"-8UN	24	ASTM A320 - L7	50000	344.74	C10-02	14578	1005					14578	1005	56.0	1532	1130	0.12	431.7	SPT	N
NEW APPLICATION 20" x 900 NORSOK	NORSOK L-005 E42	WN	SW	1.3/8"-8UN-8 UN	24	ASTM A320 - L7	50000	344.74	C10-02	14233	991					14233	991	54.7	1532	1130	0.12	491.3	SPT	N

Note:
 (1) Max Detensioning Pressure refers to the maximum capacity of the tensioning tool and should not be considered to be the safe max load capacity of the flange
 (2) 100% Tensioning is the recommended mode of bolt tensioning, whenever possible use 100% Bolt to tool ratio
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Individual Application Report

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Customer Project Project Reference Date and Engineer 26/08/2009		  																					
Bolt Tensioning Datasheet		Flange Ident Specification MANUAL INPUT NEW APPLICATION Manual Input																					
Joint Information		Proposed Tensioning Tool																					
Nom Thread Size	2"-8UN	Flange Configuration																					
TPI	8	F1	0.00 WN																				
Num Bolts		Gap	0																				
Bolt to Tensioning Ratio	100%	F2	0.00 WN																				
Load Transfer Factor LTF	1.2806	WS																					
Clamp Length	2.772	In	70.40 mm																				
Tensioning Tool Information																							
Proposed Tensioning Tool	HTT.4568.000B	RN																					
Tool Pressure Area	10.536	In ²	1518.76 mm ²																				
Bolt Information		<table border="1"> <thead> <tr> <th>Tensioner Pass</th> <th>Bolt #</th> <th>Applied Pressure psi</th> <th>bar</th> </tr> </thead> <tbody> <tr><td>Pass 1</td><td>1</td><td>-</td><td>-</td></tr> <tr><td>Pass 2</td><td></td><td></td><td></td></tr> <tr><td>Pass 3</td><td></td><td></td><td></td></tr> <tr><td>Pass 4</td><td></td><td></td><td></td></tr> </tbody> </table>		Tensioner Pass	Bolt #	Applied Pressure psi	bar	Pass 1	1	-	-	Pass 2				Pass 3				Pass 4			
Tensioner Pass	Bolt #	Applied Pressure psi	bar																				
Pass 1	1	-	-																				
Pass 2																							
Pass 3																							
Pass 4																							
Bolt Material		<table border="1"> <thead> <tr> <th>Checking Pass</th> <th>Bolt #</th> <th>Applied Pressure psi</th> <th>bar</th> </tr> </thead> <tbody> <tr><td>Pass 1</td><td>1</td><td>-</td><td>-</td></tr> <tr><td>Pass 1</td><td>1</td><td>-</td><td>-</td></tr> </tbody> </table>		Checking Pass	Bolt #	Applied Pressure psi	bar	Pass 1	1	-	-	Pass 1	1	-	-								
Checking Pass	Bolt #	Applied Pressure psi	bar																				
Pass 1	1	-	-																				
Pass 1	1	-	-																				
Bolt Yield Strength	105152	lb/in ²	N/mm ²																				
Tensile Stress Area		In ²	mm ²																				
Bolt Length		In	mm																				
Torque Information																							
Torque		ft.lb	N.m																				
Coefficient of Friction																							
-		Bolt Stress																					
Based on Tensile Stress Area		lbs/in ²	N/mm ²																				
T1 @ A Pressure																							
T1 @ B Pressure																							
T2 Residual																							
Stress @ Detensioning																							
Tensioning Pressures		Bolt Load																					
	1st Pass	2nd Pass	% of Bolt Yield																				
	psi	Bar	psi																				
			Bar																				
			%																				
100% Tensioning Pressures		-	-																				
50% Tensioning Pressures																							
Max Detensioning Pressures		-	-																				
Predicted Bolt Stress Path																							
																							
Key to Graph T0=Unloaded Bolt T1=Tensioner Initial Load T2= Tensioner Residual Load (retained) T3																							
Max Detensioning Pressure refers to the maximum capacity of the tensioning tool and should not be considered to be the safe max load capacity of the flange 100% Tensioning is the recommended mode of bolt tensioning, wherever possible use 100% Bolt to tool ratio Tentec Limited do not accept any liability for errors within or caused by the use of this software. © 2009 Tentec Limited - All Rights Reserved																							

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