

## Cylinder Force Table (K pounds & Tons Listed)

| Bore Dia. (in.) | Bore Area (in <sup>2</sup> ) | K pounds / Ton @ Given Pump Pressures (Psi) |      |          |      |          |      |          |      |          |      |
|-----------------|------------------------------|---|------|----------|------|----------|------|----------|------|----------|------|
|                 |                              | 1500 psi                                    |      | 2000 psi |      | 2250 psi |      | 2500 psi |      | 3000 psi |      |
|                 |                              | K Lbs                                       | Tons | K Lbs    | Tons | K Lbs    | Tons | K Lbs    | Tons | K Lbs    | Tons |
| 2               | 3.14                         | 4.7   | 2.4  | 6.3      | 3.1  | 7.1      | 3.5  | 7.9      | 3.9  | 9.4      | 4.7  |
| 2.25            | 3.98                         | 6.0   | 3.0  | 8.0      | 4.0  | 9.0      | 4.5  | 9.9      | 5.0  | 11.9     | 6.0  |
| 2.5             | 4.91                         | 7.4   | 3.7  | 9.8      | 4.9  | 11.0     | 5.5  | 12.3     | 6.1  | 14.7     | 7.4  |
| 2.75            | 5.94                         | 8.9   | 4.5  | 11.9     | 5.9  | 13.4     | 6.7  | 14.9     | 7.4  | 17.8     | 8.9  |
| 3               | 7.07                         | 10.6  | 5.3  | 14.1     | 7.1  | 15.9     | 8.0  | 17.7     | 8.8  | 21.2     | 10.6 |
| 3.25            | 8.3                          | 12.4  | 6.2  | 16.6     | 8.3  | 18.7     | 9.3  | 20.7     | 10.4 | 24.9     | 12.4 |
| 3.5             | 9.62                         | 14.4  | 7.2  | 19.2     | 9.6  | 21.7     | 10.8 | 24.1     | 12.0 | 28.9     | 14.4 |
| 3.75            | 11.04                        | 16.6  | 8.3  | 22.1     | 11.0 | 24.9     | 12.4 | 27.6     | 13.8 | 33.1     | 16.6 |
| 4               | 12.57                        | 18.9  | 9.4  | 25.1     | 12.6 | 28.3     | 14.1 | 31.4     | 15.7 | 37.7     | 18.9 |
| 4.25            | 14.19                        | 21.3  | 10.6 | 28.4     | 14.2 | 31.9     | 16.0 | 35.5     | 17.7 | 42.6     | 21.3 |
| 4.5             | 15.9                         | 23.9  | 11.9 | 31.8     | 15.9 | 35.8     | 17.9 | 39.8     | 19.9 | 47.7     | 23.9 |
| 4.75            | 17.72                        | 26.6  | 13.3 | 35.4     | 17.7 | 39.9     | 19.9 | 44.3     | 22.2 | 53.2     | 26.6 |
| 5               | 19.63                        | 29.5  | 14.7 | 39.3     | 19.6 | 44.2     | 22.1 | 49.1     | 24.5 | 58.9     | 29.5 |
| 5.25            | 21.65                        | 32.5  | 16.2 | 43.3     | 21.7 | 48.7     | 24.4 | 54.1     | 27.1 | 64.9     | 32.5 |
| 5.5             | 23.76                        | 35.6  | 17.8 | 47.5     | 23.8 | 53.5     | 26.7 | 59.4     | 29.7 | 71.3     | 35.6 |

## Cylinder Cycle Time Chart (seconds)

| Pump GPM | Bore Size | Rod Dia | Stroke | Extend Time | Retract Time | Total Cycle |
|----------|-----------|---------|--------|-------------|--------------|-------------|
| 11       | 4         | 1.5     | 24     | 7.1         | 6.2          | 13.3        |
| 11       | 4         | 2       | 24     | 7.1         | 5.3          | 12.4        |
| 16       | 4         | 2       | 24     | 4.9         | 4.2          | 9.1         |
| 16       | 4         | 2       | 30     | 6.1         | 4.6          | 10.7        |
| 22       | 4         | 2       | 24     | 3.6         | 2.1          | 6.3         |
| 22       | 4         | 2       | 30     | 4.5         | 3.3          | 7.8         |
| 28       | 4         | 2       | 24     | 2.8         | 2.1          | 4.9         |
| 28       | 4         | 2       | 30     | 3.5         | 2.6          | 6.1         |
| 16       | 4.5       | 2       | 24     | 6.2         | 5            | 11.2        |
| 16       | 4.5       | 2       | 30     | 7.7         | 6.3          | 14          |
| 22       | 4.5       | 2       | 24     | 4.5         | 3.6          | 8.1         |
| 22       | 4.5       | 2       | 30     | 5.7         | 4.5          | 10.2        |
| 28       | 4.5       | 2       | 24     | 3.5         | 2.9          | 6.4         |
| 28       | 4.5       | 2       | 30     | 4.4         | 3.6          | 8           |
| 16       | 5         | 2       | 24     | 7.7         | 6.5          | 14.2        |
| 16       | 5         | 2       | 30     | 9.7         | 8.1          | 17.8        |

Source for these Calculations:

[www.baumhydraulics.com/calculators/cyl\\_speed.htm](http://www.baumhydraulics.com/calculators/cyl_speed.htm)

Engine Requirements:

Hp to drive single stage hydraulic pump = GPM X psi / 1714 X % Pump Efficiency

11 GPM X 2500/1714 X 85% = 16.4 hp  
 16 GPM X 2500/1714 X 85% = 23.8 hp  
 22 GPM X 2500/1714 X 85% = 32.7 hp  
 28 GPM X 2500/1714 X 85% = 49.0 hp

General Rule for 2-stage Pumps: 1/2 hp per gallon/min

11 GPM 5.5 hp 6 hp recommended  
 16 GPM 8 hp 9 hp recommended  
 22 GPM 11 hp 13 hp recommended  
 28 GPM 14 hp 17 - 18 hp recommended

[illegible]