

Fire Syringe

P1-2020



BACKGROUND:

When a gas is compressed rapidly, its temperature will increase. This process is known as adiabatic compression. You've probably noticed this effect while inflating a bicycle tire. The increase in temperature results from the work being done on the gas. Pushing on the gas increases the kinetic energy of the gas molecules. This increase in internal energy manifests itself as an increase in temperature. The rapid compression reduces the amount of energy lost to the environment.

In a diesel engine, air is compressed adiabatically. This compression raises the temperature inside the cylinder to the flash point of the fuel mixture. The diesel engine differs from the gasoline engine by using adiabatic compression to ignite the fuel rather than a spark plug.

The fire syringe provides a rather dramatic way of demonstrating the heating of a gas, in this case air, that accompanies rapid compression. With this fire syringe, the air can reach a temperature of over 260 degrees C (500 degrees F). As cotton fibers burn at 235 degrees C (454 degrees F), a small piece of cotton fiber placed at the bottom of the combustion tube will ignite.

USING THE FIRE SYRINGE:

Note: Prior to use, ensure that the seal is tight. To do this, place the piston 2-3 cm into the combustion tube. Depress the piston as far as possible and then release it. The piston should spring back almost to the end of the combustion tube. If this does not occur, the O-rings may need to be greased with silicone lubricant to ensure a tight seal. Once the syringe is ready, follow these steps for proper use:

1. Put on protective eyewear.
2. With a paper towel, dry the inside of the combustion tube.
3. Place a small piece of cotton fiber in the bottom of the combustion tube.
4. Insert the end of the piston part way into the combustion tube.

5. Darken the room to increase visibility.
6. While holding the piston upright with the rubber stopper end against a table, quickly depress the piston with the palm of the hand. The combustion of the cotton fiber should create a flash. If not, release the piston partway and depress again.

RELATED PRODUCTS:

Pressure Globe demonstrates the amazing power of air. P1-2015 \$ 24.95 each

BIBLIOGRAPHY:

Conceptual Physics: The High School Physics Program. Paul G. Hewitt. Pearson Education, Inc.

REPLACEMENT PARTS:

Replacement O-Ring Size:

O-Ring # 5

3/8" O.D. X 1/4" I.D. X 1/16"

