

## **D Star Ultra-Low Temperature Difference Stirling Engine**



The Ultra Low Temperature Difference (ULTD) Stirling Engine is a heat engine that operates off as little heat as from your hand. The Stirling Engine can be used for classroom demonstrations, or by hobbyists who enjoy heat-to-mechanical energy engines.

### **Operation (hand)**

The ULTD Stirling Engine can operate on the heat of your hand. But keep in mind it may not operate on everyone's hand. It may not operate if :

- a) you have low circulation in your hands (cold hands)
- b) the ambient temperature is too close to your body's external temperature.
- c) you are a zombie.

Hold the ULTD in the palm of your hand with as much of the base touching your actual palm. Allow it to warm up in your hand for about 30 seconds and then gently spin the wheel to get

it started. The wheel will now spin from the temperature difference between you hand and the ambient air temperature.

### **Operation (heat source)**

The ULTD Stirling Engine will operate if placed over a source of heat such as a warm drink. The heat source needs to be 7-10C warmer than the ambient air temperature for it to operate.

Place the ULTD Stirling Engine on the heat source and allow the base to warm up for a few seconds. Then gently spin the wheel to get it started. The wheel will now spin from the power of temperature difference.

*Do not use a heat source that is hotter than 212F/100C as this may damage the LTD Stirling Engine*

### **Operation (cold)**

The ULTD Stirling Engine can also operate on cold temperatures assuming the ambient temperature is sufficiently different from the cold item. The best way to demonstrate this is to use a bowl of ice. Place the ULTD Stirling Engine into the bowl carefully and let it cool down for several seconds. Then give the wheel a gentle spin and watch it go. The ULTD Stirling Engine is actually using the warmer air as the heat source in this set-up.

Do not leave the ULTD Stirling Engine unattended for very long when running off a bowl of ice. The ice can melt and get water into the engine's parts.

*Do not use a product that is colder than 15F/-10C for cold operation.*

### **Maintenance**

The ULTD Stirling Engine is covered by a limited lifetime warranty. However, note that the ULTD Stirling Engine is very delicate and

should be handled with care. When not in use it should be returned to its box for storage. Do not operate the ULTD Engine for an excessively long period of time and do not expose it to the higher ends of its temperature limits for more than a couple of minutes.

Children should not be allowed to handle the ULTD Stirling Engine due to its delicate nature

The ULTD Stirling Engine should require very minimal maintenance. Should a problem arise please contact D Star for help. See the end of this instruction for contact information.

If the wheel is not moving smoothly or is making excess noise, a single drop very light oil (no more more than 5W, knife honing works great) can be applied with a cotton swab to help lubricate the bearings. Do not use an excess of oil.

***Do not put any oil on the bottom glass piston or brass bushing***

### **How does a Stirling Engine Work?**

A Basic Stirling Engine has two cylinders. One of the cylinders is kept under constant heat. This causes the gas in the chamber to expand pushing the cylinder out and moving the wheel. The air in the second chamber is compressed. While in larger model Stirling Engines a coolant system would be needed to keep the cycle going this model is small enough that the momentum of the flywheel is enough to keep it operating.

When the wheel spins around from momentum it compresses the air in the heating chamber. The heat from the flame quickly expands from the heat of the flame and the process starts over again.

### **What are Stirling Engines used for?**

A Stirling Engine differs from a Steam Engine

in that only the air in the chamber needs to be heated. A Steam engine requires water to be boiled into a gas and that gas then must be pushed into a chamber to move a piston. Stirling Engines are more efficient, quieter, and requires less maintenance than steam engines. They also do not have any boilers that will explode.

However, Stirling Engines were unable to compete with Steam Engines in the 19<sup>th</sup> century due to material limitations of the era. Larger Stirling Engines experienced many failures and only small engines were of any use.

In the present era, Stirling Engines are finding new uses as heat pumps, and for generating electricity from renewable heat sources such as concentrated sunlight.

New uses for Stirling Engines are being found thanks to modern materials making them viable – as of this writing a device is in development that uses a Stirling Engine powered by a hot cup of coffee. The engine generates electricity that can be used recharge your Smart Phone or other portable electronic device.

### **Warranty**

D Star Stirling Engines have a limited lifetime warranty. This warranty covers defects in manufacture. It does not cover any defects caused by misuse, modification, or damage

*Parts and repairs to your Stirling Engine are available at reasonable cost from D Star Engines. Please contact the number below for parts and service either in our out of warranty.*

### **Need Help?**

Need a hand getting your engine working?  
You can call 831-338-8354 or email  
rex@dstarengines.com