

Prepared by:-	Malcolm Macfie	Approved by:-	Martin Davies	Date:12/09/14
REV NO:-	001			
ECO:-	4276			

WARNING!

All equipment used must be rated for the same operating pressure i.e. 1500Bar (21,750psi) **DO NOT MIX** high and low pressure components.

If in doubt, contact your local Hi-Force distributor.

SAFETY NOTES

Never attempt to use this high pressure equipment if you are in any doubt regarding the correct assembly and operation.

Always ensure the equipment is of Hi-Force supply and is in good working order.

Never use bolt tensioning equipment that has been modified or machined by anyone other than Hi-Force.

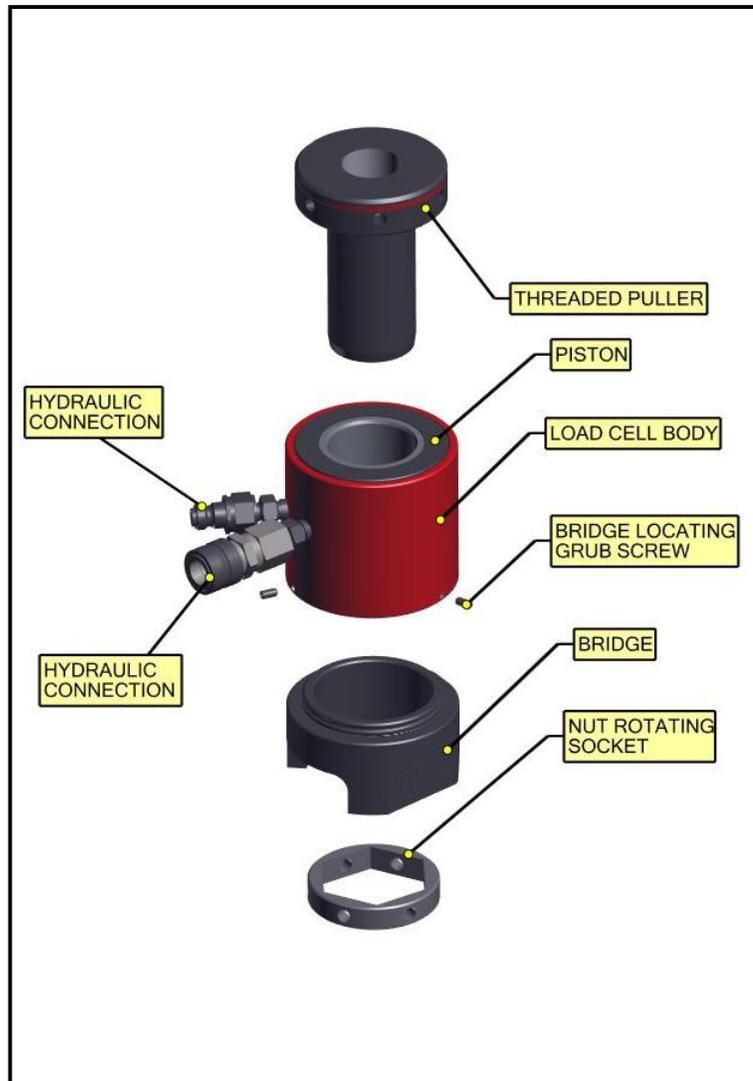
Always wear eye protection and gloves.

Ensure that all personnel in the immediate vicinity are aware that pressurisation of high pressure equipment is about to take place.

Only approach pressurised bolt tensioners when you are certain pressure is holding.

Never attempt to solve leaks in the system while the system is pressurised.

Do not exceed the maximum working pressure as stated on the load cell, or exceed the maximum piston stroke of the tool, as indicated by the marker band.



**FAILURE TO FOLLOW THESE INSTRUCTIONS WILL RESULT IN DAMAGE TO THE UNIT
OR MAY RESULT IN OPERATOR INJURY OR DEATH**

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TENSIONING

In order to apply an evenly distributed load to a bolted joint, the sequence in which hydraulic tensioners are applied to the joint is important. The exact detail of this sequence of bolts in the joint, and the number of bolt is dependent upon the number tensioners available.

STEP 1

Ensure there is sufficient stud protruding from the top of the nuts. A minimum of 1 x stud diameter is essential (see illustration below right).

Example: for a bolt size of M30 the minimum required stud protrusion is 30mm.

STEP 2

If holes are not drilled in the faces of the hexagonal nuts, assemble the nut rotating sockets over every alternate bolt to be simultaneously tensioned.

Tighten down every bolt on the flange using the Tommy bar supplied with the tensioning equipment.

Ensure the two halves of the joint are pulled firmly together.

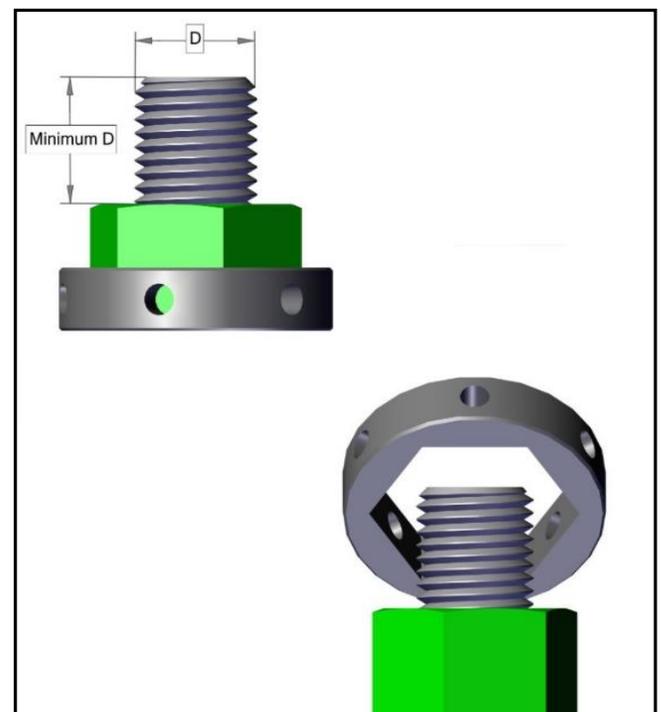
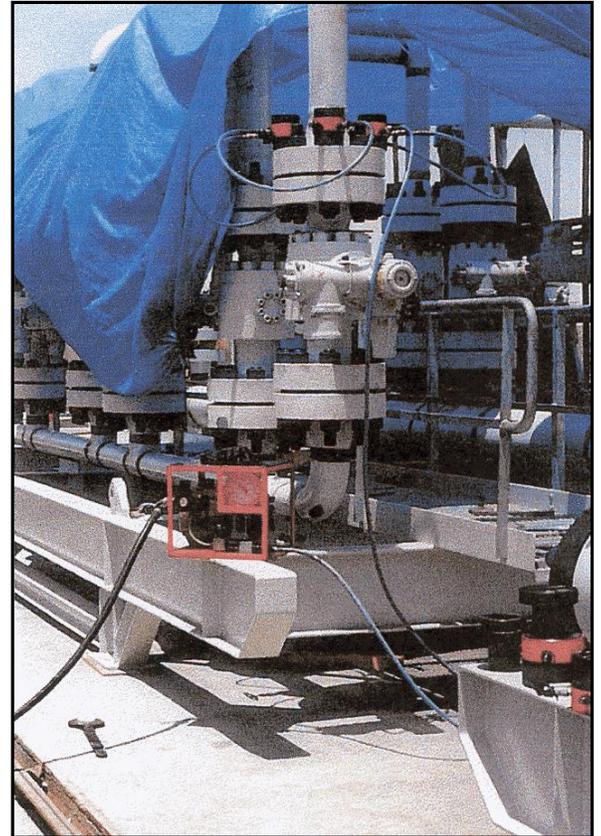
STEP 3

Assemble the load cell and bridge over the first 50% of the bolts to be tensioned (every alternate bolt).

Position the bridge window so that access to either the nut rotating socket or hexagon nut is comfortably achieved.

It is normal for the bridge window to face radially out from the centre of a circular flanged joint. Examine around the circumference of the bridge base to ensure it is sitting flat against the tensioning surface.

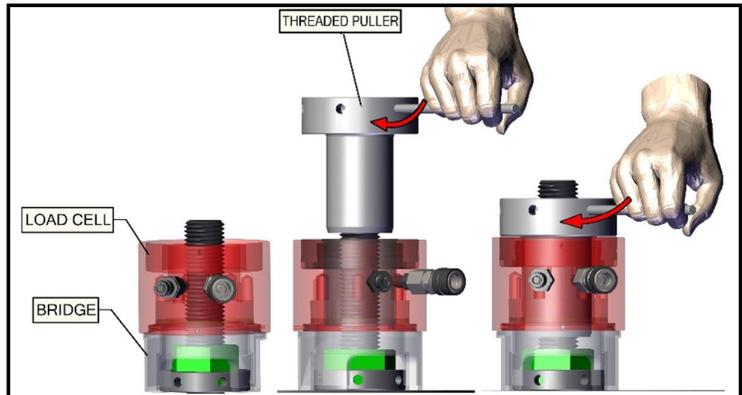
The bridge can be adjusted in relation to the load cell by means of 3 set screws, positioned around the base of the load cell.



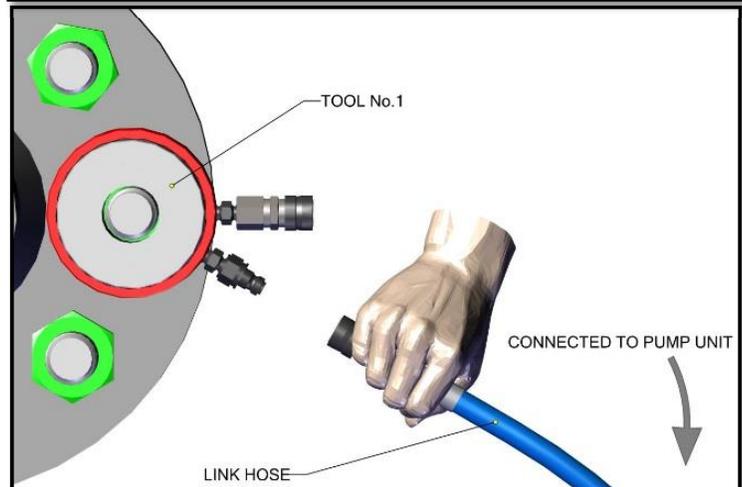
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STEP 4

Ensure the threaded puller is threaded to the same diameter, thread form and pitch as the bolts to be tensioned. Assemble the threaded pullers into each bolt tensioner, screwing down onto the threads protruding above the nut. Using the Tommy bar, fully screw down the inserts, until contact is made with the top face of the load cells.

**STEP 5**

Remove the plastic protection caps from all male and female quick connect couplings. Connect a link hose from the pump unit to the first tool, connection is made by pulling back the spring loaded collar on the female connection. Insert the male connector and release the female collar. A gentle tug on the link pipe should be enough to make sure the hose is connected properly.

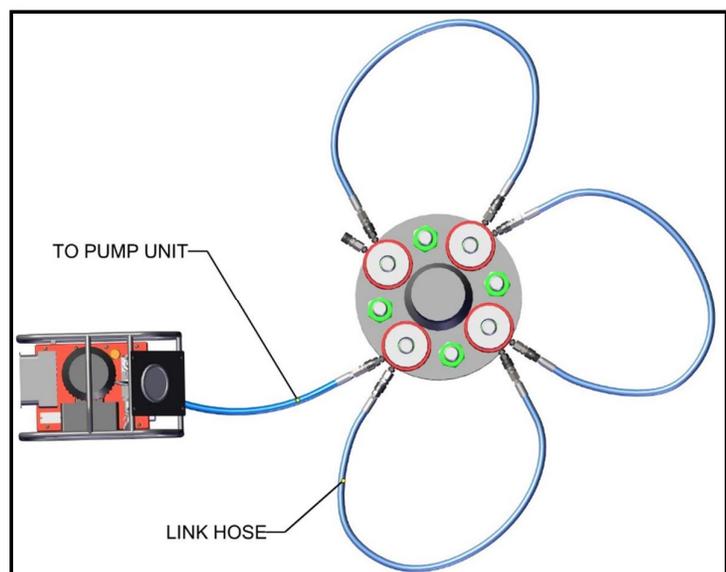
**SAFETY NOTE**

Link hose . maximum working pressure = 21750 psi (1500 Bar)

STEP 6

Continue until all of the tensioners are connected together with link hoses. The last tensioner in the system will have an unconnected female coupling, this is correct, and can be left un-connected, alternatively this last coupling can be removed and a suitable high pressure blanking plug fitted (consult Hi-Force for further details).

Never pressurise an un-connected male connector!



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TENSIONING PROCEDURE

The tensioning system is now ready to apply a bolt load to the joint. Before applying pressure to the system make sure you observe the following points

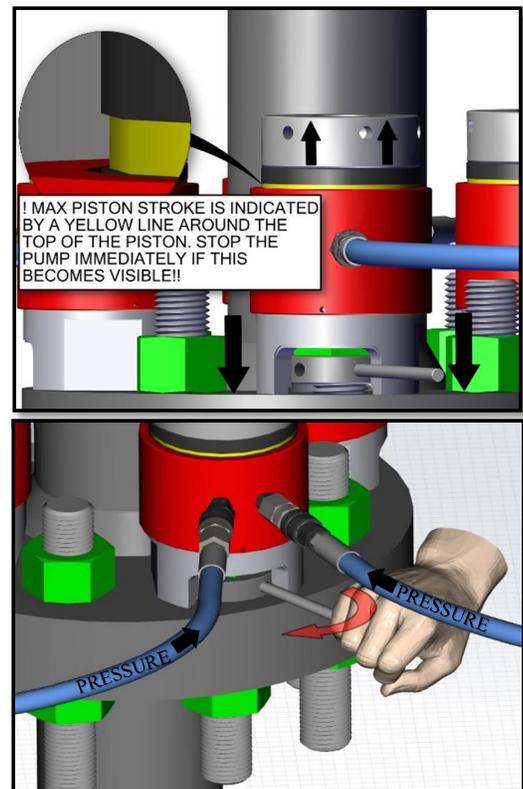
- You are aware of the correct operation of the pump unit.
- You are aware of the maximum working pressure of the tensioners.
- You are aware of the maximum piston movement of the tensioners.
- You are aware of the required working pressure that must be applied to the tensioners.
- It is recommended the next steps 7, 8, 9 are read and understood prior to tensioning.

STEP 7

During the pressurisation procedure, continually monitor both piston stroke and pressure. Never exceed either. If the maximum piston stroke is reached before the working pressure is obtained go to STEP 9. Close stop valve on pump unit, then pressure the system to the required pressure. When the required pressure is reached, stop the pump (by closing off the air supply shut off valve). At this stage, the bolts will be initially loaded, with the load being held by the tensioners.

STEP 8

Check the pump and gauge to ensure the pressure is holding firm. When you are satisfied the pressure is stable, approach the tensioners and by using the tommy bar, rotate the nuts, (through the bridge access windows) back down towards the face of the joint. Seat the nuts firmly against the joint, by use of a mallet and tommy bar (if the nuts are not seated firmly, the tensioning procedure will take much longer to complete). It is not important which order the nuts are tightened but to be sure of not missing one, it is recommended they are tightened in sequence.



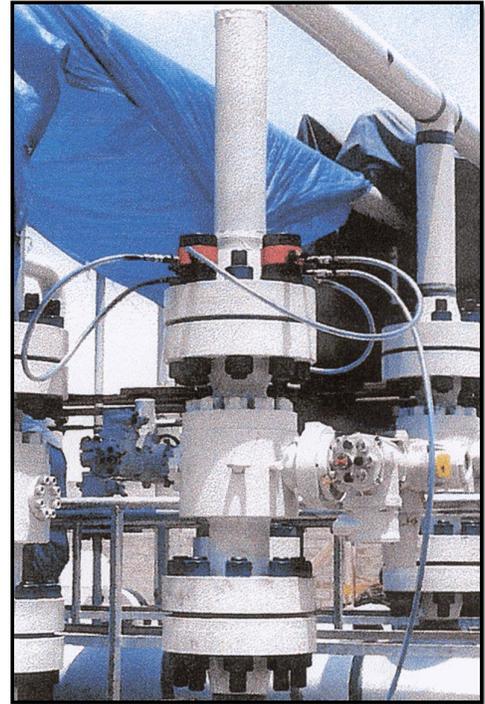
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STEP 9

Slowly release the return to tank valve on the pump. The load is now transferred from the tensioners to the nuts and the springs should be returning the pistons to the closed position. Use a tommy bar in the threaded puller to assist them to their fully closed position. If the desired pressure has not yet been reached, continue from STEP 6. Disconnect all of the hydraulic link hoses and reposition the tensioners on to the final 50% of bolts to be tensioned, and continue from STEP 4.

SEQUENCE

It is generally agreed the correct bolt / tool ratio is 50%, in certain instances a 25% ratio is acceptable or even a minimum of 4 tensioners diametrically opposed. The general rule is:- The lower the bolt / tool ratio, the more time it will take to tension the joint.



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