Air Hydraulic Pumps

ENERPAC Hydraulic Technology Worldwide

▼ Shown from top to bottom: **PA-1150, PA-133**

PA Series

Reservoir Capacity:
0,6-1,3 litres

Flow at Rated Pressure:
0,13 l/min

Air Consumption:
255 l/min

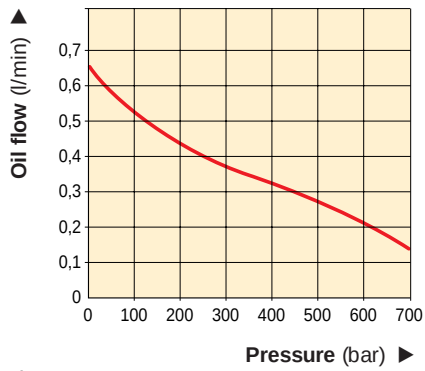
Maximum Operating Pressure:
700 bar

PC-66 Reservoir Conversion Kit

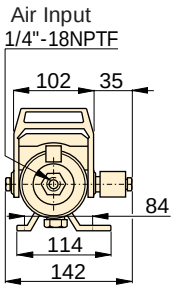
Double the reservoir capacity of your existing PA-133 with this easy to install conversion kit.

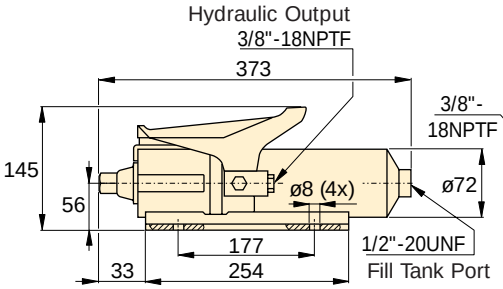
- **Rugged construction – built for long life and easy service**
- **Swivel coupling simplifies hydraulic connection and pump operation**
- **Three-position treadle provides cylinder advance, hold or retract operation**
- **Operates in all positions for increased versatility in use and mounting (except PA-1150)**
- **Base mounting slots provided on PA-133**

FLOW CHART

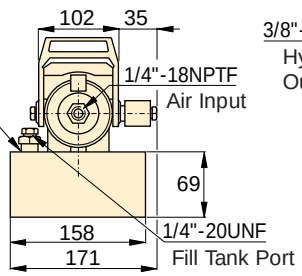


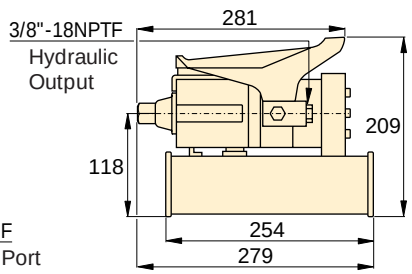
Air pressure:
PA-Series (@6,9 bar)





PA-133 (mm)





PA-1150 (mm)

Used with Cylinder	Usable Oil Capacity (cm^3)	Model Number	Pressure Rating (bar)	Output Flow Rate (l/min) No load	Output Flow Rate (l/min) Load	Valve Function	Air Pressure Range* (bar)	Air Consumption (l/min)	Sound Level (dBA)	(kg)
Single-Acting	589	**PA-133**	700	0,65	0,13	Advance/Hold/Retract	2,7-6,9	255	85	5,4
	1311	**PA-1150**	700	0,65	0,13	Advance/Hold/Retract	2,7-6,9	255	85	8,2

* Recommended Regulator-Filter-Lubricator: RFL-102.

Air Hydraulic Pumps

▼ Shown: **PAM-1041**

PAM Series

Reservoir Capacity:
4,0 - 8,0 litres

Flow at Rated Pressure:
0,15 l/min

Air Consumption:
510 l/min

Maximum Operating Pressure:
700 bar

Locking Valves
Pumps with 4/3 manual valves are available with 4/3 manual locking valves instead. Add suffix "L" to pump model number.

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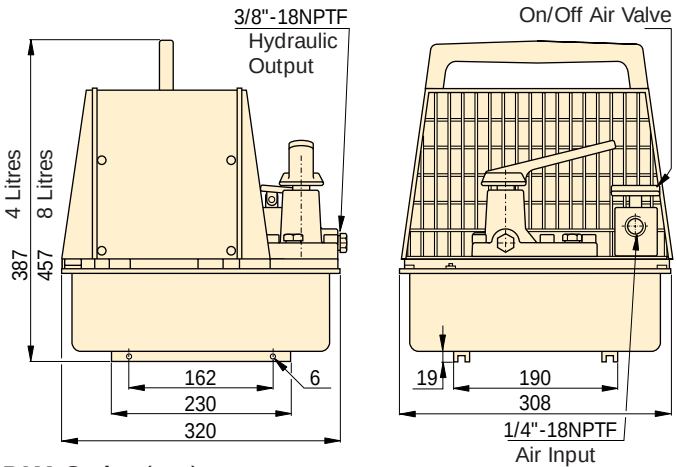
VA-2 Remote Valve
For remote operation of PAM-Series air pumps. Permits either hand or foot operation.

- **Twin air motor configuration delivers high-flow performance in first stage, up to 14 bar, for rapid cylinder advance**
- **4 and 8 litres reservoirs for use with a wide range of cylinders**
- **Integral shroud protects air motors and provides easy carry**



PAM-Series (mm)

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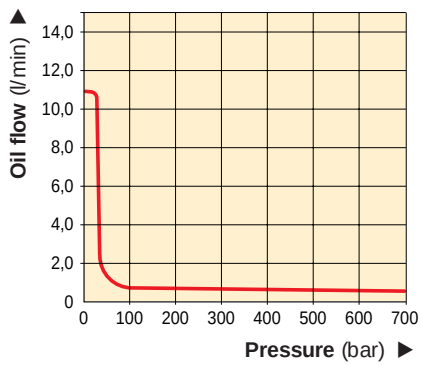

Used with Cylinder	Usable Oil Cap. (litres)	Model Number with Shroud	Pressure Rating (bar)	Output Flow Rate (l/min) 1st stage	Output Flow Rate (l/min) 2nd stage	Valve Function	Valve Type	Air Pressure Range* (bar)	Air Consumption (l/min)	Sound Level (dBA)	(kg)
Single-Acting	2,6	**PAM-1021**	700	10,65	0,15	Adv./Hold/Retr.	3/2	2,7-6,9	510	87	22,7
	7,6	**PAM-1022**	700	10,65	0,15	Adv./Hold/Retr.	3/2	2,7-6,9	510	87	27,2
Double-Acting	2,6	**PAM-1041**	700	10,65	0,15	Adv./Hold/Retr.	4/3	2,7-6,9	510	87	22,7
	7,6	**PAM-1042**	700	10,65	0,15	Adv./Hold/Retr.	4/3	2,7-6,9	510	87	27,2

* Recommended Regulator-Filter-Lubricator: RFL-102.

PAH-Series, Air Hydraulic Pumps

ENERPAC Hydraulic Technology Worldwide

▼ Shown: **PAH-90**

The High-Flow 'Multi-Fluid' Pump

- **Converts 2-7 bar air pressure to 18-900 bar hydraulic pressure**
- **Can be used with hydraulic oil or other non corrosive liquids such as water, kerosene, gasoline etc.**
- **Six models offer many pressure-flow combinations**
- **User supplied valving and reservoir provides system flexibility**
- **Exhaust-air muffler lowers sound level for reduced operator fatigue**
- **Heavy duty construction for long life, even in harsh environments**
- **Ideal for multi-fluid testing applications**

Multifluid Hand Pumps

Corrosion resistant hand pumps for low pressure filling and high pressure testing applications, suitable for a wide range of fluids.

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Hoses

Enerpac offers a complete line of high quality hydraulic hoses. To ensure the integrity of your system, specify only genuine Enerpac hydraulic hoses.

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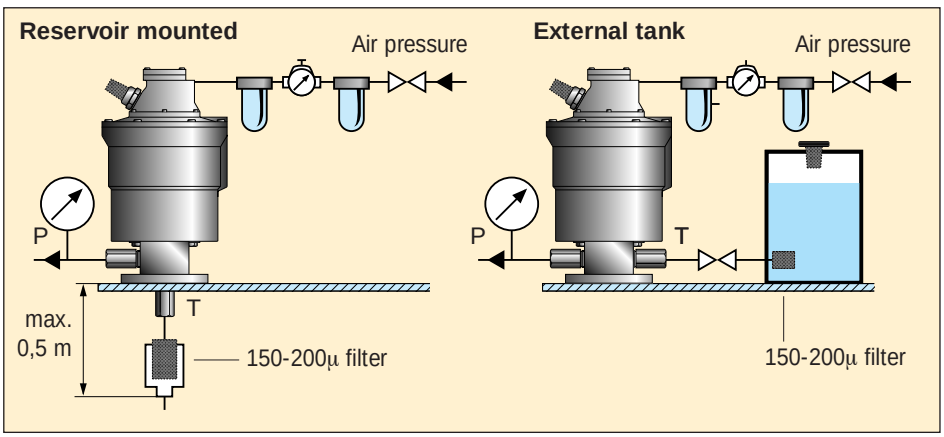
Gauges

Minimize the risk of overloading and ensure long, dependable service from your equipment. Refer to the System Components section for a full range of gauges.

Page: 119

▼ *The PAH-05 was selected for pumping water at high flow for testing a heat exchanger.*

▼ *The PAH-Serie pumps can be reservoir mounted (except PAH-90) or connected to an external tank.*



Air Hydraulic Pumps

All PAH-Series air hydraulic pumps require a user supplied remote valve and reservoir.

For more ordering information, call your Enerpac distributor. For a full range of valves, please refer to the valve section of this catalogue.

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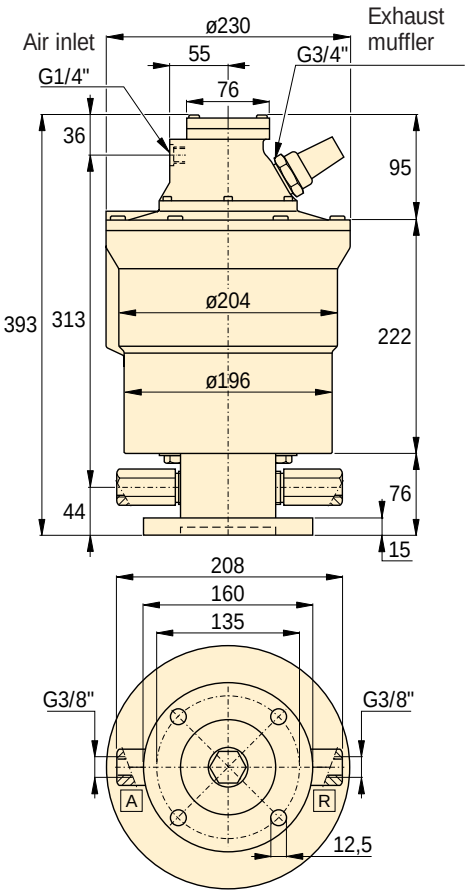
PAH Series

Pressure Intensification Ratio:
1:9 - 1:165

Flow at Rated Pressure:
0,17-5,00 l/min

Air Consumption:
3000 l/min

Maximum Operating Pressure:
56-900 bar



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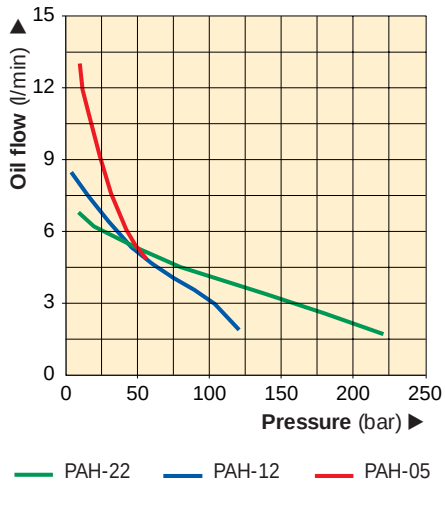

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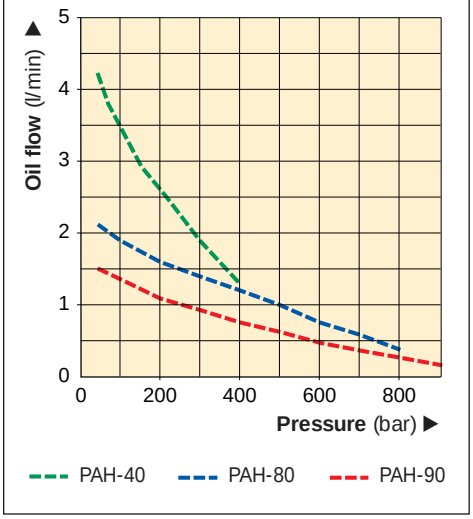

Maximum Pressure Rating (bar)	Output Flow Rate (l/min) no load	Output Flow Rate (l/min) load	Model Number	Air Pressure Range (bar)	Pressure Intensification Ratio	Sound Level (dBA)	(kg)
56	13,0	5,0	**PAH-05**	2-7	1:9	80-85	19
120	8,5	2,0	**PAH-12**	2-7	1:20	80-85	19
220	6,8	1,7	**PAH-22**	2-7	1:36	80-85	19
400	4,2	1,3	**PAH-40**	2-7	1:67	80-85	19
800	2,1	0,38	**PAH-80**	2-7	1:127	80-85	19
900	1,5	0,17	**PAH-90**	2-7	1:165	80-85	19

PGM-Series, Gasoline Pumps

ENERPAC Hydraulic Technology Worldwide

▼Shown from left to right: **PGM-3410R, PGM-2408R, PGM-5410R**

Featuring Genesis Technology

- **Patented Genesis Technology means**
  - coaxial piston design ensures high performance
  - first-stage piston pump for improved efficiency
- **High by-pass pressures improve productivity**
- **All Atlas pumps feature sturdy Roll Cages for use in tough environments**
- **4, 8, 20 and 40 litres reservoirs for use with a wide range of cylinders**
- **Available in three four-cycle motor sizes: 2,2 - 3,7 - 4,0 kW**

Hoses

Enerpac offers a complete line of high quality hydraulic hoses. To ensure the integrity of your system, specify only Enerpac hydraulic hoses.

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Gauges

Minimize the risk of overloading and ensure long, dependable service from your equipment. Refer to the System Components section for a full range of gauges.

Page: 119

▼ *This PGM-5310R is used to power a hydraulic re-bar cutter on a construction site before power was available.*

Used with Cylinder	Usable Oil Capacity (litres)	Model Number	Pressure Rating (bar)	Output Flow Rate (l/min) 1st stage	Output Flow Rate (l/min) 2nd stage
Single-Acting	3,8	PGM-2304R*	700	3,2	0,66
Double-Acting	3,8	PGM-2404R*	700	3,2	0,66
Single-Acting	7,6	PGM-2308R*	700	3,2	0,66
Double-Acting	7,6	PGM-2408R*	700	3,2	0,66
Single-Acting	9,5	PGM-3310R	700	7,8	0,90
	18,9	PGM-3320R	700	7,8	0,90
Double-Acting	9,5	PGM-3410R	700	7,8	0,90
	18,9	PGM-3420R	700	7,8	0,90
Single-Acting	9,5	PGM-5310R	700	7,8	1,6
	18,9	PGM-5320R	700	7,8	1,6
Double-Acting	9,5	PGM-5410R	700	7,8	1,6
	18,9	PGM-5420R	700	7,8	1,6
	37,8	PGM-5440R	700	7,8	1,6

* Note: The PGM-20 series are available with a carrying handle instead of a rollcage. For ordering omitt the 'R' from the model number

Atlas Series, Gasoline Pumps

Atlas Gasoline Pump Performance

Elevation can affect the performance of any gasoline engine. Atlas pumps are designed to develop rated performance at elevations up to 1500 m.

For applications above this elevation, please consult your Enerpac office.

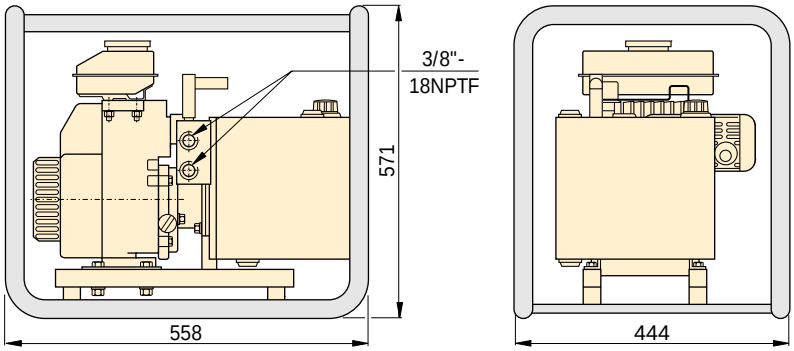
PGM Series

Reservoir Capacity:
4, 8, 20 and 40 litres

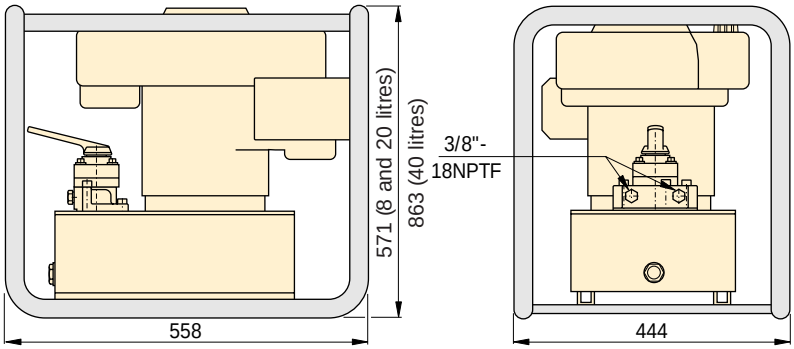
Flow at Rated Pressure:
0,66 - 1,6 l/min

Motor Size:
2,2 - 4,0 kW

Maximum Operating Pressure:
700 bar



PGM-20 series



PGM-30 and PGM-50 Series

Speed Chart

See the Enerpac Cylinder Speed Chart in our 'Yellow Pages' section.

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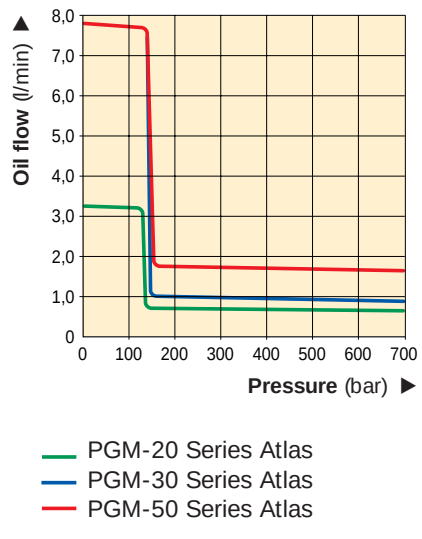
By-Pass Pressure (bar)	Valve Type	Valve Function	Motor Type / Size	Sound Level (dBA)	(kg)
140	3-way, 3-position	Advance/ Hold/Retract	Honda 2,2 kW	89	25
140	4-way, 3-position			89	25
140	3-way, 3-position	Advance/ Hold/Retract	Honda 2,2 kW	89	33
140	4-way, 3-position			89	33
140	3-way, 3-position	Advance/ Hold/Retract	Briggs 3,7 kW	93	55
140	3-way, 3-position			93	68
140	4-way, 3-position			93	55
140	4-way, 3-position			93	68
140	3-way, 3-position	Advance/ Hold/Retract	Honda 4,0 kW	93	59
140	3-way, 3-position			93	75
140	4-way, 3-position			93	59
140	4-way, 3-position			93	75
140	4-way, 3-position			93	93

FLOW CHART



Global Warranty Policy

ENERPAC Hydraulic Technology Worldwide

ENERPAC products are warranted to be free of defects in materials and workmanship under normal use for as long as they are owned by the original purchaser, subject to the exclusions and limitations described below. This warranty does not cover ordinary wear and tear, overloading, alterations, (including repairs or attempted repairs by parties other than ENERPAC or its authorised service representatives), improper fluid, use in a manner for which they are not intended or use which is contrary to instructions for the products. THIS WARRANTY IS LIMITED TO NEW PRODUCTS SOLD THROUGH ENERPAC AUTHORISED DISTRIBUTORS, ORIGINAL EQUIPMENT MANUFACTURERS OR OTHER DESIGNATED CHANNELS OF DISTRIBUTION. NO AGENT, EMPLOYEE, OR OTHER REPRESENTATIVE OF ENERPAC HAS THE AUTHORITY TO IN ANY WAY CHANGE OR AMEND THIS WARRANTY.

Electronic products and components are warranted against defects in material and workmanship for a period of two years from the date of purchase.

The following items supplied with ENERPAC products are excluded from this warranty:

- Components not manufactured by ENERPAC, including air motors, electric motors, gasoline engines, and diesel engines. Such items are warranted to the extent of the warranty provided by the manufacturers of such items.
- Consumable items, including cutter blades, nut splitter chisels, punches and dies.
- Chains

If the customer believes a product is defective, the product must be delivered, or shipped freight prepaid, to the nearest ENERPAC Authorised Service Center. The customer should contact ENERPAC to locate an Authorised Service Center in the customer's area. Products that do not conform to this warranty will be repaired or replaced at ENERPAC's expense and returned by ground transportation, freight prepaid.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

The remedy of repair, replacement or refund is customer's exclusive remedy in the event of breach of this warranty.
SELLER SHALL NOT BE SUBJECT TO AND DISCLAIMS:

(a) ANY OTHER OBLIGATIONS OR LIABILITIES ARISING OUT OF BREACH OF CONTRACT OR OF WARRANTY,
(b) ANY OBLIGATIONS WHATSOEVER ARISING FROM TORT CLAIMS (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR ARISING UNDER THEORIES OF LAW WITH RESPECT TO PRODUCTS SOLD OR SERVICES RENDERED BY SELLER OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATING THERETO, AND
(c) ALL CONSEQUENTIAL, INCIDENTAL AND CONTINGENT DAMAGES WHATSOEVER.

ENERPAC's liability in all cases is limited to, and shall not exceed, the purchase price paid.

Effective June 1, 1997

Enerpac 'Yellow Pages' *stand for* Hydraulic Information!

If selecting hydraulic equipment is not your daily routine, then you will appreciate these pages. The 'Yellow Pages' are designed to help you work with hydraulics. They will help you to better understand the basics of hydraulics, of system set-ups and of the most commonly used hydraulic techniques. The better your choice of equipment, the better you will appreciate hydraulics. Take the time to go through these 'Yellow Pages' and you will benefit even more from Enerpac High Pressure Hydraulics.

GLOBAL LIFETIME WARRANTY STATEMENT

www.enerpac.com
Visit our web site for the complete Global Lifetime Warranty or call your Authorized Service Center.

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Enerpac products are warranted to be free of defects in materials and workmanship. Any product that does not conform to specification will be repaired or replaced at Enerpac's expense, anywhere in the world; simple as that !!

This warranty does not cover ordinary wear and tear, abuse, misuse, alterations, or the use of improper fluids. Determination of the authenticity of a warranty claim will be made only by Enerpac or its Authorized Service Centers.

Enerpac is certified for several quality standards. These standards require compliance with standards for management, administration, product development and manufacturing.
Enerpac worked hard to earn the quality rating ISO 9001, in its ongoing pursuit of excellence.

ASME B30.1
Our cylinders fully comply with the criteria set forth by the American National Standards Institute (except '**BRD**', '**CLL**' and **CLS** series).

UL approved
All electrical components used on Enerpac products carry the UL rating when possible.

IP 55F
All electric motors used on Enerpac power pumps meet this protection and insulation classification.

DIN 20024
Enerpac thermoplastic hoses are related to the criteria set forth in Deutsche Industrie Norm 20024.

Canadian Standards Association
Where specified, Enerpac electric pump assemblies meet the design, assembly and test requirements of the Canadian Standards Association.

Product Design Criteria
All hydraulic components are designed and tested to be safe for use at maximum 700 bar pressure unless otherwise specifically noted.

EMC Directive 89/336/EEC
Where specified, Enerpac electric power pumps meet the requirements for Electro-magnetic Compatibility per EMC Directive 89/336/EEC.

CE Marking & Conformity
Enerpac provides a Declaration of Conformity and CE marking for products that conform with the European Community Directives.

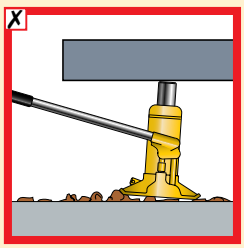
Safety Instructions

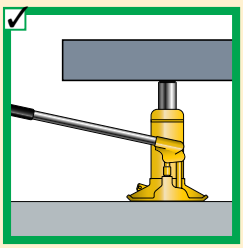
ENERPAC Hydraulic Technology Worldwide

Hydraulic power is one of the safest methods of applying force to your work - when used correctly. And to that end we offer some DOs and DON'Ts, simple common sense points which apply to practically all Enerpac hydraulic products.

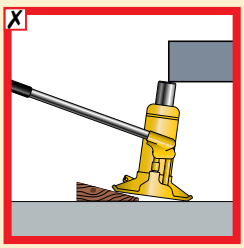
The line drawings and application photo's of Enerpac products throughout this catalog are used to portray how some of our customers have used hydraulics in industry. In designing similar systems, care must be taken to select the proper components that provide safe operation and fit your needs. Check to see if all safety measures have been taken to avoid the risk of injury and property damage from your application or system. Enerpac can not be held responsible for damage or injury, caused by unsafe use, maintenance or application of its products. Please contact the Enerpac office or a representative for guidance when you are in doubt as to the proper safety precautions to be taken in designing and setting up your particular system.
In addition to these tips, every Enerpac product comes with instructions spelling out specific safety information. Please read them carefully.

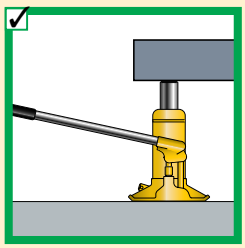
Jacks



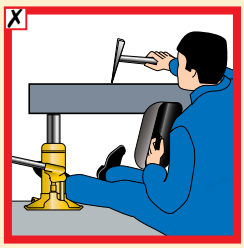


◄ Provide a level and solid support for the entire jack base area.

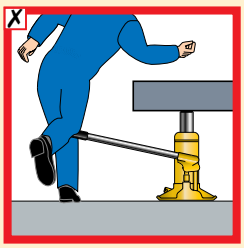


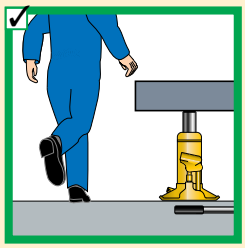


◄ The entire jack saddle must be in contact with the load. Movement of the load to be in the same direction as jack plunger.



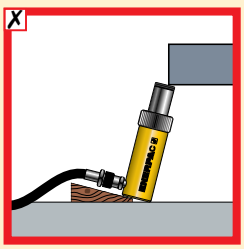
◄ Never place any part of your body under the load. Ensure the load is on a solid support before venturing under.

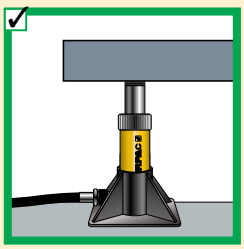




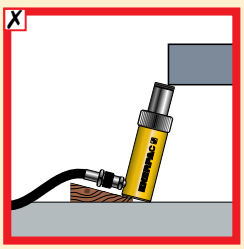
◄ Remove the jack handle when it is not being used.

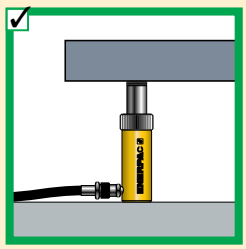
Cylinders



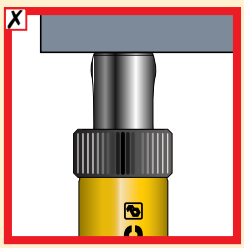


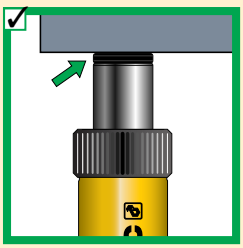
◄ Provide a solid support for the entire cylinder base area. Use cylinder base attachment for more stability.



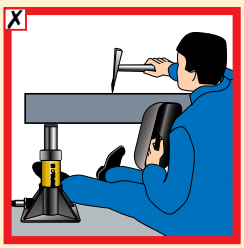


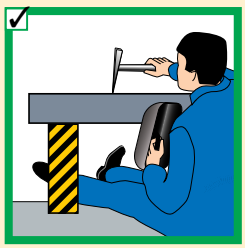
◄ The entire cylinder saddle must be in contact with the load. Movement of the cylinder must be parallel with the movement of the load.





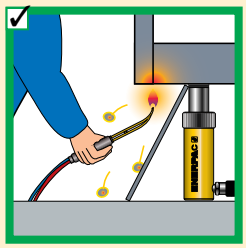
◄ Do not use cylinder without saddle. This will cause plunger to "mushroom". Saddles distribute load evenly on the plunger.





◄ As with jacks, never place any part of your body under the load. Load must be on cribbing before venturing under.

◄ Always protect cylinder threads for use with attachments.



◄ Keep hydraulic equipment away from open fire and tempertures above 65 °C (150 °F).

Pump Selection

ENERPAC Hydraulic Technology Worldwide

▼ HAND PUMP AND SINGLE-ACTING CYLINDER MATCHING CHART

Capacity (ton) ▸ / ▼ Stroke	5 t	10 t	15 t	25 t	30 t	50 t	60 t	75 t	100 t	150 t
< 25 mm										
25 mm										
50 mm										
75 mm										
100 mm										
125 mm										
150 mm										
175 mm										
200 mm										
225 mm										
250 mm										
300 mm										
325 mm										
350 mm										

P-392

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Note: Selection based on oil capacity requirements of cylinders.

▼ POWER PUMP SELECTION CHART

Oil Flow*	Low (0,1 - 0,3 l/min)		Medium (0,5 -2,0 l/min)		High (2,0 - 14,5 l/min)	
Usable Oil Capacity	1,9 - 3,8 litres	5,7 litres	4 - 40 litres	4 - 40 litres	10 - 40 litres	60 litres
Duty Cycle**	Intermittent	Extended	Intermittent	Extended	Extended	Extended
Portable/Stationary***	Portable	Stationary	Portable	Stationary	Stationary	Stationary
Recommended Series	**PU-Series Economy**	**PE-Series Submerged**	**ZU4-Series**	**ZE3-, ZE4- and ZE5-Series**	**ZE6-Series**	**8000-Series 9000-Series**
						
	Page: 78	Page: 80	Page: 86	Page: 90	Page: 90	Page: 96

* Oil Flow
- Determined by motor size
- Directly affects electrical power requirements
- Determines cylinder or tool speed

** Duty Cycle
- Extended applications require more than one hour of interrupted pump use
- Intermittent would be used less than one hour of continuous pump use.

*** Portability

Portable
- Ergonomic handles
- Flexible power requirements

Stationary
- Mounting options
- Normally requires stable power

Selection Worksheet

▼ **Complete the following information to select the right products:**

Cylinder Selection

Question:	*Tips/help*	*Data*	*Model Number*
Total force required in tons:	Total load		
Number of cylinders required:	Number of lifting points		
Force per cylinder in ton:	Should be 80% of total cylinder cap.		
Stroke required:	Plunger travel		
Single or double-acting (D/A):	D/A used when pull force is required, or retract speed is critical		
Type of plunger required:	Hollow or solid		
Collapsed height required:			
Optional saddle required:	Tilt, Grooved, Flat		
Cylinder base:	Improves stability		
Cylinder attachments: (RC-series)	Expanded functions		
Selected cylinder model:		▶	
Including coupler model:			

Pump Selection

The three most commonly selected pumps are hand pumps, electric pumps and air-driven pumps. Gas powered pumps, however can be selected in the same way.

Available power source: ☐ **Manual** ☐ **Electric** ☐ **Compressed Air** ☐ **Petrol**

Hand pump	Not for high cycle applications		
Single- or double-acting operation	Use 4-way valve for D/A applications		
	Check speed chart on page 117 for number of mm per stroke)		
Selected hand pump:		▶	
Electric or Compressed Air pump			
Need for portability:			
Duty cycle:	Intermittent or extended		
Required usable oil capacity:	Intermittent =1,2 x oil capacity		
	high cycle = 2 x oil capacity		
Available Voltage:			
Lifting speed (Important/not important):	Use speed chart on page 117		
Type of control:	Manual/remote pendant		
Type of actuation/function:	Advance/hold/retract		
Accessories:	Filter Kit, Level Switch, Roll bar ...		
Selected pump:		▶	
Including Coupler:	Oil connection		

System Components

Number of hoses and length required:			
Selected Hoses:		▶	
Manifold or tee:		▶	
Extra hose per manifold (2):		▶	
Gauge (kN or bar scale):	GF-series for high cycle	▶	
Gauge adapter:		▶	
Fittings:		▶	
Pressure Relief Safety Valve:		▶	
Load-holding Valve(s):		▶	
Hydraulic oil:		▶	

Basic System Set-ups

1 Cylinder
Applies hydraulic force.
Page **7**

2 Cylinder Base Plate
For applications like lifting where additional cylinder stability is required.
Page **12**

3 Pump
Provides hydraulic flow.
Page **67**

4 Hose
Transports hydraulic fluid.
Page **120-121**

5 Male Coupler
For quick connection of the hose to system components.
Page **122-123**

6 Female Coupler
For quick connection of the hose end to the system components.
Page **120-121**

7 Gauge
To monitor pressure of the hydraulic circuit.
Page **126-131**

8 Gauge adaptor
For quick and easy gauge installation. *Page* **132**

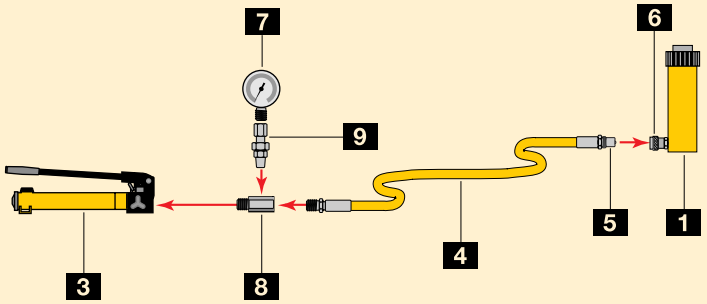
9 Swivel connector
Allows proper allignment of valves and/or gauges. Used when units being connected cannot be rotated.
Page **132**

10 Auto-Damper Valve V-10
Used to protect gauge from damage due to sudden pressure pulses in the system. Needs no adjustment and allows correct positioning of gauge, prior to tightening.
Page **138-139**

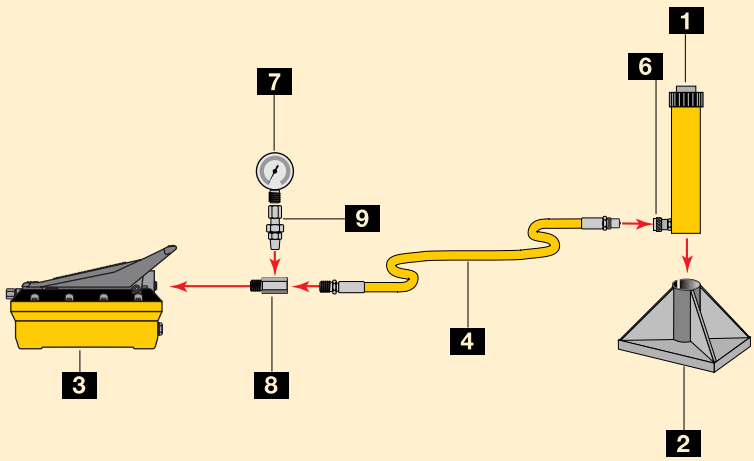
11 4-Way Directional Control Valve
Controls the direction of hydraulic fluid in a double-acting system.
Page **136**

Single-acting push application, such as in a press. The handpump offers controlled cylinder advance, but may require many handpump strokes in longer stroke applications when the cylinder capacity is 25 ton or above.

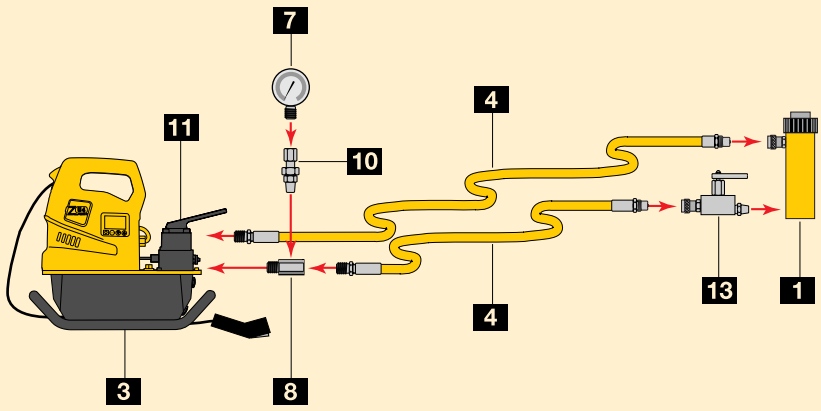
Examples of pump, hose and cylinder sets can be found on page 64.



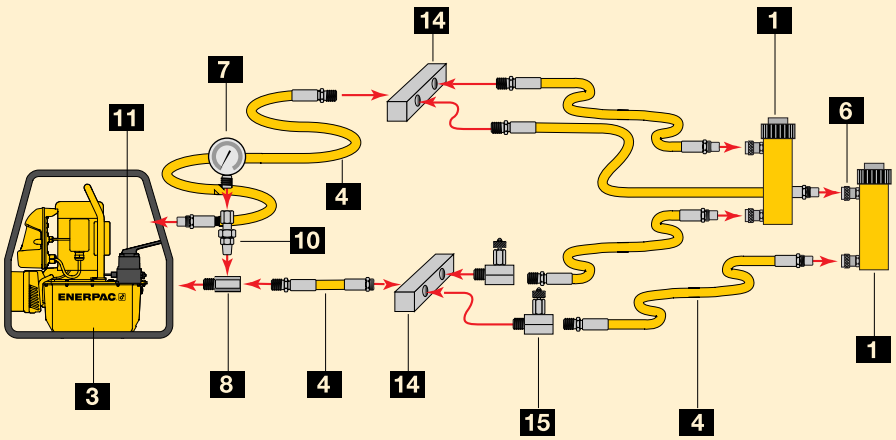
Single-acting cylinder with longer stroke used for lifting applications.



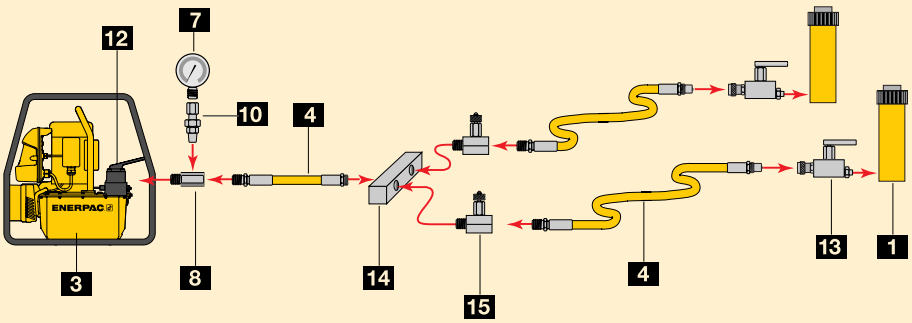
Double-acting cylinder set-up used for lifting applications where a slow controlled descent of the load must be maintained.



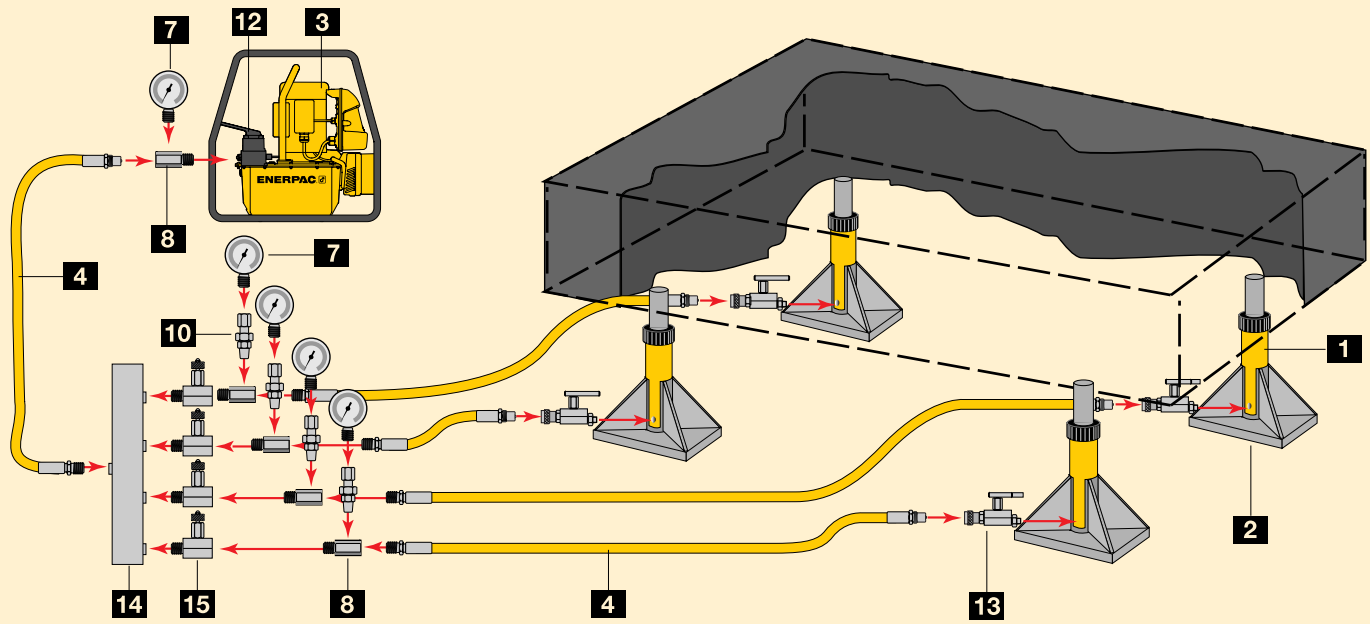
Double-acting cylinder set-up used in a push/pull application.



Two point lifting set-up using single-acting cylinders.



Four point lifting set-up, using single-acting cylinders and directional control valves.



12 3-Way Directional Control Valve
Controls the direction of hydraulic fluid in a single-acting system.
Page **134**

13 Safety Holding Valve
Controls load descent in lifting applications.
Page **138-139**

14 Manifold
Allows distribution of hydraulic fluid from one power source to several cylinders
Page **124**

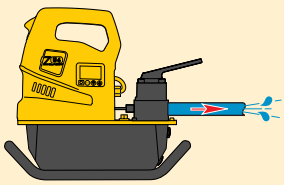
15 Needle valve
Regulates the flow of hydraulic fluid to or from the cylinders.
Page **138-139**

www.enerpac.com
Visit our web site to learn more about hydraulics and system set-ups.

Basic Hydraulics

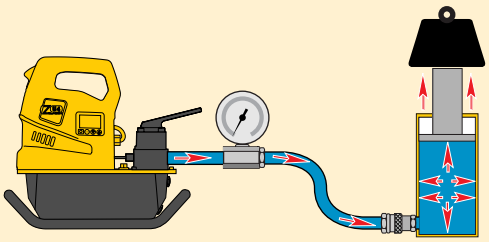
Flow

A hydraulic pump produces flow.



Pressure

Pressure occurs when there is resistance to flow.



Pascal's Law

Pressure applied at any point upon a confined liquid is transmitted undiminished in all directions (Fig.1).
This means that when more than one hydraulic cylinder is being used, each cylinder will lift at its own rate, depending on the force required to move the load at that point (Fig. 2).

Cylinders with the lightest load will move first, and cylinders with the heaviest load will move last (Load A), as long as the cylinders have the same capacity.

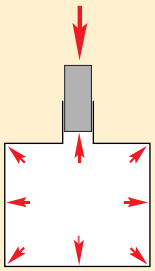
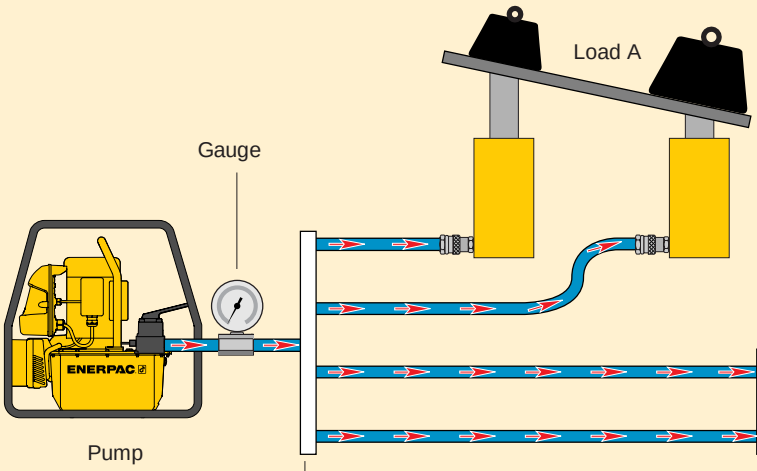


Figure 1

To have all cylinders operate uniformly so that the load is being lifted at the same rate at each point, either control valves (see Valve section) or Synchronous Lift System components (see Cylinder section) must be added to the system (Load B).

✗ **WRONG!**



✓ **RIGHT!**

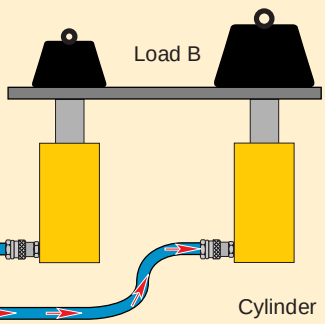


Figure 2

Synchronous Lift or Control Valves to provide uniform lifting of load.

CAUTION!

When lifting or pressing, always use a gauge.
A gauge is your 'window' to the system. It lets you see what's going on. You will find the gauges in the System Components section.

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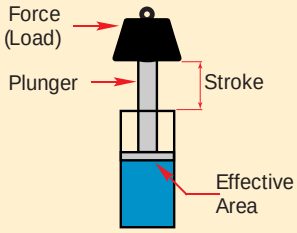
Learn more about hydraulics

Visit **www.enerpac.com** to learn more about hydraulics and system set-ups.

Force

The amount of force a hydraulic cylinder can generate is equal to the hydraulic pressure times the "effective area" of the cylinder (see cylinder selection charts).



Force	=	Hydraulic Working Pressure	x	Cylinder Effective Area
F	=	P	x	A

Use this formula to determine either force, pressure or effective area if two of the variables are known.

Example 1
An RC-106 cylinder with 14,5 cm^2 effective area operating at 700 bar will generate what force?
Force = 7000 N/cm^2 x 14,5 cm^2 = 101500 N = 101,5 kN

Example 2
An RC-106 cylinder lifting 7000 kg will require what pressure?
Pressure = 7000 x 9,8 N ÷ 14,5 cm^2 = 4731,0 N/cm^2 = 473 bar.

Example 3
An RC-256 cylinder is required to produce a force of 190.000 N. What pressure is required?
Pressure = 190.000 N ÷ 33,2 cm^2 = 5722,9 N/cm^2 = 572 bar.

Example 4
Four RC-308 cylinders are required to produce a force of 800.000 N. What pressure is required?
Pressure = 800.000 N ÷ (4 x 42,1 cm^2) = 4750,6 N/cm^2 = 476 bar.
Remember, since four cylinders are used together, the area for one cylinder must be multiplied by the number of cylinders used.

Example 5
A CLL-2506 cylinder is going to be used with a power source that is capable of 500 bar. What is the theoretical force available from that cylinder?
Force = 5000 N/cm^2 x 366,4 cm^2 = 1.832.000 N = 1832 kN.

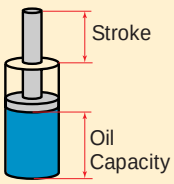
Cylinder Oil Capacity

The volume of oil required for a cylinder (cylinder oil capacity) is equal to the effective area of the cylinder times the stroke*.

Cylinder Oil Capacity	=	Cylinder Effective Area	x	Cylinder Stroke

* Note: these are theoretical examples and do not take into account the compressibility of oil under high pressure.

Example 1:
An RC-158 cylinder with 20,3 cm^2 effective area and 200 mm stroke requires what volume of oil?
Oil Capacity = 20,3 cm^2 x 20 cm = 406 cm^3



Example 2:
An RC-5013 cylinder has an effective area of 71,2 cm^2 and a stroke of 320 mm. How much oil will be required?
Oil Capacity = 71,2 cm^2 x 32 cm = 2278,4 cm^3

Example 3:
An RC-10010 cylinder has an effective area of 133,3 cm^2 and a stroke of 260 mm. How much oil will it require?
Oil Capacity = 133,3 cm^2 x 26 cm = 3466 cm^3

Example 4:
Four RC-308 cylinders are being used, each with an effective area of 42,1 cm^2 and a stroke of 209 mm. How much oil will be required?
Oil Capacity = 42,1 cm^2 x 20,9 cm = 880 cm^3 for one cylinder
Multiply by four to obtain the required capacity: 3520 cm^3

CAUTION!
Enerpac oil will compress 2,28% at 350 bar and 4,1% at 700 bar.

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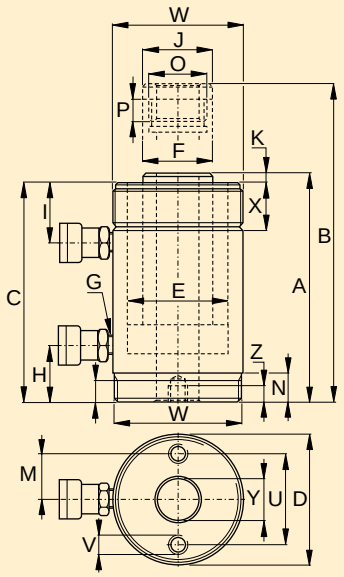
Conversion Tables

Key to cylinder dimensions

Dimensions shown in the Selection Charts of the cylinder section are identified on the relevant drawings by the capital letter references listed here: A for collapsed height through Z_1 for depth of internal base thread.



A = Collapsed height
B = Extended height
C = Cylinder body length
D = Cylinder outside diameter
D_1 = Cylinder width
E = Cylinder inside diameter
F = Plunger rod diameter
G = Oil inlet thread
H = Cylinder bottom to advance port
I = Cylinder top to retract port
J = Saddle outside diameter
K = Cylinder rod protrusion at collapsed height
L = Plunger centre to side of base
M = Mounting holes to plunger centre
N = Length of smaller cylinder part
O = Plunger hole or thread of saddle
P = Plunger thread length
Q = Plunger outside thread
U = Bolt circle diameter of mounting holes
V = Thread of cylinder mounting holes
W = Collar thread
X = Collar thread length
Y = Centre hole diameter
Z = Internal base thread
Z_1 = Depth of internal base thread

Key to measurements

All capacities and measurements in the catalog are expressed in uniform values.
The conversion chart provides helpful information for their translation into equivalent systems.

All ton values specified in this catalogue are metric tonnes and are for cylinder class identification only.
Please refer to the kN data for calculations.

Free Conversion Calculator

Visit **enerpac.com** and download the free conversion calculator.

Pressure:

1 psi	= 0,069 bar
1 bar	= 14,50 psi
	= 9,8 N/cm²
	= 100.000 Pa
1 kPa	= 0,145 psi

Volume:

1 in³	= 16,387 cm³
1 cm³	= 0,061 in³
1 litre	= 61,02 in³
	= 0,264 gal
1 USgal	= 3785 cm³
	= 3,785 l
	= 231 in³

Weight:

1 pound (lb)	= 0,4536 kg
1 kg	= 2,205 lbs
1 metric ton	= 2205 lbs
	= 1000 kg
1 ton (short)	= 2000 lbs
	= 907,18 kg

Temperature:

To Convert ℃ to ℉:
$T^{℉} = (T_{℃} \times 1{,}8) + 32$
To Convert ℉ to ℃:
$T_{°C} = (T_{℉} - 32) \div 1{,}8$

Other measurements:

1 in	= 25,4 mm
1 mm	= 0,039 in
1 in²	= 6,452 cm²
1 cm²	= 0,155 in²
1 hp	= 0,746 kW
1 kW	= 1,359 hp
1 Nm	= 0,73756 Ft.lbs
1 Ft.lbs	= 1,355818 Nm
1 kN	= 225 lbs

Imperial to metric

Inches	Decimal	mm
1/16	.06	1,59
1/8	.13	3,18
3/16	.19	4,76
1/4	.25	6,35
5/16	.31	7,94
3/8	.38	9,53
7/16	.44	11,11
1/2	.50	12,70
9/16	.56	14,29
5/8	.63	15,88
11/16	.69	17,46
3/4	.75	19,05
13/16	.81	20,64
7/8	.88	22,23
15/16	.94	23,81
1	1.00	25,40

Cylinder Speed Charts

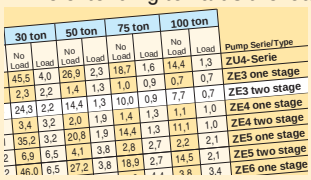
Cylinder Speed

This chart will help you calculate the time required for an Enerpac cylinder to lift a load when powered by a 700 bar Enerpac hydraulic pump. The Cylinder Speed Chart can also be used to determine the pump type and model best suited for an application when you know the plunger speed required.

To determine:

Cylinder plunger speed

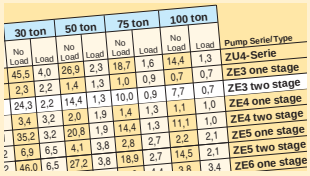
An RC-256 cylinder (25 ton) is powered by a ZE3-Series two stage pump. While lifting the load, the cylinder plunger travels at 3,0 mm per second. While extending towards the load, the cylinder plunger travels at 30,9 mm per second.



To determine:

Best matching pump

Your 25 ton cylinder needs to move a load at a speed of 3,0 mm per second. Simply go down from the top of the chart, to the value of 3,0 mm per second. Follow the chart to the right to find that the ZE3-Series pump is most suitable for your application.



Millimetres of Cylinder Plunger Travel per Hand Pump Plunger Stroke

Cyl. Capacity ▶	5 ton		10 ton		15 ton		25 ton		30 ton		50 ton		75 ton		100 ton			
▼ Power Source	No Load	Load	No Load	Load	No Load	Load	No Load	Load	No Load	Load	No Load	Load	No Load	Load	No Load	Load	Pump Type	*Page*
Manual	3,9	3,9	1,7	1,7	1,2	1,2	0,7	0,7	0,6	0,6	0,3	0,3	0,2	0,2	0,2	0,2	**P-391**	**68**
	17,6	3,9	7,8	1,7	5,5	1,2	3,4	0,7	2,6	0,6	1,6	0,3	1,0	0,2	0,8	0,2	**P-392**	**68**
	25,3	3,8	11,2	1,7	7,9	1,2	4,9	0,7	3,7	0,6	2,3	0,3	1,5	0,2	1,1	0,2	**P-80/801/84**	**70**
	61,4	3,9	27,1	1,7	19,3	1,2	11,8	0,7	9,0	0,6	5,5	0,3	3,5	0,2	2,8	0,2	**P-802/842**	**70**
	197	7,4	87,1	3,3	61,8	2,3	37,9	1,4	29,0	1,1	17,7	0,7	11,4	0,4	8,8	0,3	**P-462/464**	**70**

Millimetres per Second of Cylinder Plunger Travel

Cyl. Capacity ▶	5 ton		10 ton		15 ton		25 ton		30 ton		50 ton		75 ton		100 ton			
▼ Power Source	No Load	Load	No Load	Load	No Load	Load	No Load	Load	No Load	Load	No Load	Load	No Load	Load	No Load	Load	Pump Serie/Type	*Page*
Electric (speed based on 50 Hz)	86	8,3	38	3,7	27	2,6	17	1,6	13	1,3	7,7	0,7	5,4	0,5	4,1	0,4	**PU Economy**	**78**
	53	7,1	24	3,2	17	2,2	10	1,4	8,1	1,1	4,8	0,6	3,3	0,4	2,6	0,3	**PE Submerged**	**80**
	295	25,6	132	11,5	94,4	8,2	57,7	5,0	45,5	4,0	26,9	2,3	18,7	1,6	14,4	1,3	**ZU4-Series**	**84, 86**
	15,1	14,1	6,8	6,3	4,8	4,5	3,0	2,8	2,3	2,2	1,4	1,3	1,0	0,9	0,7	0,7	**ZE3 one stage**	**84, 90**
	158	14,1	70,7	6,3	50,5	4,5	30,9	2,8	24,3	2,2	14,4	1,3	10,0	0,9	7,7	0,7	**ZE3 two stage**	**84, 90**
	22,3	21,0	10,0	9,4	7,1	6,7	4,4	4,1	3,4	3,2	2,0	1,9	1,4	1,3	1,1	1,0	**ZE4 one stage**	**84, 90**
	228	21,0	102	9,4	72,9	6,7	44,6	4,1	35,2	3,2	20,8	1,9	14,4	1,3	11,1	1,0	**ZE4 two stage**	**84, 90**
	44,9	42,1	20,1	18,9	14,4	13,5	8,8	8,2	6,9	6,5	4,1	3,8	2,8	2,7	2,2	2,1	**ZE5 one stage**	**84, 90**
	298	42,1	133	18,9	95,3	13,5	58,3	8,2	46,0	6,5	27,2	3,8	18,9	2,7	14,5	2,1	**ZE5 two stage**	**84, 90**
	76,9	70,0	34,5	31,4	24,6	22,4	15,1	13,7	11,9	10,8	7,0	6,4	4,9	4,4	3,8	3,4	**ZE6 one stage**	**84, 90**
	315	70,0	141	31,4	101	22,4	61,7	13,7	48,7	10,8	28,8	6,4	20,0	4,4	15,4	3,4	**ZE6 two stage**	**84, 90**
	Use the formula below to calculate cylinder plunger speed																**PP 8000/9000**	**96**
Air (at 6,9 bar air pressure)	25,9	4,2	11,6	1,9	8,2	1,3	5,0	0,8	4,0	0,6	2,3	0,4	1,6	0,3	1,3	0,2	**Turbo II Air**	**98**
	17	3,4	7,6	1,5	5,4	1,1	3,3	0,7	2,6	0,5	1,5	0,3	1,1	0,2	0,8	0,2	**PA-Series**	**100**
	277	3,8	123	1,7	88	1,2	53	0,7	42	0,6	25	0,3	17	0,2	13,0	0,2	**PAM-Series**	**101**
Petrol	85	17	38	7,6	27	5,4	16	3,3	13	2,6	7,7	1,5	5,3	1,1	4,1	0,8	**PGM-20 Atlas**	**104**
	205	23	91	10	65	7,4	39	4,5	31	3,6	18	2,1	13	1,5	9,8	1,1	**PGM-30 Atlas**	**104**
	205	43	91	19	65	13	39	8,2	31	6,5	18	3,8	13	2,7	9,8	2,0	**PGM-50 Atlas**	**104**

No Load indicates the plunger speed as the plunger extends towards the load (1st stage).

Load indicates the plunger speed as the load is lifted at a system pressure of 700 bar (2nd stage).

$$\text{Cylinder Plunger Speed (mm/sec)} = \frac{\text{Pump Oil Flow (cm}^3\text{/min)} \times 10}{\text{Cylinder Effective Area (cm}^2\text{)} \times 60}$$

Example: At what speed (V) will the RC-256 (25 ton) cylinder move when powered by a ZE3-Series pump?

RC-256 Cylinder Effective Area = 33,2 cm^2

ZE3-Series pump oil Flow (no load) = 6150 cm^3/min

$$\text{Speed V} = \frac{6150\ cm^3/min \times 10}{33,2 \times 60} = 30,9\ mm/sec$$

Valve Information

ENERPAC Hydraulic Technology Worldwide

Ways

The (oil) ports on a valve.
A 3-way valve has 3 ports:
pressure (P), tank (T), and cylinder (A).
A 4-way valve has 4 ports:
pressure (P), tank (T), advance (A) and retract (B).

Single-Acting cylinders require at least a 3-way valve, and can, under certain instances, be operated with a 4-way valve.

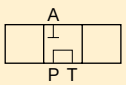
Double-Acting cylinders require a 4-way valve, providing control of the flow to each cylinder port.

Positions

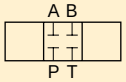
The number of control points a valve can provide. A 2-position valve has the ability to control only the advance or retraction of the cylinder. To be able to control the cylinder with a hold position, the valve requires a 3rd position.

Centre Configuration

The centre position of a valve is the position at which there is no movement required of the hydraulic component, whether a tool or cylinder.

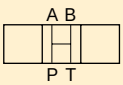


The most common is the **Tandem Centre**. This configuration provides for little to no movement of the cylinder and the unloading of the pump. This provides for minimum heat build-up.

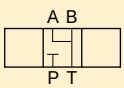


The next most common is the **Closed Centre** configuration, which is used mostly for independent control of multi-cylinder applications. This configuration again provides for little to no movement of the cylinder, but also dead-heads the pump, isolating it from the circuit.
Use of this type of valve may require some means of unloading the pump to prevent heat build-up.

There are many more type of valves, such as Open Centre and Float Centre.
These valves are used mostly in complex hydraulic circuits and require other special considerations.



Open Centre

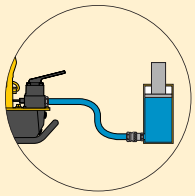


Float Centre

Directional Control Valves

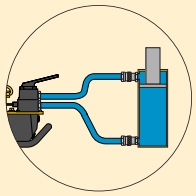
3-Way Valves

are used with single-acting cylinders



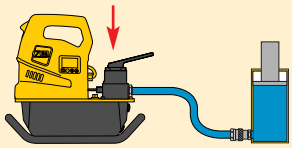
4-Way Valves

are used with double-acting cylinders

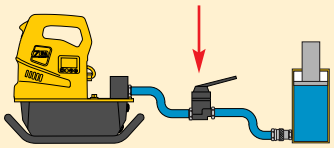


Valves may be either pump mounted or remote mounted.

Pump Mounted

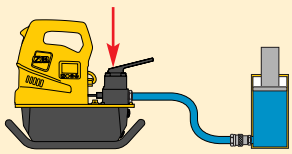


Remote Mounted

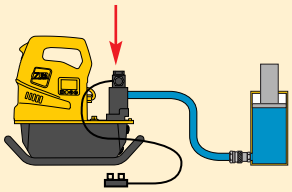


Valves may be either manually or solenoid operated.

Manually Operated



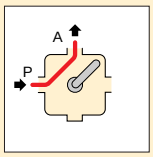
Solenoid Operated



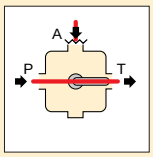
Advance Hold Retract

Single-acting cylinder

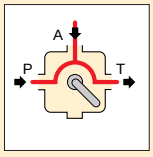
Controlled by a 3-way, 3-position valve.



Advance
The oil flows from the pump pressure port P to the cylinder port A: the cylinder plunger will extend.



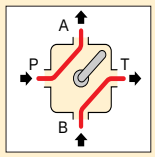
Hold
The oil flows from the pump pressure port P to the tank T. The cylinder port A is closed: the cylinder plunger will maintain its position.



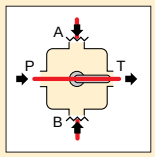
Retract
The oil flows from the pump and cylinder port A to the tank T: the cylinder plunger will retract.

Double-acting cylinder

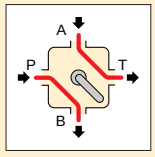
Controlled by a 4-way, 3-position valve.



Advance
The oil flows from the pump pressure port P to the cylinder port A and from cylinder port B to tank T.



Hold
The oil flows from the pump pressure port P to the tank T. The cylinder ports A and B are closed: the cylinder plunger will maintain position.



Retract
The oil flows from the pump pressure port P to cylinder port B and from cylinder port A to tank T: the cylinder plunger will retract.

System Components Section Overview

ENERPAC System Components:

All the additional elements you need to complete your high pressure hydraulic system and get started.

Engineered to work with your Enerpac cylinders, pumps and tools, all Enerpac components are designed to the most exacting standards.

With this complete line of hydraulic hoses, couplers, fittings, manifolds, oil and gauges, Enerpac has the accessories to complement your system and ensure the efficient operation, long life and safety of your hydraulic equipment.

700-Series, High Pressure Hoses

ENERPAC Hydraulic Technology Worldwide

▼ Shown from top to bottom: **HA-7206B, HC-7206, H-7206**

Thermo-Plastic Safety Hoses (700-Series)

- **For demanding applications, featuring a 4:1 design factor**
- **Maximum working pressure of 700 bar**
- **Four layer design, including two high strength steel wire braids**
- **Outside jacket is polyurethane, to provide maximum abrasion resistance**
- **Exhibits low volumetric expansion under pressure to enhance overall system efficiency**
- **Crimped-on rubber strain relief for improved life and durability on all models**

▼ *To prevent back pressure and to increase cylinder retraction speed, when using long hoses with single-acting cylinders, the Enerpac HC-7300-Series of hoses with increased internal diameter is the best choice.*

Safety and Quality

To ensure the integrity of your system, specify only Enerpac hydraulic hoses.

WARNING !

- **Do not exceed 700 bar maximum pressure.**
- **Do not handle hoses which are under pressure.**

More safety instructions in our 'Yellow pages'.

Page: **108**

▼ **Hose End Couplings**

1/4" NPTF	
3/8" NPTF	
A-604	
A-630	
AH-604	
AH-630	
C-604	
CH-604	

High Pressure Hydraulic Hoses

700 Series

Inside Diameter:
6,4 and 9,7 mm

Length:
0,6 - 15 m

Maximum Operating Pressure:
700 bar

Internal Diameter	Hose End Assemblies and Couplers*		Hose Length	Model Number	
(mm)	End one	End two	(m)		(kg)
6,4	1/4" NPTF			–	
				–	
		A-630	1,8	HB-7206QB	1,1
				–	
		CH-604	1,8	HC-7206Q	1,0
	3/8" NPTF	3/8" NPTF	0,6	H-7202	0,5
			0,9	H-7203	0,7
			1,8	H-7206	0,9
			3,0	H-7210	1,4
			6,1	H-7220	2,8
			9,1	H-7230	4,5
			15	H-7250	7,0
		A-604		–	
			1,8	HA-7206B	1,1
				–	
		AH-604		–	
				–	
			1,8	HA-7206	1,0
			3,0	HA-7210	1,5
		AH-630	1,8	HB-7206	1,0
		C-604	0,9	HC-7203B	1,0
			1,8	HC-7206B	1,3
			3,0	HC-7210B	1,8
		CH-604	0,9	HC-7203	0,8
			1,8	HC-7206	1,0
			3,0	HC-7210	1,5
			6,1	HC-7220	2,9
	CH-604	CH-604	1,8	HC-7206C	1,1
			15	HC-7250C	7,0
9,7	3/8" NPTF	3/8" NPTF	1,8	H-7306	1,6
				–	
			3,0	H-7310	2,4
			6,1	H-7320	4,5
			9,1	H-7330	7,3
			15	H-7350	11,5
		CH-604	1,8	HC-7306	1,7
			3,0	HC-7310	2,5
			6,1	HC-7320	5,1

* For technical information on couplers see next page.

Torque Wrench Hoses
Use Enerpac THC and THQ-Series twin safety hoses with double-acting wrenches to ensure the integrity of your hydraulic system.

Page: 206

Fittings
For additional fittings see the fitting page of the System Components section.

Page: 125

Hose Oil Capacity
When using greater hose lengths, it is sometimes necessary to fill the pump reservoir after filling the hoses. To determine the hose oil capacity, use the following:

For 6,4 mm inside diameter hoses:
Capacity (cm^3) = 32,1699 x Length (m)

For 9,7 mm inside diameter hoses:
Capacity (cm^3) = 73,8981 x Length (m)

A, C, F, T-Series, Hydraulic Couplers

ENERPAC Hydraulic Technology Worldwide

▼ Shown: **FH-604, FR-400, AR-630, C-604, AH-604, AR-400**

Quick Connection of Hydraulic Lines

Thread sealer
To seal NPTF threads use one of the new anaerobic thread sealers or Teflon paste. When using Teflon Tape, apply the tape one thread from the end of a fitting to prevent it from winding up in the hydraulic system.

WARNING!
Couplers should be pressurized only when completely connected and should not be coupled or uncoupled when pressurized.

More safety instructions in our 'Yellow Pages'.

Page: 108

3/8" High Flow Couplers
- Standard equipment on most Enerpac cylinders
- Recommended for use on all Enerpac pumps and cylinders where space and porting permits
- Includes "2-in-1" dust cap for use on male and female coupler halves

3/8" High Pressure 'Flush-face' Couplers
- Featuring "Push-to-connect" operation, to guarantee good connection every time
- Flush-face, zero-leak operation for minimal spillage
- HTMA* recognized for safety and performance
- Will not interchange with low pressure couplers

3/8" Regular Spee-D-Coupler®
- For medium duty applications with hand pumps
- Includes female aluminium dust cap

1/4" Regular Coupler
- For use with small cylinders and hand pumps
- Includes female aluminium dust cap

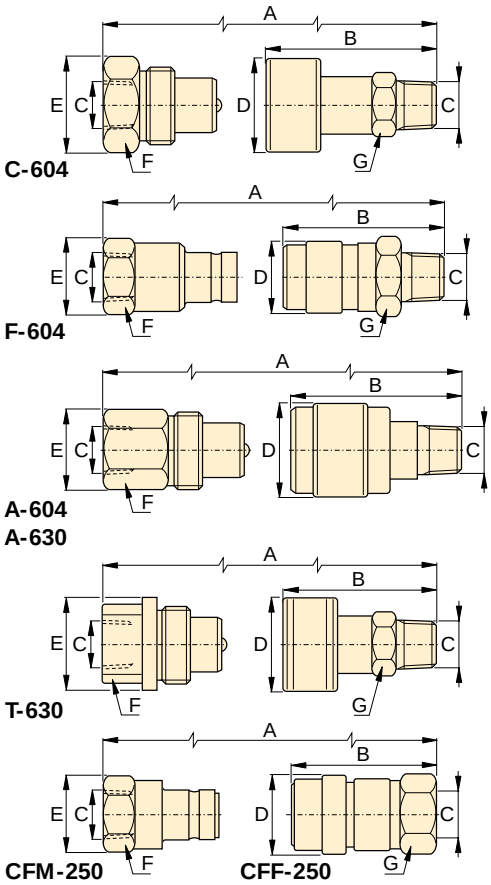
1/4" Spin-on Torque Wrench Couplers
- Use with 700 bar S and W-series torque wrenches, THQ-series hoses and torque wrench pumps with suffix "Q"

1/4" Lock-ring Torque Wrench Couplers (dustcaps included)
- Use with 800 bar SQD and HXD-series torque wrenches, THC-series hoses and torque wrench pumps

* Hydraulic Tool Manufacturers Association

▼ *With the use of Enerpac High Flow Couplers, hoses are easily installed for multiple hydraulic line connections in this 34 points PLC-controlled lifting system.*

Hydraulic Couplers



A / C
F / T
Series

Maximum Flow Capacity:
6,1 - 40,0 l/min

Thread:
1/4" and 3/8" NPTF

Maximum Operating Pressure:
700 and 800 bar

Metal Dust Caps

Steel dust caps are available for the C-604 series couplers. Order model number:

CD-411M for female half
CD-415M for male half

Maximum Flow Capacity (l/min)	Coupler Type	Model Numbers			Dimensions (mm)							Dust Cap(s)
		Complete Set	Female Half	Male Half	A*	B	C	D	E	F	G	
35	700 bar High-Flow Coupler 	C-604	CR-400	CH-604	83	64	3/8" NPTF	35	36	32	25	(2x) CD-411
40	700 bar Flush-Face coupler 	F-604	FR-400	FH-604	110	72	3/8" NPTF	31	31	26	28	–
7,6	700 bar Regular Spee-D-Coupler© 	A-604	AR-400	AH-604	77	42	3/8" NPTF	28	26	23	19	Z-410 female only
7,6	700 bar Regular Coupler 	A-630	AR-630	AH-630	66	35	1/4" NPTF	22	20	19	15	Z-640 female only
11,4	700 bar Spin-on Coupler 	T-630	TR-630	TH-630	73	60	1/4" NPTF	29	29	19	21	–
6,1	800 bar Lock-ring Coupler 	–	CFF-250	CFM-250	76	58	1/4" NPTF	23	28	24	22	–

* Value A is total length when male and female half are connected.

Hydraulic Oil, Manifolds and Fittings

ENERPAC Hydraulic Technology Worldwide

▼ Shown : **A-65, FZ-1625, HF-95Y, FZ-1634, FZ-1607, A-64, AM-21**

The Genuine Range

- **Maximum pump volumetric efficiency**
- **Maximum internal heat transfer**
- **Prevents pump cavitation**
- **Additives prevent rust, oxidation and sludge**
- **High viscosity index**
- **Maximum film protective lubricity**

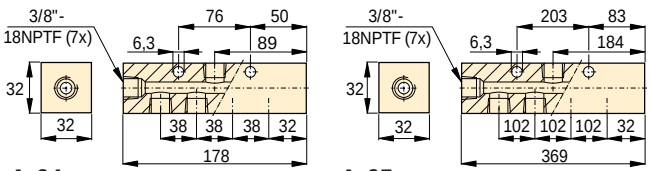
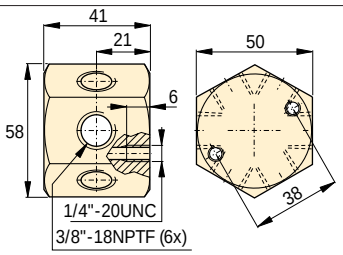
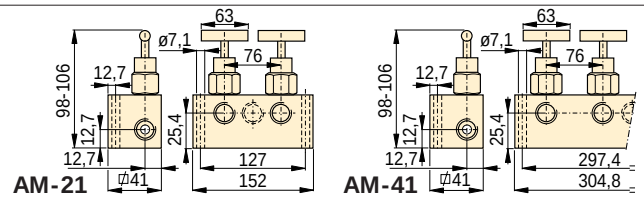
Hydraulic Oil

Contents	Model Number	
1 litre	**HF-95 X**	Use only genuine Enerpac Hydraulic Oil. The use of any other fluid will render your Enerpac warranty null and void.
5 litres	**HF-95 Y**	
60 litres	**HF-95 Z**	

▼ **Oil Specifications chart**

Viscosity Index	100 min
Viscosity at 210℉	42/45 S.U.S.
Viscosity at 100℉	150/165 S.U.S.
Viscosity at 0℉	<12,000 S.U.S.
API Gravity	31.0/33.0
Flash, C.O.C.℉	400
Pour Point, ℉	-25
Aniline Point, ℉	210/220
Paraffinic Base Colour	Blue

Manifolds

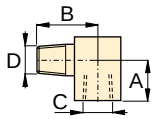
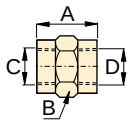
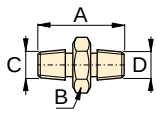
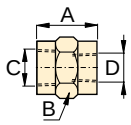
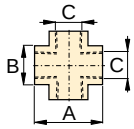
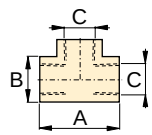
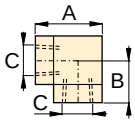
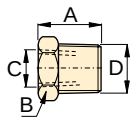
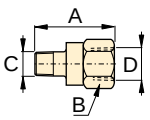
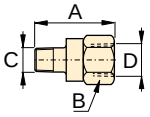
Description		Model Number	Dimensions (mm)
178 mm Long Manifold with 7 female ports		**A-64**	
369 mm Long Manifold that allows direct mounting of control valves to the manifold. Plugs .38 NPTF.		**A-65**	
6-Port Hexagon Manifold. Plugs furnished for all ports 3/8"-18 NPTF.		**A-66**	
Premounted Manifolds Split-flow valve to control two or four single-acting cylinders simultaneously. **AM-21** with 5 ports 3/8" NPTF. **AM-41** with 7 ports 3/8" NPTF.		**AM-21**	
		AM-41	

Recommended Tubing

Enerpac does not supply high-pressure pipe or tubing, but recommends the use of cold drawn steel tubing in stead of regular pipe in the following dimensions:
In stead of .25" pipe, use 13 mm O.D. x 11 ga. (3 mm) wall.
In stead of .38" pipe, use 9 mm Schedule 80 seamless pipe.
In steadof .50" pipe, use 21 mm O.D. x .4 mm wall.
This tubing can be threaded with standard pipe threading dies.

A, AM BFZ FZ HF Series

Fittings 700 bar

		Model Number	Dimensions (mm)				
			A	B	C	D	
Street Elbow From: 3/8"-NPTF Male To: 3/8"-NPTF Female		FZ-1616	23	33	3/8"-18 NPTF	3/8"-18 NPTF	
Reducing Connector From: 3/8"-NPTF Female To: 1/4"-NPTF Female		FZ-1615	28	25	3/8"-18 NPTF	1/4"-18 NPTF	
From: 1/2"-NPTF Female To: 3/8"-NPTF Female		FZ-1625	47	29	1/2"-14 NPTF	3/8"-18 NPTF	
Hexagon Nipple From: / To: 1/4"-NPTF / 1/4"-NPTF 3/8"-NPTF / 3/8"-NPTF 3/8"-NPTF / 3/8"-NPTF		FZ-1608	38	16	1/4"-18 NPTF	1/4"-18 NPTF	
		FZ-1619	51	19	3/8"-18 NPTF	3/8"-18 NPTF	
		FZ-1617	37	19	3/8"-18 NPTF	3/8"-18 NPTF	
Coupling From: / To: 3/8"-NPTF / 3/8"-NPTF 1/4"-NPTF / 1/4"-NPTF		FZ-1614	29	23	3/8"-18 NPTF	3/8"-18 NPTF	
		FZ-1605	29	19	1/4"-18 NPTF	1/4"-18 NPTF	
Cross From: 3/8"-NPTF Female To: 3/8"-NPTF Female		FZ-1613	45	25	3/8"-18NPTF	–	
Tee From: / To: 3/8"-NPTF / 3/8"-NPTF 1/4"-NPTF / 1/4"-NPTF 3/8"-NPTF / 3/8"-NPTF		FZ-1612	45	25	3/8"-18 NPTF	–	
		FZ-1637	45	24	1/4"-18 NPTF	–	
		BFZ-16312	57	3/8"-18 NPTF	3/8"-18 NPTF	–	
Elbow From: / To: 3/8"-NPTF / 3/8"-NPTF 1/4"-NPTF / 1/4"-NPTF		FZ-1610	33	20	3/8"-18 NPTF	–	
		FZ-1638	36	24	1/4"-18 NPTF	–	
Reducer From: / To: 3/8"-NPTF / 1/4"-NPTF 1/4"-NPTF / 1/2"-NPTF 3/8"-NPTF / G1/4"		FZ-1630	19	19	1/4"-18 NPTF	3/8"-18 NPTF	
		BFZ-1630	28	22	1/4"-18 NPTF	1/2"-14 NPTF	
		BFZ-16301	19	19	G 1/4"	3/8"-18 NPTF	
Adaptor From: / To: G 1/4" / 1/4"-NPTF G 1/4" / 1/8"-NPTF G 3/8" / 1/4"-NPTF G 3/8" / 3/8"-NPTF		BFZ-16411	35	19	1/4"-18 NPTF	G 1/4"	
		BFZ-16421	31	19	1/8"-27 NPTF	G 1/4"	
		BFZ-16323	43	24	1/4"-18 NPTF	G 3/8"	
		BFZ-16324	43	24	3/8"-18 NPTF	G 3/8"	
Adaptor From: / To: 1/4"-NPTF / 3/8"-NPTF 1/4"-NPTF / 1/8"-NPTF 1/2"-NPTF / 3/8"-NPTF		FZ-1055	44	23	1/4"-18 NPTF	3/8"-18 NPTF	
		FZ-1642	30	19	1/8"-27 NPTF	1/4"-18 NPTF	
		FZ-1634	42	28	3/8"-18 NPTF	1/2"-14 NPTF	

Hydraulic Force & Pressure Gauges

ENERPAC Hydraulic Technology Worldwide

▼ Shown from left to right: **GP-230B, GF-835B, GP-10S**

- **GF-series gauges: calibrated with dual scale reading for pressure and force in bar and kN**
- **GF-series gauges: all pressure sensing parts are sealed and dampened by glycerine for long life**
- **GP-series gauges: calibrated with dual scale reading for pressure in bar and psi**
- **Excellent readability: gauge face dimensions 100 mm**
- **Fast, easy installation**
- **Stainless steel gauge cases for corrosion resistance**

▼ *A GP-10S gauge is used on this press to check the hydraulic pressure required to bend flat steel bar.*

Visual Reference for System Pressure and Force

Auto-Damper Valve V-10

For automatic control of gauge fluctuations, the **V-10** Auto-Damper Valve controls the movement of the gauge needle by restricting oil flow in and out of the gauge. No adjustments needed.

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Snubber Valve V-91

Infinitely adjustable for metering oil out of a gauge. The **V-91** Snubber Valve is also suitable as a shut-off valve to protect the gauge during high cycle applications.

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	Used With
	All Cylinders
	All Cylinders
	All 5 ton Cylinders
	All 10 ton Cylinders
	All 25 ton RC-Cylinders
	All 50 ton Cylinders
	13 ton RCH-Series
	RCS-201, 302
	RCS-502, 1002
	RCH-202, 302, 603
	All 25, 30, 50 ton cylinders
	All 75, 100 ton cylinders
	All 150, 200 ton cylinders
	10 ton VLP Presses
	25 ton VLP Presses
	50 ton VLP, BPR Presses
	100 ton VLP, BPR Presses
	200 ton VLP, BPR Presses

Hydraulic Force & Pressure Gauges

Maximum Indicator Pointer
Indicator retains peak readings of pressure or force generated by the system. Order model nr: **BSA-881**.

Can easily be installed on GP-Series dry gauges.

Pressure Gauges
To measure the input pressure into cylinders or high pressure systems. Also for all testing applications.

Load Gauges
To measure external load supported by a cylinder or jack in kN. For pressing parts together under pre-determined loads, weighing, testing, etc.

GP-Series are dry gauges.
GF-Series are glycerine filled gauges.

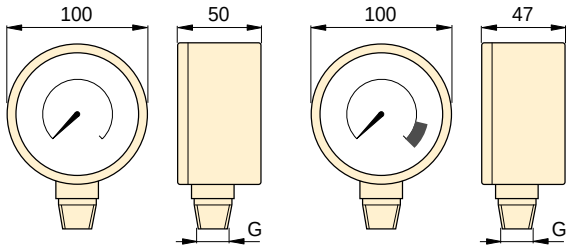
GF GP Series

Pressure Range:
0 - 1000 bar

Force Range:
0 - 2000 kN

Gauge Face Diameter:
100 mm

Accuracy, % of full scale:
± 1%



GP-serie GF-serie

Gauge Type and Calibration				Units per Division	Model Number*	Thread G	Gauge Adaptor Required		
							 132		
bar	psi	bar	kN				GA-1	GA-2	GA-3
0-700	0-10.000	–	–	10 bar, 100 psi	**GP-10S**	½" NPTF	●	●	
0-1000	0-15.000	–	–	10 bar, 200 psi	**GP-15S**	½" NPTF	●	●	
–	–	0-700	0-45	10 bar, 0,5 kN	**GF-5B**	½" NPTF	●	●	
–	–	0-700	0-100	10 bar, 1 kN	**GF-10B**	½" NPTF	●	●	
–	–	0-700	0-232	10 bar, 2 kN	**GF-20B**	½" NPTF	●	●	
–	–	0-700	0-500	10 bar, 5 kN	**GF-50B**	½" NPTF	●	●	
–	–	0-700	0-124	10 bar, 1 kN	**GF-120B**	½" NPTF	●	●	
–	–	0-700	0-175/275	10 bar, 2 + 5 kN	**GF-230B**	½" NPTF	●	●	
–	–	0-700	0-450/900	10 bar, 5 + 10 kN	**GF-510B**	½" NPTF	●	●	
–	–	0-700	0-210/320/570	10 bar, 5 kN	**GF-813B**	¼" NPTF			●
–	–	0-700	0-232/300/500	10 bar, 5 kN	**GF-835B**	¼" NPTF			●
–	–	0-700	0-720/930	10 bar, 10 kN	**GF-871B**	¼" NPTF			●
–	–	0-700	0-1400/2000	10 bar, 25 kN	**GF-200B**	¼" NPTF			●
–	–	0-700	0-100	10 bar, 1 kN	**GF-10B**	½" NPTF	●	●	
–	–	0-700	0-232	10 bar, 2 kN	**GF-20B**	½" NPTF	●	●	
–	–	0-700	0-500	10 bar, 5 kN	**GF-50B**	½" NPTF	●	●	
–	–	0-700	0-720/930	10 bar, 10 kN	**GF-871B**	¼" NPTF			●
–	–	0-700	0-1400/2000	10 bar, 25 kN	**GF-200B**	¼" NPTF			●

* GF-Series Force gauges with imperial scale reading (psi, lbs) are available by changing the suffix 'B' into 'P'.

G, H-Series, Hydraulic Pressure Gauges

ENERPAC Hydraulic Technology Worldwide

▼ Shown from left to right: **H4049L, G-2534R, G-4089L, G-2535L, G-4040L**

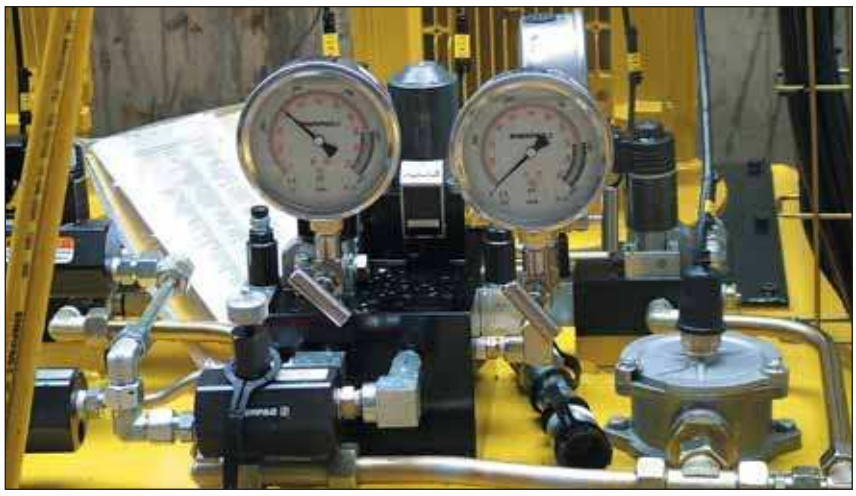
Visual Reference of System Pressure

Glycerine Filled (G-Series)

- **Dual scale reading calibrated in bar and psi**
- **All pressure sensing parts sealed and dampened by glycerine for long life**
- **Includes safety blow-out disk and pressure equalizing membrane**
- **Gauge snubbers or needle valves recommended for high cycle applications**

High Cycle Dry Gauges (H-Series)

- **Dual scale reading calibrated in bar and psi**
- **Ideal for use in many applications, specifically for high cycle and harsh environments**
- **Gauge snubbers or needle valves recommended to shut off gauge when not in use**



◀ *When lifting or pressing, always use a gauge. A gauge is your 'window' to the system. It lets you see what's going on.*

Gauge adaptor

For easy gauge installation into almost any system, Enerpac offers a complete line of gauge adaptors.

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Snubber Valve V-91

Infinitely adjustable for metering oil out of a gauge. The V-91 Snubber Valve is also suitable as a shut-off valve to protect the gauge during high cycle applications.

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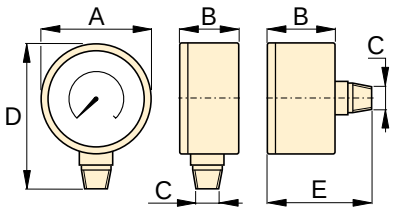
Hydraulic Pressure Gauges



Dimensions (mm)						
Size	Connection	A	B	C	D	E
63	Lower Mount	63	37	1/4" NPTF	84	–
63	Center Rear	63	37	1/4" NPTF	–	63
100	Lower Mount	100	29	1/4" NPTF	121	–
100	Lower Mount	100	49	1/2" NPTF	136	–

Note: dimensions for reference only.

G H Series

Pressure Range:
0-1000 bar/15.000 psi

Face Diameter:
63-100 mm

Accuracy, % of full scale:
±1,0 - 1,5%

Maximum Indicating Pointer

Indicator retains peak readings of pressure or force generated by the system.
Order model number: **BSA-881**.

Note: For use on H-Series of gauges only.

▼ SELECTION CHART

Gauge Series	Pressure Range		Model Number				Major Graduation		Minor Graduation		Major Graduation		Minor Graduation	
			ø 63 1/4 NPTF Lower Mount	ø 63 1/4 NPTF Center Rear	ø 100 1/4 NPTF Lower Mount	ø 100 1/2 NPTF Lower Mount	bar				psi			
	(bar)	(psi)	Accuracy: ± 1,5 %		Accuracy: ± 1,0 %		ø 63	ø 100	ø 63	ø 100	ø 63	ø 100	ø 63	ø 100
G-Series	0-7	0-100	**G2509L**	–	–	–	1	–	0,01	–	10	–	2	–
	0-11	0-160	**G2510L**	–	–	–	1	–	0,02	–	10	–	2	–
	0-14	0-200	**G2511L**	–	–	–	1	–	0,02	–	50	–	5	–
	0-20	0-300	**G2512L**	–	–	–	5	–	0,50	–	50	–	5	–
	0-40	0-600	**G2513L**	–	–	–	10	–	1	–	100	–	10	–
	0-70	0-1.000	**G2514L**	**G2531R**	–	–	10	–	1	–	100	–	20	–
	0-140	0-2.000	**G2515L**	–	–	–	10	–	2	–	500	–	50	–
	0-200	0-3.000	**G2516L**	–	–	–	50	–	5	–	500	–	50	–
	0-400	0-6.000	**G2517L**	**G2534R**	–	–	100	–	10	–	1000	–	100	–
	0-700	0-10.000	**G2535L**	**G2537R**	**G4088L**	**G4039L**	100	100	10	10	2000	1000	200	100
	0-1000	0-15.000	**G2536L**	**G2538R**	**G4089L**	**G4040L**	100	100	20	20	3000	3000	200	200
H-Series	0-700	0-10.000	–	–	**H4049L**	**H4071L**	–	100	–	10	–	1000	–	100

Test System Gauges

ENERPAC Hydraulic Technology Worldwide

▼ Gauge shown: **T-6003L**

T Series

Pressure Range:
0 - 3500 bar

Face Diameter:
152 mm

Accuracy, % of full scale:
±0,5 - 1,5%

Cone Mount Gauge Adaptor

Contains fittings to connect 0,25" cone fitting gauge to 0,38" cone system. Kit includes 43-301 tee and 43-704 gauge adaptor. Order model number: **83-011**.

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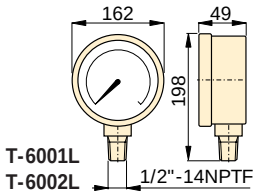
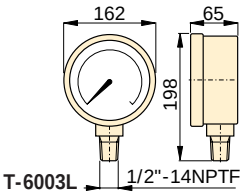
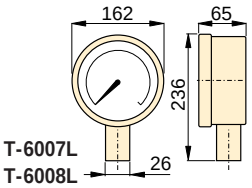
Cone Mount Gauge Connector

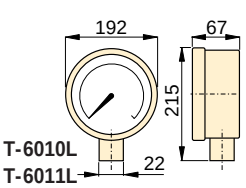
For connecting gauges with 0,25" cone fitting directly to model number **11-100** or **11-400** pump (page 76). May be used with other 0,25" cone systems
Order model number: **43-704**

- **Dual scale reading calibrated in bar and psi**
- **All gauges have spring-loaded backs with rubber blow-out plugs to protect case assembly in case of over-pressurization**
- **Integral maximum indicator pointer standard included**
- **2800 and 3500 bar models include flange mounting**
- **1/2" NPTF versions are made of high strength alloy steel**
- **0,25" cone models are made of 316 stainless steel, with 403 stainless steel on 2800 and 3500 bar models**









▼ *An Enerpac P-2282 hand pump equipped with a T-6011L test system gauge is used for proof pressure testing of hydraulic valves.*

Pressure Range (bar)	Pressure Range (psi)	Model Number: Alloy Steel 1/2 NPTF	Model Number: Stainless Steel 0,25" Cone	Number Intervals (bar)	Graduation Intervals (bar)	Number Intervals (psi)	Graduation Intervals (psi)
0-70 [1]	0-1000	**T-6001L**	–	10	1	100	10
0-350 [1]	0-5000	**T-6002L**	–	50	5	500	50
0-700 [1]	0-10.000	**T-6003L**	**T-6007L**	100	10	1.000	100
0-1400 [1]	0-20.000	–	**T-6008L**	200	20	1.000	100
0-2800 [2]	0-40.000	–	**T-6010L**	500	20	5.000	200
0-3500 [2]	0-50.000	–	**T-6011L**	500	50	5.000	200

[1] Acccuracy ± 0,5%
[2] Acccuracy ± 1,5%

Digital Hydraulic Pressure Gauges

▼ Shown: **DGR-1**

DGR Series

Pressure Range:
0 - 1000 bar

Voltage:
3 Volt (battery)

Accuracy, % of full scale:
± 0,2%

- **Two modes**
  - **Automatic shut off (15 min)**
  - **Continuous display**
- **Zero reset - ensures that gauge reads actual system pressure**
- **Maximum and minimum pressure displayed**
- **Peak On/Off mode for 5000/second measuring mode**
- **Rated for system pressure up to 1000 bar**
- **IP65 protection**
- **Displays high pressure in bar, psi, and MPa; low pressure in kPa, MPa, hPa and mbar**
- **Display can be rotated 355 degrees for easy reading and use in all positions**
- **3 Volt battery included (type CR2430) with 1400 hours continuous operation in standard mode**

Gauge adaptor

For easy gauge installation into almost any system, Enerpac offers a complete line of gauge adaptors.

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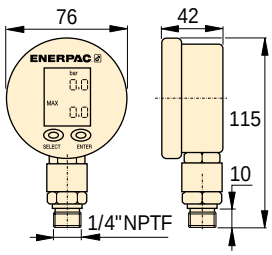


High Pressure Rating bar		High Pressure Rating MPa		Model Number	Low Pressure Rating kPa		Low Pressure Rating mbar, hPa	
Range	Interval	Range	Interval		Range	Interval	Range	Interval
0-1000	0,2	0-100	0,02	**DGR-1**	0-20.000	200	0-20.000	200

High Pressure Rating: 0-15.000 psi, interval 3 psi. Weight: 0,23 kg.

▼ *Greater accuracy and easier to read: enhance your ability to monitor and control hydraulic system pressure up to 1000 bar.*

Gauge Accessories

ENERPAC Hydraulic Technology Worldwide

▼ Shown from left to right: **GA-3, V-91, GA-1, GA-2, GA-4, NV-251, GA-918**

GA/NV/V Series

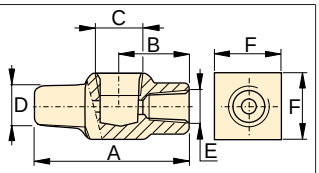
Operating Pressure:
700 bar

▼ *A gauge is easily installed into your hydraulic system using a gauge adaptor.*

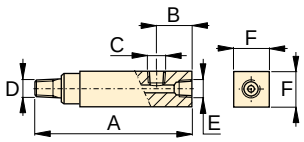
Gauge Adaptors (GA-Series)

- For easy mounting of a pressure gauge onto your system
- Male end screws into pump or cylinder port, female end accepts hose or coupler, 3rd port is for gauge connection
- GA-918 provides for swivel connection

Model Number	Gauge Port (NPTF)	Male End (NPTF)	Female End (NPTF)	Dimensions (mm)					
				A	B	C	D	E	F
GA-1	1/2"	3/8"	3/8"	71	31	1/2" NPTF	3/8" NPTF	3/8" NPTF	32
GA-2	1/2"	3/8"		155	35	1/2" NPTF	3/8" NPTF	3/8" NPTF	32
GA-3	1/4"	3/8"		133	48	1/4" NPTF	3/8" NPTF	3/8" NPTF	32
GA-4	1/2"	1/4"		111	35	1/2" NPTF	1/4" NPTF	3/8" NPTF	32



GA-1

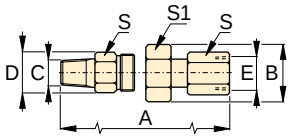


GA-2, GA-3, GA-4

Swivel Adaptor (GA-918)

- Simplifies gauge installation and reading

Model Number	Dimensions (mm)						
	A	B	C	D	E	S	S1
GA-918	117	43	1/2" NPTF	28,5	1/2" NPTF	29	38

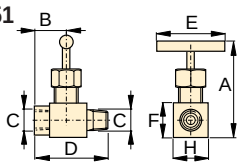


Needle Valves (V- and NV-Series)

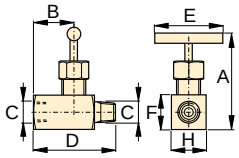
- Both NV-251 and V-91 provide positive shut-off
- 303 stainless steel stem, 16 threads/in (NV-251)

Model Number	Orifice (mm)	Thread Size	Dimensions (mm)						
			A	B	C	D	E	F	H
NV-251	4,3	1/4" NPTF	57	29	1/4" NPTF	57	46	19	19
V-91	4,8	1/2" NPTF	89	32	1/2" NPTF	64	32	37	37

NV-251



V-91



Valves Section Overview

ENERPAC hydraulic valves are available in a wide variety of models and configurations.

Whatever your requirements… directional control, flow control, or pressure control… you can be sure that Enerpac has the correct valve to match your application exactly.

Designed and manufactured for safe operation up to 700 bar, the range of Enerpac valves allows for direct pump mounting, remote mounting, manual or solenoid actuation, and in-line installation, giving you flexible solutions to control your hydraulic system.

3-Way Directional Control Valves

ENERPAC Hydraulic Technology Worldwide

▼ Shown from left to right: **VE32D, VE33, VC-3L, VM33L, VM32**

For Reliable Control of Single-Acting Cylinders

- **User adjustable relief valves on VM- and VE-Series allow the operator to easily set the working pressure for each application**
- **All VM- and VE-series valves feature several gauge ports for "system", A and B port pressure monitoring**
- **All valves (except VM32, VE32D and VC-Series) include manifold with built-in "System Check" feature, for more precise pressure holding and improved system control**
- **VM33 has improved porting for faster cylinder retraction while pump motor is running**
- **VE-Series solenoid valves include wire and connectors**
- **Manual or solenoid operation.**

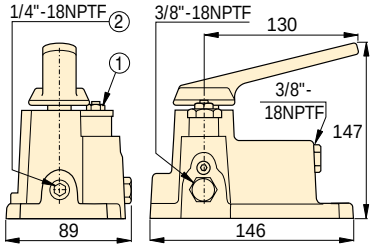
Valving Help
See Basic System Set-Up and Valve Information in our 'Yellow Pages'
Page: 118

Valve Operation	Valve Location	Valve Type
Manual	Pump Mounted	3-way, 2-position
Manual	Pump Mounted	3-way, 3-position, Tandem Center
Manual	Pump Mounted	3-way, 3-position, Tandem Center, Locking [1]
Manual	Remote Mounted [3]	3-way, 3-position Tandem Center
Manual	Remote Mounted [3]	3-way, 3-position Tandem Center, Locking [1]
Manual	Remote Mounted [3]	3-way, 3-position Closed Center
Manual	Remote Mounted [3]	3-way, 3-position Closed Center, Locking [1]
Solenoid 24 VDC	Pump Mounted	3-way, 2-position [2]
Solenoid 24 VDC	Pump Mounted	3-way, 2-position Dump
Solenoid 24 VDC	Pump Mounted	3-way, 3-position Tandem Center

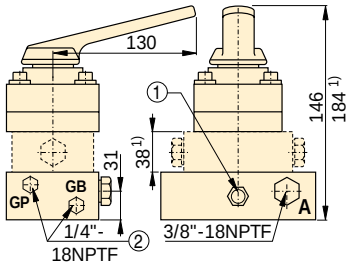
[1] with pilot-operated check valve.
[2] VE32 provides "HOLD" function by turning off pump and holding pressure against system check.

◀ *A typical multi-cylinder control set-up using solenoid directional control valves.*

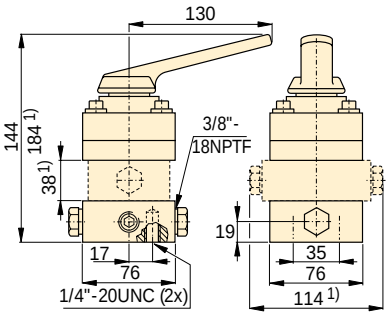
3-Way Directional Control Valves



VM32

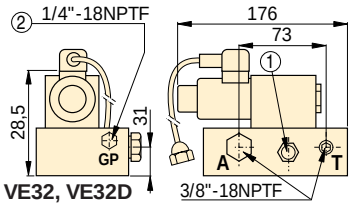


VM33, VM33L 1) for VM33L only



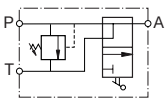
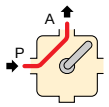
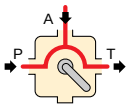
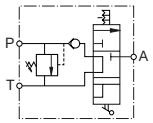
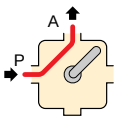
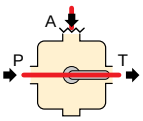
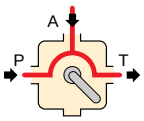
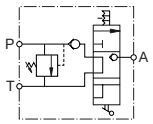
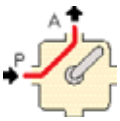
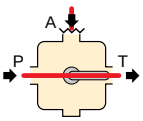
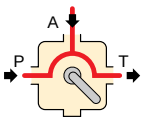
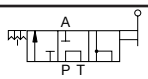
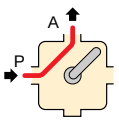
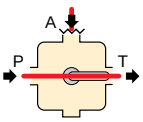
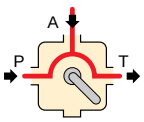
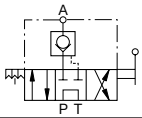
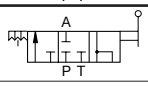
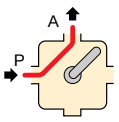
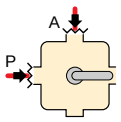
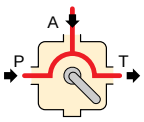
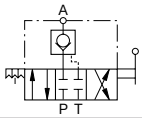
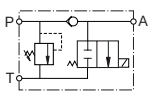
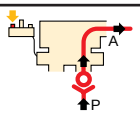
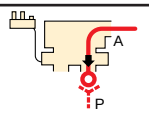
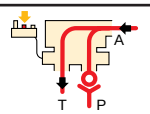
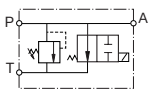
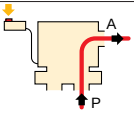
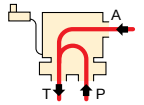
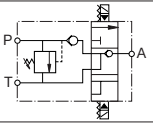
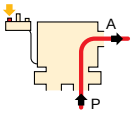
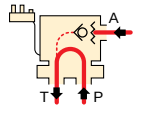
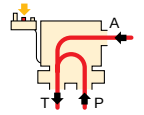
VC-3, VC-3L, VC-15, VC-15L

1) VC-3L and VC-15L only



VE32, VE32D

① adjustable relief valve ② auxiliary ports

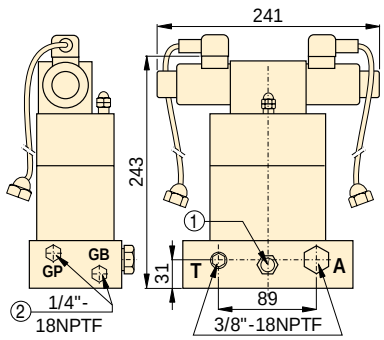
Model Number	Hydraulic Symbol	Schematic Flowpath: Advance	Hold	Retract	(kg)
VM32					2,5
VM33					3,0
VM33L					4,8
VC-3 3)					2,9
VC-3L 3)					4,7
VC-15 3)					2,9
VC-15L 3)					4,7
VE32					3,9
VE32D					3,9
VE33					9,2

3) VC-Series remote valves include Return line kit VRL-10.

VC/VM VE Series

Flow Capacity:
17 l/min

Maximum Operating Pressure:
700 bar



VE33

Locking Valves

For applications requiring positive load holding, VM- and VC-Series valves (except VM32) are available with a pilot-operated check valve. This provides hydraulic locking of the load until the valve is shifted into the retract position. To order this feature, place an **"L"** at the end of the model number

Pendants for VE-Series Solenoid Valves

When ordering Enerpac VE-Series solenoid valves, the pendant must be ordered separately. Pendant connection to be plugged into electric box of pump.

To be used with solenoid valves:	Pendant Model Nr.
VE32D	ZCP-1
VE32, VE33	ZCP-3

4-Way Directional Control Valves

ENERPAC Hydraulic Technology Worldwide

▼ Shown from left to right: **VM43, VE43, VC-20L**

For Double-Acting Cylinder Control

Valving Help

See Basic System Set-Up and Valve Information in our 'Yellow Pages'

Page: 118

User Adjustable Relief Valve

All VM- and VE-Series have a user adjustable relief valve to allow the operator to easily set the optimum working pressure.

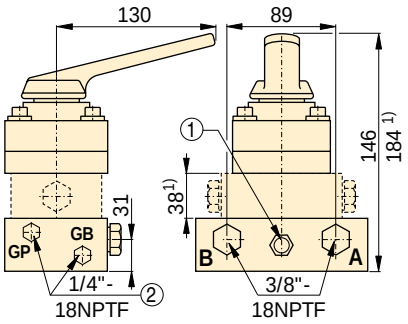
- **User adjustable relief valves on VM- and VE-Series allow the operator to easily set the working pressure for each application**
- **All VM- and VE-Series valves feature several gauge ports for "system", A and B port pressure monitoring**
- **All valves (except VC-Series) include manifold with built-in "System Check" feature, for more precise pressure holding and improved system control**
- **VE43 solenoid valve includes wire and connectors**
- **Manual or solenoid operation.**

▼ *In a fine control 120 ton hydraulic system for lifting a string of anchors in a subsea pipeline project, the VC-4 remote valve provides safety shutdown capacity on the ship's deck.*

Valve Operation	Valve Location	Valve Type
Manual	Pump Mounted	4-way, 3-position, Tandem Center
Manual	Pump Mounted	4-way, 3-position, Tandem Center, Locking
Manual	Pump Mounted	4-way, 3-position, Tandem Center,
Manual	Remote Mounted	4-way, 3-position, Tandem Center, Locking [1]
Manual	Remote Mounted	4-way, 3-position, Closed Center
Manual	Remote Mounted	4-way, 3-position, Closed Center, Locking [1]
Solenoid 24 VDC	Pump Mounted	4-way, 3-position, Tandem Center

[1] with pilot-operated check valves.

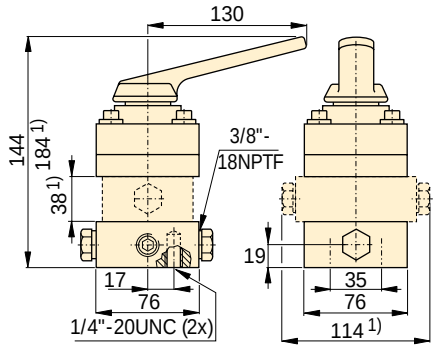
4-Way Directional Control Valves



① adjustable relief valve
② auxiliary ports

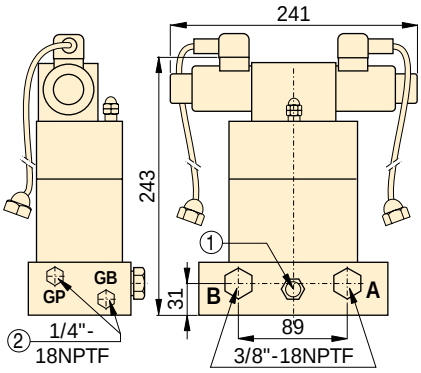
VM43, VM43L

1) for VM43L only

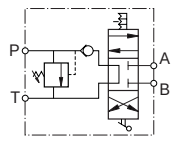
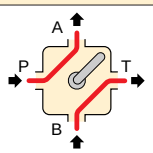
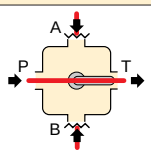
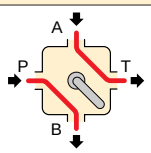
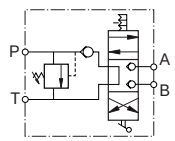
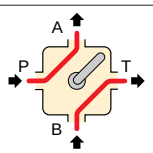
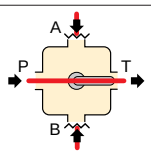
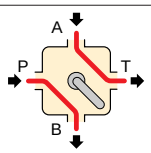
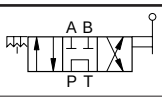
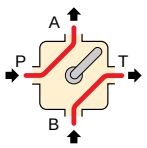
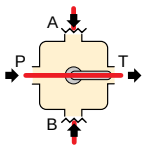
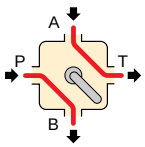
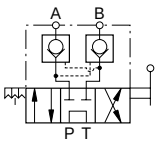
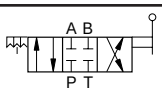
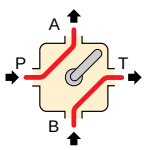
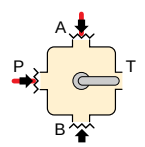
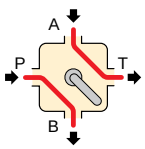
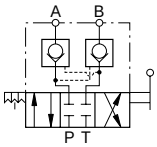
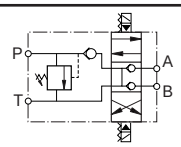
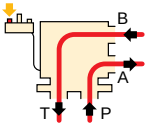
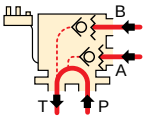
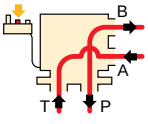


VC-4, VC-4L, VC-20, VC-20L

1) VC-4L and VC-20L only



VE43

Model Number	Hydraulic Symbol	Schematic Flowpath: Advance	Schematic Flowpath: Hold	Schematic Flowpath: Retract	(kg)
VM43					3,1
VM43L					4,9
VC-4 [2]					2,9
VC-4L [2]					4,7
VC-20 [2]					2,9
VC-20L [2]					4,7
VE43					9,3

2) VC-Series remote valves include Return line kit VRL-10.

VC/VM VE Series

Flow Capacity:
17 l/min

Maximum Operating Pressure:
700 bar

Fittings

For additional fittings see the fitting page of the System Components section.

Page: 125

Locking Valves

For applications requiring positive load holding, VM- and VC-Series valves are available with a pilot-operated check valve. This provides hydraulic locking of the load until the valve is shifted into the retract position. To order this feature, place an **"L"** at the end of the model number

Pendants for VE-Series Solenoid Valves

When ordering Enerpac VE-Series solenoid valve, the pendant must be ordered separately. Pendant connection to be plugged into electric box of pump.

To be used with solenoid valve:	Pendant Model Nr.
VE43	ZCP-3

Pressure and Flow Control Valves

ENERPAC Hydraulic Technology Worldwide

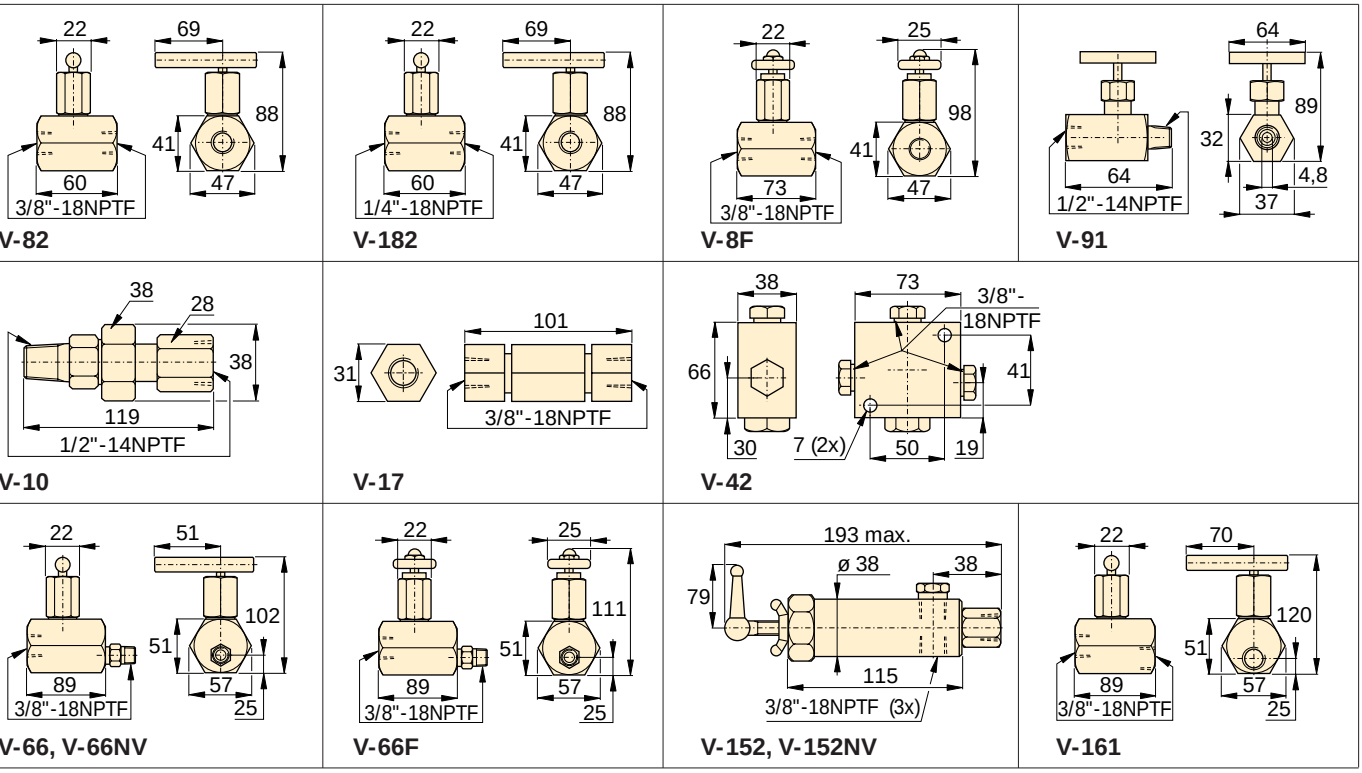
▼ From left to right: **V-152, V-66, V-82, V-161, V-42, V-17**

Your Hydraulic Control Solution

Valve Applications
To see these valves used in typical hydraulic circuits, please see our 'Yellow Pages'.
Page: 112

- **All valves are rated for 700 bar operating pressure**
- **All valves feature NPTF porting to insure against leakage at rated pressure**
- **All valves are painted, coated, or plated for corrosion resistance**
- **Viton® seals (in V-66NV and V-152NV) for high temperature applications, nickel-plated for maximum corrosion resistance**

▼ *The V-152 pressure relief valve limits the pressure or force developed in the hydraulic system.*



Valve dimensions in mm

Pressure and Flow Control Valves

Premounted Manifolds

For two or four port manifolds with integral flow control valves, see the manifold page of the System Components section.

Page: 124

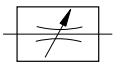
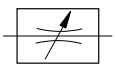
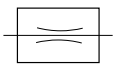
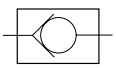
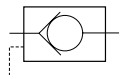
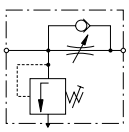
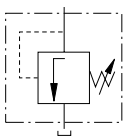
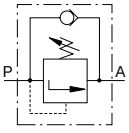
Fittings

For additional fittings see the fitting page of the System Components section.

Page: 125

V Series

Maximum Operating Pressure:
700 bar

Valve Type and Model Number		Description		Hydraulic Symbol
Needle Valve **V-82** **V-182** **V-8F**		**V-82:** To control cylinder speed. Can also be used as shut-off valve for temporary load holding. 3/8" NPTF female ports. **V-182**: Same as V-82, but with	1/4" NPTF female ports. Also suitable for gauge snubbing (also V-82). **V-8F:** Like V-82, but with very fine metering for precise flow control. **Not recommended as shut-off valve.**	
Snubber Valve **V-91**		**V-91:** Infinitely adjustable for metering oil out of a gauge to prevent snapping of gauge pointer when load or pressure is suddenly released. Also suitable as shut-off	valve to protect the gauge during high cycling applications. 1/2" NPTF male and female threads for use with GA-1, GA-2 or GA-4 gauge adaptors.	
Auto Damper® Valve **V-10**		**V-10:** To be used when gauge pressure must be monitored during high cycle applications. Creates a flow resistance when load is released suddenly.	No adjustments are necessary. 1/2" NPTF male and female threads for use with GA-1, GA-2 or GA-4 gauge adaptors.	
Check Valve **V-17**		**V-17:** Ruggedly built to resist shock and operate with low pressure drop. Closes smoothly without pounding. 3/8" NPTF female ports.		
Pilot Operated Check Valve **V-42**		**V-42:** Can be mounted at the cylinder to hold the load in case of system pressure loss. Normally used with double-acting cylinders where pilot port receives pressure from a	Tee-fitting in the cylinder retract line. 3/8" NPTF female ports. Pilot presure ratio 14% (6,5:1).	
Manually Operated Check Valve **V-66, V-66NV *** **V-66F**		**V-66, V-66NV:** For load holding applications with single and double acting cylinders. Valves allow oil to flow back to tank when cylinder retracts. V-66NV with Viton seals,	nickel-plated. **V-66F:** Similar to V-66, but with very fine metering capability for precise flow control. V-66F is not designed for load holding.	
Pressure Relief Valve **V-152** **V-152NV ***		**V-152:** Limits pressure developed by the pump in hydraulic circuit, thus limiting the force imposed on other components. Valve opens whenever preset pressure is reached.	To increase pressure setting, turn handle clockwise. Includes: • 0,9 m return line hose kit, • ±3% repeatability, • 55-700 bar adjustment range.	
Sequence Valve **V-161**		**V-161:** To control oil flow to a secondary circuit. Flow is blocked until system pressure rises to the V-161 setting. When this pressure level is reached, the V-161 opens to	allow flow to the secondary circuit. A pressure differential is always maintained between the primary and secondary circuit. **Min. operating pressure: 140 bar.**	

* See page 62 for more information about products for use in high temperature and extreme environment applications.

Enerpac Hydraulic Presses

ENERPAC Hydraulic Presses are available in a variety of capacities and sizes. The press frames are welded for maximum strength and durability. Strong frames and powerful high-pressure hydraulics will provide years of dependable service in many applications.

Enerpac Presses are available in Bench, C-Frame, Arbor, Workshop and Roll-Frame models.

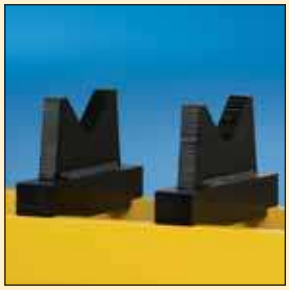
For safety reasons, all Enerpac presses with air and electric-drive pumps can be supplied with hand operated valves. This allows operation only when the valve handle is hand-held in the appropriate position. Once released, the valve automatically returns to the centre (hold) position.

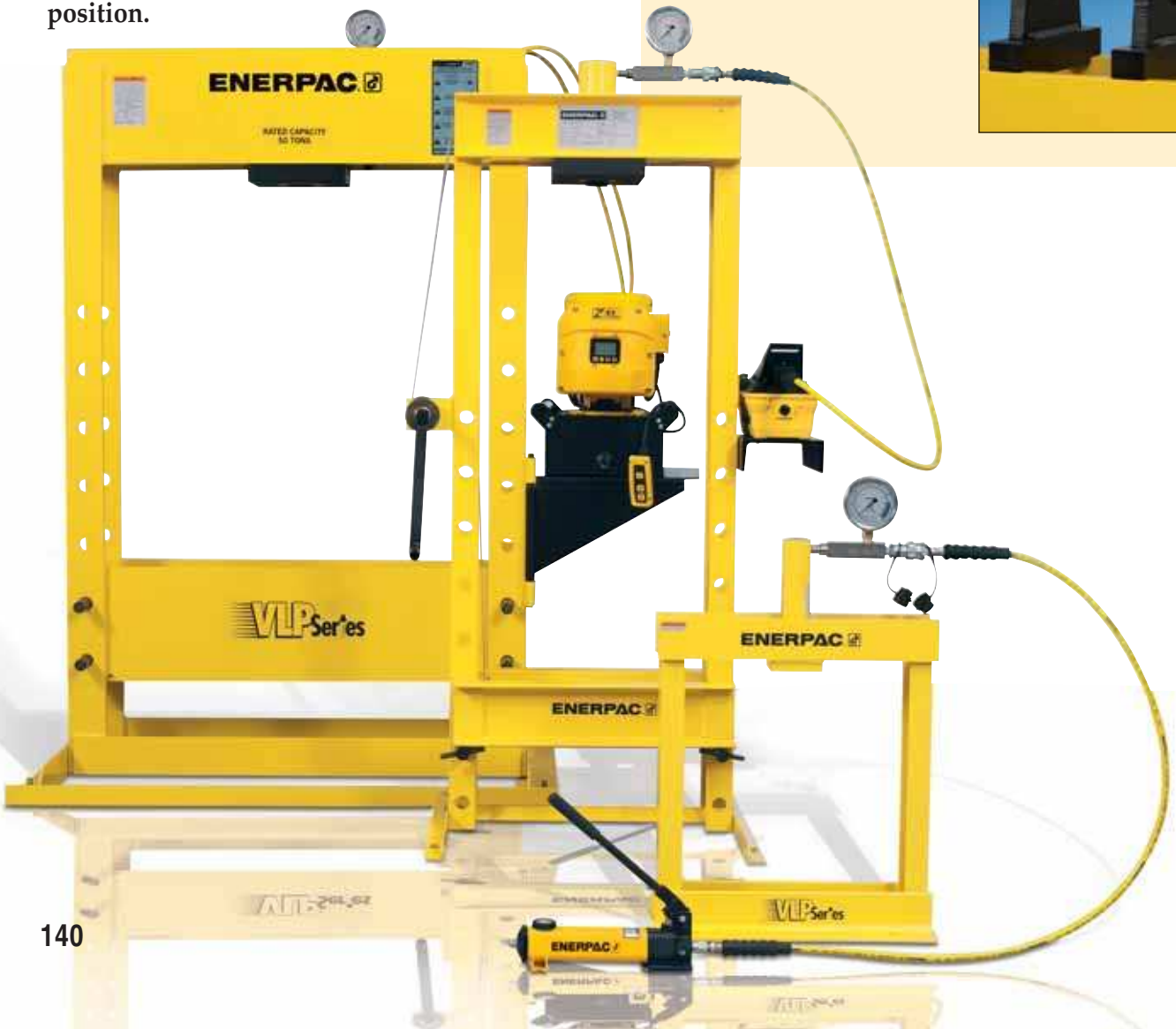
These Press features increase productivity and broaden the range of applications:

The exclusive **"Hydrajust" bed positioning** is standard on 50, 100 and 200 ton VLP-Series workshop presses with double-acting cylinder, allowing adjustment of the lower bed.

Moveable pumptable on presses with electric pumps allow for easy side loading of large workpieces.

Optional "V-blocks" for positioning of complex parts, are designed with high-strength steel for long life.





Press Section Overview

Capacity ton (kN)	Press type and functions	Serie	Page
10 (101)	**Bench Presses**	**VLP**	 **142** ▶
25-200 (232-1995)	**Workshop Presses**	**VLP**	 **142** ▶
50-200 (498-1995)	**Roll-Frame Presses**	**BPR**	 **144** ▶
5-20 (45-178)	**C-Clamp Presses**	**A**	 **146** ▶
10-30 (101-295)	**Arbor Presses**	**A**	 **146** ▶
10-200 (101-1995)	**Press Accessories** **Press Speed Chart**	**VB, A** **IPL**	 **148** ▶
900-90.000 kg	**Tension Meters** **Load Cells**	**TM** **LH**	 **149** ▶

Available in capacities from 10 to 200 ton, each Enerpac press consists of three basic high quality components: a press frame, a power source and a cylinder.

Welded Frame
All presses feature a welded steel frame for optimum strength. The larger models include features like workpiece side-loading and height adjustment of the lower bed.

Power Source
Depending on the production requirements, Enerpac presses can be powered by manual, air-hydraulic and electric-drive power sources.

Cylinder
Depending on the application, double-acting cylinders offer increased efficiency. Check out the Selection Charts for the press best suited for your needs.

Gauge
All Workshop presses and Roll-Frame Presses feature an easy to monitor pressure/force gauge for increased safety.

IMPORTANT!
The frameworks of the workshop presses are exclusively designed for pressing operations, not for pulling. For pulling applications please contact Enerpac.

In order to fully comply with CE regulations, some presses must be equipped with specific safety components, such as spring centered valves, two-hand control devices or others.

VLP-Series, Bench and Workshop Presses

ENERPAC Hydraulic Technology Worldwide

▼ From left to right: **VLP-506ZE5S, VLP-1006ZE3S, VLP-106P142, VLP256PAT1**

No Workshop can do without one

Optional V-Blocks

To facilitate positioning of pipes and bars, or placed upside-down, to serve as a convenient worktable. Featuring precise fit into the press bolster. Each model number includes two V-blocks.

To be used with VLP-press ton	V-Blocks Model Number
10	**VB-10**
25	**VB-25**
50	**VB-501**
100	**VB-101**
200	**A-200**

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Centered Manual Valves

Manual 3-position valves on electric pumps supplied on VLP-Series presses automatically move to the tandem centre position for safety reasons.

- **Quality welded frame for maximum strength and stability**
- **Optimum daylight and bed width**
- **With hand pump, air or electric driven power source**
- **Single or double-acting GOLDEN RING DESIGN cylinders**
- **Standard glycerine filled gauge with scale reading in kN/bar**
- **Moveable pump table on presses with electric pump allows for easy side loading for large workpieces**
- **Height adjustment of lower bed on 25 ton press with a winch**
- **Unique "Hydrajust" bed positioning device on 50, 100 and 200 ton press with double-acting cylinder allows adjustment of the lower bed**

▼ **SELECTION CHART**

Press Capacity ton (kN)	Maximum Daylight (mm)		Press Model Number	Power Source							Cylinder				
				Pump Type			Valve Type		Pump Model Nr.	*Page:*			Stroke (mm)	Cylinder Model Nr.	*Page:*
	Vertical	Horizontal		Man.	Elec.	Air	Man.	Elec.							
10 (101)	430	432	**VLP-106P142**	●			●		P-142	**68**	●		155	RC-106	**8**
	430	432	**VLP-106PAT1**			●	●		PATG-1102N	**98**	●		155	RC-106	**8**
25 (232)	1225	510	**VLP-256P392**	●			●		P-392	**68**	●		159	RC-256	**8**
	1225	510	**VLP-256PAT1**			●	●		PATG-1102N	**98**	●		159	RC-256	**8**
50 (498)	994	1000	**VLP-506P802**	●			●		P-802	**70**	●		159	RC-506	**8**
	994	1000	**VLP-506ZE5S**		●			●	ZE5410SW-S	**90**		●	155	RR-506	**34**
	994	1000	**VLP-506ZE5C**		●		●		ZE5410CW-S	**90**		●	155	RR-506	**34**
	994	1000	**VLP-5013ZE5S**		●			●	ZE5410SW-S	**90**		●	333	RR-5013	**34**
100 (933)	989	1000	**VLP-1006ZE3C**		●		●		ZE3410CW	**90**		●	168	RR-1006	**34**
	989	1000	**VLP-1006ZE3S**		●			●	ZE3410SW	**90**		●	168	RR-1006	**34**
	989	1000	**VLP-10013ZE3S**		●			●	ZE3410SW	**90**		●	333	RR-10013	**34**
200 [1)]	1340	1220	**VLP-20013ZE4S**		●			●	ZE4420SW	**90**		●	333	RR-20013	**34**

[1)] 1995 kN

= Single-Acting = Double-Acting

Bench and Workshop Presses

Press Gauges

All presses include a gauge and gauge adaptor, matching the press capacity.

Press Capacity ton	Gauge Model Number	Adaptor Model Number
10	GF-10B	GA-4
25	GF-20B	GA-2
50	GF-50B	GA-2
100	GF-871B	GA-3
200	GF-200B	GA-3

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"Hydrajust" Bed Positioning

Allows vertical adjustment of the lower bed on the 50, 100 and 200 ton VLP press.

The "Hydrajust" bed positioning is not designed to withstand full cylinder capacity, only to be used for bed adjustment.

Page: 148

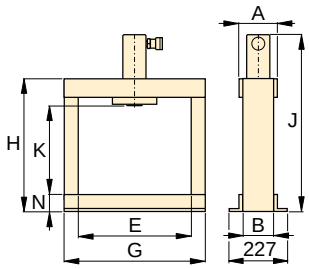
VLP Series

Capacity:
10 - 200 ton

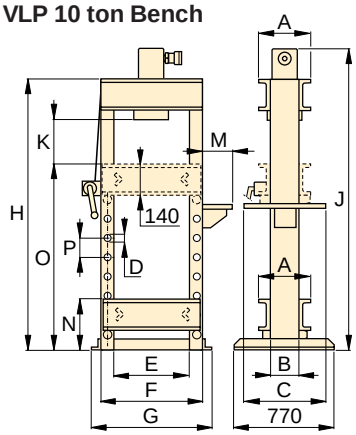
Maximum Daylight x Width:
1340 x 1220 mm

Maximum Operating Pressure:
700 bar

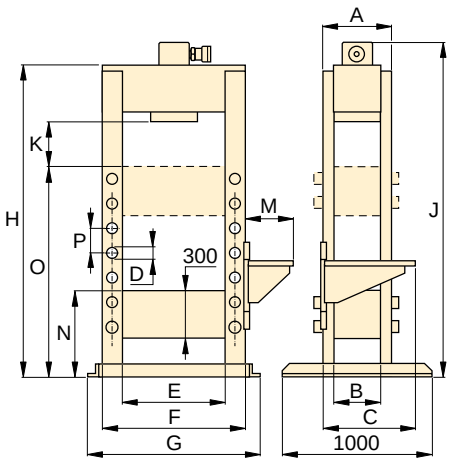
IMPORTANT! The frameworks of the workshop presses are exclusively designed for pressing operations, not for pulling. For pulling applications please contact Enerpac.



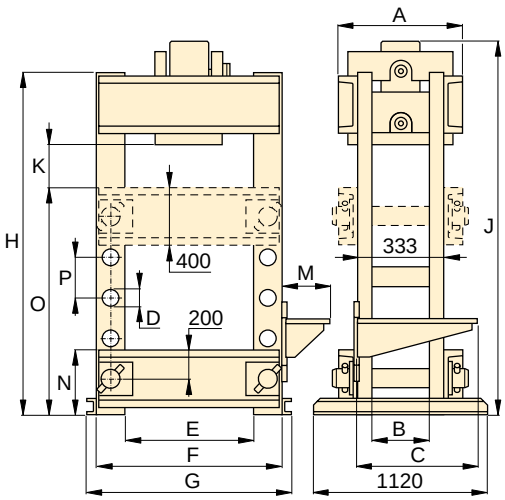
VLP 10 ton Bench



VLP 25 ton



VLP 50 and 100 ton



VLP 200 ton

Speed (mm/sec)*		Dimensions (mm)														Press Model Number
Rapid Advance	Pressing	A	B	C	D	E	F	G	H	J	K	M	N	O	P	(kg)
{2,5} *	{0,6} *	110	80	–	–	432	–	542	620	748	430	–	80	–	–	49	VLP-106P142
10,0	1,8	110	80	–	–	432	–	542	620	748	430	–	80	–	–	54	VLP-106PAT1
{3,4} *	{0,7} *	260	140	510	32	510	630	700	1622	1740	370	140	212	1070	122	165	VLP-256P392
5,0	0,8	260	140	610	32	510	630	700	1622	1740	370	323	212	1070	122	161	VLP-256PAT1
{5,5} *	{0,3} *	290	250	560	32	990	1200	1360	1879	1879	244	425	540	1290	150	595	VLP-506P802
4,1	3,9	290	250	560	32	990	1200	1360	1879	1879	244	425	540	1290	150	675	VLP-506ZE5S
4,1	3,9	290	250	560	32	990	1200	1360	1879	1879	244	425	540	1290	150	660	VLP-506ZE5C
4,1	3,9	290	250	560	32	990	1200	1360	1879	2042	244	425	540	1290	150	700	VLP-5013ZE5S
7,7	0,7	400	340	560	40	990	1240	1400	1879	1885	239	425	540	1290	150	962	VLP-1006ZE3C
7,7	0,7	400	340	560	40	990	1240	1400	1879	1885	239	425	540	1290	150	970	VLP-1006ZE3S
7,7	0,7	400	340	560	40	990	1240	1400	1879	2050	239	425	540	1290	150	993	VLP-10013ZE3S
5,2	0,5	553	233	560	76	1220	1620	1740	2285	2370	377	425	453	1415	254	1992	VLP-20013ZE4S

* {...} = advance speed in mm per handpump stroke.

BPR-Series, Roll-Frame Presses

ENERPAC Hydraulic Technology Worldwide

▼ Shown: **BPR-5075**

Expert Designed Versatility

- **Quality welded frame for maximum strength and long life**
- **Frame rolls easily on 4 steel roller bearings**
- **Exclusive 'Hydra-Lift' bolster for effortless adjustment of the vertical daylight**
- **Roller head design is standard to allow lateral movement and locking of the cylinder up to 300 mm left or right of centre**
- **All models in the quick selection chart have been matched to an electric pump, double-acting cylinder, hose and gauge, offering the complete package**
- **Roll-Frame design features a stationary bed with the ability to support heavy loads**

Cylinder adjustment
Cylinder adjustment allows horizontal side to side cylinder positioning.

Hydra-Lift
Allows easy, effortless daylight adjustment. Standard on all Roll-Frame presses.

Page: **148**

Optional V-Blocks
These V-Blocks are designed for easy fixturing of round stock and other non-uniform materials. Featuring precise fit into the press bolster.

Page: **148**

Press Capacity ton (kN)	Vertical Daylight A (mm) min.	Vertical Daylight A (mm) max.	Maximum Bed Width E (mm)	Electric Pump Model Number	Page	Press Model Number	Double-Acting Cylinder Stroke (mm)	Double-Acting Cylinder Model Number	Page	Speed (mm/sec) Rapid Advance	Speed (mm/sec) Pressing
50 (498)	152	942	730	ZE5420SW-S	**90**	**BPR-5075**	333	RR-5013	**34**	4,1	3,9
100 (933)	159	1048	889	ZE3420SW	**90**	**BPR-10075**	333	RR-10013	**34**	7,7	0,7
200 (1995)	279	1295	1219	ZE4420SW	**90**	**BPR-20075**	330	RR-20013	**34**	5,2	0,5

Roll-Frame Presses

▼ *An BPR-20075 Roll-Frame Press is used to remove a large shaft from this pillow-block assembly. The Roll Frame design allows this heavy part to be safely loaded with an overhead crane.*

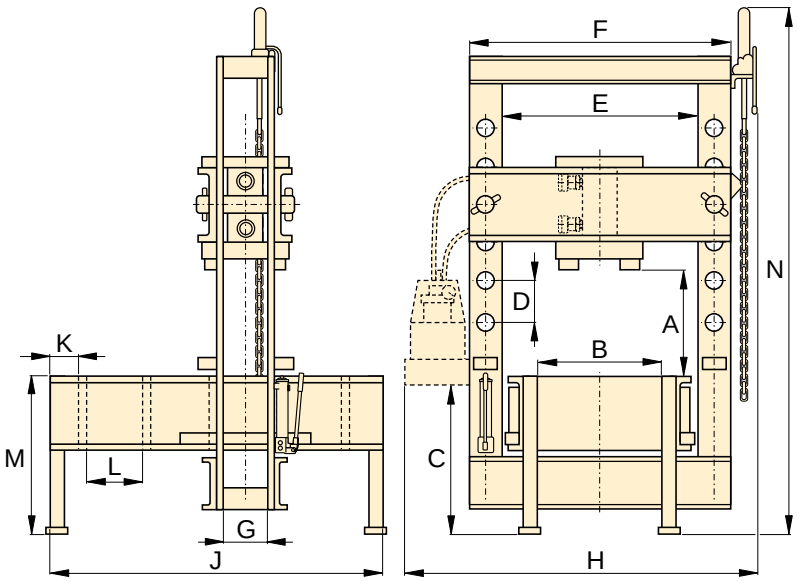
BPR Series

Capacity:
50-200 ton

Maximum Daylight x Width:
1295 x 1219 mm

Maximum Operating Pressure:
700 bar

IMPORTANT!
The frameworks of the presses are exclusively designed for pressing operations, not for pulling. For pulling applications please contact Enerpac.



Gauges

All press models include a gauge and gauge adaptor, matching the press capacity:

Press Capacity ton	Gauge Model Number	Adaptor Model Number
50	**GF-50B**	**GA-2**
100	**GF-871B**	**GA-3**
200	**GF-200B**	**GA-3**

For more information on gauges, please refer to the System Components section.

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Roll-Frame Press Dimensions (mm)														Press Model Number
A (min.-max.)	B	C	D	E	F	G	H	J	K	L	M	N	(kg)	
152-942	526	971	264	730	933	127	1420	1626	203	270	762	2870	917	**BPR-5075**
159-1048	673	965	222	889	1143	146	1605	1676	203	270	813	3021	1767	**BPR-10075**
279-1295	984	933	254	1219	1626	232	2150	2197	203	381	915	3200	4186	**BPR-20075**

A-Series, C-Clamp and Arbor Presses

ENERPAC Hydraulic Technology Worldwide

▼ Shown from left to right: **A-220, A-330 and A-310**

The Standard Workshop Tools

Push Pin A-183

For applications requiring precision pressing, such as shaft removal and insertion. This attachment fits 10 ton cylinders and requires the use of a threaded adaptor saddle (A-13).

Smooth Saddle A-185

For pressing applications of delicate parts, such as aluminium castings, this saddle decreases surface marks during the pressing application. Requires 10 ton cylinder and threaded adaptor saddle (A-13).

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10 ton Bench Presses

For 10 ton VLP-Series Bench Presses selection see:

Page: 142

C-Clamp Press

- **5, 10 and 20 ton capacity**
- **Operational in all positions**

Arbor Press

- **10 and 30 ton capacity**
- **Foot mounting holes for horizontal or vertical positioning**
- **Machined working surfaces for easier fixturing**
- **Slotted back to simplify loading and unloading of longer parts**

◀ *A-310 Abor Press used for compacting powder at 10 ton.*

Press Type	Press Capacity ton (kN)	Maximum Vertical Daylight (mm)	Maximum Bed Width (mm)	Press Model Number	Cylinder Model Number *	Page:
C-Clamp	**5** (45)	165	51	**A-205**	5 ton RC-cylinder*	8
	10 (101)	228	57	**A-210**	10 ton RC-cylinder*	8
	20 (178)	305	70	**A-220**	25 ton RC-cylinder**	8
Arbor	**10** (101)	227	135	**A-310**	10 ton RC-cylinder*	8
	30 (295)	260	178	**A-330**	RC-308*	8

* Recommended cylinder must be ordered separately.

** Must be limited to 20 ton.

C-Clamp and Arbor Presses

▼ *A perfect example of the force and versatility of the Enerpac A-220 C-Clamp press.*

A Series

Capacity:
5-30 ton

Maximum Daylight x Width:
305 x 178 mm

Maximum Operating Pressure:
700 bar

For high-cycle production applications, the C-Clamp and Arbor presses should be limited to 50% of their capacity.

Hydraulic Cylinders

Cylinders for C-Clamps and Arbor Presses must be ordered separately.

Page: 7

Hydraulic Pumps

Pumps for C-Clamps and Arbor Presses must be ordered separately.

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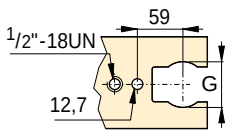
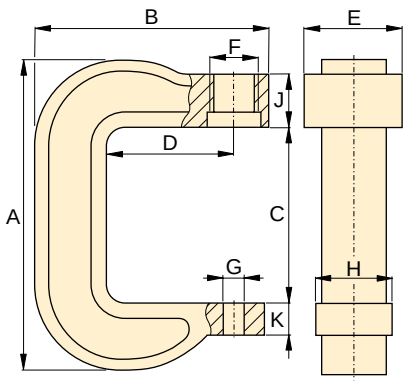
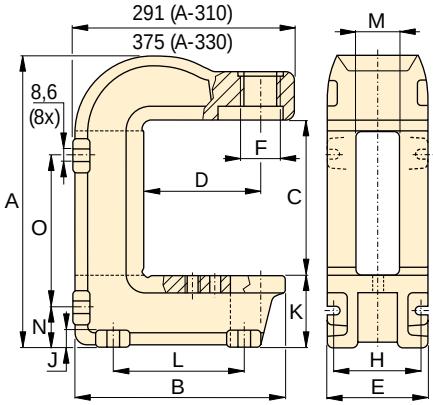
Top View Working Surface





A-205, A-210, A-220

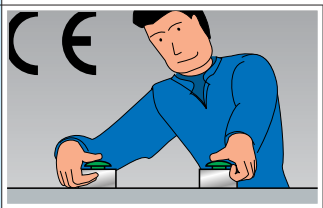


A-310, A-330

Press Dimensions (mm)																Press Model Number
A	B	C	D	E	F	G	H	J	K	L	M	N	O	(kg)	
291	203	165	95	73	1 1/2-16 UN	26	51	66	25	–	–	–	–	7	**A-205**
406	283	228	152	83	2 1/4-14 UN	26	76	64	41	–	–	–	–	17	**A-210**
540	346	305	152	108	3 5/16-12 UN	26	95	70	44	–	–	–	–	38	**A-220**
414	281	227	152	135	2 1/4-14 UN	63	122	19	97	175	65	54	219	27	**A-310**
557	353	260	152	178	3 5/16-12 UN	63	140	25	165	203	67	98	276	86	**A-330**

Press Accessories, Press Speed Chart

ENERPAC Hydraulic Technology Worldwide

Description	Press Type and Capacity	Model Number		Features
V-Blocks	10 ton Bench VLP-Presses 25 ton Workshop VLP-Presses 50 ton Workshop VLP-Presses 100 ton Workshop VLP-Presses 200 ton Workshop VLP-Press 200 ton BPR-Roll-Frame Press	**VB-10** **VB-25** **VB-501** **VB-101** **A-200** **A-200R**		• Facilitate positioning of pipes and bars • All V-Block model numbers include 2 V-blocks.
Hydra-Lift	50 and 100 ton BPR-Roll-Frame Presses 200 ton BPR-Roll-Frame Press	**IPL-R100** **IPL-R200**		• Allows easy, effortless daylight adjustments • Includes accessory chain.
"Hydrajust" Bed Positioning	50 ton Workshop VLP-Presses 100 ton Workshop VLP-Presses 200 ton Workshop VLP-Presses	**VHJ-50** **VHJ-100** **BSS-5380**		• Allowing effortless daylight adjustment by moving the lower bed up and down • Can be used with presses equipped with double-acting cylinder.
Centered Manual Valves	On VLP-Series Workshop Presses equiped with electric pumps with manual valves	**ZE-Series Pumps**		• The handle of the manual 3-position valve will automatically move to the tandem centre position when not operated.
Two-Push-Button Control	All press models with electric operated valves	–		• Two hand operation of the press for maximum operator safety • Call Enerpac for detailed information.

▼ PRESS SPEED CHART

Press Capacity ton (kN)	Cylinder Load	Hand Pumps mm of plunger travel per handpump stroke Two speed P-142	Hand Pumps Two speed P-392	Hand Pumps Two speed P-802	Electric Pumps mm of plunger travel per second Single-speed ZE5410SW-S ZE5410CW-S ZE5420SW-S	Electric Pumps Two speed ZE3410SW ZE3420SW	Electric Pumps Two speed ZE4420SW	Air Pumps Two speed At 6,9 bar air pressure PATG-1102N
10 (101)	No load	2,5	7,8	–	–	–	–	10,0
	Load	0,6	1,7	–	–	–	–	1,8
25 (232)	No load	–	3,4	–	–	–	–	5,0
	Load	–	0,7	–	–	–	–	0,8
50 (498)	No load	–	–	5,5	4,1	–	20,8	–
	Load	–	–	0,3	3,9	–	1,9	–
100 (933)	No load	–	–	–	–	7,7	11,1	–
	Load	–	–	–	–	0,7	1,0	–
200 (1995)	No load	–	–	–	–	–	5,2	–
	Load	–	–	–	–	–	0,5	–

Note: Values are approximate. Cylinder speed may vary in actual application.
See page 117 in the yellow pages for speed of other combinations with pump and cylinder.

Tension Meter and Load Cells

▼ Shown: **LH-102 and TM-5** (in middle)

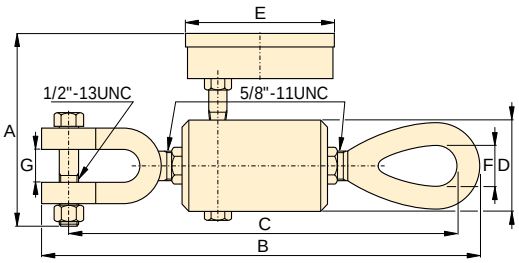
TM LH Series

Capacity:
900 - 90.000 kg

Accuracy, % of full scale:
±2%

Tension Meter TM-5

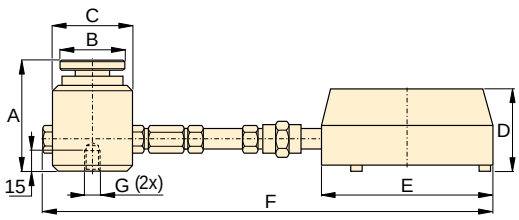
- **Accuracy ±2% of full scale**
- **Zinc and bronze plated to resist corrosion**
- **Dual-range readout in kilograms and pounds**
- **Cushioned metal case provides safe storage and transport**



TM-5

Load Cells LH-Series

- **Accuracy ±2% of full scale**
- **Swivel loading pad reduces eccentric loading for improved accuracy**
- **Maximum indicating pointer reading pre-selected forces or to maintain maximum force readings**
- **Dual-range readout in kilograms and pounds**



LH-Series

Type	Gauge Capacity		Model Number	Minimum Reading		Gauge Increments		Dimensions (mm)						
	(kg)	(lbs)		(kg)	(lbs)	(kg)	(lbs)	A	B	C	D	E	F	G
Direct Mounted	4.500	10.000	**TM-5**	500	1.000	100	100	120	247	236	50	93	22	19
Direct Mounted Load Cell	900	2.000	**LH-10**	100	200	20	20	77	44	57	60	101	215	1/4"- 20, 44,5 BC
	4.500	10.000	**LH-50**	500	1.000	100	100	77	44	57	60	101	215	1/4"- 20, 44,5 BC
Remote Mounted with 0,6 m Hose	900	2.000	**LH-102**	100	200	20	20	77	44	57	60	147	846	1/4"- 20, 44,5 BC
	4.500	10.000	**LH-502**	500	1.000	100	100	77	44	57	60	147	846	1/4"- 20, 44,5 BC
	9.000	20.000	**LH-1002**	1.000	2.000	200	200	77	44	57	60	147	846	1/4"- 20, 44,5 BC
Remote Mounted with 1,8 m Hose	21.000	50.000	**LH-2506**	3.000	5.000	500	500	101	69	85	60	147	2094	3/8"- 24, 63 BC
	45.000	100.000	**LH-5006**	5.000	5.000	1.000	1.000	132	101	127	60	147	2135	3/8"- 24, 89 BC
	90.000	200.000	**LH-10006**	10.000	10.000	1.000	2.500	158	127	158	60	147	2166	3/8"- 24, 102 BC