





# **Basic Hydraulics**



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).



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

# 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\*.



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

## Example 1

An RC-106 cylinder with 2.24 in<sup>2</sup> effective area operating at 8,000 psi will generate what force? **Force** = 8,000 psi x 2.24 in<sup>2</sup> = 17,920 lbs.

## Example 2

An RC-106 cylinder lifting 14,000 lbs will require what pressure? **Pressure** = 14,000 lbs  $\div$  2.24 in<sup>2</sup> = 6,250 psi.

#### Example 3

An RC-256 cylinder is required to produce a force of 41,000 lbs. What pressure is required? **Pressure** = 41,000 lbs.  $\div$  5.15 in<sup>2</sup> = 7961 psi.

## Example 4

Four RC-308 cylinders are required to produce a force of 180,000 lbs. What pressure is required? **Pressure** = 180,000 lbs  $\div$  (4 x 6.49 in<sup>2</sup>) = 6933 psi.

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 7,500 PSI. What is the theoretical force available from that cylinder?

**Force** = 7,500 psi x 56.79 in<sup>2</sup> = 425,925 lbs.

#### Example 1:

An RC-158 cylinder with 3.14 in<sup>2</sup> effective area and an 8 in stroke will require what volume of oil? **Oil Capacity** =  $3.14 \text{ in}^2 \times 8 \text{ in} = 25.12 \text{ in}^3$ 



#### Example 2:

An RC-5013 cylinder has an effective area of 11.05 in<sup>2</sup> and a stroke of 13.25 in. How much oil will be required? **Oil Capacity** = 11.05 in<sup>2</sup> x 13.25 in = 146.41 in<sup>3</sup>

# Example 3:

An RC-10010 cylinder has an effective area of 20.63 in<sup>2</sup> and a stroke of 10.25 in. How much oil will it require? **Oil Capacity** = 20.63 in<sup>2</sup> x 10.25 in = 211.46 in<sup>3</sup>

#### Example 4:

Four RC-308 cylinders are being used, each with an effective area of 6.49 in<sup>2</sup> and stroke of 8.25 in. How much oil will be required? **Oil Capacity** = 6.49 in<sup>2</sup> x 8.25 in = 53.54 in<sup>3</sup> for one cylinder Multiply by four to obtain the required capacity: 214.17 in<sup>3</sup>

CAUTION! Enerpac oil will compress 2.28% at 5,000 psi and 4.3% at 10,000 psi. Page: 112

