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Repair Parts Sheets for this product are available from the Enerpac web site at [www.enerpac.com](http://www.enerpac.com), or from your nearest Authorized Enerpac Service Center or Enerpac Sales office.

## 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.



**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 350 bar [5,000 psi]. Do not connect a jack or cylinder to a pump with a higher pressure rating.



**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.



**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.



**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 DESCRIPTION

These hydraulically advanced work supports provide additional support to avoid excessive movement, vibrations, or deflection of the workpiece during machining.

As alternatives, spring advanced work supports may also be used as either air spring loaded or as air advanced units by simply removing the internal adjustable spring and attaching a low pressure air line to the air breather vent port.

### 4.0 SPECIFICATIONS

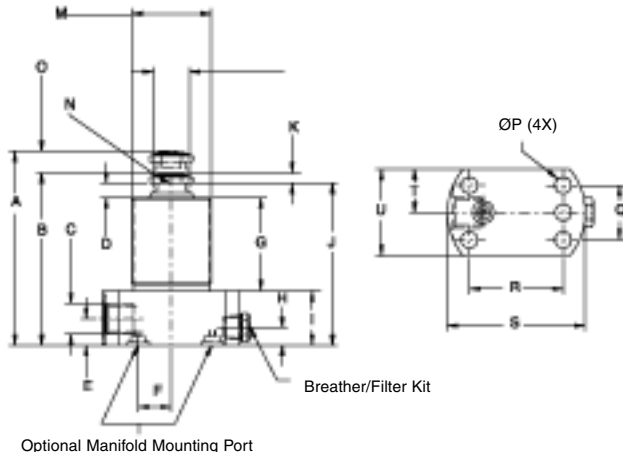
#### 5.0 INSTALLATION

1. Locate the work supports at the lowest point of the fixture's hydraulic system to aid in venting. Work supports must be purged of air by cycling several times and allowing air in the system to vent at the highest point in the system.
2. Install the work supports by either threading into the fixture, using the accessory jam nuts, or bolting the flange onto the fixture. Mount the work support so that the plunger is at the approximate middle of its stroke when contacting the workpiece in the fixture. If the work support is to be hydraulically manifold mounted to the fixture through the bottom port, the port screw plugs and copper gaskets must first be removed (see item B, Figure 2). Lubricate the provided o-rings and install them (see Figure 2) in the counterbore around the port prior to mounting and bolting down the work support. Be sure that the o-rings do not get pinched or damaged during this mounting as leakage could result. To ensure that the manifold mounting does not leak, provide a fixture mounting surface with flatness within .003 inch (0.08 mm) and a surface roughness not to exceed 32 uin. rms. (Ra 0,8).

#### Specification Table

Model No.	Pressure Range	Stroke In. (mm)	Capacity at Maximum Pressure lbs. (kg)	Oil Capacity cu. in. (cu. cm.)	Spring Applied Force @ MidPoint of Stroke lbs. (kg)	Support Deflection @ Max. Force in. (mm)
<b>WFL111/112</b>	0-5000 PSI 0-350 BAR	.38 (9,65)	2,500 (1136)	.06 (0,98)	4.3 (1,95)	.0025 (0,06)
<b>WSL111/112</b>	0-5000 PSI 0-350 BAR	.38 (9,65)	2,500 (1136)	.02 (0,33)	4.4 (1,99)	.0025 (0,06)

Figure 1



Model No.	A	B	C	D	E	F	G	H
WFL111	3.91 (99,3)	3.53 (89,7)	#4 SAE	.25 (6,4)	.56 (14,2)	.57 (14,5)	2.02 (51,3)	.70 (17,8)
WFL112	3.91 (99,3)	3.53 (89,7)	.25-19 BSPP	.25 (6,4)	.56 (14,2)	.57 (14,5)	2.02 (51,3)	.70 (17,8)
Model No.	I	J	K	L	M	N	O	P
WFL111	1.08 (27,4)	3.35 (85,1)	.18 (4,6)	Ø.629 (Ø16,0)	1.375-18 UNEF	M10x1,5 6G	.38 (9,7)	Ø.284 (Ø7,21)
WFL112	1.08 (27,4)	3.35 (85,1)	.18 (4,6)	Ø.629 (Ø16,0)	M35x1,5 6G	M10x1,5 6G	.38 (9,7)	Ø.284 (Ø7,21)
Model No.	Q	R	S	T	U	Dimensions inches (mm)		
WFL111	.94 (23,9)	1.62 (41,1)	Ø2.38 (Ø60,5)	.75 (19,1)	1.50 (38,1)			
WFL112	.94 (23,9)	1.62 (41,1)	Ø2.38 (Ø60,5)	.75 (19,1)	1.50 (38,1)			

Model No.	A	B	C	D	E	F	G	H
WSL111	3.35 (82,6)	2.97 (75,4)	#4 SAE	.25 (6,4)	.44 (11,2)	.57 (14,5)	1.60 (40,6)	.39 (9,9)
WSL112	3.35 (82,6)	2.97 (75,4)	.25-19 BSPP	.25 (6,4)	.44 (11,2)	.57 (14,5)	1.60 (40,6)	.39 (9,9)
Model No.	I	J	K	L	M	N	O	P
WSL111	.94 (23,9)	2.79 (70,9)	.18 (4,6)	Ø.629 (Ø16,0)	1.375-18 UNEF	M10x1.5 6G	.38 (9,7)	Ø.284 (Ø7,21)
WSL112	.94 (23,9)	2.79 (70,9)	.18 (4,6)	Ø.629 (Ø16,0)	M35x1,5 6G	M10x1,5 6G	.38 (9,7)	Ø.284 (Ø7,21)
Model No.	Q	R	S	T	U	Dimensions inches (mm)		
WSL111	.94 (23,9)	1.62 (41,1)	Ø2.38 (60,5)	.75 (19,1)	1.50 (38,1)			
WSL112	.94 (23,9)	1.62 (41,1)	Ø2.38 (60,5)	.75 (19,1)	1.50 (38,1)			



**WARNING** The fixture manifold must be capable of withstanding a hydraulic 5000 psi (350 bar) working pressure.

- If making hydraulic connections to the side port, remove the port plug and connect the hydraulic line using appropriate fittings. All hoses, lines, and fittings must be rated at 5000 psi (350 bar) minimum.

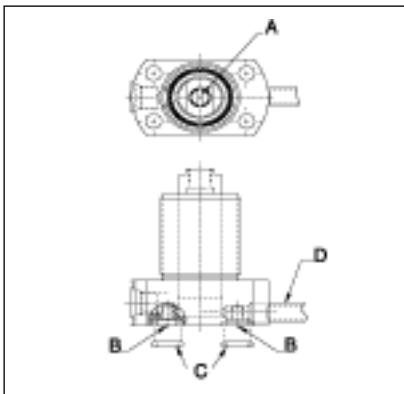


Figure 2

- A - spring force adjustment screw**
- B - portscrew (must be removed for manifold mounting)**
- C - O-ring (for manifold mounting)**
- D - breather vent tube**

- The hydraulic power pump should not exceed 5000 psi (350 bar) maximum. Power pumps must be large enough to provide a usable oil supply for the work supports, hoses, clamps, and all items in the system. Refer to Table 1 for maximum applied loads vs. operating pressure.
- When there is a risk of machining coolants, debris, and chips entering the cylinder via the breather vent (see Figure 2), plumb into the vent port with a line which runs to an area protected from chips, coolant, etc.

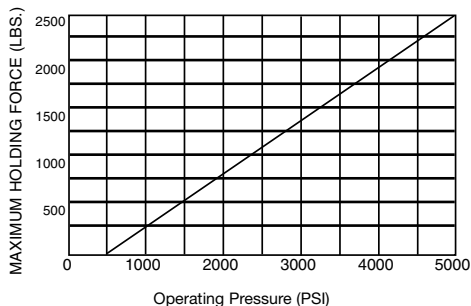
### 5.1 For Spring Advanced Work Supports Only:

If machining coolant and debris will create a problem of entering the work support, install the work support as an air spring type. This will blow air through the wiper and help prevent coolant and debris from entering the work support.

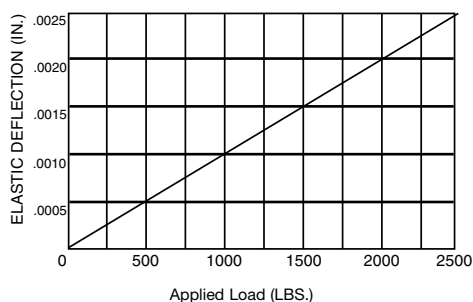
- Remove the contact bolt from within the work support plunger together with the spring inside.
- After removing the spring, replace the contact bolt utilizing Loctite 242 to seal the threads.
- Connect the air breather tube to the air vent port. By providing an adjustable zero to 5 psi (0,35 bar) air supply, the work support will now become an "air spring" loaded work support.
- Increase or decrease the contact force of the plunger against the workpiece by adjusting the air supply pressure.

**NOTE:** To prevent the part from lifting, do not exceed 5 psi (0,35) bar. To provide an air advanced type of work support, install an air line (described above) and add a

**TABLE 1**  
MAXIMUM HOLDING FORCE VS. HYDRAULIC OPERATING PRESSURE



**TABLE 2**  
SUPPORT PLUNGER DEFLECTION VS. APPLIED LOAD  
(AT 5000 PSI OPERATING PRESSURE)



two-position manual air valve (VA-42) or a solenoid operated air valve (VAS-42) to the supply line. This valve will block the air supply and vent the work support in one position and provide air supply to the work support without venting in the other position.

**NOTE:** When the air supply is removed from the work support, the plunger will not retract by itself except under gravity when mounted vertically. However, the plunger will be free to move if bumped or contacted by a workpiece being loaded or unloaded.

## 5.2 Modifications

If the work support is to be used without a contact bolt, replace the bolt with the provided set screw. Seal this set screw with Loctite 242 and position flush with the top of the plunger.

## 6.0 OPERATION

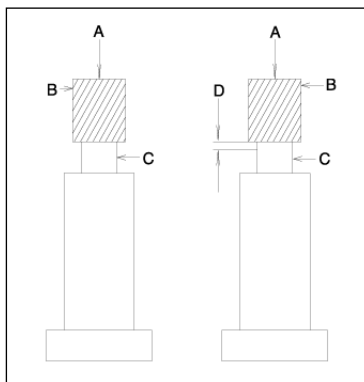
1. Install work supports according to preceding instructions.
2. Place the workpiece into the fixture and above the work supports.

3. Activate hydraulic pressure to advance the plunger against the workpiece. Work support plunger position will be maintained until hydraulic pressure is released.
4. Clamp the workpiece in position to facilitate machining operations.
5. When machining is complete, release the clamps and then release the work support hydraulic pressure. The work supports will now be released and the plungers will retract.
6. Remove workpiece from the fixture.

**NOTE:** Do not exceed the specified maximum load on the support plunger. This load is the result of clamping forces from other hydraulic components such as swing clamps and machining forces. Table 1 shows the maximum applied load versus the pressure which locks the plunger. Table 2 shows the deflection of the support plunger when applying a load on the cylinder.

## 6.1 For Spring Advanced Work Supports Only:

Operation is similar for a work support using air as the spring. If air is used to advance the plunger, then the air valve must be shifted to advance the plunger after the workpiece is mounted in its final position in the fixture. The air valve can be released after the support is hydraulically locked.



**Figure 3**

- A - Load**                      **B - Workpiece**  
**C - Support Plunger**      **D - Deflections**

## 7.0 MAINTENANCE AND SERVICE

Maintenance is required when wear and/or leakage is noticed. Occasionally inspect all components to detect any problem requiring service and maintenance. Enerpac offers Repair Part Kits for equipment maintenance. Repair Part Sheets are also available. Contact your Enerpac representative.

## 8.0 TROUBLESHOOTING

<b>Problem</b>	<b>Possible Cause</b>
Plunger will not advance completely when system maximum pressure is activated.	<ol style="list-style-type: none"><li>1. Determine if hydraulic system is exceeding flow rate (see specifications table)</li><li>2. Check for broken take up spring.</li><li>3. Check plunger and sleeve for damage.</li></ol>
Work support raises part off of rest surfaces.	<ol style="list-style-type: none"><li>1. Work support may be over-size for application.</li></ol>
Work Support plunger is slipping.	<ol style="list-style-type: none"><li>1. Hydraulic pressure may be below minimum amount to hold plunger.</li><li>2. Cutting forces may be exceeding the capacity of the work support.</li></ol>
Plunger will not retract. Plunger will not release to extended height.	<ol style="list-style-type: none"><li>1. Hydraulic pressure has not been released from the the system.</li><li>2. Excessive back pressure from small diameter tubing or tight bends.</li><li>3. Check plunger and sleeve for damage or debris accumulation</li><li>4. Check for broken return spring.</li></ol>
Work support leaks oil.	<ol style="list-style-type: none"><li>1. Check seals for wear or damage.</li><li>2. Connection to work supports may be leaking.</li></ol>