ORIGINAL INSTRUCTIONS

SRT BOLT TENSIONER

OPERATION MANUAL

SPX BOLTING SYSTEMS
UNIT 4 WANSBECK BUSINESS PARK – ROTARY PARKWAY - ASHINGTON
NORTHUMBERLAND – NE63 8QW – UNITED KINGDOM
TEL: +44 (0) 1670 850580 FAX: +44 (0) 1670 850655
www.spxboltingsystems.com

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1. INTRODUCTION

1.1 GENERAL INFORMATION

The SRT Tensioning System has been designed to ensure simple but safe tensioning operations with the added benefit of speed and reliability. The SRT tensioning tool comprises a single hydraulic load cell with interchangeable adaptor kits enabling the load cell to fit up to five different bolt diameters. An adaptor kit comprises a threaded pulling sleeve and a bridge and nut rotator assembly.

In operation, the tensioning tools are assembled to one or more bolts to be tightened. The combined hydraulic cell and bridge are positioned over an extended bolt protrusion and held in position by a pulling sleeve.

Usually multiple tensioners are assembled to a single flanged joint to ensure simultaneous and uniform joint compression and bolt loading. Each tensioner is hydraulically connected in series using an 'interconnect' hose, with the hydraulic system completed using 'feed' hoses from the first and last tensioner to the pump unit.

In order to apply load to the bolt, the pump is activated and a predetermined pressure applied to the system. As the tensioners apply load to each bolt, the flanged joint is compressed and the flange nuts will be lifted from the flange surface. Whilst the tensioner system pressure is maintained, each of the flange nuts are re-tightened by the use of a toggle bar placed through the tensioner bridge window. Upon release of the system pressure, load shall be retained in each bolt.

1.2 SPRING RETURN TYPE (SRT) TENSIONER BENEFITS

The SRT tensioner has been specifically designed to incorporate several benefits that allow the system to be safe and quick under operation.

SPRING ASSISTED PISTON RETURN

Springs incorporated within the hydraulic cell ensure that the piston retracts automatically upon release of the hydraulic system pressure. Not only does this feature eliminate the physical exertion required to manually retract each piston, but it also allows the tensioners to be ready for use on the next application within minutes, saving time.

PISTON OVERSTROKE ELIMINATOR

In the interest of safety, an overstroke eliminator valve has been included. Should the tensioner be accidentally stroked beyond the 10mm limit, the valve will be activated and hydraulic fluid safely vented. Not only does this prevent the operator from being exposed to hydraulic oil expelled at high pressure, but it also eliminates seal damage and thus downtime due to seal replacement.

PISTON STROKE INDICATOR

All bolt tensioning tools include a piston stroke indicator in the form of a coloured band, visible as the piston approaches the maximum 10mm stroke.

HYDRAULIC CELL TO BRIDGE CONNECTION

Innovative design includes quick and simple assembly of hydraulic cell to bridge, eliminating the need for spanners, keys, etc. when changing bridges.

NUT ROTATING RING

The 'SRT' range of bolt tensioners incorporate nut rotating rings which are self retained within the bridge. This prevents the loss of loose components and the unnecessary cost of pre-drilled nuts.

COMPACT DESIGN

With the aid of the most up to date technology, the product range has been designed to be as small and light as possible, but include as many features beneficial to the end user as possible.

1.3 TECHNICAL SPECIFICATIONS

The following data is applicable to all SRT tensioners:

TENSIONER DESIGN : Single acting cylinder, spring assisted piston retract

MAXIMUM PRESSURE : 1500 Bar (21750psi)

MAXIMUM PISTON STROKE : 10mm (0.375”). except SRT0 - 8mm (0.315”)

OPERATING TEMPERATURE : -20°C to +50°C

HYDRAULIC OIL TYPE : Houghtosafe 620 or equivalent

TOOL REF	BOLT DIA		HYDRAULIC AREA		MAX TOOL LOAD		WEIGHT
	Imperial	Metric	mm2	in2	KN	tonf	Kg
SRT0	3/4” 7/8”	M20 ** M22	1067	1.65	160	16.1	1.40
SRT1	1” 1 1/8”	M24 ** M27	1867	2.89	280	28.1	2.7
SRT2	1” 1 1/8” 1 1/4” 1 3/8”	M24 ** M27 M30 M33 M36	3001	4.65	450	46.0	4.1
SRT3	1 1/4” 1 3/8” 1 1/2” 1 5/8”	M33 M36 M39 M42	4401	6.82	660	66.2	5.4
SRT4	1 1/2” 1 5/8” 1 3/4” 1 7/8” 2”	M39 M42 M45 M48	6668	10.34	1000	101.4	8.4
SRT5	2” 2 1/4” 2 1/2” 2 3/4”	M52 M56 ** M60 M64 ** M68 **	10003	15.50	1500	150.5	13.8
SRT6	2 3/4” 3” 3 1/4” 3 1/2”	M72 ** M76 ** M80 ** M85 ** M90 **	16671	25.84	2500	250.9	23.0
SRT7	3 1/2" 3 3/4" 4”	M90 ** M95 ** M100 **	21339	33.06	3200	321.2	32.0
SRT8	4” 4 1/4" 4-1/2”	M105 ** M110 M115	27340	42.38	4100	411.4	45.0

** Indicates that the Nut Rotating Ring is specific to the metric nut size only and will not fit the imperial equivalent. Note that Nut Rotating Rings which are metric only (indicated thus **) are plated yellow/ gold. Standard Imperial Nut Rotating Rings are black.

1. Bridges are stamped with both the imperial and equivalent metric size where applicable. Bridges with metric Nut Rotating Rings indicated ** are stamped with the imperial size only.
2. Weight includes Load Cell, Bridge and Nut Rotating Ring (excludes the Pulling Sleeve)

1.4 TABLE INDICATING MAXIMUM RECOMMENDED WORKING PRESSURES

TOOL REF	BOLT DIA	HYDRAULIC AREA		MAX TOOL LOAD		MAX. REC. PUMP PRESSURE	
	(Note 1)	mm2	in2	KN	tonf	Bar	PSI
SRT0	3/4” 7/8”	1067	1.65	160	16.1	1154 1500	16744 21750
SRT1	1” 1 1/8”	1867	2.89	280	28.1	1202 1500	17433 21750
SRT2	1” 1 1/8” 1 1/4” 1 3/8”	3001	4.65	450	46.0	747 983 1253 1500	10835 14260 18167 21750
SRT3	1 1/4” 1 3/8” 1 1/2” 1 5/8”	4401	6.82	660	66.2	854 1060 1288 1500	12387 15378 18685 21750
SRT4	1 1/2” 1 5/8” 1 3/4” 1 7/8” 2”	6668	10.34	1000	101.4	850 1014 1193 1390 1500	12324 14713 17309 20165 21750
SRT5	2” 2 1/4” 2 1/2” 2 3/4”	10003	15.50	1500	150.5	1067 1373 1500 1500	15473 19918 21750 21750
SRT6	2 3/4” 3” 3 1/4” 3 1/2”	16671	25.84	2500	250.9	1131 1357 1500 1500	16402 19683 21750 21750
SRT7	3 1/2" 3 3/4” 4”	21339	33.06	3200	321.2	1481 1500 1500	21485 21750 21750
SRT8	4” 4 1/4” 4 1/2”	27340	42.38	4100	411.4	1500 1500 1500	21750 21750 21750

1. For Metric bolts, please contact the Supplier.
2. The *‘Maximum Recommended Pump Pressure*’ indicated will induce a gross bolt stress not exceeding 85% of the minimum specified material yield strength for bolt material grades B7, L7, L43 and B16.
3. For information on other bolt materials, please contact the Supplier.

2. SAFETY

Always adopt safe working practices when working with pressurised equipment. Protective clothing including eye and head protection must always be worn as well as gloves and safety footwear. Exhibit common sense and most importantly of all, READ AND UNDERSTAND THE OPERATING MANUAL AND PROCEDURES.

a) Never exceed the tensioning tool maximum working pressure of 1500 Bar (21750psi)

b) Ensure that a minimum studbolt protrusion (above the flange nut) of at least 1 x bolt diameter exists.

c) Ensure that the pulling sleeve is of the correct thread form and size, and is correct for the size of hydraulic cell to be used.

d) Ensure that the bridge is correctly assembled onto the hydraulic cell

e) When assembling the tensioning tool to the flanged joint, ensure that the tensioning tool sits squarely on the flange face and does not foul the flange hub or adjacent bolting.

f) Check that hoses are in good condition and undamaged. When assembling the hydraulic harness do not unduly bend hoses beyond their safe bend radius limit or kink the hose.

g) Ensure that the tensioning tools can operate without obstruction, i.e. during pressurisation, the piston / puller sleeve moves away from the load cell, make sure it can move without obstruction.

h) Do not pressurise unconnected quick connect couplings.

i) Take care when handling equipment. Quick connect couplings are especially susceptible to knocks and damage and therefore care must be taken. Note that damaged couplings are difficult to connect. Do not force couplings.

j) Do not retighten any equipment whilst under pressure.

k) Stand clear of the tensioning tools whilst pressurising up the system.

l) Stand to the side of the tensioning tools whilst under pressure. Do not work over the top of the tensioning tool (i.e. along the tool axis).

m) Keep the system under pressure for as short a time as possible. Be fully conversant with the working procedures such that operation times are kept to a minimum.

n) Keep other personnel clear of the working area and only allow trained personnel to use the equipment. Ideally rope off the working area.

o) Only use pumps, hoses, tensioners, etc, which were supplied by the Manufacturer or Distributor. The equipment will be certified for the specific working pressures

p) Only use the Manufacturer's genuine spare parts for repairs and servicing. Repairs should only be carried out by the Manufacturer.

q) Do not strike, misuse or abuse any of the equipment. If any abuse or misuse of the equipment is evident, the warranty shall be invalid and the Manufacturer shall not be responsible for any injuries or failures as a result.

r) If not in use, and when practical, disconnect the pump from the power supply to prevent accidental starting. Also ensure tensioning tools are depressurised.

THE SRT TENSIONER (AND ANCILLARIES) ARE DESIGNED FOR THE TIGHTENING AND LOOSENING OF BOLTS AND STUDBOLTS ONLY. DO NOT USE IT FOR ANY OTHER PURPOSE

3.1 FLANGED JOINT PREPARATION

3.1 STUDBOLT PREPARATION

In order to reduce potential problems during the tensioning operation, a few simple checks carried out before the tools are applied can significantly reduce wasted time. It is recommended that the following studbolt preparations and checks be carried out before the tensioning tools are assembled.

- In order to accommodate the SRT Tensioning system, there must be a minimum thread protrusion above the flange nut of 1 x bolt diameter. See Figure 1.

- Check that the tensioner Pulling Sleeve is of the same thread size and form as that of the bolt to be tightened. Ensure that the Pulling Sleeve is free running on the bolt thread protrusion.

- If possible, check that the flange nut on the side of the bolt protrusion is free running over a further 20mm of thread.

3.2 GALVANISED STUDBOLTS

In order to offer corrosion protection, studbolts and nuts may be hot dipped galvanised (zinc coated. In general, the process of hot dipped galvanising involves manufacturing the bolts to the lower tolerance and the nuts to the upper tolerance, the nuts then re-tapped after coating to fit the bolts. The nature of this process generally results in uneven coating thickness and often thicker deposits accumulating at the root of the threads.

Hot dipped galvanised studbolts can present problems for bolt tensioners due to the studbolts being oversize as a result of the coating. It may be difficult to attach the tensioner pulling sleeve on some, if not all galvanised bolts. If this is the case, oversize pulling sleeves manufactured specially for galvanised bolts are required. Contact the Supplier for availability.

Never force the pulling sleeve onto a galvanised studbolt and do not attempt to modify or re-cut the pulling sleeve thread.

3.3 FLANGED JOINT ASSEMBLY

Before application of the bolt tensioning tools, the flanges should be aligned and the flange faces brought in close proximity to each other. The studbolts should be assembled into the flanged joint and set up in a manner to accommodate the tightening procedure to be adopted, i.e. 50% tensioning method or 100% tensioning method.

Studbolt Installation for 50% tool coverage - This is the usual method of bolt tensioning for land based applications. This method adopts a two stage tensioning procedure where half the bolts are tightened in the first stage with the remainder tightened in a second stage. The bolts should be assembled as indicated in Figure 1.

Studbolt Installation for 100% tool coverage - This is an alternative method which adopts a one stage procedure where all of the bolts in the joint are tensioned simultaneously. The bolts should be assembled as indicated in Figure 2.

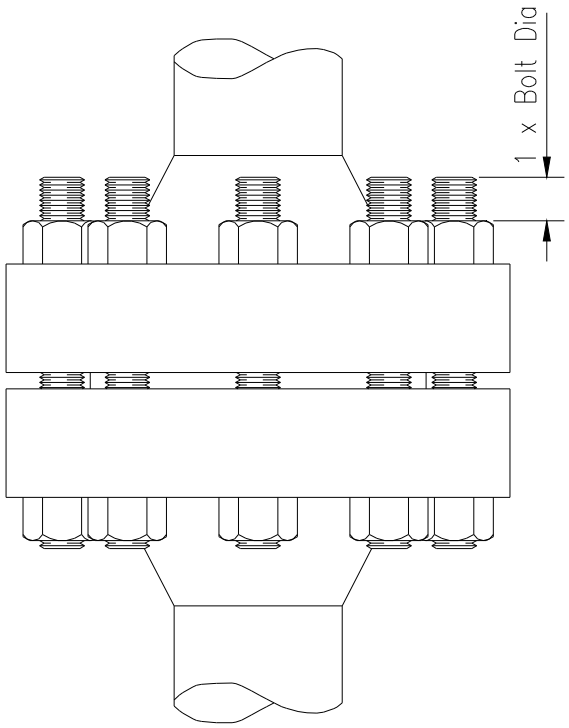

Figure 1 - For 50% tool coverage

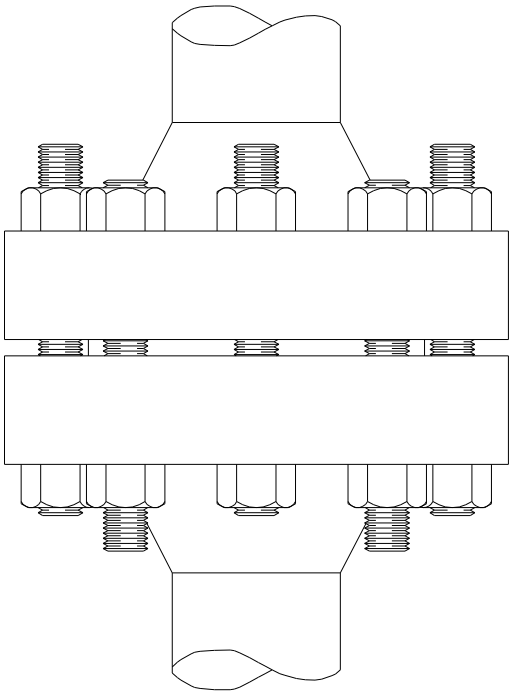

Figure 2 - For 100% tool coverage

4. TENSIONING TOOL ASSEMBLY

4.1 ATTACHING THE BRIDGE TO THE HYDRAULIC CELL

The bridge can be attached to the hydraulic cell without the need for spanners, keys, etc. Assembling the bridge is as follows: (NOTE: disconnect tools from hydraulic supply !)

a) Identify the two slots in the top portion of the bridge.

b) Insert the top portion of the bridge into the hydraulic cell bridge recess, aligning the two bridge slots with the two pins protruding into the hydraulic cell bridge recess bore.

c) Press the bridge and hydraulic cell firmly together and rotate the bridge through 90° such that the bridge toggle bar window is positioned between the hydraulic cell couplings. A spring loaded plunger will retain the bridge in position

d) The tensioning tool assembly is now ready for use.

e) Note that the design of the bridge also allows it to be positioned at 45° either side of the central position. When the bridge is rotated, the spring loaded plunger will again locate the bridge at these alternative positions.

4.2 ASSEMBLING THE TOOLS ONTO THE FLANGE

NOTE : If the bolts are to be de-tensioned, please refer to Section 6.3, *' Bolt De-Tensioning Procedure'* prior to assembling the tensioning tools onto the flange.

Assembling the tensioning tools to the flanged joint is carried out as follows:

a) Ensure that the tensioning tools (both hydraulic cell and bridge adapter) are correct for the bolts to be tensioned.

b) Ensure that all hydraulic cell pistons are fully retracted, i.e. top surface of piston is flush with the top of the cylinder.

c) Place the tensioning tool assembly (combined hydraulic cell, bridge and nut rotating ring) over the thread protrusion of the bolt to be tensioned. Ensuring that the flange nut has engaged into the nut rotating ring and the bridge is sitting squarely on the flange surface, the assembly should be positioned such that the bridge toggle bar slot can be easily accessed, and the couplings easily accessible for hose connection.

   NOTE : If washers are fitted to the studbolt assemblies, the washer must be of a diameter equal to or larger than the bridge diameter. The tensioner must be assembled on top of the washer. If the washer is smaller than the bridge diameter, consult Torque Tension Systems Ltd.

d) Insert the pulling sleeve into the tensioning tool assembly, and engage onto the bolt thread protrusion. Screw down the pulling sleeve until it sits firmly and squarely on top of the hydraulic cell piston.

e) Visually examine the assembly checking that no part of the tensioner fouls the flange hub taper or the adjacent nuts and bolts. If there is interference between flange and tensioner the tensioner assembly must either be repositioned or an alternative tensioner used.

f) Assemble the remaining tensioning tools in the same manner. Once all of the tensioners have been assembled, the hoses may be connected.

4.3 ASSEMBLING THE HOSES (Hydraulic Hose Harness)

NOTE : All hoses are fitted with self-sealing quick connect couplings which ensure that hydraulic fluid will not flow through the coupling unless fully connected. Therefore, it is important to ensure that the female coupling is fully engaged with the male coupling before pressurising the system.

Connecting the hoses is carried out as follows:

a) Working around the flange assembly (either clockwise or anticlockwise) connect each tensioning tool to each other in series using interconnecting hoses.

b) Once all of the interconnecting hoses have been assembled;

   For 50% tool coverage - Two tensioners should remain and each with one unconnected coupling. Attach two 3metre feed hoses, one to each of the unconnected tensioner couplings. Attach the other end of the feed hoses to the pump unit manifold.

   For 100% tool coverage - Four tensioners should remain (two on each side of the flange) and each with one unconnected coupling. Connect an interconnecting hose from one tensioner (with an unconnected coupling) on one side of the flange to a tensioner (with an unconnected coupling) on the other side of the flange. Attach two 3metre feed hoses, one to each of the remaining unconnected tensioner couplings (one on each side of the flange). Attach the other end of the feed hoses to the pump unit manifold.

c) The hydraulic hose harness is complete when there are no remaining unconnected couplings or hoses.

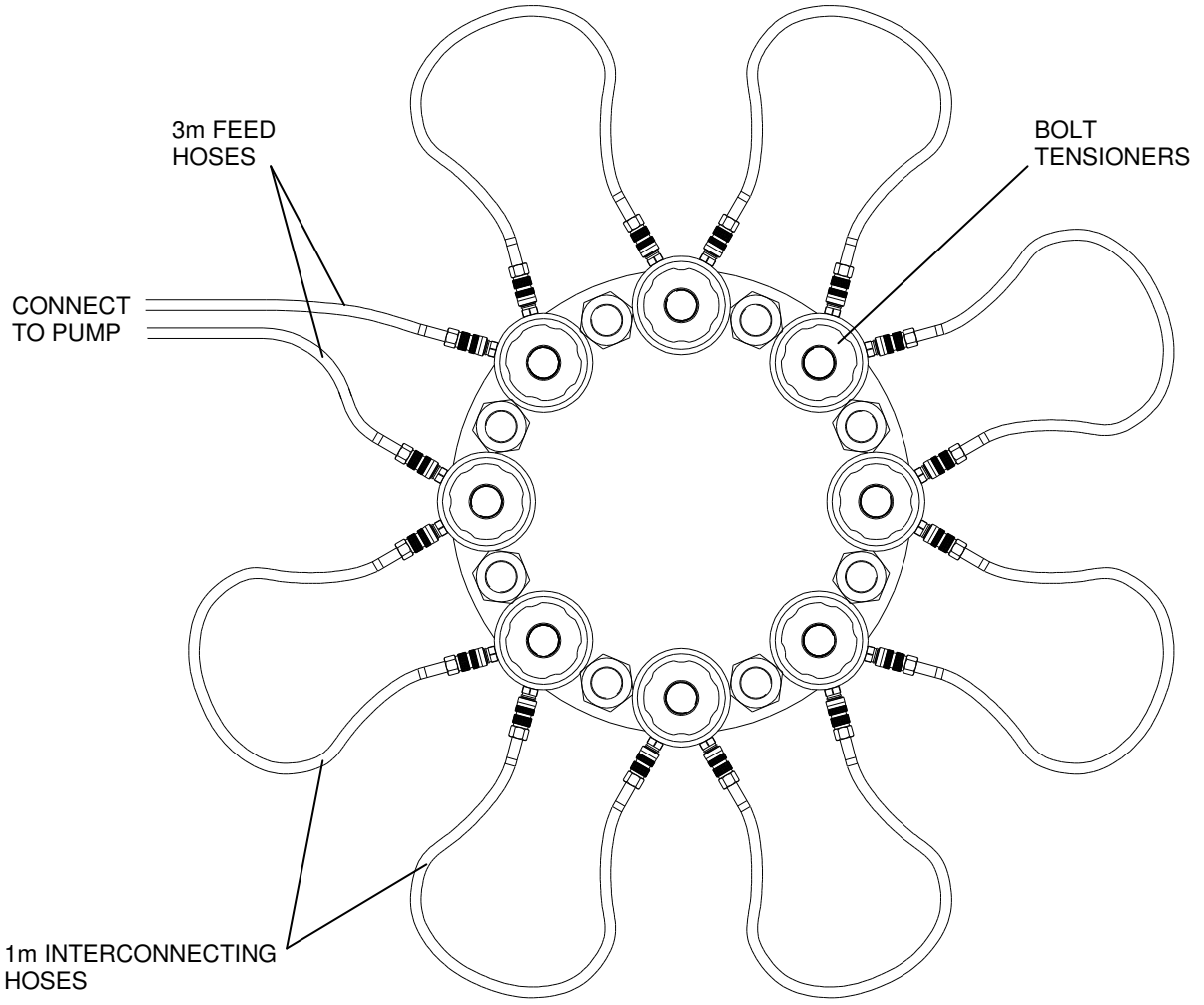

Figure 3 - Typical Tensioner Assembly and Hose Connection

5. AIR DRIVEN PUMP UNIT

5.1 PUMP REQUIREMENTS

AIR SUPPLY	:	1/2" Nominal bore supply line
AIR PRESSURE	:	5.5 - 6.9 Bar (80 - 100psi)
AIR CONSUMPTION	:	28CFM @ 6.9 Bar

Prior to pump operation, the following fluid level checks should be carried out.

- Hydraulic fluid reservoir - Ensure that the tank is full. Top up with Houghtosafe 620 hydraulic oil if necessary.
- Air Lubricator - Ensure bowl is filled to within 6mm of the top. Use pneumatic tool oil such as Silkolene Icefree.
- Air Filter / Regulator - Drain any water from the filter bowl (use drain plug on bottom of bowl). In operation, drain away water from the bowl before it reaches the level of the lower baffle.

5.2 PUMP OPERATING PROCEDURE

The pump unit should be regulated on-site to either stall at a predetermined hydraulic pressure (associated with the particular bolt size to be tightened) or to the maximum pressure of the tensioning tools, i.e. 1500Bar (21750psi). This is achieved by carrying out the following procedure:

a) Either loop a 3m feed hose across the pump hydraulic oil outlets or alternatively attach blank female couplings.

   WARNING: Unattached couplings, male or female, must not be pressurised under any circumstances

b) Open the pump hydraulic oil pressure release valve.

c) Ensure that the pump start / stop valve is closed.

d) Connect the pump to the air supply

e) Turn the air pressure regulator adjustment knob anti clockwise until the air pressure gauge reads zero pressure.

f) Open the pump start / stop valve. As the regulator has been set to read zero pressure the pump should not start. If the pump does operate, it should be very slow.

g) Close the hydraulic oil pressure release valve.

h) Rotate the air pressure regulator adjusting knob slowly clockwise until the required hydraulic oil pressure reads on the pump pressure gauge

i) Close the pump start / stop valve.

j) Slowly open the hydraulic oil pressure release valve to relieve the system pressure.

The pump is now ready for operation and will automatically stall at the pre-set pressure. When using the pump unit the following safety rules must be adhered to.

- Always wear eye protection during pump operation and during tensioning.
- Although the pump may be have been pre-set to stall at a certain pressure, always monitor the pressure gauge during pressure build up.
- Should power failure occur during pressurisation, close the pump start / stop valve, and depressurise the system by opening the hydraulic oil pressure release valve. Disconnect the power supply until the power has been restored.
- Always depressurise before leaving the system unattended.

6. BOLT TENSIONING PROCEDURES

The following tensioning procedures are only for use with Hydraulic Bolt Tensioners and are specifically compiled for tension tightening of standard pressure containing flanged joints. The object of each procedure is to accurately achieve a pre-determined residual bolt stress.

6.1 BOLT TENSIONING PROCEDURE - 50% TOOL COVER

SAFETY: Prior to commencement of bolt tensioning ensure that:

a) All necessary safety precautions have been carried out
b) Personnel involved in bolt tensioning are competent and fully trained in the use of bolt tensioners and tightening techniques.
c) The joints / pipework to be worked on are not 'live'. Joints must be at zero pressure and free from hazardous substances.
d) Bolt tensioning pressures, specific to the flanged joint to be tightened, are available.

STAGE 1 Number each bolt 1, 2, 3, etc.

STAGE 2 Square up the flanged joint using hand tools, or if necessary bolt tensioners.

STAGE 3 Assemble the tensioning tools to 50% of the bolts (i.e. all odd numbered bolts) and apply the *'Pressure 1'* as indicated in the bolt tensioning data. Whilst maintaining the system under pressure, turn down the flange nuts using a toggle bar. Always tap the toggle bar using a hammer to firmly seat the nut against the flange surface.

STAGE 4 Release the system pressure and repeat STAGE 3 twice further, i.e. apply *'Pressure 1'* and turn down nuts three times.

NOTE: It is often advisable to continuously re-apply 'Pressure 1', especially with Ring Type Joints, until no further movement of the flange nuts can be obtained. Also, it may be beneficial to allow a few minutes between each pressurisation to allow the gasket to bed in.

STAGE 5 Move the tensioning tools onto the remaining 50% of bolts (all even numbered bolts) and apply the *'Pressure 2'* as indicated in the bolt tensioning data. Turn down the flange nuts.

STAGE 6 Release the system pressure and repeat STAGE 5 twice further, i.e. apply *'Pressure 2'* and turn down nuts three times.

STAGE 7 As a check to see if an excessive load has been lost in the initial 50% of bolts tightened (odd numbered bolts), assemble two tensioning tools to randomly selected but diametrically opposite odd numbered bolts. Apply *'Pressure 2'* and attempt to further tighten the flange nuts. If the nuts cannot be further tightened, then tensioning is complete and the tensioners may be removed.

If the flange nuts can be further tightened, then reassemble the tensioning tools onto all of the odd numbered bolts. Apply *'Pressure 2'* and turn down the flange nuts once more.

The bolt tensioners may now be removed.

STAGE 8 As a final check, using a hammer, 'ring' each bolt to ensure that no loose bolts remain

6.2 BOLT TENSIONING PROCEDURE - 100% TOOL COVER

SAFETY: Prior to commencement of bolt tensioning ensure that:

a) All necessary safety precautions have been carried out
b) Personnel involved in bolt tensioning are competent and fully trained in the use of bolt tensioners and tightening techniques.
c) The joints / pipework to be worked on are not 'live'. Joints must be at zero pressure and free from hazardous substances.
d) Bolt tensioning pressures, specific to the flanged joint to be tightened, are available.

STAGE 1 Square up the flanged joint using hand tools, or if necessary bolt tensioners.

STAGE 2 Assemble one tensioning tool to each bolt. Occasionally, depending upon the pitch of the bolting, the tensioners may be able to be assembled on one side of the flange. Otherwise, 50% of the tensioners are to be assembled to one side of the joint with the remaining on the opposite. Upon hose connection ensure that tensioners from both sides of the flange are connected into the hydraulic hose harness.

STAGE 3 Apply the *'Pressure 2'* as indicated in the bolt tensioning data. Whilst maintaining the system under pressure, turn down the flange nuts using a toggle bar. Always tap the toggle bar using a hammer to firmly seat the nut against the flange surface.

STAGE 4 Release the system pressure and repeat STAGE 3 twice further, i.e. apply *'Pressure 2'* and turn down nuts three times.

NOTE: It is often advisable to continuously re-apply *'Pressure 2'*, especially with Ring Type Joints, until no further movement of the flange nuts can be obtained. Also, it may be beneficial to allow a few minutes between each pressurisation to allow the gasket to bed in.

STAGE 5 As a check, apply *'Pressure 2'* once more and attempt to further tighten the flange nuts. If the nuts cannot be further tightened, then tensioning is complete and the tensioning tools may be removed.

If the flange nuts can be further tightened, then *'Pressure 2'* must be continuously re-applied until no further movement of the flange nuts can be obtained.

The bolt tensioners may now be removed

STAGE 6 As a final check, using a hammer, 'ring' each bolt to ensure that no loose bolts remain

6.3 BOLT DE-TENSIONING PROCEDURE

When de-tensioning, specific tool pressures are not normally available as it is not always possible to calculate the pressure at which the flange nut will break free. As a guide, if the original flange bolt tightening pressures are available, the de-tensioning pressure is usually marginally higher than the original tensioning pressure (but not always)

SAFETY: Prior to commencement of bolt de-tensioning ensure that:

a) All necessary safety precautions have been carried out
b) Personnel involved in bolt tensioning are competent and fully trained in the use of bolt tensioners and tightening techniques.
c) The joints / pipework to be worked on are not 'live'. Joints must be at zero pressure and free from hazardous substances.
d) The maximum pressure that can be applied has been calculated to ensure that either 85% of bolt material yield is not exceeded or the maximum tool pressure is not exceeded, whichever is the lower. Pump must be pre-set to achieve this.

STAGE 1 Assemble the tensioning tools to the bolts. With the pulling sleeve fully screwed down and seated on the piston, unscrew the pulling sleeve through one half turn. This will prevent the pulling sleeve becoming locked onto the piston when the bolt tension is released.

STAGE 2 Insert a toggle bar through the tensioner bridge window and into a hole in the nut rotating ring. Apply hydraulic pressure to the system until the flange nuts can be rotated, ensuring that the piston does not exceed maximum stroke or system pressure does not exceed that indicated in (d) above.

STAGE 3 Turn back each flange nut through one full turn (6 holes on the nut rotating ring).

STAGE 4 De-pressurise the system and check to see that the flange nuts are still free to rotate.

STAGE 5 Remove the bolt tensioners. If the pulling sleeve cannot be unscrewed and the flange nut is also tight, then the pulling sleeve has locked onto the top face of the flange nut - see STAGE 6. If the pulling sleeve cannot be unscrewed but the flange nut is free, then the pulling sleeved has locked onto the piston - see STAGE 7.

STAGE 6 Pulling sleeve locked onto top face of nut - If the flange nut is unscrewed further than that indicated in STAGE 3, it can cause the nut to become locked onto the pulling sleeve when bolt tension is released. To release the pulling sleeve / flange nut, the hydraulic pressure must be re-applied and the flange nut rotated clockwise (to tighten) half a turn (3 holes on the nut rotating ring). Upon de-pressurisation the pulling sleeve should be free to rotate.

STAGE 7 Pulling sleeve locked onto piston - This occurs if the pulling sleeve has not been unscrewed sufficiently in STAGE 1 (half a turn may be insufficient for fine threaded bolts) causing the pulling sleeve to become locked onto the piston as the tension is released in the bolt. To release the pulling sleeve, re-apply the hydraulic pressure and turn down the flange nut. Upon depressurisation, the pulling sleeve should freely rotate. Unscrew the pulling sleeve a further half turn and repeat STAGES 2 to 5.

7. MAINTENANCE

In order to keep the tensioning system in good working condition, it is recommended that simple post use maintenance be carried following each period of use.

7.1 SRT TENSIONING TOOLS - POST USE MAINTENANCE

Post use maintenance can be carried out as follows:

a) Ensure that all tensioning tool pistons are fully retracted. On SRT tensioning tools, the pistons may be retracted by simply connecting to the pump unit and allowing the hydraulic oil to drain back to tank.

b) Clean any debris from the surfaces of tensioning tools and bridges using a clean cloth. Clean pulling sleeves, particularly the thread.

c) Spray all components with a water-repellent spray (such as WD40).

7.2 HYDRAULIC HOSES - POST USE MAINTENANCE

a) Clean and inspect each hydraulic hose and quick connect coupling. Check the entire length of the hose for cuts, abrasions and damage. Any evidence of hose damage and the entire hose must be replaced.

b) Coat each quick connect coupling with a water repellent spray (WD40), retracting and releasing the collars several times to ensure correct operation and ingress of repellent spray.

8. SERVICING AND REPAIRS

8.1 GENERAL SERVICING

It is recommended that servicing is carried out on an annual basis. The Manufacturer or Approved Service Agent should carry out any repairs and servicing (other than post use maintenance). All components shall be inspected and critical components subjected to non-destructive testing. Hydraulic cells will be pressure tested and issued with Test Certification.

8.2 PULLING SLEEVE LIFE

Due to the nature of operation of the pulling sleeve, for safety reasons, it is recommended that it should be regularly inspected for signs of damage, wear and cracks. Particular attention should be paid to the fillet radius under the pulling sleeve head and the threaded barrel portion, both inside and out. The pulling sleeve should be replaced if any dents, score marks or cracks are evident, as these can be potential stress raisers and could lead to component failure.

Where possible the user should keep record of the approximate number of load cycles that the pulling sleeves have completed and look to replace at no more than 3000 cycles. If the number of cycles are unknown then it is recommended that the pulling sleeves are replaced every 5 years.

8.3 WARRANTY

All SRT Bolt Tensioners are supplied under the Manufacturers' standard terms and conditions.

All components shall be guaranteed for a period of twelve months from the date of purchase against material defects and workmanship. All components shall be guaranteed for a period of twelve months from the date of purchase against defects arising from normal use with the following exclusions;

- Hydraulic seals and back-up rings
- O-ring seals
- Quick-disconnect couplings
- Labels and decals
- Tommy bars
- Paints and coatings
- Plastic screws
- Springs

End of Life and Disposal

In accordance with our End of Life Policy, should the product be no longer required for use, it should be returned to SPX Bolting Systems where it shall be disposed of in a safe and environmentally friendly manner.

9. FREQUENTLY ASKED QUESTIONS

1. How will I know when the over-stroke eliminator valve operates?

   The valve will only operate if the maximum piston stroke is exceeded. When the valve operates the pump will suddenly lose pressure (or will not further build up pressure) and the maximum stroke indicator line on the piston will be fully visible. During operation of the valve, hydraulic oil will be vented from the underside of the hydraulic cell.

2. I have completed a bolt tensioning operation and some of the bolts are still loose?

   The flange nut not being fully seated against the flange surface due to a poor or damaged thread may cause this. When turning the flange nuts down, look through the cut out in the bridge (underneath the toggle bar window) to ensure that the nut has contacted the flange surface.

3. How long should it take for a tensioner piston to retract?

   Depending on how many tensioning tools are assembled, it may take several minutes. Ensure that the all hoses are still assembled and the pump hydraulic oil pressure release valve is fully opened.

4. Can other types of pump and hoses be used with the tensioning tools?

   Always use the recommended pump unit and hose systems as they are certified for use at the maximum pressures of the tensioning tools.

5. The pump shows pressure, but some or all of the tensioning tools do not pressurise/operate?

   Ensure that all hoses and quick connect couplings are fully connected. Quick connect couplings are self sealing and will not allow hydraulic oil to flow unless fully connected. Check that hoses are not kinked. If tensioners will still not operate, check for a blocked hose or coupling.

6. The specified tensioning pressure cannot be reached?

   Check for any obvious leaks from the pump, hoses and tensioning tools. Look for any tensioners which are at full stroke (overstroke eliminator valve may have operated). Check that the pump pressure release valve is firmly closed. Check that the bolt materials are correct and tensioning pressures are correct for bolt material (it could be that bolts are being stretched beyond yield).

7. Why do I need to apply pressure and turn the flange nuts down three times during a tensioning operation?

   Applying the pressure three times attributes to the bedding process of the flange nut and flange surface, thus reducing load loss and residual bolt load scatter.

8. Can the SRT Tensioner be used underwater?

   The SRT Tensioning system has not been designed for use in underwater environments. Use the purpose designed SST subsea range of tensioning tools.

9. Following de-tensioning a studbolt, the pulling sleeve appears to be locked, how can it be removed?

   If the pulling sleeve cannot be unscrewed and the flange nut is also tight, then the pulling sleeve has locked onto the top face of the flange nut. To release the pulling sleeve / flange nut, the hydraulic pressure must be re-applied and the flange nut rotated clockwise (to tighten) half a turn (3 holes on the nut rotating ring). Upon de-pressurisation the pulling sleeve should be free to rotate.

   If the pulling sleeve cannot be unscrewed but the flange nut is free, then the pulling sleeved has locked onto the piston. To release the pulling sleeve, re-apply the hydraulic pressure and turn down the flange nut. Upon depressurisation, the pulling sleeve should freely rotate. Unscrew the pulling sleeve a further half turn and repeat the de-tensioning operation.

SPX Bolting Systems
4 Wansbeck Business Park
Rotary Parkway
Ashington
Northumberland
NE63 8QW
Tel. +44 (0) 1670 850580
Fax +44 (0) 1670 850655
www.spxboltingsystems.com

DECLARATION OF INCORPORATION

INDIVIDUAL MACHINE / ASSEMBLY/ COMPONENT

We declare that this product complies with the appropriate ESR's of the following directives,

- **2006/42/EC**

Where appropriate the requirements of the following standards have been invoked,

- **EN 292/2/91**

Product description : HYDRAULIC BOLT TENSIONER.

Model type : SRT0, 1, 2, 3, 4, 5, 6, 7, 8 HYDRAULIC BOLT TENSIONERS.
MRT1, 2, 3, 4, 5, 6 HYDRAULIC BOLT TENSIONERS.
SST1, 2, 3, 4, 5, 6, 7 HYDRAULIC BOLT TENSIONERS.

In addition, the goods supplied have been classified as Category 1 (Mod A) according to the EC Pressure Equipment Directive (PED) 97/23/EC.

SPX BOLTING SYSTEMS, is the person authorised to compile the technical file.

SPX BOLTING SYSTEMS, the manufacturer / supplier, undertake to transmit and / or make available in response to reasoned request, technical file details and other relative information to EEC National Authorities, in electronic or hard copy format

Installation and operation of this equipment must be in accordance with the installation and operating instructions provided. This product must not be put into service until the machinery into which it is incorporated has been declared in conformity with the provisions of the above directives.

The Company Directors are the equally responsible persons. The person named below is empowered to act as signatory on behalf of the Company Directors

Signed: D. Campbell

Printed: **DAVID CAMPBELL** **Date:** **29th December 2009**