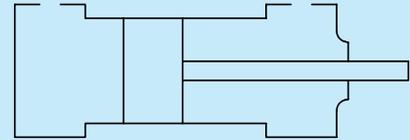


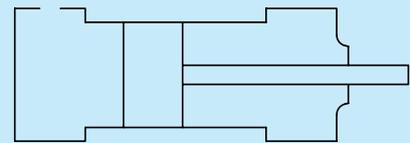
Standard Double-Acting

Power stroke is in both directions and is used in the majority of applications.



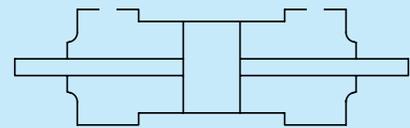
Single-Acting

When thrust is needed in only one direction, a single-acting cylinder may be used. The inactive end is vented into the atmosphere through a breather filter for pneumatic applications, or vented to a reservoir below the oil level in hydraulic applications.



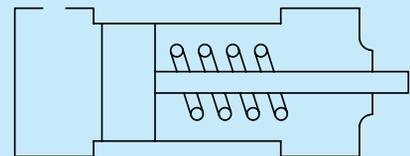
Double Rod

Used when equal displacement is needed on both sides of the piston, or when it is mechanically advantageous to couple a load to each end. The extra end can be used to mount cams for operating limit switches, etc.



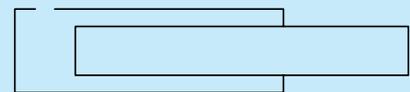
Spring Return, Single-Acting

Usually limited to very small, short stroke cylinders used for holding and clamping. The length needed to contain the return spring makes them undesirable when a long stroke is needed.



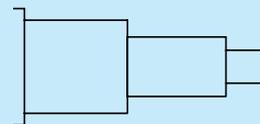
Ram Type, Single-Acting

Containing only one fluid chamber; this type of cylinder is usually mounted vertically. The weight of the load retracts the cylinder. They are sometimes known as "displacement cylinders", and are practical for long strokes.



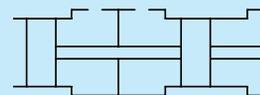
Telescoping

Available with up to 4 or 5 sleeves; collapsed length is shorter than standard cylinders. Available either as single or double-acting, they are relatively expensive compared to standard cylinders.



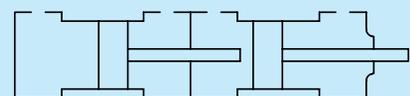
Tandem

A tandem cylinder is made up of two cylinders mounted in line with pistons connected by a common piston rod and rod seals installed between the cylinders to permit double acting operation of each. Tandem cylinders allow increased output force when mounting width or height are restricted.



Duplex

A duplex cylinder is made up of two cylinders mounted in line with pistons not connected and with rod seals installed between the cylinders to permit double acting operation of each. Cylinders may be mounted with piston rod to piston (as shown) or back to back, and are generally used to provide three position operation.



Cylinders

Hydraulic Cylinder Speeds — Inches/Minutes

This chart is based on the formula: $V \text{ (Velocity)} = \frac{231 \times \text{GPM}}{\text{Eff. Cyl. Area (Sq. In.)}}$

| Piston Diameter | Rod Diameter | Flow-GPM | | | | | | | | | | |
|-----------------|--------------|----------|-----|------|------|------|------|------|------|------|------|------|
| | | 1 | 2 | 3 | 5 | 10 | 12 | 15 | 20 | 25 | 50 | 75 |
| 1 | - | 298 | 596 | 849 | 149 | | | | | | | |
| | 1/2 | 392 | 784 | 1176 | 196 | | | | | | | |
| 1 1/2 | - | 130 | 260 | 392 | 654 | 1308 | | | | | | |
| | 5/8 | 158 | 316 | 476 | 792 | 1584 | | | | | | |
| | 1 | 235 | 470 | 706 | 1176 | 2352 | | | | | | |
| 2 | - | 73 | 146 | 221 | 368 | 736 | 883 | 1120 | | | | |
| | 3/4 | 85 | 170 | 257 | 428 | 956 | 1025 | 1283 | | | | |
| | 1 | 97 | 184 | 294 | 490 | 980 | 1175 | 1465 | | | | |
| | 1 3/8 | 139 | 278 | 418 | 697 | 1394 | 1673 | 2090 | | | | |
| 2 1/2 | - | 47 | 94 | 141 | 235 | 470 | 565 | 675 | 940 | 1175 | | |
| | 1 | 56 | 112 | 168 | 280 | 560 | 672 | 840 | 1120 | 1400 | | |
| | 1 3/8 | 67 | 134 | 203 | 339 | 678 | 813 | 1015 | 1355 | 1695 | | |
| | 1 3/4 | 92 | 184 | 277 | 463 | 926 | 1110 | 1385 | 1850 | 2310 | | |
| 3 | - | 32 | 64 | 98 | 163 | 326 | 392 | 490 | 653 | 817 | | |
| | 1 | 36 | 72 | 110 | 184 | 368 | 440 | 551 | 735 | 920 | | |
| | 1 1/2 | 43 | 86 | 131 | 218 | 436 | 523 | 655 | 872 | 1090 | | |
| | 2 | 58 | 116 | 176 | 294 | 588 | 705 | 882 | 1175 | 1470 | | |
| 3 1/2 | - | 24 | 48 | 72 | 120 | 240 | 288 | 360 | 480 | 600 | 1200 | |
| | 1 1/4 | 27 | 54 | 82 | 137 | 274 | 330 | 411 | 548 | 685 | 1370 | |
| | 1 3/4 | 32 | 64 | 96 | 160 | 320 | 384 | 480 | 640 | 800 | 1600 | |
| | 2 | 35 | 70 | 107 | 178 | 356 | 428 | 534 | 712 | 890 | 1780 | |
| 4 | - | 18 | 36 | 55 | 92 | 184 | 220 | 276 | 368 | 460 | 920 | |
| | 1 1/4 | 20 | 40 | 61 | 102 | 204 | 244 | 306 | 408 | 510 | 1020 | |
| | 1 3/4 | 22 | 44 | 68 | 113 | 226 | 273 | 339 | 452 | 565 | 1130 | |
| | 2 | 24 | 48 | 73 | 122 | 244 | 294 | 366 | 488 | 610 | 1220 | |
| | 2 1/2 | 30 | 60 | 90 | 150 | 300 | 362 | 450 | 600 | 750 | 1500 | |
| 5 | - | 12 | 24 | 35 | 58 | 116 | 141 | 174 | 232 | 290 | 580 | 870 |
| | 1 1/2 | 13 | 26 | 39 | 64 | 128 | 155 | 193 | 258 | 320 | 640 | 960 |
| | 2 | 14 | 28 | 42 | 70 | 140 | 168 | 210 | 280 | 350 | 700 | 1050 |
| | 2 1/2 | 16 | 32 | 47 | 78 | 156 | 188 | 235 | 315 | 390 | 780 | 1170 |
| | 3 | 18 | 36 | 55 | 92 | 184 | 220 | 275 | 365 | 460 | 920 | 1380 |
| | 3 1/2 | 22 | 44 | 66 | 111 | 222 | 266 | 333 | 444 | 555 | 1110 | 1665 |
| 6 | - | 8 | 16 | 24 | 41 | 82 | 98 | 123 | 162 | 202 | 404 | 606 |
| | 1 3/4 | 9 | 18 | 27 | 45 | 90 | 107 | 135 | 180 | 225 | 450 | 675 |
| | 2 1/2 | 10 | 20 | 30 | 50 | 100 | 118 | 150 | 200 | 250 | 500 | 750 |
| | 3 | 11 | 22 | 33 | 54 | 108 | 130 | 165 | 206 | 270 | 540 | 810 |
| | 3 1/2 | 12 | 24 | 37 | 62 | 124 | 148 | 185 | 245 | 310 | 620 | 930 |
| 8 | - | 4 | 8 | 14 | 23 | 46 | 55 | 69 | 92 | 115 | 230 | 345 |
| | 3 1/2 | 5 1/2 | 11 | 17 | 28 | 56 | 68 | 85 | 115 | 140 | 280 | 420 |
| | 4 | 6 | 12 | 18 | 30 | 60 | 73 | 90 | 122 | 150 | 300 | 450 |
| | 5 | 7 1/2 | 15 | 22 | 38 | 76 | 90 | 114 | 150 | 185 | 375 | 555 |
| | 5 1/2 | 8 1/2 | 17 | 26 | 43 | 86 | 104 | 129 | 172 | 215 | 430 | 645 |
| 10 | - | 3 | 6 | 9 | 15 | 30 | 35 | 44 | 60 | 73 | 146 | 220 |
| | 4 1/2 | 3 1/2 | 7 | 11 | 18 | 36 | 44 | 55 | 75 | 92 | 184 | 275 |
| | 5 | 4 | 8 | 12 | 20 | 40 | 47 | 60 | 80 | 100 | 200 | 300 |
| | 5 1/2 | 4 1/2 | 9 | 13 | 21 | 42 | 50 | 63 | 84 | 105 | 210 | 315 |
| | 7 | 5 1/2 | 11 | 17 | 29 | 58 | 69 | 87 | 115 | 145 | 290 | 435 |



Theoretical Push and Pull Forces for Pneumatic and Hydraulic Cylinders

The cylinder output forces are derived from the formula:
 $F = P \times A$

$$V_1 = \frac{(P_2 + 14.7)V_2}{14.7}$$

F = Force in pounds

P = Pressure at the cylinder in pounds per sq. inch, gauge

A = Effective area of cylinder piston in sq. inches

Free air refers to normal atmospheric conditions of the air at sea level (14.7 psi). Use cu. ft. free air required data (see chart below) to compute CFM required from a compressor at 80 cu. ft. of free air required. Other pressures can be calculated using the information below.

V_1 = Free air consumption per inch of stroke (cubic feet)

V_2 = Cubic feet displaced per inch of stroke

P_2 = Gauge pressure required to move maximum load

| Push Force and Displacement | | | | | | | | | | | | | |
|-----------------------------|-----------------------|---|------|-------|-------|-------|-------|-------|--------|--------|--------|---|--|
| Cyl. Bore Size (Inches) | Piston Area (Sq. In.) | Cylinder Push Stroke Force in Pounds at Various Pressures | | | | | | | | | | Cu. Ft. Free Air at 80 Lbs. Pressure, Required to move Max. Load 1 Inch | Displace. Per Inch of Stroke (Gallons) |
| | | 25 | 50 | 65 | 80 | 100 | 250 | 500 | 1000 | 2000 | 3000 | | |
| 1 | 0.785 | 20 | 39 | 51 | 65 | 79 | 196 | 392 | 785 | 1570 | 2355 | .00293 | .00340 |
| 1 1/2 | 1.767 | 44 | 88 | 115 | 142 | 177 | 443 | 885 | 1770 | 3540 | 5310 | .00659 | .00765 |
| 2 | 3.14 | 79 | 157 | 204 | 251 | 314 | 785 | 1570 | 3140 | 6280 | 9420 | .01171 | .0136 |
| 2 1/2 | 4.91 | 123 | 245 | 319 | 393 | 491 | 1228 | 2455 | 4910 | 9820 | 14730 | .01830 | .0213 |
| 3 1/4 | 8.30 | 208 | 415 | 540 | 664 | 830 | 2072 | 4150 | 8300 | 16600 | 24900 | .03093 | .0359 |
| 4 | 12.57 | 314 | 628 | 817 | 1006 | 1257 | 3143 | 6285 | 12570 | 25140 | 37710 | .04685 | .0544 |
| 5 | 19.64 | 491 | 982 | 1277 | 1571 | 1964 | 4910 | 9820 | 19640 | 39280 | 58920 | .07320 | .0850 |
| 6 | 28.27 | 707 | 1414 | 1838 | 2262 | 2827 | 7068 | 14135 | 28270 | 56540 | 84810 | .10540 | .1224 |
| 7 | 38.49 | 962 | 1924 | 2502 | 3079 | 3849 | 9623 | 19245 | 38490 | 76980 | 115470 | .14347 | .1666 |
| 8 | 50.27 | 1257 | 2513 | 3268 | 4022 | 5027 | 12568 | 25135 | 50270 | 100540 | 150810 | .18740 | .2176 |
| 10 | 78.54 | 1964 | 3927 | 5105 | 6283 | 7854 | 19635 | 39270 | 78540 | 157080 | 235620 | .29280 | .3400 |
| 12 | 113.10 | 2828 | 5655 | 7652 | 9048 | 11310 | 28275 | 56550 | 113100 | 226200 | 339300 | .42164 | .4896 |
| 14 | 153.94 | 3849 | 7697 | 10006 | 12315 | 15394 | 38485 | 76970 | 153940 | 307880 | 461820 | .57389 | .6664 |

| Deductions for Pull Force and Displacement | | | | | | | | | | | | | |
|--|---------------------------|---|------|------|------|------|-------|-------|-------|--------|--------|---|--|
| Piston Rod Dia. (Inches) | Piston Rod Area (Sq. In.) | Piston Rod Diameter Force in Pounds at Various Pressures To determine Cylinder Pull Force or Displacement, deduct the following Force or Displacement corresponding to Rod Size, from selected Push Stroke Force or Displacement corresponding to Bore Size in the table above | | | | | | | | | | Cu. Ft. Free Air at 80 Lbs. Pressure, Required to move Max. Load 1 Inch | Displace. Per Inch of Stroke (Gallons) |
| | | 25 | 50 | 65 | 80 | 100 | 250 | 500 | 1000 | 2000 | 3000 | | |
| 1/2 | 0.196 | 5 | 10 | 13 | 16 | 20 | 49 | 98 | 196 | 392 | 588 | .00073 | .0009 |
| 5/8 | 0.307 | 8 | 15 | 20 | 25 | 31 | 77 | 154 | 307 | 614 | 921 | .00114 | .0013 |
| 1 | 0.785 | 20 | 39 | 51 | 65 | 79 | 196 | 392 | 785 | 1570 | 2355 | .00293 | .0034 |
| 1 3/8 | 1.49 | 37 | 75 | 97 | 119 | 149 | 373 | 745 | 1490 | 2980 | 4470 | .00554 | .0065 |
| 1 3/4 | 2.41 | 60 | 121 | 157 | 193 | 241 | 603 | 1205 | 2410 | 4820 | 7230 | .00897 | .0104 |
| 2 | 3.14 | 79 | 157 | 204 | 251 | 314 | 785 | 1570 | 3140 | 6280 | 9420 | .01171 | .0136 |
| 2 1/2 | 4.91 | 123 | 245 | 319 | 393 | 491 | 1228 | 2455 | 4910 | 9820 | 14730 | .01830 | .0213 |
| 3 | 7.07 | 177 | 354 | 460 | 566 | 707 | 1767 | 3535 | 7070 | 14140 | 21210 | .02635 | .0306 |
| 3 1/2 | 9.62 | 241 | 481 | 625 | 770 | 962 | 2405 | 4810 | 9620 | 19240 | 28860 | .03587 | .0416 |
| 4 | 12.57 | 314 | 628 | 817 | 1006 | 1257 | 3143 | 6285 | 12570 | 25140 | 37710 | .04685 | .0544 |
| 4 1/2 | 15.90 | 398 | 795 | 1033 | 1272 | 1590 | 3975 | 7950 | 15900 | 31800 | 47708 | .05929 | .0688 |
| 5 | 19.64 | 491 | 982 | 1277 | 1571 | 1964 | 4910 | 9820 | 19640 | 39280 | 58920 | .07320 | .0850 |
| 5 1/2 | 23.76 | 594 | 1188 | 1544 | 1901 | 2376 | 5940 | 11880 | 23760 | 47520 | 71280 | .08857 | .1028 |
| 7 | 38.49 | 962 | 1924 | 2502 | 3079 | 3849 | 9623 | 19245 | 38490 | 76980 | 115470 | .14347 | .1666 |
| 8 1/2 | 56.75 | 1419 | 2838 | 3689 | 4540 | 5675 | 14187 | 28375 | 56750 | 113500 | 170250 | .21157 | .2455 |



Cylinders

How to Select a Hydraulic Cylinder and Power Unit

Selection of the proper components for a hydraulic system is quite simple when you use the accompanying table and chart. Here is an example to illustrate their use. Assume your requirements are: 20,000 lbs. of force, 28" stroke, and 7.5 seconds for full cylinder extension.

Step One:

The table below shows a 3" diameter cylinder will develop 21,204 lbs. of force with 3,000 psi pressure.

Step Two:

A line has been drawn on the chart from 3" diameter through 28" stroke.

Step Three:

By continuing this line, it intersects 200 cubic inch displacement.

Step Four:

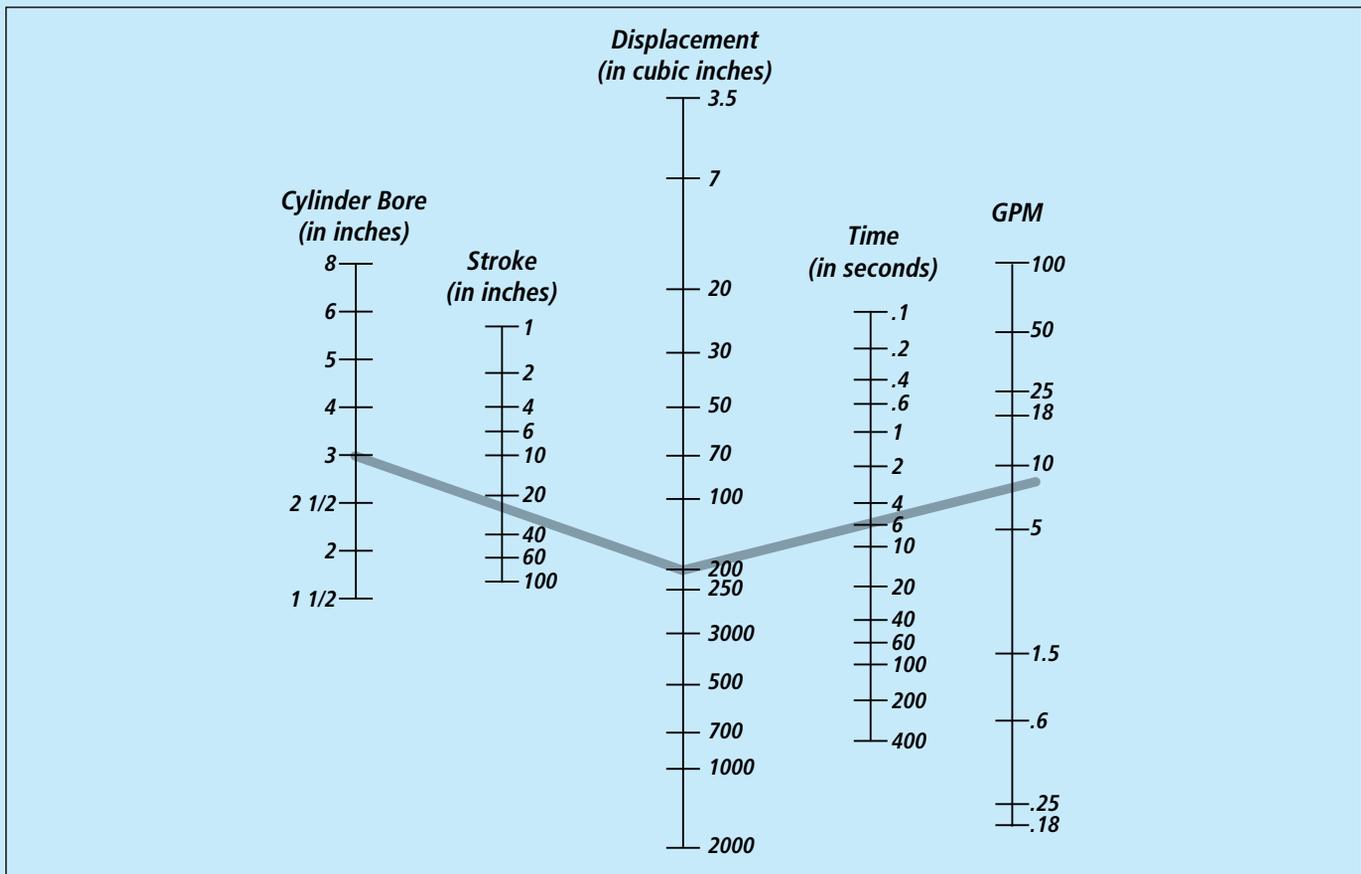
Another line drawn from 200 cubic inches through 7.5 seconds intersects 7 GPM.

Your Answer:

Using this example, the chart and table show that your components should be a 3" diameter 3,000 psi cylinder and a hydraulic power unit with approximately 7 GPM and 3,000 psi rating.

Theoretical horsepower for these values would be 12.25 hp. However, since most applications usually require maximum GPM and pressure for only a very short portion of each cycle, the electric motor of the hydraulic power unit will usually be considerably smaller (one half or less).

| Cylinder Bore | Cylinder push in pounds | | |
|---------------|-------------------------|------------|------------|
| | @ 1000 psi | @ 2000 psi | @ 3000 psi |
| 2 | 3141 | 6282 | 9423 |
| 2 ½ | 4908 | 9816 | 14724 |
| 3 | 7068 | 14136 | 21204 |
| 4 | 12566 | 25132 | 37698 |
| 5 | 19635 | 39270 | 58905 |
| 6 | 28274 | 56548 | 84822 |
| 7 | 38465 | 76930 | 115395 |



Cylinder Speed

This chart will help you calculate the time required for an Enerpac cylinder to lift a load when powered by a 10,000 psi 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

| 30 ton | | 50 ton | | 75 ton | | 100 ton | | Pump Type |
|---------|------|---------|------|---------|-------|---------|-------|-----------------|
| No Load | Load | No Load | Load | No Load | Load | No Load | Load | |
| 1.9 | 1.5 | 3.3 | 33.2 | 4.8 | 47.7 | 6.2 | 61.9 | .5 hp Economy |
| .63 | 6.5 | 1.1 | 11.1 | 1.6 | 15.9 | 2.0 | 20.6 | Titan |
| 2.6 | 1.5 | 4.4 | 33.2 | 6.4 | 47.7 | 8.3 | 61.9 | .5 hp Submerged |
| 1.6 | 9.3 | 2.8 | 15.8 | 4.0 | 22.7 | 5.2 | 29.5 | 20-Series |
| .61 | 6.5 | 1.0 | 11.1 | 1.5 | 15.9 | 1.9 | 20.6 | 3-Series Hushh |
| .61 | 3.2 | 1.0 | 5.5 | 1.5 | 8.0 | 1.9 | 10.3 | 5-Series Hushh |
| .38 | .84 | .65 | 1.4 | .94 | 2.1 | 1.2 | 2.7 | 8000-Series |
| 6.5 | 39.0 | 11.0 | 66.3 | 15.9 | 95.5 | 20.6 | 123.9 | Turbo II Pump |
| 7.8 | 48.7 | 13.3 | 82.9 | 19.1 | 119.3 | 24.8 | 154.7 | PA-133 |
| .60 | 43.3 | 1.0 | 73.7 | 1.5 | 106.0 | 1.9 | 137.5 | 10-Series |
| .46 | 13.0 | .80 | 22.1 | 1.1 | 31.8 | 1.5 | 41.3 | Modular Air |

Your 30 ton cylinder needs to move a load at a speed of 6.50 sec/in. Simply go down from the top of the chart, to the value of 6.50 sec/in. Then follow the chart to the right to find that the 3-Series Hushh pump or Titan most suitable for your application.

To determine:

Cylinder plunger speed

| 30 ton | | 50 ton | | 75 ton | | 100 ton | | Pump Type |
|---------|------|---------|------|---------|-------|---------|-------|-------------------|
| No Load | Load | No Load | Load | No Load | Load | No Load | Load | |
| 1.9 | 1.5 | 3.3 | 33.2 | 4.8 | 47.7 | 6.2 | 61.9 | .5 hp Economy |
| .63 | 6.5 | 1.1 | 11.1 | 1.6 | 15.9 | 2.0 | 20.6 | Titan |
| 2.6 | 1.5 | 4.4 | 33.2 | 6.4 | 47.7 | 8.3 | 61.9 | .5 hp Submerged |
| 1.6 | 9.3 | 2.8 | 15.8 | 4.0 | 22.7 | 5.2 | 29.5 | 20-Series |
| .61 | 6.5 | 1.0 | 11.1 | 1.5 | 15.9 | 1.9 | 20.6 | 3-Series Hushh |
| .61 | 3.2 | 1.0 | 5.5 | 1.5 | 8.0 | 1.9 | 10.3 | 5-Series Hushh |
| .38 | .84 | .65 | 1.4 | .94 | 2.1 | 1.2 | 2.7 | 8000-Series |
| 6.5 | 39.0 | 11.0 | 66.3 | 15.9 | 95.5 | 20.6 | 123.9 | Turbo II Pump |
| 7.8 | 48.7 | 13.3 | 82.9 | 19.1 | 119.3 | 24.8 | 154.7 | PA-133 |
| .60 | 43.3 | 1.0 | 73.7 | 1.5 | 106.0 | 1.9 | 137.5 | 10-Series |
| .46 | 13.0 | .80 | 22.1 | 1.1 | 31.8 | 1.5 | 41.3 | Modular Air |
| 1.9 | 9.7 | 3.3 | 16.6 | 4.8 | 23.9 | 6.2 | 30.9 | Atlas Pump 2.5 hp |
| .81 | 7.1 | 1.4 | 12.1 | 2.0 | 17.3 | 2.6 | 22.5 | Atlas Pump 5.0 hp |

An RC-308 cylinder (30 ton) is powered by a 5-Series Hushh pump. While lifting the load, the cylinder plunger will require 3.2 seconds to travel 1 inch. While extending towards the load, the cylinder plunger travels at .61 sec/in.

Number of Pump Handle Strokes per Inch of Cylinder Plunger Travel

| Cyl. Capacity ▶ | 5 ton | | 10 ton | | 15 ton | | 25 ton | | 30 ton | | 50 ton | | 75 ton | | 100 ton | | Pump Type |
|-----------------|---------|------|---------|------|---------|------|---------|------|---------|------|---------|------|---------|------|---------|------|-------------|
| | No Load | Load | |
| Manual | 7 | 7 | 15 | 15 | 21 | 21 | 34 | 34 | 43 | 43 | 73 | 73 | 105 | 105 | 137 | 137 | P-391 |
| | 2 | 7 | 4 | 15 | 5 | 21 | 8 | 34 | 10 | 43 | 16 | 73 | 24 | 105 | 30 | 137 | P-392 |
| | 1 | 7 | 2 | 15 | 3 | 21 | 5 | 34 | 7 | 43 | 11 | 73 | 16 | 105 | 21 | 137 | P-80/84/801 |
| | 1 | 7 | 1 | 15 | 1 | 21 | 2 | 34 | 3 | 43 | 5 | 73 | 7 | 105 | 9 | 137 | P-802/842 |
| | 1 | 3 | 1 | 8 | 1 | 11 | 1 | 18 | 1 | 23 | 2 | 38 | 2 | 55 | 3 | 71 | P-462/464 |

Seconds per Inch of Cylinder Plunger Travel

| Cyl. Capacity ▶ | 5 ton | | 10 ton | | 15 ton | | 25 ton | | 30 ton | | 50 ton | | 75 ton | | 100 ton | | Pump Type |
|---|---------|------|---------|------|---------|------|---------|------|---------|------|---------|------|---------|-------|---------|-------|-------------------|
| | No Load | Load | No Load | Load | |
| Electric (speed based on 60 Hz) | .30 | 3.0 | .67 | 6.7 | .94 | 9.4 | 1.5 | 15.5 | 1.9 | 19.5 | 3.3 | 33.2 | 4.8 | 47.7 | 6.2 | 61.9 | 0.5 hp Economy |
| | .09 | 1.0 | .22 | 2.2 | .31 | 3.1 | .50 | 5.2 | .63 | 6.5 | 1.1 | 11.1 | 1.6 | 15.9 | 2.0 | 20.6 | Titan |
| | .40 | 3.0 | .90 | 6.7 | 1.3 | 9.4 | 2.1 | 15.5 | 2.6 | 19.5 | 4.4 | 33.2 | 6.4 | 47.7 | 8.3 | 61.9 | 0.5 hp Submerged |
| | .25 | 1.4 | .56 | 3.2 | .79 | 4.5 | 1.3 | 7.4 | 1.6 | 9.3 | 2.8 | 15.8 | 4.0 | 22.7 | 5.2 | 29.5 | 20-Series |
| | .09 | 1.0 | .21 | 2.2 | .29 | 3.1 | .48 | 5.2 | .61 | 6.5 | 1.0 | 11.1 | 1.5 | 15.9 | 1.9 | 20.6 | 3-Series Hushh |
| | .09 | .50 | .21 | 1.1 | .29 | 1.6 | .48 | 2.6 | .61 | 3.2 | 1.0 | 5.5 | 1.5 | 8.0 | 1.9 | 10.3 | 5-Series Hushh |
| Air (speed based on 100 psi air pressure) | .06 | .13 | .13 | .29 | .19 | .41 | .30 | .67 | .38 | .84 | .65 | 1.4 | .94 | 2.1 | 1.2 | 2.7 | 8000-Series |
| | 1.0 | 5.9 | 2.2 | 13.4 | 3.1 | 18.8 | 5.2 | 30.9 | 6.5 | 39.0 | 11.0 | 66.3 | 15.9 | 95.5 | 20.6 | 123.9 | Turbo II Pump |
| | 1.2 | 7.4 | 2.7 | 16.8 | 3.8 | 23.6 | 6.2 | 38.6 | 7.8 | 48.7 | 13.3 | 82.9 | 19.1 | 119.3 | 24.8 | 154.7 | PA-133 |
| | .09 | 6.6 | .21 | 14.9 | .29 | 20.9 | .48 | 34.3 | .60 | 43.3 | 1.0 | 73.7 | 1.5 | 106.0 | 1.9 | 137.5 | 10-Series |
| Gasoline | .07 | 2.0 | .16 | 4.5 | .22 | 6.3 | .36 | 10.3 | .46 | 13.0 | .80 | 22.1 | 1.1 | 31.8 | 1.5 | 41.3 | Modular Air |
| | .30 | 1.5 | .67 | 3.4 | .94 | 4.7 | 1.5 | 7.7 | 1.9 | 9.7 | 3.3 | 16.6 | 4.8 | 23.9 | 6.2 | 30.9 | Atlas Pump 2.5 hp |
| | .12 | 1.1 | .28 | 2.4 | .39 | 3.4 | .64 | 5.6 | .81 | 7.1 | 1.4 | 12.1 | 2.0 | 17.3 | 2.6 | 22.5 | Atlas Pump 5.0 hp |
| | .12 | .59 | .28 | 1.3 | .39 | 1.9 | .64 | 3.1 | .81 | 3.9 | 1.4 | 6.6 | 2.0 | 9.5 | 2.6 | 12.4 | Atlas Pump 5.5 hp |
| | .06 | .30 | .13 | .67 | .19 | .94 | .31 | 1.5 | .39 | 1.9 | .66 | 3.3 | .95 | 4.7 | 1.2 | 6.2 | Atlas Pump 13 hp |

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

Load indicates the plunger speed as the load is lifted at a system pressure of 10,000 psi (2nd stage).

Formula V = A ÷ Q

V (sec/in) = A (in²) ÷ Q (in³/min)

V = Cylinder plunger speed in seconds per inch

A = Cylinder effective area in square inches

Q = Pump oil flow in cubic inches

Example

At what speed (V) will the RC-308 (30 ton) cylinder move when powered by a 20-Series electric driven pump?

20-Series pump:

Oil flow Q, (no load) is 240 in³/min

RC-308 cylinder:

Effective area A is 6.50 in²

V = 6.50 in² ÷ 240 in³/min x 60 = 1.60 sec/in

Cylinder Plunger Speed (sec/in)

=

Cylinder Effective Area (in²)
Pump Flow Rate (in³/min)

=

60 sec
1

