

# Free Piston Stirling Engine Kit



## IMPORTANT NOTICE !

These low temperature differential Stirling engines require only a small difference in the bottom and top plates to operate. **DO NOT** place them on a high temperature heat source (e.g. oil/wood burning stove, candle, Arga stove). If you do, it will melt a number of parts on the Stirling engine. It can be placed on top of a recently boiled cup of water/tea/coffee but nothing hotter.

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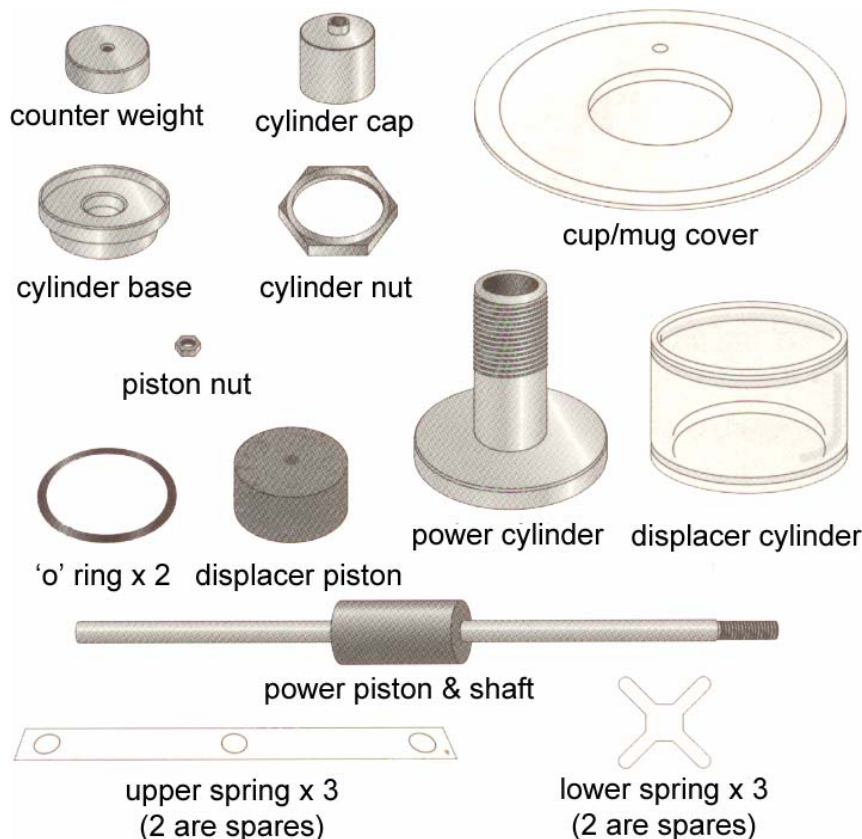
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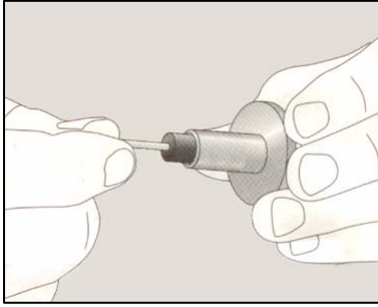
## Starting your engine

Once you have built your engine, place the engine on top of a recently boiled cup of water (as shown on picture on the left). Leave the engine for a minute in order for the cylinder base to warm up. Then simply tap the counter weight.

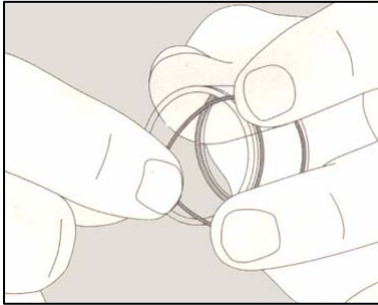
## Parts included with the kit



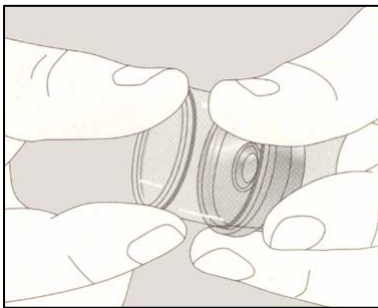
## Assembling Your Stirling Engine



1. Take the **power cylinder** and push the **power piston/shaft** through the centre. The thread on the shaft should be protruding from the thinnest part of the **power cylinder**. Make sure the piston moves through easily. Check for any debris in the **power cylinder**. Then remove the power cylinder until later.



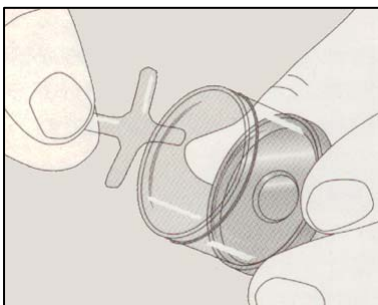
2. Take the **displacer cylinder** and add the two **'o' rings** as shown on the diagram. They will be a tight fit.



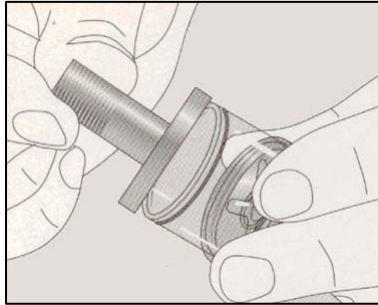
3. Take the **displacer cylinder** and place **cylinder base** at one of the ends.



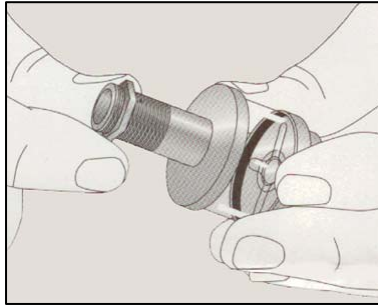
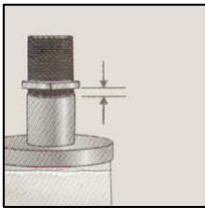
4. Place them both on a solid surface and press down hard so the **cylinder base** fits over the **'o' rings** to create a good seal.



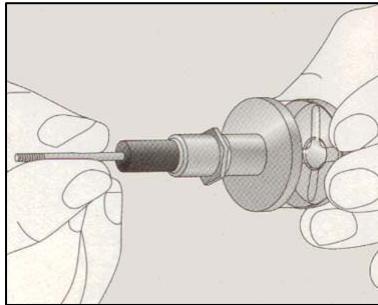
5. Take one of the **lower springs** and place in the bottom of the **displacer cylinder**.



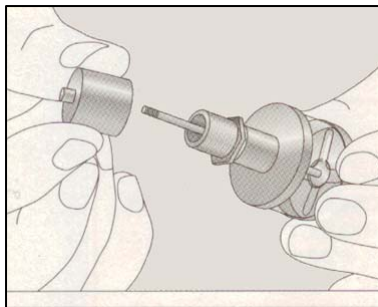
6. Take the **power cylinder** and push onto the top of **displacer cylinder**.



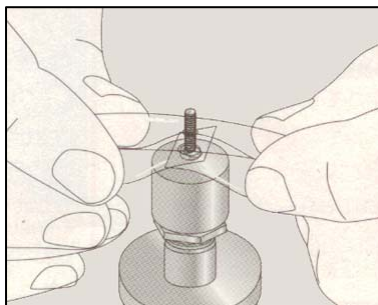
7. Add the **cylinder nut** onto the thread. Make sure there is a 3mm gap of thread below the nut.



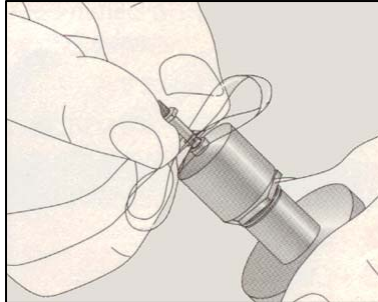
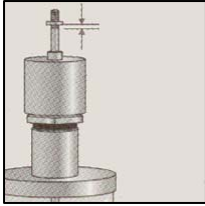
8. Take the **power cylinder** and push the **power piston/shaft** through the centre. The thread on the shaft should be protruding from the thinnest part of the **power cylinder** (shown on the left of the diagram).



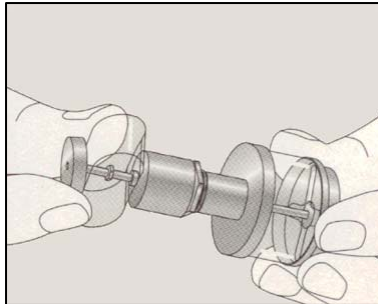
9. Take the **cylinder cap** and screw it on to the power cylinder. Make sure it is on tight and the nut does not move (there should still be a 3mm gap of thread below the nut).



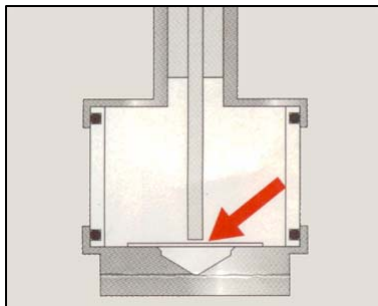
10. Take the **upper spring**; fold it over the top of the **power piston/shaft** as shown in the diagram.



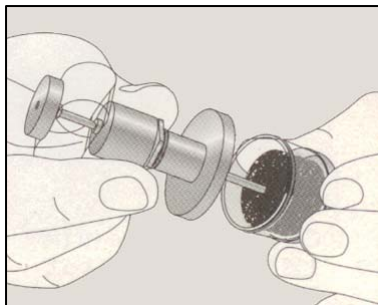
11. Screw the **piston nut** onto the **power piston/shaft**. Make sure there is a 1mm gap of thread below the nut.



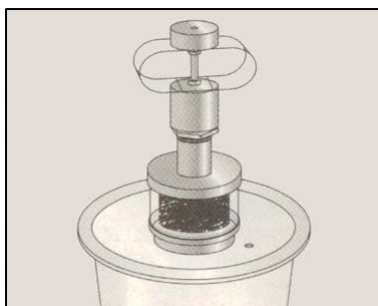
12. Screw the **counter weight** onto the **power piston/shaft**. Make sure there is a 1mm gap of thread below the nut. Make sure it is on tight and the nut does not move (there should still be a 1mm gap of thread below the nut).



13. The end of the **power piston/shaft** should just touch or be just above the **lower spring**. If it is not, adjust the nuts according.

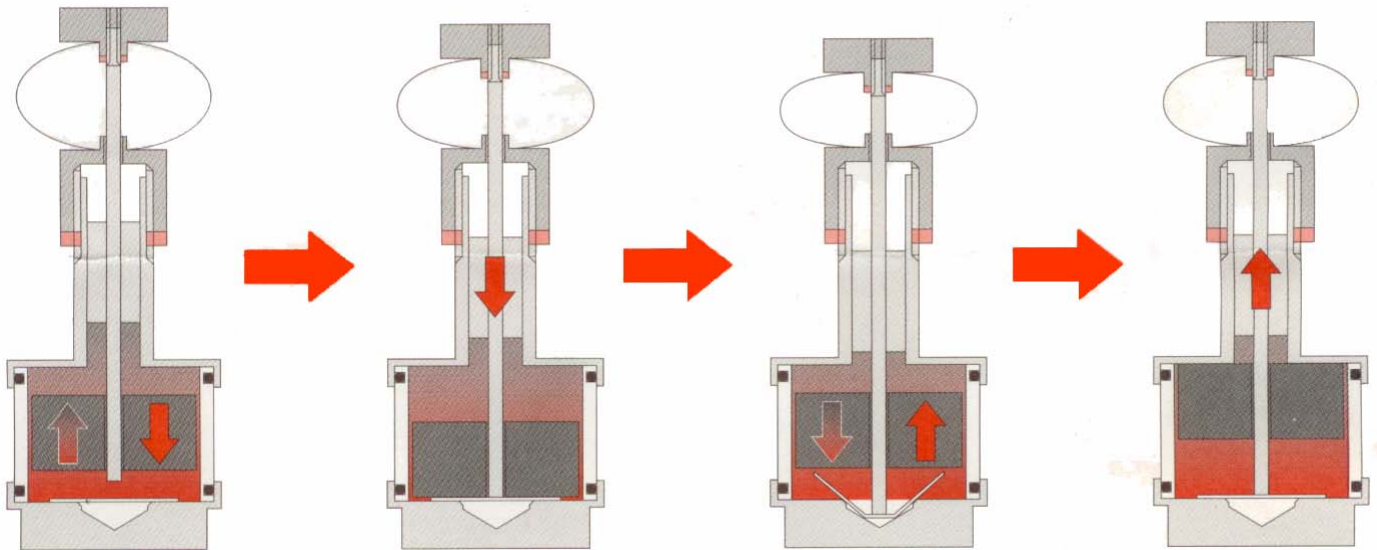


14. Take off the **power cylinder** and insert the **displacer piston**. It **SHOULD NOT** be glued or fixed in anyway. This is a free piston.



15. Put the **power cylinder** back on the **displacer cylinder**. Prepare a cup of freshly boiled water. Place the **cup/mug cover** on the cup/mug. Then place the finished Stirling engine onto of the cover. Wait a minute and gently tap the **counter weight**.

## How the Stirling Engine Works



**Cooling Phase (Far left)** – The displacer piston (large piston) is begins to drop. The air in the Stirling engine is beginning to cool ready for the contraction phase.

**Contraction Phase (Second from left)** – The Cooling phase has just finished. The overall temperature of the air inside the Stirling engine has dropped and hence the internal air pressure is dropping. The power piston (small piston) is being pulled down by this pressure drop. The displacer piston (large piston) is now at the bottom and the cooling has reached its peak.

**Heating Phase (Second from right)** – The displacer piston (large piston) is has been pushed up by the spring. The air under the displacer piston begins to heat up.

**Expansion Phase (Far right)** – The overall temperature of the air inside the Stirling engine has increased and so has the air pressure. The air is expanding and the power piston is being pushed up. The displacer piston (large piston) is now at the top, heating is at its peak. The cycle will repeat until the difference in temperature between the top and bottom plates are too small.