

Atlas Copco Bolting Solutions



Instruction Manual BTS - Bolt Tightening Software

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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 (32-bit or 64-bit editions), Windows 10 (32-bit or 64-bit editions) and 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

Problems Running the Software

Some company IT systems are security locked down and issues can occur when installing the Tentec software. If after installation you have problems with running the software, try the following.

Navigate to the Tentec Bolt Load Software .exe file. By default the file can be found at C:\program files\boltload.exe

Right click on the file and select "run as administrator"

Double click on the file to run the software.

Problems Authorising the Software

When the software is run for the first time, the user is asked to complete some user details in order for the software to be authorised. If the software has problems connecting to the tentec servers, it is possible to manually authorise the software by sending the serial key to **Support@tentec.net** We will send you back a activation key that can be pasted into the authorisation window.

Introduction

The Tentec Bolt Load Software is a purpose designed software package, that allows rapid creation of necessary documentation for topside and subsea bolt tightening 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
API 6A
API 17D
SPO* and SPO-S* Compact Flanges

Notes:

Tentec Bolt Load Software is currently in beta.

It contains data for Tentec ranges of tensioners, such as:

Subsea Optimus 6
Subsea Optimus 5
CTST
V-Series
Force10

It also allows the user to create a library of tools from other manufacturers.

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 tightened 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)

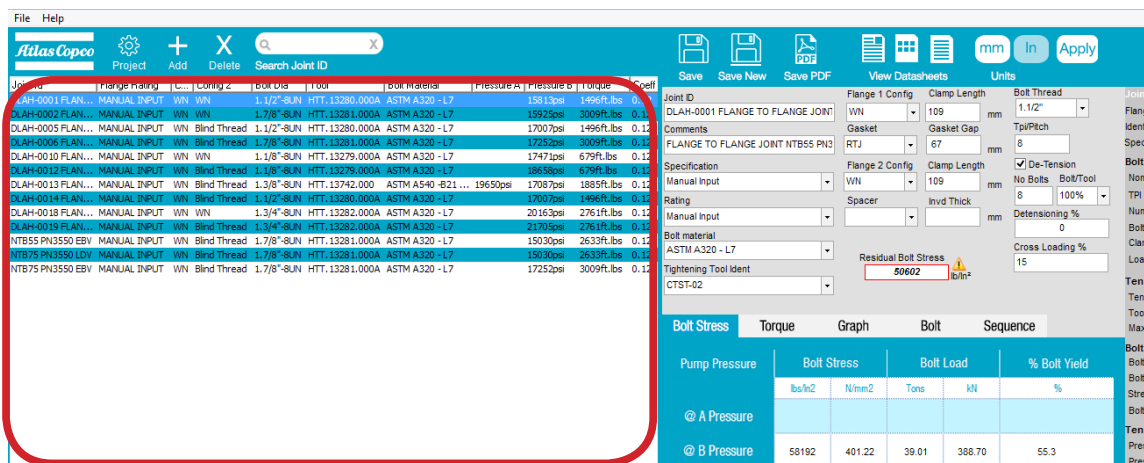
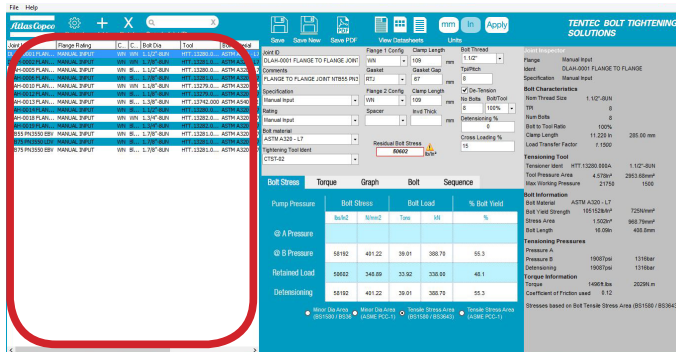
The data produced by this software is only applicable when using Tentec Bolt Tightening tools.

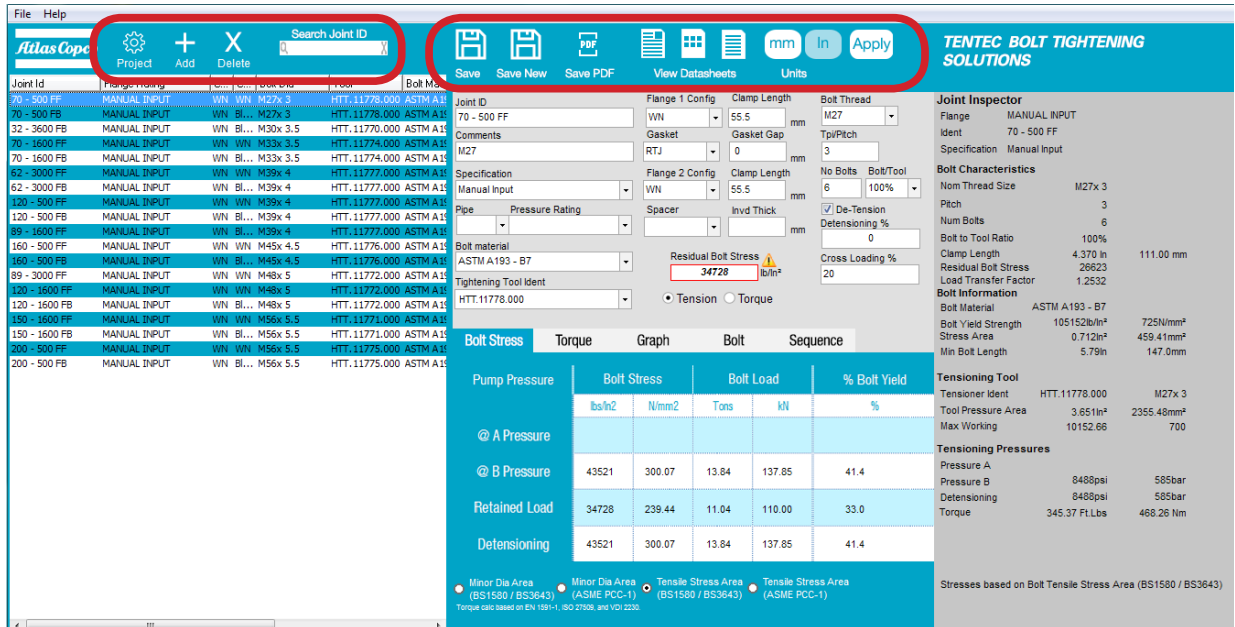
Flange Service Temperature range for the recommended bolt stress values are -101°C to +200°C. Or as limited by the piping class specifications or the bolt minimum or maximum temperature specification. Do not use the recommended bolt stress values outside of this range of temperature.

*SPO is a trade mark of Vector AS

The Main Screen Application List

This area lists the bolted joint applications that make up the project. Individual applications can be selected and edited. The main window of the software can be re-sized to maximise use of wide screen monitors. The list of bolted joint application can be re-ordered by dragging and dropping rows. The order of the columns can be changed by dragging and dropping the column headers. Columns can be re-sized by hovering the mouse near to the edges of the column headers, right clicking and dragging. The order of applications within a project can be re-ordered by clicking on the column headers.





Application Tool Bar

This area is the main control tool bar.



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 PDFs - Allows the user to view the summary and application documents.



Toggle unit display between millimetre and Inches.



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.



Delete App - Applications from the Project List can be deleted



Search the Joint ID column in the application list. Press the return key after typing in a suitable search string. The list will then only contain applications matching the search string.

Application Definition Area

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

The screenshot shows the 'Application Definition Area' in the Atlas Copco software. A red circle highlights the configuration fields for the bolted joint application. The fields include:

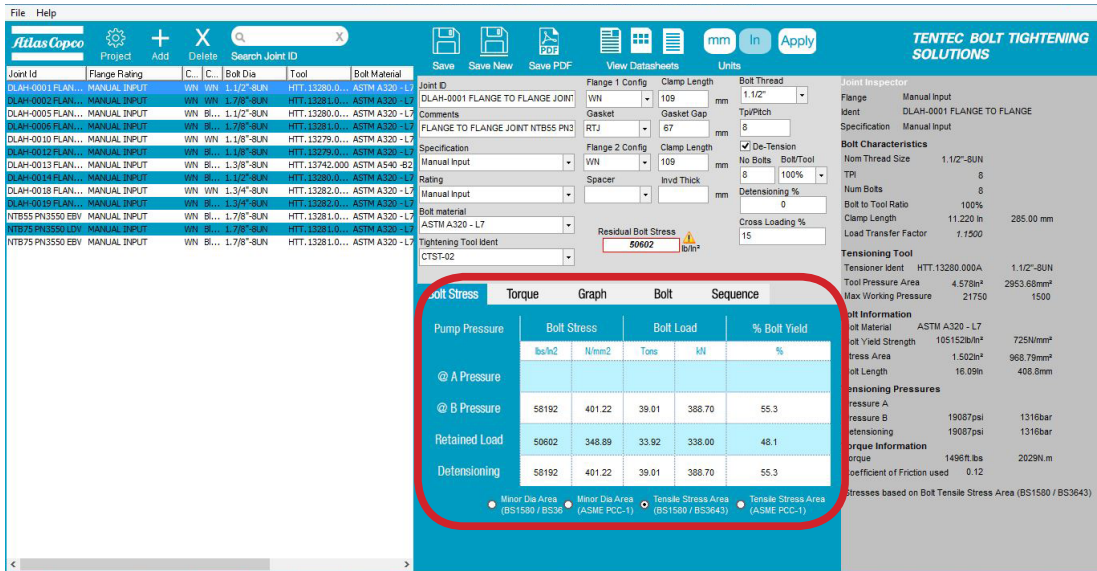
- Flange 1 Config: Flange Rating, Bolt Dia, Tool, Bolt Material
- Flange 2 Config: Flange Rating, Bolt Dia, Tool, Bolt Material
- Clamp Length
- Bolt Thread
- Gasket
- Gasket Gap
- TopPitch
- No Bolts
- Bolt/Tool
- De-Tension
- Invd Thick
- Denstensioning %
- Cross Loading %
- Residual Bolt Stress

Joint Inspector

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

The screenshot shows the 'Joint Inspector' area in the Atlas Copco software. A red circle highlights the Joint Inspector fields. The fields include:

- Flange Inspector
- Flange
- Manual Input
- Ident
- DLAH-0001 FLANGE TO FLANGE
- Specification
- Manual Input
- Bolt Characteristics
- Nom Thread Size
- 1.1/2"-8UN
- TPH
- 8
- Num Bolts
- 8
- Bolt to Tool Ratio
- 100%
- Clamp Length
- 11.220 in
- 285.00 mm
- Load Transfer Factor
- 1.1500
- Tensioning Tool
- Tensioner Ident
- HTT:13280.000A
- 1.1/2"-8UN
- Tool Pressure Area
- 4.578in²
- 2953.68mm²
- Max Working Pressure
- 21750
- 1500
- Bolt Information
- Bolt Material
- ASTM A320 - L7
- Bolt Yield Strength
- 1051520in²
- 725N/mm²
- Stress Area
- 1.552in²
- 968.79mm²
- Bolt Length
- 16.09in
- 408.6mm
- Tensioning Pressures
- Pressure A
- 19087psi
- 1316bar
- Pressure B
- 19087psi
- 1316bar
- Denstensioning
- 19087psi
- 1316bar
- Torque Information
- Torque
- 1496ft.lbs
- 2029N.m
- Coefficient of Friction used
- 0.12
- Stresses based on Bolt Tensile Stress Area (BS1580 / BS3643)



Information Tab Bar

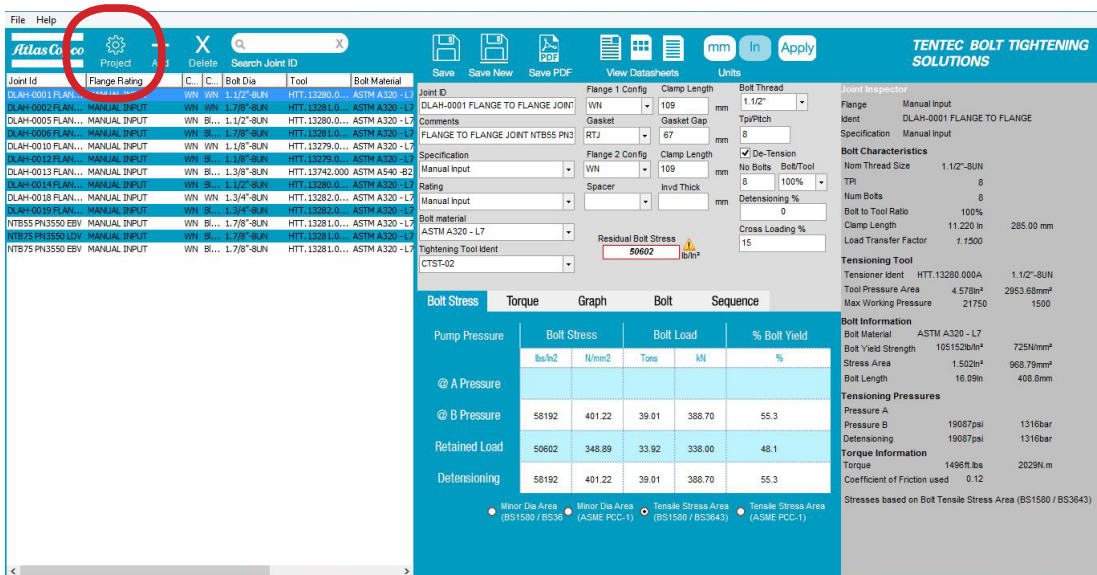
This area is where categorised information for the current application is displayed.

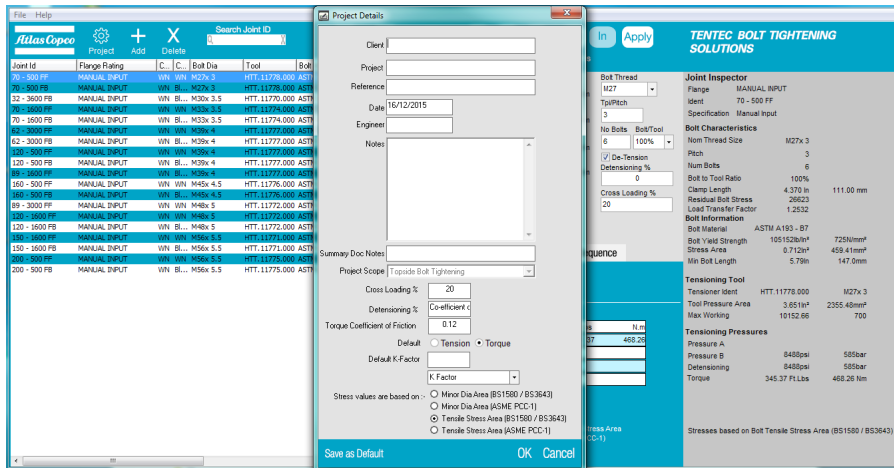
The are 5 tabs.

- Bolt Stress
- Torque
- Graph
- Bolt
- 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 category of tools per project can be selected. It is not possible to change the selected category once a project contains an application.

Tool Ranges Categories Available:

- Topside Bolt Tightening
- Subsea Bolt Tightening

Tool ranges available within categories:

- Topside Bolt Tensioner
 - CTST Range
 - V-Series Range
 - Force10 Range
- Subsea Bolt Tensioner
 - Optimus 5 Range
 - Optimus 6 Range
 - Compact 8 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 (*It is possible to define a different factor on each application by altering the % in the application definition area*).

Default = 0%

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

Default Tension / Torque:

defines when you add a joint to the project, which option is selected first by default.

Default K-Factor:

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

(*It is possible to define a different K-Factor on each application by altering the K-Factor in the Information Tab Bar select Torque Tab*)

Stress areas are based on:

Defines if the bolt stress is calculated using the Bolt Tensile Stress Area or Bolt Minor Diameter Area and between B.S. or ASME PCC-1 versions of either (The software defaults to Tensile Stress Area to BS 1580).

Setting up your first application (Tension).

Tension Torque

First select what type of tooling will be used on this joint. Projects are able to handle multiple different types of tooling per project set.

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).

C Defines the flange rating.

D Defines the bolt material for the application. It is possible to add user definable bolt materials (See Page 17)

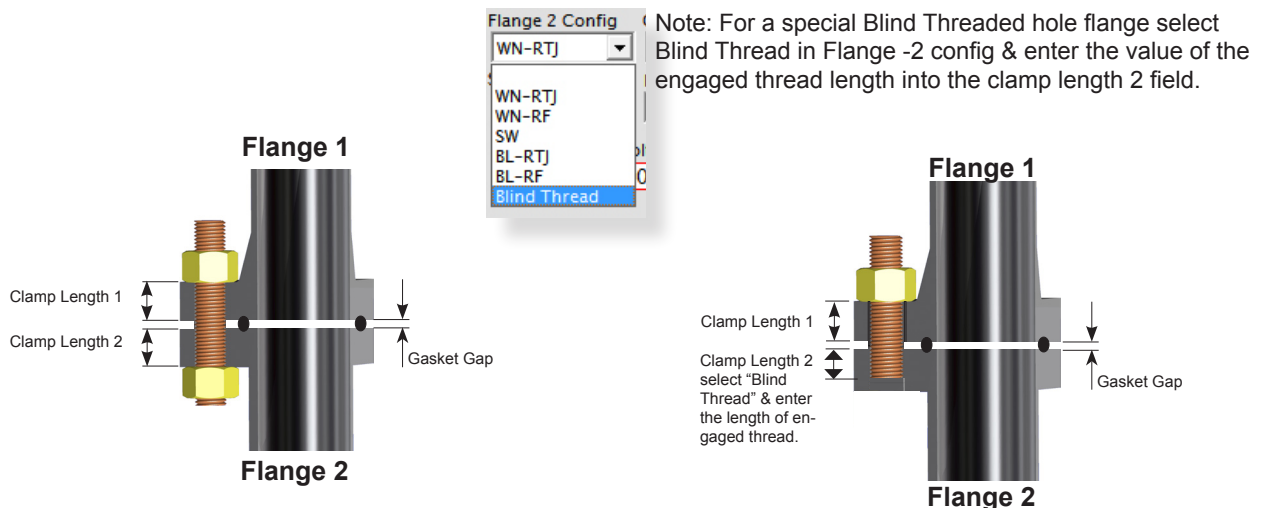
E Selects the appropriate Tentec tool for the application. It is possible to add user definable tools (See Page 17)

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.

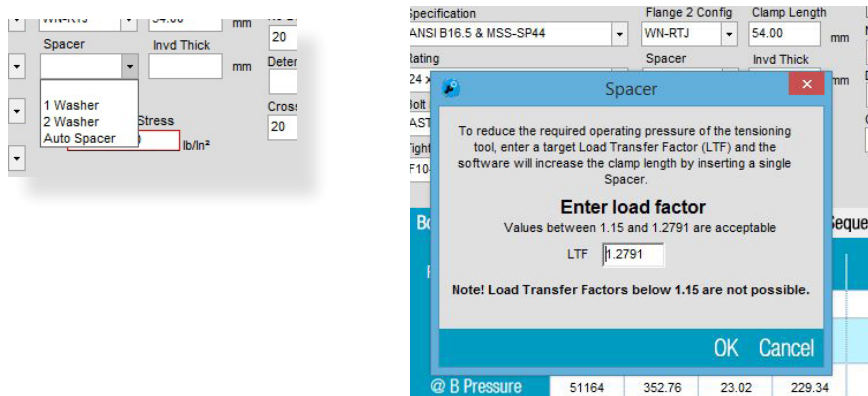
J Defines the configuration of the flange 2 configuration and enters the thickness of the flange at **K**
In the case of a special thickness flange being used the flange thickness can be edited.



L In some cases an application may be fitted with washers underneath the 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 tensioning 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
Metric Threads - 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

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

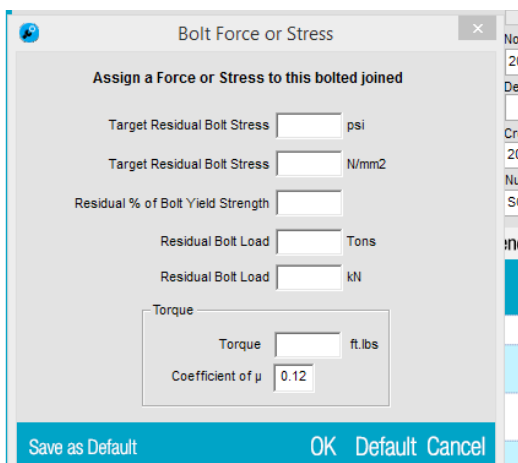
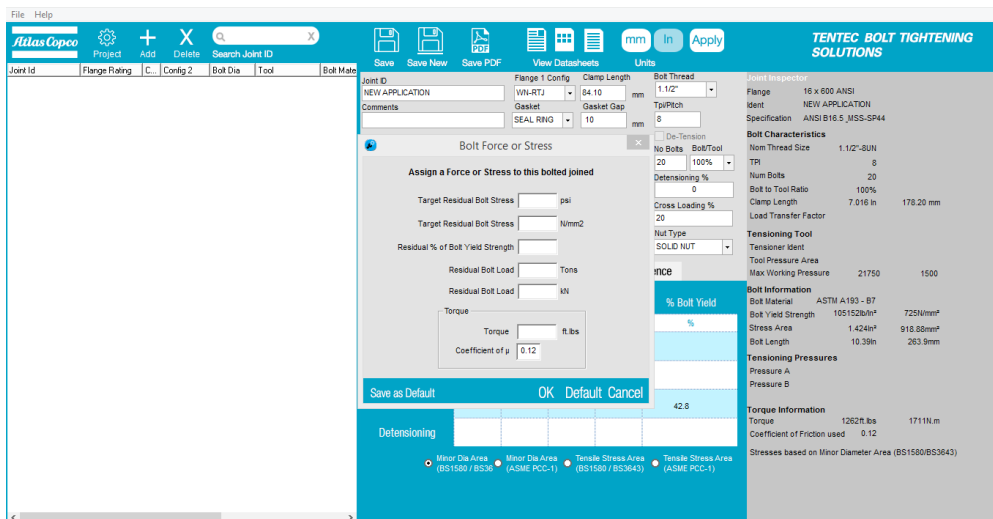
50% & 25% Tensioning uses 2 pressure passes, the first pressure pass is higher than the second pressure by a factor that is defined in cell **W** and globally in the project definition window.

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 project scope is Subsea Bolt Tightening.

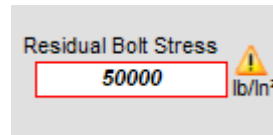
T Residual Bolt Stress, here is where the software recommends the residual bolt stress, it can be overwritten by clicking on the cell which opens up a edit window



Bolt tightness 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)
- Residual Bolt Load (kN)
- Torque (ft.lbs) in conjunction with a coefficient of friction value

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

Setting up your first application (Torque).

The screenshot shows a software interface for setting up a torque application. The interface is divided into several sections:

- Joint ID:** NEW APPLICATION (marked with a red 1)
- Comments:** (empty field)
- Specification:** ANSI B16.5 & MSS-SP44 (marked with a red 3)
- Pipe:** 5 (marked with a red 2)
- Pressure Rating:** x 150 ANSI
- Bolt material:** ASTM A193 - B7
- Tightening Tool Ident:** RT-0.5 1/2" (marked with a red 4)
- Clamp Length:** (empty field, marked with a red 1)
- Nut AF:** 1.1/4 in (marked with a red 2)
- Bolt Thread:** 3/4" (marked with a red 3)
- Tpi/Pitch:** 10
- No Bolts:** 8
- K Factor:** 0.16 (marked with a red 3)
- Residual Bolt Stress:** 40000 lb/in²
- Co-efficient of friction:** 0.12 (highlighted in a callout box)

Additional information in the interface includes:

- Torque calc based on NUT FACTOR (K= 0.16) 'An Introduction to the Design and Behaviour of Bolted Joints' Blackford, p. 233
- Torque calc based on EN 1591-1, ISO 27509, and VDI 2230
- Options: Tension Torque

1 Clamp length of the joint may be shown here for recording purposes (not used in the calculation).

2 The nut across flats are shown here. Figure is calculated from Bolt Thread selection and used in final torque required calculation.

3 User can select to use either a 'K' factor ^a or Co-efficient of friction to calculate torque. Use whichever term you are most familiar with as the formula varies with whichever term is selected.

4 Types of torque wrench ^b can be selected from this drop-down menu.

Notes:

^a) K Factor automatically selects Minor Area according to PCC-1, as its default bolt section area.

^b) If the option 'Hand Torque' is the only option available, no standard Torque Wrench is available that will satisfy the criteria given ie. Torque amount is too low for our smallest wrench.

Information Tab Bar

The information tab bar consists of 5 Tabs labelled


Bolt Stress
Torque
Load Graph
Bolt
Sequence

Bolt Stress Tab

Bolt Stress	Torque	Graph	Bolt	Sequence	
Pump Pressure	Bolt Stress		Bolt Load		% Bolt Yield
	lbs/in2	N/mm2	Tons	kN	%
@ A Pressure	66085	455.64	44.30	441.42	62.8
@ B Pressure	55071	379.70	36.92	367.85	52.4
Retained Load	45000	310.26	30.17	300.58	42.8
Detensioning	60578	417.67	40.61	404.63	57.6

Minor Dia Area (BS1580 / BS36)
 Minor Dia Area (ASME PCC-1)
 Tensile Stress Area (BS1580 / BS3643)
 Tensile Stress Area (ASME PCC-1)

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

Bolt Stress	Torque	Graph	Bolt	Sequence	
Pump Pressure	Bolt Stress		Bolt Load		% Bolt Yield
	lbs/in2	N/mm2	Tons	kN	%
@ A Pressure	117485	810.03	78.76	784.75	111.7 
@ B Pressure	97904	675.03	65.63	653.95	93.1
Retained Load	80000	551.58	53.63	534.36	76.1
Detensioning	107694	742.53	72.19	719.35	102.4


Minor Dia Area (BS1580 / BS36)
 Minor Dia Area (ASME PCC-1)
 Tensile Stress Area (BS1580 / BS3643)
 Tensile Stress Area (ASME PCC-1)

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.

<input checked="" type="radio"/> Minor Dia Area (BS1580 / BS36)	<input checked="" type="radio"/> Minor Dia Area (ASME PCC-1)	<input checked="" type="radio"/> Tensile Stress Area (BS1580 / BS3643)	<input checked="" type="radio"/> Tensile Stress Area (ASME PCC-1)
---	--	--	---

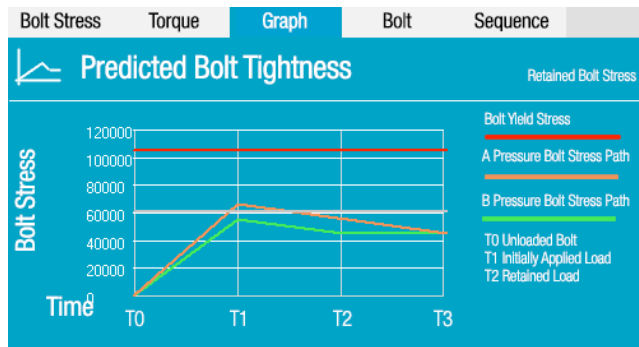
This tab also allows the user to switch between different specifications of bolt tensile stress area and bolt minor area to calculate bolt stress. When switching a new bolt load is calculated based on the type of bolt area chosen.

Torque Tab

Bolt Stress	Torque	Graph	Bolt	Sequence
				
			ft. lbs	N.m
Torque			120.76	163.73
K Factor			0.16	
Pump Pressure			3042 psi	210 bar
Selected Wrench			RT-0.5 1/2"	

This tab displays the torque value to achieve the residual bolt load based on the displayed coefficients of friction. The global coefficient of friction / K factor value can be edited in the project definition window. Changing the 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
T2 = Initial bolt stress B pressure
T3 = 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 Stress	Torque	Graph	Bolt	Sequence
Bolt Information				
Stresses based on Bolt Tensile Stress Area (BS1580 / BS3643)				
Bolt Material	ASTM A193 - B16			
Bolt Diameter	1.1/2"			
Quantity	20			
Yield Strength	105152	lb/in ²	725	N/mm ²
Bolt Length	11.89	in	302.0	mm
Tensile Stress Area	1.502	in ²	968.79	mm ²
Minor Diameter Area		in ²		mm ²

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.

Sequence Tab

Tensioning Sequence

Bolt / Tool Ratio

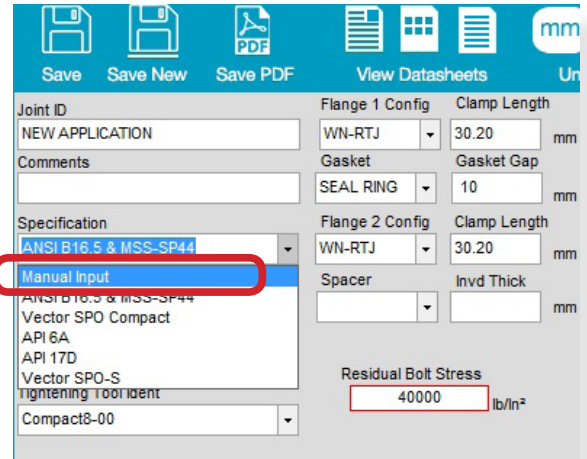
Tensioner Pass	Bolt #	Pump Pressure	
		psi	bar
Pass 1	1	21676	1494
Pass 2	2	18063	1245
Pass 3			
Pass 4			
Checking Pass			
Pass 1	1	18063	1245
Pass 1	1	18063	1245

This tab displays the recommended tensioning sequence.

Manual Input Mode

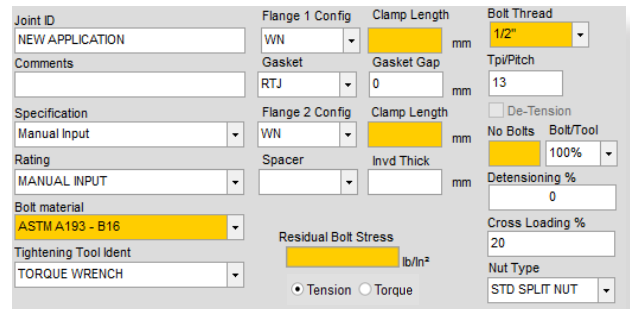
Manual Input mode can be chosen from the Specification drop down menu.

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

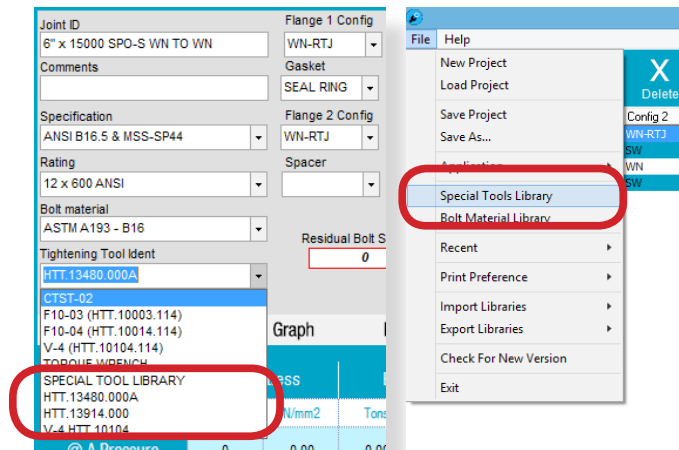


All 6 orange fields in the application definition area are to be completed first before the Joint Inspector displays the results. It is recommended that the bolt thread is selected first. Once the thread is selected the software will suggest tensioning tools in the tensioning tool ident menu.

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



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. This feature is discussed further on page 17.



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.

4064 R1 - Pig Launcher Pulling Heads.bprj
Project (*.bprj)

Reference: in this case 4064 R1

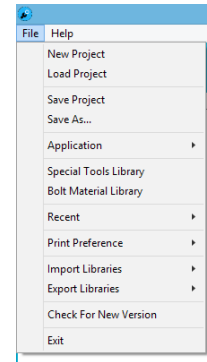
Note R1 represents "Revision1" can be used as a simple revision counter.

Project: Pig Launcher Pulling Heads

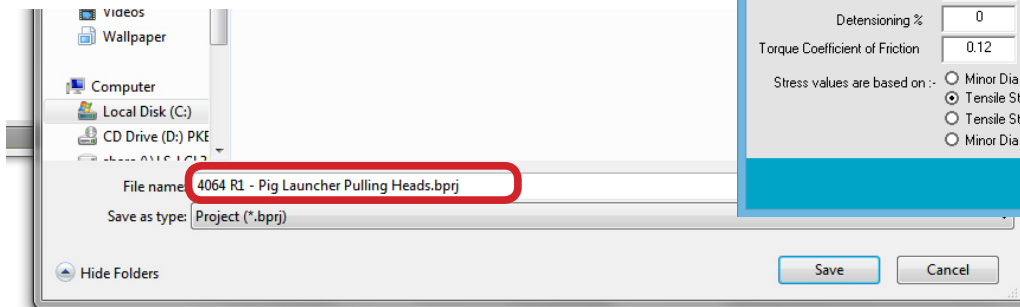
The summation of the two variables makes the project file name.

Note:

Similar file names are created for the report PDF Files.

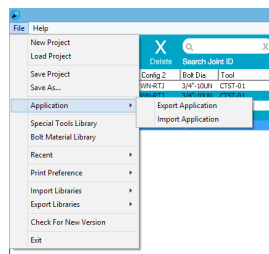


Client	Halldan
Project	Pig Launcher Puller Heads
Reference	4064 R1
Date	18/03/2016
Engineer	MPE
Notes	
Summary Doc Notes	
Project Scope	Topside Bolt tensioning
Cross Loading %	20
Detensioning %	0
Torque Coefficient of Friction	0.12
Stress values are based on :	<input type="radio"/> Minor Dia Area (BS1580 / BS3643) <input checked="" type="radio"/> Tensile Stress Area (BS1580 / BS3643) <input type="radio"/> Tensile Stress Area (ASME PCC-1) <input type="radio"/> Minor Dia Area (ASME PCC-1)



Application

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

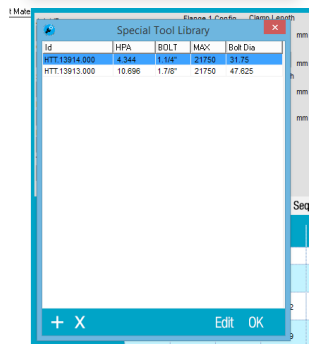


Special Tool Library.

Here define a special tool that can be used on manual input applications. 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 for you to edit the special tool details.
- Clicking the X button deletes the currently selected tool.
- Click OK to leave the special tools library.



Bolt Size

The bolt size the special tool will be used on.

Tool Ident.

The code that the tool can be identified by.

Tensioner Pressure Area

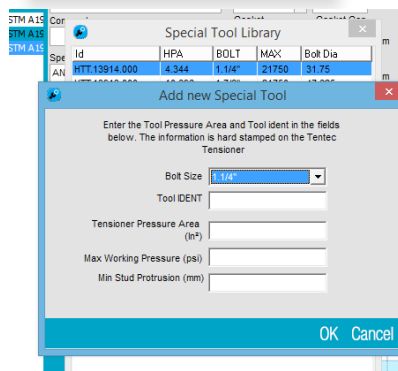
Normally shown as the Hydraulic Pressure Area.

Max. Working Pressure

The maximum working pressure of the tool.

Min. Stud Protrusion

The Minimum stud protrusion required (normally 1D).

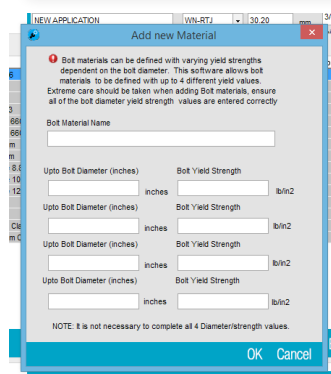
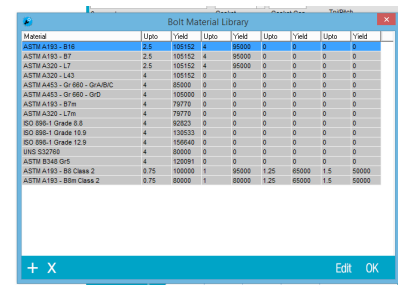


Bolt Material Library

In the latest version of the software, a feature has been added to allow users to add bolt materials that are not covered in the standard bolt materials list. In the library window, the standard bolt materials that come with the software can be seen along with their yield strengths and bolt diameter limits. The default bolt materials cannot be edited.



- To add a new material to the library click the add button and enter the required material details.
- To edit a special material, select the material in the list and select the edit button. A new window will open up for you to edit the special material details.
- Clicking the X button deletes the currently selected material.
- Click OK to leave the bolt material library.



Care should be taken when defining new bolt materials. Incorrect yield values can result in dangerous and unsafe values being generated.

Bolt materials can be defined with varying yield strength dependent on bolt diameter. The software allows bolt materials to be defined with up to 4 different yield values at 4 different bolt diameters.

To give an example of how this feature can be used...

Bolt Material to be added = ASTM A193 - B8 Class 2

This materials yield strength is defined at 4 different bolt diameters as follows

Up to and including 3/4" diameter, Yield Strength = 100000 lbs/in²

Up to and including 1" diameter, Yield Strength = 95000 lbs/in²

Up to and including 1.1/4" diameter, Yield Strength = 65000 lbs/in²

Up to and including 1.1/2" diameter, Yield Strength = 50000 lbs/in²

Recent

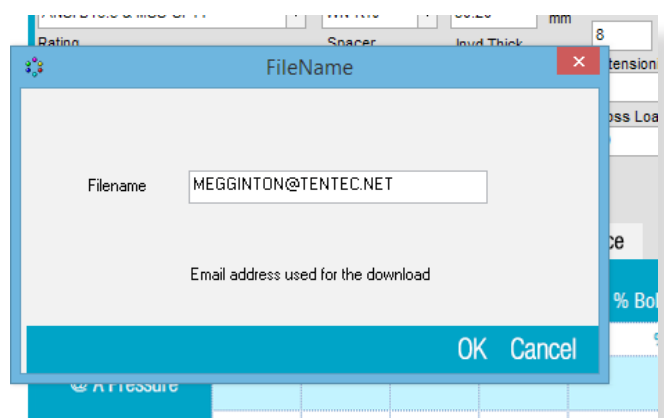
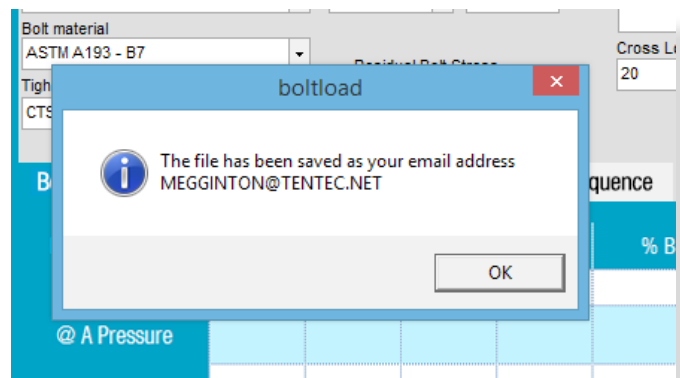
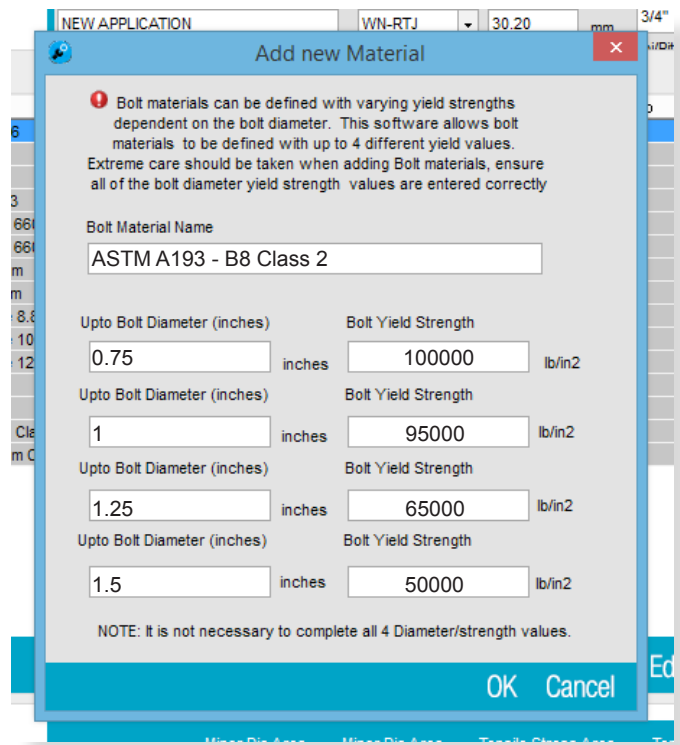
Displays the recent project files.

Import / Export Libraries

This feature allows the user to transmit both 'Special Tools Library' and 'Bolt Material Library' to other users of the BLS. Selecting 'Export' uploads the selected library to a cloud based server, using the email address that you used during the initial setup of the program.

-Tip- You may want to use a neutral email address so every user in a department/company can use the same library.

To Import a library, Select the relevant option, and enter the agreed email address. Your libraries will be updated automatically.



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Summary Report

Customer [REDACTED]
 Project [REDACTED]
 Project Reference 151112
 Date and Engineer 11/05/2015 MPE

Tentec Bolt Tightening Solutions



Bolt Tightening Summary

Bolted Joint Description	Flange Specification	Flange Type		Bolt Dia	No Bolts	Bolt Material	Residual Target Bolt Stress		Tool Ident	(ii) 100% Tensioning			(i) De-tensioning		Torque Values			Bolt Length	Space Washer Req
		S.1	S.2				lbs/In2	N/mm2		1st Pass	2nd Pass	Max Pressure	Yield	N.m	Ft.lbs	u			
																	psi (bar)		
DLAH-0001 FLANGE TO FLANGE JOINT NT855 PN3550 MANUAL INPUT	Manual Input	WN	WN	1.1/2"-8UN	8	ASTM A320 - L7	50602	348.89	HTT.132 80.000A	19087psi (1316bar)			19087psi (1316bar)	55.3	2029N.m	1496ft.lbs	0.12	408.8m	N
DLAH-0002 FLANGE TO FLANGE JOINT NT875 PN3550 MANUAL INPUT	Manual Input	WN	WN	1.7/8"-8UN	8	ASTM A320 - L7	51233	353.24	HTT.132 81.000A	15925psi (1098bar)			15925psi (1098bar)	56.0	4079N.m	3009ft.lbs	0.12	0mm	N
DLAH-0005 FLANGE TO BLOCK JOINT NT855 PN3550 MANUAL INPUT	Manual Input	WN	Blind Thread	1.1/2"-8UN	8	ASTM A320 - L7	50602	348.89	HTT.132 80.000A	17007psi (1173bar)			17007psi (1173bar)	59.5	2029N.m	1496ft.lbs	0.12	0mm	N
DLAH-0006 FLANGE TO BLOCK JOINT NT875 PN3550 MANUAL INPUT	Manual Input	WN	Blind Thread	1.7/8"-8UN	8	ASTM A320 - L7	51233	353.24	HTT.132 81.000A	17252psi (1189bar)			17252psi (1189bar)	60.7	4079N.m	3009ft.lbs	0.12	0mm	N
DLAH-0010 FLANGE TO FLANGE JOINT NT863 PN1750 MANUAL INPUT	Manual Input	WN	WN	1.1/8"-8UN	8	ASTM A320 - L7	56091	386.73	HTT.132 79.000A	17471psi (1205bar)			17471psi (1205bar)	61.3	921N.m	679ft.lbs	0.12	0mm	N
DLAH-0012 FLANGE TO BLOCK JOINT NT863 PN1750 MANUAL INPUT	Manual Input	WN	Blind Thread	1.1/8"-8UN	8	ASTM A320 - L7	56091	386.73	HTT.132 79.000A	18658psi (1286bar)			18658psi (1286bar)	65.5	921N.m	679ft.lbs	0.12	0mm	N
DLAH-0013 FLANGE TO BLOCK JOINT NT885 PN1750 MANUAL INPUT	Manual Input	WN	Blind Thread	1.3/8"-8UN	8	ASTM A540 - B21 Class 1	83417	575.14	HTT.137 42.000	17087psi (1178bar)	19650psi (1355bar)	17087psi (1178bar)	17087psi (1178bar)	68.6	2556N.m	1885ft.lbs	0.12	0mm	N
DLAH-0014 FLANGE TO BLOCK JOINT NT855 PN3550 MANUAL INPUT	Manual Input	WN	Blind Thread	1.1/2"-8UN	8	ASTM A320 - L7	50602	348.89	HTT.132 80.000A	17007psi (1173bar)			17007psi (1173bar)	59.5	2029N.m	1496ft.lbs	0.12	0mm	N
DLAH-0018 FLANGE TO FLANGE JOINT NT8120 PN1750 MANUAL INPUT	Manual Input	WN	WN	1.3/4"-8UN	8	ASTM A320 - L7	58089	400.51	HTT.132 82.000A	20163psi (1390bar)			20163psi (1390bar)	63.5	3743N.m	2761ft.lbs	0.12	0mm	N
DLAH-0019 FLANGE TO BLOCK JOINT NT8120 PN1750 MANUAL INPUT	Manual Input	WN	Blind Thread	1.3/4"-8UN	8	ASTM A320 - L7	58089	400.51	HTT.132 82.000A	21705psi (1496bar)			21705psi (1496bar)	68.4	3743N.m	2761ft.lbs	0.12	0mm	N
NT855 PN3550 EBV MANUAL INPUT	Manual Input	WN	Blind Thread	1.7/8"-8UN	8	ASTM A320 - L7	44840	309.16	HTT.132 81.000A	15030psi (1036bar)			15030psi (1036bar)	52.9	3570N.m	2633ft.lbs	0.12	0mm	N
NT875 PN3550 LDV MANUAL INPUT	Manual Input	WN	Blind Thread	1.7/8"-8UN	8	ASTM A320 - L7	44840	309.16	HTT.132 81.000A	15030psi (1036bar)			15030psi (1036bar)	52.9	3570N.m	2633ft.lbs	0.12	0mm	N
NT875 PN3550 EBV MANUAL INPUT	Manual Input	WN	Blind Thread	1.7/8"-8UN	8	ASTM A320 - L7	51233	353.24	HTT.132 81.000A	17252psi (1189bar)			17252psi (1189bar)	60.7	4079N.m	3009ft.lbs	0.12	0mm	N

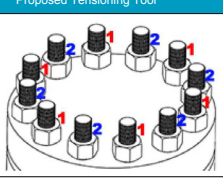
Note:
 (i) Max Detensioning Pressure refers to the maximum capacity of the tensioning tool and should not be considered to be the safe max load capacity of the flange
 (ii) 100% Tensioning is the recommended mode of bolt tensioning, wherever possible use 100% Bolt to tool ratio

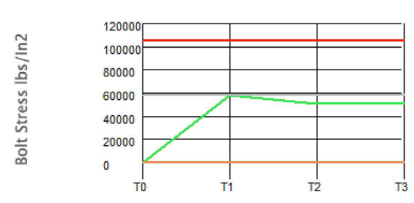
Individual Application Report

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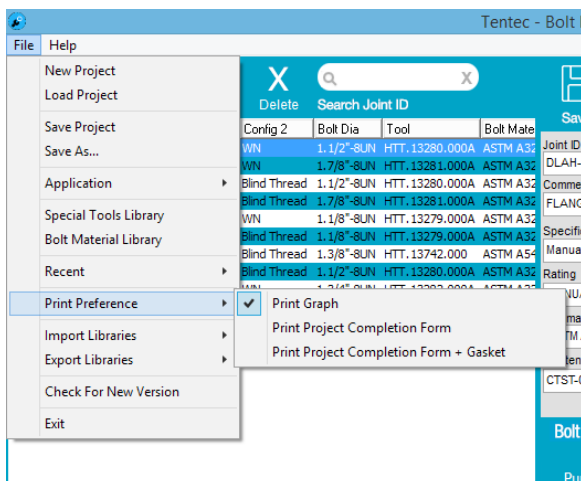
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Client	SIMON CARVES		
Project	LDPE PLANT		
Project Reference	151112		
Date and Engineer	11/05/2015 MPE		
Bolt Tensioning Datasheet			
Flange Specification	MANUAL INPUT		
Ident	DLAH-0001 FLANGE TO FLANGE JOINT NTB55 PN3550		
Joint Information		Proposed Tensioning Tool	
Nom Thread Size	1.1/2"-8UN	Flange Configuration	F1 109 WN
TPI	8	Gap	67
Num Bolts	8	F2	109 WN
Bolt to Tensioning Ratio	50%	Ws	0 0
Load Transfer Factor LTF	1.15	In	285 mm
Clamp Length	11.220		
Tensioning Tool Information			
Proposed Tensioning Tool	HTT.13280.000A	RN	
Tool Pressure Area	4.578	In2	2953.68 mm2
Bolt Information			
Bolt Material	ASTM A320 - L7		
Bolt Yield Strength	105152	lb/in2	725 N/mm2
Stress Area	1.502	In2	968.79 mm2
Bolt Length	16.09	In	408.8 mm
Torque Information		Checking Pass	
Torque	1496	ft.lb	2029 N.m
Coefficient of Friction	0.12		
Load Information		Bolt Stress	
Tensile Stress Area (BS1580 / BS3643)	lbs/in2	N/mm2	Tons kN %
T1 @ A Pressure	64012	441.35	42.91 427.57 60.9
T1 @ B Pressure	58192	401.22	39.01 388.7 55.3
T2 Residual	50602	348.89	33.92 338 48.1
Stress @ Detensioning	58192	401.22	39.01 388.7 55.3
Tensioning Pressures		% of Bolt Yield	
	psi	Bar	psi Bar %
100% Tensioning Pressures	19087	1316	- - 55.3
50% Tensioning Pressures	20995	1448	19087 1316 60.9
Max Detensioning Pressures	19087	1316	- - 55.3
Predicted Bolt			
Application Comments		FLANGE TO FLANGE JOINT NTB55 PN3550	





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
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To add a flange completion signature box to each application report, select

File/Print Preferences/Print Project Completion Form

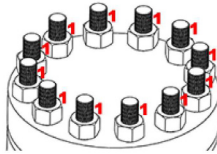
Print Project Completion Form

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Client			
Project			
Project Reference			
Date and Engineer		17/03/2016	
Bolt Tensioning Datasheet			
Flange Specification	6" x 15000 Vector SPO-S		
Ident	Vector SPO-S		
	6" x 15000 SPO-S WN TO WN		
Joint Information		Proposed Tensioning Tool	
Nom Thread Size	1.1/4"-8UN	Flange Configuration	
TPI	8	F1	79 WN
Num Bolts	16	Gap	0
Bolt to Tensioning Ratio	100%	F2	79 WN
Load Transfer Factor LTF	1.2109	Ws	0 0
Clamp Length	6.220	In	158 mm
Tensioning Tool Information			
Proposed Tensioning Tool	HTT.13914.000	RN	
Tool Pressure Area	4.344	In2	2802.58 mm2
Bolt Information		Tensioner	
Bolt Material	ASTM A320 - L7m		Bolt #
Bolt Yield Strength	79770	lb/in2	550 N/mm2
Stress Area	0.929	In2	599.26 mm2
Bolt Length	10.35	In	262.8 mm
Torque Information		Checking Pass	
Torque	927	ft.lb	1256 N.m
Coefficient of Friction	0.12		
Load Information		Applied Pressure	
Minor Diam Area(ASME PCC-1)		psi	bar
T1 @ A Pressure			
T1 @ B Pressure	72389	499.1	30.02 299.09 90.7
T2 Residual	59781	412.18	24.79 247 74.9
Stress @ Detensioning		% of Bolt Yield	
Tensioning Pressures		% of Bolt Yield	
	1st Pass	2nd Pass	
100% Tensioning Pressures	15479	1067	- - 90.7
50% Tensioning Pressures			
Max Detensioning Pressures			
Signed for on behalf of Tentec		Signed for on behalf of	
Date	Date	Application Comments	
Print name	Print Name		
Signature	Signature		

Tentec Bolt Tightening Solutions



Section available for signing, suitable for record keeping.

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
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TENTEC BOLT TIGHTENING SOLUTIONS

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