

# POWERMMASTER CONTROLLED BOLTING SOFTWARE

SOLUTIONS FOR EVERY BOLTING APPLICATION



USER  
MANUAL



AN EXPRESS WAY FOR EASE OF BOLT LOAD CALCULATION AND DOCUMENTATION.

## Contents

- Installation Guide
- Introduction
- Tool Bars
- Setting up project, Setting up application
- Project application list, Joint Inspector
- Information Tab Bars
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## Minimum System Requirements:

- Operating system: Windows 7 and above
- Disk Space: Minimum 1 GB
- Processor: Intel dual core or equivalent
- Screen Resolution: 1366 x 768
- RAM : Minimum 512 MB

## Instruction for installation:

- First screen informed about copy right, system requirement, and end user license agreement. Press NEXT button.
- Press browse button, select the drive other drive if limited permission available for default location in 'C' drive. Press NEXT button.
- Press NEXT button.
- Click on create desktop shortcut. Press NEXT
- Click on install button.
- Select full installation (for Sqlite). Click on NEXT.
- Select checkbox for “Generate native images for the assemblies & install them into native image cache” also select the checkbox for “Install the assemblies into the global assembly cache”. (This is very important as Sqlite has to be in GAC (Global Assembly Cache) to run this software)
- Click NEXT.
- Click NEXT.
- Finish.

# Introduction

Powermaster Bolting Software "CBex" helps users to calculate bolt tensioner pressures for specific bolt joint application and to prepare documentation for the same. User need to feed the minimum essential data to get the necessary details for application using specific tool from Powermaster. It helps to create Job sheet for a specific application as well as summery Sheet / Job Register for multiple jobs of a specific project. The software contains data for the following standard bolted flanges.

- ANSI B16.5
- ANSI B16.47
- API 6A

## Notes:

It contains data for the Subsea TSS Series & Topside PST Series of Powermaster Bolt Tensioning Tools. The software has been developed completely in-house by Powermaster and as such we have the ability to implement changes and add additional features.

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

**Caution:** The recommended values are based on the experience and are used without any guarantee or liability to Powermaster. The recommended bolt stress values assume that flange material yield strength is equal to or greater than  $247\text{N/mm}^2$  ( $35840\text{lbs/In}^2$ ).

**DO NOT USE THE RECOMMENDED ANSI B16.5 BOLT STRESS VALUES FOR FLANGES MANUFACTURED WITH MATERIAL YIELD STRENGTH LESS THAN  $247\text{N/mm}^2$  ( $35840\text{lbs/In}^2$ )**

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

- ASTM A105
- ASTM A182 Grades -F65, - F60, -F52 & -F51
- ASTM A350 Grade -LF2& -LF3
- ASTM A694 Grade F52, 60 & -F65

Flange Service Temperature range for the recommended bolt stress values are  $-101^\circ\text{C}$  to  $+200^\circ\text{C}$ . 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

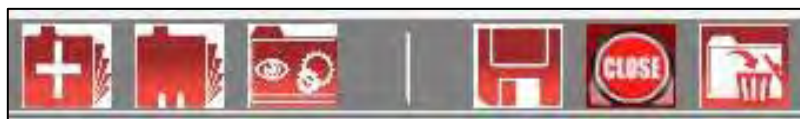
This software helps user to create a project with multiple joint application.






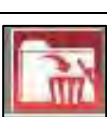
Basic working on software is to first create a Project. Then add multiple applications as applicable.

# Toolbars

## Project Toolbar:

Refer below project bar for setting up a new project and working on it.









1.		To add a New Project	4.		To save the Project
2.		To Open an Existing Project	5.		To close the Project
3.		To edit an open existing project	6.		To delete the project

## Application Toolbar:


Using Application data sheet, applications are added to a project, using below application bar.

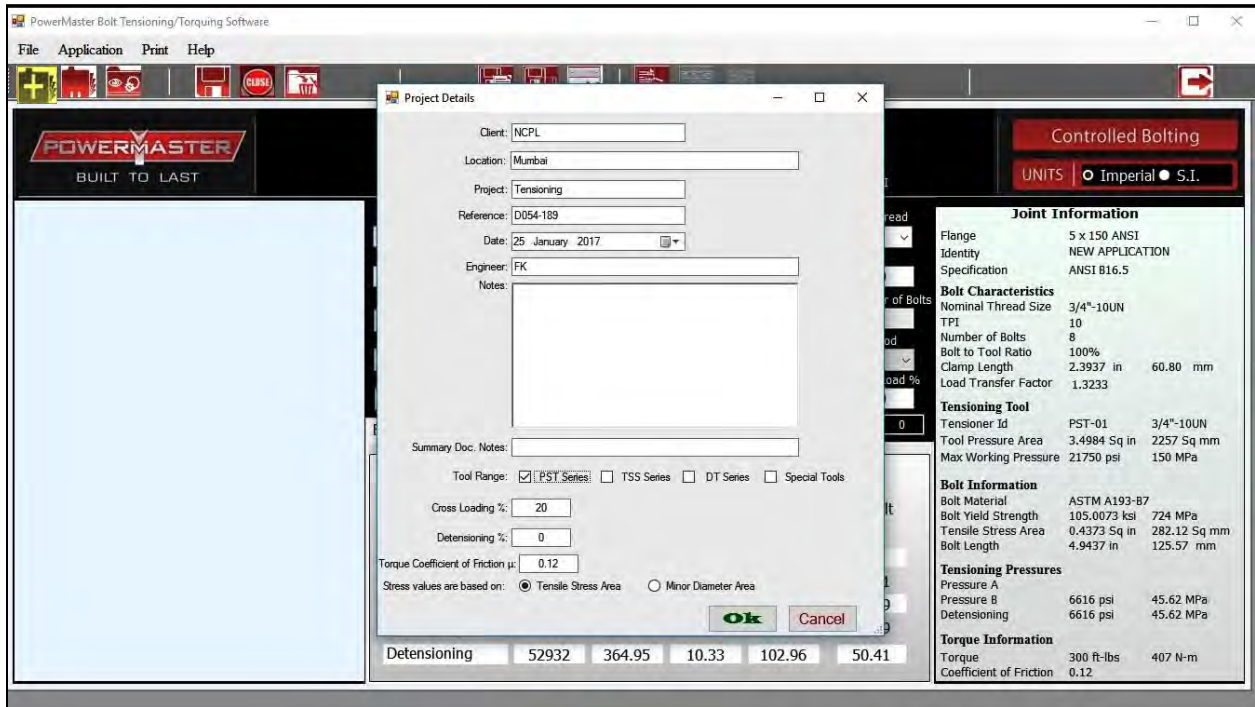


1.		Save application as New	4.		View application details
2.		Save or Over write application	5.		View applications in Grid form of an project.
3.		Delete application	6.		View application and Joint Summary sheet/ Report.



# Setting up a project:

Click on icon "  ", and enter project details.



The screenshot shows the PowerMaster Bolt Tensioning/Torquing Software interface. A "Project Details" dialog box is open, allowing users to enter project information. The dialog box contains the following fields and options:

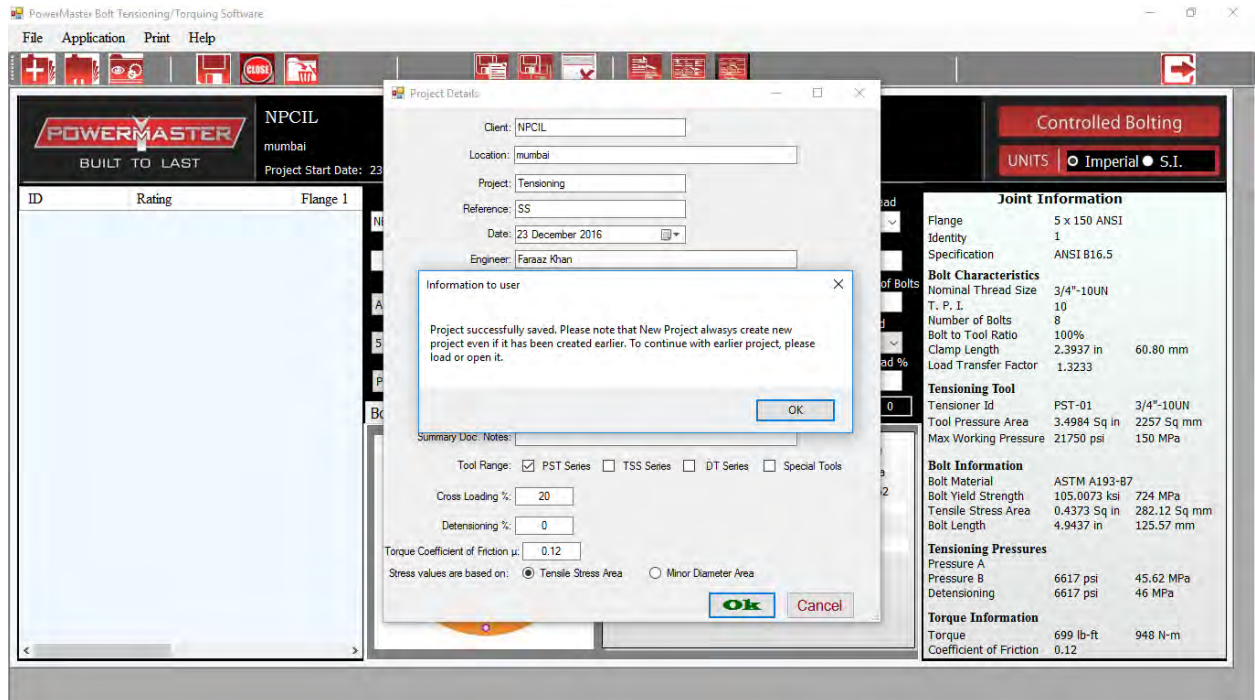
- Client: NCPL
- Location: Mumbai
- Project: Tensioning
- Reference: D054-189
- Date: 25 January 2017
- Engineer: FK
- Notes: (Empty text area)
- Summary Doc. Notes: (Empty text area)
- Tool Range: ☒ PST Series, ☐ TSS Series, ☐ DT Series, ☐ Special Tools
- Cross Loading %: 20
- Detensioning %: 0
- Torque Coefficient of Friction  $\mu$ : 0.12
- Stress values are based on: ☒ Tensile Stress Area, ☐ Minor Diameter Area

At the bottom of the dialog box, there are buttons for "Ok" and "Cancel". Below the dialog box, a row of values is displayed: Detensioning 52932 364.95 10.33 102.96 50.41.

The background software interface includes a menu bar (File, Application, Print, Help), a toolbar with various icons, and a main panel with a "POWERMASTER BUILT TO LAST" logo and a "Controlled Bolting" section with "UNITS" set to Imperial and S.I. The "Joint Information" section on the right lists various specifications:

- Flange: 5 x 150 ANSI
- Identity: NEW APPLICATION
- Specification: ANSI B16.5
- Bolt Characteristics**
  - Nominal Thread Size: 3/4"-10UN
  - TPI: 10
  - Number of Bolts: 8
  - Bolt to Tool Ratio: 100%
  - Clamp Length: 2.3937 in 60.80 mm
  - Load Transfer Factor: 1.3233
- Tensioning Tool**
  - Tensioner Id: PST-01 3/4"-10UN
  - Tool Pressure Area: 3.4984 Sq in 2257 Sq mm
  - Max Working Pressure: 21750 psi 150 MPa
- Bolt Information**
  - Bolt Material: ASTM A193-B7
  - Bolt Yield Strength: 105,0073 ksi 724 MPa
  - Tensile Stress Area: 0.4373 Sq in 282.12 Sq mm
  - Bolt Length: 4.9437 in 125.57 mm
- Tensioning Pressures**
  - Pressure A: 6616 psi 45.62 MPa
  - Pressure B: 6616 psi 45.62 MPa
  - Detensioning: 6616 psi 45.62 MPa
- Torque Information**
  - Torque: 300 ft-lbs 407 N-m
  - Coefficient of Friction: 0.12

Close it by clicking on "OK"



The screenshot shows the PowerMaster Bolt Tensioning/Torquing Software interface. The "Project Details" dialog box is open, and a message box titled "Information to user" is displayed over it. The message box contains the following text:

Project successfully saved. Please note that New Project always create new project even if it has been created earlier. To continue with earlier project, please load or open it.

The "Information to user" message box has an "OK" button. The "Project Details" dialog box is partially visible behind it, showing the same fields as in the previous screenshot. The background software interface is also visible, showing the "POWERMASTER BUILT TO LAST" logo and the "Controlled Bolting" section with "UNITS" set to Imperial and S.I. The "Joint Information" section on the right lists various specifications:



- Flange: 5 x 150 ANSI
- Identity: 1
- Specification: ANSI B16.5
- Bolt Characteristics**
  - Nominal Thread Size: 3/4"-10UN
  - T. P. I.: 10
  - Number of Bolts: 8
  - Bolt to Tool Ratio: 100%
  - Clamp Length: 2.3937 in 60.80 mm
  - Load Transfer Factor: 1.3233
- Tensioning Tool**
  - Tensioner Id: PST-01 3/4"-10UN
  - Tool Pressure Area: 3.4984 Sq in 2257 Sq mm
  - Max Working Pressure: 21750 psi 150 MPa
- Bolt Information**
  - Bolt Material: ASTM A193-B7
  - Bolt Yield Strength: 105,0073 ksi 724 MPa
  - Tensile Stress Area: 0.4373 Sq in 282.12 Sq mm
  - Bolt Length: 4.9437 in 125.57 mm
- Tensioning Pressures**
  - Pressure A: 6617 psi 45.62 MPa
  - Pressure B: 6617 psi 46 MPa
  - Detensioning: 6617 psi 46 MPa
- Torque Information**
  - Torque: 699 lb-ft 948 N-m
  - Coefficient of Friction: 0.12

## Setting up your first application:

Joint ID	Flange 1 Config	Clamp Length	Bolt Thread
PM/IOCL/43-01	WN-RF	1.189 in	3/4"
Comment	Gasket	Gasket Gap	TPI
	Seal Ring	0.3937 in	10
Specification	Flange 2 Config	Clamp Length	Number of Bolts
ANSI B16.5	WN-RF	1.189 in	8
Rating	Spacer	Individual Thick	Method
8 x 150 ANSI		0 in	100%
Tensioning Tool	Bolt Material	Residual Stress	Cross Load %
PST-01	ASTM A193-B7	45000 psi	20

☒ Detensioning %

Bolt Stress | Torque | Graph | Bolt | Sequence

- Provide an identification no. / serial no in ‘Joint ID’.
- Enter any comment if required.
- Select Flange specification.
- Select flange w.r.t. to its size and rating.
- Check for bolt specification in bolt thread, change if required.
- Select Tool to be used for the application.
- Confirm Flange-1 configuration & then select gasket.
- Select Flange -2 configuration .Add spacer details if applicable.
- Select bolt material from dropdown list and change Residual stress if required.
- Select Application Method i.e. 25%, 50%, 100% or Torque application.
- Select De-tensioning if required and enter the percentage above residual load it need to be set.
- Save this application using icon "  ".
- Add as many as applicable applications for the project. To edit an application use icon "  ".

# Project Application List

All applications related to project are displayed in this area. An application can be selected and edited from here.

The screenshot displays the PowerMaster Bolt Tensioning/Torquing Software interface. The top menu bar includes File, Application, Print, and Help. The main window is divided into several sections:

- Header:** POWERMASTER BUILT TO LAST logo, Powerrmaster Engineers, Project Name: IOCL Shahpur Project, Project Start Date: 23-01-2017, Project End Date: 25-01-2017, Project ID: PM-ASDF-12345-2016-17, A-87956, ANSI B16.5, 8 x 150 ANSI.
- Controlled Bolting:** UNITS: Imperial (selected), S.I.
- Joint Information:** Flange: 8 x 150 ANSI, Identity: PM/IOCL/43-01, Specification: PST-01, Bolt Characteristics: Nominal Thread Size: 3/4"-10UN, TPI: 10, Number of Bolts: 8, Bolt to Tool Ratio: 100%, Clamp Length: 2.3937 in, Load Transfer Factor: 1.3233, Tensioning Tool: Tensioner Id: PST-01, Tool Pressure Area: 3.4984 Sq in, Max Working Pressure: 21750 psi, 150 MPa.
- Bolt Information:** Bolt Material: ASTM A193-B7, Bolt Yield Strength: 105,0073 ksi, 724 MPa, Tensile Stress Area: 0.4373 Sq in, Bolt Length: 4.9437 in, 125.57 mm.
- Tensioning Pressures:** Pressure A: 7443 psi, 51.32 MPa, Pressure B: 7443 psi, 51.32 MPa, Detensioning: 7443 psi, 51.32 MPa.
- Torque Information:** Torque: 699 ft-lbs, 948 N-m, Coefficient of Friction: 0.12.
- Joint ID List:** A table with columns ID, Rating, and Flange 1. The list includes applications like PM/IOCL/43-01, PM/IOCL/43-02, etc.
- Joint ID Details:** PM/IOCL/43-01, Flange 1 Config: WN-RF, Clamp Length: 1.189 in, Bolt Thread: 3/4", Gasket Gap: 0.3937 in, TPI: 10, Specification: ANSI B16.5, Flange 2 Config: WN-RF, Clamp Length: 1.189 in, Number of Bolts: 8, Rating: 8 x 150 ANSI, Individual Thick: 0 in, Method: 100%, Tensioning Tool: PST-01, Bolt Material: ASTM A193-B7, Residual Stress: 45000 psi, Cross Load: 20.
- Bolt Stress/Torque Graph Bolt Sequence:** Choose ☒ Tensile Stress ☐ Minor Diameter. Units: psi, MPa, Metric, kN, % Bolt. Data table for T1@A Pressure, T1@B Pressure, T2 Residual, T3 Residual, and Detensioning.

## Joint Information & Calculation Data.

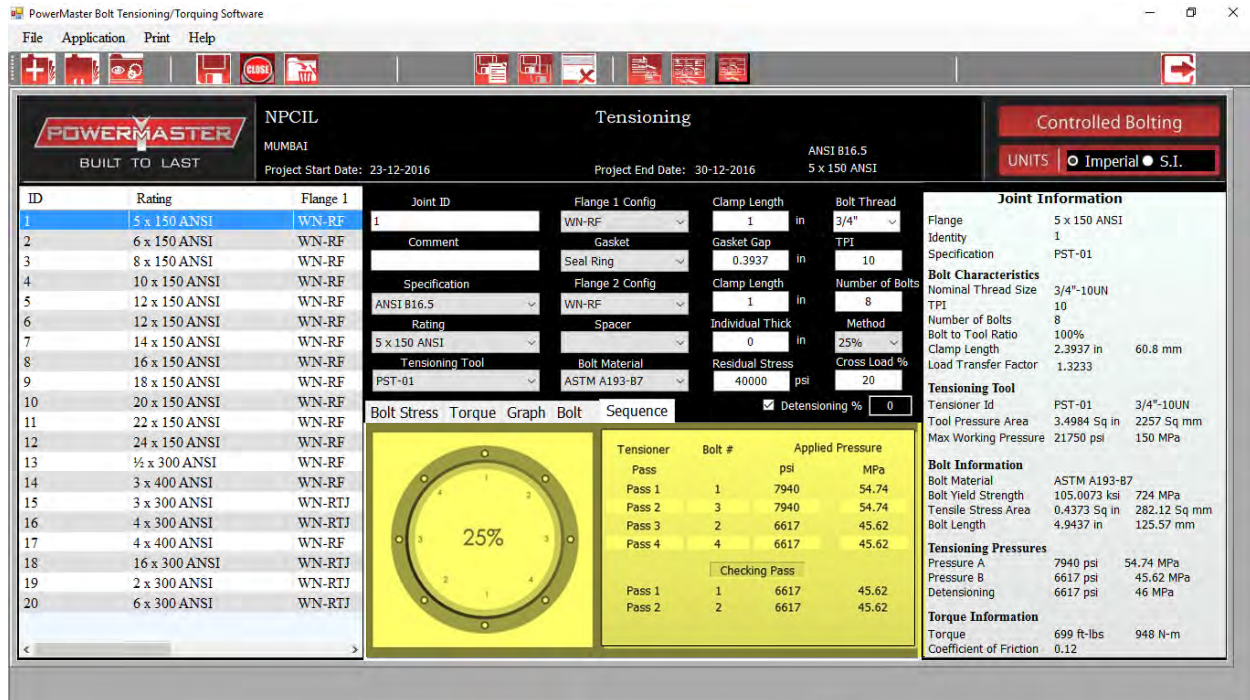
This area is where the current bolted joint information is with load application data is displayed.

The screenshot displays the PowerMaster Bolt Tensioning/Torquing Software interface, showing the Joint Information and Calculation Data section. The top menu bar includes File, Application, Print, and Help. The main window is divided into several sections:

- Header:** POWERMASTER BUILT TO LAST logo, Powerrmaster Engineers, Project Name: IOCL Shahpur Project, Project Start Date: 23-01-2017, Project End Date: 25-01-2017, Project ID: PM-ASDF-12345-2016-17, A-87956, ANSI B16.5, 8 x 150 ANSI.
- Controlled Bolting:** UNITS: Imperial (selected), S.I.
- Joint Information:** Flange: 8 x 150 ANSI, Identity: PM/IOCL/43-01, Specification: PST-01, Bolt Characteristics: Nominal Thread Size: 3/4"-10UN, TPI: 10, Number of Bolts: 8, Bolt to Tool Ratio: 100%, Clamp Length: 2.3937 in, Load Transfer Factor: 1.3233, Tensioning Tool: Tensioner Id: PST-01, Tool Pressure Area: 3.4984 Sq in, Max Working Pressure: 21750 psi, 150 MPa.
- Bolt Information:** Bolt Material: ASTM A193-B7, Bolt Yield Strength: 105,0073 ksi, 724 MPa, Tensile Stress Area: 0.4373 Sq in, Bolt Length: 4.9437 in, 125.57 mm.
- Tensioning Pressures:** Pressure A: 7443 psi, 51.32 MPa, Pressure B: 7443 psi, 51.32 MPa, Detensioning: 7443 psi, 51.32 MPa.
- Torque Information:** Torque: 699 ft-lbs, 948 N-m, Coefficient of Friction: 0.12.
- Joint ID List:** A table with columns ID, Rating, and Flange 1. The list includes applications like PM/IOCL/43-01, PM/IOCL/43-02, etc.
- Joint ID Details:** PM/IOCL/43-01, Flange 1 Config: WN-RF, Clamp Length: 1.189 in, Bolt Thread: 3/4", Gasket Gap: 0.3937 in, TPI: 10, Specification: ANSI B16.5, Flange 2 Config: WN-RF, Clamp Length: 1.189 in, Number of Bolts: 8, Rating: 8 x 150 ANSI, Individual Thick: 0 in, Method: 100%, Tensioning Tool: PST-01, Bolt Material: ASTM A193-B7, Residual Stress: 45000 psi, Cross Load: 20.
- Bolt Stress/Torque Graph Bolt Sequence:** Choose ☒ Tensile Stress ☐ Minor Diameter. Units: psi, MPa, Metric, kN, % Bolt. Data table for T1@A Pressure, T1@B Pressure, T2 Residual, T3 Residual, and Detensioning.



# Information Tab Bar



The information tab bar consists of 5 Tabs,

- Bolt Stress
- Torque
- Graph
- Bolt
- Sequence

## Bolt Stress Tab:

Bolt Stress   Torque   Graph   Bolt   Sequence					
Choose <input checked="" type="radio"/> Tensile Stress <input type="radio"/> Minor Diameter					
Units	Bolt Stress		Bolt Load		% Bolt
	psi	MPa	Metric	kN	%
T1@A Pressure					
T1@B Pressure	59548.1	410.57			56.71
T2 Residual	44999.4	310.26	12695.1	87.53	42.85
T3 Residual	44999.4	310.26	12695.1	87.53	42.85
Detensioning	59548.1	410.57	16799.7	115.83	56.71

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

## Torque Tab:

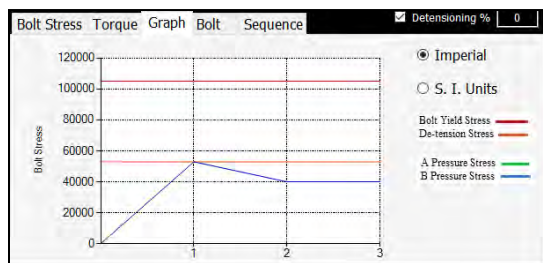
**Torque**

Coefficient of Friction  $\mu$  0.12

Torque Value 948 N-m  
699 ft-lbs

- 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.

## 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 orange line indicates the maximum detensioning stress.

## Bolt Details Tab:

**Bolt Information**

Bolt Material ASTM A193-B7

Nominal Bolt Diameter 3/4"

Number of Bolts 8

Bolt Yield Strength 105.0073 ksi 724 MPa

Tensile Stress Area 0.4373 Sq in 282.12 Sq mm

Bolt Length 4.9437 in 125.57 mm

- This tab displays the bolt detail

## Tightening Sequence Tab:

**TORQUE**

Tensioner Bolt # Applied Pressure

Pass 1 1 psi MPa

Pass 2

Pass 3

Pass 4

Checking Pass

Pass 1

Pass 2

Torque: 1051 N-m 775 ft-lbs

- This tab displays the recommended torque application sequence.
- Final Torque Value is displayed in Both ft lbs & Nm

# Manual Input Mode

Joint ID	Flange 1 Config	Clamp Length	Bolt Thread
NEW APPLICATION	WN-RF	1 in	3/4"
Comment	Gasket	Gasket Gap	T. P. I.
	Seal Ring	0.3937 in	10
Specification	Flange 2 Config	Clamp Length	Number of Bolts
ANSI B16.5	WN-RF	1 in	8
ANSI B16.5	Spacer	Individual Thick	Method
ANSI B16.47 Series A			100%
Manual Input	Bolt Material	Residual Stress	Cross Load %
API API 6A	ASTM A193-B7	40000 psi	20
NORSOK L-005			
NORSOK Vector SPO Compact			
Bolt Stress	Torque	Graph	Detensioning %
			0

- Manual Input mode can be chosen from the Specification menu.
- Manual input mode is used application having non standard joints.
- In this mode below values are to be entered manually :-
  - Flange 1 data
  - Flange 2 data
  - Bolt Size / thread
  - Number of bolts
  - Residual Stress


Joint ID	Flange 1 Config	Clamp Length	Bolt Thread
NEW APPLICATION	WN		1/2"
Comment	Gasket	Gasket Gap	T. P. I.
	Seal Ring	0 in	13
Specification	Flange 2 Config	Clamp Length	Number of Bolts
Manual Input	WN		
Rating	Spacer	Individual Thick	Method
Manual Input			TORQUE
Tensioning Tool	Bolt Material	Residual Stress	Cross Load %
	ASTM A193-B7		20
Bolt Stress	Torque	Graph	Detensioning %
			0

- All the 5 orange coloured fields in the application definition area are to be filled first before the joint inspector displays the result.
- It is recommended to select values in sequence .
- Once the thread is selected the software will suggest tensioning tools in the tensioning tool menu

Joint ID	Flange 1 Config	Clamp Length	Bolt Thread
NEW APPLICATION	WN		1"
Comment	Gasket	Gasket Gap	T. P. I.
	Seal Ring	0 in	8
Specification	Flange 2 Config	Clamp Length	Number of Bolts
Manual Input	WN		
Rating	Spacer	Individual Thick	Method
Manual Input			TORQUE
Tensioning Tool	Bolt Material	Residual Stress	Cross Load %
STS-01	ASTM A193-B7		20
STS-01			
Bolt Stress	Torque	Graph	Detensioning %
			0

- The Tensioning Tool menu will display the tools for the selected bolt thread size. The tools include the special tool created by the user along with the standard tool range.
- The special tool can be created by the user in the file menu/special tool library.

## Summary Report

To view summary report of project select on icon "  "

Summary Report

1 of 22

100%

Reference:A-87956

Powermaster Engineers

Start Date: 23 / 1 / 2017

Engineer : Anupam Tiwari

PM-ASDF-12345-2016-17


End Date: 25 / 1 / 2017

Summary Sheet

Units: S. I. Units

Bolted Joint Description	Flange Specification	Flange Type		Bolt Dia		Bolts	Bolt Material	Residual Target Bolt Stress	Tool	100% Tension One Pass only	50% Tension Pass 1 Pass 2		Pass 1	25% Tension Pass 2 Pass 3 Pass 4	Torque	Bolt Length	Spacer
5 x 150 ANSI	ANSI B16.5	WN-RF	WN-RF	3/4"	10	8	ASTM A193-B7	40000	PST-01	45.62			45.62		407	125.57	
18 x 300 ANSI	ANSI B16.5	WN-RTJ	WN-RTJ	1 1/4"	8	24	ASTM A193-B7	34000	PST-02	84.52			84.52		1304	259.17	
20 3/4 x 3000 - Type 6B	NORSOK L-005	WN	WN	2"	8	20	ASTM A193-B7	53311	PST-05	119.24			119.24		3160	413.33	
32 x 300 ANSI	ANSI B16.47 Series A	WN-RF	WN-RF	1 7/8"	8	28	ASTM A193-B7	45629	PST-05	48.07			48.07		1534	254.97	
12 x 400 ANSI	ANSI B16.5	WN-RF	WN-RF	1 1/4"	8	16	ASTM A193-B7	31000	PST-02	78.7			78.7		1189	241.97	
4 x 2500 ANSI	ANSI B16.5	WN-RF	WN-RF	2 3/4"	8	12	ASTM A193-B7	50699	PST-08	120.3			120.3		4066	610.07	
22 x 900 ANSI	ANSI B16.5	WN-RF	WN-RF	2"	8	20	ASTM A193-B7	50699	PST-05	113.4			113.4		3005	400.72	

## Application List

To view all application details in the project select on icon "  "

Application List

1 of 2 ?

100%

Reference : A-87956

Powermaster Engineers

Start Date: 23 / 1 / 2017

Engineer : Anupam Tiwari


PM-ASDF-12345-2016-17


End Date: 25 / 1 / 2017

Application List

Joint Id	Specification	Flange Rating	Flange1	Flange2	Clamp Length	Bolts	Bolt Thread	Model Number
PM/IOCL/43-01	ANSI B16.5	5 x 150 ANSI	WN-RF	WN-RF	60.8	8	3/4"	PST-01
PM/IOCL/43-02	ANSI B16.5	18 x 300 ANSI	WN-RTJ	WN-RTJ	154.4	24	1 1/4"	PST-02
PM/IOCL/43-03	NORSOK L-005	20 3/4 x 3000 - Type 6B	WN	WN	251.4	20	2"	PST-05
PM/IOCL/43-04	ANSI B16.47 Series A	32 x 300 ANSI	WN-RF	WN-RF	150.2	28	1 7/8"	PST-05
PM/IOCL/43-05	ANSI B16.5	12 x 400 ANSI	WN-RF	WN-RF	137.2	16	1 1/4"	PST-02
PM/IOCL/43-06	ANSI B16.5	4 x 2500 ANSI	WN-RF	WN-RF	391	12	2 3/4"	PST-08
PM/IOCL/43-07	ANSI B16.5	22 x 900 ANSI	WN-RF	WN-RF	238.8	20	2"	PST-05

## Individual Application Report

To view individual application report click on icon"  "

<b>Client</b> Trilok Fabrication & Engr <b>Project</b> HPCL Mumbai <b>Project Reference</b> <b>Engineer</b> Anupam Tiwari		 <b>BUILT TO LAST</b> <a href="http://www.powermaster.in">www.powermaster.in</a>																																	
<b>Bolt Tensioning</b>		<b>Project Start Date:</b> 3 / 11 / 2016 <b>Project End Date:</b> 15 / 12 / 2016																																	
<b>Flange</b> 44 x 150 ANSI <b>Specification</b> ANSI B16.47 Series A <b>Identity</b> 100		<table border="1"> <thead> <tr> <th>Tensioner</th> <th>Bolt</th> <th colspan="2">Applied Pressure</th> </tr> <tr> <th>Pass</th> <th>#</th> <th>psi</th> <th>MPa</th> </tr> </thead> <tbody> <tr> <td>Pass 1</td> <td>1</td> <td>15125</td> <td>104.28</td> </tr> <tr> <td>Pass 2</td> <td>3</td> <td>15125</td> <td>104.28</td> </tr> <tr> <td>Pass 3</td> <td>2</td> <td>12604</td> <td>86.9</td> </tr> <tr> <td>Pass 4</td> <td>4</td> <td>12604</td> <td>86.9</td> </tr> </tbody> </table>		Tensioner	Bolt	Applied Pressure		Pass	#	psi	MPa	Pass 1	1	15125	104.28	Pass 2	3	15125	104.28	Pass 3	2	12604	86.9	Pass 4	4	12604	86.9								
Tensioner	Bolt	Applied Pressure																																	
Pass	#	psi	MPa																																
Pass 1	1	15125	104.28																																
Pass 2	3	15125	104.28																																
Pass 3	2	12604	86.9																																
Pass 4	4	12604	86.9																																
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<b>ADDITIONAL INFORMATION</b> <b>Bolt Yield Strength</b> 105 ksi 724 MPa <b>Tensile Stress Area</b> 1.7571 Sq in 1133.62 Sq. mm <b>Bolt Length</b> 13.465 in 342.01 mm																																			
<b>Tensioning Tool</b>		<b>Torque</b>																																	
<b>Proposed Tensioning Tool</b> PST-03 <b>Tool Pressure Area</b> 6.6015 Sq in 4259 Sq. mm		<b>Torque</b> 930 lb-ft 1261 N-m <b>Coefficient of Friction <math>\mu</math></b> 0.12																																	
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T1 @ A Pressure	56823 391.78	64416	444.13																																
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