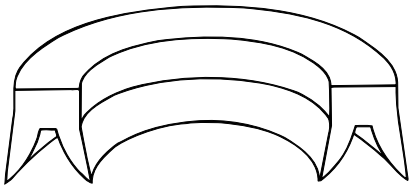
FLUID POWER SEALING SOLUTIONS

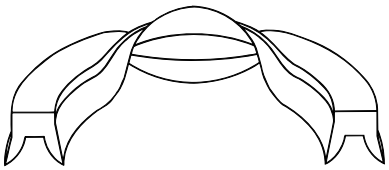
TROUBLESHOOTING GUIDE

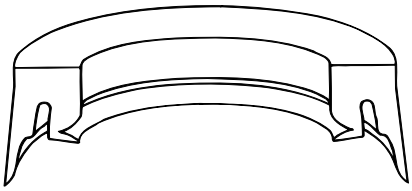
POLYMER SEALS

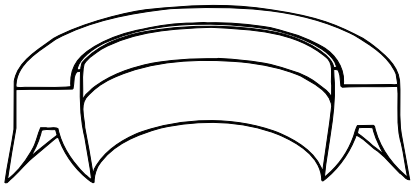
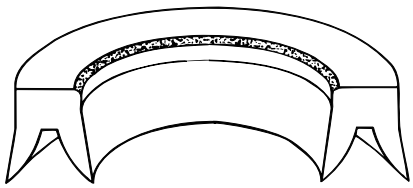
CHESTERTON®
Global Solutions, Local Service.

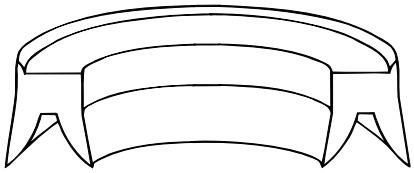
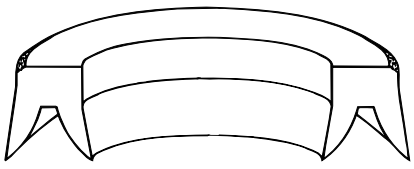
This section provides troubleshooting criteria for Chesterton's hydraulic and pneumatic sealing devices. It should be used only as a general reference guide when repacking, rebuilding, or redesigning any cylinder or press and specific guidance can be provided by your Chesterton representative. By installing superior, longer lasting seals and components in a properly designed cylinder, one can expect greatly extended, leak-free service.

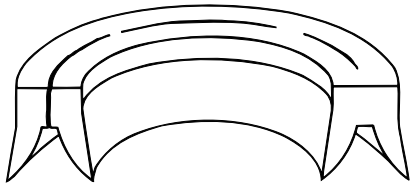
SEAL CONDITION	No visible damage, but leaking	
	Probable Cause	**Possible Solution**
	Incorrect size seal not sealing dynamically or statically.	Check seal and equipment dimensions. Check for additional causes of leak such as static O-ring or gasket leak.
	Hydroplaning due to low sealing pressure with high viscosity fluid and too smooth surface finish.	Check fluid pressure on return to tank cycle. Check dynamic surface finish. Check cycle speed. Consider alternate seal design with higher pre-load.

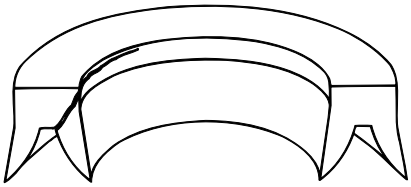
SEAL CONDITION	Rolled or twisted seal may have permanent creases from twisting in seal cavity and may be severely rolled	
	Probable Cause	**Possible Solution**
	A variety of conditions may cause rolling of a seal. Drag due to sizing problem, vacuuming, extrusion, or swelling may all cause seals to roll. In addition, side loading and shock loading could be contributing factors.	Check dimensions of seal and equipment. Check system and application for operating condition. Look for other types of damage to help troubleshoot this problem.

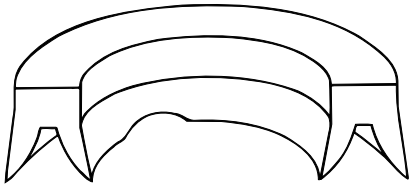
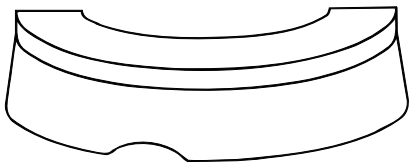
SEAL CONDITION	Seal lips are crushed, crimped or creased	
	Probable Cause	**Possible Solution**
	Seal too tall for groove.	Remachine seal groove or choose shorter seal.
	Loose bottom bushing under seal hits seal when pressurized.	Secure and vent bottom bushing.
	Seal is being mechanically loaded by a metallic or elastomeric retaining device.	Remove device if not necessary or re-work device to prevent contact with seal lip(s).
	Seal is being dragged to bottom of groove or box by vacuum or by missizing of seal.	Correct vacuum condition or secure seal with retaining device. Check seal dimensions and correct application of piston and rod designed seals.
	Piston cup lip is jammed by hold down plate on piston or is acting as stop at end or stroke.	Correct inside ("d2" dimension) of piston cup relative to diameter of hold down plate. Provide mechanical stop on stroke or choose cup with shorter lip.

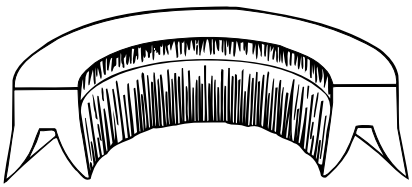
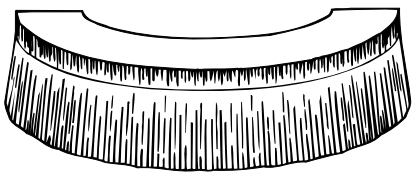
SEAL CONDITION	Extrusion of inside diameter heel	
	Probable Cause	**Possible Solution**
	If extrusion is evident all around circumference of inside diameter heel, rod or ram to gland or bushing clearance is excessive for pressure.	Rework or replace gland or bushing to achieve recommended clearance. Use rigid back-up ring.
	If extrusion is evident on half of the circumference of the inside diameter heel, rod or ram is side loading. Gland may not be centered or cylinder head may be cocked.	Rework or replace gland or bushing. Replace bearings. Use backup ring. Check gland for centering.

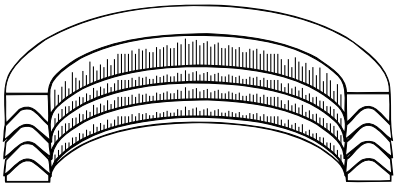
SEAL CONDITION	Extrusion of outside diameter heel	
	Probable Cause	**Possible Solution**
 A. Piston Application	A1: If extrusion is evident all around circumference of outside diameter heel, piston head-to-bore clearance is excessive. May be due to poor design, wear, or pressure swelling or "ballooning."	A1: Rework or replace piston head or retube to achieve recommended clearance. Use non-metallic bearing band(s) to prevent wear. Check cylinder integrity relative to maximum pressure. Use back-up rings under extreme shock loads.
	A2: If extrusion is evident on half of the circumference of the outside diameter heel, piston is side loading or cylinder is out-of-round.	A2: Rework piston head for non-metallic bearing band thus centering piston. Check cylinder bore for possible ovality.
 B. Rod Seal Application	B: Excessive clearance between gland and stuffing box bore.	B: Rework or replace gland or use back-up ring.

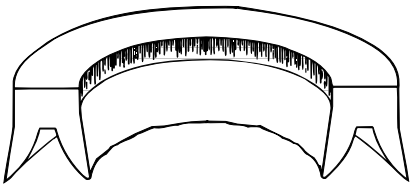
SEAL CONDITION	U-cup split through center of its cross-section	
	Probable Cause	**Possible Solution**
	If splitting or separation is apparent over most or all of seal's circumference, the cause is a dial oversizing or incorrect seal size.	Check equipment dimensions and compare to seal dimension.

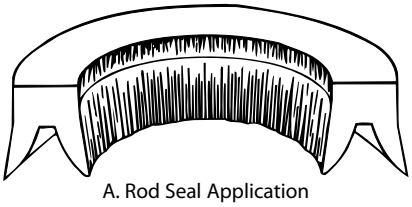
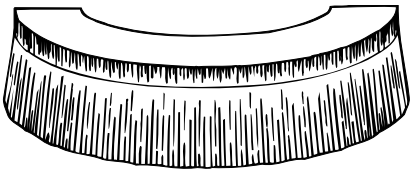
SEAL CONDITION	U-cup or piston cup lip is separated from heel	
	Probable Cause	**Possible Solution**
	If splitting or separation is apparent over a small portion of seal's circumference, the cause is a lack of concentricity or ovality of equipment.	Rework or replace bearing support to achieve concentricity of rod and piston. Check stuffing box and cylinder bores for roundness.

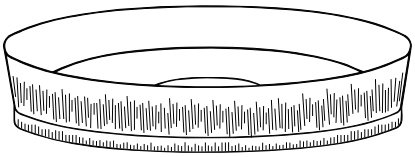
SEAL CONDITION	Crescent shaped section missing from dynamic sealing lip	
	Probable Cause	**Possible Solution**
	Piston seal lip is passing over port either during installation or actual use.	Chamfer sharp internal port edges, alter stroke or piston design to avoid port. If caused during installation, use shim or otherwise protect seal from sharp edges.
	Seal lip was kinked, jammed, or curled back during installation.	Use care when installing. Don't use sharp tools. Check lip before pushing into bore.
		

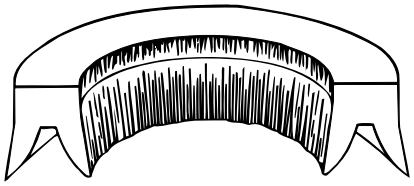
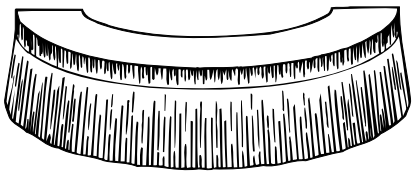
SEAL CONDITION	Excessive abrasion or grooving of dynamic sealing lip	
	Probable Cause	**Possible Solution**
 A. Rod Seal Application	A1: Excessive wear on inside diameter indicates poor rod finish.	A1: Rework or replace rod or ram to achieve finish of 8 – 24 R.M.S (Ra).
	A2: Excessive wear on inside diameter indicates abrasive particles in the system.	A2: Install sharp lip, abrasion resistant wiper. Consider an externally mounted, easily replaceable wiper. May require a custom wiper in excessively wet/dirty environments.
 B. Piston Application	B1: Excessive wear on outside diameter indicates poor bore finish.	B1: Rework or replace cylinder tube to a bore finish of 8 – 24 R.M.S (Ra).
	B2: Excessive wear on outside diameter indicates abrasive particles in the system.	B2: Check condition of fluid. Filter system with portable filtration or drain and flush system.

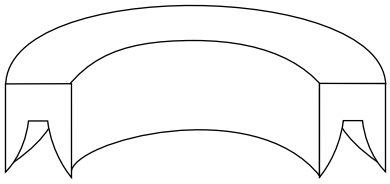
SEAL CONDITION	Excessive wear, misshaping, darkening of V-ring sets in stacked sets	
	Probable Cause	**Possible Solution**
	Undercompression of stacked V-ring set can cause rings to roll or twist and bind causing leakage and excessive friction.	Check split if applicable, check alignment of each ring before installing next ring.
	Overcompression of stacked V-ring set can cause binding and excessive friction due to lack of lubricating barrier and additional drag.	Measure equipment and seal set carefully; shim and adjust properly. If ram or rod is binding, loosening of load on set may ease binding. May need to remove and re-pack V-rings properly.

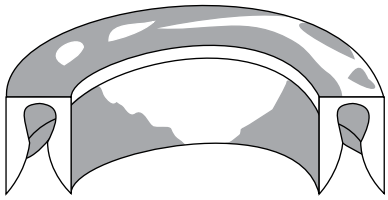
SEAL CONDITION	Wear on dynamic heel 360˚ of seal's circumference	
	Probable Cause	**Possible Solution**
	Misapplication of rod or piston designed seal or wrong seal size.	Use rod seals for rod applications and piston mounted seals on pistons. Check equipment and seal dimensions.

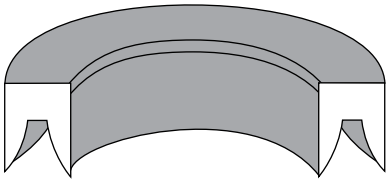
SEAL CONDITION	Excessive wear on dynamic heel and lip of 180˚ of seal's circumference. May also show extrusion of dynamic heel 180˚ opposite of the worn side of the seal	
	Probable Cause	**Possible Solution**
 A. Rod Seal Application  B. Piston Application	Side loading due to misalignment, mounting and clevis design or application and design causing bushing and bearing wear and excessive seal wear. Also increases clearances resulting in possible extrusion.	Re-work or replace bearing or bushing to achieve concentricity. Check for misalignment or cause of side loading. Increase bearing area with strong, non-metallic bearings. Check diametral clearances for adequate seal support.

SEAL CONDITION	Excessive wear on heel 360˚ of circumference of piston cup, often the seal lip will not show wear	
	Probable Cause	**Possible Solution**
	Overcompression of the piston cup due to overtightening of the hold down plate or base thickness too great for the available space causes the heel to squeeze-out.	Compress flange thickness (H2)10%. Check base thickness relative to space available. Do not overtighten. Check cup visually after tightening for heel squeeze-out.

SEAL CONDITION	Vertical/Axial scratches on static lip may be associated with other damage	
	Probable Cause	**Possible Solution**
	Incorrect sizing of rod or piston seal will cause seal to move axially in the seal groove/ stuffing box. Axial movement is evident due to scratches on static lip.	Check dimensions of seal groove/stuffing box and rod or bore diameter. Check for seal fit and correct application of rod seal or piston mounted seal.
A. Piston Application	Vacuuming due to inability of fluid to fill cylinder to make up for increasing volumetric area.	Correct shock-loading if possible. Check system for pipe flow volume. Consider alternate seal design.
	A: Excessive wear or "pock-marked" appearance on *outside* diameter indicates a poor static finish on box bore or seal groove.	A: Re-work to achieve a static finish 32 – 45 R.M.S. (Ra).
B. Rod Seal Application	B: Excessive wear or "pock-marked" appearance on *inside* diameter indicates a poor static finish on piston seal groove.	B: Re-work to achieve a static finish 32 – 45 R.M.S. (Ra).

SEAL CONDITION	Discoloration, swelling, softening, or hardening of seal compound	
	Probable Cause	**Possible Solution**
	Fluid incompatibility with hydraulic fluid, lubricating oil, installation grease, or cleaning solvent.	Check compatibility of seal compound. Change fluid type or substitute seal compound.

SEAL CONDITION	Black, tar-like deposits and/or burned spots, possibly burned completely through the heel of the seal. This damage will appear in the crotch area between the seal lips.
	Probable Cause / **Possible Solution**
	Dieseling, due to auto ignition of hydraulic fluid causing intense heat at the damaged area. Dieseling results from trapped air bubbles in the fluid rising to settle between the seal lips where, under pressure, the bubbles are compressed. Rapid decompression of compressed air bubble results in energy released as heat. / Bleed all air from hydraulic system. Caution should be used to bleed system after any work is done to pump, valves, lines, or actuators.

SEAL CONDITION	Seal is dark or black in color, has lost flair or is drastically misshaped	
	Probable Cause	**Possible Solution**
	Darkening of entire seal indicates excessive fluid temperatures or environmental heat exposure.	Protect against environmental heat source. Maintain or utilize cooling system. Use high temperature seal compound.
	Darkening of dynamic lip only indicates excessive friction due to speed, lack of lubricity, or jamming of dynamic lip or heel.	Check reciprocating or rotating speed. Check lubrication of pneumatic system or lubricity of hydraulic fluid. Look for evidence of jamming of lip or extrusion of heel.
	Drastically misshaped seal indicates prolonged exposure to heat or extremely high heat. May be caused by continual rolling of seal in groove.	Use high temperature seal compound. Check seal groove dimensions.

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- Global manufacturing operations
- More than 500 Service Centers and Sales Offices worldwide
- Over 1200 trained local Service Specialists and Technicians

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