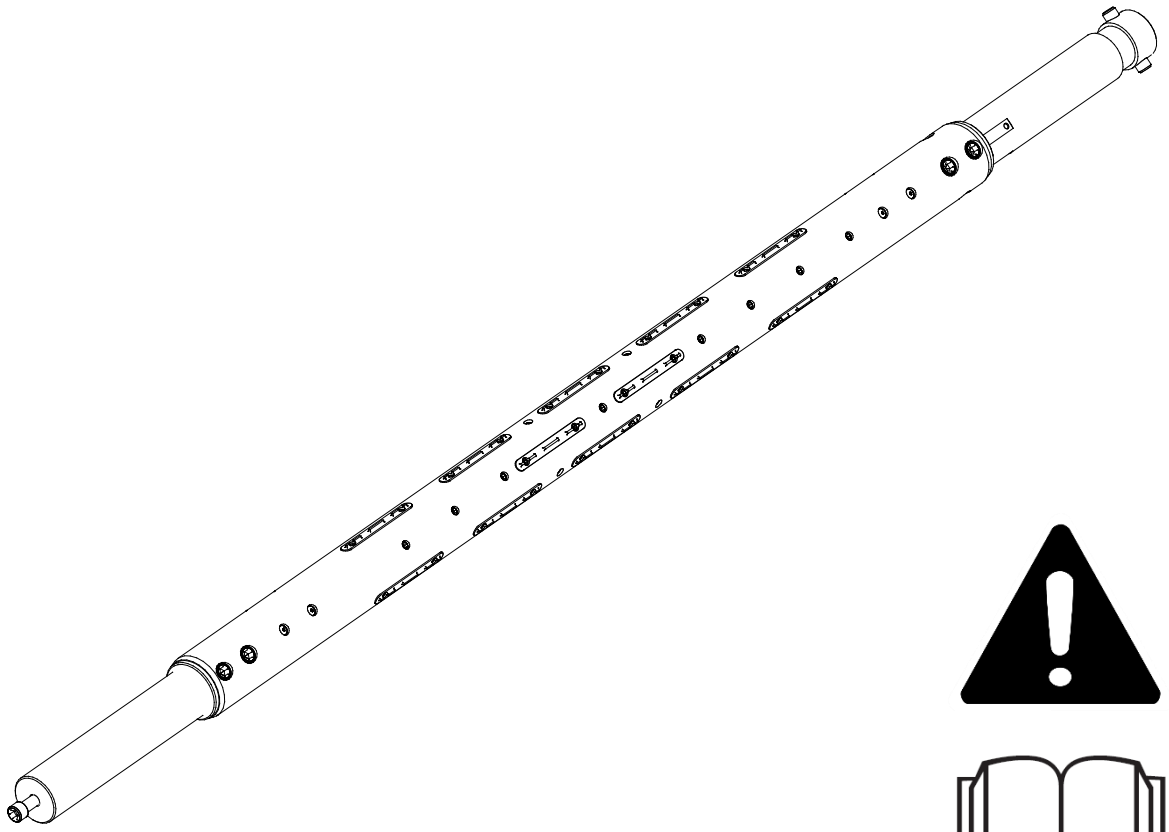
USER'S GUIDE AND MAINTENANCE MANUAL FOR PM-1000 & PM-3000 AIR RETRACTABLE PNEUMATIC/MECHANICAL SHAFTS



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USER'S GUIDE AND MAINTENANCE MANUAL FOR PM-1000 & PM-3000 LUG SHAFTS

Version 1.0

February 27, 2018

A. INTRODUCTION

A.1 Introduction

We thank you for choosing Double E Company PM-1000 or PM-3000 pneumatic/mechanical shafts and are pleased to have you as a customer. We are confident that our product will provide you with years of satisfaction. For optimal performance, please use and maintain your PM-1000 and PM-3000 shafts as outlined in this manual.

We recommend that you read this manual carefully and refer to it whenever a problem may arise. Our Technical Support department is also always available for advice and assistance. This manual describes the installation, operation, usage precautions, and detailed information about this product's accessories and options.

The product must be used according to the instructions. Keep this manual as a reference for the future.

Double E Company reserves the right, at any time, to make changes (without any obligation of revision) felt to be useful for the product improvement or for any constructive or commercial reason. Copying, buffering and transmission in any form (electronic, mechanical, by photocopying, translating or others) of this publication is forbidden without express Double E Company authorization.

Double E Company refuses any responsibility in case supplied shafts are set at work before the machine where they are going to be fitted has been declared to be in accordance with provision of the law 89/392 and its subsequent modifications.

A.2 Table of Contents

A.3 Important

- Do not use this product before having read and understood the whole content of this manual.
- Double E Company has done everything possible to make this manual complete and correct.
- Please transfer this manual to subsequent users if the product is lent or sold.
- Should this documentation or the warning labels applied on the device be lost or damaged, please request replacements from the supplying company.

A.4 Warranty

See general terms of sale. Our standard warranty is available on our website at www.ee-co.com.

B. SAFETY

B.1 Safety Instruction - Symbology

• For safe operation of the PM-1000 and PM-3000 pneumatic/mechanical shafts, carefully read these safety instructions before use.

• Follow every WARNING and CAUTION note, described in this section, as they are extremely important for safety.

• In this manual, warnings and are indicated by the following signal word conventions.

Indicates a potentially dangerous situation that, if not avoided, is almost certain to cause serious injuries or death.

Indicates a potentially dangerous situation that, if not avoided, can cause moderate to serious injuries, or even death.

Indicates a potentially dangerous situation that, if not avoided, can cause minor to moderate injuries or damage to the equipment.

Highlights information needed to ensure the proper use of this device.

B.2 Safe Operation of Equipment

⚠WARNING *Double E Company designs and manufactures shafts with maximum safety in mind. Please take careful note of the following rules for safe operation:*

- Double E recommends always using the shaft carefully without abusing it. Avoid strong collisions and/or accidental impacts with foreign bodies. These collisions can damage the shaft's external gripping elements or body.
- There is risk of injury or pinching from the rotation of this shaft during un/winding. Keep sufficient distance during un/winding and do not touch any part of the shaft during rotation.
- Do not wear loose hair or clothing near rotating shaft for risk of entanglement.
- Avoid unnecessary emergency braking.
- Do not cantilever the shaft during winding or roll unloading unless stated in the customer approval drawing.
- Do not use the shaft in working conditions different than stated in the specifications table or on any notes on the approval drawing.
- Do not exceed the operating loads of the shaft as specified on the customer quotation and/or approval drawing. This voids shaft warranty and can be unsafe.
- Make sure all fasteners are in place and torqued to the appropriate specification before operation.
- All replacement parts on this shaft should be original equipment supplied by the Double E Company.

Visually inspect the shaft prior to each use:

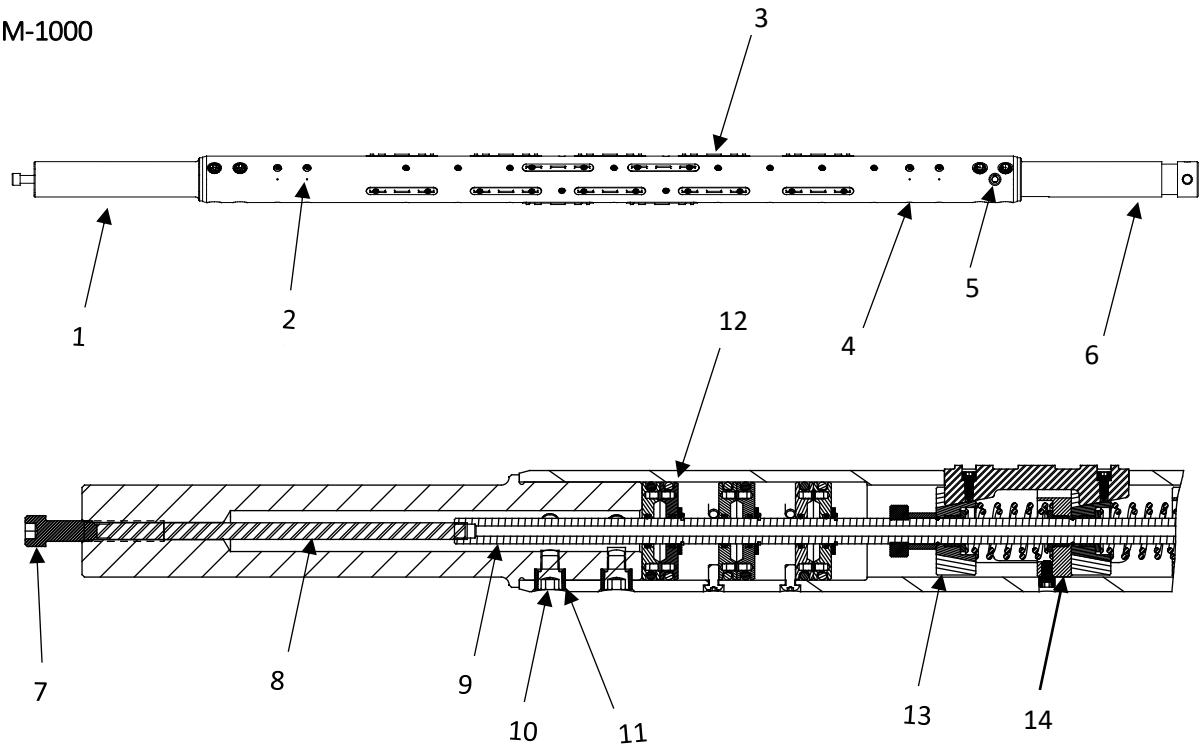
- Check the body for any cracks or excessive wear in the metal housing.
- Check the lugs for any cracks or excessive wear.
- Check the journals for any cracks or excessive wear.

In the event that any of the above conditions are identified, do not put the shaft in service and contact Double E Company Technical Support at 508-588-8099 extension 571.

C. TERMINOLOGY

C.1 Lug Shaft Components

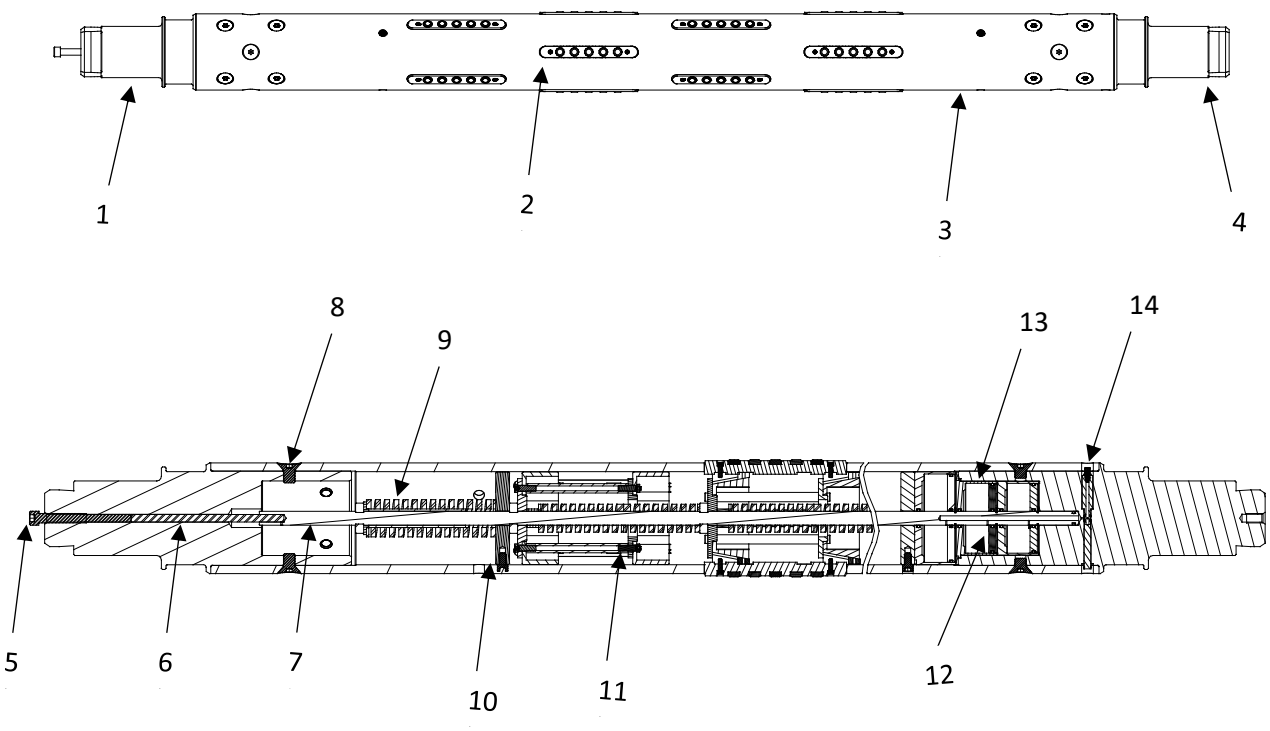
PM-1000



1. Jacking Journal
2. Bleed Hole
3. Lug Assembly
4. Housing
5. Valve Assembly
6. Valve Journal
7. Jacking Screw (1/2-13 U.N.C.)
8. Jacking Rod
9. Center Rod
10. Journal Screw
11. Expanding Bushing
12. Piston
13. Cam Assembly
14. Chamber Divider

Drawing is for reference only. Actual configuration may vary. Please refer to your approval drawing for an exact list of components included.

PM-3000



1. Jacking Journal
2. Lug Assembly
3. Housing
4. Valve Journal
5. Jacking Screw (1/2-13 U.N.C.)
6. Jacking Rod
7. Center Rod
8. Journal Screw
9. Master Spring
10. Chamber Divider
11. Cam Assembly
12. Piston
13. Piston Cup
14. Valve Assembly

Drawing is for reference only. Actual configuration may vary. Please refer to your approval drawing for an exact list of components included.

D. OPERATING INSTRUCTIONS

D.1 Pneumatic Lug Expansion/Retraction

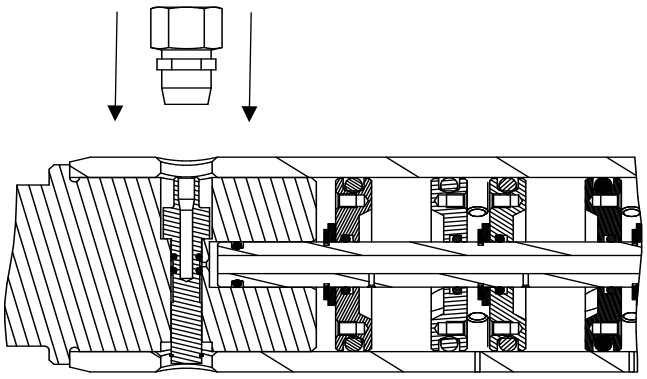
⚠WARNING *Do not expand or retract lugs while shaft is rotating. Never use a finger to release air from the shaft.*

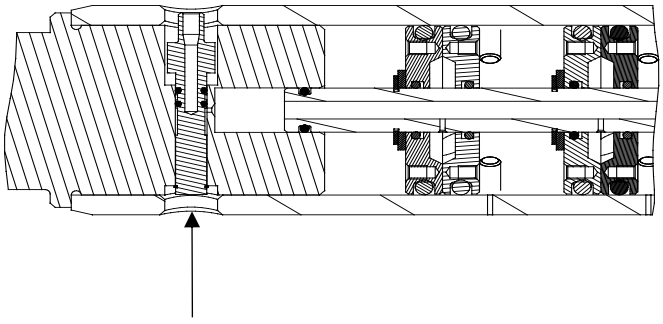
To **retract** the lugs, press the tip of the Double E Inflation Tool onto the air valve assembly. Apply air while maintaining firm contact between the tool and the air valve. Refer to your specific assembly drawing for the correct air pressure for normal operation. In most cases, the shaft should be operated at a minimum of 80psi (5.5 bar) and should not exceed 100psi (7 bar). The mechanical force applied by the inflation tool is required to slide the valve assembly into the correct position. As air is applied, the lugs will retract into the housing. Once the lugs have retracted completely, remove the air tool. The lugs should remain in this position until the system is vented in the deflate procedure. Most Double E PM-1000 & PM-3000 shafts are equipped with a single air valve assembly. Refer to your assembly drawing for the exact location of inflation air valves on the lug shaft.

To **expand** the lugs, depress the air valve with the tip of the inflate/deflate tool for at least 30 seconds to allow all the air to fully exhaust from the shaft.

NOTICE *Never try to remove cores from the shaft without fully deflating the shaft. This can cause serious damage to the core, lugs, and body of the shaft.*

Lug Retraction (Right):





Lug Expansion (Left):

D.2 Mechanical Override

⚠WARNING *Do not expand or retract lugs while shaft is rotating. Fully remove the mechanical override screw for normal operation.*

If pneumatic lug retraction cannot be accomplished, the mechanical override may be used to collapse the lugs. Grease the "Jacking Screw," (½-13 U.N.C.) and thread into the "Jacking Journal" on the opposite end from the air valve (refer to Section C.1 Lug Shaft Components). Upon contact with the "Jacking Rod," the screw will begin to push the center rod towards the collapsed position. As the screw is tightened, the lugs will collapse. Discontinue tightening the jacking screw when lugs are collapsed.

NOTICE *Manually applied tightening torque is required. Overtightening during the mechanical override process may damage the shaft.*

E. PRODUCT SPECIFICATIONS

E.1 Technical Specifications

⚠WARNING *Do not exceed the operating parameters of the shaft as specified on the assembly drawing. This voids shaft guarantees and can cause serious injury.*

Please refer to the approval drawing for the operating parameters and limits of your shaft.

F. MAINTENANCE

F.1 Routine Inspection

Perform routine inspection ***weekly***. Routine inspection can usually be accomplished without disassembly or removal of the shaft from the machine. The purpose of routine inspection is to ensure that the shaft is functioning properly prior to being used in the machine. Check the pneumatic system to ensure that all of the lugs expand and contract properly and that the lugs are free of defects, chips, or any foreign debris. Additionally, inspect the lug slots to make sure that there is no foreign debris, such as a dust buildup, that

may impair the proper functionality of the shaft. Ensure that all fasteners are tightened properly and are not missing.

F.2 Annual Maintenance

Perform annual inspection/maintenance ***yearly.*** Ensure that all fasteners are tightened properly and that the journals and lugs are installed per shaft assembly drawing. If present, grease all bearing assemblies per assembly drawing. Replace any lugs if uneven or excessive wear is seen. Inspect all lug slots and ensure that there is no cracking or elongation of the slot.

F.3 Non-Routine Maintenance

If the product is used under normal conditions and inspected regularly, it is rare that any non-routine or extraordinary maintenance will be needed. In the event that it is necessary, it is recommended that you contact Double E Company Technical Support at 508-588-8099 extension 571.

F.4 Decommissioning

If the product is withdrawn or removed from service, it is necessary to make all at-risk components harmless through proper demolition. These operations must be carried out in accordance with the provisions existing in the nation or locale in which the product will be disposed.

F.5 Product Storage

All Double E shafts should be carefully stored when not in use. To ensure maximum performance, Double E shafts should be rested on padded surfaces to protect the components. Storage locations should be in cool, dry environments away from high levels of human or vehicle traffic.

G. REPLACEMENT OF COMPONENTS

G.1 Valve Removal and Installation

⚠CAUTION *Always fully deflate shaft prior to removing valves. Shaft should be secured to a work surface before performing any maintenance.*

NOTICE *Valve styles and configurations may vary. The following instructions may not apply to all shafts. Consult a Double E representative for additional instruction if needed.*

Side Valve

1. Remove the snap ring from the side opposite the air inlet. Grasp the air inlet and pull the valve out. Alternatively, the valve may be pushed out from the snap ring end.
2. Inspect the valve assembly and replace if necessary. Refer to the shaft drawing or contact Double E for the appropriate part numbers.
3. Grease the exposed O-Rings around the perimeter of the valve with O -Ring grease.
4. Slide the valve assembly into place and secure with snap ring.

End Valve

1. Loosen the set screws which capture the valve within the journal. Pull the valve from the end of the journal.
2. Inspect the valve assembly and replace if necessary. Refer to the shaft drawing or contact Double E for the appropriate part numbers.
3. Grease the exposed O-Rings around the perimeter of the valve with O -Ring grease.
4. Slide the valve assembly into the journal.
5. Install set screws using thread adhesive.

G.2 Lug Replacement

⚠CAUTION *Always fully deflate shaft prior to performing any maintenance on the lugs. Shaft should be secured to a work surface before performing any maintenance. When removing or replacing lugs, take care to prevent loose components from falling into the shaft as these can prevent the expansion/retraction of lugs.*

NOTICE *Lug styles may vary depending on applications and production dates. Lugs can be replaced without removal of journals.*

Disassembly

1. Position the shaft horizontally with the lug to be replaced on the top. Deflate shaft completely. The lugs must be in the fully expanded position for removal.
2. Remove the #10 socket head cap screws located on the top of the lugs. Do not remove the lug at this point. Note the threaded end of the screw. If it is modified to a point, the lug is held in place with dowel pins. If it is not modified, the lug is held in place with "Lug Tees." "Lug Tees" may be held in place by lightly threading a #10 set screw through the top of the lug into the "Lug Tee." This procedure is optional but recommended since recovering "Lug Tees" typically requires complete disassembly of the shaft.
3. Once the type of lug has been identified, it can be removed. Take care to avoid losing dowel pins or "Lug Tees" when removing the lug. If necessary, jack the lug out by inserting ¼-20 screws into the lug.

Installation

1. With the shaft still in the expanded position (deflated), position the new lug over the slot.
2.
    a. If using "Lug Tees," align the lug over the tees and gently tap into place. Remove the set screws (if applicable) and replace the socket head cap screws with Red Loctite. Torque to 50-75 inch-pounds.
    b. If using dowel pins, align the lug over the slot and push two dowel pins flush into each .125" diameter hole in the lug. The modified socket head cap screw must be completely removed before inserting the pins. Carefully slide the lug down into the shaft. Once the lug is fully engaged with the cam, insert a scriber or other pointed object and push dowel pins outward into the cam. Install the modified socket head cap screws.

G.3 Journal Replacement

⚠CAUTION *Always fully deflate shaft prior to performing any maintenance on the journals. Shaft should be secured to a work surface before performing any maintenance. Do not apply heat to remove fasteners or journals.*

Journal Removal

All Journal Configurations

1. Remove air valve (if applicable; see Section G.1 Valve Removal and Installation)
2. Remove journal fasteners with a high torque Allen wrench. Remove expanding bushings (if applicable) with Double E Scrivet Remover, Double E part number 74000.
3. Extract the journal from the shaft. In some cases, the journal may be difficult to remove. In this case, utilize the 1/2-13 UNC extraction thread found on the end of most journals to facilitate removal. Refer to your specific approval drawing for details.

Journal Installation

All Journal Configurations

1. Install journal with all fastener holes and valve hole (if applicable) aligned.
2. Tap expanding bushings into place with countersunk end first (if applicable).
3. Apply Teflon paste to the heads of journal screws
4. Install screws tightly, applying approximately 100 ft.lbs (136 Nm) of torque.
5. Install valve assembly (if applicable).

G.4 Center Rod Assembly Removal

⚠CAUTION *The center rod springs are under heavy preload. Handle the center rod with caution while servicing internal components.*

1. Remove all lugs (section G.2).
2. Remove journals (section G.3).
3. Remove the chamber divider screws and piston stop screws (if applicable) from the housing. Do not use heat.
4. Remove the center rod assembly horizontally from the housing.
5. To reinstall center rod assembly, ensure "Lug Tees" are in place (if applicable) and perform steps 2 & 3 in reverse. Ensure approximate angular alignment of lug slots before insertion.

G.5 Piston and O-Ring Replacement

⚠CAUTION *The center rod springs are under heavy preload. Handle the center rod with caution while servicing internal components.*

NOTICE *Scheduled preventative O-ring replacement is not recommended. Replace O-rings only if shaft leaks after valve replacement. O-ring and Piston configurations vary. Contact Double E for part numbers.*

1. Remove center rod assembly (section G.4)
2. Remove the O-rings on the end of the center rod. Take care not to scratch the center rod.
3. Carefully remove the klip ring in front of the outermost piston with a screwdriver or pry tool. Pull the piston or piston cup assembly off the center rod.
4. Repeat step 3 for all piston or piston cup assemblies.
5. Remove all the piston and piston cup O-rings. Take care not to scratch the O-ring grooves.
6. Replace pistons or piston cups if needed.

7. Install all new O-rings on the pistons and piston cups and apply O-ring grease.
8. Reassemble the piston or piston cup assemblies onto the center rod one by one, securing with klip rings.
9. Install new O-ring on the end of the center rod with O-ring grease.

H. TROUBLESHOOTING

H.1 Troubleshooting

A. Lugs will not retract or remain retracted.	B. Core slips on shaft during operation.	C. Excessive shaft vibration.	D. Core will not fit on shaft.	E. Journals are worn prematurely.	POSSIBLE CAUSE OF PROBLEM	CORRECTIVE MEASURE
					Instructions: *Identify the problem along the upper left corner of the grid. The numbers in the corresponding column below indicate the order in which to troubleshoot potential causes.* *If applicable, the location of the corrective measure is shown in parantheses next to a description of the corrective action.*	
3					Air valve is not installed correctly.	Remove air valve and install according to section G.1.
	4				Mechanical override is engaged	Remove jacking screw
	5				O-rings are worn or damaged	Relace O-rings according to section G.5
4	6				Center Rod Failure	Contact Double E Technical Support for assistance.
2					Leak in air valve.	Using soapy water, spray around air valve. Bubbles indicate a leak. If valve is leaking from the center, replace valve. If valve is leaking from the threads, remove and reinstall with Loctite® Thread Sealant 545 or equivalent.
	2		3		Lugs are worn or damaged.	Inspect all lugs for damage or premature wear. Follow instructions in section G.2. to replace as needed.
	3				Cores are oversized.	Refer to approval drawing to ensure your core ID is within the acceptable range.
			2		Cores are undersized.	Refer to approval drawing to ensure your core ID is within in the acceptable range.
	1				Air has not been released from shaft.	Ensure that shaft is completely deflated by depressing air valve for at least 30 seconds.
1			1		Shaft is not inflated properly.	Ensure shaft is inflated fully to a minimum of 80 psi (5.5 Bar).
		1			Shaft is out of balance.	Contact Double E Technical Support for assistance.
				1	Excessive speed or loading.	Refer to approval drawing to confirm that loads and speeds being run are within acceptable specifications.

I. MANUFACTURER'S DECLARATION

Buyer shall afford Double E Company prompt and reasonable opportunity to inspect any goods as to which a claim is made and Double E Company shall have the right of final determination of the cause and existence of any defect under this warranty. No material may be returned to Double E Company without Double E Company's express prior permission in the form of a return authorization number.

Correction of non-conformities, in the manner and for the period provided above, shall constitute fulfillment of all liabilities of Double E Company to Buyer with respect for the goods, whether based on contract, negligence, strict tort, or otherwise.

J. RETURNS

Warranty and non-warranty returns are initiated through the issuance of a return material authorization (RMA) number from an authorized Double E Company sales or service/support representative. This can be obtained by calling Double E Company in West Bridgewater, MA at 508-588-8099.

The RMA number should be clearly evident on the shipping label and/or invoice and the package should be shipped freight prepaid. If questions arise or if additional information is required, please call the Inside Sales department at 508-588-8099

Product returns should be sent to the address below:

Double E Company, LLC
319 Manley Street
West Bridgewater, MA 02379
ATTN: RMA # _____

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