



OPERATING MANUAL

1.1-GENERAL

The aim of the Rapid-Torc Tensioning System is to quickly and accurately apply a pre-determined load to a nut. It has been primarily developed for use where safety, speed, ease of operation and reliability are paramount.

In use, a TRT Tensioner is attached to every other stud bolt (every stud for 100% cover) in the joint assembly allowing simultaneous and uniform bolt tightening. The TRT Tensioner is applied to an extended portion of the stud bolt, passing through a standard hexagon nut. A Puller is then fitted to the stud bolt protruding above the nut and screwed down until sits against the tensioner piston. Each TRT Tensioner is connected together using high pressure, flexible hoses to form a hydraulic 'harness', which is connected to the pump via the feed hoses.

A pre-determined hydraulic pressure is applied to the system, thus stretching the stud bolt as the piston pushes against the puller. As the stud bolt stretches, the standard hexagon nut lifts from the flange surface. The bolt load is retained in each bolt by inserting a tommy bar through the TRT Tensioner bridge window, into the nut's socket drilled hole and turning in a clockwise direction until the nut sits against the flange surface. The hydraulic pressure is released and the load is retained in each bolt whilst the piston automatically retracts ready for the next tightening operation. The TRT Tensioners are then removed as bolt tightening is complete.

1.2-NORMAL USE OF TRT TENSIONER

- 1.2.1 With the appropriate thread protrusion above the top of the nut. In general the length of the protrusion must be minimum one and a half the height of the nut or one and a half the stud diameter.
- 1.2.2 With 8-UN (i.e.: 2 ½"-8UN) or Metric threads (M30x3,5). Can be also applied others threads forms.
- 1.2.3 With heavy hexagon nuts or any others specific nuts such cylindrical nuts.
- 1.2.4 Where the contact area of the flange for the bridge is flat and complete. When washers are used, then they must be through hardened and have a diameter greater or just a few smaller than the bridge internal diameter.
- 1.2.5 Where the tool is removed from the application once the load has been introduced into the threaded fastener. The TRT tool is not designed to induce and maintain the load in the fastener for a long period of time such as hydraulic nuts
- 1.2.6 Where the appropriate adapters kit (specified bridge, puller and socket) are used for the stud
- 1.2.7 *Uncoated (i.e. not hot dip galvanized or PTFE or similar coated). These processes can be accommodated upon request.*

- 1.2.8 On standard ANSI B 16.5, MSS-SP44 & API 6A flanges. (Although the compact design enables use on many other applications) However, if the application is not standard, dimensional clearances should be checked.
- 1.2.9 On Non live joints (i.e. no line pressure or medium present).

1.3-INCORRECT USE OF EQUIPMENT

The equipment cannot be used:

- 1.3.1 Without the correct bridge fitted, as the load cell spigot may be damaged.
- 1.3.2 As multiple units on the same fastener (i.e. one Tensioner being placed on top of another to increase the load in the fastener). Load will be transferred to the bottom tensioner, possibly resulting in tool failure.
- 1.3.3 When the bridge is not sitting squarely on the flanges surface (i.e. the axis of the tool is not parallel to the axis of the fastener). Possible causes are due to the flanges /pipe weld obstructing the load cell, or the flange hub radius, obstructing the bridge. Upon pressurization, the tensioner will have a tendency to self align, which may result in damage to the tensioner or plant.
- 1.3.4 Without a puller, whereby a standard hex nut is used as a reaction nut. The piston will be damaged unless a suitable washer is provided between the reaction nut and piston.

1.4-TENSIONER FEATURE

Considering the working environment for both equipment and operator, the TRT Tensioner has been designed to include a host of features to benefit its use and operation.

1.4.1 OVERSTROKE ELIMINATION

Tensioners TRT-2 to TRT-9 incorporates a system to prevent over stroking, thus eliminating unnecessary seal damage and downtime. The system is activated when the piston exceeds maximum stroke of 15mm – 0,59” and safety vents the hydraulic fluid inside the tool without risk on the operator.

1.4.2 RAPID POWER SPRING RETURN STROKE

Automatic, spring assisted piston return reduces the duration of tensioning programmed.

1.4.3 COMPACT DESIGN

Compact tool design allows easier access into restricted applications and low headroom clearances.

1.4.4 PISTON STROKE INDICATOR

The red colored piston stroke indicator allows piston stroke to be viewed, measured and controlled.

1.4.5 SEALS

Low friction and anti roll/non spiraling seals and rigid back-up rings are incorporated within a unique piston/cylinder design for improved life and reliability.

1.4.6 NUT'S SOCKET

A range of nut's sockets are incorporated to eliminate the need for, and preparation of pre-drilled nuts.

2.0 TECHNICAL SPECIFICATION

2.1-TRT BOLT TENSIONER

2.1.1 PUMP REQUIREMENTS

Air Source	½" nominal diameter hose supply
Air Consumption	28 CFM at 100 psi / 7 Bar
Air Pressure	80-100 psi

Prior to use, check the following fluid level;

2.1.2 HYDRAULIC FLUID RESERVOIR

Ensure tank is full. Fill it up if necessary.

2.1.3 AIR LUBRICATOR

Check oil level. To fill, unscrew bowl and fill to within ¼" of the top. Use pneumatic tool oil, typically Silkolene Icefree (available at Rapid-Torc). Check the lubricator oil drip feed rate. With the pump running, (ensure the hydraulic oil return valve is open) adjust the drip rate to give one drop of oil to every twenty strokes of the pump.

2.1.4 AIR FILTER REGULATOR

The air filter regulator drain automatically the water from filter bowl before it reaches the level of the lower baffle. Check the system during operation when air compressed is humid or when weather is cold and humid. Use drain plug-valve situated on the bottom of the filter bowl.

2.1.5. AIR HOSE

Check air coupling to make sure that the hose coupling is safely tight and secure in the air coupling from the pump. Check integrity of the air hose

3-JOINT FLANGE PREPARATION

3.1 Stud Bolt Preparation

Simple stud bolt preparation will significantly reduce the risk of problems that occur during the application and operation of the TRT tensioners. Therefore, we would recommend that the following preparations and checks are adopted whenever possible.

- 3.1.1 To accommodate the TRT tensioner, an extended portion of the stud bolt is required above the hexagonal nut. It is recommended that this extension be a minimum of 1 ½" the nut's height.
- 3.1.2 The hexagonal nut must be free running on all bolts over the length protruding through the flange faces. The puller must be free running on all bolts over the extended portion above the nut.
- 3.1.3 Protect the stud bolt protrusion using sleeves, adhesive tape, etc. This will protect the threads from knocks and damage during installation.
- 3.1.4 Ensure that the socket fits over the nut. (Machined nuts generally have sharp A/C and hence, may foul the nut's socket)
- 3.1.5 It is advisable that upon completion of the tensioning operation protector caps be fitted to the nut/thread protrusion. This will minimize corrosion and therefore assist in future disassembly.

3.2 Flange and Stud Bolt Assembly

Prior to the installation of the flange stud bolts, it is recommended that the flange is squared and brought into close contact. The stud bolts and gasket may be installed once the flange faces are square and in close proximity.

The stud bolts must be installed in a specific manner depending on whether 100% tensioner coverage or 50% coverage is adopted.

3.2.1 Stud Bolt Installation for 100% Tensioner Coverage (Fig 2A)

Using this method of assembly all stud bolts are tensioned in one operation. In order to achieve this, the stud bolts must be assembled with the thread protrusions staggered over each side of the flanged joint as illustrated in Fig 2A.

3.2.2 Stud Bolt Installation for 50% Tensioner Coverage (Fig 2B)

This method of installation is normally used where stud bolts are required to be tensioned from one side of the flange only, due to an access restriction on the opposite. It is basically a two stage tensioning operation where 50% of the stud bolts are tensioned on the first stage, followed by the remaining 50% of the stud bolts in the second stage. In order to adopt this method, the stud bolts must be assembled with the protrusions on the same side of the flange as illustrated in Fig 2B.

TENSIONING TOOL TRT ASSEMBLY

4.1 Assembling the TRT Tensioner

IMPORTANT NOTICE: If de-tensioning, refer to section 5.3

- 4.1.1 Ensure that the bridge and puller sizes are compatible with the thread form of the fastener to be tightened.
- 4.1.2 Ensure that the piston in the load cell is fully retracted. If not, just plug the TRT Cell to the pump. The piston returns due to the spring action.
- 4.1.3 Ensure that bridge is held by the TRT Cell by retaining screws.
- 4.1.4 Ensure that socket is held by the Bridge by retaining screws.
- 4.1.5 Tight nut firmly to the flange surface.
- 4.1.6 Check that the length of free stud over the nut equals to minimum one and a half the height of the nut.
- 4.1.7 Place the TRT assembly (Load cell, Bridge and Socket) over every nut ensuring that one of the two windows of the bridge faces outwards.
- 4.1.8 With the tommy bar, screw down the puller on the stud until the puller sits on the piston.
- 4.1.9 **VERY IMPORTANT:** When the puller sits on the piston, unscrew the puller from half of a turn using the tommy bar. This operation allows the operator to remove the tensioner from the bolt after tensioning.
- 4.1.10 TRT tensioners are now assembled.

4.2-HOSE CONNECTION

- 4.2.1 Each Load cell TRT owns two port manifold different (a male port and a female port). Connect tensioners together either in a clockwise or counter-clockwise direction around the flange
- 4.2.2 Ensure that the pump hydraulic oil return valve is fully open.
- 4.2.3 Two feed hoses from the power pack must be connected to the tensioners to complete hydraulic harness.
- 4.2.4 No unconnected couplings should exist when the hydraulic harness is complete. All hoses are fitted with quick disconnect.

4.2.5 Connection couplings are reference 10.116.1219 + 19.950.1601 & 10.116.6202 + 19.950.1601.

5-BOLT TENSIONING PROCEDURES

5.1 RAPID-TORC TRT BOLT TENSIONING PROCEDURE-100% TOOL COVER

Scope

This is a general tightening procedure for use with Rapid-Torc TRT bolt tensioners, for bolting of standard pressure containing flanged joints fitted with standard gaskets, (i.e. Spiral Wound, RTJ, CAF, etc.). The procedure has been compiled to accurately and efficiently achieve a pre-determined residual bolt stress.

Pre-Requisites

Before any job you MUST check that:

- a) All personnel are aware of all safety precautions.
- b) All personnel are competent and trained in the use of the equipment for joint tightening procedures.
- c) The Client approves the procedure prior to start

STAGE 1 Using tensioning tools (if necessary), square up the flanged joint.

STAGE 2 Assemble one tensioning to each bolt. Depending upon the pitch of the bolting, the tensioner cylinders may foul each other if attempting to assemble all tensioners to one side of the flange only. If this occurs, it will be necessary to assemble 50% of the tensioners to one side and the other 50% to the other. When connecting hoses ensure that the tensioners on both sides of the flange are connected into the hydraulic loop.

STAGE 3 Apply the 2nd pass pressure as specified in the tensioning data and turn down the flange nuts using a tommy bar (whilst tensioners are under pressure). Always tap the tommy bar using a hammer to firmly seat the nut against the flange surface.

NOTE: 1ST pass pressure should be ignored when adopting 100% tool coverage.

STAGE 4 Release the system pressure and repeat STAGE 3 twice. Apply pressure and turn down nuts three times.

STAGE 5 As a final check, apply the pressure once more and attempt to further tighten the flange nuts, if the nuts cannot be turned, then tensioning is complete and the system may be depressurized and the tensioners removed.

If the nuts can be turned, then STAGES 4 and 5 must be repeated until no further movement is obtained.

STAGE 6 Using a hammer; 'ring' each nut to ensure that each bolt has been correctly loaded and that no slack bolts remain.

The above tensioner procedure is typical only. Should the operator wish to adopt their own 'tried and tested' tensioning procedure with the RAPID-TORC TRT equipment, then RAPID-TORC will be pleased to advise accordingly.

5.2 RAPID-TORC TRT BOLT TENSIONING PROCEDURE-50% TOOL COVER

The following procedure is extracted from RAPID-TORC specification XXXXXXX.

Scope

This is a general tightening procedure for use with RAPID-TORC TRT type bolt tensioners for the tension tightening of standard pressure containing flanged joints fitted with standard gaskets. (I.e. Spiral Wound, RTJ, CAF, etc.) The procedure has been compiled to accurately and efficiently achieve a pre-determined residual bolt stress.

Pre-Requisites

The Client must assure that:

- a) Risk to personnel and assets have been assessed and that all necessary safety precautions are being carried out.
- b) All personnel employed in using this procedure are competent and trained in the use of the equipment and joint tightening procedures.
- c) The Client must approve this procedure prior to commencement of work.
- d) Tensioning pressures to be used are those as recommended or compiled by RAPID-TORC.

- STAGE 1** Number each bolt consecutively; 1, 2, 3 etc.
- STAGE 2** Using tensioning tools (if necessary), square up the flanged joint.
- STAGE 3** Using tensioning tools to 50% of the bolts (i.e. all odd numbered bolts), apply the 1st Pass pressure as specified in the tensioning data and turn down the flange nuts using a tommy bar (whilst tensioners are under pressure). Always tap the tommy 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 the 1st Pass pressure and turn down three times.
- NOTE: When tightening flanges fitted with RTJ gaskets, it is advisable to continuously re-apply the 1st Pass pressure until no further movement of the flange nuts can be obtained. It may also be an advantage to allow a few minutes between each pressure application to allow the gasket to 'bed in'.
- STAGE 5** Move tensioning tools to the remainder of the bolts (i.e. all even numbered bolts); apply the 2nd Pass pressure as specified in the tensioning data and turn down the flange nuts.
- STAGE 6** Release the system pressure and repeat STAGE 5 twice further, i.e. Apply 2nd Pass pressure and turn down nuts three times.
- STAGE 7** As a final check to see if an excessive load has been lost in the bolts tightened on the 1st Pass, assemble two tensioners on the bolts randomly selected but diametrically opposite (from 1st Pass only), apply the 2nd Pass pressure and attempt to further tighten the flange nuts. If the nuts cannot be turned, then tensioning is complete and the system may be depressurized and the tensioners removed.

If the nuts can be turned, then re-assemble the tensioning tools to remainder of the bolts (i.e. all odd numbered bolts), apply the 2nd Pass pressure and turn down the flange nuts once more.

STAGE 8 Using a hammer; 'ring' each nut to ensure that each bolt has been correctly loaded and that no slack bolts remain.

The above tensioner procedure is typical only. Should the operator wish to adopt their own 'tried and tested' tensioning procedure with the RAPID-TORC TRT equipment, then RAPID-TORC will be pleased to advice accordingly.

5.3 RAPID-TORC TRT BOLT DE-TENSIONING PROCEDURE

A hydraulic tool pressure for de-tensioning is not normally provided as it is not always possible to predict the pressure at which the nut will break free. However, it is beneficial to be aware of the original 'make-up' tensioning pressure before the de-tensioning procedure is carried out as generally, the de-tensioning pressure is marginally higher than the original make up pressure.

A general de-tensioning procedure is described below.

STAGE 1 Pre-set the pump unit to deliver the maximum system working pressure of 21750 psi (1500bar).

STAGE 2 Assemble the tensioners and harness as per section 4. With the puller screwed down and seated on the piston, now unscrew the puller through ONE HALF TURN. This will raise the knurled section of the puller above the top washer, preventing the puller from becoming locked on the piston when the bolt tensioner is released.

STAGE 3 With the tensioners assembled and the hydraulic harness connected; close the hydraulic oil release valve and apply a nominal hydraulic tool pressure of 1000psi. Check the tensioners for squareness and centralization.

STAGE 4 Insert the tommy bar through the bridge window and into a hole in the socket. Increase the hydraulic pressure to the system, ensuring that the piston does not exceed its maximum stroke, thus activating the over stroke eliminator. (If the over stroke eliminator is activated, a significant reduction in oil pressure will be observed on the pressure gauge) Apply the hydraulic pressure to the system until the hex nuts within the bridge insert can be rotated. If over stroking occurs, then repeat STAGES 2 to 4.

STAGE 5 Turn back each nut through a minimum of two thirds of one full turn (approx 4 holes on the bridge insert) and no more than one full turn (approx 6 holes on bridge insert).

STAGE 6 Depressurize the system allowing the pistons to automatically retract. Check to see if the nuts are still free to rotate.

STAGE 7 Remove the tensioners. If the puller cannot be unscrewed, and the nut is also tight, then the puller has locked on the top face of the nut (see stage 8). If the nut can be rotated, then the puller has locked onto the piston. (See stage 9)

STAGE 8 **Puller Locked on the Top Face of the Nut**

Unscrewing the nut further than specified in STAGE 5 can cause the puller to become locked on the top face of the nut when the tension in the stud is released. To release the puller the hydraulic pressure must be re-applied and the nut rotated via the bridge insert until the nut seats

on the flange/joint face. Depressurize the system, the puller should now be free to be turned, if not, repeat until it can be unscrewed.

STAGE 9 Puller Locked onto the Piston

This situation may only arise on the studs with fine pitches, whereby unscrewing the puller through one half turn (STAGE 2) has been insufficient and upon releasing the hydraulic pressure (tension in the stud) has caused the puller to become locked on the piston. To release the puller the hydraulic pressure must be re-applied and the nut rotated via the bridge insert until the nut sits on the flange/joint face. Depressurize the system, the puller should now be free to be turned by hand.

6-AIR OPERATED PUMP UNIT

6.1 GENERAL

The air operated pump unit consists of the following main components, Ref fig 5.

6.1.1 PUMP

An air operated reciprocating piston type pump, which operates on the principle of pressure intensification via differential areas, i.e. a large, low pressure air piston drives a much smaller hydraulic piston to provide oil flow at high pressure.

6.1.2 AIR FILTER/REGULATOR

A combined unit consisting of an air filter, air pressure gauge and air pressure regulatory assembly. The air filter removes water and foreign particles from the inlet air supply, and should be periodically cleaned and drained.

The air regulator is used to regulate the incoming pressure and can be used to set the pump stall when a pre-determined hydraulic pressure is attained.

The inlet air supply is connected directly to the air filter/regulator unit via a quick disconnect coupling.

6.1.3 AIR LUBRICATOR

Connected directly onto the air filter/regulator unit, it is used to lubricate the incoming air supply and hence lubricate the pump unit.

6.1.4 PUMP START/STOP VALVE

A simple manual on/off valve to start and stop the air supply to the pump. The speed of operation of the pump can be finely regulated using this valve.

6.1.5 HYDRAULIC OIL RETURN VALVE

A high pressure valve allowing hydraulic pressure to be built up when closed, and released when opened, diverting the hydraulic oil back to the reservoir.

6.1.6 PUMP EXHAUST SILENCER

A muffle/filter connected to the pump exhaust port to reduce the operating noise level.

6.1.7 PRESSURE GAUGE

A Budenberg 0-25000psi oil pressure gauge positioned behind a protective wire guard.

6.1.8 HYDRAULIC RESERVOIR

A tank of approximately 9 liters (2 gallons) capacity incorporating an external transparent tube type level indicator. Filters are fitted into the filler neck and the oil port.

6.2 OPERATION

It is always good practice to regulate the pump to stall at the pre-determined hydraulic pressure required to achieve the desired bolt load. Failing this RAPID-TORC demand that the pump is regulated to stall at 21750psi. This can only be carried out on-site as the air consumption and pressure determine the pressure out-put. The recommended pump operating procedure is indicated as follows:

- a) Connect two blanked –off female quick disconnect coupling (as supplied in the ancillary equipment) to the pump hydraulic oil outlets.
- b) Open the hydraulic oil return valve to tank (counter-clockwise). Ensure the valve is fully open.
- c) Close the pump start/stop valve (handle in vertical position).
- d) Connect an external air supply line to the pump unit.
- e) Turn the air filter/regulator adjusting screw counter-clockwise until zero pressure reads on the air pressure gauge.
- f) Open the pump start/stop valve (handle in horizontal position). The pump should not operate as the regulator has been set to produce zero air pressure. Should the pump operate, then re-adjust the air pressure regulator until the pump stops.
- g) Close the hydraulic oil return valve (clockwise).
- h) Turn the air filter/regulator adjusting screw slowly clockwise until pre-determined hydraulic oil pressure reads on the oil pressure gauge.
- i) Close the pump start/stop valve (handle in vertical position).
- j) Slowly open the hydraulic oil return valve (counterclockwise) to release the system pressure. Ensure the valve is fully opened.

The pump is now ready to be operated by using the pump start/stop valve. When the pre-determined required hydraulic oil pressure is reached, then the pump will automatically stall.

SAFETY NOTES ON PUMP OPERATION

- 1) Although the pump has been set to all the desired hydraulic pressure, it is always advisable to monitor the pressure as it is applied.
- 2) Never pressurize the pump unit without either a blank quick disconnect coupling or the completed hydraulic harness feed hoses attached.
- 3) Wear safety glasses at all times during pump operation.

- 4) Always depressurize the system when leaving unattended.

7-MAINTENANCE

7.1 POST-USE MAINTENANCE

In order to keep the equipment in good working condition it is important that at the end of each period of use, prior to being replaced into dry storage, a post-use maintenance is carried out.

TRT TENSIONER

- a) Unscrew the bridge retaining screws and detach the bridge assembly from the load cell. Inspect each sub assembly for any visible damage, leaks, etc.
- b) With the piston fully retracted in the load cell, unscrew the quick disconnect couplings. Unscrew the top washer retaining tools and remove the top washer and associate springs.

NOTE: As a nominal load is retained in the piston retraction springs, care must be taken when removing the final screw.

- c) Pull the piston free from the cylinder bore.
- d) Using either a clean cloth or compressed air, remove all dirt and debris from the piston and cylinder. It is very important that all dust and debris be removed from the seal/back-up rings as failure to do so may result in seal failure. If necessary, remove the back-up rings.
- e) Lubricate the seals and tensioner bores with silicone grease or clean hydraulic oil (Houghtosafe 620). Push the piston into the cylinder bore ensuring that the seal/back-up rings do not become nipped.
- f) Refit the springs, top washer and quick disconnect coupling.
- g) Clean the puller (in particular the thread), and bridge assembly. If necessary, remove the retaining pins and hence nut's socket.
- h) Assemble the tensioner onto a stud (see section 4) and pressurize in accordance with the maximum recommended tensioning pressure quoted in table 2.1, for approximately a minute. Piston stroke should be ministered to prevent the over stroke eliminator valve being activated.
- i) Having removed the tensioner from the stud coat each sub-assembly in a water repellent spray such as WD-40 or similar. Alternatively, rinse in light oil.
- j) Replace the dust caps on the quick disconnect couplings.

PUMP UNIT

- a) Inspect the unit for any visible damage such as leaks, etc.
- b) Clean the pump using a mild solvent where necessary.

- c) Clean, then coat each quick disconnect coupling in a water repellant spray such as WD-40 or similar, retracting and releasing the collars several times. Ensure that the collars do not seize in the retracted position.
- d) Coat all exposed/unprotected components in a water repellant spray such as WD-40 or similar.
- e) Check all fluid levels and fill/drain accordingly. (See section 2.2)

HOSES

- a) Clean, then coat each quick disconnect coupling in a water repellant spray such as WD-40 or similar, retracting and releasing the collars several times. Ensure that the collars do not seize in the retracted position. Visually inspect the entire length of the hose for damage. Test to maximum working pressure. (Ensure blanking plugs are inserted into small end of coupling.)

7.2 CHANGING THE SEALS

Hydraulic seal replacement must be carried out only if the seals become damaged. This seals should not be removed during post –use maintenance.

7.2.1 CYLINDER/PISTON SEALS

- a) Remove the piston as described in section 7.1 PS TENSIONER (b) and (c).
- b) Remove the back-up rings, then using a flat screwdriver, remove the piston/cylinder seals ensuring that the housing groove is not damaged.
- c) Inspect the seal housing grooves ensuring that they are clean and free from debris.
- d) Install the new seal assembly and fit the appropriate back-up rings, ensuring that the scarfed joint does not overlap.
- e) Lubricate the seals and tensioner bores with silicone grease or clean hydraulic oil (Houghtosafe 620). Push the piston into the cylinder bore ensuring that the seal/back-up rings do not become nipped.
- f) Refit the springs, top washer and quick disconnect coupling.

7.2.2 QUICK DISCONNECT COUPLING SEALS

A simple sealing arrangement exists between the PS tensioner body and the quick disconnect coupling. The seal consists of a simple O-Ring surrounded by a steel back-up ring located inside a counterpoint on the tensioner body behind the coupling. Should the seal leak or become damaged, then it should be replaced as follows:

- a) Unscrew the male quick-disconnect coupling.

NOTE: A ¼" BSP threaded adapter is fitted into the male quick-disconnect coupling. Under normal circumstances, this will remain an integral part of the coupling and should not be removed. However, should the adapter and coupling become separated or unscrewed, then the adapter must be reassembled into the

coupling and re-tightened. The ¼" BSP adapter should never be installed into the tensioner body before the male quick-disconnect and seals are attached.

- b) Remove and discard the O-Ring and steel back-up ring.
- c) Clean any dirt and debris from the tensioner body counter bore and the quick-disconnect coupling face.
- d) Insert the new back-up ring inside the counter bore followed by the O-Ring into the back-up ring.
- e) Lubricate the quick disconnect coupling thread with Omega 95 (Or similar lubricant with coefficient of friction (Mu)=0.12) and tighten to a torque of 45 lbf.ft (61 Nm). Ensure that the seal and back-up ring do not become dislodged or nipped.

7.3 TRT TENSIONER FULL MAINTENANCE/SERVICING

Other than post-use maintenance, repairs and servicing should be carried out by RAPID-TORC at intervals agreed by RAPID-TORC and customer. All parts will be thoroughly inspected and specified parts will be non-destructively tested using MPI techniques and replaced where necessary. Certain components (e.g. Seals) will be replaced automatically.

Tensioners will be re-assembled and pressure tested. A test certificate will be issued.

NOTE: All parts will have been manufactured, inspected and tested in accordance with the Rapid-Torc's stringent requirements. Any parts failing in use that are found upon Rapid-Torc's inspection not to be Rapid-Torc's genuine spare parts will invalidate any operative warranty or guarantee.

7.4 PUMP UNIT FULL MAINTENANCE/SERVICING

Other than post-use maintenance, repairs and servicing should be carried out by Rapid-Torc at intervals agreed by Rapid-Torc and customer. It is not recommended that the customer services or repairs their own pump unit, but should return it to Rapid-Torc where the pump can be serviced and repaired by qualified technicians. New components will be fitted where necessary and the pump calibrated and tested.

NOTE: Any pump parts failing in use that found upon Rapid-Torc's inspection not to be Rapid-Torc's genuine spare parts will invalidate any operative warranty or guarantee.

8-SAFETY NOTES

- a) Always ensure that a minimum length of thread equal to one and half bolt diameter is protruding above the nut to be tightened.
- b) Ensure that the nut height is equivalent to the diameter of the stud (except metric).
- c) Ensure that the fastener thread, form, and size correspond with that stamped on the top of the puller.
- d) Ensure that the load cell tool reference (i.e. TRT4) corresponds with that stamped on the top of the puller.

- e) Ensure that the bridge and insert correspond to that of the nut A/F.
- f) Ensure that the tensioner load cell is situated correctly and securely onto the appropriate bridge.
- g) Ensure that no loose objects are lodged between the piston and the top washer.
- h) When assembled, ensure that the knurled section of the puller is level with the top washer.
- i) Ensure that the tensioner is appropriately situated on the application, i.e. bridge sitting square on the flange surface, load has adequate clearance, and the bridge is not sitting on a washer of smaller diameter, etc.
- j) Do not, under any circumstances, exceed the maximum working pressure of 21750 psi (1500 bar).
- k) Ensure that the hoses are free of obstructions and do not cross such that upon pressurization, detrimental loads will be induced on the connectors and adapters potentially leading to failure.
- l) Never pressurize an uncoupled MALE quick-disconnect coupling.
- m) Never operate the tensioner without the puller fitted.
- n) Quick-disconnect couplings are susceptible to knocks and damage; therefore, take care when handling the equipment. A damaged coupling may prove very difficult to connect.
- o) Never attempt to disconnect or re-tighten any part of the hydraulic system while at pressure.
- p) Frequently check, top up or drain the pump unit fluid levels and ensure the lubrication drip rate is adequate. Failure to do so will cause premature wear resulting in improper running of the pump, needing repairs.
- q) Keep personnel clear while pressurizing the system. Ideally rope off the area and only allow relevant personnel to enter when necessary (e.g. to turn down the nuts).
- r) Personnel must never be positioned in the line of projection, i.e. along the axis of the stud/tensioner.
- s) Only use pumps and hoses supplied by Rapid-Torc. These have adequate factors of safety.
- t) Ensure that the strengths of the fasteners are known and that the recommended tensioning gross loads are well within the safe limits.
- u) Suitable protective overalls, eye protection, head wear, gloves and footwear must be worn at all times when using hydraulic equipment.
- v) Only use genuine Rapid-Torc parts.
- w) If any equipment abuse is evident, the warranty will be invalidated and Rapid-Torc will not be made responsible for an injury due to misuse or failure to comply with the above safety notes.
- x) Ensure that the joint being tensioned is not live (i.e. no medium present/line pressure reduced to zero).
- y) READ THE OPERATING INSTRUCTIONS

9-FAULT FINDING CHART

PROBLEM	POSSIBLE CAUSE	SOLUTION
Hoses difficult to assemble.	Damaged coupling Coupling locking collars not fully screwed back. Internal pressure in load cell, due to over tightening of puller	Replace coupling. Screw back collars. Unscrew puller.
PS pistons do not stroke (with no gauge pressure build up).	Open pump hydraulic oil return valve. Leaking/burst hose Leaking coupling seals Leaking tensioner seals Defective pump unit	Close valve Replace hose Replace coupling seals Replace seals Check pump for oil deliver
PS pistons do not stroke (with gauge pressure build up)	Coupling not assembled Incorrect 'harness' assembly	Check couplings Check harness
Pump does not operate	Air supply connected? Air regulator closed Start/stop valve closed	Connect air supply Set air regulator Operate valve
Pump stalls prior to reaching required pressure	Insufficient air supply Air pressure regulator	Increase air supply Adjust air regulator
Maximum pressure cannot be achieved, even when pump is running continuously	Leaking couplings Leaking tensioner seals Hydraulic oil return valve	Replace suspect couplings Replace suspect seals Fully close valve or replace
Pressure reading erratic	Defective gauge	Replace gauge
Puller will not screw down bolt/stud	Oversize bolts Differing thread form	Check bolt size Check thread form
Hydraulic fluid visible at top/bottom of tensioner	Maximum stroke achieved, over stroke eliminator valve activated (PS2-PS8) Leaking tensioner seals	Tighten nut and repeat procedure Replace seals
Pump runs erratically/jerky after a period of time	Foreign matter in hydraulic oil	Renew hydraulic oil

10-ANCILLARY EQUIPMENT

10.1 ANCILLARY EQUIPMENT

10.1.1 PUMP UNIT

A high delivery air powered pump unit used to supply hydraulic oil to the PS tensioner.

10.1.2 FEED HOSES

3 meters long, used to connect pump unit to PS tensioners.

10.1.3 INTERCONNECTING HOSES

1 meter long, used to link the tensioners together constructing a ring main harness.

10.1.4 BLANK FEMALE QUICK-DISCONNECT COUPLING

Used to blank the pump hydraulic oil outlets when pre-setting the pump hydraulic pressure.

*Included in recommended spare parts list.

10.2 RECOMMENDED SPARE PARTS (SALE EQUIPMENT ONLY)

2 Open ended female quick disconnect couplings (Part No: SY46)

2 Open ended male quick disconnect couplings (Part No: SY45)

2 Blank female quick disconnect couplings (Part No: EI-8)

2 Elbow couplings (Part No: EI-9)

Quick disconnect coupling seals (Part No: SAJSE2-104)

Cylinder Seal (for specific tensioner, refer to GA and part list)

Piston Seal (for specific tensioner refer to GA and part list)

Tommy bar (for specific tensioner)

Allen Key (for specific tensioner)

1 Gal Houghtosafe 620

½ Liter Silkolene Ice-free

1 can WD-40

10.3 SPARE PART ORDERING INFORMATION

The following information should be quoted when ordering spare parts.

- a) The assembly name and serial number, obtained from GA and Parts list/actual assembly (respectively).
- b) The component name and part number (obtained from GA and parts list)

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c) The contract number or approximate date the equipment was purchased.