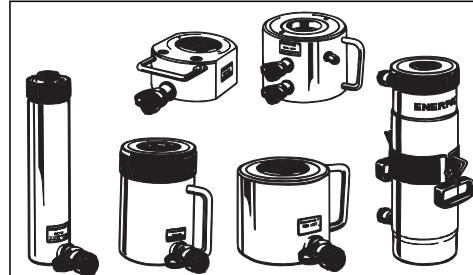


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Instruction Sheet

Hydraulic Cylinders



Repair Parts Sheets for this product are available from the Enerpac web site at www.enerpac.com, or from your nearest Authorized Enerpac Service Center or Enerpac Sales office.

1.0 IMPORTANT RECEIVING INSTRUCTIONS

Visually inspect all components for shipping damage. Shipping damage is **not** covered by warranty. If shipping damage is found, notify carrier at once. The carrier is responsible for all repair and replacement costs resulting from damage in shipment.

SAFETY FIRST

2.0 SAFETY ISSUES

  Read all instructions, warnings and cautions carefully. Follow all safety precautions to avoid personal injury or property damage during system operation. Enerpac cannot be responsible for damage or injury resulting from unsafe product use, lack of maintenance or incorrect product and/or system operation. Contact Enerpac when in doubt as to the safety precautions and operations. If you have never been trained on high-pressure hydraulic safety, consult your distribution or service center for a free Enerpac Hydraulic safety course.

Failure to comply with the following cautions and warnings could cause equipment damage and personal injury.

A **CAUTION** is used to indicate correct operating or maintenance procedures and practices to prevent damage to, or destruction of equipment or other property.

A **WARNING** indicates a potential danger that requires correct procedures or practices to avoid personal injury.

A **DANGER** is only used when your action or lack of action may cause serious injury or even death.



WARNING: Wear proper personal protective gear when operating hydraulic equipment.

 **WARNING:** Stay clear of loads supported by hydraulics. A cylinder, when used as a load lifting device, should never be used as a load holding device. After the load has been raised or lowered, it must always be blocked mechanically.



WARNING: USE ONLY RIGID PIECES TO HOLD LOADS. Carefully select steel or wood blocks that are capable of supporting the load. Never use a hydraulic cylinder as a shim or spacer in any lifting or pressing application.



DANGER: To avoid personal injury keep hands and feet away from cylinder and workpiece during operation.



WARNING: Do not exceed equipment ratings. Never attempt to lift a load weighing more than the capacity of the cylinder. Overloading causes equipment failure and possible personal injury. The cylinders are designed for a max. pressure of 700 bar [10,000 psi]. Do not connect a jack or cylinder to a pump with a higher pressure rating.



DANGER: Never set the relief valve to a higher pressure than the maximum rated pressure of the pump. Higher settings may result in equipment damage and/or personal injury. Do not remove relief valve.



WARNING: The system operating pressure must not exceed the pressure rating of the lowest rated component in the system. Install pressure

gauges in the system to monitor operating pressure. It is your window to what is happening in the system.



CAUTION: Avoid damaging hydraulic hose. Avoid sharp bends and kinks when routing hydraulic hoses. Using a bent or kinked hose will cause severe back-pressure. Sharp bends and kinks will internally damage the hose leading to premature hose failure.



Do not drop heavy objects on hose. A sharp impact may cause internal damage to hose wire strands. Applying pressure to a damaged hose may cause it to rupture.



IMPORTANT: Do not lift hydraulic equipment by the hoses or swivel couplers. Use the carrying handle or other means of safe transport.



CAUTION: KEEP HYDRAULIC EQUIPMENT AWAY FROM FLAMES AND HEAT. Excessive heat will soften packings and seals, resulting in fluid leaks. Heat also weakens hose materials and packings. For optimum performance do not expose equipment to temperatures of 65°C [150°F] or higher. Protect hoses and cylinders from weld spatter.



DANGER: DO NOT HANDLE PRESSURIZED HOSES. Escaping oil under pressure can penetrate the skin, causing serious injury. If oil is injected under the skin, see a doctor immediately.



WARNING: Only use hydraulic cylinders in a coupled system. Never use a cylinder with unconnected couplers. If the cylinder becomes extremely overloaded, components can fail catastrophically causing severe personal injury.



WARNING: BE SURE SETUP IS STABLE BEFORE LIFTING LOAD. Cylinders should be placed on a flat surface that can support the load. Where applicable, use a cylinder base for added stability. Do not weld or otherwise modify the cylinder to attach a base or other support.



Avoid situations where loads are not directly centered on the cylinder plunger. Off-center loads produce considerable strain on cylinders and plungers. In addition, the load may slip or fall, causing potentially dangerous results.



Distribute the load evenly across the entire saddle surface. Always use a saddle to protect the plunger.



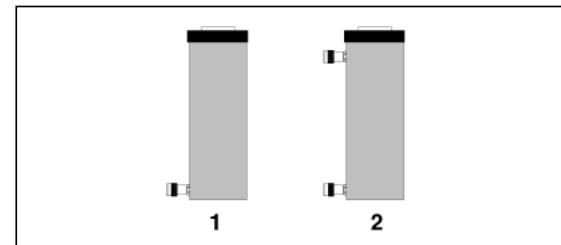
IMPORTANT: Hydraulic equipment must only be serviced by a qualified hydraulic technician. For repair service, contact the Authorized ENERPAC Service Center in your area. To protect your warranty, use only ENERPAC oil.



WARNING: Immediately replace worn or damaged parts by genuine ENERPAC parts. Standard grade parts will break causing personal injury and property damage. ENERPAC parts are designed to fit properly and withstand high loads.

3.0 INSTALLATION

1. Make hydraulic connections. Use a pump with a release valve or a 3-way valve and one hose for single-acting cylinders **(1)**. Use a pump with a 4-way valve and two hoses for double-acting cylinders **(2)**.



IMPORTANT: Double-acting cylinders must have both couplers connected.

Fully hand-tighten all couplers. Loose coupler connections will block the flow of oil between the pump and the cylinder.

2. Remove air from the cylinder as shown below.

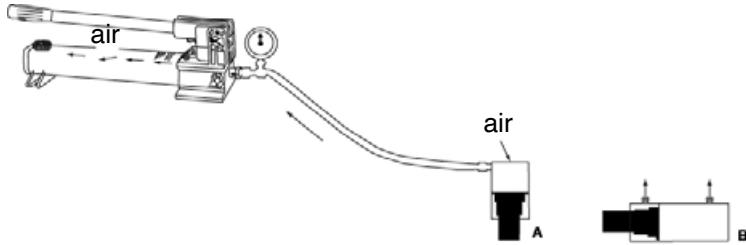
Single-acting cylinders: Position the cylinder so that the plunger is pointed down and the cylinder lower than the pump. Fully extend and retract the cylinder 2 or 3 times.

Double-acting cylinders: Lay the cylinder on its side and have the couplers facing up. Fully extend and retract the cylinder 2 or 3 times.

3. Do not allow plunger to rotate when installing adaptors. Damage to the spring may result in rotating the plunger preventing retraction.

NOTE: Collar threads are rated for the full capacity of the cylinder when fully engaged in attachments.

NOTE: The use of cylinder attachments or extensions reduces the cylinder capacity by at least 50%.



4.0 OPERATION

Operate the hydraulic pump to advance and retract the cylinder. Some single-acting cylinders are spring-return, others are load-return. The speed of retraction is affected by the length of the hose and other restrictions in the line. Double-acting cylinders are powered in both directions by the pump.

The cylinder stop ring is designed to take the full load. However, to reduce cylinder wear, use less than full stroke when possible.

5.0 MAINTENANCE

1. Use only Enerpac oil with these cylinders. The use of any other oil may invalidate your warranty.

2. Use dust caps when cylinders are disconnected from the hose. Keep entire cylinder clean to prolong cylinder life.
3. Store cylinders upright to prevent seal distortion.

6.0 TROUBLESHOOTING

These cylinders should be repaired only by Authorized Enerpac Technical Service Centers. Single-acting cylinders are spring-loaded and require special disassembly techniques to prevent personal injury.

PROBLEM	POSSIBLE CAUSE
Cylinder will not advance.	Pump release valve open. Coupler not fully tightened. Oil level in pump is low. Pump malfunctioning. Load is too heavy for cylinder.
Cylinder advances part way.	Oil level in pump is low. Coupler not fully tightened. Cylinder plunger binding.
Cylinder advances in spurts.	Air in hydraulic system. Cylinder plunger binding.
Cylinder advances slower than normal.	Leaking connection. Coupler not fully tightened. Pump malfunctioning.
Cylinder advances but will not hold.	Cylinder seals leaking. Pump malfunctioning. Leaking connection. Incorrect system set-up.
Cylinder leaks oil	Worn or damaged seals Internal cylinder damage. Loose connection.
Cylinder will not retract or retracts slower than normal.	Pump release valve is closed. Coupler not fully tightened. Pump reservoir over-filled. Narrow hose restricting flow. Broken or weak retraction spring. Cylinder damaged internally.
Oil leaking from external relief valve.	Coupler not fully tightened. Restriction in return line.