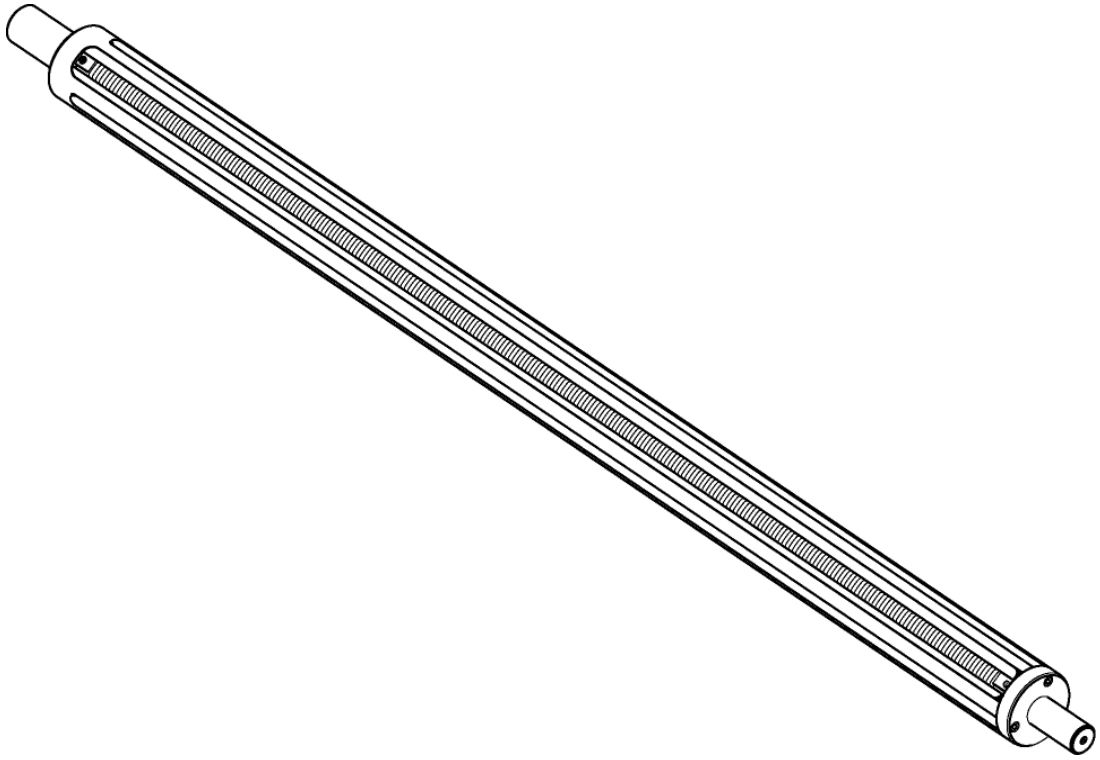
TIDLAND WINDING SOLUTIONS

MAXCESS

MAGPOWR FIFE TIDLAND

Tidland D3 Differential Air Shaft

Installation, Operation and Maintenance Manual



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For use with Tidland Serial Numbers 651931 and after
Includes Appendices for earlier shaft models

MI 638671 1 Q

SAFETY INSTRUCTIONS

When using this Tidland product, basic safety precautions should always be followed to reduce the risk of personal injury. Your company's safety instructions and procedures should always be followed. When using this product with any other equipment or machinery, all safety requirements stipulated by that equipment or machinery manufacturer must be followed. Compliance with local, state, and federal safety requirements is your responsibility. No part of these or the following instructions should be construed as conflicting with or nullifying the instructions from other sources. Be familiar with the hazards and safety requirements in your work environment and always work safely.

1. Read and understand all instructions and shaft design application limits before operation.
2. Never use this product for a purpose or in a machine that it was not specifically designed for. See Product Safety Data Sheet (PSDS).
3. Do not exceed the operation loads for this shaft as noted on its PSDS, Product Safety Data Sheet.
4. Follow all warnings and instructions marked on the product and on the PSDS.
5. Inspect the shaft for wear and/or other safety and functional deficiencies daily, before each use.
6. Wear safety glasses or proper eye protection when inflating or deflating or otherwise operating the air system.
7. Do not remove or otherwise alter any setscrews or fastening devices prior to using this product.
8. Do not operate this product if any setscrews or fastening devices are missing.
9. Do not lift shaft manually if it is beyond your capacity. Loads over 1/3 your body weight may be prohibitive. Consult your company safety policy.
10. When lifting a shaft, use proper lifting techniques, keeping back straight and lifting with the legs.
11. Do not carry or lift this product over wet or slippery surfaces.
12. Use appropriate mechanical lifting devices, such as a hoist or shaft puller, for heavier shafts.
13. When performing maintenance or repair procedures, do not pressurize the shaft if journal setscrews are loose or missing.
14. When performing maintenance procedures, do not pressurize the shaft if the journal is missing.
15. All replacement parts used on this product should be made to original Tidland specifications.
16. All maintenance and repair procedures performed on this product should be done to Tidland specifications by qualified personnel.

TABLE OF CONTENTS

CAUTION

- Wear eye protection when using tools or compressed air.

NOTICE	• Maximum operating air pressure = 40 psi (2.8 bar) • Maximum overspeed = 10%; recommend 5%

TIDLAND CUSTOMER SERVICE

800.426.1000
360.834.2345

www.maxcessintl.com

Visit the Tidland Repair and Return Center online to review our return policies or to submit an electronic Return Material Authorization Request at *www.maxcessintl.com/returns.*

RECOMMENDED TOOLS

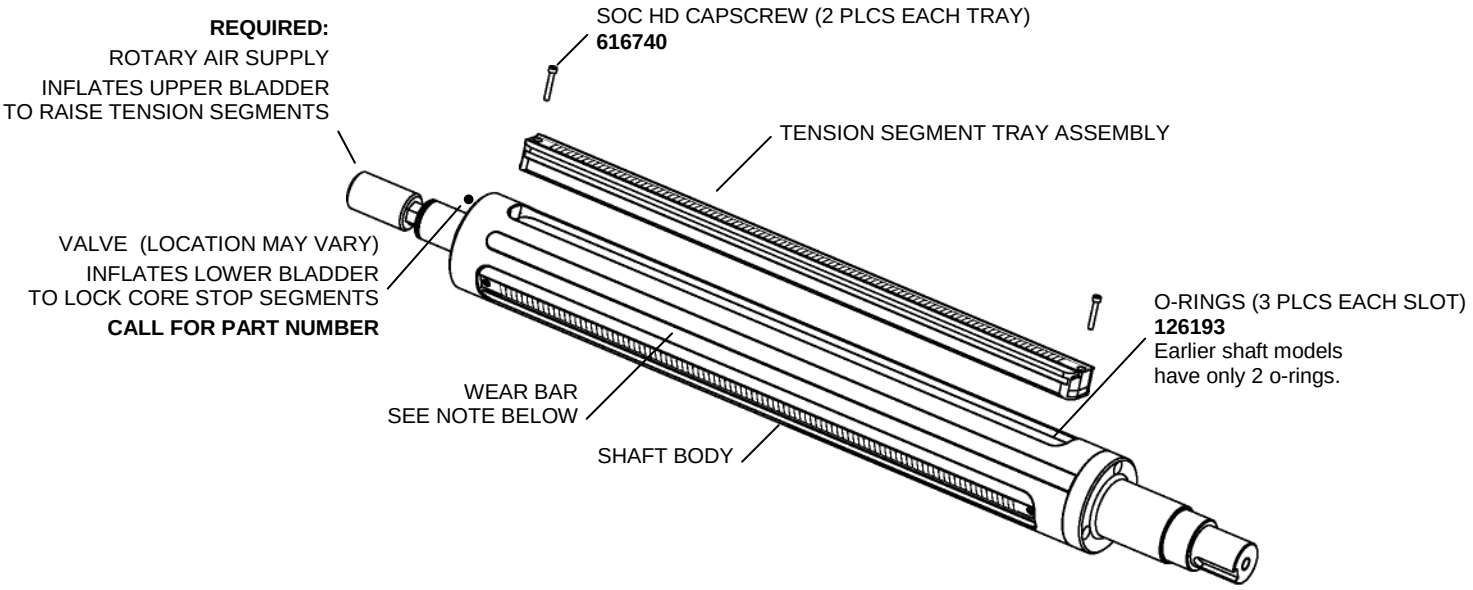
-
- Clean non-lubricated air supply: 0-40 psi (0.0-2.8 bar) for proper operation.
- Tidland Inflation Tool (P/N 128052)
- Tidland Air Release Tool and (P/N 111630)
- Tidland Hole Punch Tool (P/N 560345)
- Hex drive wrenches: 2.5mm, 7/64"
- *LOCTITE® 242* (blue)
- *Parker Super O-Lube* O-ring Lubricant (make no substitutions)
- Small pliers
-

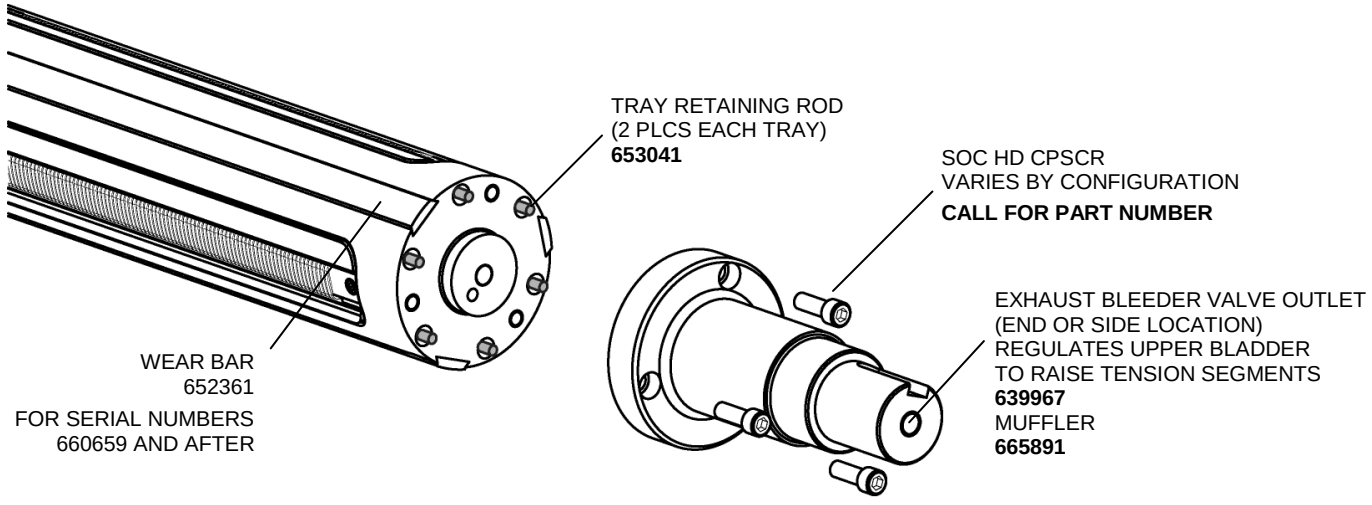
For more accessories to help with your winding processes, visit *www.maxcessintl.com*

NOMENCLATURE AND PART NUMBERS

Air valve locations vary for the Tidland Equalizer Model D3 Differential Air Shaft. See page 9 for complete instructions on inflation sequence and valve operation.

Shaft





For shaft serial numbers before 660659, see page 11 for information about wear bars.

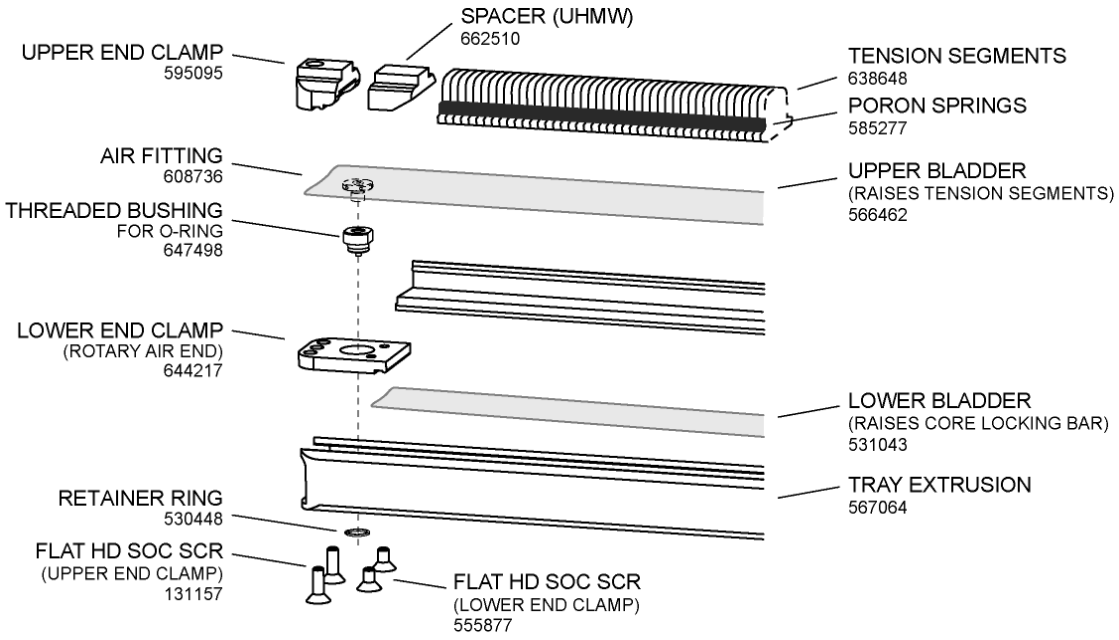
ASSEMBLY DIAGRAM AND PART NUMBERS

Tray Assembly

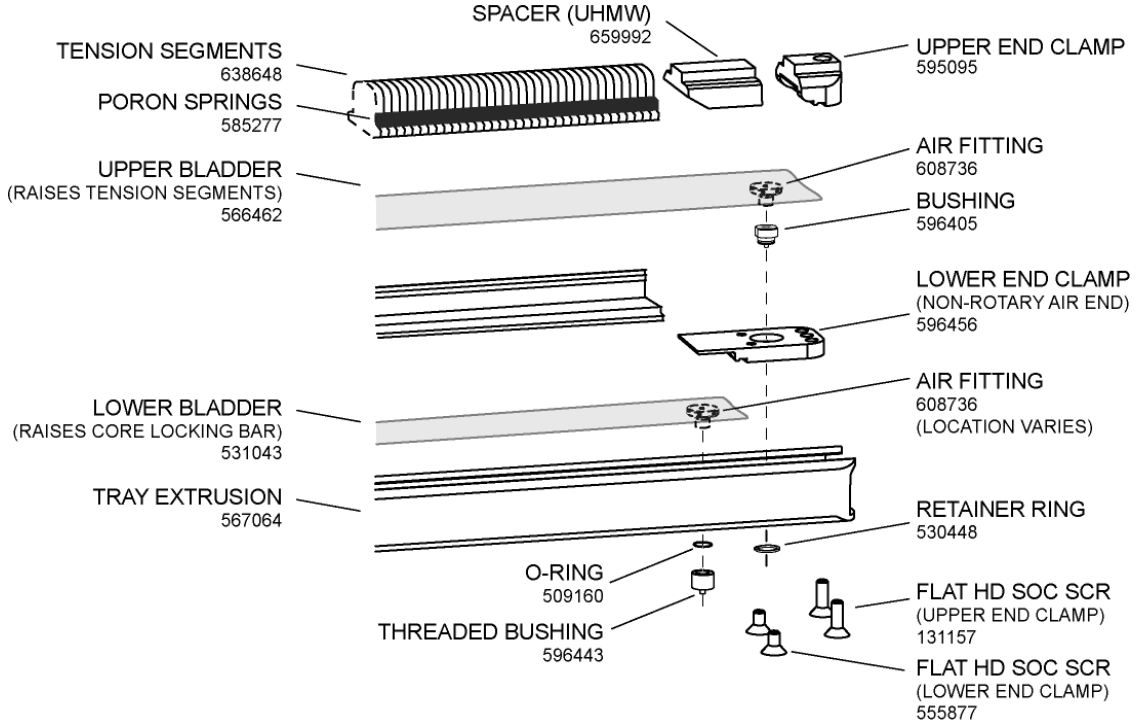
See Appendix B for shaft serial numbers up to and including 651018.

Spacer (UHMW) part profile changed with serial number XXXXXX, but it does not affect assembly.

Rotary Air End



Non-Rotary Air End



OPERATION

NOTICE	**Before beginning the winding operation,** please read and understand the following.

Pressure Control Valve System

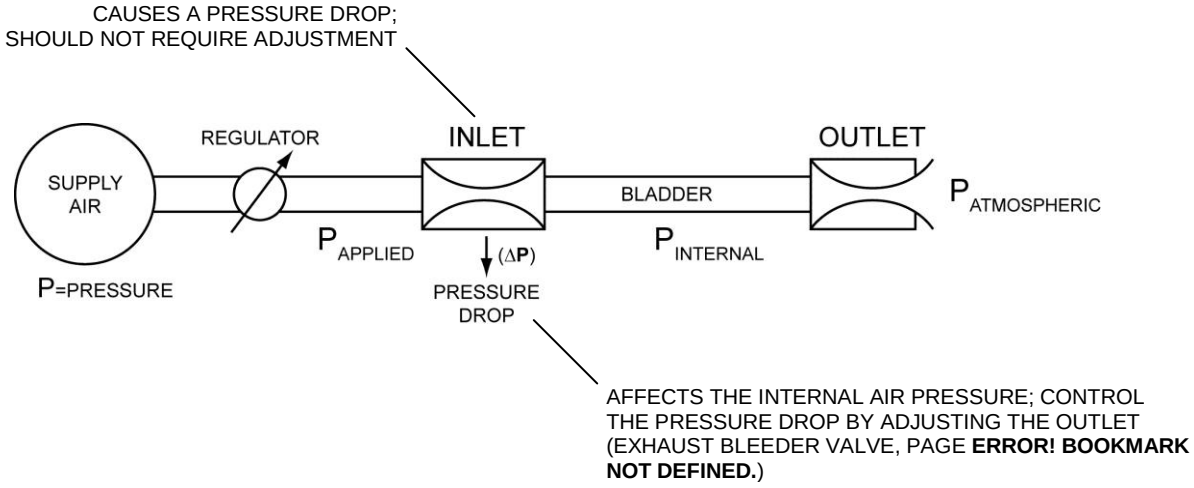
Successful operation of the Tidland Differential Shaft series depends upon proper internal air pressure. Each of the Differential Shaft models can be equipped with a *pressure control system* comprising two bleeder valves. Used with your applied air pressure, these valves allow the operator to adjust and maintain internal air pressure, which is critical in low-tension winding applications where the required internal pressure is very low and the pressure range is very small.

Variable pressure is required in order to control the air pressure on the tension segments as the roll diameter increases. As the roll diameter grows, the required rate of pressure increase will diminish due to the weight of the roll and friction between the roll and shaft. These parameters will vary based on your application.

How it Works

As operating air pressure is applied to the shaft, the factory-set *inlet valve* causes a drop in pressure as air enters the bladder. The *exhaust bleeder valve* controls the amount of that pressure drop. The larger the exhaust opening, the greater the pressure drop, resulting in lower internal bladder pressure. Reducing the exhaust opening increases the internal air pressure.

If you are unable to achieve optimal tension control by adjusting your applied air pressure, use the exhaust bleeder valve to improve the resolution of your tension controller.



For the D3 Differential Shaft, this Pressure Control Valve System affects only the upper bladder that controls the tension segment height.

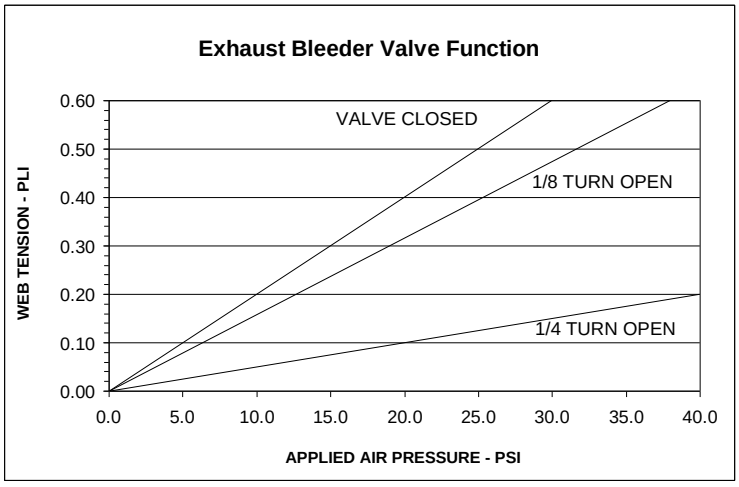
Note: The Pressure Control Valve System is installed in Tidland D3 shafts starting with serial number 644698.

Bleeder Valves

As operating air pressure is applied to the shaft, the factory-set *inlet valve* causes a drop in pressure as air enters the bladder. The *exhaust bleeder valve* controls the amount of that pressure drop. The larger the exhaust opening, the greater the pressure drop, resulting in lower internal bladder pressure. Reducing the exhaust opening increases the internal air pressure.

- Both valves are factory-set according to customer operating specifications: roll specs (width, diameter and weight), and web tension (PLI).
- If you are unable to achieve optimal tension control by adjusting your applied air pressure, use the exhaust bleeder valve to improve the resolution of your tension controller. For the majority of applications, no adjustment is required for the exhaust bleeder valve. For higher internal pressure, adjust to a smaller opening in the valve. For lower internal pressure, adjust to a larger opening. Adjustments are made with a 1/8" hex key.
- The restrictor valve at the inlet should not require adjustment.
- Do not operate shaft with missing valves.
- A muffler may be installed* on the exhaust bleeder valve outlet to reduce noise. A slight hiss may be audible: this indicates that the Pressure Control Valve System is functioning, allowing air to escape from the shaft as designed. The muffler must be removed (12 mm socket) before attempting to adjust or remove the bleeder valve. (See Bleeder Valve Maintenance, page 12.)

*Not available on all Differential shaft designs.

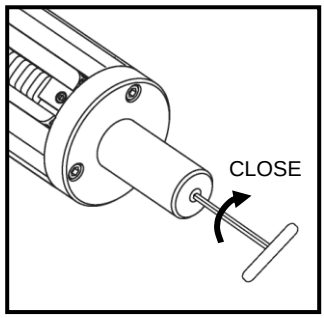


- The purpose of this graph is to illustrate the characteristics of bleeder valve function. The tension values displayed are arbitrary.
- Actual winding tension will differ by variables such as bladder length, shaft speed, roll specs (width, diameter and weight), and core material.

Adjusting the Exhaust Bleeder Valve

1. Stop winding operation and shaft rotation.
2. To adjust the internal air pressure, turn the valve in 1/8 turn increments using a 1/8" hex drive wrench.
   - To increase the pressure, turn the valve clockwise.
   - To decrease the pressure, turn the valve counterclockwise.

DO NOT adjust while shaft is spinning.



To clean or replace the valve, see page 12.

OPERATION

Inflation Sequence

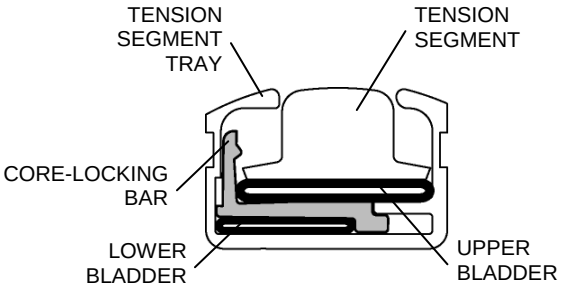
NOTICE	**The core-locking feature may be disarmed if the appropriate pressurization sequence is not followed.**

- Successful operation of the D3 differential shaft depends upon proper pressurization.
- Tidland recommends the use of precision instrumentation to ensure that inflation specifications are met.
- Do not exceed maximum operating pressure as outlined in chart on page 10. Excessive pressure may cause bladder to explode or premature wear of tension segments and wear bars.

Deflate the Bladders

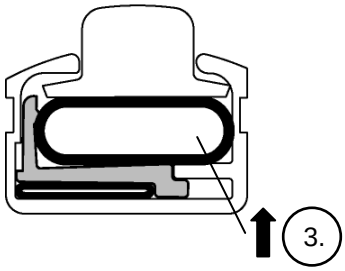
- The D3 shaft is equipped with two separate bladders. The upper bladder, inflated through the rotary union air supply, controls the pressure of the tension segments against the cores.
- The lower bladder, inflated through a side or end valve, raises the core-locking bar that locks the tension segments between the cores in a raised position.

1. Make sure both bladders are completely deflated.
2. Install cores on shaft.



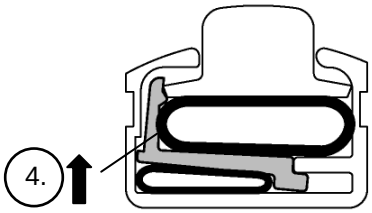
At the Rotary Union Air Supply

3. Using clean, non-lubricated air, inflate the tension element bladder with a constant air source at a pressure high enough to raise the tension segments to their maximum height.
   Recommended: 20-40 psi (1.4-2.8 bar)



At the Side Valve

4. Using clean, non-lubricated air, manually inflate the lower core-locking bladder to raise the locking angle bar. You may hear it "click" into place as it locks the tension segments in their raised position.
   Recommended: 40 psi (2.8 bar)

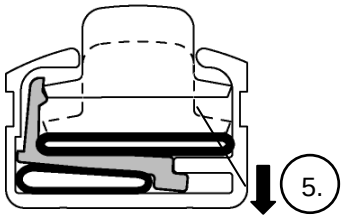


At the Rotary Union Air Supply

5. Deflate the upper bladder to 0 (zero) psi, which will lower the tension segments under the cores.

The following conditions must be met or the shaft will not work properly:

- The tension segments **between** the cores must remain raised at a height that prevents lateral movement of the cores on the shaft.
- The tension segments **beneath** the cores must be fully retracted, and cores should turn by hand easily on the shaft. If they do not, refer to *Troubleshooting* on page 21.

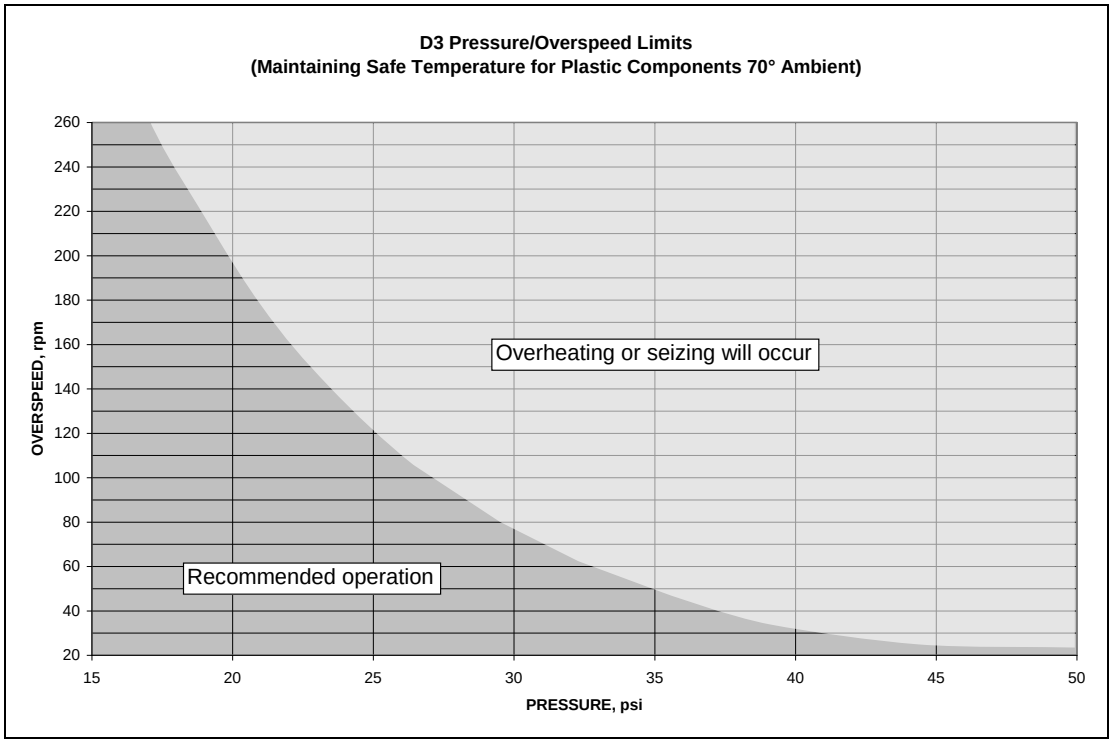


OPERATION

To Begin Winding

Important! Low-tension winding requires very low pressure.

1. Begin winding between 0 – 1 psi (0-0.1 bar).
   Tidland recommends precision instrumentation to ensure proper air pressure.
2. Make sure that cores can slip on the shaft as the winding continues.
   (If they do not, refer to Troubleshooting on page 21.)
3. Continue winding.
4. During winding, observe the tension controller readout and adjust the applied air pressure as needed. Adjusting the exhaust bleeder valve may improve the effectiveness of the tension controller. (See page 8.)



When Winding is Complete

1. When the desired roll size is reached and winding has stopped, manually deflate the lower bladder (side or end valve) using the Tidland air release tool. To ensure that all the air is exhausted from the bladder, increase the air pressure in the tension segment bladder (rotary union valve) while engaging the air release tool in the side/end valve. This forces the core-locking bar down and squeezes the air out of the lower bladder.
2. Reduce tension segment pressure (rotary union valve) to zero psi.
3. Rolls are now ready to be repositioned or removed from shaft.

MAINTENANCE

General Information

Complete maintenance procedures begin on page 13.

Maintenance Schedule

- During operation shifts, use compressed air to keep shaft free from dust and debris.
- As needed, remove sticky residue. Use a soft cloth damp with a mild solvent, such as rubbing alcohol.

Shaft Care

- Clean shaft with a soft cloth.
- Mild solvents may be used sparingly; make sure shaft slot and all parts are wiped completely dry of solvents before beginning reassembly.
- Avoid lubricants as they cause dust to accumulate, preventing the shaft from functioning properly.

Polyurethane Bladders

- Petroleum-based lubricants will damage polyurethane bladders and o-rings. **Do not use.**
- To help ensure leak free operation when replacing bladders:
  a. Measure the length carefully so that bladder will be secured under the element end clamps.
  b. Always cut the bladders square across the end; bladders cut at an angle are at risk for leaks.
  c. Ensure that the element end clamp screws are tightened to 30 in·lbs (3.4 Nm). Use *LOCTITE 242* on screw threads.
     -

Poron® Springs

- The Poron material attached to the tension segment strip is fragile – use care when handling the strip.
- A torn or broken strip can function, but such damage may result in the loss of tension segments when the strip is outside of the tray.
- Strips with missing tension segments will prevent proper shaft operation. Do not use.
-

Wear Bars

- Inspect the UHMW wear bars for gouges and deep wear depressions. If they are evenly worn, Tidland recommends replacing all wear bars at the same time.
- Single replacements can be made in the event of a damaged wear bar.
- Wear bar configurations vary.
  - **For shaft serial numbers up to 653669**, contact Tidland Customer Service for replacement information. 1-800-426-1000
  - **Shaft serial numbers 660659 and after**, see page 19 for replacement instructions.

Maintaining the Bleeder Valve

If maintaining low tension during winding becomes difficult, the bleeder valve may require adjustment or cleaning.

Note:

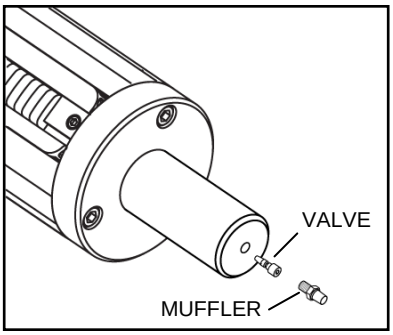
- The fine threads on the needle and the housing are easy to damage. Use care when working with these components.
- Do not attempt to remove the bleeder valve housing from the shaft. If repair is necessary, return the shaft to Tidland. (***www.tidland.com/returns***)
- Location of valve varies due to custom shaft configurations.

Do not operate the shaft if:

- the valve is missing.
- the orifice is otherwise plugged.

Cleaning the Exhaust Bleeder Valve

1. Stop the winding operation and shaft rotation.
2. Locate the bleeder valve at the end or on the side of the shaft.
3. Using a 12 mm socket, carefully remove muffler*, if installed.
4. Using a 1/8" hex drive, carefully back the needle valve all the way out of its housing (counterclockwise).
5. Using compressed air, blow dust and debris out of the valve.
6. Carefully reinstall the needle valve in the housing.
7. Close the valve down until it just bottoms out in the housing, and then adjust as required for your application.
8. Resume winding operation.
9. Adjust the bleeder valve incrementally to achieve required internal pressure.



*Not available on all Differential shaft designs.

Replacing the Exhaust Bleeder Valve

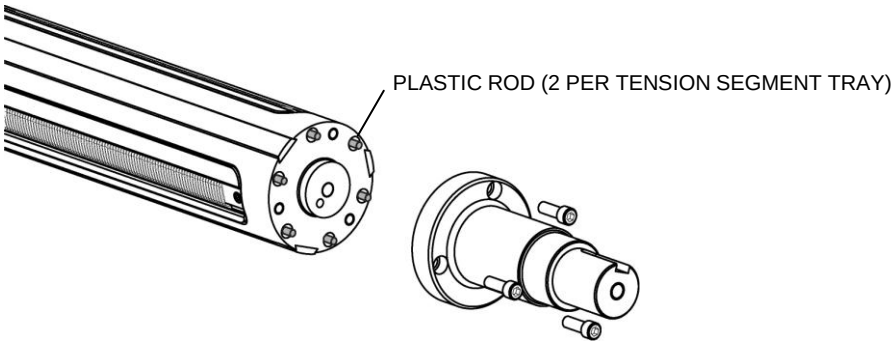
1. Stop the winding operation and shaft rotation.
2. Locate the bleeder valve at the end or on the side of the shaft.
3. Using a 12 mm socket, carefully remove muffler, if installed.
4. Using a 1/8" hex drive, carefully back the needle all the way out of its housing (counterclockwise).
5. Carefully reinstall the needle valve in the housing.
6. Close the valve down until it just bottoms out in the housing, and then adjust as required for your application.
7. Resume winding operation.
8. Adjust the bleeder valve incrementally to achieve required internal pressure.

Tension Segment Tray

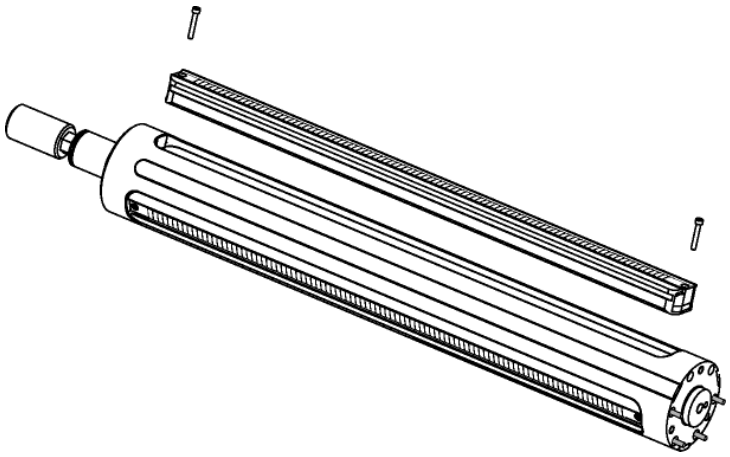
For shaft serial numbers up to and including 651018, see *Appendix A* (page 22) for tray removal instructions.

Remove Tension Segment Tray from Shaft

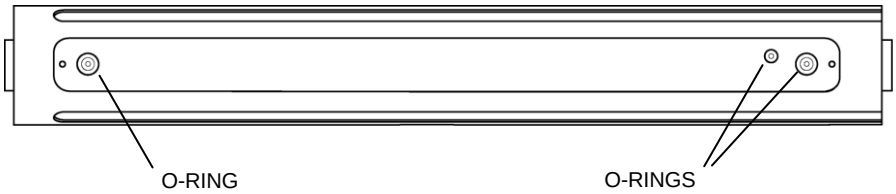
1. Remove the journal (or end cap) from the shaft. (Configurations vary.)
2. Remove the two plastic rods that hold the selected tray in place. Grasp the protruding end of the rod with small pliers and pull it out.



3. Remove the socket head capscrews that secure the tray to the slot. (7/64" hex drive)
4. Lift the tray out of the shaft and set it on a workbench.



5. Ensure that three o-rings remain in the shaft body slot after the tray is removed. Earlier shaft models have two o-rings: see page 23.

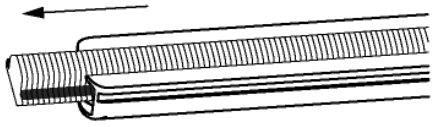


Disassemble Tension Segment Tray

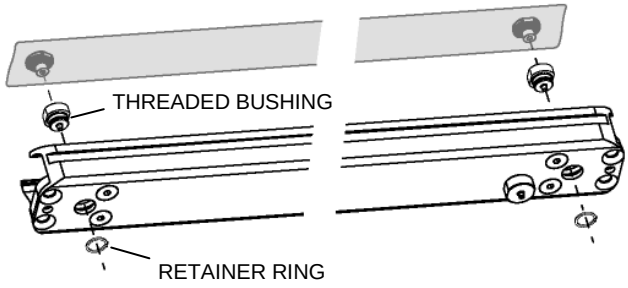
Tray configurations vary for earlier shafts. See *Appendix B* (page 23) for shaft serial numbers up to and including 651018.

1. On the bottom side of the tray, remove the two outermost screws at each end to remove the upper bladder end clamps.
   (2.5mm hex drive)
   [21 in·lbs/2.37 Nm]

2. Push – and gently pull – on the tension segment strip to slide it out of the tray. Use care not to tear the fragile Poron spring material.



3. On the bottom side of the tray, remove the retainer rings to release the bladder from the tray. Unseat the air fittings and remove the bladder from the tray. Unscrew the threaded bushing from the air fitting and remove the air fitting from the bladder.

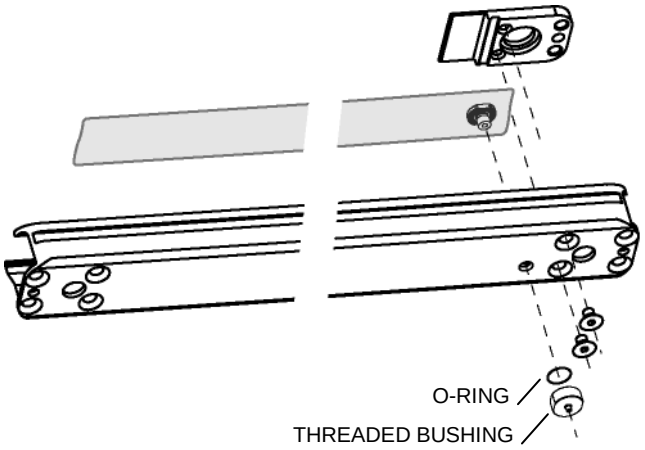


4. On the bottom side of the tray, remove two screws that secure the lower bladder end clamp. (2.5mm hex drive)

5. Slide the core-locking bar out of the tray.

Disassemble Tension Segment Tray (continued)

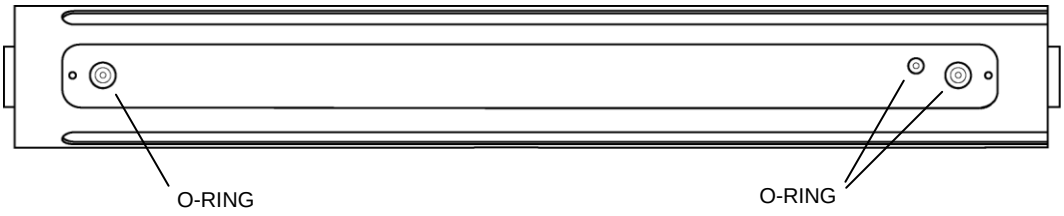
1. On the bottom side of the tray, remove two screws that secure the lower bladder end clamp to the tray.
2. Unscrew the threaded bushing from the air fitting to release the bladder from the tray.
3. Remove the air fitting from the bladder.



Note: Retain the o-ring that is seated in the threaded bushing.
If your shaft design does not have an o-ring on the bushing, wipe the external threads of the air fitting with a small amount of *LOCTITE 242* during reassembly.

Shaft and Tray Maintenance

1. After the tension segment tray has been removed, clean the shaft slot using a soft cloth. A mild solvent, such as rubbing alcohol, may be used sparingly; make sure shaft slot is wiped completely dry before beginning reassembly.
2. Ensure that there are three o-rings seated in the positions shown below in each slot. Earlier shaft models have two o-rings: see page 23.

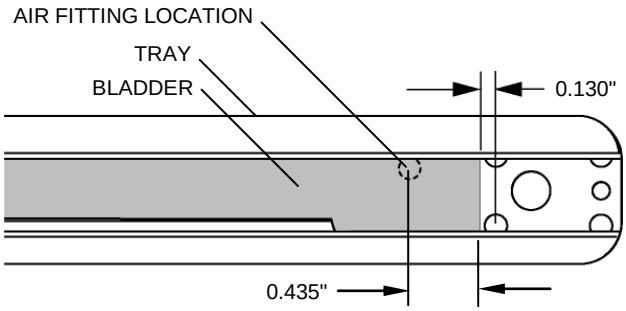


3. Apply a small amount of o-ring lubricant to each o-ring before beginning reassembly.
4. Clean the tension segment tray with a mild solvent, such as rubbing alcohol. Dry thoroughly before beginning reassembly.

NOTICE	Petroleum-based lubricants will damage the bladders and o-rings. **Do not use!**

Install Bladders

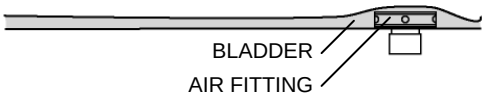
Use a small amount of *LOCTITE 242* on the threads of all screws and tighten to torque specifications noted in brackets.



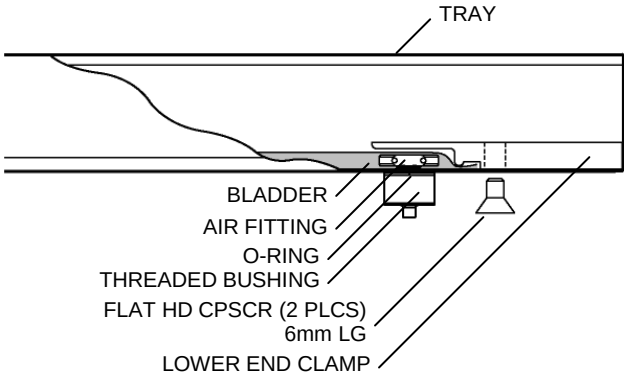
Core-Locking Element (Lower Bladder)

1. Cut the end of the lower bladder square and install it in the tray lined up just at the edges of the screw holes, as shown.
2. On the bladder, mark the location of the center of the air fitting and remove the bladder from the tray.

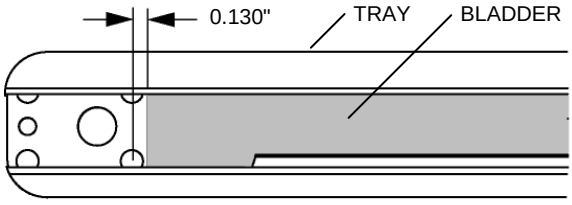
3. Using the Tidland Hole Punch Tool, punch a hole in one wall only of the bladder and insert the air fitting into the bladder.



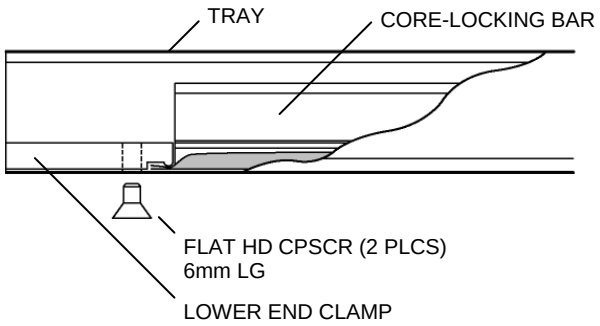
4. Reinstall the bladder in the tray with the air fitting extending through the hole in the tray.
5. Screw the threaded bushing (with o-ring installed) onto the air fitting to secure it to the tray. Do not over-tighten or the bladder will distort, which may result in leaks.
   Note: If your shaft does not use an o-ring on the bushing, wipe the external threads of the air fitting with a small amount of LOCTITE.
6. Install the element end clamp with two flathead cap screws, securing the bladder underneath. (2.5mm hex drive)
   [21 in·lbs/2.37 Nm]



7. Mark the other end of the bladder at a point that lines up just at the edges of the screw holes, as shown, and cut the end of the bladder square.



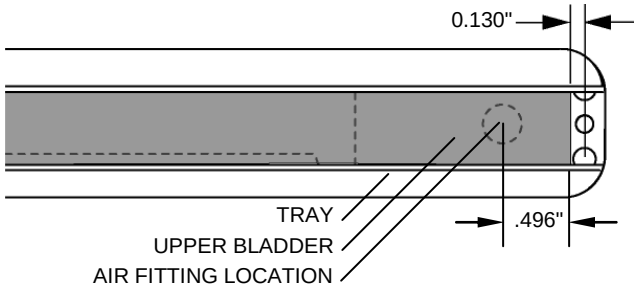
8. Slide the core-locking bar into the tray.
9. Install the element end clamp with two flathead cap screws, securing the bladder underneath. (2.5mm hex drive)
   [21 in·lbs/2.37 Nm]



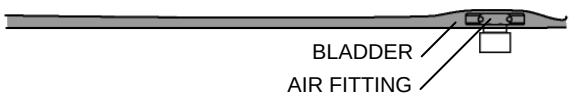
Before continuing reassembly, test the bladder for air leaks at 80 psi (5.5 bar). Spray soapy water onto element end clamps and air fittings and watch for bubbles. When inflated, the bladder should cause the core-locking bar to lift.

Tension Segment Element (Upper Bladder)

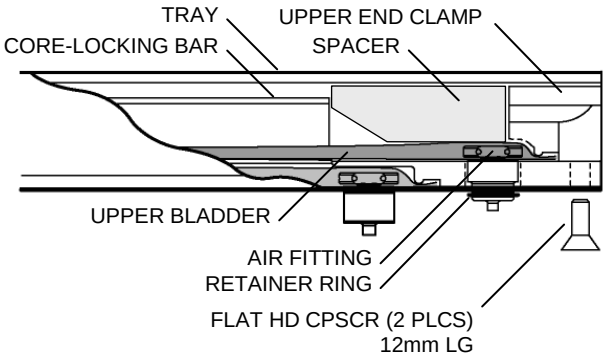
1. Cut the end of the upper bladder square and install it in the tray (on top of the core-locking bar) lined up just at the edges of the screw holes, as shown.
2. On the bladder, mark the location of the center of the air fitting and remove the bladder from the tray.



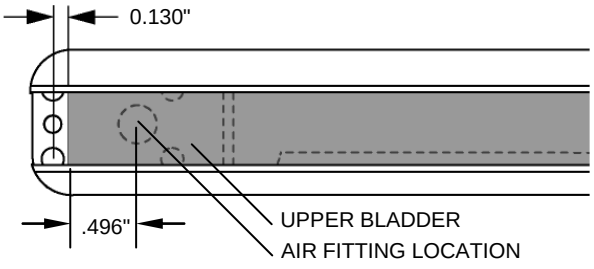
3. Using the Tidland Hole Punch Tool, punch a hole in one wall only of the bladder and insert the air fitting into the bladder.

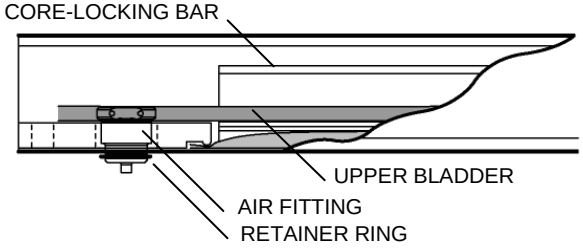


4. Reinstall the bladder in the tray with the air fitting extending through the hole in the lower element end clamp.
5. On the underside of the tray, install the retainer ring to secure the air fitting.
6. Install plastic spacer as shown.
7. Install the upper element end clamp with two flathead cap screws in the outermost holes of the tray. (2.5mm hex drive) [21 in·lbs/2.37 Nm]



8. Cut other end of the bladder square at a point that lines up at the edges of the screw holes, as shown.
9. Mark the location of the center of the air fitting and remove the end of the bladder from the tray.
10. Using the Tidland Hole Punch Tool, punch a hole in one wall only of the bladder and insert the air fitting into the bladder.
11. Return the end of the bladder to the tray with the air fitting extending through the hole in the tray.
12. Install the retainer ring to secure the air fitting to the tray.

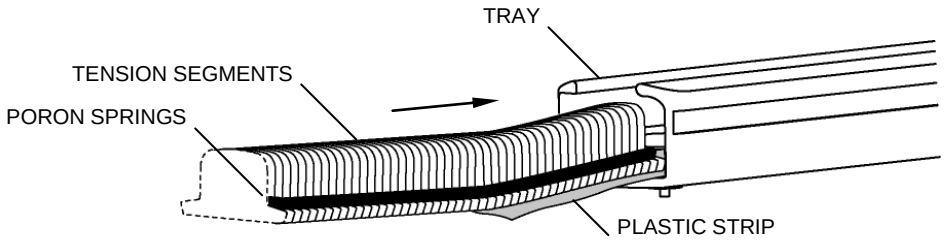




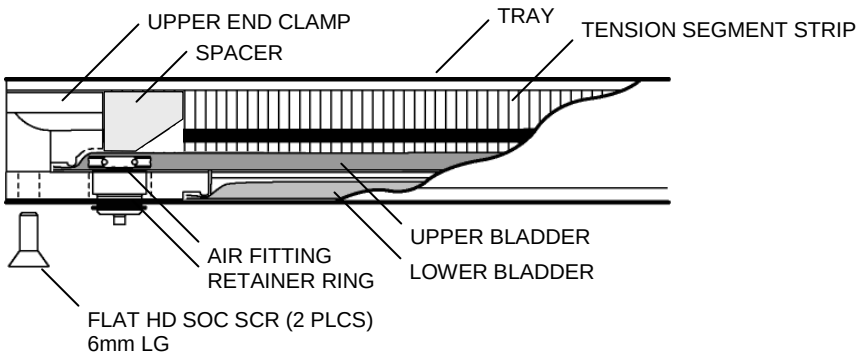
Install Tension Segment Strip

1. Carefully feed the end of the tension segment strip into the open end of the tray.
2. Push – do not pull – the strip into the tray. The Poron spring material is fragile.
3. As the strip is installed, ensure that the bladder does not wrinkle underneath it.

Tip: Lay a small strip of thin plastic or sturdy paper across the air fitting and the end of the tray to help start feeding the tension segment strip into the shaft. Be sure to remove the plastic strip before installing the remaining element end clamp.



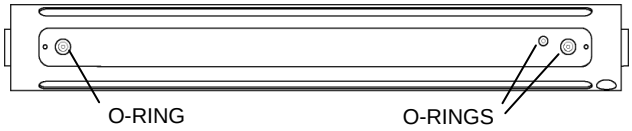
4. When the tension segment strip has been completely loaded into the tray, install the short plastic spacer, in the direction shown below.
5. Install the remaining upper element end clamp with two flathead cap screws in the outermost holes of the tray. (2.5mm hex drive) [21 in·lbs/2.37 Nm]



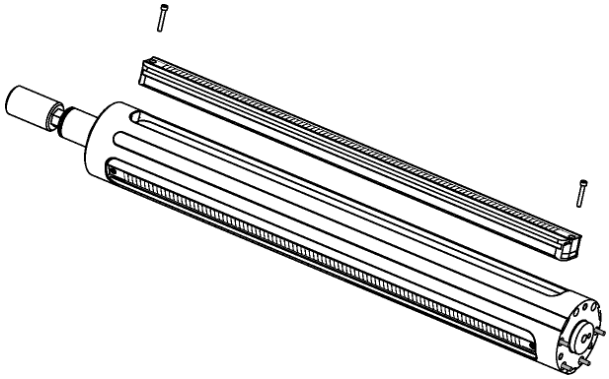
Before continuing reassembly, test the bladder for air leaks at 80 psi (5.5 bar) using soapy water at end clamps and air fitting. When inflated, the bladder should cause the tension segments to lift.

Install Tray in the Shaft Slot

1. Ensure that there are three o-rings in each slot of the shaft body. Use a small amount of o-ring lubricant on each o-ring before installing the tray.
   Note: Earlier shaft models have two o-rings: see page 23.

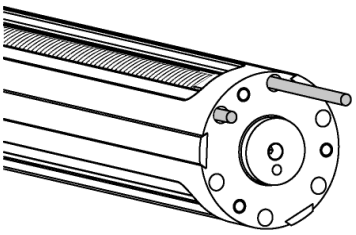


2. Insert the tray in the shaft slot, making sure that fittings on the bottom of the tray align with holes in shaft slot.
3. Apply *LOCTITE 242* to the threads of the socket head capscrews and install at each end of the tray.
4. Tighten to 17 in·lbs (1.9 Nm).



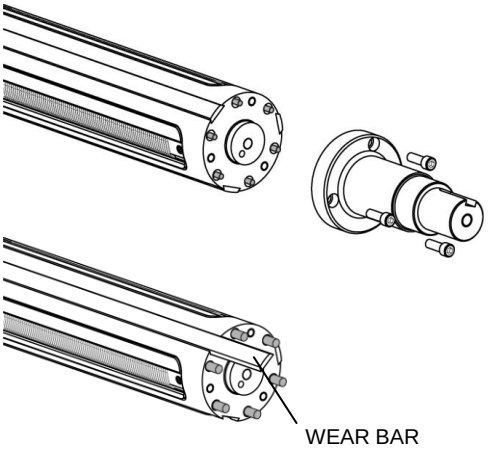
5. Slide the plastic rods into the grooves in the shaft to retain the tray. If they do not slide in easily, press down gently on the tray as the rod goes into the shaft.
6. Install the shaft journal or end cap. (Shaft end cap configurations vary.) Use *LOCTITE 242* on bolt threads and tighten to specifications for your shaft material.

Aluminum	5 ft·lbs (6.8 Nm)
Steel	9 ft·lbs (12.2 Nm)



Replace Wear Bars

1. Remove shaft journal or end cap.
2. Slide wear bar out of shaft.
3. Slide new wear bar into shaft and reinstall the shaft journal or end cap. (Configurations vary.) Use *LOCTITE 242* on bolt threads and tighten to specifications for your shaft material (see Step 6 above).



Note: If there is a valve in the wear bar slot, remove it before attempting to slide the wear bar out. When reinstalling the valve, do not use *LOCTITE*. Tighten valve to 8-10 in·lbs (0.9-1.1 Nm).

Aluminum Wear Bars are installed with button head screws. Use a hex drive wrench (2.5mm) to remove. When reinstalling screws, apply *LOCTITE 242* to threads and tighten to 15 in·lbs (1.7 Nm).

TROUBLESHOOTING

Problem	Possible Cause	Recommended Solution
Tension segments do not activate	Exhaust Bleeder Valve missing or not adjusted correctly – too much air escaping from shaft.	Ensure bleeder valve is installed. Carefully tighten bleeder valve until it seats in its housing. Back off one-quarter turn (90°). Make further adjustments 45° at a time.
	Air Leak or obstruction in air system.	Make sure element end clamps are tightened to 21 in·lbs. Inflate bladders and use soapy water at element end caps to locate leaks. Replace bladders or air lines as needed.
	Tension segments jammed with core dust or debris	Remove cores; use compressed air to remove dust and debris
Tensions segments do not retract	Bladder(s) not deflated properly	Use Tidland Air Release tool to deflate bladder(s),
	Tension segments jammed with core dust or debris	Cut web and cores from shaft; use compressed air to remove dust and debris. Use care not to damage tension segment strip when cutting cores.
	Overheated shaft has deformed the bladder(s).	Cut web and cores from shaft; replace bladder(s).
Overheated shaft	Shaft spinning inside cores after winding operation has stopped	Stop shaft rotation when not in winding operation.
	Excessive friction caused by dust or residue buildup on shaft	Stop winding operation; remove cores and clean shaft. Use compressed air to remove dust. For residue, use a rag damp with small amount of mild solvent, such as rubbing alcohol. Let shaft dry completely before reloading cores.
	Overspeed	Reduce winding speed: 10% max overspeed; recommend 5%
	Oversized cores will not allow core locking bar to engage; tension segments will not retract properly – rubbing on cores.	Replace cores. *****

TROUBLESHOOTING

Problem	Possible Cause	Recommended Solution
Excessive core dust	Poor quality cores with rough edges	Replace cores.
	Oversized cores will not allow core locking bar to engage; tension segments will not retract properly – rubbing on cores.	Replace cores. *****
Cores stuck on shaft	Excessive tension crushing core	Reduce winding speed: 5% overspeed recommended Lower the range tension pressure or adjust taper tension. Check Bleeder Valve adjustment.
	Overspeed	Reduce winding speed: 10% max overspeed; recommend 5%
	Core crushed by web shrinkage (e.g., stretchable materials)	Cut web and core from shaft
	Core residue binding core to shaft	Cut web and core from shaft. Use a rag damp with small amount of mild solvent, such as rubbing alcohol, to clean the shaft. Let shaft dry completely before reloading cores.
	Damaged tension segments are not retracting	Cut web and core from shaft; replace tension segment strip.
Different tension from individual shafts (Duplex Winder)	Leak or obstruction in air system	Make sure element end clamps are tightened to 21 in·lbs. Check all bladders for holes, deformation or debris around air fittings. Replace bladder(s) or air lines as needed.
	Exhaust Bleeder Valve not adjusted correctly.	Match tensions by adjusting Pressure Control System in each shaft (p. 7).

***** +0.20/+0.10 nominal clearance, unless otherwise specified.

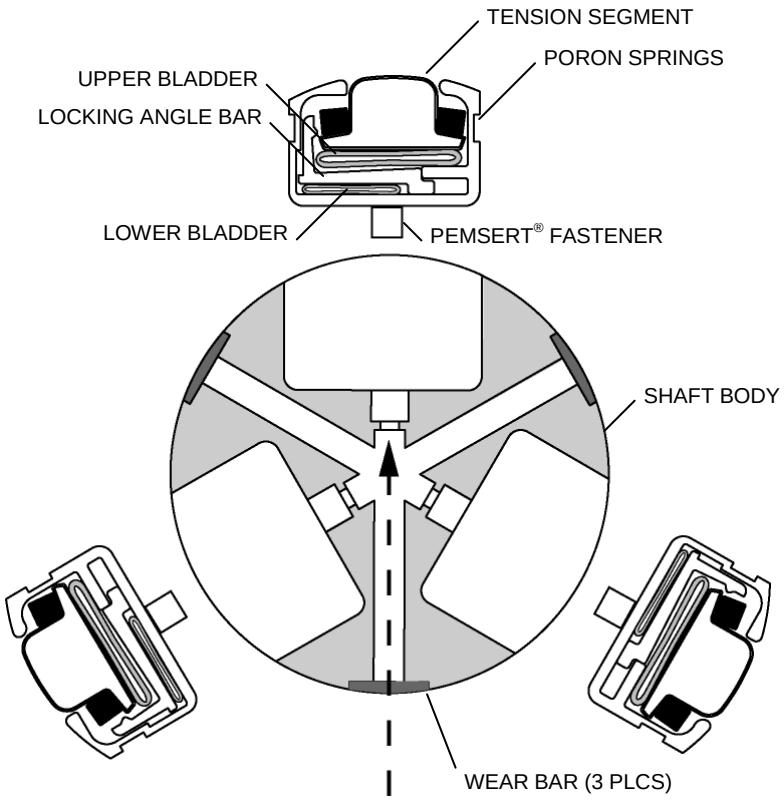
APPENDIX A

Tidland D3 Serial Numbers up to and including 651018.

Remove Tension Segment Trays

Important:

- Earlier shaft models use air hoses. Use care when removing the tray from the shaft
- Carefully remove the hose end from the air fittings in the tray.
- Clip off the damaged part of the hose end before reconnecting it to the air fitting.
- To keep the hose from falling back inside the shaft body, wrap it with a piece of tape.



Insert hex wrench through holes in wear bars
to access the fasteners that hold trays in place.

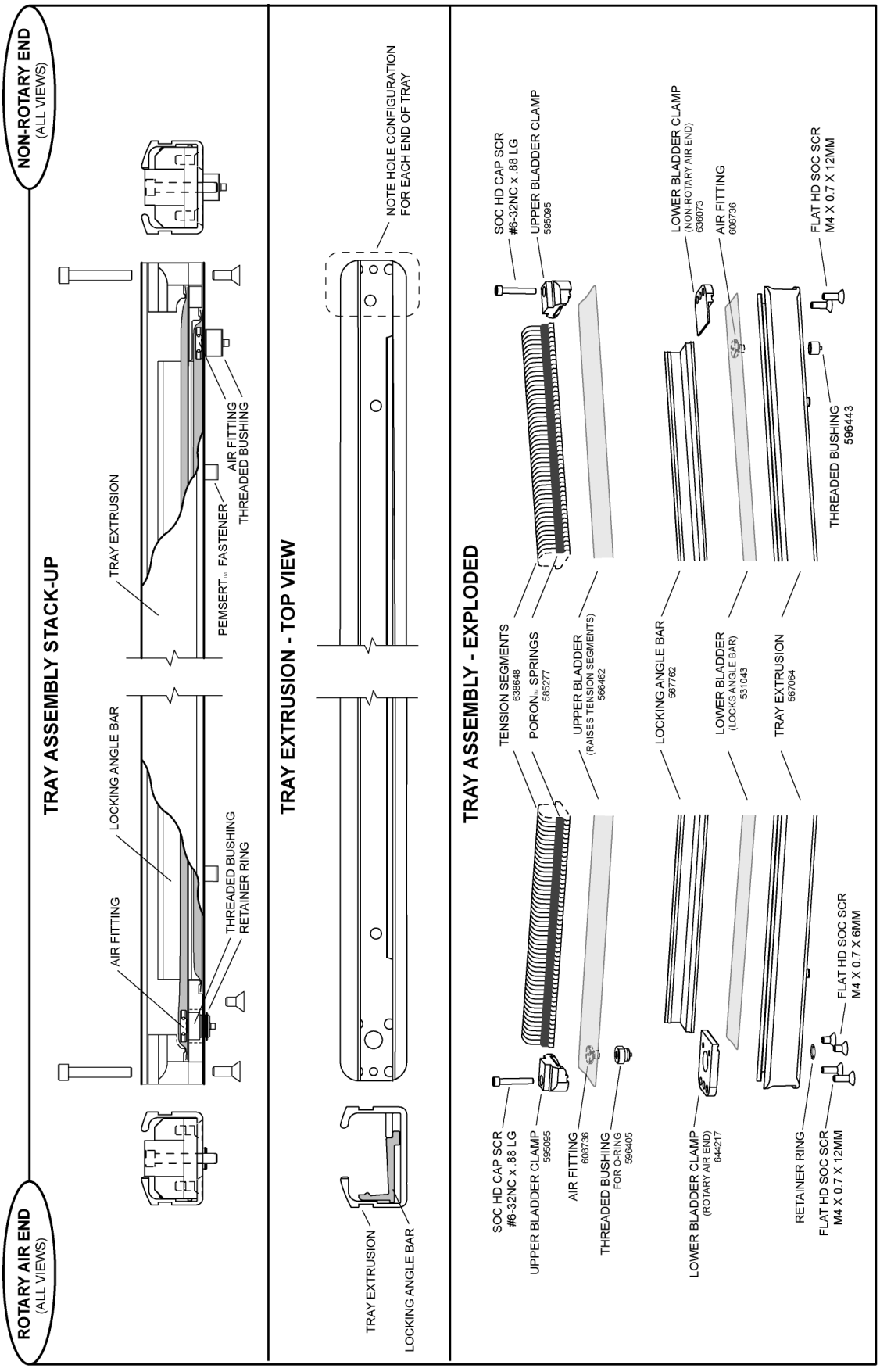
NOTE:
Orient the shaft with access holes at the bottom
so the screws come straight down and out.

- After the tension segment tray has been removed, clean the shaft slot using a soft cloth.
- A mild solvent, such as rubbing alcohol, may be used sparingly; make sure shaft slot and tray are wiped completely dry before beginning reassembly.

NOTICE	Petroleum-based lubricants will damage the bladders and o-rings. **Do not use!**

APPENDIX B

For use with Tidland D3 Serial Numbers up to and including 651018.



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