

# **Atlas Copco Bolting Solutions**

#### **Instruction Manual BTS - Bolt Tightening Software**

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### **Tentec**

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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/ln2)

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/ln2).

## DO NOT USE THE RECOMMENDED ANSI B16.5 BOLT STRESS VALUES FOR FLANGES MANUFACTURED WITH MATERIAL YIELD STRENGTH LESS THAN 247N/mm2 (35840lbs/ln2)

#### 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.

#### 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.



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Atlas Copco	र्ट्रे Project	+ Add	X Delete	Q Search Jo	vint ID												mm	In /	Apply
oi na	mange mating	<b>L</b>	coning 2	BOX DIA	1001	BOIL Material	Pressure A	Fressure b	rorque	Coeff	Save	Save New	Save PDF	Viev	v Datash	ieets	Unit	S Delli Three d	
AH-0001 FLAN	MANUAL INPUT									0.	Joint ID			Flange 1	Config	Clamp Leng	itn -	Doit Thread	
LAH-0002 FLAN	MANUAL INPUT	WN	WN	1.7/8"-8UN	HTT.13281.000A	ASTM A320 - L7		15925psi	3009ft.lbs	0.1	DLAH-0001	FLANGE TO	FLANGE JOINT	WN	-	109	mm	1.1/2	-
LAH-0005 FLAN	MANUAL INPUT	WN	Blind Thread	1.1/2"-8UN	HTT.13280.000A	ASTM A320 - L7		17007psi	1496ft.lbs	0.12	Comments			Gasket		Gasket Gap	0	Tpi/Pitch	
LAH-0006 FLAN	MANUAL INPUT	WN	Blind Thread	1.7/8"-8UN	HTT.13281.000A	ASTM A320 - L7		17252psi	3009ft.lbs	0.12	FLANGE TO	FLANGE JO	INT NTB55 PN3	RTJ	-	67	mm	8	
LAH-0010 FLAN	MANUAL INPUT	WN	WN	1.1/8"-8UN	HTT. 13279.000A	ASTM A320 - L7		17471psi	679ft.lbs	0.12	0.10.11			Electro D	0	01		Do Topo	ion.
LAH-0012 FLAN	MANUAL INPUT	WN	Blind Thread	1.1/8"-8UN	HTT.13279.000A	ASTM A320 - L7		18658psi	679ft.lbs	0.12	Specification	n		Flange 2	Loning	Clamp Leng	m	Vo Bolto B	
LAH-0013 FLAN	MANUAL INPUT	WN	Blind Thread	1.3/8"-8UN	HTT.13742.000	ASTM A540 -B21.	19650psi	17087psi	1885ft.lbs	0.12	Manual Inpu	л	•	WN	-	109	mm	NO DOILS L	0001001
LAH-0014 FLAN	MANUAL INPUT	WN	Blind Thread	1.1/2"-8UN	HTT.13280.000A	ASTM A320 - L7		17007psi	1496ft.lbs	0.12	Rating			Spacer		Invd Thick		8	00%
LAH-0018 FLAN	MANUAL INPUT	WN	WN	1.3/4"-8UN	HTT. 13282.000A	ASTM A320 - L7		20163psi	2761ft.lbs	0.12	Manual Inpu	ıt	-		-		mm	Detensionin	g %
LAH-0019 FLAN	MANUAL INPUT	WN	Blind Thread	1.3/4"-8UN	HTT.13282.000A	ASTM A320 - L7		21705psi	2761ft.lbs	0.12	Bolt material							0	
TB55 PN3550 EBV	MANUAL INPUT	WN	Blind Thread	1.7/8"-8UN	HTT.13281.000A	ASTM A320 - L7		15030psi	2633ft.lbs	0.12	ASTM A320							Cross Load	ing %
ITB75 PN3550 LDV	MANUAL INPUT	WN	Blind Thread	1.7/8"-8UN	HTT.13281.000A	ASTM A320 - L7		15030psi	2633ft.lbs	0.12				Residu	al Bolt St	ress A		15	
11B75 PN3550 EBV	MANUAL INPUT	WIN	Bind Inread	1.7/8 -8UN	H11.13281.000A	ASTM A320 - L7		17252psi	3009ft.lbs	0.1.	I igntening I	ool ident			50602	lb/ln <sup>2</sup>			
											C1S1-02		-						
											Polt Stre	nee Tr	rauo	Granh	C	lolt	Socia	onco	
											Doit Out		ique	urapri			ocqu	CHOC	
											Pump I	Pressure	Bolt S	tress	B	olt Load		% Bolt	Yield
													Buda 2	M/mm2	Terre	LA			
													US/III2	WIIIII2	TONS	N.		70	
											@ A D	rocouro							
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File Help															
Atlas Cope	දිරි Project	<b>∔</b> Add	X Delete	Searc Q	ch Joint ID	Save :	Save New	PDF Save PDF	View	Datasheets	Units	In Apply	TENTEC BOI SOLUTIONS	LT TIGHTEN	ling
Joint Id 70 - 500 FF 70 - 500 FF 70 - 1600 FF 70 - 1600 FF 62 - 3000 FF 62 - 3000 FF 120 - 500 FF 120 - 500 FF 150 - 500 FF 150 - 500 FF 120 - 1600 FF 120 - 1600 FF 120 - 1600 FF	MANUAL INPU MANUAL INPU		VIN         VIN         BL           VVN         BL         N           WIN         BL         N           WIN         WIN         WIN           WIN         WIN         WIN           WIN         WIN         WIN           WIN         BL         N           WIN         WIN         WIN           WIN         WIN         WIN           WIN         WIN         WIN	427x 3 427x 3 427x 3 427x 3 433x 3.5 433x 3.5 433x 3.5 439x 4 439x 4 439x 4 439x 4 439x 4 439x 4 445x 4.5 445x 4.5 448x 5 448x 5	Toto         Bok           HTT1778.000         ASTM           HTT1778.000         ASTM           HTT1774.000         ASTM           HTT1777.000         ASTM           HTT1772.000         ASTM           HTT1772.000         ASTM           HTT1772.000         ASTM           HTT1772.000         ASTM	Joint ID           A11           70 - 500           A12           70 - 500           A13           70 - 500           A14           70 - 500           A15           70 - 500           A12           70 - 500           A13           70 - 500	FF s s tion Pressure I v I 193 - B7 g Tool Ident 78.000	Rating - - -	Flange 1 WN Gasket RTJ Flange 2 WN Spacer Re	Config (	Clamp Length IS-5 mm Sasket Gap 0 mm Clamp Length IS-5 mm Nvd Thick mm tress A Ib/In <sup>2</sup> Torque	Bot Thread M27 • Tp/Ptch 3 No Bots Bot/Tool 6 100% • 7 De-Tension 9 Octave 0 Octave Cross Loading % 20	Joint Inspector Flange MANU, Ident 70 - 5 Specification Manu Bolt Characteristics Num Bolts Bolt to Tool Ratio Clamp Length Residual Bolt Stress Load Transfer Factor Bolt Information Bolt Material	IAL INPUT 00 FF al Input 8 M27× 3 3 6 100% 4.370 in 26623 r 1.2532 ASTM A193 - B7	111.00 mm
150 - 1600 FF 150 - 1600 FB 200 - 500 FF	MANUAL INPU MANUAL INPU MANUAL INPU	T T T	WN WN M WN BL M WN WN M	456x 5.5 456x 5.5 456x 5.5	HTT.11771.000 ASTM HTT.11771.000 ASTM HTT.11775.000 ASTM	A19 A19 A19 Bolt S	tress	Torque	Graph	Bo	olt Sec	quence	Bolt Yield Strength Stress Area Min Bolt Length	105152lb/ln² 0.712ln² 5.79ln	725N/mm² 459.41mm² 147.0mm
200 - 500 FB	MANUAL INPU	Т	WN 81 N	456x 5.5	HTT.11775.000 ASTM	Pum	p Pressure	Bolt Bolt	Stress N/mm2	B	olt Load kN	% Bolt Yield %	Tensioning Tool Tensioner Ident Tool Pressure Area	HTT.11778.000 3.651ln <sup>2</sup>	M27× 3 2355.48mm <sup>2</sup>
						@ A	Veressure						Tensioning Pressu	10152.66	700
						@ B	Pressure	43521	300.07	13.84	137.85	41.4	Pressure B Detensioning	8488psi 8488psi	585bar 585bar
						Det	ensioning	43521	239.44 300.07	11.04	110.00	41.4	Torque	345.37 Ft.Lbs	468.26 Nm
						Minor E (BS15) Torque calo b	Dia Area 80 / BS3643) based on EN 1591-	Minor Dia Are (ASME PCC-1 1, ISO 27509, and VDI 22	a o Tensii )) ● (BS15 300	e Stress Are 80 / BS3643	a o Tensile St 3) O (ASME PC	ress Area CC-1)	Stresses based on B	loit Tensile Stress A	Area (BS1580 / BS3643)

#### **Application Tool Bar**

This area is the main control tool bar.





mm

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.

File Help													
Atlas Cope	र्र्ट्रे Project	+ Add	X Delete	Q Search Joi	X Int ID	)						m In Apply	TENTEC BOLT TIGHTENING SOLUTIONS
Joint Id	Flange Rating	2	C C B	olt Dia	Tool	Bolt Material						Pell Thread	
DLAH-0001 FLAN						ASTM A320	/ Joint ID		Flange 1	Config C	amp Length	1 1/2" -	- nt inspector
DLAH-0002 FLAN	. MANUAL INPU	T .	WN WN 1.	.7/8"-8UN	HTT.13281.0.	ASTM A320	DLAH-0001 FLANGE	TO FLANGE JOINT	WN	- 1	09 п	1m	Flatte Manual Input
DLAH-0005 FLAN	. MANUAL INPU	Т	WN Bl 1.	1/2"-8UN	HTT.13280.0.	ASTM A320	7 Comments		Gasket	0	lasket Gap	TpVPitch	Iden DLAH-0001 FLANGE TO FLANGE
DLAH-0005 FLAN.	MANUAL INPU		WN 5 1.	1/0" OUN	HTT. 13281.0.	ASIM A320	FLANGE TO FLANG	E JOINT NTB55 PN3	RTJ	- 1	57 π	nm 8	Spe fication Manual Input
DLAH-0012 FLAN	MANUAL INPO	T	WM RI 1	1/8"-8UN	HTT 13279.0	ASTM A320	Specification		Flange 2	Config C	lamp Length	De-Tension	Bol Characteristics
DLAH-0013 FLAN.	MANUAL INPU	г	WN Bl 1	3/8"-8UN	HTT, 13742.00	0 ASTM A540	Manual Input	•	WN	- 1	m 60	No Bolts Bolt/Tool	No Thread Size 1.1/2"-BUN
DLAH-0014 FLAN	MANUAL INPU	T .	WN Bl 1.	1/2"-8UN	HTT.13280.0.	. ASTM A320	7 Rating		Spacer	k	vd Thick	8 100% -	TP 8
DLAH-0018 FLAN	. MANUAL INPU	Т	WN WN 1.	.3/4"-8UN	HTT.13282.0.	ASTM A320 L	7 Manual Input			-	п	Detensioning %	Nu Bolts 8
DLAH-0019 FLAN	. MANUAL INPU	T	WN Bl 1.	.3/4"-8UN	HTT.13282.0.	ASTM A320	7 Bolt material					0	Bo Tool Ratio 100%
NTB55 PN3550 EBV	MANUAL INPU	Т	WN Bl 1.	.7/8"-8UN	HTT. 13281.0.	ASTM A320	ASTM A320 - L7					Cross Loading %	Clean Length 11.220 In 285.00 mm
NTB75 PN3550 LDV	MANUAL INPU	-	WIN BL 1.	7/8 -8UN	HTT 12281.0.	ASTM AS20	Tightoning Tool Ideat		Resid	ual Bolt Stre	SS A	15	Lo Transfer Factor 1.1500
1410/3 2143330 204	MANUAL INFO		VIII D 1.	.7/0 -00/1	1111.15281.0.	ASTIMAS20	CTST 02			50602	lb/ln <sup>2</sup>		Traisioning Tool
							0151-02						rensioner Ident HTT.13280.000A 1.1/2"-8UN
													Tool Pressure Area 4.578ln <sup>2</sup> 2953.68mm <sup>2</sup>
							Bolt Stress	Torque	Graph	Bo	lt Si	equence	Max Working Pressure 21750 1500
							Pump Pressur	e Bolt S	tress	Bo	lt Load	% Bolt Yield	Bolt Information Bolt Material ASTM A320 - L7 Bolt Vield Strength 105152/b/ln <sup>2</sup> 725N/mm <sup>2</sup>
								lbs/in2	N/mm2	Tons	kN	96	Strees Area 1 502/n2 000 702
							Carthold						Pail Leads 40 00 40 2mm
							@ A Pressure						Doir Lengar 10.05in 400.0mm
													Tensioning Pressures
							@ B Pressure	58192	401.22	39.01	388.70	55.3	Pressure A
													Pressure B 1908/psi 1316bar
							Retained Loar	50602	348.89	33.92	338.00	48.1	Detensioning 1908/psi 1316bar
													Torque Information
							Detensioning	59102	401 22	39.01	288 70	55.3	Coefficient of Eriction used 0.12
							Dotonoroning	30132	401.22	33.01	500.70	55.5	
							•	Minor Dia Area (BS1580 / BS36	Minor Dia A (ASME PCC	rea o Ter (-1) o (BS	sle Stress Ar 1580 / BS364	ea • Tensile Stress Area 3) • (ASME PCC-1)	Stresses based on Bolt Tensile Stress Area (BS1580 / BS3643)
< .						>							

**Joint Inspector** This area is where the current bolted joint application is displayed.

Intrast Copic         Project         Add         Disk         Call         Disk																		
Joint Id         Flarge Raing         C.         C.         Both         Both         Both         Both         Prace         Prace <th< th=""><th>Atlas Cop</th><th><b>دہ</b> کی Project</th><th>+ Add</th><th>X Delete</th><th>Q Search Jo</th><th>X Int ID</th><th>)</th><th>Save S</th><th>Ave New</th><th>PDF Save PDF</th><th>View</th><th>Datashe</th><th>ets 0</th><th>nm</th><th>In Apply</th><th>TE SC</th><th>NTEC BOL DLUTIONS</th><th>T TIGHTENING</th></th<>	Atlas Cop	<b>دہ</b> کی Project	+ Add	X Delete	Q Search Jo	X Int ID	)	Save S	Ave New	PDF Save PDF	View	Datashe	ets 0	nm	In Apply	TE SC	NTEC BOL DLUTIONS	T TIGHTENING
Curecool 12-Min. MARULE (Part)         VMI. VMI. 12/2-EUK         HT125200.01, SSIM XX0.12 5 AMRU. 12/2         VMI. VMI. 10/2         Manual Input           Curecool 12-Min. MARULE (Part)         VMI. VMI. 11/2/2-RMI. HT112520.01, SSIM XX0.12 5 AMRU. 12/2         VMI. VMI. 10/2         File         Sect.         Gasket         Gasket         Gasket         Gasket         Gasket         Sect.         Curecool 12-Min. Marule (Part)         Manual Input         Manual Input         File         Sect.         Curecool 12-Min. Marule (Part)         Manual Input         File         Sect.         Sect. <td>Joint Id</td> <td>Flange Rating</td> <td></td> <td>C C</td> <td>Bolt Dia</td> <td>Tool</td> <td>Bolt Material</td> <td>in the second se</td> <td></td> <td></td> <td>Elange 1 (</td> <td>Config C</td> <td>lamp Length</td> <td></td> <td>Bolt Thread</td> <td>lo aspector</td> <td></td> <td></td>	Joint Id	Flange Rating		C C	Bolt Dia	Tool	Bolt Material	in the second se			Elange 1 (	Config C	lamp Length		Bolt Thread	lo aspector		
Bart Note Rate:         Source Rat	DLAH-0001 FLA	N MANUAL INPUT	1	WN WN	1.1/2"-8UN	HTT, 13280.0.	ASTM A320 - L7	Joint ID	LANCE TO F	ANGE ION	ww	_ 1	no		1.1/2" •	лос Малиа	Input	
DATA         Manual Partir         Manual Partir <td>DLAH-0002 FLA</td> <td>N MANUAL INPUT</td> <td>-</td> <td>WN B</td> <td>1.1/2"-8LIN</td> <td>HTT 13281.0.</td> <td>ASTM A320 - 1.7</td> <td>Commente</td> <td></td> <td></td> <td>Gasket</td> <td>6</td> <td>lasket Gan</td> <td>mm</td> <td>ToVPitch</td> <td>dent DLAH-</td> <td>0001 FLANGE TO</td> <td>FLANGE</td>	DLAH-0002 FLA	N MANUAL INPUT	-	WN B	1.1/2"-8LIN	HTT 13281.0.	ASTM A320 - 1.7	Commente			Gasket	6	lasket Gan	mm	ToVPitch	dent DLAH-	0001 FLANGE TO	FLANGE
DL4+0017 RAM MANULL IPUT         VM         VM         L10 <sup>+</sup> 3/40         Fill 32270 ASTM 3230-17         Sectoration         Flange 2 Config         Cump Length         Ø De-Tension         Solt Characteristics           DL4+0017 RAM MANULL IPUT         VM         H         1.12 <sup>+</sup> 3/4         HTT 132270 ASTM 3230-17         Sectoration         Flange 2 Config         Cump Length         Ø De-Tension         Nom More 3	DLAH-0005 FLA	N MANUAL INPUT	8	WN BL	1.7/8"-8UN	HTT. 13281.0.	ASTM A320 - L7	ELANGE TO E	LANGE JOB	T NTB55 PN3	RTI	-	57		8	Specification Manua	Input	
DAH+0012FAM, MANUL IPUT         VM B.         L18*6/R         HTI_13220,045TM A320-17         Pathyle Cutific         Camp Length         Cut of De-Inition         Nom Thread Size         1.12*8UN           DAH+0012FAM, MANUL IPUT         VM B.         L10*8/R         HTI_13220,045TM A320-17         Pathyle         Limon Input         VM         Image Space	DLAH-0010 FLA	N MANUAL INPUT	r	WN WN	1.1/8"-8UN	HTT.13279.0.	ASTM A320 - L7				Electron D.C		la sua di sua atta	mm	Do Tonnion	Bolt Characteristics		
DL4H-0015FA.M.: MAAULE PEVIT WH BL.: 13/8'-SI.M. HTT.: 1374.2000 ASTM A320 - 12 MARCOSTFA.M.: MAAULE PEVIT WH BL.: 13/8'-SI.M. HTT.: 1328.2.0ASTM A320 - 17 DL4H-0015FA.M.: MAAULE PEVIT WH BL.: 13/8'-SI.M. HTT.: 1328.2.0ASTM A320 - 17 Manual Pevit Manual Pevit HTTS: 591.5550 EBV MAAULE PEVIT WH BL.: 13/8'-SI.M. HTT.: 1328.2.0ASTM A320 - 17 HTTS: 591.5550 EBV MAAULE PEVIT WH BL.: 13/8'-SI.M. HTT.: 1328.2.0ASTM A320 - 17 HTTS: 591.5550 EBV MAAULE PEVIT WH BL.: 13/8'-SI.M. HTT.: 1328.2.0ASTM A320 - 17 HTTS: 591.5550 EBV MAAULE PEVIT WH BL.: 13/8'-SI.M. HTT.: 1328.2.0ASTM A320 - 17 HTTS: 591.5550 EBV MAAULE PEVIT WH BL.: 13/8'-SI.M. HTT.: 1328.1.0ASTM A320 - 17 HTTS: 591.5550 EBV MAAULE PEVIT WH BL.: 13/8'-SI.M. HTT.: 1328.1.0ASTM A320 - 17 HTTS: 591.5550 EBV MAAULE PEVIT WH BL.: 13/8'-SI.M. HTT.: 1328.1.0ASTM A320 - 17 HTTS: 591.5550 EBV MAAULE PEVIT WH BL.: 13/8'-SI.M. HTT.: 1328.1.0ASTM A320 - 17 Tightengr Tool lent 15 15 15 15 15 15 15 15 15 15	DLAH-0012 FLA	N MANUAL INPUT	19 A.	WN BL	1.1/8"-8UN	HTT. 13279.0.	ASTM A320 - L7	Specification			Flange 2 C	config C	tamp Length		No Bolte Bolt/Tool	Nom Thread Size	1.1/2"-8UN	
Addression (1974/m)         Maxuel	DLAH-0013 FLA	N MANUAL INPUT	r	WN BI	1.3/8"-8UN	HTT. 13742.00	0 ASTM A540 -B2	manoarmpor		•	TTN	- L	09	mm	8 100%	TPI	8	
Construction         Construction<	DLAH-0014 FLA	MANUAL INPUT	r.	WIN BL	1.1/2 -8UN 1.2/4"-9UN	HTT 12282.0	ASTM A320 - L7	Rating			Spacer	lr III	ivd Thick		Determination 9/	Num Bolts		
NTB55 PNI3550 EBV     MANUAL INPUT     VIN BL 17/8*8/N     HTT.1228 LO ASTM A320 - L7 <ul> <li>ASTM A320 - L7</li> <li>ASTM A320 - L7</li> <li>Cross Loading %</li> <li>Cross Loading %</li> <li>Comp Length</li> <li>Comp Length</li> <li>11220 in</li> <li>285 00 mm</li> <li>Cross Loading %</li> <li>Lead Transfer Factor</li> <li>1.500</li> <li>Tothering Tool Ment</li> <li>Cross Loading %</li> <li>Cross Loading %&lt;</li></ul>	DLAH-0019 FLA	N MANUAL INPUT	2	WN BL.	1.3/4"-8UN	HTT, 13282.0.	ASTM A320 - L7	Manual Input		-		-		mm	Detensioning %	Bolt to Tool Ratio	100%	
HITE/TS PRICESSOLD/F         MANUAL IPPLIT         VM B         1.78 <sup>+</sup> -8.M         HTT. 1328.1.0.         ASTM A320 - 17         Y         Residual Bot Stress         15         Load Transfer Factor         1.3000           NTB/TS PRICESSOLED/F         VANUAL IPPLIT         VAN         B         1.78 <sup>+</sup> -8.M         HTT. 1328.1.0	NTB55 PN3550 P	BV MANUAL INPUT	r	WN BI	1.7/8"-8UN	HTT.13281.0.	ASTM A320 - L7	Bolt material							Carac L and in a N	Clamp Length	11 220 In	285.00 mm
NT5757N3550 EBV MANUAL INPUT WN B 1/18 <sup>1</sup> -SLN HTT.13281.0 ASTM A320 -17 Tighteming Tool lent	NTB75 PN3550 I	DV MANUAL INPUT	8	WN BL	1.7/8"-8UN	HTT.13281.0.	ASTM A320 - L7	ASTM A320 -	L7	•	Residu	al Bolt Stre	55		Loss Loading %	Load Transfer Factor	1 1500	
CTST-02	NTB75 PN3550 8	BV MANUAL INPUT	r -	WN BI	1.7/8"-8UN	HTT. 13281.0.	ASTM A320 - L7	Tightening Too	Ident			50602	lb/lo <sup>2</sup>		13			
								CTST-02		-						Tensioning Tool		
Tensioner bent HTTT3280.000A 1.1/2-80N																Tensioner ident HT	1.13280.000A	1.1/2"-80N
Rolt Stress Torrule Graph Bolt Sequence Hardware Area 4.5780m 2953.58000								Bolt Stres	Tor	ane	Granh	Bo	H 9	Senu	ience	Max Working Brossure	4.578In*	2953.68mm <sup>4</sup>
Existence index arthur sorr conducto maximizities 51/20 1200								Durcuru		quo	araph	00		ooqu	101100	max working Pressure	21/50	1500
Duran December Dall Streng Dell Lond 2/ Dell Vold ASTI 0320-17										Doll CI			01004		N 0-11 10-14	Bolt Information	TM A320 17	
Pump Pressure Doit Otess Doit Ludu 76 Boilt Trein Doit and an Autor and Autor an								Pump Pri	essure	DUIL OI	less	DU	it Luau		% BOIL YIEID	Bolt Vield Strength	105152lb/ln2	725N/mm <sup>2</sup>
bein/2 N/mm2 Tons KN % Street Area 1 600a 700a 700a 700a 700a 700a 700a 700a										bs/h2	N/mm2	Tons	kN		96	Strace Area	1 602/08	000 70
Bablandh 1900/1911																Bolt Length	16.090	408.8mm
@ A Pressure								@ A Pre	ssure							Concerningen	10.0511	400.000
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@ B Pressure 58192 401.22 39.01 388.70 55.3 Pressure A 19037api 1316Par								@ B Pre	essure	58192	401.22	39.01	388.70		55.3	Pressure A	19087nei	1316har
Pressure D instorpain 1010ar																Pressure b	19097psi	1316bar
Retained Load 50602 348.89 33.92 338.00 48.1 Convertigence								Retained	d Load	50602	348.89	33.92	338.00		48.1	Forque Information	radorpar	13 TODAT
Torque 1496ft.lbs 2029N.m																Torque	1496ft.lbs	2029N.m
Detensioning 58192 401.22 39.01 388.70 55.3 Coefficient of Friction used 0.12								Detensi	oning	58192	401.22	39.01	388.70		55.3	Coefficient of Friction	used 0.12	
Planara have an Bak Tanak Chara Anna (BC) 1929/3																Channess based on D.	Tanala Chases	Ame (BC4500 (BC2642)
Minor Dia Area Minor Dia Area Tensle Stress Area Tensle Stress Area									<ul> <li>Minor</li> </ul>	Dia Area	Minor Dia Ar	ea 💿 Ten	sile Stress A		o Tensile Stress Area	Siresses based on bi	AL TENSIE SUESS	Alea (0313007 033043)
(BS15807/BS36 (ASME PCC-1) (BS15807/BS3643) (ASME PCC-1)											(ASME PCC-				(ASME PCC-1)			
	<						>											

File Help																	
Atlas Copco	+ Add	X Delete	Q Search J	X bint ID								mm	In Apply		TENT SOLU	TEC BOL JTIONS	t tightening
Joint Id Flange Ra	ing	C C	Bolt Dia	Tool Bolt Ma	aterial	Curro C		Guild I Di	Elanas 1	Config	Clamp Land	b.	Bolt Thread	Intel Incode			
DLAH-0001 FLAN MANUAL IN	PUT		1.1/2"-8UN	HTT, 13280.0 ASTM A	1320 - L7 JC	Dint D	ANCE TO B	ANCE LONG	mange i	Comig	100		1.1/2" -	Fiance	Manual Inn	ert	
DLAH-0002 FLAN MANUAL II	PUT	WN WN	1.7/8-8UN	HTT. 13281.0 ASTM A	A320 - L7 U	LAN-000TFC	ANGE TO I	LANGE JOIN	Canket		Contrat Con	mm	To/Ditch	klent	DI AH-000	1 FLANGE TO	FLANGE
DLAH-0005 FLAN MANUAL II	PUT	WN BL	1.7/8"-8UN	HTT 13281.0 ASTM A	320 -17	ANCE TO E	ANCE IOR	T NTREE DN2	DTI		Gaskel Gap		8	Specification	Manual Inn	at	
DLAH-0010 FLAN MANUAL IN	PUT	WN WN	1.1/8"-8UN	HTT. 13279.0 ASTM A	A320 - L7	DANGE TO T	DANGE JOI	IT NTD 35 PNS	Ris	•	07	mm		Polt Character	inting		
DLAH-0012 FLAN MANUAL IN	PUT	WN BL	. 1.1/8"-8UN	HTT. 13279.0 ASTM A	4320 - L7 S	pecification			Flange 2	Config	Clamp Lengt	h	Ue-Tension	Nom Thread Si	151105	1 1 225 21101	
DLAH-0013 FLAN MANUAL IN	PUT	WN BI	. 1.3/8"-8UN	HTT.13742.000 ASTM A	A540 -B2	lanual Input		•	WN	-	109	mm	NO BOILS BOILTOOT	TO		1.112 -0014	
DLAH-0014 FLAN MANUAL IN	PUT	WN BL	. 1.1/2"-8UN	HTT. 13280.0 ASTM A	A320 - L7 R	ating			Spacer		Invd Thick		0 100%	Num Bolte		0	
DLAH-0019 FLAN MANUAL IN	PUT	WN NN	1.3/4 -8UN	HTT 13282.0 ASTM A	1320 -L7 N	lanual Input		-		-		mm	Detensioning %	Bolt to Tool Pat	in	5	
NTB55 PN3550 EBV MANUAL IN	PUT	WN Bl	. 1.7/8"-8UN	HTT. 13281.0 ASTM A	4320 - L7 B	olt material								Clamp Length	~	11 220 lp	285.00 mm
NTB75 PN3550 LDV MANUAL IN	PUT	WN BL	. 1.7/8"-8UN	HTT. 13281.0 ASTM A	A320 - L7	STM A320 -	.7	•	Reside	ual Bolt S	tress		Cross Loading %	Load Transfer	Factor	1 1500	200.00 mm
NTB75 PN3550 EBV MANUAL IN	PUT	WN BI	. 1.7/8"-8UN	HTT. 13281.0 ASTM A	4320 - L7 Ti	ghtening Too	Ident			50602	lb/lo <sup>2</sup>		13			1.1000	
					C	TST-02		-			ion in			Tensioning Te	lool		
														Tensioner Iden	t HTT.13	280.000A	1.1/2"-8UN
						oft Stress	Tor	nue	Granh		Bolt	Sem	ience	Max Working P	Area	4.578ln*	2953.68mm*
						Solic Ourood	101	quo	arapii		Jon	ooqu	101100	max working P	Cooure	21/50	1500
						n		Dalt Ch			Toll Lood		N 0-11 10-14	olt Informati	ASTM	A320 17	
						Pump Pre	ssure	DUIL OL	1622		SUIL LUAU		% BOIL YIEID	of Vield Street	oth 10	)5152lb/ln²	725N/mm <sup>2</sup>
								bs/h2	N/mm2	Tons	kN kN		%	tress Area	igui	1 502102	069 70mm8
						~								olt Length		16.09in	408.8mm
						@ A Pre	ssure							on conget			
														ressure A	essures		
						@ B Pre	ssure	58192	401.22	39.0	1 388.7	0	55.3	ressure A		19087nei	1316har
														etensioning		19087psi	1316bar
						Retained	Load	50602	348.89	33.9	2 338.0	0	48.1	braue Inform	nation	10001001	Torobal
														orque		1496ft.lbs	2029N.m
						Detensio	oning	58192	401.22	39.0	1 388.7	0	55.3	oefficient of f	riction use	d 0.12	
														Stresses base	d on Bolt Te	ensile Stress	Area (R\$1580 / R\$3643)
							O Minor	Dia Area	Minor Dia A		ensile Stress	Area	Tensile Stress Area		o on Sole II	0110110 0010000	
1.2																	

#### **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

File Help										
Atlas Co co	Delete Search Jo	X ID		PDF		•		nm	In Apply	TENTEC BOLT TIGHTENING SOLUTIONS
Joint Id Flange Bating	C C Bolt Dia	Tool Bolt Material	Save Save New	Save PDF	View	/ Datashee	its	Units		
DLAH-0001 FLAN	WN WN 1.1/2"-8UN	HTT. 13280.0 ASTM A320 - L7	Joint ID		Flange 1 C	Config Cl	amp Length	B	Bolt Thread	
DLAH-0002 FLAN MANUAL INPUT	WN WN 1.7/8"-8UN	HTT. 13281.0 ASTM A320 - L7	DLAH-0001 FLANGE TO	FLANGE JOINT	WN	+ 10	9	mm	1.1/2" -	Flange Manual Input
DLAH-0005 FLAN MANUAL INPUT	WN Bl 1.1/2"-8UN	HTT.13280.0 ASTM A320 - L7	Comments		Gasket	Ga	asket Gap	Т	pi/Pitch	Ident DLAH-0001 FLANGE TO FLANGE
DLAH-0005 FLAN MANUAL INPUT	WN Bl 1.7/8"-8UN	HTT. 13281.0 ASTM A320 - L7	FLANGE TO FLANGE JOI	NT NTB55 PN3	RTJ	- 6	7		8	Specification Manual Input
DLAH-0010 FLAN MANUAL INPUT	WN WN 1.1/8"-8UN	HTT. 13279.0 ASTM A320 - L7			Firster D.C		and the set	nun L	Do Toppion	Bolt Characteristics
DLAH-0012 FLAN MANUAL INPUT	WN BL 1.1/8"-8UN	HTT.13279.0 ASTM A320 - L7	Specification		Flange 2 C	config Ck	amp Length		Ue-lension	Non Thread Size 4 472" 910
DLAH-0013 FLAN MANUAL INPUT	WN Bl 1.3/8"-8UN	HTT.13742.000 ASTM A540 -B2	Manual Input	-	WN	- 10	9	mm N	O Bolts Bolorool	TO:
DLAH-0014 FLAN MANUAL INPUT	WN Bl 1.1/2*-8UN	HTT. 13280.0 ASTM A320 - L7	Rating		Spacer	Inv	vd Thick	1	8 100% -	1PI 8
DLAH-0018 FLAN MANUAL INPUT	WN WN 1.3/4"-8UN	HTT. 13282.0 ASTM A320 - L7	Manual Input	-		-		mm D	Detensioning %	Num Bolts 8
DLAH-0019 FLAN MANUAL INPUT	WN Bl 1.3/4*-8UN	HTT.13282.0 ASTM A320 - L7	Bolt material						0	Bolt to Tool Ratio 100%
NTB55 PN3550 EBV MANUAL INPUT	WN BL 1.7/8-80N	HIT.13281.0 ASIM A320 - L/	ASTM A320 - L7	-				C	Cross Loading %	Clamp Length 11.220 In 285.00 mm
NTP75 PN2550 EDV MANUAL INPUT	MIN DI 1.7/6 -0UN	HTT 12281.0 ASTM A220 - L7	Tightoning Tool Ident		Residua	al Bolt Stres	IS A		15	Load Transfer Factor 1.1500
NID/S PROSO EDV MARCAE SPOT	WIN DI 1.7/0 -00/4	1111.13281.0 ASIM AS20 - L7	CTET 02			50602	lb/in <sup>2</sup>			Tensioning Tool
			0131-02	•						Tensioner Ident HTT 13280 000A 1 1/2"-8UN
										Tool Pressure Area 4 579in3 2052 69mm3
			Bolt Stress To	raue	Graph	Bolt	t s	Seauer	nce	Max Working Pressure 21750 1500
										Dette Information
			D	Dolt Of		Dell	1 and		0/ 0-0 10-14	Bolt Information
			rump riessure	DOI: OI	1000	BUI	LUau		70 DUIL TICIU	Bolt Vield Strength 105152(b/ln <sup>2</sup> 725N/mm <sup>2</sup>
				bs/h2	N/mm2	Tons	kN		96	Streep dree
										Siless Alea 1.502ii- 968./9mm
			@ A Pressure							Bolt Length 16.09in 408.8mm
										Tensioning Pressures
			@ R Pressure	58192	401 22	30.01	388 70		55.3	Pressure A
										Pressure B 19087psi 1316bar
			Detained Land							Detensioning 19087psi 1316bar
			netamed Load	50602	348.89	33.92	338.00		48.1	Torque Information
										Torque 1496ft.lbs 2029N.m
			Detensioning	58192	401.22	39.01	388.70		55.3	Coefficient of Friction used 0.12
			• Mino (BS1	r Dia Area 1580 / BS36	linor Dia Are (ASME PCC-	ea ● Tens 1) ● (BS*	sile Stress A 1580 / BS36	krea 543) C	Tensile Stress Area (ASME PCC-1)	Stresses based on Boit Tensile Stress Area (BS1580 / BS3643
<		>								



#### **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).

_	Joint ID	Flange 1 Config	Clamp Length	Bolt Thread	
A	NEW APPLICATION	WN-RTJ G-	30.20 mm	3/4" 💊 🗸	
	Comments	Gasket	Gasket Gap	Tpi/Pitch	
F		SEAL RING +	10 mm	10	
	Specification	Flange 2 Config	Clamp Length	No Bolts Bolt/Tool	
В	ANSI B16.5 & MSS-SP44 -	WN-RTJ	30.20	8 <b>Q</b> 100% <b>R</b>	
	Pipe Pressure Rating	Spacer	Invd Thick	De-Tension P	C rension C forque
С	5 • x 150 ANSI •	•	Mnm	Detensioning %	
Ū.,	Bolt material				First select what type of tooling will
D	ASTM A193 - B7 -	Residual Bolt	Stress	Cross Loading %	be used on this joint. Projects are
_	Tightening Tool Ident	40000	io/in-	20	able to bandle multiple different
F	CTST-01 ·	Tension	🔾 Torque 🛛 🧲	Nut Type	
			¥		types of tooling per project set.

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

In the case of a special thickness flange being used the flange thickness can be edited.

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.

Spacer

1 Washe
 2 Washe
 Auto Spa

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.

	pecification		Flange 2 Co	nfig	Clamp Length	ı L
loud Thick 20	ANSI B16.5 & MSS-SP44	-	WN-RTJ	-	54.00	mm Nc
mm Deter	tating		Spacer		Invd Thick	2
r Cros	24 ×	Spa	acer	1000	×	mm De
r Stress 20 cer b/in²	AST To reduce the required tool, enter a target L software will increase BC Values betwee LTF	operatin oad Trai the clan Spac ter loi en 1.15 c	ng pressure of nsfer Factor (L np length by ins cer. and factor and 1.2791 are	f the te _TF) a serting	ensioning nd the g a single ptable	Cr 21 Sequen
	Note! Load Transfer F	actors	below 1.15 a	re no OK	Cancel	
	@ B Pressure 511	164	352.76	23.0	02 229.34	4

**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  $\bigcup$  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  $\mathbf{W}$  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



#### Setting up your first application (Torque).

Joint ID NEW APPLICATION	1 Clamp Lengthmm	Bolt Thread 3/4"
Comments	<b>2</b> Nut AF 1.1/4 in	Tpi/Pitch 10
Specification ANSI B16.5 & MSS-SP44 +	K Factor <b>3</b> - 0.16	No Bolts 8
Pipe Pressure Rating 5 ▼ X 150 ANSI ▼	Torque calc based on NLT FACTOR (K= 0.16) 'An Introduction to the Design and Behaviour of Bolted Joints' Bickford, p. 235	
Bolt material ASTM A193 - B7 ▼ Tightening Tool Ident RT-0.5 1/2" 4 ▼	Residual Bolt Stress 40000 lb/ln <sup>2</sup> Tension • Torque	Co-efficient of friction    O.12  Torque calc based on EN 1591-1, ISO 27509, and VDI 2230.

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 <sup>a</sup> 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 <sup>b</sup> can be selected from this drop-down menu.

Notes:

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

<sup>b)</sup> 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	Tor	que	Graph	Bolt	Sec	quence
Pump Press	sure	Bolt S	tress	Bolt	Load	% Bolt Yield
		lbs/in2	N/mm2	Tons	kN	%
@ A Pressi	ure	66085	455.64	44.30	441.42	62.8
@ B Press	ure	55071	379.70	36.92	367.85	52.4
Retained L	oad	45000	310.26	30.17	300.58	42.8
Detensioni	ng	60578	417.67	40.61	404.63	57.6
	• Minor (BS1	Dia Area 580 / BS36	Minor Dia Ar (ASME PCC-	ea o Tensil -1) o (BS15	e Stress Area 80 / BS3643)	• Tensile Stress Area (ASME PCC-1)

Bolt Stress	Tor	rque	Graph	Bolt	Sec	luence				
Pump Press	ure	Bolt S	Stress	Bolt	Load	% Bolt Yield				
		lbs/in2	N/mm2	Tons	kN	%				
@ A Pressi	ıre	117485	810.03	78.76	784.75	111.7 🧕				
@ B Pressi	ıre	97904	675.03	65.63	653.95	93.1				
Retained Lo	bad	80000	551.58	53.63	534.36	76.1				
Detensioni	ng	107694	742.53	72.19	719.35	102.4				
Miner Dia Area     Miner Dia Area     Maner Dia Area     (BS1580 / BS36      (ASME PCC-1)     (BS1580 / BS3643)     (ASME PC										

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

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.

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



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**

Bo	lt Stress	Torque	Graph	Bolt	Sequence	
Ł	~ Prec	licted Bol	t Tightnes	s	Retain	ed Bolt Stress
	12000	) <del>,</del>			Bolt Yield Stres	s
SS	10000	, <b></b>			A Pressure Bolt	t Stress Path
Str	80000				B Pressure Bolt	t Stress Path
Bolt	40000				TO Unloaded B	olt
	20000				T1 Initially App T2 Retained Lo	lied Load oad
	Time	то То	 Т1 Т	2	⊐ T3	
				-		

#### **Bolt Tab**

Bolt Stress	Torque	Graph	Bolt	Sequence								
<b>Bolt Informati</b>	on Stres	Stresses based on Bolt Tensile Stress Area (BS1580 / BS3643)										
Bolt Material	ASTN	I A193 - B16										
Bolt Diameter		1.1/2"										
Quantity		20										
Yield Strength		105152	lb/ln2	725	N/mm2							
Bolt Length		11.89	In	302.0	mm							
Tensile Stress Ar	ea	1.502	In2	968.79	mm2							
Minor Diameter A	rea		In2		mm2							

## 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.

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

Bolt Stress	Torque	Graph	Bolt	Sequ	ence	
eeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeee	sioning S	equence			Bolt	/ Tool Ratio
2	1 2		Tensioner	Bolt #	Pump	Pressure
. 6		4	Pass		psi	bar
<b>H</b> AR		2	Pass 1	1	21676	1494
2			Pass 2	2	18063	1245
			Pass 3			
	2 1	201	Pass 4			
				Checkin	g 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.

#### PDF mm Save Save New Save PDF View Datasheets U Clamp Length Flange 1 Config Joint ID NEW APPLICATION WN-RT.I ÷ 30.20 mm Gasket Gasket Gap Comments SEAL RING • 10 mm Flange 2 Config Specification Clamp Length WN-RTJ 30.20 ÷ mm Mar Spacer Invd Thick ÷ Vector SPO Compact API 6A API 17D Residual Bolt Stress Vector SPO-S rightening roor ident 40000 lb/ln<sup>2</sup> -Compact8-00 Clamp Length Bolt Thread Flange 1 Config Joint ID -NEW APPLICATION WN -Comments Gasket Gasket Gap Tpi/Pitch -13 RTJ 0 mm Flange 2 Config Clamp Length De-Te Specification Manual Input -WN No Bolts Bolt/Tool mm 100% -Rating Spac Invd Thick sioning % MANUAL INPUT -mm 0 Bolt material ASTM A193 - B16 Cross Loading % • Residual Bolt Stress 20 Tightening Tool Ident lb/in Nut Type TORQUE WRENCH -• Tension O Torque STD SPLIT NUT 🗸

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.	File       Help         File       Help         New Project       Load Project         Save Project       C         Save As       Application         Special Tools Library       Bolt Material Library         Bolt Material Library       Recent         Print Preference       Import Libraries         Export Libraries       Crect For New Version
	Exit
4004 KI - Pig Launcher Pulling Heads.bprj	Project Details X
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 Halidan Project Pig Launcher Puller Heads Reference 4064 R1 Date 18/03/2016 Engineer MPE Notes
 Videos	Summary Doc Notes Project Scope Topside Bolt tensioning Cross Loading % 20 Determining % 0
Wallpaper Wallpaper Computer Computer Colorisk (C:) CD Drive (D:) PKE	Torque Coefficient of Friction 0.12 Stress values are based on :- O Minor Dia Area (BS1580 / BS3643) O Tensile Stress Area (ASME PCC-1) O Minor Dia Area (ASME PCC-1)
File name 4064 R1 - Pig Launcher Pulling Heads.bprj	OK Cancel
Save as type: Project (*.bprj)	Save Cancel

#### 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**

+

Edit

0K

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.

+ Edit

Х

0K

• 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/ln2

Up to and including 1" diameter, Yield Strength = 95000 lbs/ln2

Up to and including 1.1/4" diameter, Yield Strength = 65000 lbs/ln2

Up to and including 1.1/2" diameter, Yield Strength = 50000 lbs/ln2

#### 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.

	NE	W APPLICATION		WN-RTJ	▼ 30.2	) mm	3/4"							
	۲	A	dd new	Material		×	si/Di#							
6 3 661		<ul> <li>Bolt materials can be defined with varying yield strengths dependent on the bolt diameter. This software allows bolt materials to be defined with up to 4 different yield values.</li> <li>Extreme care should be taken when adding Bolt materials, ensure all of the bolt diameter yield strength values are entered correctly</li> <li>Bolt Material Name</li> </ul>												
66) m	ASTM A193 - B8 Class 2													
m 8.8 10	ı	Upto Bolt Diameter (inches)	inches	Bolt Yield Stren	igth 00	lb/in2	E							
12	ι	Joto Bolt Diameter (inches)	inches	Bolt Yield Stren	ath	10/11/2								
Cla m C		1		9500	0	lb/in2								
	l	Jpto Bolt Diameter (inches)	inches	Bolt Yield Stren 6500	gth O	lb/in2	П							
	U	Jpto Bolt Diameter (inches)		Bolt Yield Stren	gth									
		1.5	inches	5000	0	lb/in2								
		NOTE: It is not necessary	to comple	ete all 4 Diameter	r/strength v	values.								
4					OK	Cancel	EC							
- 1		Minor Dia			T	01	-							



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#### Tentec Bolt Tightening Solutions

#### **Summary Report**

Customer Project Project Reference Date and Engineer



### Atlas Copco

#### Bolt Tightening Summary

Bolted Joint Description	Flange Specification	Fla Ty	nge /pe	Bolt Dia	No Bolts	Bolt Material	Residual Target Bol Stress		Residual Target Bolt Stress		Tool Ident	(ii) (iii) (iii) 100% 50% Tensioning Tensioning		(i) De- tensio	ning	Torq	ue Valu	es	Bolt Length	Washer Req
		S.1	S.2				lbs/ln2	N/mm2		psi (bar)	psi (bar)	psi (bar)	psi (bar)	%	N.m	Ft.lbs	u	mm	Spacer	
DLAH-0001 FLANGE TO FLANGE JOINT NTB55 PN3550 MANUAL INPUT	Manual Input	WN	WN	1.1/2"-8UN	8	ASTM A320 - L7	50602	348.89	HTT.132 80.000A	19087psi (1316bar)	(bur)	(but)	19087psi (1316bar)	55.3	2029N.m	1496ft.lb s	0.12	408.8m m	N	
DLAH-0002 FLANGE TO FLANGE JOINT NTB75 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.lb s	0.12	0mm	N	
DLAH-0005 FLANGE TO BLOCK JOINT NTB55 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.lb s	0.12	0mm	N	
DLAH-0006 FLANGE TO BLOCK JOINT NTB75 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.lb s	0.12	0mm	N	
DLAH-0010 FLANGE TO FLANGE JOINT NTB63 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 NTB63 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 NTB85 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.lb s	0.12	0mm	N	
DLAH-0014 FLANGE TO BLOCK JOINT NTB55 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.lb s	0.12	0mm	N	
DLAH-0018 FLANGE TO FLANGE JOINT NTB120 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.lb s	0.12	0mm	N	
DLAH-0019 FLANGE TO BLOCK JOINT NTB120 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.lb s	0.12	0mm	N	
NTB55 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.lb s	0.12	0mm	N	
NTB75 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.lb s	0.12	0mm	N	
NTB75 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.lb s	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

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#### **Individual Application Report**

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Client Project Project Reference Date and Engineer	SIMON CARVES LDPE PLANT 151112 11/05/2015 M	PE			Tentec Bo	ht Tighteni	ng Solut	ions	•
Bolt Tensioning Datasheet Flange Specification Ident	MANUAL INPUT Manual Input DLAH-0001 FLA	NGE T	D FLANGE JO	INT NTB	55 PN3550 Prop			pco	
Joint Information					гюр		ing roor		
Nom Thread Size	1.1/2"-8UN	Flan	ge Configura	ation		0			
TPI	8	F1	109	WN			-Qī		
Num Bolts	8	Gap	67			BU	U		
Bolt to Tensioning Ratio	50%	F2	109	WN					
Load Transfer Factor LTF	1.15	Ws	0	0			$\circ$		
Clamp Length	11.220	In	285	mm	T				
Tensioning Tool Information					1				
Proposed Tensioning Tool	HTT.13280.000A	RN			111		-	//	r
Tool Pressure Area	4.578	In2	2953.68	mm2	Tensione	r	Applier	l I Pressure	
					Pass	Bolt #	nsi	har	
Bolt Information						-	P31	Dai	
Bolt Material	ASTM A320 -	L7			Pass 1	1	20995	1448	-
Bolt Yield Strength	105152	Ib/in2	725	N/mm2	Pass 2	2	19087	1316	
Stress Area	1.502	In2	968.79	mm2	Pass 3				
Bolt Length	16.09	In	408.8	mm	Pass 4				
Torque Information					Checking P	ass			
Torque	1496	ft.lb	2029	N.m	Pass 1	1	19087	1316	
Coefficient of Friction	0.12				Pass 1	1	19087	1316	
Load information	Bolt	Stress		Bolt Lo	ad	%	of Bolt Yield		
Tensile Stress Area (BS1580 / BS3643)	lbs/in2		N/mm2	т	ons	kN		%	
T1 @ A Pressure	64012		441.35	42	42.91 427.57 60.9				
T1 @ B Pressure	58192		401.22	39	9.01	388.7		55.3	i
T2 Residual	50602		348.89	33	3.92	338		48.1	†
Stress @ Detensioning	58192		401.22	39	9.01	388.7		55.3	1
Tensioning Pressures	151	Pass			2nd Pa	ISS	.%	of Bolt Yie <u>ld</u>	
	psi		Bar		osi	Bar		*	
100% Tensioning Pressures	19087		1316	l '	-	-		55.3	
50% Tensioning Pressures	20995	-	1448	10	087	1316		60.9	
Max Detensioning Pressures	19087	-	1316					55.3	
Predicted Rolt	15007	1	1310	I		-		د.رر	
					Applic FLANC	ation Comm SE TO FLANC	nents GE JOINT	NTB55 PN3550	
120000 100000 80000 60000 60000									
LS 40000 HS 20000 0 T0	т1	1	2	T3					
tax Detensioning Pressure refers to the maxim 00% Tensioning is the recommended mode of entec Limited do not accept any liability for ee	num capacity of the tensio bolt tensioning, whereve rors within or caused by	oning too r possible the use o	and should not l e use 100% Bolt to f this software.	e consideren o tool ratio	d to be the safe r © 2016 Te	nax load capacit	y of the flan	<sup>je</sup> s Reserved	-



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				Tentec Bo	lt Tighteni	ing Soluti	ons		
Bolt Tensioning Datasheet	1					,	ltlas Cop	ю		
Flange	6" x 15000 Ve	ctor SP	0-S			_				
Ident	6" x 15000 SP	O-S WN	I TO WN	L					1	
loint Information	10 x 15000 51	0 3 11			Propo	sed Tensio	ning Tool		i	
Nom Thread Size	1.1/4"-8UN	Ela	nae Configur	ation	1	0			•	
TPI	8	F1	79	WN			1			
Num Bolts	16	Gap	0				HA			
Bolt to Tensioning Ratio	100%	F2	79	WN			- (			
Load Transfer Factor LTE	1,2109	Ws	0	0						
Clamp Length	6,220	In	158	mm						
Tensioning Tool Information			1	- <u>I</u>		D P		0/		
Proposed Tensioning Tool	HTT.13914.00	) RN					0			
Tool Pressure Area	4,344	In2	2802.58	mm2		1	1	1	Т	
			,	1	Tensioner	·	Applied	Pressure		
Bolt Information				_	Pass	Bolt #	psi	bar		
Bolt Material	ASTM A320	- L7m			Pass 1	1	15479	1067	†	
Bolt Yield Strength	79770	lb/in2	550	N/mm2	Pass 2				Ť	
Stress Area	0.929	In2	599.26	mm2	Pass 3				Ť	
Bolt Length	10.35	In	262.8	mm	Pass 4				Ť	
Torque Information					Checking Pa	ass				
Torque	927	ft.lb	1256	N.m	Pass 1		1		1	
Coefficient of Friction	0.12				Pass 1				T	
Load information	Bo	It Stres	s		Bolt Lo	ad	% c	of Bolt Yield	4	
Minor Diam Area(ASME PCC-1)	lbs/in2		N/mm2	1	Fons	kN		%	1	
T1 @ A Pressure									1	
T1 @ B Pressure	72389		499.1	30	0.02	299.09		90.7	-	
T2 Residual	59781		412.18	24	4.79	247		74.9	-	
Stress @ Detensioning									-	
Tensioning Pressures	1	st Pass			2nd Pa	ss	% (	of Bolt Yield		
	psi		Bar		psi	Bar		%	9	
100% Tensioning Pressures	15479		1067	<u> </u>	-	-		90.7	Section available for s	igning, suitable
50% Tensioning Pressures									for record keeping	
Max Detensioning Pressures	-			-					for record keeping.	
Signed for on behalf o	f	Sian	ed for on beł	alfof						
Tentec					Applic	ation Com				
Date	Date				0				-	
Brint name	Drint I	lama								
Print name	Print	vame							4	
Signature										
Signature	Signal	ure								

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 both tensioning, wherever possible use 100% Bolt to tool ratio Tenter Limited of our caccert any liability for errors within or caused by the use of this software.

# TENTEC BOLT TIGHTENING SOLUTIONS



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