

# Stirling Engine SE-13-kit

## Tools and Supplies

For assembling this kit, you need the following tools and supplies, which are not included: Hex screwdriver Size 1.5, tweezers, pointed pliers, hex key Size 2.5, Torx screwdrivers Size 8, 10 and 20. Included are: 1 syringe of ceramic paste, 1 syringe of Aeroshell Fluid 12 oil, 1 syringe of ball bearing adhesive Super Glue.

## Assembly

- 1 – Carefully push one bearing (2) each into the sides of rocker arm (1).
- 2 – Using Super Glue, glue one bearing (3) each into the side frames (9 + 10) – flush with the outside frame surface (countersunk). Apply just a small quantity of Super Glue to the bores of the side frames.
- 3 – Press the piston cover (20) into the displacer piston (19), then screw the piston (19) onto the displacer shaft (18). Apply a small amount of Super Glue to the thread and carefully wipe off any excess adhesive with a cloth.
- 4 – Guide the displacer piston assembly (19/20) into the cooling cylinder (22). If the cylinder is held in a vertical position, the displacer piston must glide in by itself and must not bind. Using a pin (16), connect the connecting rod (21) to the displacer shaft (18) of cooling cylinder (22).  
**CAUTION:** Do not cause damage to the surface of the shaft! Connect connecting rod (15) to working piston (17) using a pin (16).  
**CAUTION:** The wall of the piston is very thin, do not use pliers! One bore may be an easier fit than the other!
- 5 – Center the heating cylinder (23) over the cooling cylinder (22) and secure it with screws (24).
- 6 – On the inside of the rear side frame (10), guide the crankshaft (13) with its longer end into its bearing.
- 7 – Position the cooling cylinder (22) on the inside of the rear side frame (10) and secure it with two Torx screws (29).
- 8 – Using Torx screw (29), attach the rocker arm shafts (14) to the inside of the rear side frame (10).
- 9 – Slide on the rocker arms (1) with the aluminum part toward the front side frame (9).
- 10 – Using a Torx screw (8), attach the hex distance piece (4) to the rear side frame (10). The threaded holes of the hex distance piece (4) must be vertically aligned.
- 11 – Fit the front side frame (9) to the crankshaft (13), the rocker arm shaft (14), and the hex distance piece (4). Secure the assembly with Torx screws (8 + 29). When placed on an even surface, the assembled engine must not rock or tilt – the two side frames (9 + 10) must be in alignment.
- 12 – Attach connecting rod (27) of crankshaft (13) to rocker arm (1). Fit the black plastic bushing (11) into the connecting rod (27) and secure it from up front with screw (6). Tighten lightly with a torque of just 3 cNm to avoid squeezing the plastic bushing (2X)!
- 13 – Apply a touch of ceramic paste to your index finger and rub it against your thumb until the paste is virtually invisible. Now apply a thin coating to the working piston (17). Guide the piston (17) into the cooling cylinder (22) and move it back and forth. The piston (17) must glide without scratching or binding! Make sure that no oil touches working piston (17), Ø 9 mm. Using the syringe, apply a small drop of oil to the displacer shaft (18).
- 14 – Attach the connecting rod (15) and rocker arm (1). Fit the black plastic bushing (11) into the connecting rod (27) and secure it from up front with screw (6). Tighten lightly with a torque of just 3 cNm to avoid squeezing the plastic bushing!
- 15 – Turn the two grub screws (26) into the flywheels (25) – see assembly drawing.
- 16 – Fit a flywheel (25) to the front side frame (9) so that the crankshaft (13) is flush on the outside. Lightly tighten the grub screw (26).
- 17 – Fit the second flywheel (25) to the other side of the crankshaft (13) so that it butts against the bearing (with a little play). Lightly tighten the grub screw (26).
- 18 – Fit the black drive wheel (30).
- 19 – Glue three rubber feet (31) to the underside of the beech base (12) – two to the outer corners of the rear edge and one centered along the front edge.
- 20 – Using screws (5) and washers (7), attach the engine to the beech base (12).
- 21 – Apply the self-adhesive type plate.
- 22 – **PLEASE NOTE:** A slight unbalance of the flywheels (25) is normal and cannot be avoided. It is not covered by the warranty.

23 – Never loosen the grub screws of the crankshaft (13)! The crankshaft can only be aligned with special manufacturer's tools!

## Starting the Engine

**CAUTION:** The engine must be operated by or under the supervision of persons over 18 years of age.  
**Flammable objects must be kept from the vicinity of the engine. Do not touch the engine since this could lead to serious burns. Take great care when handling alcoholic spirits. Never leave spirits bottles open.**  
**Inappropriate handling of the engine can cause fires!**

## Instructions for Use

- 1 – Set up the engine in a draft-free area.
- 2 – Fill the aluminum burner cup to the lower marking with 94% alcoholic spirits.  
**CAUTION:** Alcoholic spirits may damage paints and lacquers. Close the spirits bottle tightly and store it in a secure place.
- 3 – Light the wick.
- 4 – Wait for approx. 10 seconds.
- 5 – Rotate the flywheels with force until the engine begins to run by itself.
  - Never leave the running engine without supervision.
  - With the burner positioned over to the far right, the engine will run more slowly.
  - The black drive wheel can be used to power accessories.

## Care

The engine should be protected from dust. Even small particles can cause the engine to stop. All mechanical moving parts must be free and have play or the engine will not run!

**Caution during dismantling:** Many parts have a wall thickness of less 0.25 mm.

## What if the engine will not start up?

- Check all mechanical components for free play.
- Have the black bushings been properly tightened?
- Does any oil cover working piston (17)? (after long standstill possible)
- Has too much ceramic paste been applied?

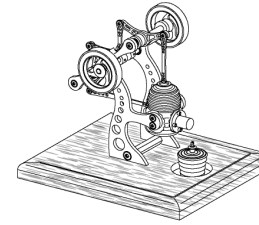
**For technical advice, please contact:**

[www.rarecreations.co.nz](http://www.rarecreations.co.nz)

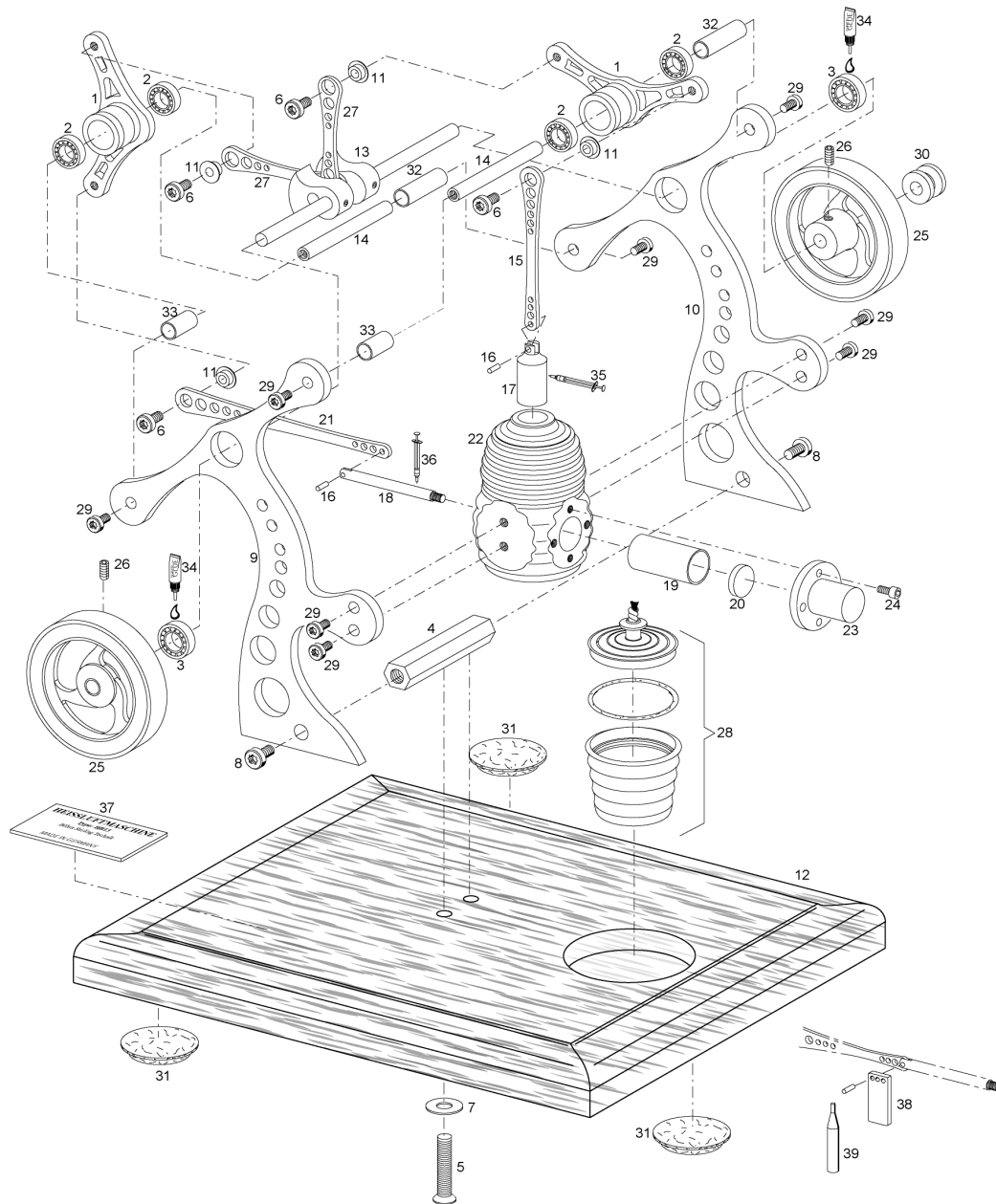
## The Working Principles of a Stirling Engine

The burner heats the air, which is in a closed system. Due to the heat expansion of the air, the piston and the flywheels are put in motion. While the piston moves toward the flywheels, the displacer piston in the displacer cylinder is pushed into the cylinder head. Because the displacer piston does not have a seal, the hot air moves past it into the fin-cooled displacer cylinder. Here, the temperature is approx. 300 °C lower, the cooled air causes a vacuum, which pulls in the piston and keeps the flywheels turning. This rotary motion causes the displacer piston to be drawn back into the displacer cylinder, the cooled air rushes into the cylinder head. It heats up again, expands and thus provides power.





## Stirling Motor SE-13



Bild/Nr. Ill. No.	Benennung Part No.	Abm. Bemerk. Diment. Remarks	Stück Pieces	Denomination
1	Kipphebel		2	Rocker arm
2	Kugellager	∅ 9x2,5 mm	4	Ball bearing
3	Kugellager	∅ 11x4mm	2	Ball bearing
4	Sechskantbolzen		1	Hex distanz piece
5	Torx Senkschraube	M4x20, TX20	2	Torx counter-sunk screw
6	Torx Linsenkopfschraube	M2,5x4, TX8	4	Torx oval-head screw
7	Beilegscheibe	∅ 11,7x1,5mm	2	Washer
8	Linsenkopfschraube	M4x6, TX20	2	Head screw
9	Seitenteil vorne		1	Side frame, front
10	Seitenteil hinten		1	Side frame, rear
11	Schwarze Plastikbüchse		4	Black plastic bush
12	Buchse		1	Beech base
13	Kurbelwelle montiert		1	Crank shaft ass.
14	Kipphebelachse		2	Rocker arm shaft
15	Pleuel kurz	45mm	1	Connecting rod, short
16	Passstift	∅ 1,5x4mm	2	Pin
17	Arbeitskolben	∅ 9x18,3mm	1	Working piston
18	Verdrängerachse	∅ 4x31mm	1	Displace axle
19	Verdrängerkolben	∅ 12x27,6mm	1	Displace piston
20	Verdrängerkolben Deckel	∅ 11,6x1,5	1	Displace piston cover
21	Pleuel	62mm	1	Connecting rod, medium
22	Kühlzylinder (Messing)		1	Cooling cylinder (brass)
23	Heizzylinder	∅ 25x21mm	1	Heating cylinder
24	Inbusschraube	M3x8mm, SW2,5	4	Sockethead screw
25	Schwungrad	∅ 39,7x10mm	2	Flywheel, brass
26	Madenschraube	M3x3mm, SW1,5	2	Grub screw
27	Pleuel (Kurbelwelle)	32mm	2	Connecting rod, long
28	Brennerdose mit Docht		1	Burner case with wick
29	Linsenkopfschraube	M3x6mm, TX10	8	Head screw
30	Antriebsrad schwarzes Plastik		1	Drive wheel, black plastic
31	Gummifuß		3	Rubber foot
32	Distanzbuechse	12mm	2	Spacer
33	Distanzbuechse	8mm	2	Spacer
34	Kugellagerkleber	SUPER GLUE	1	Ball bearing adhesive
35	Keramikpaste weiss (fest)		1	White ceramic grease
36	Öl für Verdrängerachse		1	Oil
37	Typenschild HB13		1	Type plate
38	Montagehilfe für Passstift		1	Holder plate
39	Durchschlag zum lösen des Passstift		1	Drive punch