

L3096 Rev. B Date: 12/11

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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.

## 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 safety precautions 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 the product operating specifications. The cylinders are designed for a maximum pressure of 70 bar [1000 psi]. Never adjust the circuit pressure beyond the maximum operating pressure recommendation for the clamp arm length. Exceeding these specifications can cause equipment failure and possible personal injury.



**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.



**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 with 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 PRODUCT DATA

**Table 1 - Model Number Code**

1	2	3	4	5	6	7	8
S = Swing Clamp	U = Upper Flange	R = Right Hand L = Left Hand	S = Single Acting D = Double Acting	7= 70 bar pressure rating	2 = 2 kN [441 lbs] 3 = 3,5 kN [769 lbs] 5 = 5,0 kN [1111 lbs] 7 = 7,0 kN [1570 lbs] 9 = 9,0 kN [2019 lbs] 20 = 20,0 kN [4490 lbs]	2 = Metric	S = Position Indicator Staff

**Table 2 - Cylinder Specifications**

Capacity kN [lbs]		2 kN [441 lbs]	3,5 kN [769 lbs]	5 kN [1111 lbs]	7 kN [1570 lbs]	9 kN [2019 lbs]	20 kN [4490 lbs]
<b>Body Style</b>		Upper Flange	Upper Flange	Upper Flange	Upper Flange	Upper Flange	Upper Flange
<b>Cylinder Type</b>		Single or Double Acting	Single or Double Acting	Single or Double Acting	Single or Double Acting	Single or Double Acting	Single or Double Acting
<b>Hydraulic Stroke mm [in]</b>	<b>clamp</b>	12,0 [0.47]	12,0 [0.47]	12,0 [0.47]	12,0 [0.47]	12,0 [0.47]	12,0 [0.47]
	<b>total</b>	22,1 [0.87]	22,1 [0.87]	22,1 [0.87]	22,1 [0.87]	22,1 [0.87]	22,1 [0.87]
<b>Effective Area mm<sup>2</sup> [in<sup>2</sup>]</b>	<b>clamp</b>	3,02 [0.47]	5,28 [0.82]	7,54 [1.17]	10,30 [1.60]	13,19 [2.04]	30,44 [4.72]
	<b>unclamp</b>	6,16 [0.95]	9,08 [1.41]	11,34 [1.76]	15,21 [2.36]	18,10 [2.80]	38,48 [5.97]
<b>Oil Capacity cm<sup>3</sup> [in<sup>3</sup>]</b>	<b>clamp</b>	6,7 [0.41]	11,7 [0.71]	16,7 [1.02]	22,8 [1.39]	29,1 [1.78]	67,3 [4.10]
	<b>unclamp</b>	13,61 [0.83]	20,07 [1.22]	25,06 [1.53]	33,60 [2.05]	39,99 [2.44]	85,05 [5.19]

3.1 Clamping Force vs. Arm Length

Refer to the tables in this section when selecting the swing cylinder model and arm length for your application.

**IMPORTANT:** As the arm length increases, the maximum allowable pressure and flow rate decreases. Exceeding these limits may cause damage to the product. If the pressure required for a desired clamping force and arm length exceeds the specified limits, select a higher capacity swing cylinder model.

Table 3 - Clamp Arm Dimensions “M”, “N” and “P”

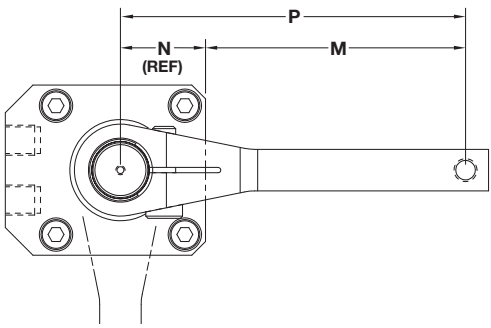
						
Size	2 kN	3,5 kN	5 kN	7 kN	9 kN	20 kN
Dimension “M”	See Table 4	See Table 5	See Table 6	See Table 7	See Table 8	See Table 9
Dimension “N”	25 mm	27 mm	30 mm	37 mm	38 mm	49 mm
Dimension “P”	M + N	M + N	M + N	M + N	M + N	M + N
Conversion Information: 1 mm = 0.039 in.						

Table 4 - Clamping Force vs. Arm Length - 2 kN Models

Pressure (bar)	Dimension “M” (See Graphic in Table 3) Flange Face to Clamping Point - In Millimeters											
	10*	20	30	40	50	60	70	80	95**			
	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)			
70	1,96	NOT RECOMMENDED										
65	1,82											
60	1,69											
55	1,56											
45	1,25	1,33	NOT RECOMMENDED									
40	1,11	1,20								1,18		
35	0,98	1,07								1,02	1,02	
30	0,85	0,89								0,85	0,85	0,85
25	0,71	0,76	0,71	0,71	0,71	0,71	NOT RECOMMENDED					
20	0,56	0,62	0,58	0,58	0,58	0,58				0,58	0,56	
15	0,42	0,44	0,40	0,40	0,40	0,40				0,40	0,40	0,38
10	0,29	0,31	0,27	0,27	0,27	0,27				0,27	0,27	0,27
Maximum Flow (lpm)	0,41	0,31	0,25	0,21	0,18	0,15	0,14	0,12	0,11			
Notes:      * CAS-722 standard arm      ** CAL-722 long arm												
Conversion Information: 1 mm = 0.039 in.      1 kN = 224.82 lbs.      1 bar = 14.5 psi      1 lpm = 61.02 in³/min												

Table 5 - Clamping Force vs. Arm Length - 3,5 kN Models

Pressure (bar)	Dimension "M" (See Graphic in Table 3) Flange Face to Clamping Point - In Millimeters																
	23*	30	40	50	60	70	80	90	100	110	120	125**					
	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)					
70	3,42	NOT RECOMMENDED															
65	3,20																
60	2,94												3,16				
55	2,71												2,89				
45	2,22												2,36	2,36	2,36		
40	1,96	2,09	2,09	2,09	2,09	NOT RECOMMENDED											
35	1,73	1,85	1,78	1,78	1,78								1,78				
30	1,47	1,60	1,51	1,51	1,51								1,51	1,51	1,51		
25	1,25	1,33	1,25	1,25	1,25								1,25	1,25	1,25	1,25	1,22
20	0,98	1,07	0,98	0,98	0,98								0,98	0,98	0,98	0,98	0,98
15	0,73	0,80	0,76	0,76	0,76	0,76	0,76	0,76	0,76	0,76	0,71	0,71	0,69				
10	0,49	0,53	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49				
Maximum Flow (lpm)	0,82	0,79	0,73	0,67	0,63	0,59	0,55	0,52	0,50	0,47	0,45	0,44					
Notes:    * CAS-7352 standard arm    ** CAL-7352 long arm																	
Conversion Information:   1 mm = 0.039 in.    1 kN = 224.82 lbs.    1 bar = 14.5 psi    1 lpm = 61.02 in³/min																	

Table 6 - Clamping Force vs. Arm Length - 5 kN Models

Pressure (bar)	Dimension "M" (See Graphic in Table 3) Flange Face to Clamping Point - In Millimeters																				
	23*	30	40	50	60	70	80	90	100	110	120	125**									
	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)									
70	4,94	NOT RECOMMENDED																			
65	4,58																				
60	4,27												4,51								
55	3,91												4,14								
45	3,20												3,38	3,38							
40	2,85												3,02	2,94	2,94	2,94					
35	2,49												2,67	2,54	2,54	2,54	2,54				
30	2,14												2,27	2,14	2,14	2,14	2,14	2,11			
25	1,78												1,87	1,78	1,78	1,78	1,78	1,78	1,73	1,73	1,71
20	1,42												1,51	1,42	1,42	1,42	1,42	1,42	1,42	1,42	1,40
15	1,07	1,11	1,02	1,02	1,02	1,02	1,02	1,02	1,02	1,00	1,00	0,98	0,98								
10	0,71	0,76	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,71	0,67	0,67								
Maximum Flow (lpm)	1,31	1,26	1,16	1,08	1,01	0,94	0,89	0,84	0,79	0,75	0,72	0,70	0,70								
Notes:    * CAS-7352 standard arm    ** CAL-7352 long arm																					
Conversion Information:   1 mm = 0.039 in.    1 kN = 224.82 lbs.    1 bar = 14.5 psi    1 lpm = 61.02 in³/min																					

**Table 7 - Clamping Force vs. Arm Length - 7 kN Models**

Pressure (bar)	Dimension "M" (See Graphic in Table 3) Flange Face to Clamping Point - In Millimeters												
	18,5*	20	30	40	50	60	70	80	90	100	115**		
	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)		
70	6,98	NOT RECOMMENDED											
65	6,54											6,98	
60	6,00											6,18	
55	5,52											5,65	5,52
45	4,49											4,63	4,45
40	4,00	4,14	3,91	3,91	3,91								
35	3,51	3,60	3,38	3,38	3,38							3,34	3,34
30	3,02	3,11	2,89	2,89	2,89	2,89	2,89	2,85					
25	2,49	2,58	2,36	2,36	2,36	2,34	2,34	2,31				2,31	2,31
20	2,00	2,05	1,87	1,87	1,87	1,87	1,87	1,87	1,82	1,82	1,78		
15	1,51	1,56	1,42	1,42	1,42	1,42	1,42	1,42	1,42	1,42	1,38		
10	1,00	1,02	0,93	0,93	0,93	0,93	0,93	0,93	0,89	0,89	0,89		
Maximum Flow (lpm)	1,64	1,62	1,51	1,42	1,35	1,28	1,21	1,16	1,11	1,06	1,04		
Notes:      * CAS-7792 standard arm      ** CAL-7792 long arm													
Conversion Information:    1 mm = 0.039 in.    1 kN = 224.82 lbs.    1 bar = 14.5 psi    1 lpm = 61.02 in³/min													

**Table 8 - Clamping Force vs. Arm Length - 9 kN Models**

Pressure (bar)	Dimension "M" (See Graphic in Table 3) Flange Face to Clamping Point - In Millimeters												
	17,5*	20	30	40	50	60	70	80	90	100	120**		
	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)		
70	8,98	NOT RECOMMENDED											
65	8,38											8,72	
60	7,74											8,05	
55	7,12											7,38	7,25
45	5,78											6,05	5,87
40	5,16	5,34	5,12	5,12	5,12								
35	4,49	4,67	4,49	4,49	4,45	4,45	4,45						
30	3,87	4,00	3,83	3,83	3,83	3,78	3,78	3,74					
25	3,20	3,34	3,16	3,16	3,16	3,11	3,11	3,09	3,07	3,07			
20	2,58	2,67	2,49	2,49	2,49	2,49	2,49	2,45	2,45	2,45	2,40		
15	1,91	2,00	1,87	1,87	1,87	1,87	1,87	1,82	1,78	1,78	1,73		
10	1,29	1,33	1,25	1,25	1,25	1,25	1,25	0,71	1,20	1,20	1,16		
Maximum Flow (lpm)	2,05	2,02	1,89	1,78	1,68	1,60	1,52	1,45	1,38	1,32	1,27		
Notes:      * CAS-7792 standard arm      ** CAL-7792 long arm													
Conversion Information: 1 mm = 0.039 in.      1 kN = 224.82 lbs.      1 bar = 14.5 psi      1 lpm = 61.02 in³/min													

**Table 9 - Clamping Force vs. Arm Length - 20 kN Models**

Pressure (bar)	Dimension "M" (See Graphic in Table 3) Flange Face to Clamping Point - In Millimeters											
	19*	20	20	20	20	60	70	80	90	100	120	125**
	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)	Clamp Force (kN)
70	19,97											
65	18,64	19,79										
60	17,21	18,24										
55	15,79	16,72	16,41									
45	12,90	13,70	13,30	13,30	13,26							
40	11,48	12,19	11,70	11,70	11,70	11,65						
35	10,05	10,63	10,10	10,10	10,05	10,05	10,01	10,01				
30	8,58	9,12	8,67	8,67	8,67	8,67	8,63	8,63	8,63			
25	7,16	7,61	7,16	7,16	7,12	7,12	7,12	7,07	7,03	6,98	6,98	
20	5,74	6,09	5,74	5,74	5,74	5,74	5,74	5,69	5,65	5,60	5,60	5,56
15	4,31	4,58	4,27	4,27	4,27	4,23	4,23	4,23	4,23	4,18	4,18	4,14
10	2,85	3,02	2,8	2,80	2,80	2,78	2,76	2,76	2,76	2,76	2,76	2,71
Maximum Flow (lpm)	4,10	4,05	3,71	3,42	3,17	2,96	2,77	2,61	2,47	2,33	2,22	2,16
<b>Notes:</b> * CAS-7202 standard arm ** CAL-7202 long arm												
<b>Conversion Information:</b> 1 mm = 0.039 in.    1 kN = 224.82 lbs.    1 bar = 14.5 psi    1 lpm = 61.02 in <sup>3</sup> /min												

#### 4.0 DESCRIPTION

Enerpac 70 Bar swing cylinders are designed to swing 90° in a clockwise or counter-clockwise direction. Single-acting and double-acting models are available. Clamp arms are not supplied with cylinders. Clamp arms can be purchased separately or may be fabricated according to the specifications in Section 10.0 of this manual.

#### 4.1 Preliminary Information

**IMPORTANT:** Failure to read and follow these instructions may lead to system malfunction or product failure, and could invalidate your warranty.

1. High flow rates can lead to excessive cylinder speed which can damage the index mechanism. Hydraulic pressure and cylinder speed must be adjusted to match the length of clamp arm. The clamping force also varies with the length of the clamp arm. Refer to sections 3.0 and 3.1 of this manual for operating specifications and clamp arm length information.
2. Flow controls with return checks should be used to reduce swing cylinder speed to the recommended rate. The return checks help minimize back pressure that could lead to an unclamp malfunction on single-acting systems.
3. When using single-acting swing cylinders, limit the return flow back pressure to 3,5 bar [50 psi] maximum. Large diameter tubing (10 mm [3/8 in.] O.D. or larger) and flow controls with free flow

return checks help minimize back pressure. Consult Enerpac for proper system design.

4. An excessive retract flow rate can cause damage to the index mechanism. Double acting systems should be set up with a metered-in flow control, with a reverse check used in the clamp port.
5. Clamping of the part should occur at the midpoint of the vertical travel. No clamping of part shall occur while the swing cylinder clamp is turning. Clamp arm should freely travel during the 90° rotation (avoid contact with cutter heads, tools, etc.).
6. Attaching clamp arm to cylinder plunger must be done according to the instructions in Section 6.4.

#### 5.0 MOUNTING SPECIFICATIONS

##### 5.1 Mounting Upper Flange Cylinders

The Enerpac 70 bar swing cylinders feature an upper flange design. The cylinder can be mounted to the fixture using the supplied mounting bolts. Oil can be supplied to the cylinder using either the BSPP hydraulic ports on the flange or the O-Ring manifold ports on the underside of the flange. The sections that follow provide detailed mounting instructions and should be reviewed before attempting to install the cylinders on the fixture.



**WARNING:** The fixture must be capable of withstanding 70 bar [1000 psi] hydraulic working pressure when the cylinders are manifold mounted.

Table 10 - Mounting Dimensions (Refer to Figure 1)

Cylinder Capacity	Fixture Thread Ø D3 mm	Mounting Bolt Thread (J)	Minimum Mounting Depth (J2)		Manifold O-ring ARP No.	Lubricated Bolt Torque	
			mm	inch		Nm	ft-lbs
2,0 kN [441 lbs]	44,5	M5 x 0,8 x 30 mm long	10	0.39	568-010	8,0-9,0	5.9-6.6
3,5 kN [769 lbs]	50,5	M5 x 0,8 x 30 mm long	11	0.43	568-010	8,0-9,0	5.9-6.6
5,0 kN [1111 lbs]	55,5	M6 x 1,0 x 30 mm long	12	0.47	568-011	13,5-15,0	10.0-11.0
7,0 kN [1570 lbs]	65,5	M6 x 1,0 x 30 mm long	15	0.59	568-011	13,5-15,0	10.0-28.0
9,0 kN [2019 lbs]	88,5	M8 x 1,25 x 30 mm long	15	0.59	568-011	32,0-38,0	23.6-28.0
20,0 kN [4490 lbs]	90,5	M10 x 1,5 x 35 mm long	20	0.79	568-011	47,9-53,1	65.0-72.0

**Note:** O-rings and mounting bolts included with cylinder.

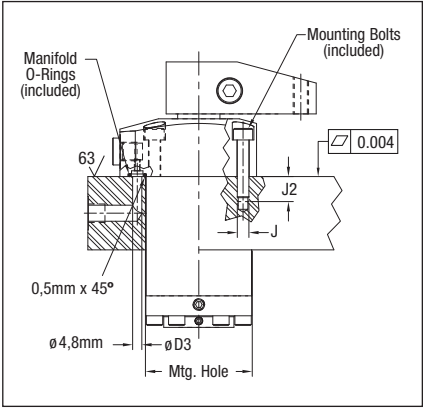


Figure 1, Cylinder Mounting Details

Before a swing cylinder can be manifold mounted, the port screw plugs must be removed. The O-Rings provided should be lubricated and installed in the counter-bore around the port prior to mounting and bolting down the swing cylinder.

Be sure that the O-Ring does not get pinched or damaged during mounting as leakage could result. To prevent leakage from the manifold mounting, provide a fixture mounting surface with latness within 0,08 mm [0.003 inch] and a surface roughness not to exceed Ra 1,6.

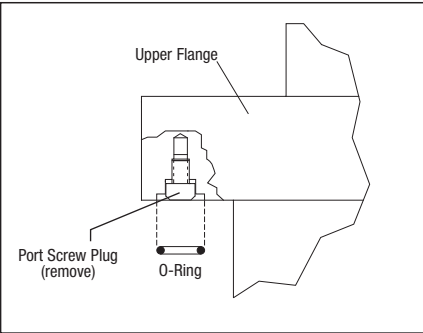


Figure 2, Port Screw Plug Removal

6.0 INSTALLATION

6.1 Port Identification

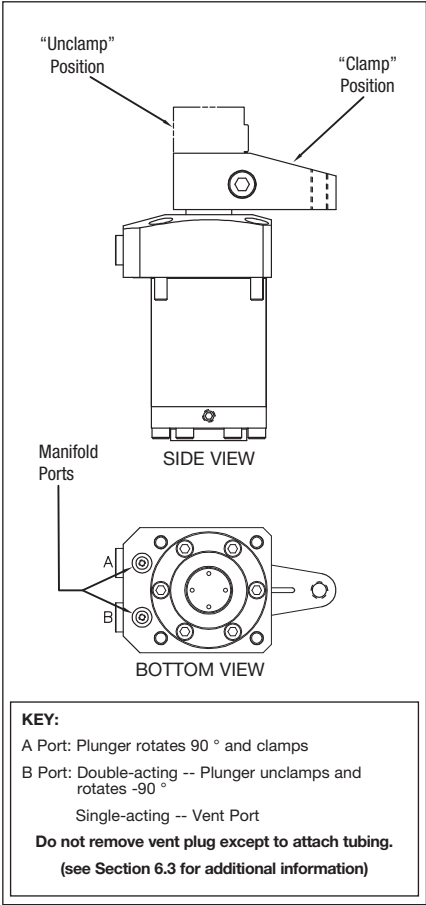


Figure 3, Cylinder Port Locations

6.2 Hydraulic Connections

To make port connections, install fittings rated for 70 bar [1000 psi].

DO NOT use thread sealant. Sealing is accomplished by using an O-Ring on the fitting boss. Lubricate the O-Ring prior to assembly.

When designing your hydraulic circuit, consider the factors listed in Section 4.1 of this manual. For additional information about plumbing hydraulic circuits, refer to the Enerpac Workholding product catalog.

Table 11 - Cylinder Ports

Cylinder Capacity	BSPP Port Size
2,0 kN [441 lbs]	G 1/8
3,5 kN [769 lbs]	G 1/8
5,0 kN [1111 lbs]	G 1/8
7,0 kN [1570 lbs]	G 1/4
9,0 kN [2019 lbs]	G 1/4
20,0 kN [4490 lbs]	G 1/4

6.3 Vent Plug

Single-acting cylinders have a vented plug on the left side of the cylinder when you are facing the hydraulic ports. To prevent entry of chips and coolant, the vent plug must not be removed. If the vent plug is subjected to a continuous coolant flood condition, attach tubing to the port using a BSPP fitting, and run the tubing to a non-contaminated area of the fixture.

6.4 Attaching Clamp Arm

1. Remove the retaining ring from the top of the plunger.
2. Slide the clamp arm down over the plunger and use a pliers to push the retaining ring back onto the plunger groove. Orient the retaining ring so the retaining ring gap will face the back of the clamp arm. See Figure 4.
3. Move the clamp arm up until it is firmly against the retaining ring and in the desired position. While maintaining this position, torque the clamp arm bolt to specification shown in Table 12.

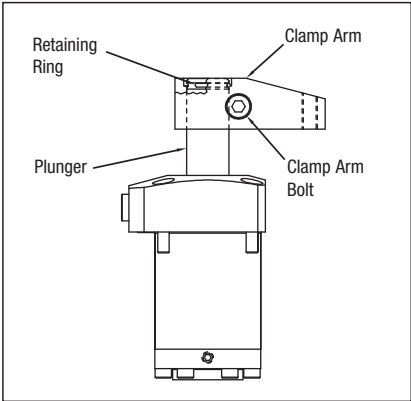


Figure 4, Attaching Clamp Arm



**CAUTION:** Inadequate torquing of the clamp arm bolt could cause the arm to slip during operation. BE SURE TO USE QUALITY 12.9 DIN 912 (GRADE 8) SOCKET HEAD CAP SCREWS (supplied with standard clamp arms).

6.5 Contact Bolt Clearance

When using a contact bolt with upper flange body style cylinders, you must be certain that the bolt head will clear the cylinder upper flange during operation. The clamp arm must be long enough for the bolt head to clear the upper flange as the arm swings down. Refer to Figure 5 and Table 13.

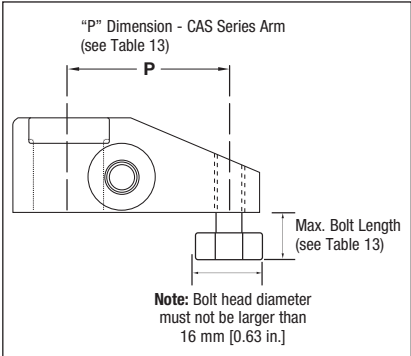


Figure 5, Contact Bolt Clearance

Table 12 - Clamp Arm Bolt Torque

Cylinder Capacity	Bolt Type	Torque
2,0 kN [441 lbs]	M8 x 1,0 x 20 mm long	32,5-39,0 Nm [24-29 ft-lbs]
3,5 kN [769 lbs]	M8 x 1,0 x 25 mm long	32,5-39,0 Nm [24-29 ft-lbs]
5,0 kN [1111 lbs]	M8 x 1,0 x 25 mm long	32,5-39,0 Nm [24-29 ft-lbs]
7,0 kN [1570 lbs]	M10 x 1,25 x 25 mm long	60,0-72,0 Nm [44-53 ft-lbs]
9,0 kN [2019 lbs]	M10 x 1,25 x 25 mm long	60,0-72,0 Nm [44-53 ft-lbs]
20,0 kN [4490 lbs]	M12 x 1.25 x 35 mm long	95,5-108,0 Nm [70-80 ft-lbs]



Table 13 - Maximum Contact Bolt Length

Cylinder Capacity	CAS Series Arm (See Fig. 5) "P" Dimension	Maximum Contact Bolt Length (See Fig. 5)
2,0 kN [441 lbs]	CAS-722 35,05 mm [1.38 inch]	14,48 mm [0.57 inch]
3,5 kN [769 lbs]	CAS-7352 53,09 mm [2.09 inch]	(unlimited)
5,0 kN [1111 lbs]	CAS-7352 53,09 mm [2.09 inch]	(unlimited)
7,0 kN [1570 lbs]	CAS-7792 55,63 mm [2.19 inch]	14,48 mm [0.57 inch]
9,0 kN [2019 lbs]	CAS-7792 55,63 mm [2.19 inch]	14,48 mm [0.57 inch]
20,0 kN [4490 lbs]	CAS-7202 68,07 mm [2.68 inch]	14,48 mm [0.57 inch]

Clearance problems are most common when using the CAS series standard length arm, with the final clamping position located at the side of the cylinder. You may need to use the longer CAL Series clamp arm for these applications. You can cut CAL series arms to meet your own requirements, or make your own custom arms, in accordance with the dimensions shown in Section 10.0 of this manual.

7.0 OPERATION

Swing cylinders rotate 90° during the first portion of the stroke, continuing without rotation for the final clamping stroke. The straight downward stroke is the clamping stroke of the cylinder. Clamping force must be applied only during the vertical travel, not during the swing motion.



**CAUTION:** If clamping force is applied during the rotation portion of the stroke, internal plunger damage may result.

- To ensure maximum cylinder performance and safety, be sure all hydraulic connections, hoses, and fittings are properly sealed and fully tightened.
- Be sure all items are rated to withstand system pressures. Under-rated components will not withstand higher pressure. Using under-rated components will lead to equipment damage and possible personal injury.

7.1 Pressure and Flow Rate

The clamp arm length determines the swing cylinder's required operating pressure and flow rate.

Set operating pressure and flow rate according to the recommendations contained in Section 3.1 for your swing cylinder model.

**IMPORTANT:** Do not exceed the load-to-length pressure ratios described in Section 3.1, tables 4 through 9. As the arm length increases, the clamping force and maximum operating pressure are reduced.

7.2 Position Indicating Staff

Enerpac 70 Bar Swing Cylinders are available with a positioning indicating staff (optional equipment) that anchors into the plunger and follows the plunger movement. The indicating staff is designed for use with either limit or proximity switches.

A suitable target or flag can be attached using the male M4 x .07 mm threads on the staff end. See Figure 6.

Clearance below the clamp must be sufficient for the extended portion of the staff to avoid damage.



**CAUTION:** It is very important that you use the correct pressure and flow settings. Operating outside these limits will cause damage to the swing cylinder. Damage caused by exceeding rated pressure and maximum flow is NOT COVERED BY WARRANTY.

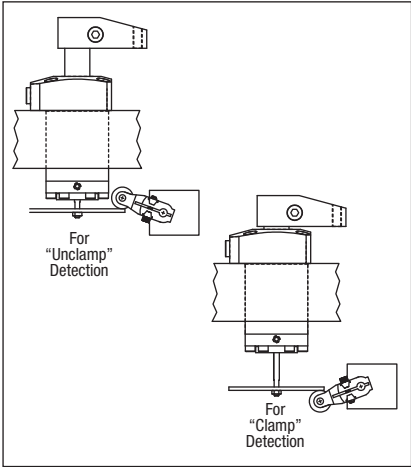


Figure 6, Position Indicating Staff

8.0 MAINTENANCE

Maintenance is required when wear or leakage is noticed. Periodically inspect all components to detect any problem requiring service and maintenance. Enerpac offers ready-to-use repair parts kits. Repair parts sheets are available with assembly diagrams and parts lists. Contact Enerpac.

**IMPORTANT:** Consult the swing cylinder repair parts sheet for service information about correct assembly and disassembly. Incorrect maintenance and service such as wrong torque values may cause product malfunctions and/or personal injury.

## 9.0 TROUBLESHOOTING

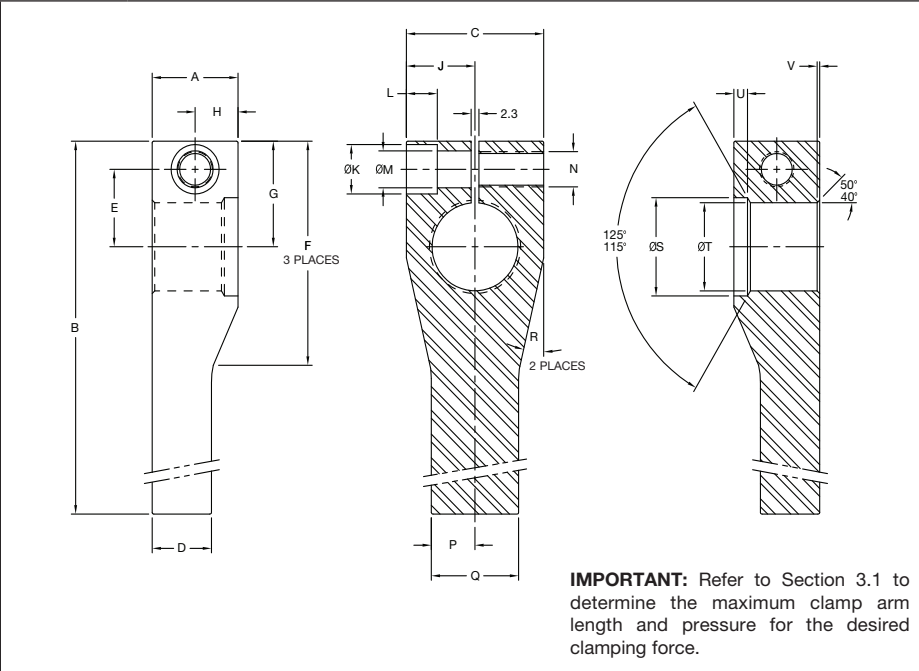
Allow only qualified hydraulic technicians to service the swing cylinder or system components. A system failure may or may not be the result of a swing cylinder malfunction. To determine the cause of the problem, the complete system must be included in any diagnostic procedure.

The information in the following chart is intended to be used only as an aid in determining if a problem exists. For repair service, contact your local Enerpac Authorized Service Center.

**Table 13 - Troubleshooting Guide**

Problem	Possible Cause	Solution
1. Cylinder will not clamp/unclamp.	a. Pump release valve open.	Close pump release valve.
	b. No oil in pump reservoir.	Fill pump reservoir.
	c. Air in system.	Remove air from hydraulic system.
	d. Couplers not fully tightened.	Retighten couplers.
	e. Blocked hydraulic line.	Check valves, fittings, and tubing.
	f. Spring broken in cylinder. (single-acting models only)	Replace spring.
2. Cylinder advances part way.	a. Oil level in pump too low.	Fill pump reservoir.
	b. Plunger binding.	Replace damaged parts - refer to cylinder repair parts sheet.
3. Cylinder clamps/unclamps slower than normal.	a. Leaking connection or loose fitting.	Retighten fittings, couplers and tubing.
	b. Restricted hydraulic line.	Check valves, fittings and tubing.
	c. Pump malfunction.	Refer to pump instruction sheet.
4. Cylinder clamps/unclamps but will not hold pressure.	a. Seals damaged.	Replace seals - refer to cylinder repair parts sheet.
	b. Leaking connection.	Retighten fittings, couplings and tubing.
	c. Pump malfunction.	Refer to pump instruction sheet.
5. Cylinder leaks oil.	a. Seals damaged.	Replace seals - refer to cylinder repair parts sheet.
	b. Plunger worn or damaged.	Replace worn or damaged parts - refer to cylinder repair parts sheet.
6. Clamp arm does not make swing movement.	a. Clamp arm loose.	Reposition and tighten clamp arm - refer to Section 6.4 for instructions.
	b. Plunger worn or damaged.	Replace worn or damaged parts - refer to cylinder repair parts sheet.

10.0 CLAMP ARM MACHINING SPECIFICATIONS



Item	Dimensions in millimeters [inches] unless otherwise noted			
	2,0 kN	3,5 kN and 5,0 kN	7,0 kN and 9,0 kN	20,0 kN
A	25 [0.99]	27 [1.06]	30 [1.18]	38 [1.49]
B (Max.)	150 [5.90]	190 [7.48]	190 [7.48]	210 [8.26]
C	30 [1.18]	34 [1.34]	40 [1.57]	48 [1.89]
D	16 [0.63]	16 [0.63]	18 [0.70]	21 [0.82]
E	19,5 [0.77]	20 [0.79]	22 [0.87]	26 [1.02]
F (3 places)	67 [0.26]	84 [3.30]	86 [3.39]	100 [3.94]
G	29 [1.14]	31 [1.22]	34 [1.34]	40 [1.58]
H	12,5 [0.49]	13,5 [0.53]	15 [0.59]	19 [0.74]
J	15 [0.59]	17 [0.67]	20 [0.79]	24 [0.94]
K (Dia.)	ø 13,5 [0.53]	ø 13,5 [0.53]	ø 16,5 [0.65]	ø 18,5 [0.73]
L	9 [0.35]	11 [0.43]	11 [0.43]	13 [0.51]
M (Dia.)	ø 8,5 [0.33]	ø 8,5 [0.33]	ø 10,5 [0.41]	ø 12,5 [0.49]
N (thread)	M8 x 1,25	M8 x 1,25	M10 x 1,5	M12 x 1,25
P	6 [0.23]	8 [0.31]	9 [0.35]	12,75 [0.50]
Q	12 [0.47]	16 [0.63]	18 [0.71]	25,5 [1.00]
R (2 places)	21° - 23°	21° - 23°	21° - 23°	21° - 23°
S (Dia.)	ø 22,75 - 23,00 [0.895 - 0.905]	ø 24,75 - 25,00 [0.974 - 0.984]	ø 27,75 - 28,00 [1.092 - 1.102]	ø 35,50 - 36,00 [1.397 - 1.417]
T (Dia.)	ø 20 H8	ø 22 H8	ø 25 H8	ø 32 H8
U	3,8 - 4,3 [0.15 - 0.17]	3,8 - 4,3 [0.15 - 0.17]	3,8 - 4,3 [0.15 - 0.17]	4,7 - 5,3 [0.19 - 0.21]
V	1,0 - 2,0 [0.04 - 0.09]	1,0 - 2,0 [0.04 - 0.09]	1,0 - 2,0 [0.04 - 0.09]	1,0 - 2,0 [0.04 - 0.09]

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