

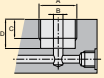


# Work supports

	▼ series	▼ page	
<b>Work support range overview</b>		<b>44 - 45</b>	
<b>Hydraulic advance work supports</b>	<b>WF</b>	<b>46 - 47</b>	
<b>Spring advance work supports</b>	<b>WS</b>	<b>48 - 49</b>	
<b>Work support mounting dimensions</b>	<b>WF, WS</b>	<b>50 - 51</b>	

## Work Supports

Enerpac's line of work support cylinders gives you maximum holding force in a compact package. Incorporating innovative material combinations, our work supports feature the lowest lock-up pressures in the industry. Also, the use of corrosion resistant materials enables Enerpac work supports to stand up time and time again to even the most abrasive applications.



## Technical support

Refer to the "Yellow Pages" of this catalog for:

- Safety instructions
- Basic hydraulic information
- Advanced hydraulic technology
- FMS (Flexible Machining Systems) technology
- Conversion charts and hydraulic symbols

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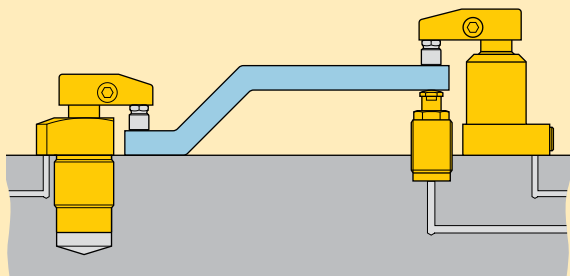
# Work supports

Shown: WFL-111, WFC-72, WFL-441



▶ The Enerpac work support is a hydraulic means of positively supporting the workpiece to minimize deflections.

The work support automatically adjusts to the contour of the workpiece, and then locks in position. This support then adds rigidity to the fixtured component to minimize machining variations.



■ Lower flange work supports, placed close to the machining area to minimize deflection of the workpiece.



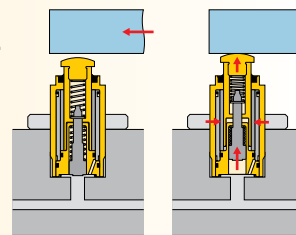
## Wide range of sizes and types to efficiently support workpiece

- Low pressure lock-up capability enables the use of machine tool hydraulic systems
- High rated support capacities allow for more compact fixture design
- Corrosion resistant materials, compatible with most coolants and environments
- Threaded and manifold air vent ports allow fixturing that prevents coolants from being drawn into the system
- Minimized deflection increases machining accuracy
- Multiple mounting configurations allow design flexibility

## i Select your work support method:

### WF series, Hydraulic advance

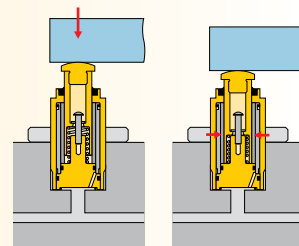
- Retracted plunger allows unobstructed workpiece loading.
- Internal hydraulic plunger advances allowing external plunger to advance under spring load. Bronze sleeve squeezes and holds plunger in fixed position.



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### WS series, Spring advance

- Workpiece weight compresses the spring of the extended plunger.
- When pressurized, the internal bronze sleeve squeezes and holds the plunger in fixed position.
- Can be operated as air advance.

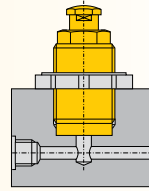


□ 48 ▶

## Select your mounting method:

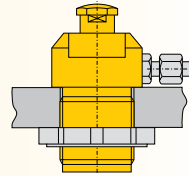
### Manifold mount

- Does not require external plumbing
- Compact design, when space is at a premium
- Internal plunger thread for optional contacts



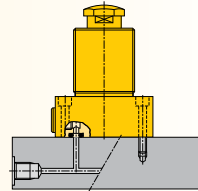
### Threaded body

- Ability to adjust height
- Plumbed from either side or bottom
- Internal plunger thread for optional contacts



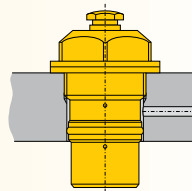
### Lower flange

- Plumbed directly or manifold mounted
- No fixture hole required
- Easy to assemble or disassemble
- Internal plunger thread for optional contacts







### Cartridge style

- Does not require external plumbing
- Allows close clustering of work supports
- Compact design, when space is at a premium
- Internal plunger thread for optional contacts



## Product selection

Maximum support force	Stroke	Manifold mount	Threaded body	Lower flange	Cartridge style
lbs	in				
<b>▼ Hydraulic advance</b>		Model number			
1650	.39	<b>WFM-71</b>	-	-	-
1650	.40	-	<b>WFT-71</b>	-	-
2500	.40	-	-	<b>WFL-111</b>	-
5000	.41	-	-	<b>WFL-221</b>	-
7500	.53	-	-	<b>WFL-331</b>	-
10,000	.65	-	-	<b>WFL-441</b>	-
1650	.39	-	-	-	<b>WFC-72</b>
2500	.36	-	-	-	<b>WFC-112</b>
5000	.41	-	-	-	<b>WFC-222</b>
<b>▼ Spring advance</b>		Model number			
1650	.38	<b>WSM-71</b>	-	-	-
1650	.38	-	<b>WST-71</b>	-	-
2500	.38	-	-	<b>WSL-111</b>	-
5000	.38	-	-	<b>WSL-221</b>	-
7500	.54	-	-	<b>WSL-331</b>	-
10,000	.66	-	-	<b>WSL-441</b>	-
1650	.38	-	-	-	<b>WSC-72</b>
2500	.38	-	-	-	<b>WSC-112</b>
5000	.47	-	-	-	<b>WSC-222</b>

Force: 1650 - 10,000 lbs

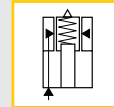
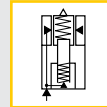
Stroke: .36 - .65 inch

Pressure: 700 - 5000 psi

**E** Cilindros de soporte

**F** Vérin anti-vibreur

**D** Abstützylinder



## Options

Swing cylinders

 22 ▶



Accessories

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In-line filters

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Sequence valves

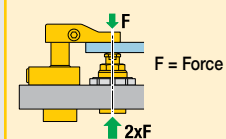
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## Important

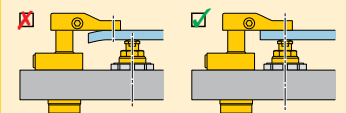
### WARNING!

Support force and clamping force must be matched. Support force should be at least 150% of clamping force.



Do not exceed maximum flow rates to avoid premature lockup.

Always center load over work support.



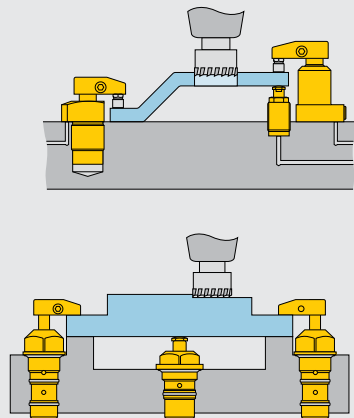
# Work supports - Hydraulic advance

Shown: WFM-71, WFL-111



## WF series

Enerpac work supports provide either additional non-fixed location points to the clamps, or support to larger or thin section workpiece components, always in order to minimize workpiece deflection during machining.



In order to load the workpiece sideways over the work supports, hydraulic advanced models are being used.



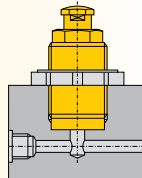
## For unobstructed part loading

- Plunger stays retracted until pressure is applied allowing unobstructed loading
- Low pressure lock-up capability enables the use of machine tool hydraulic systems
- High rated support capacities allow for more compact fixture design
- Corrosion resistant materials – compatible with most coolants and environments
- Threaded and manifold air vent ports allow fixturing that prevents coolants and debris from being ingested into the mechanism
- Minimized deflection increases machining accuracy
- Multiple mounting configurations for design flexibility
- Contact bolt included

## Four mounting styles

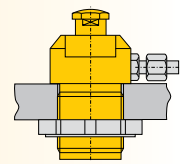
### WFM series, Manifold models

Eliminates the need for fittings and tubing on the fixture.



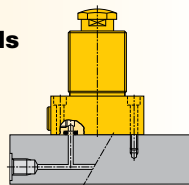
### WFT series, Threaded models

Offers the flexibility of side or bottom porting.



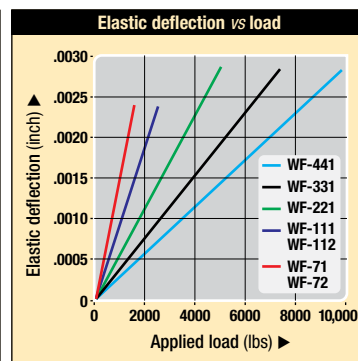
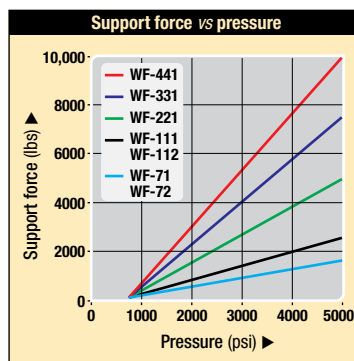
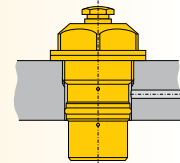
### WFL series, Lower flange models

Plumbed directly – no fixture hole required.



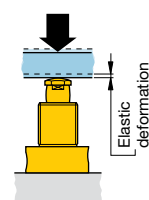
### WFC series, Cartridge models

Can be designed into narrow fixture plates as thru-hole mounting is fully functional.



## Deflection chart:

Elastic deformation of the work support resulting from the application of load.

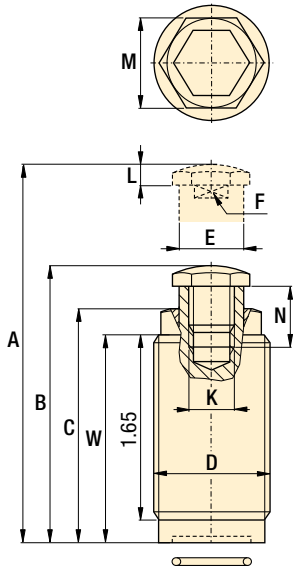


## Product selection

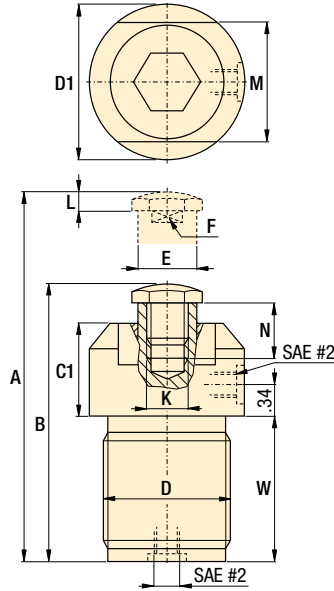
Max. support force	Support plunger stroke	Manifold mount	Threaded body	Lower flange	Cartridge style	Operating pressure		Plunger contact spring force		Oil capacity	Max. oil flow
						psi min.	psi max.	lbs ext.	lbs retr.		
1650	.39	WFM-71	-	-	-	700	5000	2.0	5.8	.04	40
1650	.40	-	WFT-71	-	-	700	5000	2.0	5.8	.04	40
2500	.40	-	-	WFL-111	-	700	5000	3.4	5.2	.06	60
5000	.41	-	-	WFL-221	-	700	5000	2.1	19.5	.19	190
7500	.53	-	-	WFL-331	-	700	5000	4.0	17.5	.24	240
10,000	.65	-	-	WFL-441*	-	700	5000	3.3	22.0	.30	300
1650	.39	-	-	-	WFC-72	700	5000	2.0	5.8	.04	40
2500	.36	-	-	-	WFC-112	700	5000	3.4	5.2	.06	60
5000	.41	-	-	-	WFC-222	700	5000	2.1	19.5	.19	190

\* This product is made to order. Please contact Enerpac for delivery information before specifying in your design.

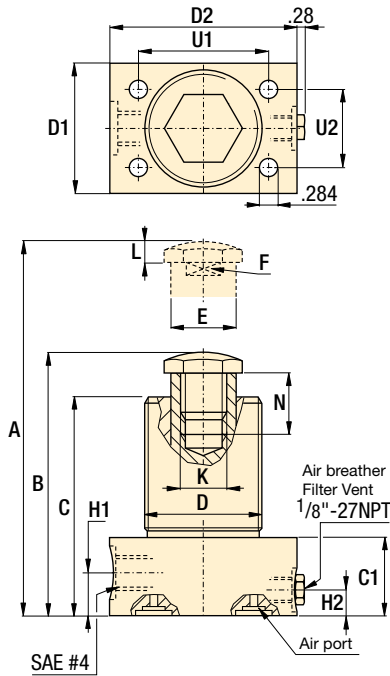
**WFM series**



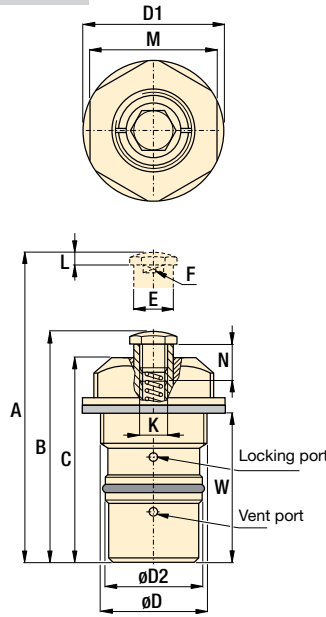
**WFT series**



**WFL series**



**WFC series**

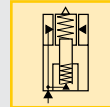


Force: 1650 - 10,000 lbs

Stroke: .36 - .65 inch

Pressure: 700 - 5000 psi

- E** Cilindros de soporte
- F** Vérin anti-vibreur
- D** Abstützzyylinder



**Options**

**Accessories**

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**In-line filters**

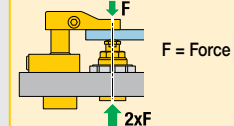
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**Important**

**WARNING!**

Support force and clamping force must be matched. Support force should be at least 150% of clamping force.



Do not exceed maximum flow rates to avoid premature lockup.

Custom cylinders including longer stroke lengths are available on request.

**Product dimensions** in inches [ ]

Model number	Capacity lbs	A	B	C	C1	D	D1	D2	E	F	H1	H2	K	L	M	N**	U1	U2	W	
		mm																		
<b>WFM-71</b>	1650	3.02	2.63	2.20	-	1.250-16 UN	-	-	0.591	0.51	-	-	M10x1,5	0.18	0.95	0.51	-	-	2.00	.5
<b>WFT-71</b>	1650	3.53	3.13	-	1.03	1.375-18 UNEF	1.72	-	0.591	0.51	-	-	M10x1,5	0.18	1.34	0.51	-	-	1.65	.5
<b>WFL-111</b>	2500	3.93	3.54	3.10	1.08	1.375-18 UNEF	1.50	2.38ø	0.629	0.49	.56	.70	M10x1,5	0.18	-	0.73	1.62	0.94	-	1.4
<b>WFL-221</b>	5000	4.13	3.72	3.07	1.04	2.625-20 UN	2.75	3.25	1.496	1.00	.55	.52	M20x2,5	0.24	-	0.92	2.19	2.19	-	4.8
<b>WFL-331</b>	7500	4.42	3.89	3.46	1.07	2.88ø	3.00	3.50	1.771	1.18	.53	.43	M20x2,5	0.24	-	0.93	2.44	2.44	-	6.3
<b>WFL-441*</b>	10,000	5.09	4.44	4.06	1.19	3.37ø	3.50	4.00	2.165	1.44	.53	.43	M20x2,5	0.24	-	1.24	2.94	2.94	-	9.5
<b>WFC-72</b>	1650	3.22	2.83	2.46	-	M33x1,5	1.66	1.18	0.591	0.51	-	-	M10x1,5	0.18	1.50	0.51	-	-	1.98	.9
<b>WFC-112</b>	2500	4.03	3.67	3.23	-	M42x1,5	2.25	1.50	0.629	0.49	-	-	M10x1,5	0.18	2.00	0.73	-	-	2.37	2.0
<b>WFC-222</b>	5000	4.56	4.15	3.60	-	M60x1,5	3.00	2.25	1.496	1.00	-	-	M20x2,5	0.24	2.75	0.92	-	-	2.72	4.0

\* This product is made to order. Please contact Enerpac for delivery information before specifying in your design.  
 \*\* Note: Dimension N is factory set. May change on types 221, 331 and 441 due to adjusted contact spring force.  
 Note: For manifold mounting dimensions (L)50.

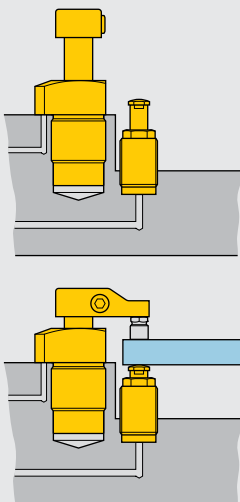
# Work supports - Spring advance

Shown: WSL-111, WSM-71



## WS series

Enerpac work supports provide either additional non-fixed location points to the clamps, or support to larger or thin section workpiece components, always in order to minimize workpiece deflection during machining.



Spring advance work supports with extended plungers, waiting for the next workpiece.



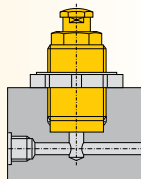
## Spring advance work support contacts workpiece as it is loaded into fixture

- Low pressure lock-up capability enables the use of machine tool hydraulic systems
- High rated support capacities allow for more compact fixture design
- Corrosion resistant materials, compatible with most coolants and environments
- Threaded and manifold air vent ports allow fixturing that prevents coolants from being drawn into the system
- Minimized deflection increases machining accuracy
- Multiple mounting configurations allow design flexibility
- Can be operated as air advance by removing the spring and applying air pressure on the vent port

## Mounting style

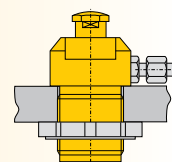
### WSM series, Manifold mount

Eliminates the need for fittings and tubing on the fixture.



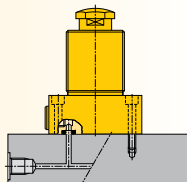
### WST series, Threaded body

Offers the flexibility of side or bottom porting.



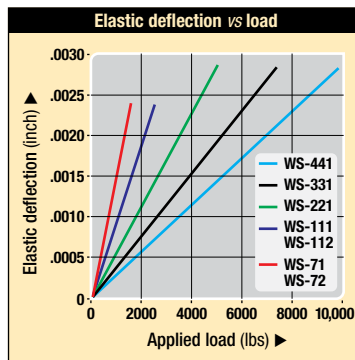
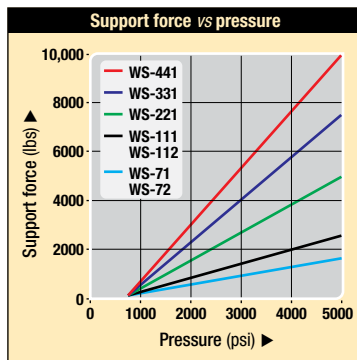
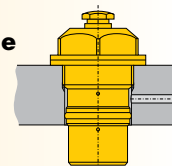
### WSL series, Lower flange

Plumbed directly – no fixture hole required.



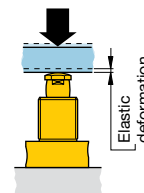
### WSC series, Cartridge mount style

Can be designed into narrow fixture plates as thru-hole mounting is fully functional.



## Deflection chart:

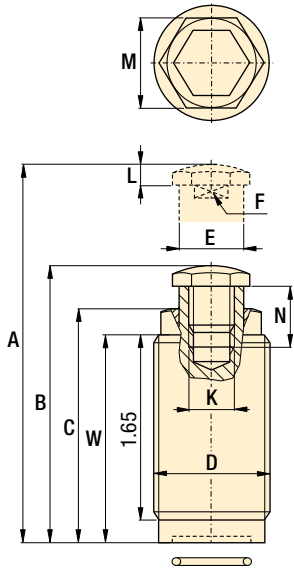
Elastic deformation of the work support resulting from the application of load.



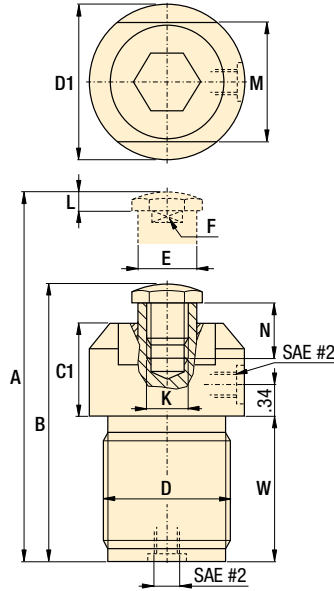
## Product selection

Max. support force	Support plunger stroke	Manifold mount	Threaded body	Lower flange	Cartridge style	Operating pressure		Plunger contact spring force		Oil capacity	Max. oil flow
						psi min.	psi max.	lbs ext.	lbs retr.		
1650	.38	WSM-71	-	-	-	700	5000	2.0	5.8	.04	40
1650	.38	-	WST-71	-	-	700	5000	2.0	5.8	.04	40
2500	.38	-	-	WSL-111	-	700	5000	3.4	5.2	.06	60
5000	.38	-	-	WSL-221	-	700	5000	2.1	19.5	.19	190
7500	.54	-	-	WSL-331	-	700	5000	4.0	17.5	.24	240
10,000	.66	-	-	WSL-441*	-	700	5000	3.3	22.0	.30	300
1650	.38	-	-	-	WSC-72	700	5000	2.0	5.8	.04	40
2500	.38	-	-	-	WSC-112	700	5000	3.4	5.2	.06	60
5000	.47	-	-	-	WSC-222	700	5000	2.1	19.5	.19	190

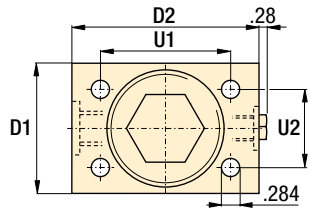
**WSM series**



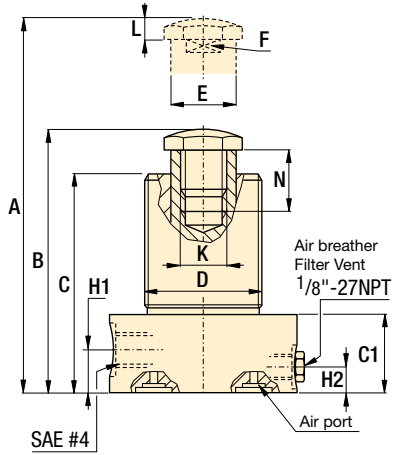
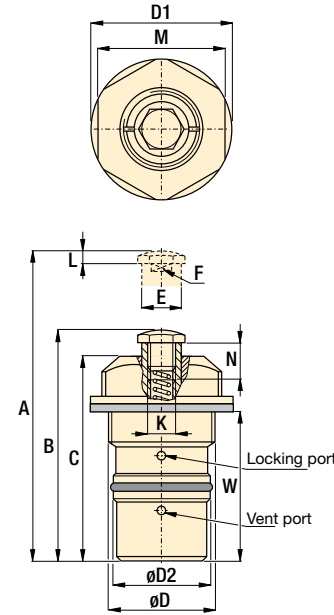
**WST series**



**WSL series**

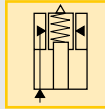


**WSC series**



- Force: 1650 - 10,000 lbs
- Stroke: .38 - .66 inch
- Pressure: 700 - 5000 psi

- E** Cilindros de soporte
- F** Vérin anti-vibreur
- D** Abstützylinder



**Options**

**Accessories**

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**In-line filters**

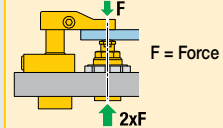
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**Important**

**WARNING!**

Support force and clamping force must be matched. Support force should be at least 150% of clamping force.



Do not exceed maximum flow rates to avoid premature lockup.

Custom cylinders including longer stroke lengths are available on request.

**Product dimensions** in inches [ ]

Model number	Capacity lbs	A	B	C	C1	D	D1	D2	E0	F	H1	H2	K	L	M	N**	U1	U2	W	lbs
		mm																		
WSM-71	1650	3.00	2.62	2.20	-	1.250-16 UN	-	-	.591	.51	-	-	M10x1,5	.18	.95	.51	-	-	2.00	.5
WST-71	1650	3.51	3.13	-	1.03	1.375-18 UNEF	1.72 $\phi$	-	.591	.51	-	-	M10x1,5	.18	1.34	.51	-	-	1.65	.5
WSL-111	2500	3.36	2.98	2.54	.95	1.375-18 UNEF	1.50	2.38	.629	.49	.44	.39	M10x1,5	.18	-	.73	1.62	.94	-	1.4
WSL-221	5000	3.91	3.53	2.95	.98	2.625-20 UN	2.75	3.25	1.496	1.00	.48	.40	M20x2,5	.24	-	.92	2.19	2.19	-	4.8
WSL-331	7500	4.29	3.75	3.37	1.07	2.88 $\phi$	3.00	3.50	1.771	1.18	.51	.37	M20x2,5	.24	-	.93	2.44	2.44	-	6.3
WSL-441*	10,000	4.99	4.33	4.04	1.19	3.37 $\phi$	3.40	4.00	2.165	1.44	.53	.43	M20x2,5	.24	-	1.24	2.94	2.94	-	9.5
WSC-72	1650	3.20	2.82	2.46	-	M33x1,5	1.67 $\phi$	1.18	.591	.51	-	-	M10x1,5	.18	1.50	.51	-	-	1.98	0.9
WSC-112	2500	3.38	3.00	2.56	-	M42x1,5	2.25 $\phi$	1.50	.629	.49	-	-	M10x1,5	.18	2.00	.73	-	-	1.70	2.0
WSC-222	5000	3.98	3.51	3.00	-	M60x1,5	3.00 $\phi$	2.25	1.496	1.00	-	-	M20x2,5	.24	2.75	.92	-	-	2.12	4.0

\* This product is made to order. Please contact Enerpac for delivery information before specifying in your design.  
 \*\* Note: Dimension N is factory set. May change on types 221, 331 and 441 due to adjusted contact spring force.  
 Note: For manifold mounting dimensions (L50).

# Mounting dimensions *for work supports*

Shown: WFL-221 holding a casting in place.



## Mounting work supports

Enerpac work supports are offered in a wide variety of mounting styles. Dimensions for fixture holes and cavity preparation are specified for each mounting style separately.

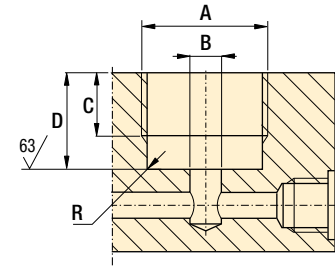
■ The combination of Enerpac swing cylinders and work supports guarantee clamping without deformation.



## Manifold work support mounting dimensions

Eliminates the need for fittings and tubing on the fixture. Use a flange nut to secure your manifold work support.

WFM/WSM



## Product dimensions in inches [ $\text{mm}$ ]

Model number	A	B	C	D	R	Manifold O-ring <sup>1)</sup>	Flange nut
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▼ For manifold mount work supports

WFM-71	1.250-16 UN 2B	.37-.39	.58-.60	.93-.95	.015	ARP-017	FN-301
WSM-71	1.250-16 UN 2B	.37-.39	.58-.60	.93-.95	.015	ARP-017	FN-301

<sup>1)</sup> Polyurethane 92 duro.

## Threaded work support mounting dimensions

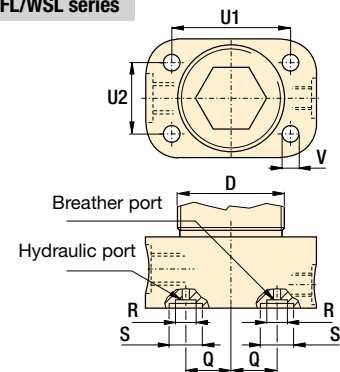
Threaded body work supports can be mounted directly into a fixture. The thread size (D) can be found in the dimension charts on  $\square 47$  (WFT) and  $\square 49$  (WST models). Use a flange nut to secure your threaded work support in the required position.

## Lower flange work support mounting dimensions

Lower flange work supports can be bolted straight onto a fixture, or can be mounted into a fixture. Flange nuts can be used to secure the cylinders at the required height.

**Note:** It is critical to keep breather port open to clean dry location.

WFL/WSL series



## Product dimensions in inches [ $\text{mm}$ ]

Model numbers	D	Q	R	S	U1	U2	V	Manifold O-ring <sup>1)</sup>	Flange nut
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▼ For lower flange work supports

WFL-111	1.375-18UNEF	.57	.23	.37	1.62	.94	.284	ARP-010	FN-351
WFL-221	2.625-20UN	1.08	.34	.56	2.18	2.18	.284	ARP-110	—
WFL-331	2.88	1.20	.34	.56	2.44	2.44	.284	ARP-110	—
WFL-441	3.38	1.44	.34	.56	2.94	2.94	.284	ARP-110	—
WSL-111	1.375-18UNEF	.57	.23	.34	1.62	.94	.284	ARP-010	FN-351
WSL-221	2.625-20UN	1.08	.34	.56	2.18	2.18	.284	ARP-110	—
WSL-331	2.88	1.20	.34	.56	2.44	2.44	.284	ARP-110	—
WSL-441	3.38	1.44	.34	.56	2.94	2.94	.284	ARP-110	—

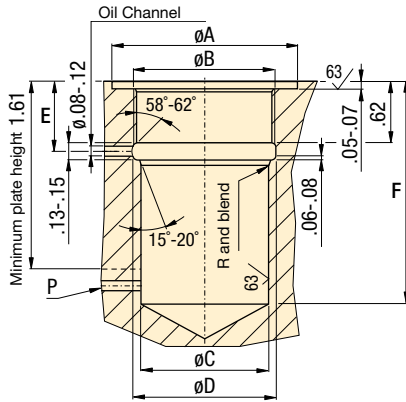
<sup>1)</sup> Polyurethane 92 duro.



**Cartridge work support** mounting dimensions

Can be designed onto narrow fixture plates as thru-hole mounting is fully functional.

**WFC/WSC**



**Dimensions** in inches [ ]

Model numbers	A	B	C	D	E	F	Ventilation below force required	
	mm						min.	
<b>▼ Hydraulic advance</b>								
<b>WFC-72</b>	1.68-1.70	M33x1,5	1.182-1.184	1.31-1.33	.62-.68	2.08	No	
<b>WFC-112</b>	2.26-2.28	M42x1,5	1.499-1.501	1.67-1.69	.69-.75	2.46	Yes	
<b>WFC-222</b>	3.01-3.03	M60x1,5	2.249-2.251	2.38-2.40	.69-.72	2.80	Yes	
<b>▼ Spring advance</b>								
<b>WSC-72</b>	1.68-1.70	M33x1,5	1.182-1.184	1.31-1.33	.62-.68	2.08	No	
<b>WSC-112</b>	2.26-2.28	M42x1,5	1.499-1.501	1.67-1.69	.69-.75	1.80	Yes	
<b>WSC-222</b>	3.01-3.03	M60x1,5	2.249-2.251	2.38-2.40	.69-.72	2.20	Yes	

Note: Ventilation required on WFC-112, 222 below 1.61 inch when mounted in blind cavity.

- Force: 1650 - 10,000 lbs
- Stroke: .36 - .66 inch
- Pressure: 700 - 5000 psi

- E** Cilindros de soporte
- F** Vérin anti-vibreur
- D** Abstützzylinder

**Options**

- Accessories** 86 ▶
- In-line filters** 193 ▶
- Fittings** 194 ▶
- Swing cylinders** 22 ▶

**Important**

**WARNING!**  
Support force and clamping force must be matched. Support force should be at least 150% of clamping force.

Do not exceed maximum flow rates to avoid premature lockup.

Always center load over work support.