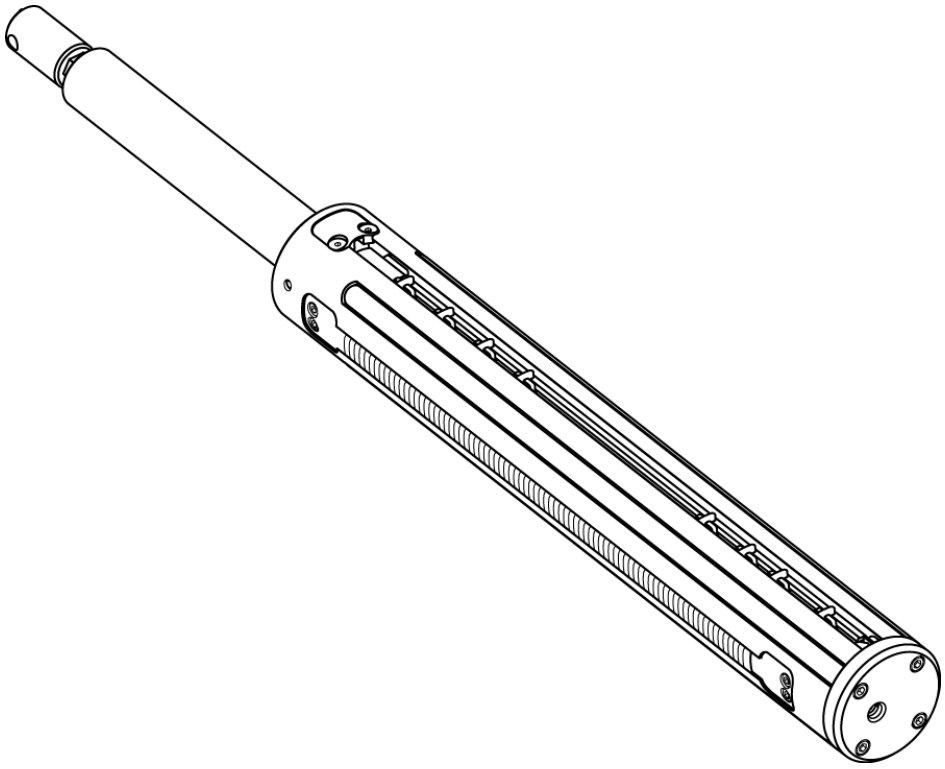
TIDLAND WINDING SOLUTIONS

Tidland D2 Differential Air Shaft

Installation, Operation and Maintenance Manual



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IMPORTANT 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.

CAUTION

- Wear eye protection when using tools or compressed air.

TABLE OF CONTENTS

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 (Part No. 128052)
- Tidland Air Release Tool (Part No. 111630)

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

GENERAL SHAFT CARE

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.
- **Complete maintenance procedures begin on page 9**.

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

- **Do not use** petroleum-based lubricants; they will damage polyurethane bladders.
- 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 recommended torque specifications. Use *LOCTITE 242* on screw threads when reinstalling.

Poron® Springs

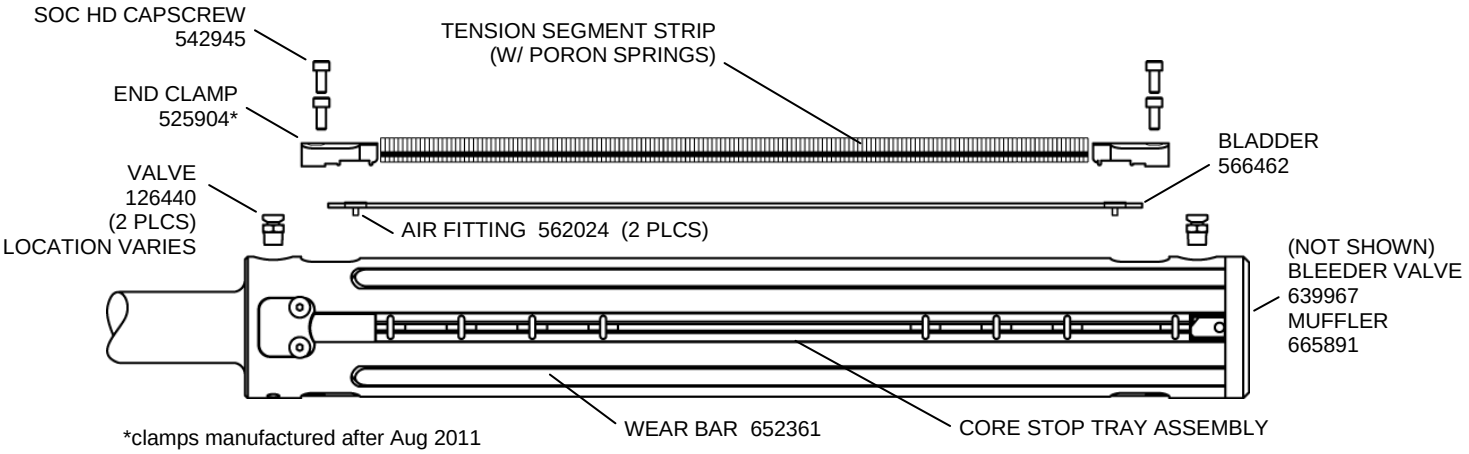
- The Poron material attached to the tension segment strip is fragile – use care when handling the strip.
- A torn or broken strip can function, but such damage may result in the loss of tension segments when the strip is outside of the tray.
- Strips with missing tension segments will prevent proper 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 and including 648913**, contact Tidland Customer Service for replacement information. (800.426.1000 / 360.834.2345)
    - **Shaft serial numbers 655176 and after**, see page 13 for replacement instructions.

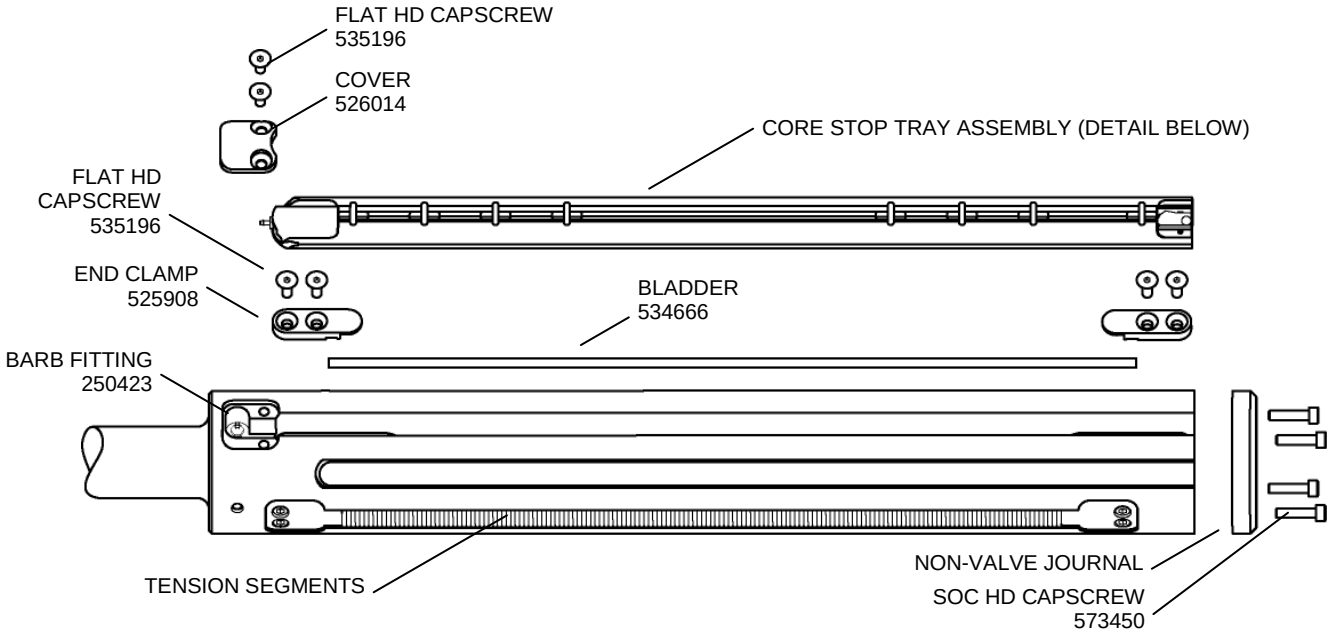
PART IDENTIFICATION

TENSION SEGMENT COMPONENTS

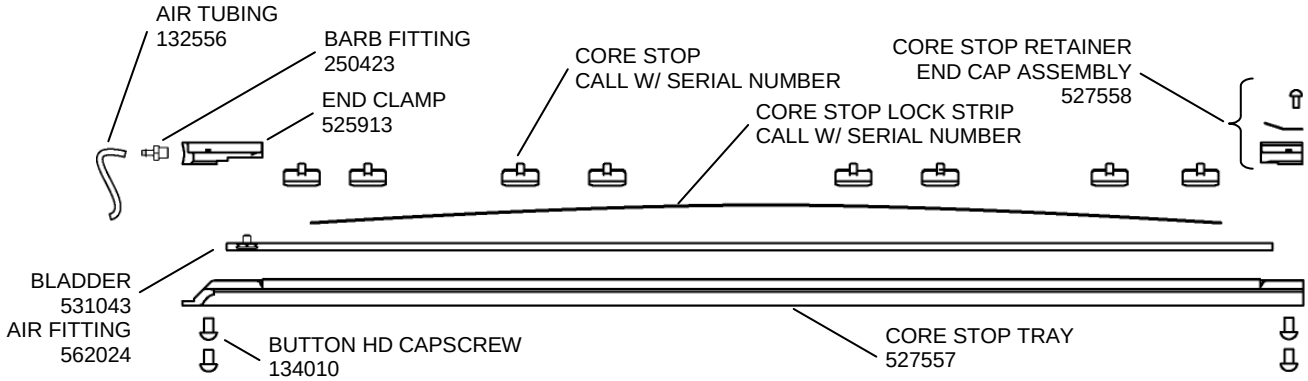


*clamps manufactured after Aug 2011
have ridges removed from undersides.

CORE STOP TRAY COMPONENTS



CORE STOP TRAY ASSEMBLY DETAIL



OPERATION

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

Pressure Control Valve System

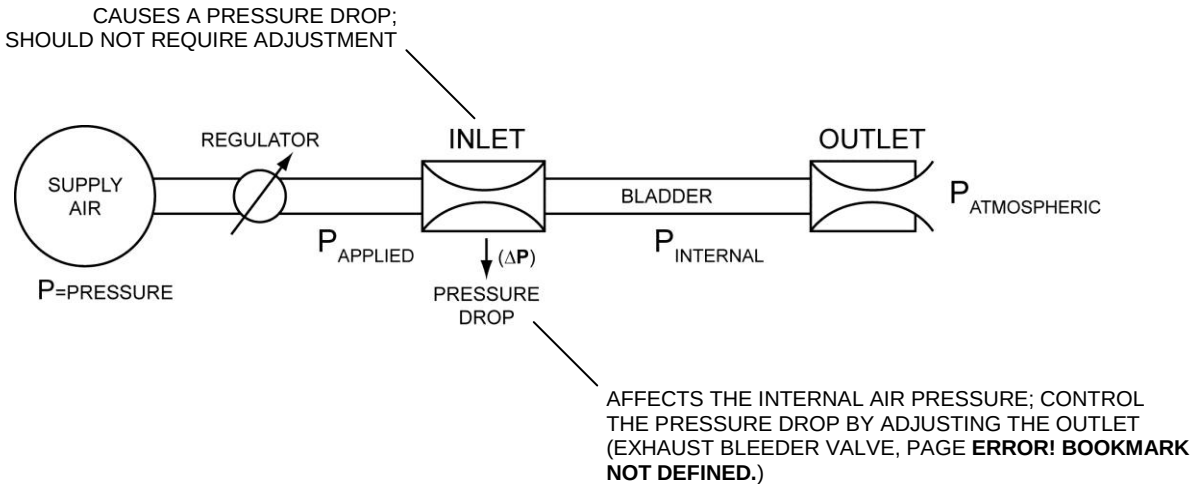
Successful operation of the Tidland Differential Shaft series depends upon proper internal air pressure. Each of the Differential Shaft models can be equipped with a *pressure control system* comprising two bleeder valves. Used with your applied air pressure, these valves allow the operator to adjust 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.

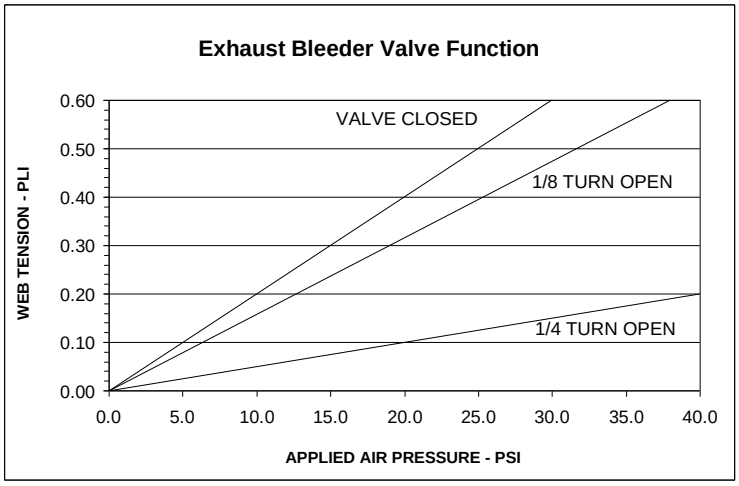


OPERATION

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 13.)

*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.

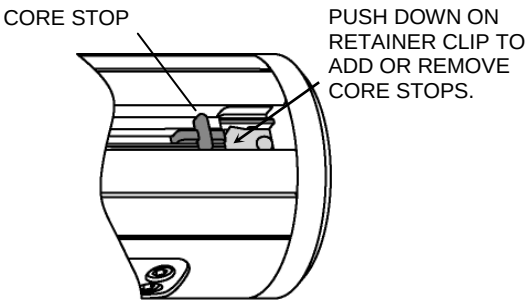
1. Stop winding operation and shaft rotation.
2. To adjust the internal air pressure, turn the valve in 1/8 turn increments using a 1/8" hex drive wrench.
   - To increase the pressure, turn the valve clockwise.
   - To decrease the pressure, turn the valve counterclockwise.

DO NOT adjust while shaft is spinning.

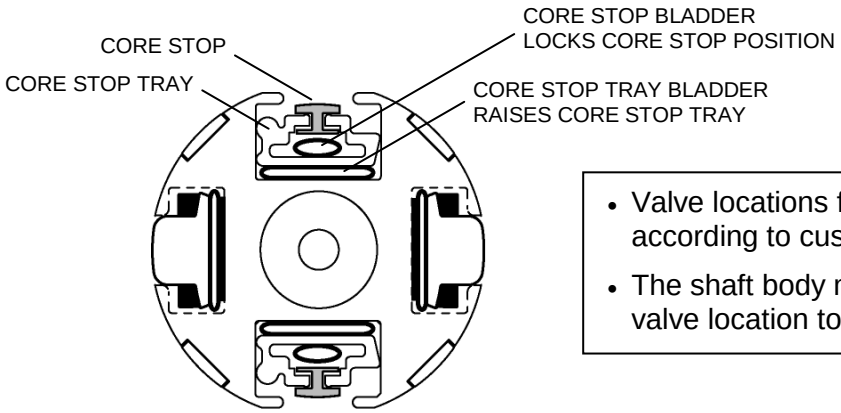
To clean or replace the valve, see page 13.

INSTALLATION

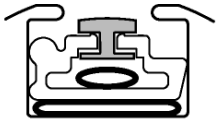
1. Install shaft as required for your application.
2. Determine how many core stops are required. (2 per core in each tray)
3. Remove excess core stops or move them to the end of the tray.
4. Load cores.



OPERATION

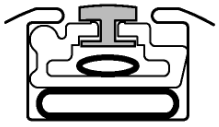


- Valve locations for the Tidland D2 shaft vary according to customer specifications.
- The shaft body may be stamped **1** or **2** at each valve location to aid with inflation sequence.



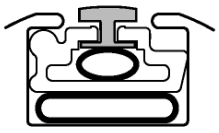
Step 1 – Before Inflation

Position core stops near the edges of cores.
Make sure no core stops are under the cores.



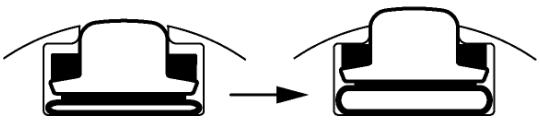
Step 2 – Begin Inflation Sequence

With the Tidland Inflation Tool, inflate the lower bladder [valve is stamped **1** on shaft body] to raise the core stop tray (max. pressure 30 psi / 2.1 bar). Position core stops against core with enough clearance to allow cores to rotate freely.



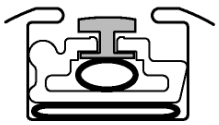
Step 3

With the Tidland Inflation Tool, inflate the upper bladder [valve is stamped **2** on shaft body] to lock core stops in place axially (max. pressure 30 psi / 2.1 bar). Cores should rotate freely on shaft. Shaft is ready for operation.



Step 4

Gradually inflate the tension segment bladder to achieve required tension. Do not exceed 40 psi (2.8 bar).
See *Pressure Control System* (page 6).



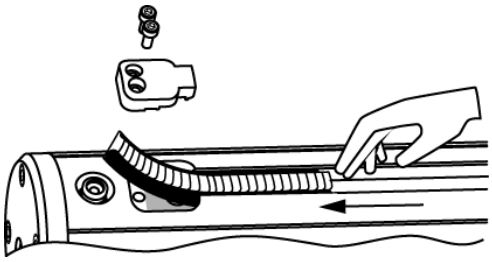
To remove cores, deflate tension segment bladder and the lower core stop bladder to drop the core stop tray. Core stops will remain locked in position in the core stop tray.

MAINTENANCE

To Replace Bladders

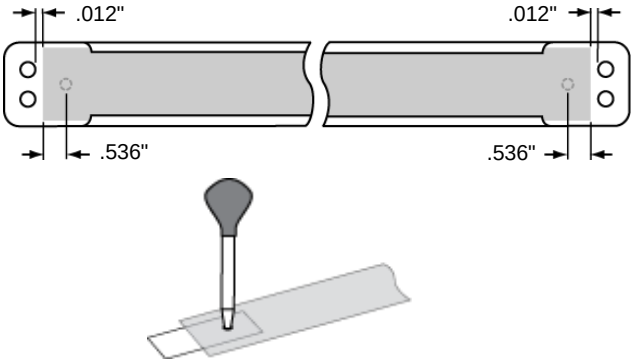
- Bladder material supplied for replacement may be longer than the required finished length. Do not cut to length until instructed.
- Use a small amount of *LOCTITE 242* on the threads of all screws and tighten to torque specifications noted in brackets.

Under Tension Segments



1. Remove both end clamps from tension segment slot. (4mm hex drive)
2. Push – and pull **gently** – on the tension segment strip to remove it from the slot. Poron spring material is fragile.
3. Lift the bladder out of the slot and remove the air fitting from the bladder.
4. Clean the shaft slot with rubbing alcohol and dry thoroughly.

Note: Earlier shaft models may have a flat Poron spring glued to the bladder under the tension segments. This is no longer required for replacement bladders.



5. Cut square across one end of the new bladder and install it in the tray, lined up near the edges of the screw holes.
6. On the bladder, mark the location of the center of the air fitting hole, as shown.
7. Using the Tidland Hole Punch Tool, punch a hole in one wall only of the bladder. Use a small piece of plastic in the bladder to prevent punching through both sides.
8. Insert the air fitting into the bladder.

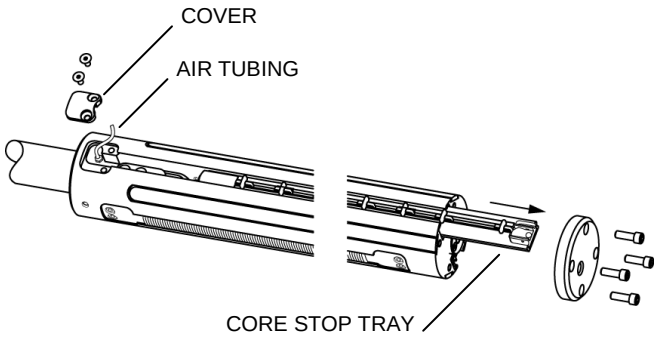
9. Reinstall the bladder in the shaft slot and seat the air fitting in the hole.
10. Install the bladder end clamp with two flat head capscrews (4mm hex drive), securing the bladder underneath. [47 in·lbs / 5.3 Nm]
11. Mark the other end of the bladder at a point that lines up near the edges of the screw holes, as in Step 4, and cut the end of the bladder square.
12. Repeat Steps 5-7.
13. Reinstall the tension segment strip in the slot, taking care not to tear the Poron spring.
14. Install the bladder end clamp with two flat head capscrews (4mm hex drive), securing the bladder underneath. [47 in·lbs / 5.3 Nm]

Note: Test the bladder for air leaks at 80 psi (5.5 bar). Spray soapy water onto bladder end clamps and air fittings and watch for bubbles. When inflated, the bladder should raise the tension segments.

To Replace Bladders

- Bladder material supplied for replacement may be longer than the required finished length. Do not cut to length until instructed.
- Use a small amount of *LOCTITE 242* on the threads of all screws and tighten to torque specifications noted in brackets.

Under Core Stop Tray



1. Remove the cover from the core stop tray. (3mm hex drive)
2. Remove journal or end cap from shaft. (3/16 hex drive)
3. Disconnect the polyurethane air tubing from the air fitting at the end of the core stop tray. (Snip off the damaged or stretched portion of the tubing – about 1/8" – before re-use.)
4. Slide core stop tray out of the shaft.
5. Clean the shaft slot with rubbing alcohol and dry thoroughly.

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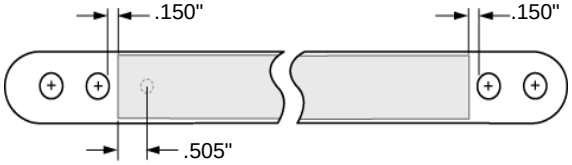
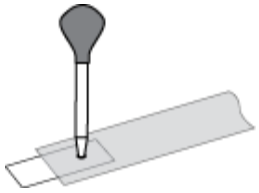
6. Remove the 4 flat head capscrews from the end clamps in the shaft slot (3mm hex drive) and remove the clamps from the slot.
7. Lift the bladder out of the slot and remove the air fitting from the bladder.
8. Cut square across one end of the new bladder and install it in the tray, lined up near the edges of the screw holes, as shown.
9. On the bladder, mark the location of the center of the air fitting.
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. Use a small piece of plastic in the bladder to prevent punching through both sides.





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11. Reinstall the bladder in the shaft slot and seat the air fitting in the hole in the slot.
12. Install one bladder end clamp with two flat head capscrews, securing the bladder underneath. [40 in·lbs / 4.5 Nm]
13. Mark the other end of the bladder at a point that lines up near the edges of the screw holes, as in Step 7, and cut the end of the bladder square.
14. Install the bladder end clamp with two flat head capscrews, securing the bladder underneath. [40 in·lbs / 4.5 Nm]

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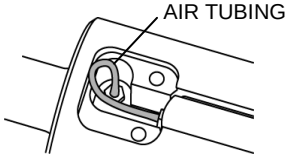
15. Slide the core stop tray into the slot and reconnect the air tubing.
16. Reinstall journal or end cap from shaft. [9 ft·lbs / 12.2 Nm]
17. Reinstall the cover over the air tubing. [40 in·lbs / 4.5 Nm]

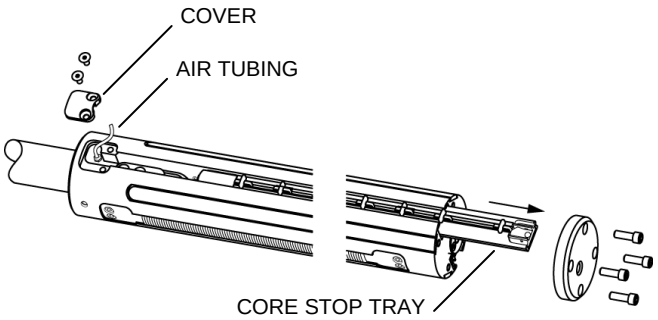


Note: Test the bladder for air leaks at 80 psi (5.5 bar). Spray soapy water onto bladder end clamps and air fittings and watch for bubbles. When inflated, the bladder should raise the core stop tray.

To Replace Bladders

- Bladder material supplied for replacement may be longer than the required finished length. Do not cut to length until instructed.
- Use a small amount of *LOCTITE 242* on the threads of all screws and tighten to torque specifications noted in brackets.

Under Core Stops



1. Remove the cover from the core stop tray. (3mm hex drive)
2. Remove journal or end cap from shaft. (3/16 hex drive)
3. Disconnect the polyurethane air tubing from the air fitting at the end of the core stop tray. (Snip off the damaged or stretched portion of the tubing – about 1/8" – before re-use.)
4. Slide core stop tray out of the shaft.
5. Clean the shaft slot with rubbing alcohol and dry thoroughly.

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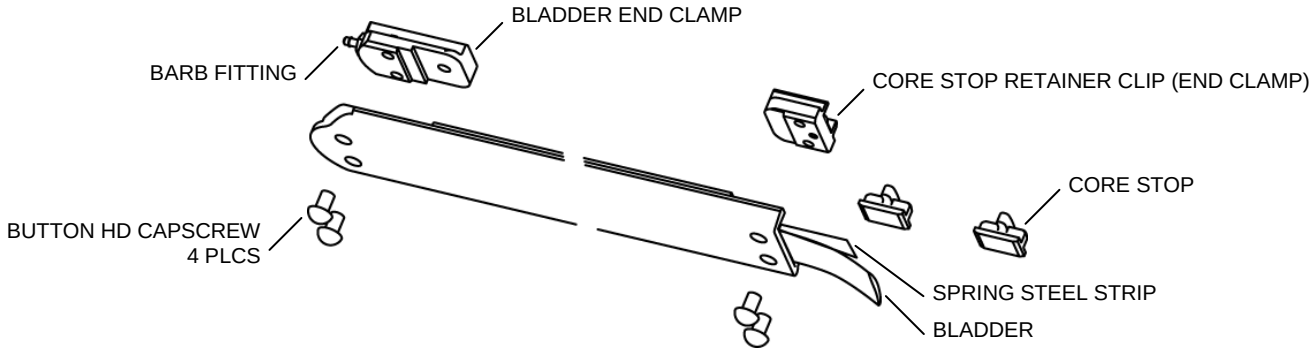
6. Remove the 4 button head capscrews on the underside of the tray that secure the end clamps to the tray (3mm hex drive) and remove the clamps.
7. Slide the core stops, bladder and core stop lock strip (spring steel) out of the tray.
8. Clean the tray with rubbing alcohol and dry thoroughly.



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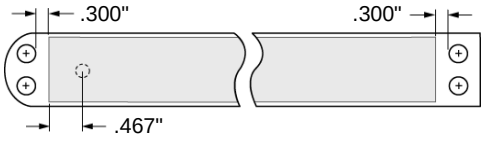
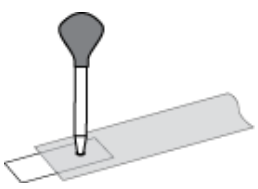
9. Remove the air fitting from the bladder
10. Cut square across one end of the new bladder and slide it into the tray, aligning the end at edges of the screw holes, as shown.



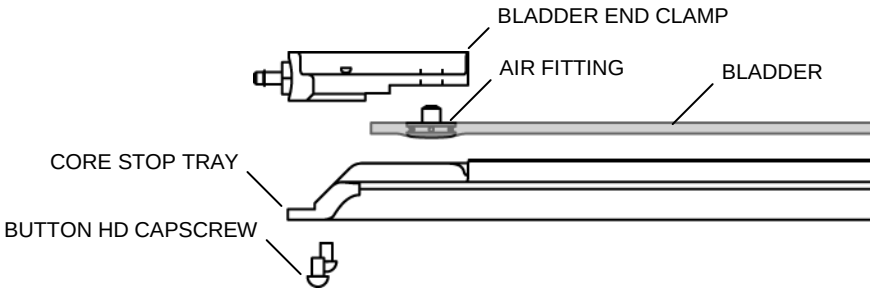
11. On the bladder, mark the location of the center of the air fitting and remove the bladder from the tray.
12. Using the Tidland Hole Punch Tool, punch a hole in one wall only of the bladder and insert the air fitting into the bladder. Use a small piece of plastic in the bladder to keep from punching through both sides.



(continued next page)

(Replace Bladder Under Core Stops – continued)

13. Reinstall the bladder in the shaft slot with the *head* of the air fitting facing down in the tray, so the bladder end clamp will seat over the inlet.

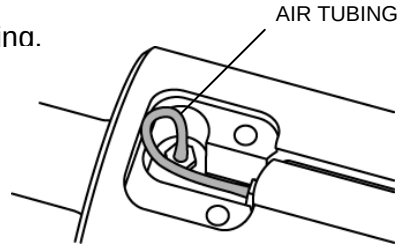


14. Install the bladder end clamp with two button head capscrews from the bottom of the tray, making sure that the air fitting is completely seated in the clamp. [30 in·lbs / 3.4 Nm]

15. Cut the other end of the bladder square across at the edges of the screw holes.
16. From this end, insert the spring steel strip into the tray and slide it all the way in.
17. Insert the required number of core stops (2 per core, per tray).
18. Install the core stop retainer end clamp assembly, from the underside of the tray, using two button head capscrews. [30 in·lbs / 3.4 Nm]

Note: Test the bladder for air leaks at 80 psi (5.5 bar). Spray soapy water onto bladder end clamps and air fittings and watch for bubbles. When inflated, the bladder should cause the core stops to lock axially.

19. Slide the core stop tray into the slot and reconnect the air tubing.
20. Reinstall journal or end cap from shaft. (3/16 hex drive) [9 ft·lbs / 12.2 Nm]
21. Reinstall the cover over the air tubing. (3mm hex drive) [40 in·lbs / 4.5 Nm]



Note: Test the bladder for air leaks at 80 psi (5.5 bar). Spray soapy water onto bladder end clamps and air fittings and watch for bubbles. When inflated, the bladder should raise the core stop tray.

MAINTENANCE

Wear Bars

To Replace

1. Remove shaft end cap or journal. (3/16 hex drive)
2. Slide damaged wear bar out of the shaft.
3. Install new wear bar.
4. Reinstall shaft end cap or journal.

Bleeder Valves

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

Note:

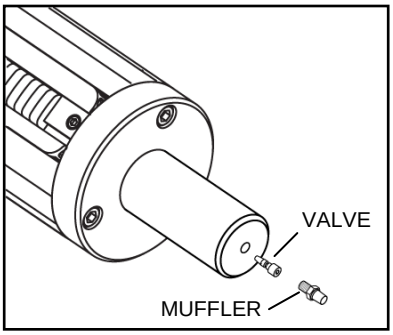
- The fine threads on the needle and the housing are easy to damage. Use care when working with these components.
- Do not attempt to remove the bleeder valve housing from the shaft. If repair is necessary, return the shaft to Tidland. (***www.tidland.com/returns***)
- Location of valve varies due to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

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%

TROUBLESHOOTING

Problem	Possible Cause	Solution
Core stop tray does not lift when air is applied	Leak or obstruction in air system	Remove core stop tray from shaft. Check bladder for holes, deformation or debris around air fittings.
	Air tubing not connected under core stop tray cover.	Remove cover from core stop tray and reconnect the air tubing to the air fittings. Check the tubing for holes or obstructions.
Core stops still move axially in tray when air is applied	Leak or obstruction in air system	Remove core stop tray from shaft and disassemble. Check bladder for holes, deformation or debris around air fittings.
	Spring steel core lock strip not installed	Remove core stop tray from shaft and disassemble. Ensure that spring steel strip is installed on **top** of the bladder.
Different tension from individual shafts (Duplex Winder)	Leak or obstruction in air system	Check all bladders for holes, deformation or debris around air fittings.
	Exhaust Bleeder Valve not adjusted correctly.	Match tensions by adjusting Pressure Control System in each shaft (p. 6).
Excessive core dust	Poor quality cores with rough edges	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.
	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.

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