BLACKIRON

ITALY

INSTRUCTION DOCUMENT

Hydraulic Bolt Tensioners

REV. 0.3 12/12/2018

INTRODUCTION

Thank you for purchasing a BLACKIRON hydraulic tensioner. This high-quality product sets unique international standards and meets high levels of safety. To preserve these characteristics, regular maintenance of the equipment is strongly recommended. Please read this operation and maintenance manual carefully and observe all information and instructions.

Improper maintenance can threaten your safety and damage the tensioner. Furthermore, failure to comply with these instructions may void the warranty!

This operation and maintenance manual include the basic notes and instructions that must be followed to properly use our hydraulic tensioners. The operator must read and understand the basic precautions before operating. This user manual must always be available on-site for consultation by the operator.

These operating and maintenance instructions apply only to BLACKIRON hydraulic tensioners.

Do not only observe the "Safety Instructions", but also all other special instructions and suggestions included in this manual.

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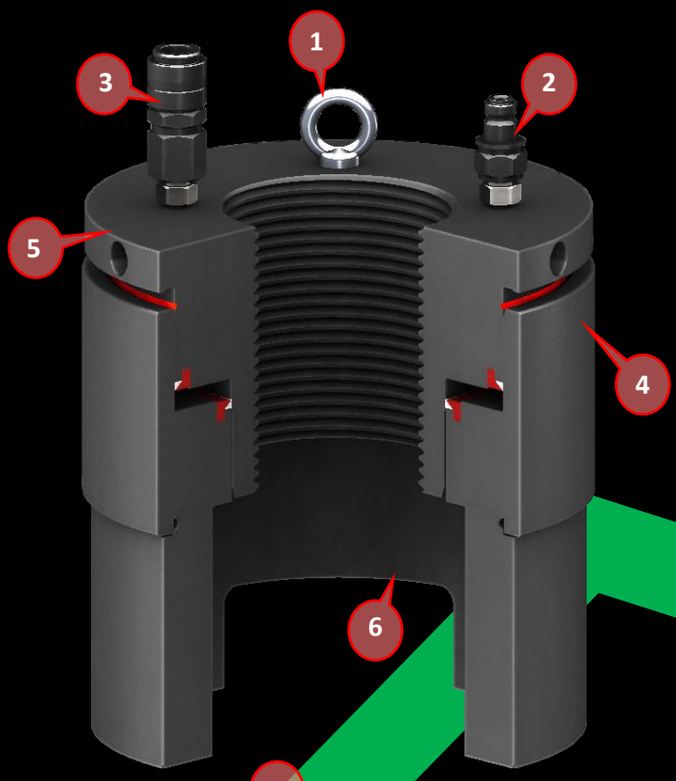
BLACKIRON ITALY



Direct Fit Tensioner

1-Eyebolt: specific component for lifting;

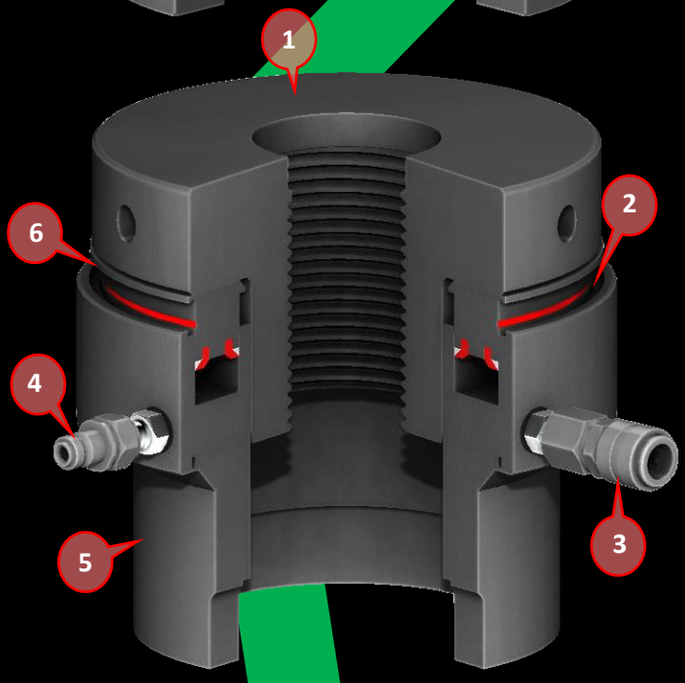
2-Male coupler: quick connector for tube;

3-Female coupler: quick connector for tube;

4-Cell: component where the pressurization takes places and the desired load is generated;

5-Piston: threaded component grips the tension rod;

6-Bridge: reaction support;



Thread Insert Tensioner

1-Puller: threaded component grips the tension rod;

2-Cell: component where the pressurization takes places and the desired load is generated;

3-Female coupler: quick connector for tube;

4-Male coupler: quick connector for tube;

5-Bridge: reaction support;

6-Piston: component that push the puller when the pressurization takes places;

The supply of eyebolts depends on the weight of the tensioner.

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1.SAFETY WARNINGS

General Hydraulic System

- Failure to practice the following safety warnings could lead to personal injury and/or equipment damage.
- Always wear recommended protective clothing during the tensioning procedure.
- Never exceed the maximum working pressure of the tensioning system. The maximum working pressure of the whole system is determined by the lowest pressure rated component.
- Treat hydraulic hose with respect. Do not sharply bend or kink the hose when connecting tensioning tools. Be aware of the minimum bend radius of the hose. Sharply bending or kinking hose can lead to premature hose rupture.
- Do not drop sharp objects on to the hydraulic hose, do not drive any type of vehicle over hydraulic hose. Doing so will cause internal hose damage and lead to premature hose failure.
- Never lift tensioning tools by the hydraulic hose or hydraulic connections.
- Never touch pressurized hoses or couplers. Escaping high pressure oil can penetrate your skin and is extremely dangerous. Seek urgent medical attention if oil penetrates skin.
- Never preset the pump unit relief valve to a pressure greater than the lowest rated pressure component in the system. Doing so may lead to injury and or equipment damage.
- If prior to the tensioning operation you have any doubt in the correct and safe use of bolt tensioning equipment please contact Mapptools for advises.
- Thoroughly read all instruction documentation prior to using the tensioning equipment. Ensure all safety precautions are followed to avoid personal injury and/or equipment damage during the tensioning procedure. Mapptools can't be held responsible for injury or damage to equipment caused by product misuse or by lack of equipment maintenance.

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1.2 Specific Tensioner

- Our BLACKIRON bolt tensioning systems should only be used by trained and experienced personnel familiar with safe operating practices of bolt tensioning systems.
- Bolting calculations should only be carried out by trained and qualified engineers who have been appropriately trained or have suitable experience in bolting technology.
- Always wear suitable protective clothes including boots, gloves and eye protection during the tensioning procedure.
- Always ensure that all personnel in the near vicinity are aware that pressurization of high pressures equipment is about to take place. Cordon off the work area and exclude anyone from the area who is not involved directly with the tensioning procedure.
- Never exceed the maximum working pressure of the system. The maximum working pressure of the tensioning tool is hard stamped on the tensioner body component.
- Never exceed the maximum piston stoke capability of the tensioning tool. A **RED** maximum piston stroke line will become visible as the tensioner approaches maximum stroke. The maximum piston stroke value will be hard stamped on the tensioner body.
- Never stand in-line with the bolt axis during the tensioning or de-tensioning procedure. Unexpected bolt failure can result in serious personal injury or death. Premature bolt failure can lead to parts of the tensioner or bolt becoming high velocity projectiles. Alert all personnel to the consequences of premature bolt failure and clear the area of unessential personnel before the procedure starts.
- Only approach pressurized tensioning tools when you are certain that the pressure is holding steady. Continually monitor the pump pressure at all times. If the pressure is not holding steady do not approach the system but release the pressure to zero and then investigate the cause of pressure loss. Never investigate at high pressure.
- Thoroughly inspect the main thread of the thread insert component, look for sign of thread damaged or worn threads. Replace any worn or damaged parts. Ensure you have adequate thread engagement between the thread insert component and the bolt being tensioned.
- Never attempt to disconnect a hydraulic coupler while at pressure.
- Before pressure is applied to the system check that each hydraulic hose is connected correctly. Physically pulling on the connector will determine if the male couplers are correctly fitted to the female connectors.
- Never pressurize an unconnected male coupler. Male couplers are not designed to withstand high pressure, in the unconnected mode. Pressurizing an unconnected Male coupler can lead to serious personal injury or death.
- It is safe to pressurize the unconnected female coupler fitted to the last tensioner in the circuit.
- Check that the bolt is capable of taking the initial load applied by the tensioners. Tensioners are capable of breaking bolts if the bolt material is not strong enough to withstand the tensioner load.
- Users should be aware at all times that pressure can build up very quickly and a member of the tensioning team should be ready to release pressure at any time.
- Never leave a pressurized system unattended.
- Ensure the correct and preferred grade of oil is used in the pump. Refer to the pump instruction manual document.
- All investigation, maintenance or repair work should only be carried out when the tensioner is at zero pressure.
- All tensioner specifications can be found hard stamped on the body of the tool. Be aware of the maximum working pressure and the maximum piston stoke capability.
- The calculated required working pressure of the tensioners will typically be less than the maximum working pressure of the tool. Never exceed the maximum rated working pressure of the tensioner.

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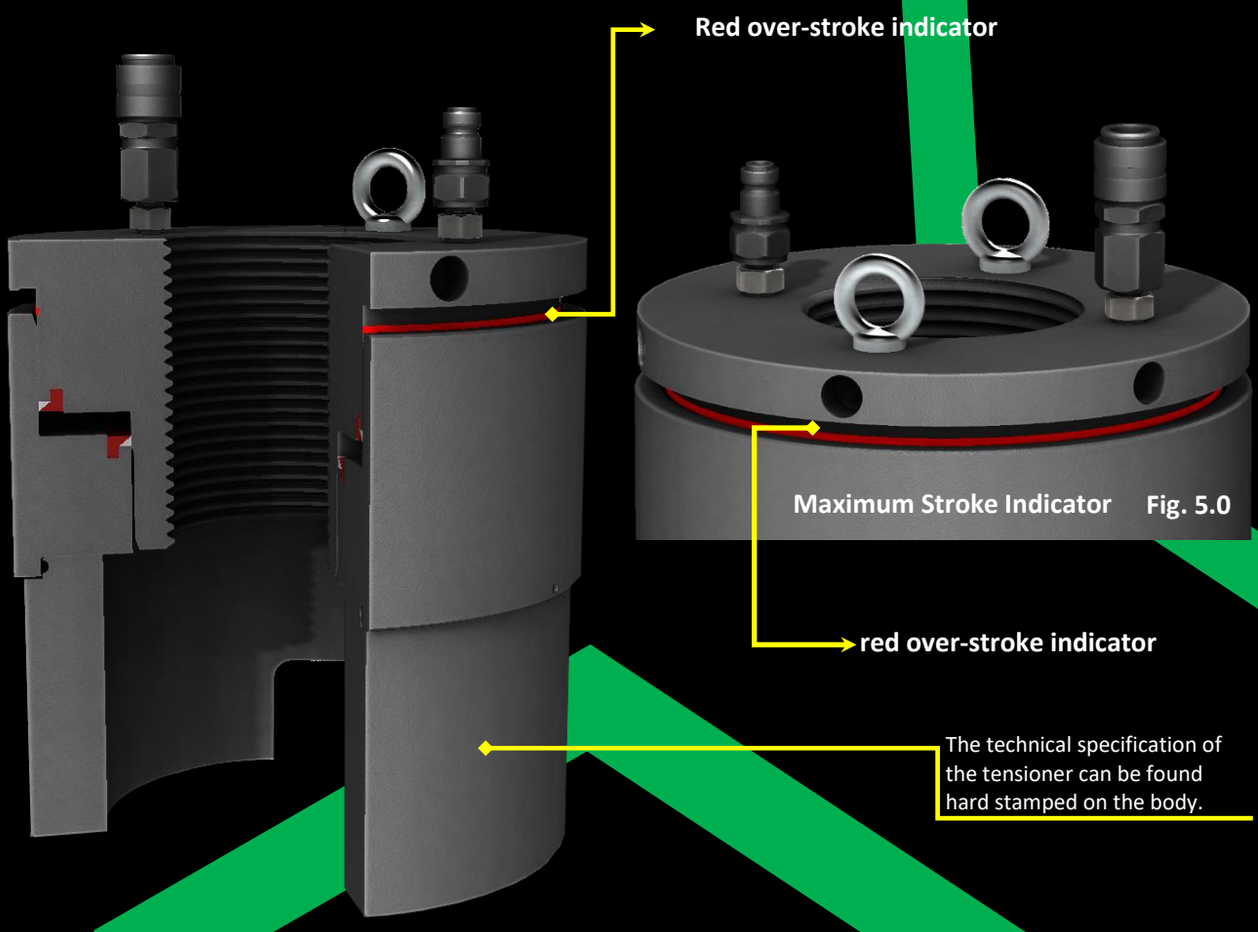

Fig. 5.0

1.3 Maximum Stroke Indicator

The tensioner maximum allowable stroke is indicated by a RED line machined into the circumference of the piston. Continually monitor the piston stroke during the tensioner pressurization. If the maximum piston stoke indicator becomes visible on any of the tensioners before the target pressure is reached immediately stop the pump, tighten the nuts down and then release the pressure to zero. Rotate the tensioner body until the pistons are shut down into the zero-stroke position. Recommence the tensioning procedure.

Failure to stop the tensioning sequence once a piston over-stroke indicator becomes visible may result in failure of the tensioner seal and will eventually cause a release of high pressures fluid which could lead to injury or death. Escaping high pressure oil can penetrate your skin and is extremely dangerous. Seek urgent medical attention if oil penetrates skin.

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2.PRE-PROCEDURE CHECKS

- Check that each bolt to be tensioned is visually free from obvious thread defects. Make sure all nuts and tensioner bodies are free to rotate on the bolts. Try a tensioner body on a bolt and make sure they are correct mating threads. Refer to the general arrangement drawing of your particular tensioner to confirm the correct level of bolt protrusion required. Also make sure full thread engagement is available through the hexagon nut on the opposite end of the studs being tensioned.
- Check that all calculations pertaining to the tensioning procedure, including pressures, bolt loads, etc. are available and have been reviewed by a qualified engineer with bolting experience.
- Ensure that personnel are fully trained in bolt tensioning procedures and have thoroughly read this guide and safety notes.
- Ensure the pump reservoir is filled and an adequate oil volume is available. Refer to the pump instruction manual document.
- Ensure the correct and preferred grade of oil is used in the pump. Refer to the pump instruction manual document.
- Ensure the pump instruction manual is thoroughly read and understood.
- Be sure all personnel are aware of the maximum working pressure and maximum piston stroke of the tensioners. These details are hard stamped on the tensioner bodies

Fig 5.1

Refer to tensioner drawing

3.TENSIONER SYSTEM CONFIGURATION

The most efficient use of bolt tensioning tools is where every bolt (100% bolt to tensioner ratio) is tensioned simultaneously. Tensioners can be fitted to either one side or both sides of the bolted joint depending on accessibility. Common examples of system configuration are 100% & 50% bolt to tensioner ratio. This document details both of these tensioner system configurations.

3.1. Tensioner Arrangement - 100% Tool Coverage

All bolts simultaneously tensioned.

Commonly, due to space restrictions, it will not be possible to fit tensioners to every bolt from the same side of the bolted joint. It is normal practice to stagger the tensioners over both sides of the bolted joint. It is normal practice to fit the bolts so adequate thread protrudes from the side of the joint that the tensioner will be fitted. Refer to fig 5.2 & 5.3.

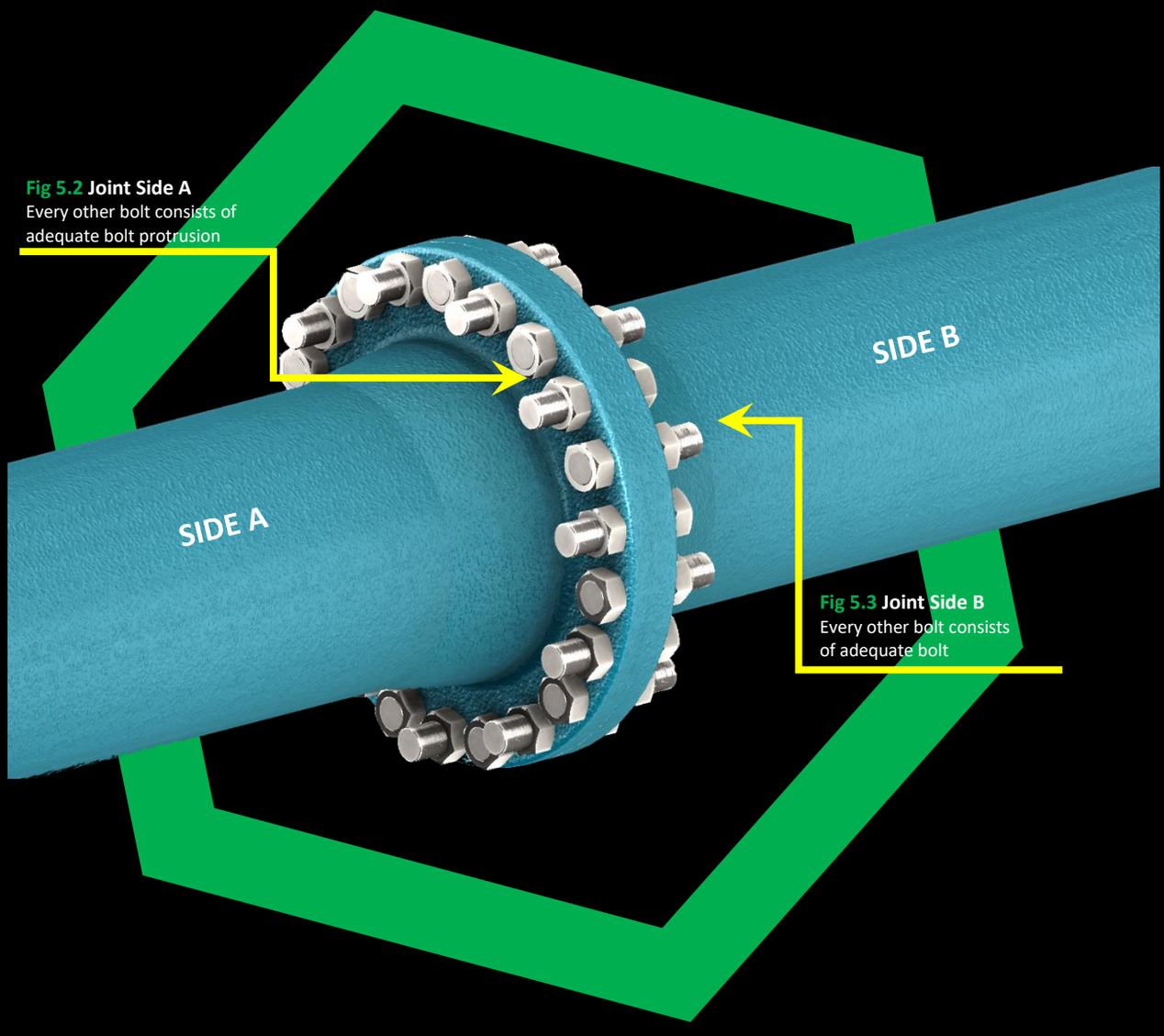

Fig 5.2 Joint Side A
Every other bolt consists of adequate bolt protrusion

Fig 5.3 Joint Side B
Every other bolt consists of adequate bolt

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Fig 5.4

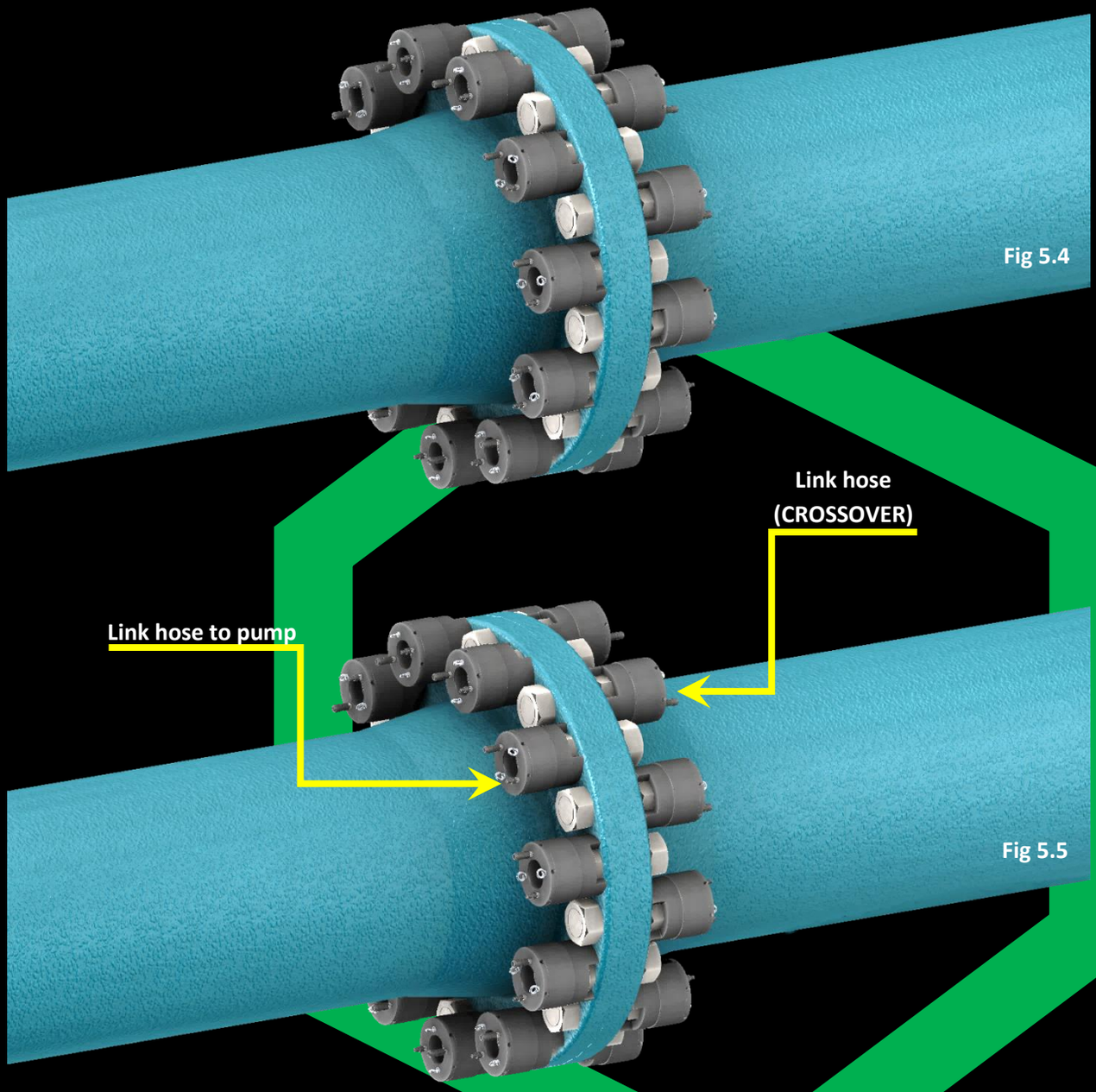

Fig 5.5

Never pressurize an unconnected male coupler. Male couplers are not designed to withstand high pressure, in the unconnected mode. Pressurizing an unconnected MALE coupler can lead to serious personal injury or death.

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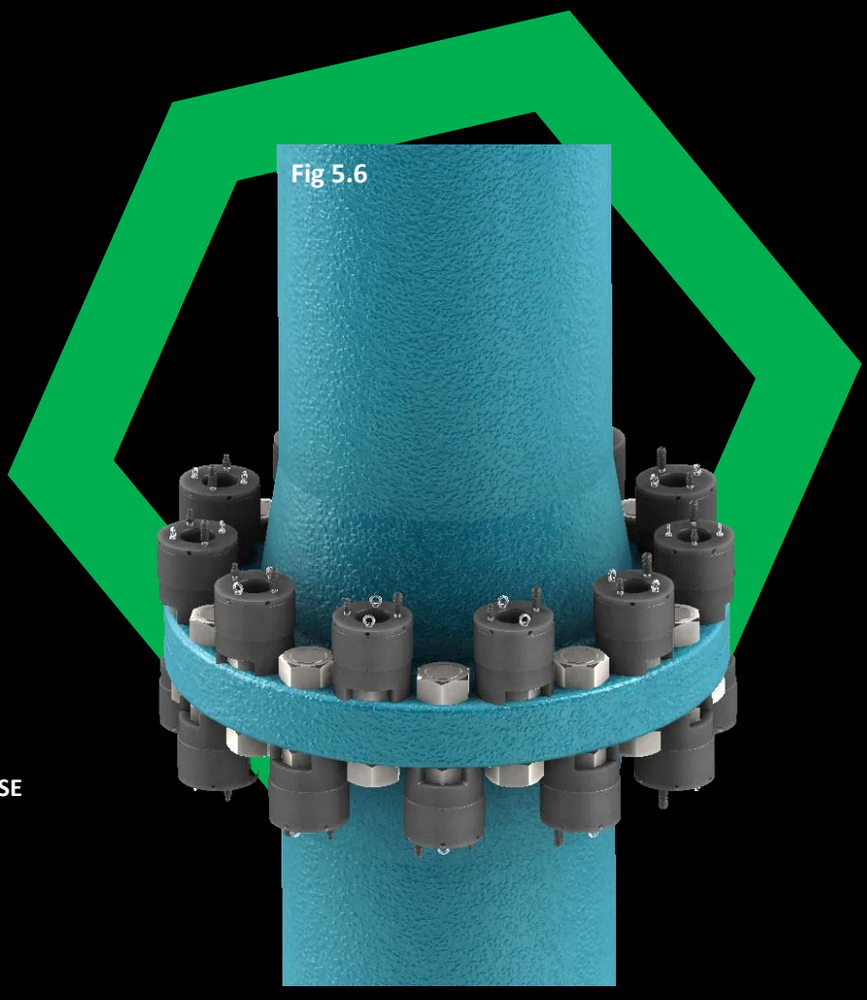
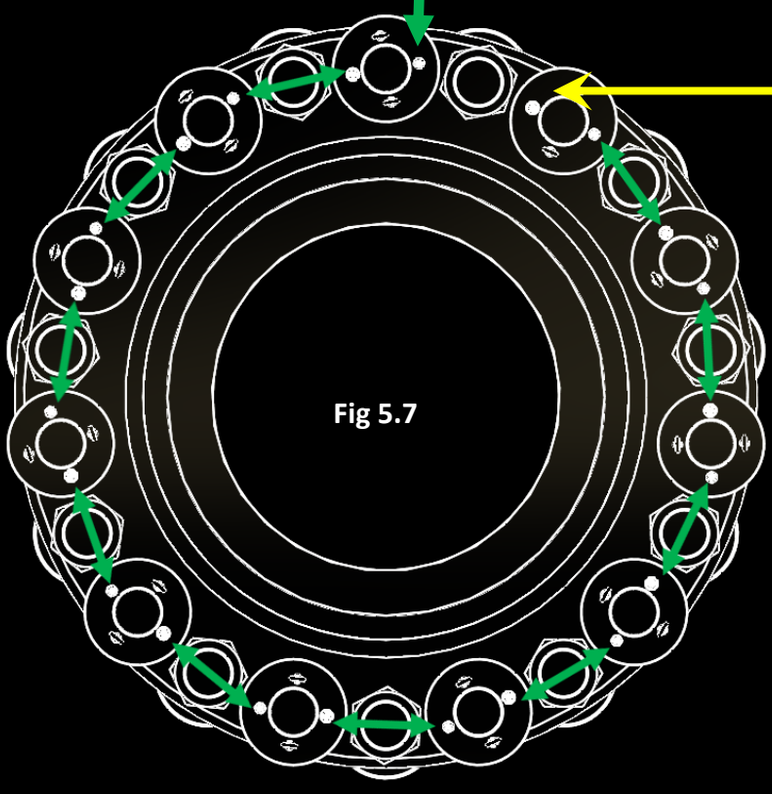


FEED HOSE



It's OK to leave the last FEMALE coupler unconnected

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3.2. Tensioner Arrangement - 50% Tool Coverage

Half bolts simultaneously tensioned.

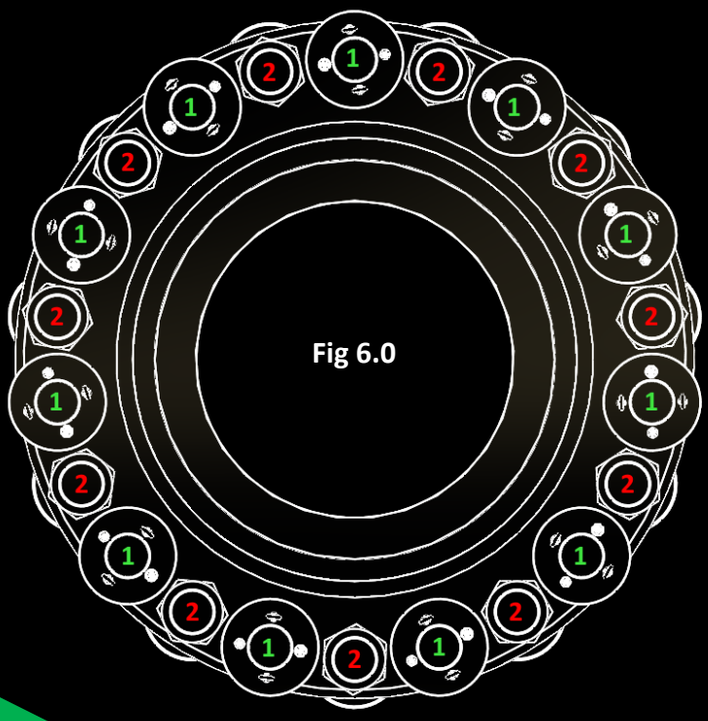

Fig 6.0

1. Ensure the two halves of the bolted joint are fully aligned. Number each bolt alternatively "1" and "2". Refer to fig 6.0.

2. Fit the tensioners to all the bolts marked "1", refer to section 4. for installation instructions.

3. Using link hoses connect the tensioners together and to a suitable pump unit. Refer to section 5. for link hose connection instructions. Before connecting a link hose to the pump unit make sure the pump is turned off and the pressure release valve is in the open position.

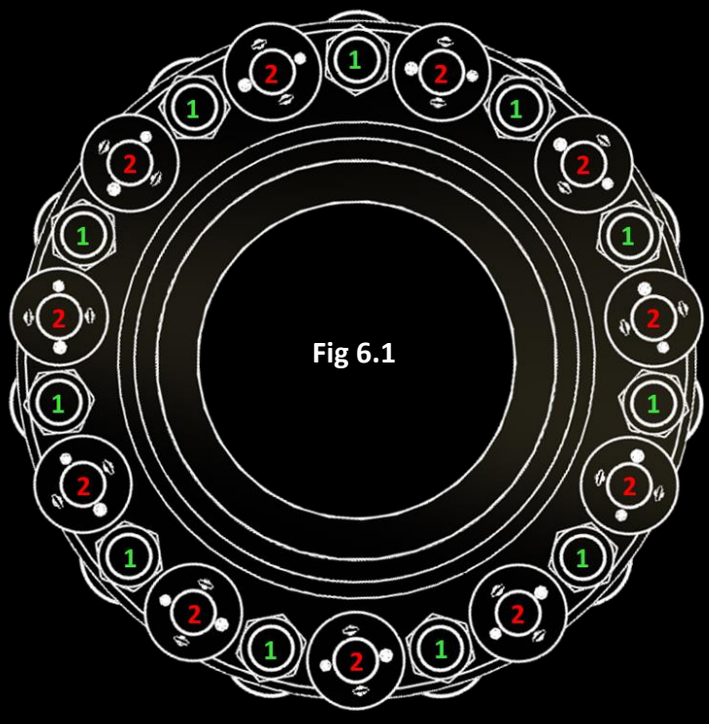

Fig 6.1

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4. TENSIONER INSTALLATION

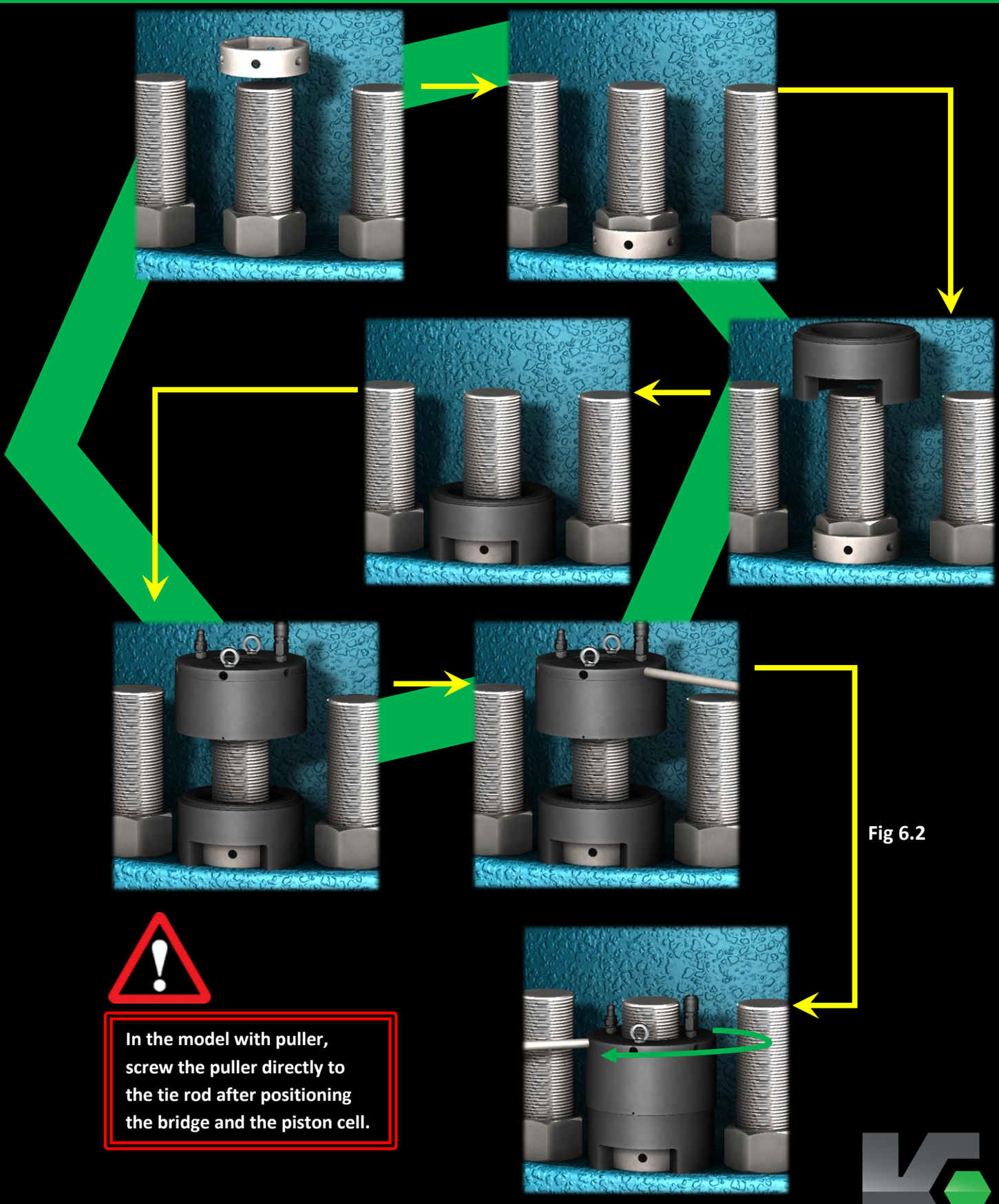

Fig 6.2

In the model with puller, screw the puller directly to the tie rod after positioning the bridge and the piston cell.

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5. TENSIONING PROCEDURE

5.1. Tensioning Procedure 100% bolt to tensioner ratio configuration.

1. Ensure the two halves of the bolted joint are full aligned.
2. Fit the tensioners to all of the bolts (Refer to section 5.1 for illustrations of tensioner set up, refer to section 6.0 for installation instructions.
3. Using link hoses connect the tensioners together and to a suitable pump unit. Refer to section 3.1 for configuration illustrations. Before connecting a link hose to the pump unit make sure the pump is turned off and the pressure release valve is in the open position.
4. Ensure the tensioning team are aware of the target working pressure.

Bolting calculations should only be carried out by trained and qualified engineers who have been appropriately trained or have suitable experience in bolting technology.

5. For pump operation refer to the supplied pump instruction document. Operate the pump unit and pressurize the system to 1000psi (70 bar) and check that the pressure is holding steady. If the pressure drops investigate the problem looking for leaks.

All investigation, maintenance or leak repair work should only be carried out when the tensioning system is at zero pressure.

6. Once the pressure is holding steady, continue to pressurize the system up to the target calculated working pressure. (Fig 7.1) Continually monitor for piston over-stroke, should any piston over-stroke indicator become visible immediately stop the pump to hold the pressure, go to step 8 then 9 then 9b. Then recommence the tensioning procedure from step 5
7. Once the target working pressure is reached, stop the pump to hold pressure. Monitor the pump pressure gauge to ensure the pressure is neither falling or rising.

Only approach pressurized tensioning tools when you are certain that the pressure is holding steady. Continually monitor the pump pressure at all times. If the pressure is not holding steady do not approach the system but release the pressure to zero and then investigate the cause of pressure loss. **Never investigate at high pressure.**

8. Once the pressure is holding steady approach the tensioners and by using a tommy bar inserted into the nut socket holes rotate the nuts firmly against the joint face. Repeat until all of the nuts have been firmly seated against the bolted joint. (Fig 7.2 & 7.3)

Fig 7.1

Fig 7.2

Fig 7.3

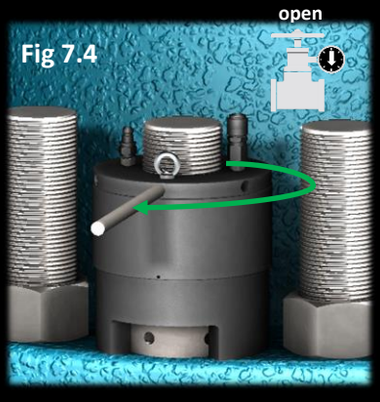

Fig 7.4

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9. Slowly open the pressure relief valve, the pressure will drop to zero.

9b. Optional Step: If the pistons are close to their fully extended position. Using a tommy bar tighten down the tensioner body to fully close the pistons. Repeat until the pistons are fully closed (Fig 7.4)

*(**Optional Spring Assisted Piston Return Type:** Pause the procedure to allow the piston to return to closed position)*

10. Repeat steps 5 through 9 for a second time

Optional checking procedure.

Pressurizes the system for a 4th time and try to seat the hexagon nuts. Use a tommy bar inserted into the nut sockets try to tighten down the nuts further by hand.

If there is no further rotation of the nuts, the tensioning sequence is considered complete. Continue from step 12.

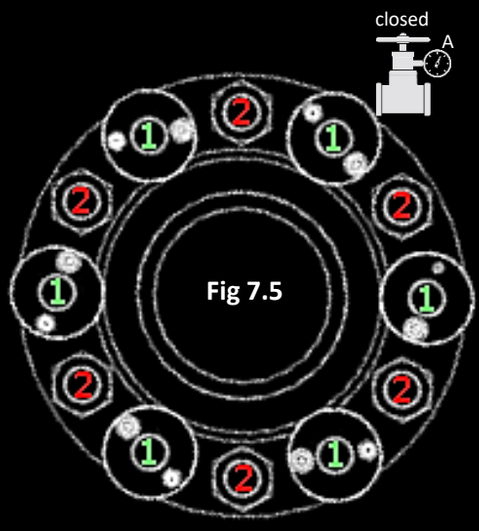
If further nut rotation is achieved, repeat the 1st pass tensioning sequence again step 5 through 9b until no further nut rotation is possible.

11. Repeat steps 5 through 9 for a third time

5.2. Tensioning Procedure 50% bolt to tensioner ratio configuration.

Tensioner installed on every other bolt.

First Pass Procedure



1. Ensure the two halves of the bolted joint are fully aligned. Number each bolt alternatively "1" and "2". Refer to fig 7.5.
2. Fit the tensioners to all the bolts marked "1", refer to section 6.0 for installation instructions. Refer to Fig 7.5
3. Using link hoses connect the tensioners together and to a suitable pump unit. Refer to section 5.2 for configuration illustrations and fig 6.4 for link hose connection instructions. Before connecting a link hose to the pump unit make sure the pump is turned off and the pressure release valve is in the open position.
4. Ensure the tensioning team are aware of the target "A" Pressure (1st pass working pressures) and "B" Pressure (2nd pass working pressure).

Pressures "A" are generally higher than "B" pressures to compensate for load loss. Bolting calculations should only be carried out by trained and qualified engineers who have been appropriately trained or have suitable experience in bolting technology.

5. For pump operation refer to the supplied pump instruction document. Operate the pump unit and pressurize the system to 1000psi (70 bar) and check that the pressure is holding steady. If the pressure drops investigate the problem looking for leaks.

closed

All investigation, maintenance or leak repair work should only be carried out when the tensioning system is at zero pressure.

6. Once the pressure is holding steady, continue to pressurize the system up to the target "A" pressure (1st pass pressure). Continually monitor for piston over-stroke (section 1.3), Should any piston over-stroke indicator become visible immediately stop the pump to hold the pressure, go to step 8 then 9 then 9b. Then recommence the tensioning procedure from step 5.

7. Once the target "A" (1st pass pressure) is reached, stop the pump to hold pressure. Monitor the pump pressure gauge to ensure the pressure is neither falling or rising.

Only approach pressurized tensioning tools when you are certain that the pressure is holding steady. Continually monitor the pump pressure at all times. If the pressure is not holding steady do not approach the system but release the pressure to zero and then investigate the cause of pressure loss. ***Never investigate at high pressure.***

8. Once the pressure is holding steady approach the tensioners and by using a tommy bar inserted into the nut socket holes rotate the nuts firmly against the joint face. Repeat until all of the nuts have been firmly seated against the bolted joint. (Fig 7.2 & 7.3)

9b. Optional Step: If the pistons are close to their fully extended position. Using a tommy bar tighten down the tensioner body to fully close the piston. Repeat until the pistons are fully closed (Fig 7.4)

9. Slowly open the pressure relief valve, the pressure will drop to zero.

*(**Optional Spring Assisted Piston Return Type:** Pause the procedure to allow the piston to return to closed position)*

10. Repeat steps 5 through 9b for a second time

Second Pass Procedure

Reposition the tensioners on to the remaining 50% of bolts, bolts marked "2" (Fig 7.6)

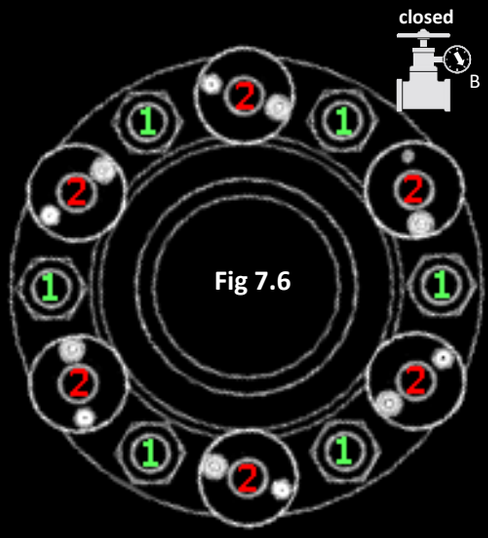


Fig 7.6

11. Ensure the tensioning team are aware of the target "B" Pressure (2nd pass pressure)

"B" pressures are generally lower than "A" pressures Bolting calculations should only be carried out by trained and qualified engineers who have been appropriately trained or have suitable experience in bolting technology.

12. For pump operation refer to the supplied pump instruction document. Operate the pump unit and pressurize the system to 1000psi (70 bar) and check that the pressure is holding steady. If the pressure drops investigate the problem looking for leaks.

All investigation, maintenance or leak repair work should only be carried out when the tensioning system is at zero pressure.

13. Once the pressure is holding steady, continue to pressurize the system up to the target "B" pressure (2nd pass pressure). Continually monitor for piston over-stroke. If the piston over stroke indicator becomes visible on any of the tensioners, immediately stop the pump to hold the pressure. Go to step 17,18, 18b. Then recommence the tensioning procedure from step 14.

14. Once the target working pressure is reached, stop the pump to hold pressure. Monitor the pump pressure gauge to ensure the pressure is neither fall or rising.

Only approach pressurized tensioning tools when you are certain that the pressure is holding steady. Continually monitor the pump pressure at all times. If the pressure is not holding steady do not approach the system but release the pressure to zero and then investigate the cause of pressure loss. ***Never investigate at high pressure.***

15. Once the pressure is holding steady approach the tensioners and by using a tommy bar inserted into the nut socket holes rotate the nuts firmly against the joint face. Repeat until all of the nuts have been firmly seated against the bolted joint. (Fig 7.2 & 7.3)

16. Slowly open the pressure relief valve, the pressure will drop to zero.

18b. Optional Step: If the pistons are close to their fully extended position. Using a tommy bar tighten down the tensioner body to fully close the piston. Repeat until the pistons are fully closed (Fig 7.4)

*(**Optional Spring Assisted Piston Return Type**: Pause the procedure to allow the piston to return to closed position)*

17. Repeat steps 14 through 18 for a second time, to pressure "B"

Checking Procedure

In order to check if excessive load was lost from the first 50% of bolts (bolts marked "1")

A. Install two tensioners on two marked "1" bolts, diametrically opposite each other. (Fig 7.7)
B. Connect the hydraulic link hoses.
C. Pressurize the system to "B" Pressure, Hold the pressure.
D. Using a tommy bar inserted into the nut sockets try to tighten down the nuts further by hand.

If there is no further rotation of the nuts go to step 21.

If further nut rotation is achieved, repeat the 1st & 2nd pass tensioning sequence again, steps 2 through 21. Then repeat this checking Procedure.

18. Repeat steps 14 through 18 for a third time, to pressure "B"

19. Using a tommy bar tighten down the tensioner body to fully close the piston. Repeat until the pistons are fully closed (Fig 7.4)

***(Optional Spring Assisted Piston Return Type:** Pause the procedure to allow the piston to return to closed position)*

Disconnect all hydraulic hoses and remove all tensioners from the bolted joint. The tensioning procedure is considered complete.

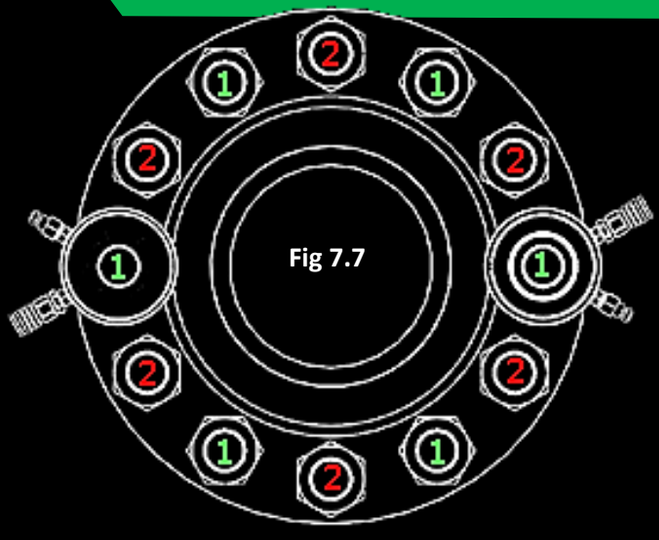


Fig 7.7

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6. DE-TENSIONING PROCEDURE

6.1. De-Tensioning Procedure 100% bolt to Tensioner Ratio Configuration.

All bolts simultaneously tensioned.

Read the safety instructions at the start of section 1.2 before beginning de-tensioning work

1. Fit a tensioner to every bolt and connect the link hose, refer to section 5.1 for system configuration and section 4.0 for installation guide

Bolting calculations should only be carried out by trained and qualified engineers who have been appropriately trained or have suitable experience in bolting technology.

2. Before commencing pressurization, back off all of the tensioner bodies by 5mm (0.2") see fig 8.1. (Ensure there is still enough thread engagement between the tensioner body and the bolt thread protrusions.

3. For pump operation refer to the supplied pump instruction document. Operate the pump unit and pressurize the system to 1000psi (70 bar) and check that the pressure is holding steady. If the pressure drops investigate the problem looking for leaks.

All investigation, maintenance or leak repair work should only be carried out when the tensioning system is at zero pressure.

NOTE: During the de-tensioning procedure NEVER exceed the maximum working pressure of the tensioner. Ensure the bolt is strong enough to withstand the load your applying.

Definition: Break Loose Pressure (BLP) is the pressure at which the user can rotate one of the joint nuts (tensioner end) by hand with a tommy bar.

4. Once the pressure is holding steady, continue to slowly increase the pressurize, continually monitor a single joint nut (tensioner end) for rotation. Use a tommy bar inserted into the nut socket fig 8.2. Once the break loose pressure (BLP) is found, stop the pump to hold the pressure and make a note of the pressure.

5. Make sure the pressure is holding steady and using a tommy bar inserted in the nut socket, back off every joint nut (tensioner end) by 3mm (1/8"). Do not back off the nut to a greater value than the distance that you backed off the thread insert in step 2 see fig 8.3

Note: If nuts are difficult to rotate at this break loose pressure, slightly increase the pressure until the nuts become loose. Never exceed the maximum working pressure of the tool. Make sure that the bolt material and joint material can withstand the load you are applying.

6. Slowly release the pressure to zero.

7. Using a tommy bar tighten down the tensioner body to fully close the piston. Repeat on all tensioners until all of the pistons are fully closed.

*(**Optional Spring Assisted Piston Return Type:** Pause the procedure to allow the piston to return to closed position)*
Disconnect all hoses and remove all tensioners from the joint.

8. The de-tensioning procedure is complete

Fig. 8.1

Fig. 8.2

Fig. 8.3

6.2. De-Tensioning Instructions 50% bolt to Tensioner Ratio Configuration.

All bolts simultaneously tensioned.

Read the safety instructions at the start of section 1.2 before beginning de-tensioning work

1. Fit a tensioner to every other bolt and connect the link hose, refer to section 5.2 for system configuration and section 3.2. for installation guide

Bolting calculations should only be carried out by trained and qualified engineers who have been appropriately trained or have suitable experience in bolting technology.

2. Before commencing pressurization, back off all of the thread inserts by 5mm (0.2") see fig 8.1. (Ensure there is still enough thread engagement between the thread inserts and the bolt thread protrusions.

3. For pump operation refer to the supplied pump instruction document. Operate the pump unit and pressurize the system to 1000psi (70 bar) and check that the pressure is holding steady. If the pressure drops investigate the problem looking for leaks.

All investigation, maintenance or leak repair work should only be carried out when the tensioning system is at zero pressure.

NOTE: During the de-tensioning procedure NEVER exceed the maximum working pressure of the tensioner. Ensure the bolt is strong enough to withstand the load your applying.

Definition: Break Loose Pressure (BLP) is the pressure at which the user can rotate one of the joint nuts (tensioner end) by hand with a tommy bar.

4. Once the pressure is holding steady, continue to slowly increase the pressurize, continually monitor a single joint nut (tensioner end) for rotation fig 8.2. Once the break loose pressure (BLP) is found, stop the pump to hold the pressure and make a note of the pressure.

5. Make sure the pressure is holding steady and using a tommy bar inserted in the nut socket, back off every joint nut (tensioner end) by 3mm (1/8"). Do not back off the nut to a greater value than the distance that you backed off the thread insert in step 2 see fig 8.3

Note: If nuts are difficult to rotate at this break loose pressure, slightly increase the pressure until the nuts become loose. NEVER exceed the maximum working pressure of the tool. Make sure that the bolt material and joint material can withstand the load you are applying.

6. Slowly release the pressure to zero.

7. Using a tommy bar tighten down the tensioner body to fully close the piston. Repeat on all tensioners until all of the pistons are fully closed.

*(**Optional Spring Assisted Piston Return Type:** Pause the procedure to allow the piston to return to closed position)*

8. Reposition the tensioners and link hoses to the remaining 50% of bolts

9. Before commencing pressurization off the final 50% of bolts, back off all of the tensioner bodies by 5mm (0.2") see fig 8.1. (Ensure there is still enough thread engagement between the thread inserts and the bolt thread protrusions.

10. For pump operation refer to the supplied pump instruction document. Operate the pump unit and pressurize the system to 1000psi (70 bar) and check that the pressure is holding steady. If the pressure drops investigate the problem looking for leaks.

All investigation, maintenance or leak repair work should only be carried out when the tensioning system is at zero pressure.

NOTE: During the de-tensioning procedure NEVER exceed the maximum working pressure of the tensioner. Ensure the bolt is strong enough to withstand the load your applying.

Definition: Break Loose Pressure (BLP) is the pressure at which the user can rotate one of the joint nuts (tensioner end) by hand with a tommy bar.

11. Once the pressure is holding steady, continue to slowly increase the pressurize, continually monitor a single joint nut (tensioner end) for rotation fig 8.2. Use a tommy bar inserted into the nut socket. Once the break loose pressure (BLP) is found, stop the pump to hold the pressure and make a note of the pressure.

12. Make sure the pressure is holding steady and using a tommy bar inserted in the nut socket, back off every joint nut (tensioner end) by 3mm (1/8”). Do not back off the nut to a greater value than the distance that you backed off the thread insert in step 2 see fig 8.3

Note: If nuts are difficult to rotate at this break loose pressure, slightly increase the pressure until the nuts become loose. NEVER exceed the maximum working pressure of the tool. Make sure that the bolt material and joint material can withstand the load you are applying.

13. Slowly release the pressure to zero.

14. Using a tommy bar tighten down the tensioner body to fully close the piston. Repeat on all tensioners until all of the pistons are fully closed.

*(**Optional Spring Assisted Piston Return Type:** Pause the procedure to allow the piston to return to closed position)*

15. Disconnect all hoses and remove all tensioners from the joint.

16. The Detensioning procedure is complete.

7. MAINTENANCE & WARRANTY

7.1. Seal Fitting Instructions

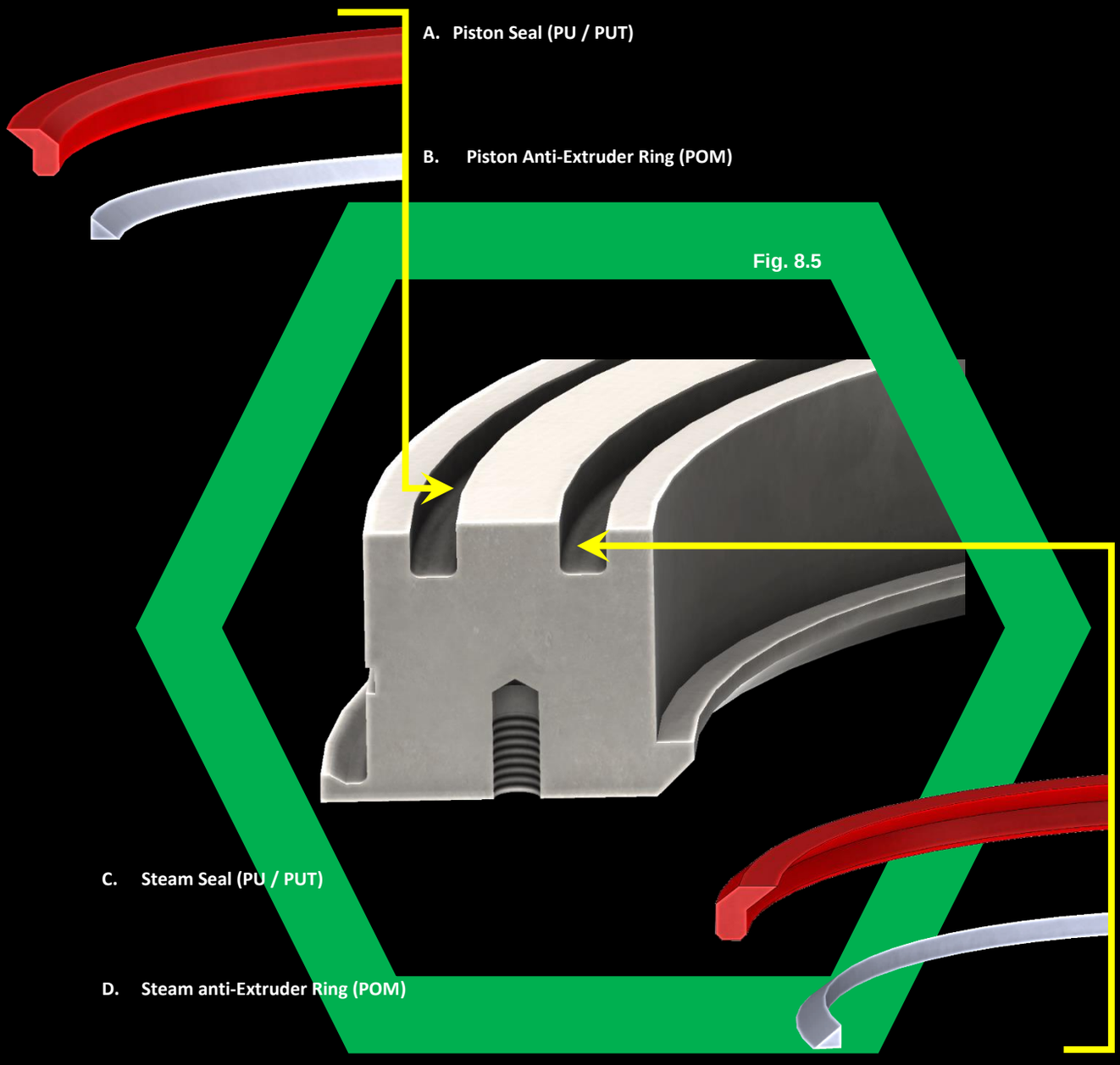


Fig. 8.5

BLACKIRON ITALY

Position the piston anti-extruder ring **(B)**

Place the piston seal **(A)** in the groove

Using a hammer, insert the gasket into the appropriate housing

Use a hammer with rubber head

to avoid damaging the gaskets and compromising the seal.

Repeat the procedure also for the stem anti-extruder ring **(D)** and the stem seal **(C)**

BLACKIRON ITALY

7.2. Tensioning Tools - Post Use Maintenance

Post use maintenance can be carried out as follows:

a) Ensure that all tensioning tool piston are fully retracted. On tensioning tools with spring, 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 pilling sleeves, particularly the thread.

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

7.3. 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 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

7.4. Servicing and Repairs

a) 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 cell will be pressure tested and issued with Test Certification.

b) Puller Life

Due to the nature of operation of the puller, for safety reason, 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 puller should be replaced if any dents, score marks or cracks are evident, as these can be potential stress raisers and could lead to components failure.

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

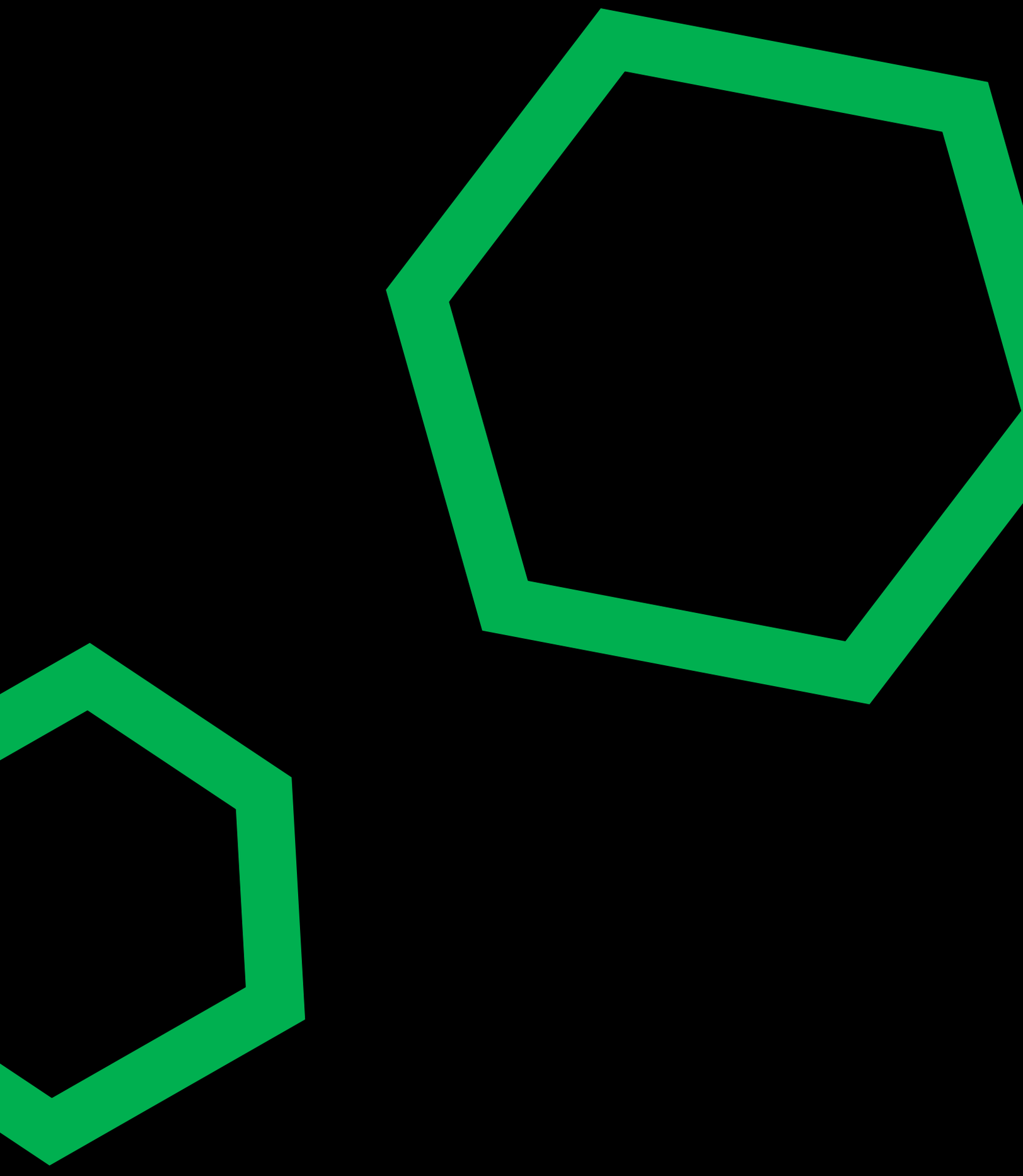
7.5. Warranty

All Bolt tensioner are supplied under the Manufacturers' standard terms and condition.

All components shall be guaranteed for a period of twelve months from the date of purchase against material defect and workmanship. All components shall be guaranteed for a period of twelve month from the date of purchase against arising from normal use with the following exclusions;Hydraulic seals and back-up rings;

- O-rings seals;
- Quick disconnected couplings;
- Labels and decals;
- Tommy bars;
- Paints and coatings;
- Plastic screws;
- Spring;

8. NOTES



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