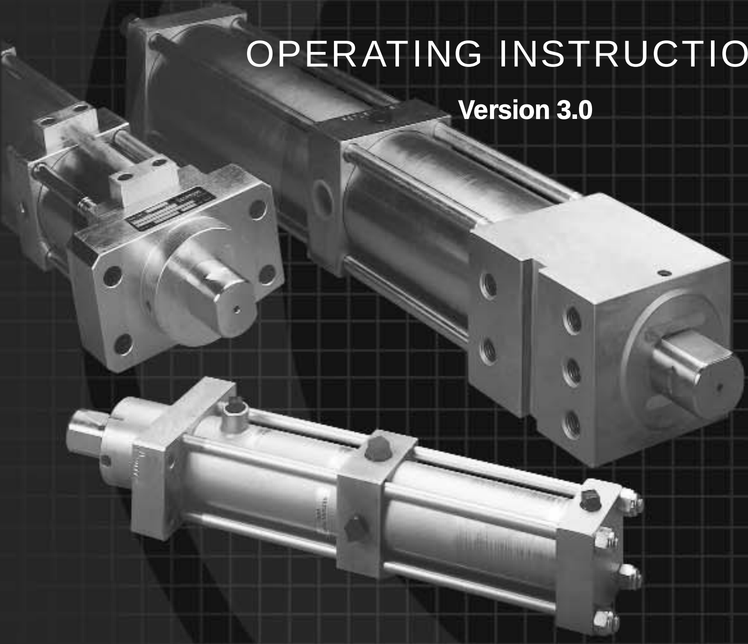
OHMA® PIERCING CYLINDER

OPERATING INSTRUCTIONS

Version 3.0



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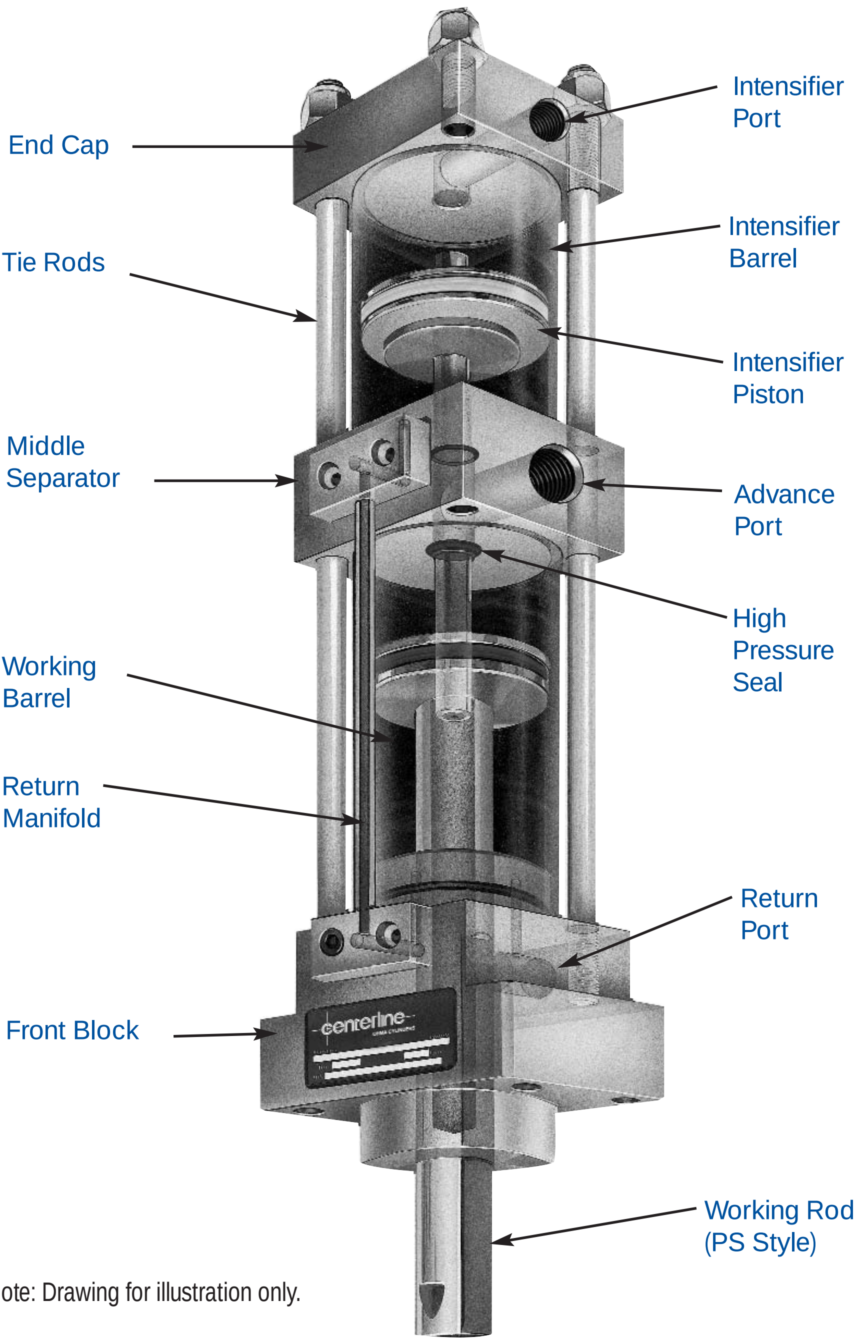
(WINDSOR) LIMITED

Attention OEM:

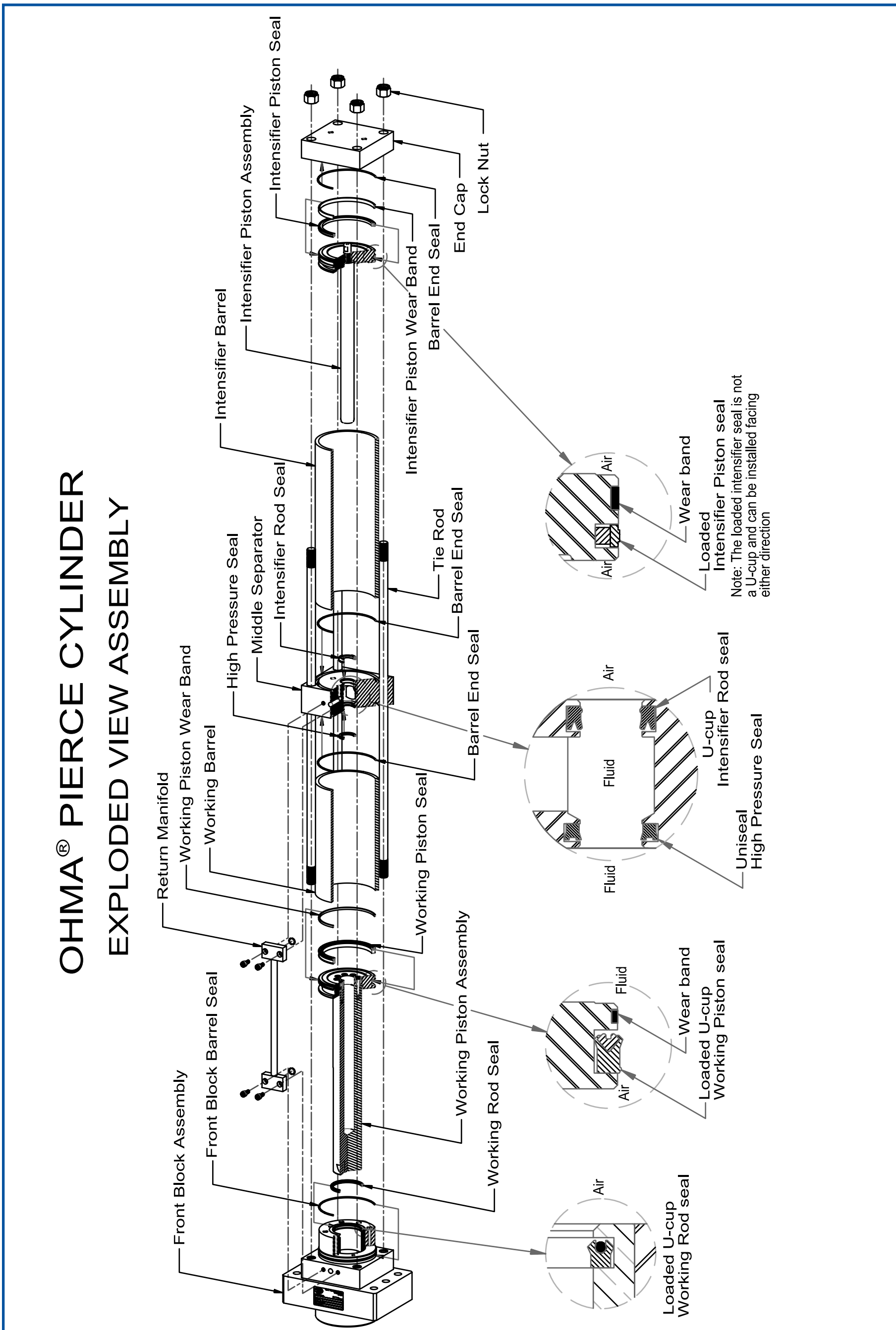
Forward this booklet to end user.

1. Cylinder Components



Note: Drawing for illustration only.

2. Piercing Cylinder Exploded View



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3. Minimum System Requirements

The following items must be provided in order to properly operate an OHMA® cylinder:

Qty.	Item
1	CenterLine Fluid Reservoir or a compatible substitute per system
2	Pneumatic Valves, properly sized. Note: Valves are incorporated with ISO and ASB OHMA® reservoirs. Valves to be dual pressure capable and configured for external pilot.
1	5 Micron Air Filter (or equivalent Coalescent Filter) NOTE: In a pneumatic supply environment with contaminants or significant moisture content, a coalescent filter is recommended.
1	Regulator
	A method of independently sequencing the two valves to produce the desired sequence of operation. This can normally be achieved with the use of two timers.
	Fluid as per CenterLine recommendations or equivalent.

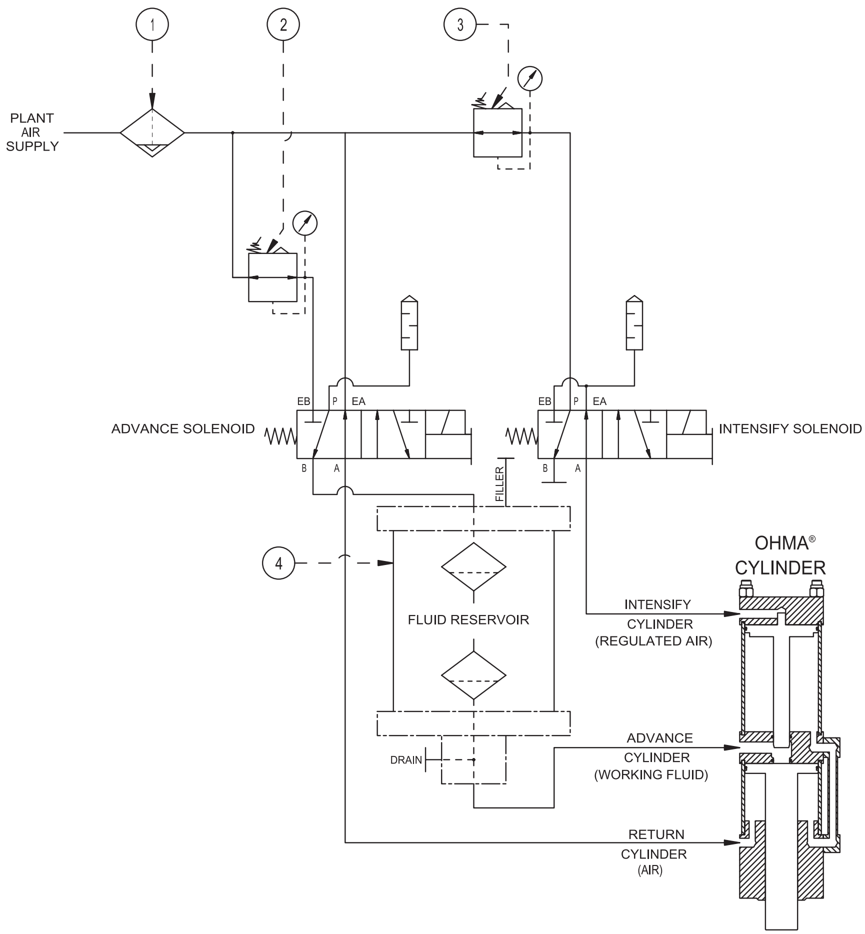
4. Pneumatic Schematic

For OHMA® cylinders with integral return manifold using OHMA® standard fluid reservoir.

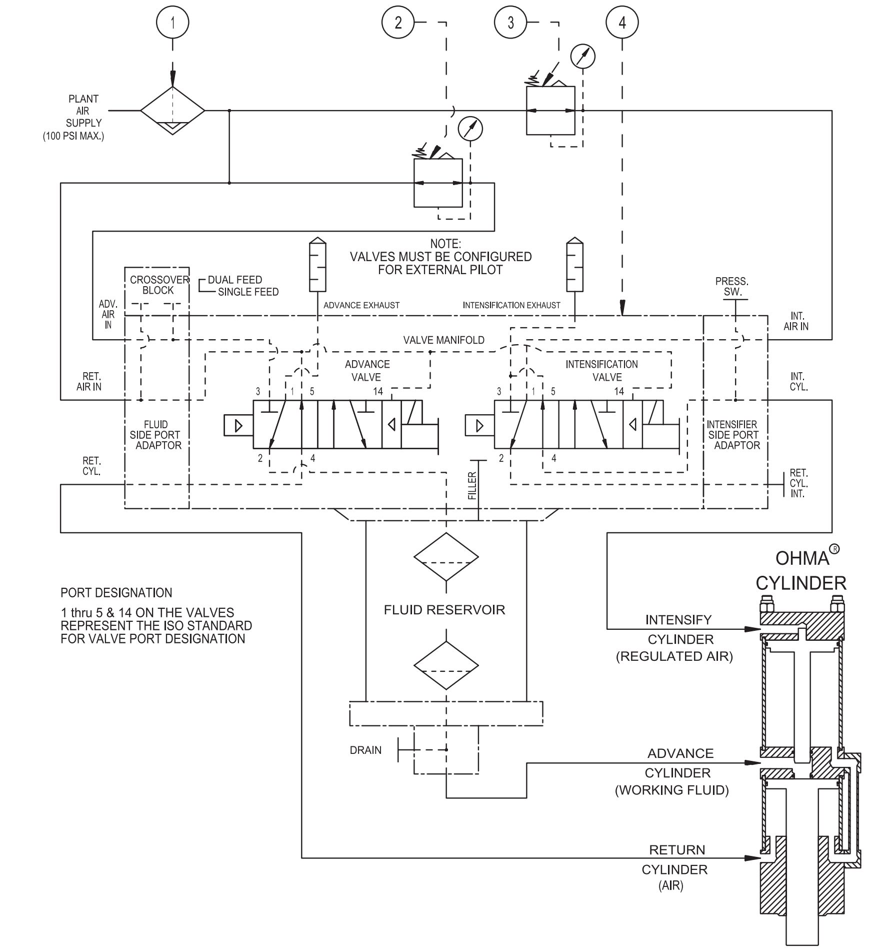
Pneumatic System Notes:

1. Filter unit sized to supply requirements of the OHMA® cylinder.
2. Advance regulator is optional, to adjust the speed and force of the advance stroke.
3. Intensification regulator is provided to regulate the supply air to the intensification valve. This regulator setting should not exceed the lowest maintainable air supply pressure. For example, if plant air supply pressure cannot be guaranteed over 60 psi, then the intensification regulator should be set no higher than 60 psi. Settings above the lowest maintainable pressure will be reflected directly through the cylinder ratio with possible process variation due to output force fluctuations.
4. Fluid reservoir must be mounted above the OHMA® cylinder and the working fluid line should be installed so that it will allow any trapped air in the working fluid to escape.

4a. Standard Fluid Reservoir



4b. ISO or ASB Fluid Reservoir



4c.Optional ISO & ASB Fluid Reservoir Operation

"DELICATE TOUCH" OPTION

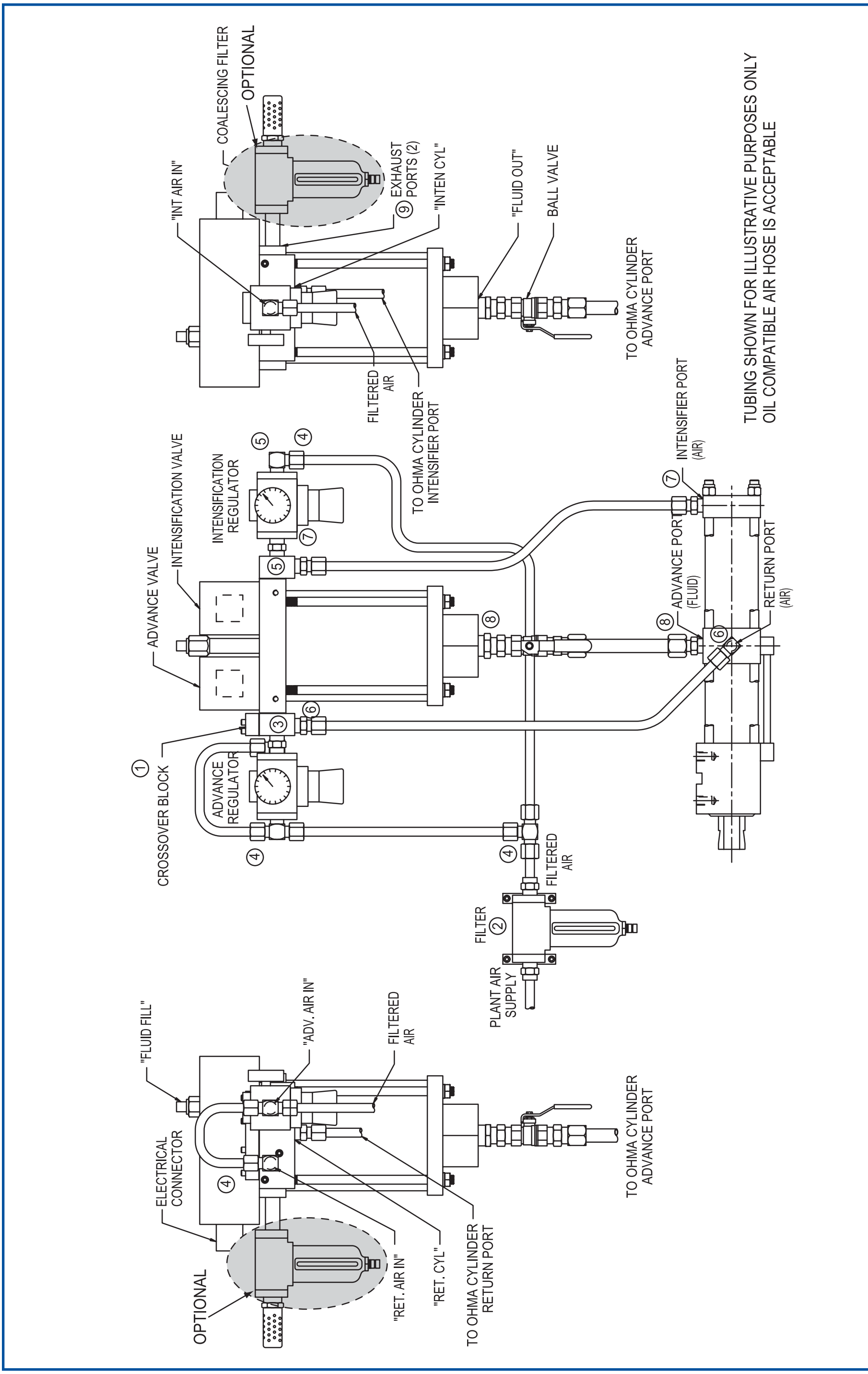
The "Delicate Touch" option allows the OHMA® cylinder to be operated with separate advance and intensification air pressure settings. This hook-up configuration is desirable for situations requiring added control over initial advance stroke impact force.

NOTE: Items in blue apply to the "DELICATE TOUCH" option only.

1. Remove the CROSSOVER BLOCK, invert it and re-install. Words "DUAL FEED" should be right side up for Delicate Touch.
2. Connect the PLANT AIR SUPPLY to the inlet port of a FILTER which is sized for the system.
3. Connect the ADVANCE REGULATOR to the "ADV. AIR IN" port on the fluid reservoir.
4. Tee the outlet port from the FILTER to the "RET. AIR IN" port and the ADVANCE REGULATOR (for Delicate Touch option if applicable) on the fluid reservoir. Also, tee the outlet port from the FILTER to the INTENSIFICATION REGULATOR.
5. Connect the INTENSIFICATION REGULATOR to the "INT AIR IN" port on the fluid reservoir.
6. Connect the "RET. CYL" port on the fluid reservoir to the OHMA® cylinder RETURN PORT (AIR).
7. Connect the "INTEN CYL" port on the fluid reservoir to the OHMA® cylinder INTENSIFIER PORT (AIR).
8. Connect the "FLUID OUT" port on the fluid reservoir to the OHMA® cylinder ADVANCE PORT (FLUID).
9. Finally put coalescing filters and mufflers on the exhaust ports (2) of the fluid reservoir.

Note: Use of hydraulic fittings will restrict the flow of fluid to the cylinder. Since the fluid pressure in the hose/tubing is not above the system air pressure supplied by the user, standard air fittings should be used.

OHMA® piercing cylinders feature a superior sealing system that assures outstanding performance. Due to close tolerances, new cylinder applications that operate below 60 psi will require a break-in period to help reduce the cylinder's internal seal friction. Please consult with CenterLine's Automation Components Division for required break-in period operating instructions for any application operating below 60 psi.



OPTIONAL
COALESCING FILTER
"INT AIR IN"
9 EXHAUST PORTS (2)
"INTEN CYL"
"FLUID OUT"
BALL VALVE
TO OHMA CYLINDER ADVANCE PORT
FILTERED AIR
TO OHMA CYLINDER INTENSIFIER PORT
TUBING SHOWN FOR ILLUSTRATIVE PURPOSES ONLY
OIL COMPATIBLE AIR HOSE IS ACCEPTABLE
INTENSIFICATION VALVE
ADVANCE VALVE
INTENSIFICATION REGULATOR
INTENSIFIER PORT (AIR)
ADVANCE PORT (FLUID)
RETURN PORT (AIR)
1 CROSSOVER BLOCK
ADVANCE REGULATOR
FILTERED AIR
FILTER 2
PLANT AIR SUPPLY
"FLUID FILL"
"ADV. AIR IN"
ELECTRICAL CONNECTOR
OPTIONAL
"RET. AIR IN"
"RET. CYL"
TO OHMA CYLINDER RETURN PORT
TO OHMA CYLINDER ADVANCE PORT

5. Sequence of Operation

For OHMA® Cylinders with Integral Return Manifold

The OHMA® cylinder operating positions are as follows:

Cylinder at rest position

In Figure 1, the OHMA® cylinder is at rest position. Supply line air pressure is directed to Port EE1 (Return Port) to maintain the working and intensifier pistons in a retracted position. Port EE3 (Intensifier Port) and the fluid reservoir are vented to atmosphere.

Low pressure advance

During the first stage of the cylinder's operation (as shown in Figure 2), air pressure is directed (via Port EE2 Advance Port) to the top of the fluid reservoir to move fluid into the OHMA® cylinder. This causes the working piston to stroke forward until it meets the work. Ports EE1 and EE3 are vented to atmosphere.

Power stroke

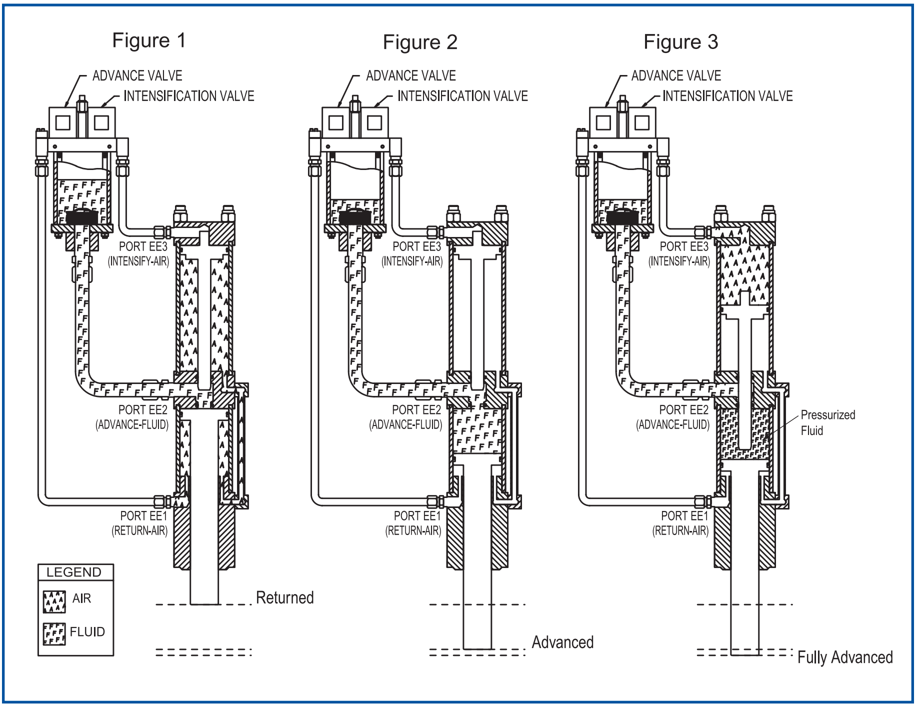
To complete the sequence of operation, regulated air pressure is applied to Port EE3 as illustrated in Figure 3 to drive the intensification piston forward. This piston advances through the middle separator to block all incoming fluid at Port EE2 and seal the OHMA® cylinder fluid chamber. As the intensification piston strokes into the fluid, trapped fluid is displaced to produce the power stroke.

Return Stroke

Once the work is completed, air pressure is again directed to Port EE1. As the intensifier piston is forced past the middle separator, fluid is allowed to return to the reservoir. At this point air pressure causes the working piston to retract and forces the fluid out of the OHMA® cylinder and back into the reservoir to return to the position in Figure 1.

Note: Some OHMA® cylinder model styles are manufactured without an integral return manifold. Contact CenterLine to obtain specific information concerning these styles of cylinder.

Cylinder Sequence of Operation

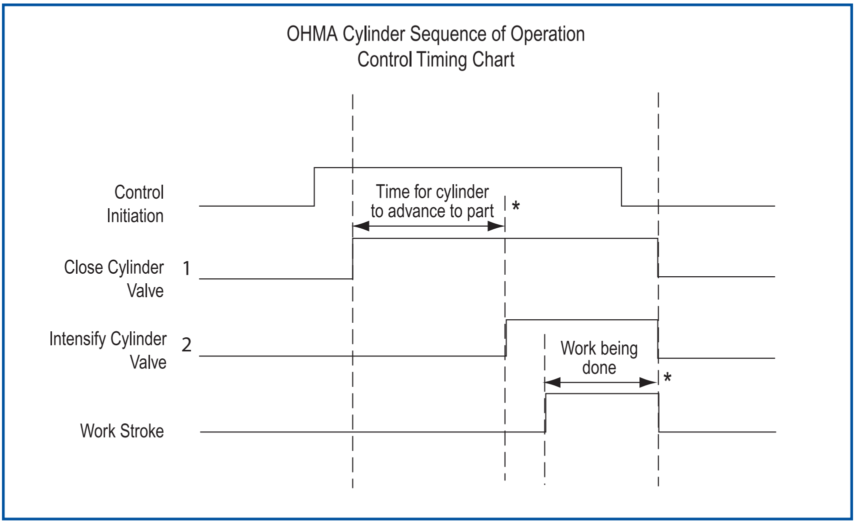


6. Control Requirements

The OHMA® cylinder may be operated with either electrical or pneumatic type control logic. Its method of operation requires that the control be capable of achieving the sequence illustrated by the time chart below. Controls must incorporate suitable anti-tie down mechanism to ensure operator safety. Other components or procedures may be required to comply with applicable safety regulations.

1. **Advance Valve (4 Way Valve):** Applies regulated line air pressure to the top of a remote mounted fluid reservoir to advance the working piston (fitted with appropriate tooling) to the work. This valve is also used to apply return air pressure to retract the cylinder once the work is completed.
2. **Intensification Valve (3 Way or 4 Way Valve):** Applies regulated air pressure to cylinder's intensifier port to generate high pressure work stroke.

   ***Note:** Generally time is used to control cylinder position.



7. OHMA® Piercing Cylinder Operating Instructions

Before completing air connections, all service lines must be purged to remove all contaminants that may have entered the system during installation work.

To ensure proper performance, CenterLine recommends the following instructions be observed:

1. With the cylinder rod in the fully retracted position, the fluid reservoir should be filled to its **indicated maximum level**, never above. With the cylinder in the fully advanced position, the fluid level in the reservoir should never be below the **indicated minimum level**. Periodic checks should be made to ensure that the fluid is at its proper level.
2. OHMA® cylinders utilize a combination of BUNA 'N' (Nitrile) and polyurethane seals. Light weight fluids that are compatible with these materials are recommended.

   Typical fluid characteristics include:

   - low viscosity to maximize speed (not more than ISO 22 @ 40° C)
   - normal (10-50° C) operating temperature
   - no phosphate ester components

   These standards must be followed to optimize cylinder operation.

Manufacturer	Fluid
Exxon	Spinesstic 22
Eppert	EPPCO SPINDLE OIL 100 (ISO 22)
Imperial	NUTO A22
Mobil	VELOCITE #10, DTE 22
Petro Canada	HARMONY AW22
Shell	TELLUS 22
Sunoco	SUNVIS 922
Texaco	SPINDURA 22

Synthetic Fluids

Quaker Quintolubric 220 Houghton Cosmolubric 130 HF

Use of synthetic fluids will slow cylinder operation as compared with oil. Information on synthetic fluids is available upon request.

3. Ensure that supply air to the fluid reservoir and OHMA® cylinder is adequately filtered to eliminate contaminants that may cause seal and/or cylinder damage.
4. Position the workpiece so the low pressure advance stroke and the power stroke do not bottom out. For example, if the OHMA® cylinder has 6.00” total stroke and a 0.50” power

stroke, positioning the work between a distance of 0” and 5.50” will ensure that all available work stroke is available for use and will protect the cylinder from bottoming out.

5. Mount tooling so that the work is performed at the **centre of the rod**. Offset loads may result in premature wear or damage to the seals and the nose bushing. For example, if piercing a pattern of holes without a die set, the centre of force of the pattern should be located at the centre of the cylinder rod.
6. Excessive tooling weight or stripping force may affect return performance.
7. Select the proper rod style for the application. Precision guided OHMA® cylinders, ‘PS’ type, make use of hand-fit bearing quality bronze keys to eliminate the need for external tool guidance. Applications making use of die sets or other forms of external guidance should use rotating rod OHMA® cylinders, ‘PR’ type, and linear alignment couplings to ensure that the cylinder or tooling do not bind during operation.
8. Minimum supply air line size (ID measurement) to the fluid reservoir should be equal to or larger in size than the largest nominal NPT air port on the OHMA® cylinder. For example, if the largest air port on the OHMA® cylinder is 1/2-NPT, then the minimum supply air line should be nominal 1/2” ID hose or tubing.
9. Minimum fluid line size (ID measurement) from the fluid reservoir to the OHMA® cylinder fluid port should be equal to or larger than fluid port size on the OHMA® cylinder. For example if the fluid port on the OHMA® cylinder is 3/4-NPT then the fluid line size should be nominal 3/4” ID hose or tubing.
10. Both fluid and air lines should be kept as short as possible. Excessive line lengths (longer than 20 feet) may result in reduced cylinder performance. If long lines are necessary, performance may be improved by increasing line size.
11. For all ports use either brass, or plated steel fittings, rated for system operating pressure, which are free of rust and dirt. At no time should hydraulic fittings be used with an OHMA® cylinder as they restrict the flow of fluid resulting in slower cylinder operation. All air and fluid lines should be fluid compatible air hose or low pressure hydraulic tubing.
12. At all times the fluid line leaving the cylinder should be travelling upward toward the fluid reservoir to release any trapped air in the system.
13. The OHMA® cylinder should be cycled several times after installation to remove any air trapped in the cylinder during the installation process. If air remains trapped in the lines the cylinder may be bled using the bleeder port on the cylinder. (NOTE: Not all OHMA® cylinders have bleeder ports.) To use the bleeder port, slowly loosen off the bleeder screw and wait until the fluid flowing from the port contains no additional air. Tighten the screw and then cycle the cylinder and confirm proper force is being generated. Bleeding of cylinder should be performed with advance air in the off state to prevent the seal from being extruded or possible injury.
14. Most OHMA® cylinders are controlled with time based control packages. Adjustments to advance and intensification times will alter the cycle time at which the cylinder operates. Advance time is the time available for the cylinder to advance to the work

before the intensification sequence is actuated. For short stroke applications requiring faster cycle time, this can be set for minimal dwell time before the high pressure intensification sequence is initiated. Intensification time determines the length of time that the high pressure sequence is applied before the return sequence is actuated. Applications that are performed with relative ease can be sped up by reducing the length of time that the high pressure stage is activated.

15. Contact CenterLine before making any modifications to a cylinder. Failure to do so may cause cylinder malfunction and will void the cylinder warranty.

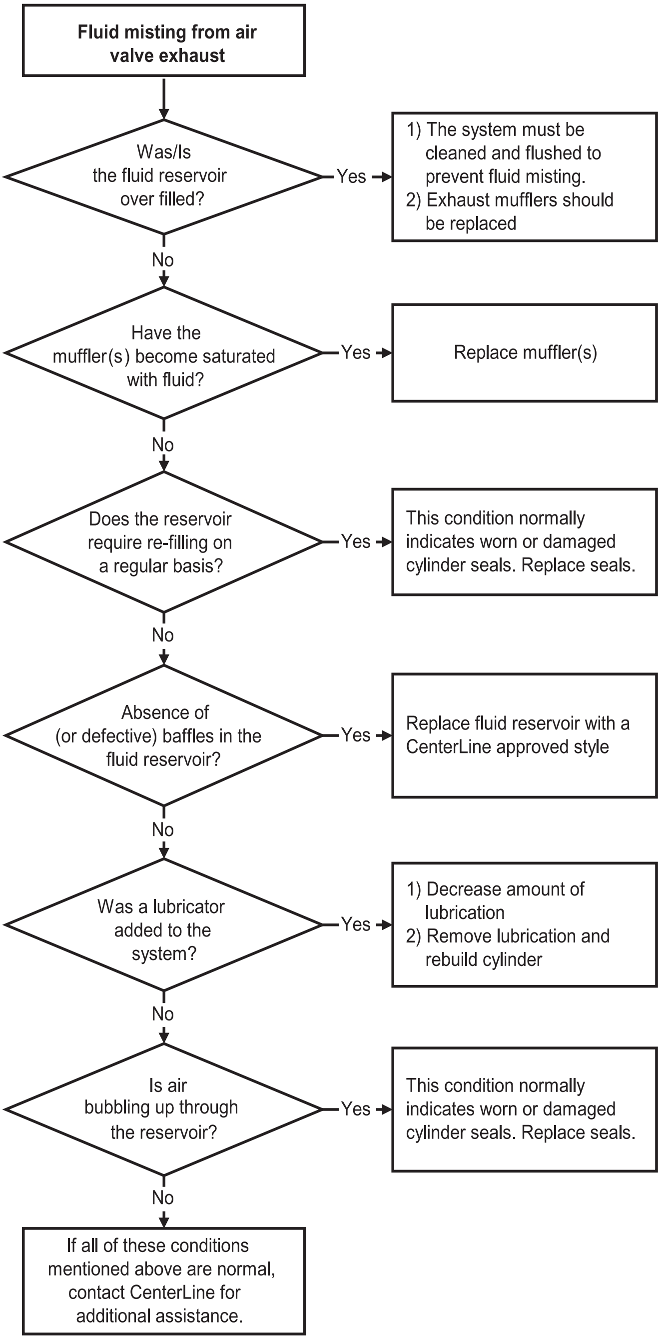
8. Preventive Maintenance

To assist customers who wish to implement a preventive maintenance program, CenterLine offers the following general guidelines. These suggestions are based on averages of actual field experience and test results. Since many factors are involved in determining wear rate, these recommendations cannot be specific. Conditions such as off-centre loading, poor air quality, excessive air pressure, or physical abuse can result in premature wear and/or damage to the cylinder or other components. Individual users may need to modify the following guidelines to reflect their unique applications.

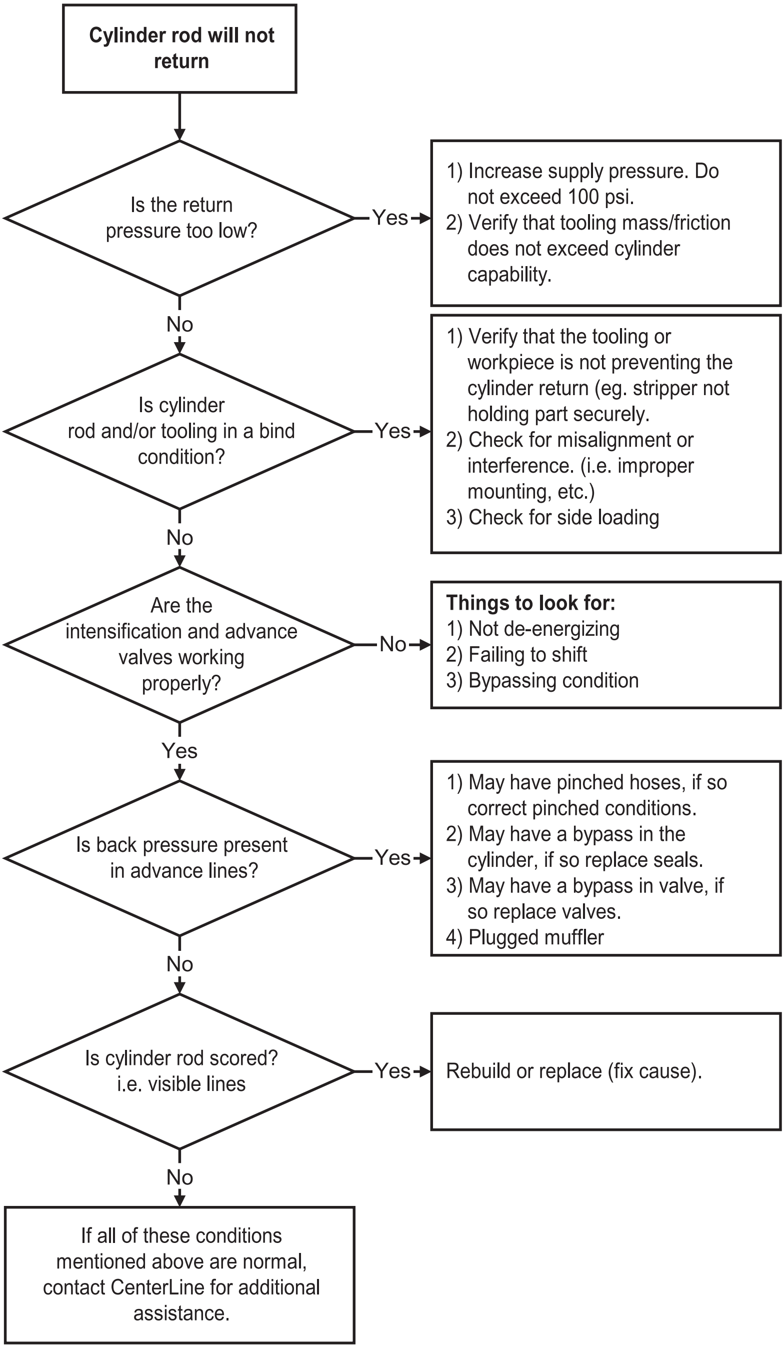
1. Check fluid level in the reservoir weekly. Fluid level should be at or near (not above) maximum fill line when cylinder is in retracted position and not fall below minimum fluid line when cylinder is in the advanced position.
2. Routine weekly visual inspection of fluid quality. Darkening of the working fluid is common and would not normally signal that fluid replacement is necessary. Visible contamination such as floating particles would signal that replacement is necessary. Milky colored fluid could indicate excessive water in air supply. Air bubbles may indicate seal failure in the cylinder. **Note: Use new fluid only. Reuse of fluid is not recommended and may cause damage to the cylinder.**
3. Check for fluid seepage at the end of the working barrel that would indicate that the cylinder tie rods may be loose. Re-torque as necessary. Refer to Torque Chart (Section 12), for proper tightening procedure.

9. Troubleshooting

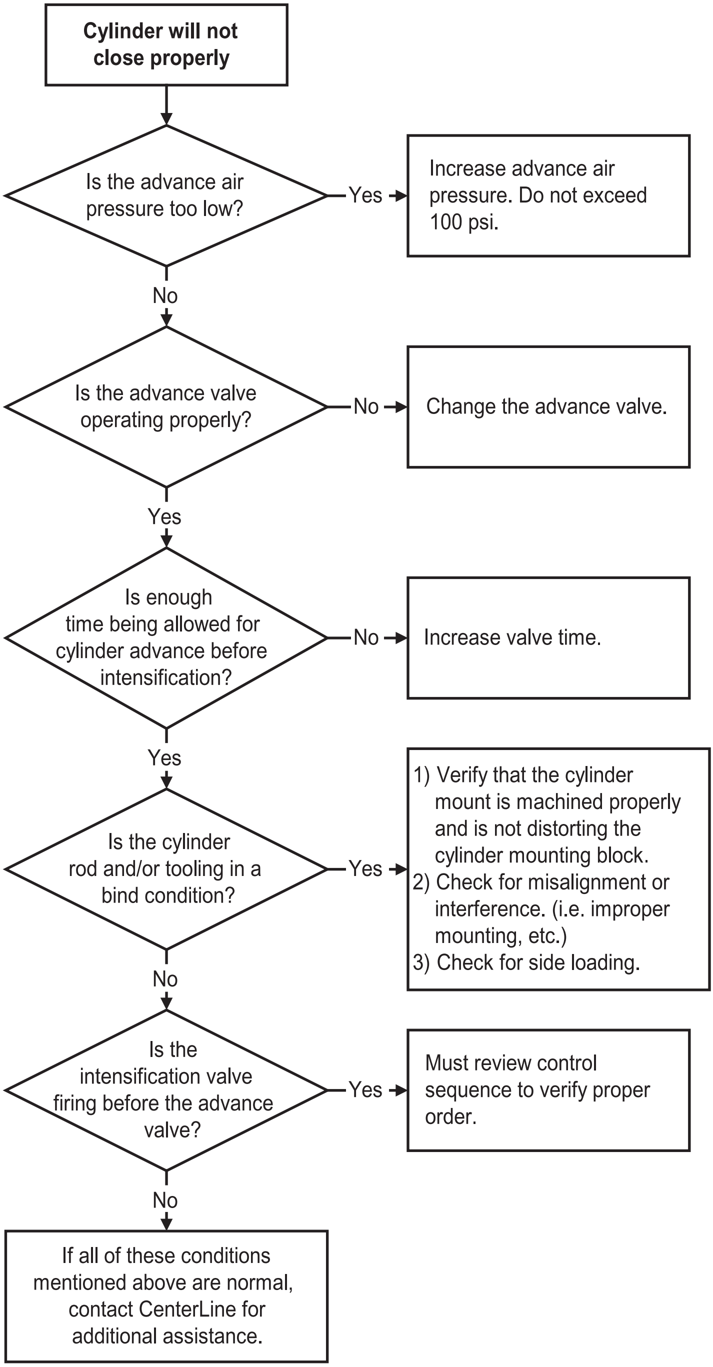
9.1 Fluid Misting from Air Valve Exhaust



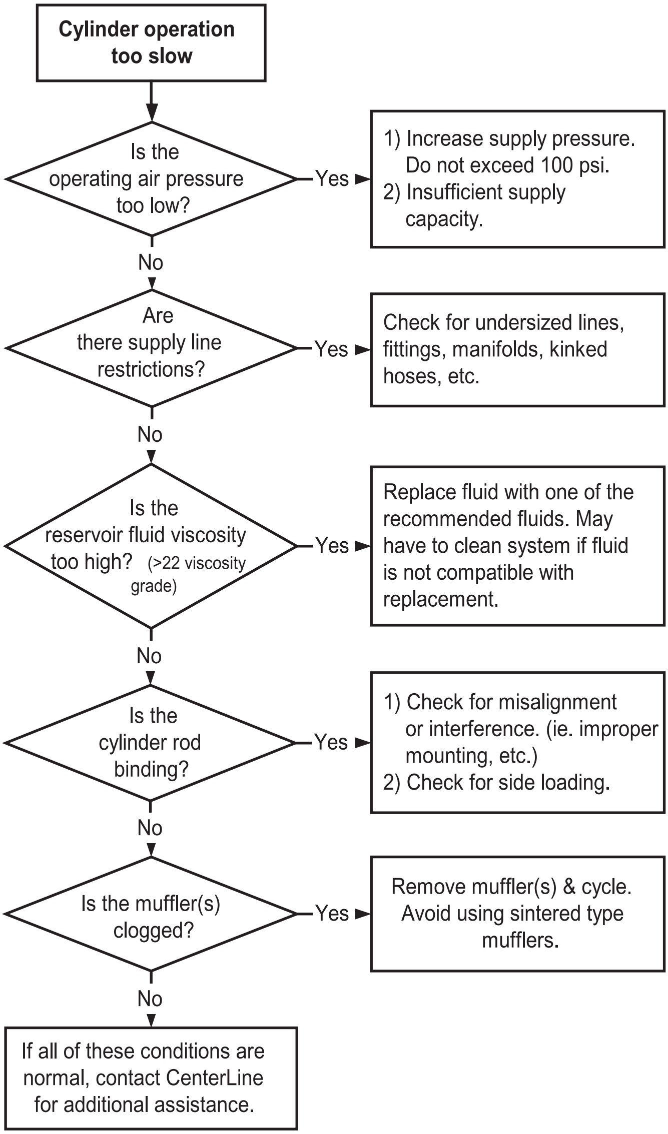
9.2 Cylinder Rod WIll Not Return



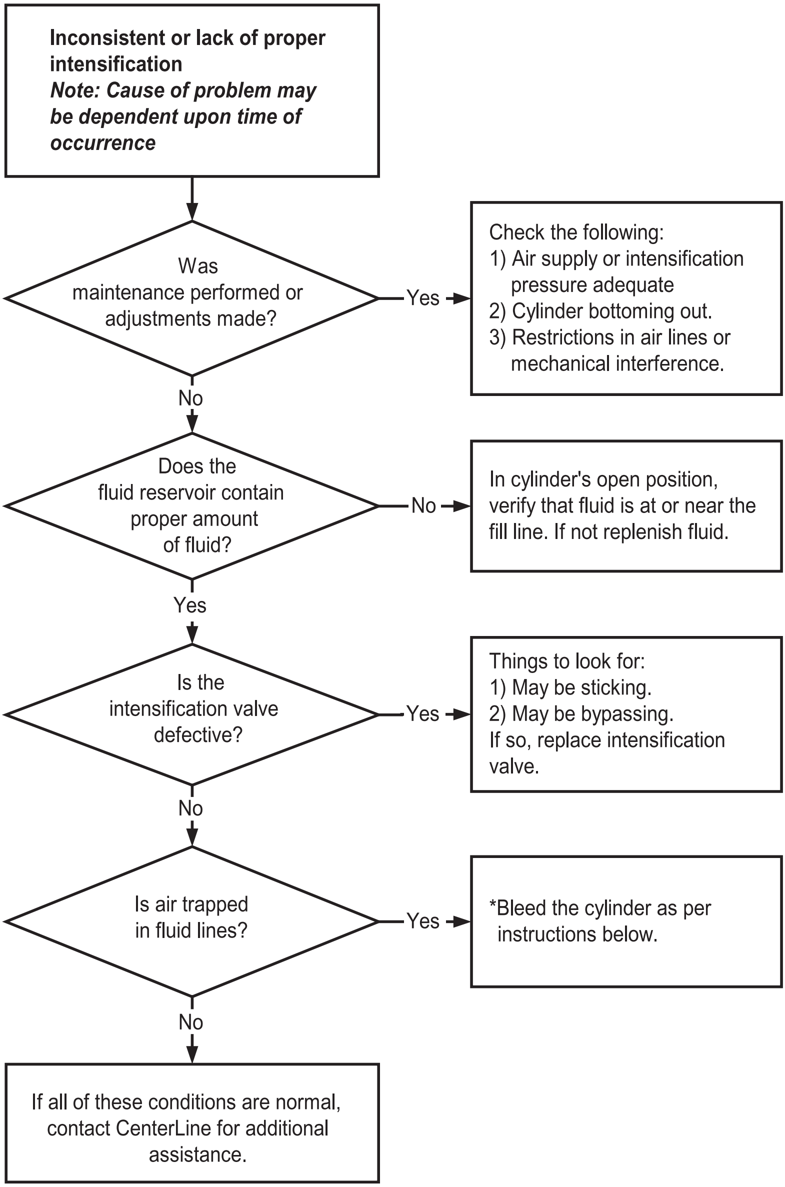
9.3 Cylinder Will Not Close Properly



9.4 Cylinder Operation Too Slow



9.5 Inconsistent or Lack of Proper Intensification



*If air is trapped in the fluid line, cycling the cylinder a few times should bleed all of the air out of the system. (To achieve the best results, the cylinder should be cycled in a vertical position with the working piston rod travelling downward otherwise the use of the bleeder screw is recommended).
Note: Not all OHMA cylinders have bleeder screws.

10. Checking the Cylinder

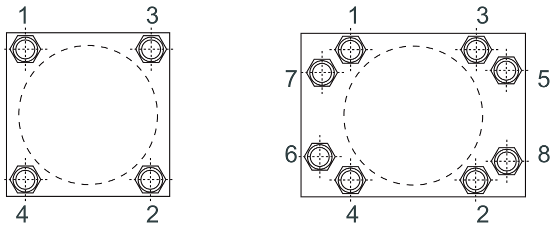
If troubleshooting has failed to determine the source of the problem, it may be necessary to perform a more detailed investigation. Conduct the following procedure in a clean environment.

1. Disconnect all fluid and air lines from the cylinder and drain all fluid contained inside the cylinder.
2. Screw temporary fittings into the open ports.
3. Apply low pressured air into the return port, located in the front block. For cylinders with an integral return manifold this will return both pistons. In the case of cylinders with independent return ports (no return manifold) air pressure must also be applied to the return port located in the middle separator of the cylinder. With air pressure applied check the open ports for air leakage. **Be careful! With no fluid, cylinder motion will be very rapid!**
4. Remove the connection(s) from the return port(s) and attach air line to the advance port. This will cause the working piston to stroke forward. Check the open ports for air leakage.
5. Remove the connection from the advance port and attach it to the intensifier port. This will cause the intensification piston to stroke forward. The metal contact should be heard when it bottoms out on the middle separator. Check the open ports for air leakage. If no leaks can be located the cylinder should be functioning properly. Other problems in the circuit may be causing cylinder malfunction.

11. Tie Rod Tightening Sequence

To prevent damage of the OHMA® cylinder due to imbalanced tie rod tension it is recommended that the following torquing procedure be used whenever the cylinder is re-assembled.

1. Install all tie rod nuts to finger tight condition, for self-locking nuts tighten until light metal-to-metal contact is achieved.
2. Using a torque wrench, and following the appropriate sequence shown below, tighten all nuts to approximately 1/3 of the recommended torque value from the Torque Chart.
3. Repeat the sequence tightening all nuts to approximately 2/3 of recommended value.
4. Complete the procedure by tightening all nuts to 100% of the recommended torque. Again, make sure to use the correct tightening sequence.



4 Tie Rod Sequence

8 Tie Rod Sequence

12. Piercing Cylinder Torque Chart for Mounting

TIGHTENING TORQUE GUIDE

The following figures represent an estimate of torque (torque being the measurement of friction, not tension) required to induce a given preload (clampload) in a bolt for the OHMA® piercing cylinders.

Coarse Thread*			Fine Thread*		
Size	**Plain (lb. ft.)**	**Plated (lb. ft.)**	**Size**	**Plain (lb. ft.)**	**Plated (lb. ft.)**
3/8-16 (.375)	31	23	3/8-24 (.375)	35	**26**
7/16-14 (.4375)	50	37	7/16-20 (.4375)	55	**41**
1/2-13 (.500)	76	57	1/2-20 (.500)	85	**64**
9/16-12 (.5625)	109	82	9/16-18 (.5625)	122	**91**
5/8-11 (.625)	150	112	5/8-18 (.625)	170	**128**
3/4-10 (.750)	266	200	3/4-16 (.750)	297	**223**
7/8-9 (.875)	430	322	7/8-14 (.875)	474	**355**
1-8 (1.000)	644	483	1-12 (1.000)	705	**529**
To convert to lb. in. multiply by 12.					

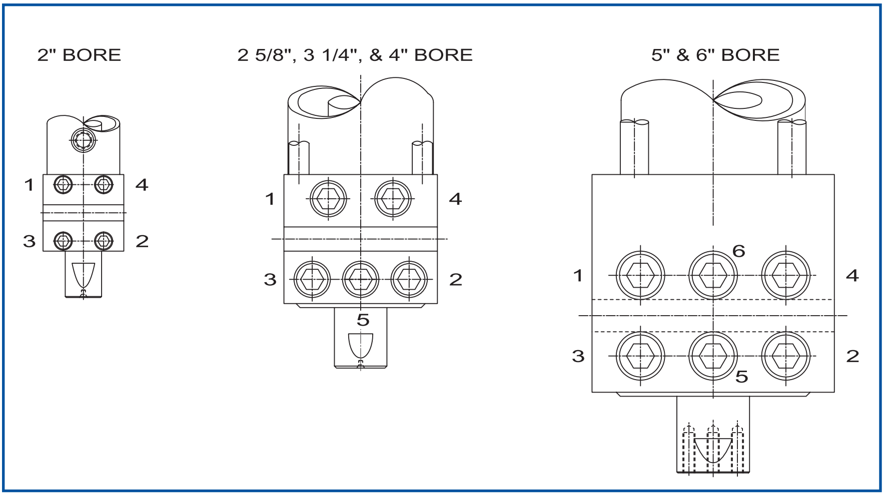
*OHMA® cylinder tie rods are always fine thread. Coarse thread chart is provided for your convenience for mounting purposes only.

Notes: All nuts used on standard OHMA® cylinders are plated. Refer to the plain chart values only when substituting non-plated nuts.

13. FBL Cylinder Mounting Block Tightening Sequence

Use only SAE Grade 8 bolts or stronger for cylinder mounting, socket head bolts are preferred.

FF and CFF block mount cylinders should be mounted using shoulder screws matched in size to mounting holes in block. Shoulder screws should be torqued per screw manufacturers specification and checked periodically to ensure proper torque is maintained.



14. Cylinder Information

Model #			
Serial #			
Purchased From			
Contact Name			
		Tel.	
		Fax	
		Date Installed	

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