



BLACKIRON
ITALY

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Mechanical jackbolt tensioner use and maintenance manual

Page 1 of 12

MECHANICAL JACKBOLT TENSIONER USE AND MAINTENANCE MANUAL

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CONTENTS

1. INTRODUCTION	4
1.1 OPERATION	5
2 PRE-TIGHTENING PROCEDURE	6
2.1 CHECK.....	6
2.2 INSTRUMENTS AND TOOLS.....	6
2.3 PREPARATION	6
3 TIGHTENING PROCEDURE	7
4 LOOSENING PROCEDURE	8
4.1 APPLICATION AT NORMAL TEMPERATURE RANGES (BELOW 100°C)	8
4.2 APPLICATION AT HIGH TEMPERATURES (ABOVE 100°C)	9
5 LUBRICATION AND TOOLS	10
5.1 LUBRICATION	10
5.2 TOOLS	10
6 MAINTENANCE.....	11
6.1 PERIODIC INSPECTION	11
6.2 PREVENTIVE MAINTENANCE.....	11
6.3 TROUBLESHOOTING	11

LIST OF FIGURES

Figure 1 – MECHANICAL JACKBOLT TENSIONER.....	5
Figure 2 – Crosswise pattern	7
Figure 3 – Circular pattern	7
Figure 4 – Loosening pattern	8
Figure 5 – Molykote 1000 Paste	10



D20020009	Mechanical jackbolt tensioner use and maintenance manual	Page 4 of 12

1. Introduction

Thank you for purchasing a **BLACKIRON** mechanical jackbolt tensioner, world leader in controlled torque tightening and tensioning. This high-quality product sets incomparable international standards and meets the highest levels of safety requirements. To retain these characteristics, regular maintenance of the device is highly recommended. Read this user and maintenance manual carefully and follow all guidelines and instructions.

Improper maintenance may compromise personal safety or damage the tensioner. In addition, non-compliance with these instructions may invalidate the warranty.

The use and maintenance manual contains a number of basic guidelines and instructions that must be followed in order to use our mechanical bolts correctly. The operator must read and understand all basic precautions before use. The user manual must always be available on-site for consultation by the operator.

The present use and maintenance instructions apply only to Blackiron mechanical jackbolt tensioners.

1.1 Operation

By tightening the jackbolts “A”, a considerable (axial) thrust force is generated. Jackbolts have a low friction diameter and are therefore able to generate large thrust forces with relatively low torques. Loads are transmitted through the nut body “B”, which is screwed onto the main thread by hand. A hardened washer “C” transfers the force while protecting the flange surface. The thrust force produced by many jackbolts, and the opposing reaction force exerted by the main bolt head or locknut, create a large tightening force on the flange. The axial thrust force produced by the jackbolts creates an equally high reaction force on the main bolt head.

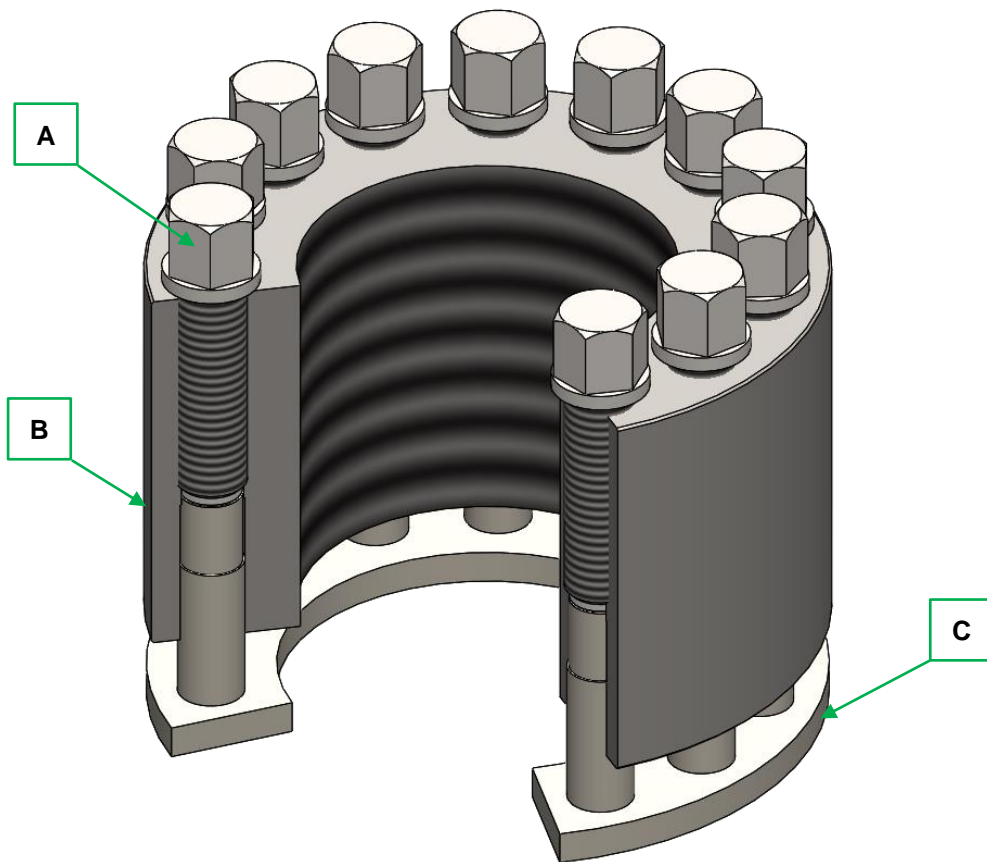


Figure 1 – MECHANICAL JACKBOLT TENSIONER

2 Pre-tightening procedure

2.1 Check

What is the tightening torque?

$M = 100\%$ nominal torque, refer to:

- internal guidelines
- Blackiron data sheet

2.2 Instruments and tools

- Heavy-duty socket wrench
- Suitable torque wrench
- Lubricant

2.3 Preparation

- Thoroughly clean the main thread and contact surface, then lubricate with an anti-seize agent as suggested in section 5, page 10.
- Ensure that the mechanical tensioner jackbolts are fully retracted and well-lubricated. Lubricate further with the supplied lubricant, if required.
- Tighten the mechanical tensioner by hand.
- Finally, make approx. a $\frac{1}{4}$ turn in the opposite direction and, depending on the size, a 1 to 3 mm clearance will appear.

3 Tightening procedure

- Screw the 4 jackbolts crosswise, as shown in **Figure 2 – Crosswise pattern** by hand or using a small wrench to centre the main thread and remove the existing play.
- Tighten the previous 4 jackbolts using the same procedure to 50% of the expected tightening torque M.
- Using the same procedure as in the previous step, tighten the 4 jackbolts to 100% of the expected tightening torque M.
- Tighten the remaining jackbolts using a circular pattern, as shown in **Figure 3 – Circular pattern** to 100% of the required end tightening torque M.
- Repeat the previous step until all jackbolts are tightened in the same way (residual movement less than 10°); usually 2 or 4 rounds are sufficient. If the bolt is particularly long, several rounds will clearly be required.

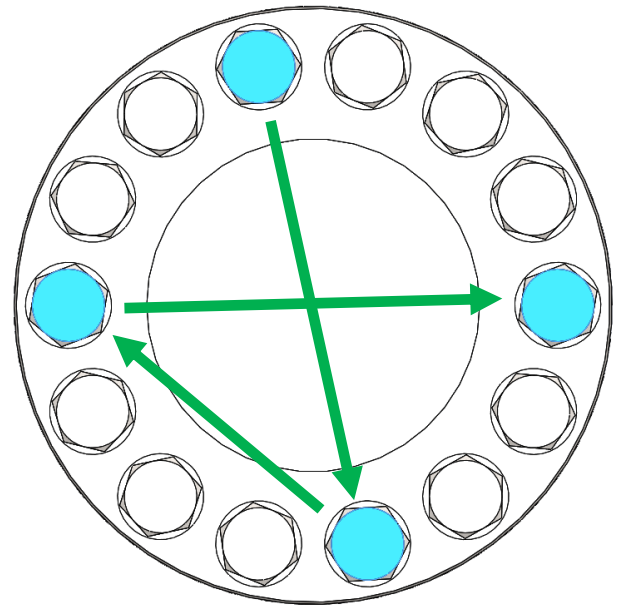


Figure 2 – Crosswise pattern

NOTE: Screw guns can save time. See section **6.2 Tools**

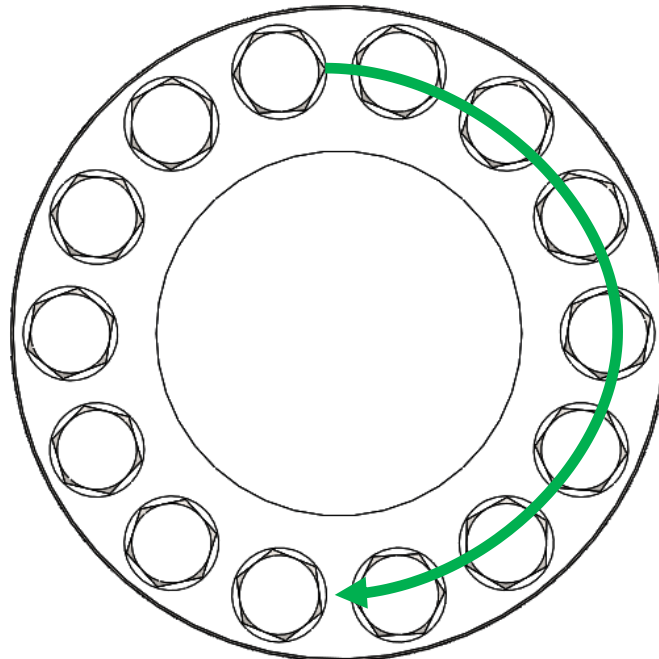


Figure 3 – Circular pattern

4 Loosening procedure

CAUTION! *Loosening requires a specific procedure – jackbolt load release must be carried out gradually! Under no circumstances should only one jackbolt be released. The remaining jackbolts would then have to carry the entire load and would be difficult to loosen. In extreme cases, so much pressure may be exerted such that loosening would be impossible!*

4.1 Application at normal temperature ranges (below 100°C)

PREPARATION: *Apply a small quantity of lubricant before loosening, especially if there are signs of rust formation.*

1. Loosen the jackbolts one at a time by $\frac{1}{4}$ of a turn, beginning with No. 1 (arbitrary) and proceeding in a circular pattern, as shown in **Figure 4 – Loosening pattern** (releasing the locking force is all that is required). After loosening all the jackbolts in the first round, No. 1 will be locked in place once more, but with a reduced load.

NOTE: *if a jackbolt should jam, refer to **section 6.3**.*

IMPORTANT: *Should several tensioners require loosening, e.g. on a flange, step 1 must be repeated for all tensioners prior to proceeding to the following step 2.*

2. Repeat step 1 until all jackbolt are completely released of their load. The mechanical jackbolt tensioner may now be removed by hand.

IMPORTANT: *Before reusing the mechanical tensioner, follow the instructions as outlined in the maintenance section.*

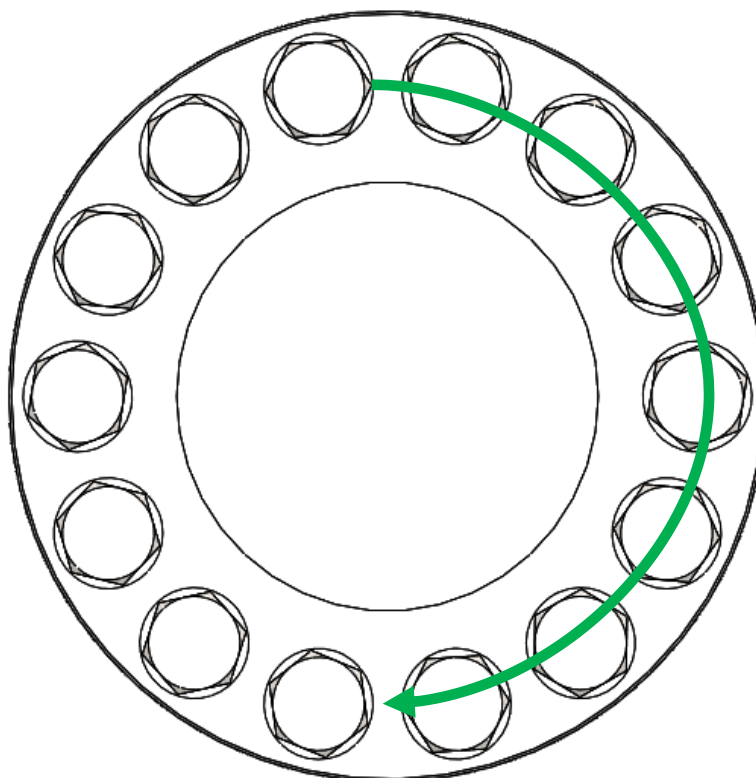


Figure 4 – Loosening pattern

4.2 Application at high temperatures (above 100°C)

PREPARATION: at high temperatures, the lubricating oil vaporises, making the loosening procedure more troublesome. If possible, apply a little lubricant during the cooling phase (at approx. 150°C). Use synthetic oils for higher temperatures.

1. Loosen the jackbolts one at a time by $\frac{1}{4}$ of a turn, beginning with No. 1 (arbitrary) and proceeding in a circular pattern, as shown in **Figure 4 – Loosening pattern** (releasing the locking force is all that is required). After loosening all the jackbolts in the first round, No. 1 will be locked in place once more, but with a reduced load.

IMPORTANT: *Should several tensioners require loosening, e.g. on a flange, step 1 must be repeated for all tensioners prior to proceeding to the following step 2.*

2. Repeat step 1 until all jackbolt are completely released of their load. The mechanical jackbolt tensioner may now be removed by hand.

CAUTION! *For application at high temperatures, bolts with bores are often used. Use of cartridge heaters will greatly facilitate loosening of the tensioners. Five minutes of heating is all that is required to speed up the procedure.*

5 Lubrication and tools

5.1 Lubrication

JACKBOLTS: jackbolts are supplied pre-lubricated and ready to use. Molykote 1000 Paste lubricant should be used, as shown in **Figure 5 – Molykote 1000 Paste** for temperatures up to 350°C. Contact the manufacturer for higher temperatures.

THRUST WASHERS: Apply the recommended anti-seize agent on both the upper surface (jackbolt support surface) and the lower surface for temperatures up to 350°C. Contact the manufacturer for higher temperatures.

MAIN THREAD: apply the recommended anti-seize agent before use for temperatures up to 350°C. Contact the manufacturer for higher temperatures.



Figure 5 – Molykote 1000 Paste

5.2 Tools

SOCKET WRENCH: Only high-quality tools in good condition should be used to tighten the jackbolts. Heavy-duty impact wrenches are recommended. Worn wrenches are hazardous and should not be used.

POWER TOOLS: Pneumatic impact wrenches have proved to be the best for tightening jackbolts in terms of speed and practicality. Tighten until immobilised and then check the torque with a torque wrench.

NOTES:

- **Up to 70 Nm** – 3/8" impact wrench or ratchet
- **70 to 130 Nm** – 1/2" derated impact wrench
- **130 to 200 Nm** – 1/2" impact wrench
- **200 to 270 Nm** – 1/2" or 3/4" impact wrench
- **Over 270 Nm** – 3/4" impact wrench

6 Maintenance

6.1 Periodic inspection

Blackiron mechanical jackbolt tensioners maintain their preload even after many years of use, provided that they are tightened correctly. When inspections are carried out, the preload force must be checked using a torque wrench calibrated to 100% of the permissible torque shown in the annexed load-torque graph.

The following procedure is recommended if jackbolts no longer reach their preload forces:

1. Loosen and remove each jackbolt, checking that the thread is intact.
2. Lubricate as outlined in **chapter 5**.
3. Tighten all jackbolts to the maximum torques provided by the manufacturer.

6.2 Preventive maintenance

E.g. in the event of removal for maintenance purposes:

1. Remove the mechanical jackbolt tensioner as described in the loosening procedure.
2. Clean both the thread and head of the jackbolt and re-lubricate according to the instructions in this manual.

NOTE: *do not use molybdenum disulphide (MoS₂) unless specifically indicated.*

3. The thrust washer may be reused despite any indentations that may have occurred. Turn it upside down (impressions of a few hundredths of a millimetre are quite normal).
4. Retighten according to the tightening procedure.

6.3 Troubleshooting

- **PROBLEM: A jackbolt cannot be loosened**

SOLUTION:

1. Try to release at least one of the others
2. Carefully lubricate and tighten the released jackbolt to 110% of the torque of the remaining bolts.

CAUTION: *Under no circumstances should the maximum torque of the jackbolt design be exceeded, as shown in the annexed graph.*

3. Adjacent jackbolts should now have a reduced axial load and therefore be easier to unscrew.
4. Repeat the same procedure as in step 2 with the released jackbolts.
5. Repeat steps 2 to 4 until all the jackbolts have been retightened.
6. Proceed now with the loosening pattern as described in Chapter 5.

- **PROBLEM: Thrust washers are excessively damaged**

SOLUTION: replace with original Blackiron washers

- **PROBLEM: Jackbolts are damaged or missing**

SOLUTION: replace with original Blackiron jackbolts. Do not use standard bolts as they are not suitable for the high stresses involved.

- **ADDITIONAL ISSUES:**

SOLUTION: contact your Blackiron sales representative



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Page 12 of 12

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