Stirling Engine Kit HB10-AS2

Tools and Supplies

For assembling this kit, you need the following tools and supplies, which are not included in this kit:

Hex screwdriver 1.5; tweezers; pointed pliers; hex key Size 2.5, Torx screwdrivers 8, 10, 20; open-end wrenches Size 5.5 and Size 7.

Included are: 1 x Ceramic-Paste, 1 x Aeroshell Fluid 12 Oil, 1 x Ball bearing adhesive.

Assembly

1 – Push two bearings (2) each into the rocker arms (1).

2 – Guide the rocker arm shafts (4) into the rocker arms (1). Using screws (5) and a touch of screw lock adhesive, attach them to the arms of the side frames (12 + 13). Firmly tighten the screws.

3 – Using Torx screws (8), attach the hex distance piece (6) to the side frame (12). Align the threaded hole so that it points straight down.

4 – Using a Torx screw (5), attach the hex distance piece (7) to side frame (12) below the bearing hole (Ø 9 mm).

5 – Press the piston cover (20) into the displacer piston (19). Using Loctite, screw the assembly onto the displacer shaft (18) all the way. Carefully wipe off excess Loctite with a cloth.

6 – Fit the assembled displacer piston into the cooling cylinder (22). If the cylinder is held vertically, the displacer piston must glide in by itself and must not bind.

7 – Center the heating cylinder (23) over the cooling cylinder (22) and secure it with screws (24) M3x8.

8 – Press the connecting pipe (10) into Ø 3.35mm hole (recessed area) of the cooling cylinder (22).

9 – Connect the assembled cooling (22 + 18) to connecting rod (17) by pressing in pin (21).

10 – Mount the cooling cylinder (22) to the side frame (12) using Torx screw (5). Tighten the screw.

11 – Attach the side frame (13) to the assembled side frame (12) using two Torx screws (8) and one Torx screw (5).

12 – Fit the power cylinder (25) onto the premounted, projecting connecting pipe (10) and press until it rests against the side frame (13). Secure the assembly with Torx screw (26).

13 – Glue three rubber feet (32) to the underside of the base (33) as shown in the sketch.

14 – Mount the assembled engine to the base (3) using two Torx screws (34) and washers (35). The heating cylinder (23) must be positioned over the cutout of the base.

15 – Glue one ball bearing (2) each into the top bores (Ø 9 mm) of the side frames (12 + 13) and let set for one hour.

16 – Fit the shaft with drive wheel (11) into the bearing. Do not use pressure.

17 – Fit the flywheel (28) with grub screws (29) on the inside.

18 – Fit the flywheels (28) so that they are even with the ends of the dive shaft (11). Do not press the wheels against the bearings to avoid binding. Once the wheels are in a correct position, tighten the grub screws (29). Both grub screws have to be in line. Rotate the flywheels – they must turn without undue friction and not come to an immediate halt!

19 – Connect the power piston (27) with connecting rod (9) using a pin (21). 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 power piston (27). Guide the piston into the power cylinder (25) and move it back and forth. It must move without scratching and/or binding! Make sure that oil does not touch working cylinder (25)!

Apply a small drop of oil (syringe included) to the displacer shaft (18).

20 – Fit the long connecting rod (16) – marker band against flywheel (28) – with black bushing (15) and a screw (14). Tighten lightly (3 cNm torque).

21 – Attach the other end of the connecting rod (16) to the upper end of the rocker arms (1) as described before.

22 – Attach the connecting rod (17) with a black bushing (15) front and rear and screw (14). Tighten lightly with a torque 3 cNm.

23 – Apply the self-adhesive Boehm logo.

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!

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. Since 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.

Instructions for Use

1 – Set up the engine in a draft-free area.

2 – Fill the aluminum burner cup to its lower mark with alcoholic spirits (94 %). The wick should not protrude more than c. 1 mm.

Caution: Alcoholic spirits can 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 – Never leave the running engine without supervision! Keep the flame low to avoid overheating the engine.

- With the burner positioned over to the far right, the engine will run slowly.
- If a flywheel is loosened and turned by 180 °, the engine's direction of rotation changes.
- The drive wheel (11) 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?
- Has too much Ceramic Paste been applied?
- Has oil coated the working cylinder (25)?

For technical advice, please contact:
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www.stirling-technik.de.

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Parts List

Part No.	Description	Pcs.
1	Rocker arm	2
2	Ball bearing	6
4	Rocker arm shaft	2
5	Torx screw M3 x 6 mm, TX10	5
6	Hex distance piece M4 x 15 mm, Size 7	2
7	Hex distance piece M3 x 15 mm, Size 5.5	1
8	Torx screw M4 x 6 mm, TX20	4
9	Connecting rod 50.5 mm	1
10	Connecting pipe Ø 3.6 mm x 25.5 mm	1
11	Shaft with drive wheel Ø 4 x 40 mm	1
12	Side frame, front	1
13	Side frame, rear	1
14	Torx screw M2.5 x 4 mm, TX8	6
15	Black plastic bushing	6
16	Connecting rod 68 mm	2
17	Connecting rod 39.5 mm	1
18	Displacer shaft Ø 4 x 31 mm	1

Part No.	Description	Pcs.
19	Displacer piston Ø 12 x 27.6 mm	1
20	Piston cover Ø 11.6 x 1.5 mm	1
21	Pin Ø 1.5 x 4 mm	2
22	Cooling cylinder (brass), Ø 30 x 31.3 mm	1
23	Heating cylinder Ø 25 x 21 mm	1
24	Hex screw M3 x 8 mm, Size 2.5	4
25	Power cylinder (brass), Ø 25 x 36 mm	1
26	Torx screw M3 x 20 mm, TX10	1
27	Working piston Ø 9 x 18.3 mm	1
28	Flywheel Ø 39.7 x 10 mm	2
29	Grub screw M3 x 3 mm, Size 1.5	2
30	Burner cup with lid	1
31	Wick	1
32	Rubber foot	3
33	Base (beech)	1
34	Torx screw M4 x 20 mm, TX20	2
35	Washer Ø 11.7 x 1.5 mm	2