



Classic Smoke-Motor SE-24

Tools and Supplies

For the assembly of this kit, the following tools and supplies are needed, but not included: Hex screwdriver Size 1.5; pointed pliers; hex key Size SW 2.5; TORX 8, 10 and 20 screwdrivers; open-end wrench Size 5.5.

A syringe with Böhm Special Oil is included.

Assembly

- 1 – Fit 2 ball bearings (4) each into bearing block (37).
 - 2 – Fasten 2 hex studs (3) to the upper rear side (2) using countersunk screws (28).
 - 3 – Fasten 2 hex studs (10) to lower rear side (29) using countersunk screws (28). Bring the threaded holes into vertical alignment.
 - 4 – Fit bearing block (37) with its side (longer shoulder) all the way into rear side (2).
 - 5 – Now push front side (1) onto bearing block (37) all the way. Screw in 4 countersunk screws (M4 x 6 mm) (28) and tighten them (lower screws lightly).
 - 6 – Please note that the 15mm hex studs (10) have to be inserted (27) so that they then can be fastened with countersunk screws (28). On the side with the circular eyelet (left), press in adjusting screw (26) until its snaps in. As a test, insert the burner tank into the left eyelet and set it into the right-hand side of the U-shape. The burner tank can now be angled by means of adjusting screw (26)! Mount the completed sides and the burner base to beech base (31) using screws (36) and washers (32). It is recommended, to loosen the lower countersunk screws somewhat in order to ensure the vertical alignment of the hex stud threads. After the sides have been mounted to the base, countersunk screws (28) can be re-tightened.
 - 7 – Fit wheel shaft (5) through bearing block (37) – it must project 2.5 mm on the piston side, front side (1). Now fit a shim (19) each on both sides. On the piston side, front side (1), fit the piston cam to the wheel shaft and fasten it to the latter using a grub screw (7).
 - 8 – On the other side, fit flywheel (23) onto the wheel shaft and secure it with a grub screw (7) from above through the flywheel. The flywheel must now rotate freely and long time!
 - 9 – Fit piston connecting rod (13) into the groove of piston connector (14) and then push pin (11) through the connector. The connecting rod should now oscillate freely on the connector! Set connector (14) against the inner face of the piston and fasten it from the outside with screw (16) through the piston's hole.
- CAUTION:** The piston can easily be damaged! Never grip the piston with force to avoid destroying it!
- 10 – Clean the inside of cylinder (24) with a clean and dry cloth. Press a ball bearing (35) into the front (flame side) and rear. Using the oil syringe, apply a minute amount of oil (1 drop) to the circumference of the piston. Slowly and carefully insert the piston into the cylinder. Take care that it does not get scratched – possibly repeat the procedure. Then push the cylinder with the already mounted piston into the cut-outs of the mounted sides. Now, secure cylinder (24) with two screws (29) from behind and one screw (30) from up front.
 - 11 – The curved side of the piston connecting rod faces out. Fit black bushing (9) to the connecting rod from behind. Fit screw M2.5 x 4 (8) through the connecting rod and bushing into the brass piston cam and tighten it lightly. Now rotate the flywheel with the mounted piston.
 - 12 – Fasten flame cam (21) to camshaft (20) with grub screw (7) (2.5 mm from the end of the shaft). Fit a shim (19) to the shaft and slide it against the flame cam. Set a shim (19) onto valve plate (22). Together with the shim, slide the valve plate from behind into the top hole of the flame cam.
 - 13 – **Carefully** and slowly fit the entire shaft with the valve plate into the ball bearing and through the cylinder so that it enters the ball bearing on the other side. Again fit a shim (19) to the shaft followed by aluminium sleeve (18). Mount cam connecting rod (12) with pin (11) between the groove of cam (17). Please make sure that the rounded side is on the outside and that milled side on the cross bore of the cam (4 mm) is on the inside so that the sleeve fits into the recess. Slide the cam onto the shaft and secure it with a grub screw (7). The side is correct if the grub screw points toward the flywheel! It is important that camshaft (20) has some axial play (approx. 0.1–0.15 mm) so that the valve plate will not bind. Should the play be greater than 0.15 mm, please adjust with additional shims (0.2 mm) on the side of cam (17). Or, if the assembly binds, remove shim(s).
 - 14 – Fit a black bushing into the last hole of cam connecting rod (12) from behind. From up front, insert screw (8) M2.5 x 4 and tighten it lightly against the flywheel. If tightened too much, the bushing will be squeezed causing it to bind!

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!*

Operating the Engine

- 1 – Place the engine in a draft-free area.
 - 2 – Remove the burner tank and fill it up to the threaded hole with 94 % alcoholic spirits. The wick should extend 7 mm.
- CAUTION:** Alcoholic spirits can damage lacquers. Close the bottle immediately and store it safely.
- 3 – Fill the cooling pot 3/4 with lime-free water.
- WITHOUT COOLING WATER, the engine can be damaged!**
- 4 – Light the wick. If the tips glow, extinguish it again.
 - 5 – Rotate the flywheel with force until the engine runs on its own.
 - 6 – The distance from flame to cylinder can be adjusted with the adjusting screw thus influencing the engine speed. Do not operate the engine at max. revs for any length of time! This could cause overheating and ultimately damage to the engine!
 - 7 – **During the first 4 minutes of operation, condensation builds up within the cylinder.** This slows down the engine and causes irregularity. Along with high humidity, this may cause the engine to stop. Once the cylinder is warm enough, the engine will run properly. **Don't stop the engine in the first 4 minutes because for drying water/humidity.**
 - 8 – Never leave the engine running without supervision.
 - 9 – The groove in the circumference of the flywheel hub can be used to drive accessories such as the windmill or the lighthouse from the Böhm Stirling technology program.

Maintenance and the Influence of Weather

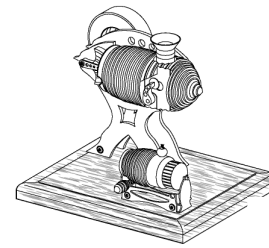
- The engine should be stored in a dust-free, dry place. Even smallest amounts of dirt can stop the engine. All mechanical, moving parts must be free so that the engine can run! It is possible that the engine will **NOT** perform properly in humid weather or during low air pressure!! **After a running time of 5 hours, the piston and the cylinder should be removed (loosen 3 screws 8, 29, 30 only), and then the inside wall of the cylinder and the piston be wiped with a clean cloth to remove dirty oil!** Re-lubricate and -assemble the parts according to instructions.
- Check all mechanical parts for free play.
- Have the black bushings been tightened too much?
- Have cylinder and piston been cleaned?
- If the piston squeaks (lack of lubricant), clean the former and relubricate (use very little oil).

For technical advice, please contact:

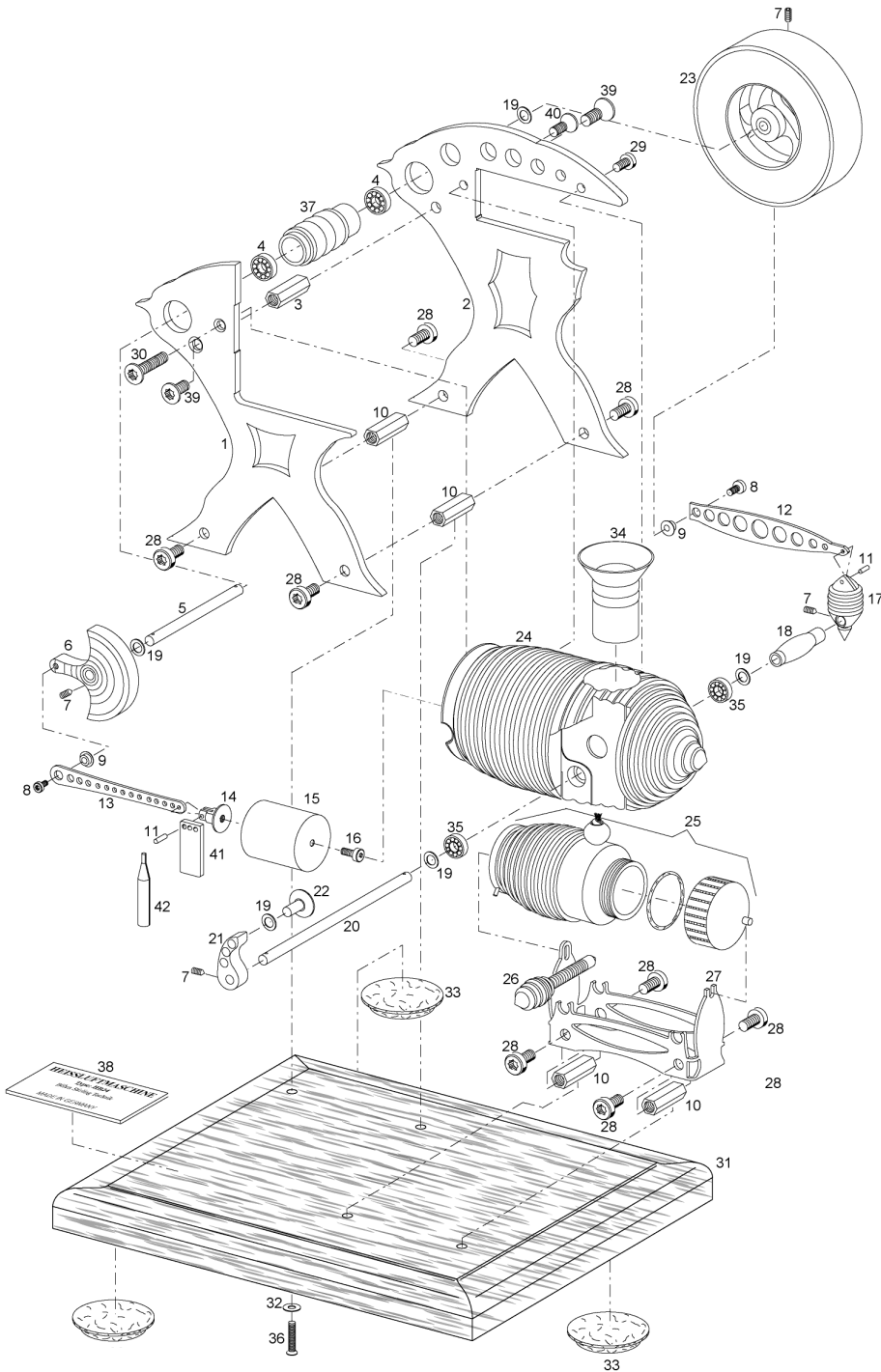
E-mail: rarecreationsnz@gmail.com

Working Principle classic Smoke engine (flame eater)

A vacuum engine, also named flame eater, is a hot-air motor but not a stirling engine. The principle is quite old. In 1758 Henry Wood already was granted a patent. From the technical point of view it is an atmospheric motor, but because the outer air pressure does the work (comparable to the first Ottomotor) . The piston sucks the flame into the cylinder through an open valve (causing a running noise, which reminds you of a Lanz-Tractor) and heat the air inside. While the piston goes back the valve closes, the air in the cylinder cools down and the outer now higher atmospheric pressure presses the piston forward. Therefore the maximum power of the piston is limited to the product of the piston x air pressure. When the piston reaches the front dead center the valve opens again and the game starts again. A balance wheel cares fort he overcoming of both dead centres. Used a functioning motors for models they are often built as stationary motors in horizontal and vertical versions and as single-, double- or multi-cylinder. They have been used for models of nostalgic tractors and rail vehicles very successfully.



Classic Smoke SE-24



Bild/Nr. Ill. No.	Benennung Part No.	Abm. Bemerk. Diment. Remarks	Stück Pieces	Denomination
1	Seitenteil vorne		1	Side, front
2	Seitenteil hinten		1	Side, rear
3	Sechskantbolzen ohne Vertikalgewinde		1	Hex stud w/o vertical thread
4	Kugellager		2	Ball bearing
5	Radachse	∅11x4mm ∅4x47.5mm	1	Wheel shaft
6	Kolbennocken, Messing		1	Piston cam, brass
7	Madenschraube	DIN914, M3x5mm	4	Grub screw
8	Linienkopfschraube	M2.5x4mm	2	Oval head screw
9	Schwarze Plastikbuechse	∅6x2.1	2	Black bushing plastic
10	Sechskantschraube mit Vertikalgewinde	SW7	4	Hex stud with vertical thread
11	Passstift	∅1,5x6mm	2	Pin
12	Kippnockenpleuel		1	Cam connecting rod
13	Kolbenpleuel		1	Piston connecting rod
14	Kolben Anschlussstück		1	Piston connector
15	Kolben, befindet sich im Zylinder		1	Piston located inside cylinder
16	Linienkopfschraube	M3x4mm	1	Oval head screw
17	Kippnocken		1	Cam
18	Alu Hülse	∅6x22,5mm	1	Aluminium sleeve
19	Passscheibe	∅7,8x0,2	5	Shim
20	Kippnockenachse	∅4x77,5	1	Camshaft
21	Flammnocken		1	Flame cam
22	Ventilteller		1	Valve plate
23	Schwungrad	∅70mm	1	Flywheel
24	Zylinder	∅60mm	1	Cylinder
25	Spiritusbrenner komplett		1	Alcohol burner
26	Einstellschraube		1	Adjusting screw
27	Brennersockel		1	Burner base
28	Linienkopfschraube	M4x6mm, TX20	8	Head screw
29	Linienkopfschraube	M3x6mm, TX10	1	Head screw
30	Linienkopfschraube	M3x12mm, TX10	1	Head screw
31	Buchenbrettchen		1	Beech base
32	Unterlegscheibe	∅11,8x1,5mm	4	Washer
33	Gummifuß		3	Rubber foot
34	Kühltopf Alu		1	Cooling pot aluminium
35	Kugellager	∅9x4mm	2	Ball bearing
36	Senkschraube	M4x20mm	4	Countersunk screw
37	Lagerbock	∅17x23mm	1	Bearing block
38	Typenschild HB24		1	Type plate
39	Senkschraube	M4x6mm, TX20	2	Counter-sunk screw
40	Senkschraube	M3x6mm, TX10	1	Counter-sunk screw
41	Montagehilfe für Passstift		1	Holder plate
42	Durchschlag zum lösen des Passstift		1	Drive punch