Stirling-Manufaktur
Hermann Böhm
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AP172-Modell

Stirling-Technik
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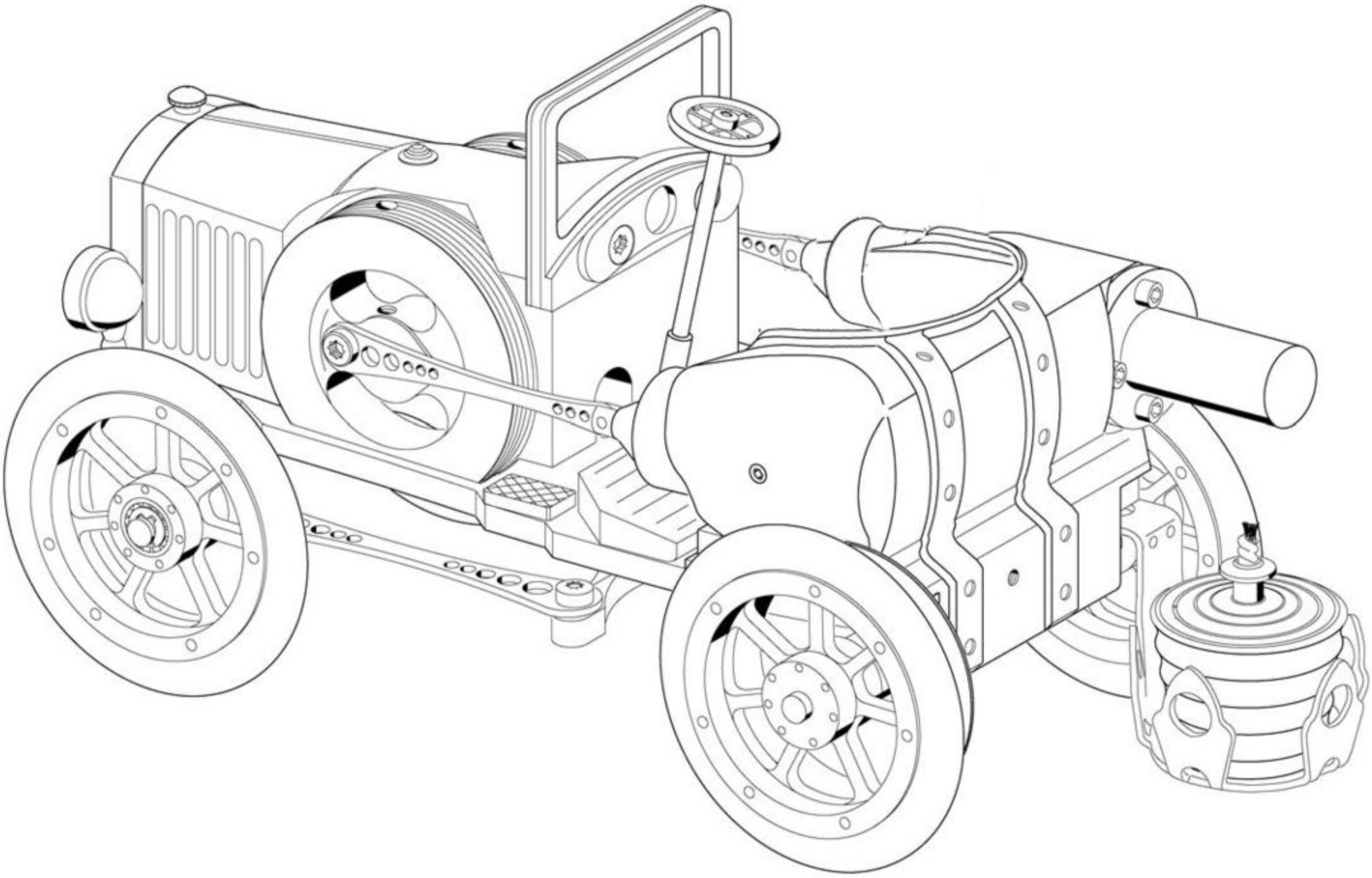

AP172

Tools and equipment
The following tools should be kept at the ready for assembling this set (not included): Allen key SW 1,5, tweezers, needle-nose pliers, Allen key SW 2,5, Torx keys 6, 8, 10 (in Shop WE Set1). Included in the set: 1 syringe of ceramic paste (dry, cannot be squeezed out! Open with side cutter), 1 syringe of AeroShell Fluid 12 oil, punch (54) 1.5mm (for removing the mounted dowel pins), retaining plate (55) (white) for dowel pin assembly

Assembly
MODULE 1::: ENGINE BLOCK:::
Slide the axle (5) into the flywheel (3) and fasten it with grub screw (15), push a bearing (4) onto the axle. Turn the grub screw (15) into drive A (6). Insert O-ring A (10) into the groove of drive A (6), hold them together and lead them into the deep hole in the engine block (1) lying on its back so the alignment of the belt corresponds with the slot to the outside. Now insert the mounted flywheel (3) with the shaft and the bearing into the bearing bore hole of the engine block (1) so that is passes the drive wheel (6) and leaves the other side. At the end of the axle (5), slide another bearing (4) into the bearing bore hole of the engine block (1). Now the other flywheel (2). Fasten it with the grub screw (15). There are bore holes on the perimeter of the wheels (2 + 3); they must be exactly in line. Guide the bearing (4) onto the transmission axle (8). Now lead the axle through the bearing bore hole of the protruding limb of the engine block (1), then through drive B (7) and through the second limb (1). From this side, lead the other bearing (4) onto the transmission axle (8) up to the bearing bore hole (including threaded O-ring A (10)). Now clip the retaining rings on both sides of the axle (8). The drive wheel (7) can now be fastened centrally with grub screw (15) and Allen wrench 1.5mm. The flywheels should now run easily. The cap (47) should be glued with to the engine block (1) with lacquer or household glue. The first assembly is now ready!

MODULE 2::: SEAT BLOCK :::
Place the displacement piston cover (20) on the table with the smooth side downwards and press the displacement piston (19) in vertically until you reach the table, apply some coloured lacquer or thread locking fluid on the internal thread of the displacement piston (19) with toothpicks and screw in until the limit stop on the displacement axle (18). Carefully remove overflowing paint with a cloth (approx. 2 hours drying time). Insert the brass sleeve (16) into the seat block (12) and secure with the flat head screw (17). Insert the assembled displacement piston (18/19/20) into the sleeve (16) (from the inside). If the seat block is held vertically, the displacement piston should fall in by itself - it should not jam. Cleanliness is very important!
Set the heating cylinder (23) on the seat block (12) and fasten with 4 Allen screws (24). Pull the working piston (56) out of the sleeve and put it aside.
Now slowly and carefully push the sleeve (13 = working piston side) with the horizontal holes into a M4 threaded hole (14) located externally and level with the seat block until the limit stop so that it and the sleeve centring device are visible externally through the threaded hole (14) in the seat block (12). Apply some glue or thread locking fluid to the threads of grub screw M4x4 (14). Now turn grub screw M4x4 (14) into the hole until there is resistance and then turn it back a quarter turn (do not tighten, otherwise the piston jams; it should only be sealed, not tightened). Secure the sleeve (13) with the flat head screw (17) from the front.
Slide the two ball bearings (4) into the seat block from one side. Clip a retaining ring onto both axles 25 + 26 (each to the inner recess). First insert the long side 16,8mm (25). Now insert it through the bearing according to the drawing to the inner retaining ring up to the limit stop. From the other side, slide a bearing over the axle and press into the bearing seat.
Now also clip a retaining ring into the groove to lock the axles.
Insert the aligning pin (21) into one of the holes of the white plastic pressing aid (55). Place on the piston (56) on the lowered side and carefully fasten the VA connecting rod (22) with needle-nose pliers. Rub a small amount of white ceramic paste between your thumb and index finger until almost no paste is visible. Now place a thin film on the working piston (56) using your index finger. Insert the piston (56) into the sleeve (13) and move back and forth. The piston (56) must not scratch or jam! Assemble the aligning pin in the same way for part 18 and 22. Place a small droplet of oil from the provided syringe onto the displacement axle (18).
The second module is now ready.

MODULE 3 ::: Final assembly of frame :::
<u>Lay the frame (36) on the table so that the single bore hole of the frame (36) is at the back where the seat block (12) is laid</u> on it (on the right). Now press the two lateral footboards (46) in from above. Glue the number plate (38) onto the front of the frame (self-adhesive, pull foil). Fasten the central steering piece (32) with the front axle (31) under the aligning pin aid (33) (use the white tile again to fix the pin). Now insert the assembled central piece from below into the frame (make sure the "above / below "side is right, see the two holes at the back left in the direction of travel), then insert from below and fasten from above (34 + 35). Thread the engine block module (1) in from the top into the central aperture of the frame (36) and fasten loosely from the bottom with two screws (40). Directly behind it, fasten the footboard loosely (39) with the two screws (40). Now press the engine block (1) and the footboard towards the back and tighten the screws carefully. Now assemble the bushing (42) and screw (41) and the two connecting rods (43) on the black part (44) from the top. Now lead the steering column (44) carefully into the footboard (through the round hole). From above, attach a retaining ring and clip it securely. Slide the seat block module from the back into the frame up to the footboard limit stop. Insert and fasten the two screws (40) from the bottom left.

Now attach the two connecting rods (22) to the flywheels with the white bushing (42) and screw M2,5x5TX6 (42).
If they now turn on the flywheel, the connecting rods must not strike and must rotate freely.
Now set the radiator grille (45) forward in front of the engine block and secure it with two screws (40).
Now assemble drive wheels C (11) onto axes 8 + 25 with screws (15). Now assemble drive A (7) with O-belts (10) to axle (25), keeping some distance (0.5mm) to the seat block. Also place the belt over the small drive wheel (11). Now assemble the drive wheel (27) and place O-belt B (28) according to the drawing. Now assemble the impeller (29) with 2 ball bearings (30). Pay attention to the 2 retaining rings (9).
You can now set the car vertically; it supports itself at the rear with the heating cylinder. Secure it there on the side.
Now slide the steering holding piece (37) all the way in on both sides of the front wheel axle (31), then clip it to the inner retaining rings (9) on the front wheel axle (31), then an impeller on each (29) with two bearings (30) and another retaining ring (9). Now permanently assemble the connecting rod (43) with sleeves (42) and screws (41) on the respective steering holding piece (37) on the left in the direction of travel, stay left of the mark on the front axle. Also stay left of the mark on the other side (offset). This prevents the steering from jamming later. Test the free movement of the connecting rod with the bushing in the assembled state, it may be necessary to bend the connecting rod slightly near the black part (44).
Turn the straight piece with the 3 slots upwards at part (57) into a gentle wave shape so that it does not go loosely into the groove, but is somewhat tighter. Now secure the torch holder from below with a screw (40). Turn the edges of the torch holder so that the torch is secured in the holder, not loose. Finally, loosen the seat block, footboard, engine block and radiator grille from below (40), then push all these parts together and hold, then fasten all screws (40) (to prevent the displacement axle from striking in the seat block). Glue the headlight ring (65) to the headlight (62). Fasten the headlight (62) with the spacer (63) and the screw (64) according to the drawing. Insert two grub screws (53) M3x16 from below. They serve as a limit stop. Then screw the windscreen (60) with the two screws (61) to the engine block (1).
The driver should enter from the right in the direction of travel; lead the knees laterally under the steering wheel, now turn towards the seat. Put a small droplet of coloured lacquer or household glue into the threaded hole from above (44), now attach the steering wheel (48) with screw (49) and tighten. Now the driver is ready to drive the car.

Put the vehicle into operation

WARNING: The car should only be operated under constant supervision by persons over 18 years of age. Easily flammable objects should not be kept in the vicinity of the demonstration area. Do not touch the seat block, heating cylinder or the flame area since this could cause burning.
Handle denaturated alcohol carefully. Never leave alcohol bottles open. Inappropriate use of the Sportscar can lead to fires! NEVER in CHILDREN'S HANDS!!!The legal regulations for open fires apply when operating the device!

Operating instructions
1 – Set up the car in a draught-free place with flat floor/table surface.
2 – Remove the lid of the aluminum burner can and fill up to the marking with **94% denaturated alcohol(fresh fluid!!!).**
WARNING: The denaturated alcohol bottle should always be closed again and tidied away:::**Danger of explosion**:::.
3 – Light the wick. Wick must be out of burner 5mm and be **good bushy.**
4 – Wait approx. 45 seconds for good heat.
5 – **Forcefully crank** the flywheel in the direction of driving until the car drives by itself.
• Never leave the car without supervision.
• Rotate flywheel (3) 180° (see line on the circumference) and the car will drive backwards.
Maintenance/ Cleaning
Maintenance:
After one Hour running time clean piston and Cylinder
Read SUPPORT instruction website
http://www.en.boehm-stirling.com/support.html

Oil got on the working piston (56)? (After longer standstill possible):
Please towel the working piston with a lint-free cloth and as well its working piston bush (13).

Never re-apply oil, oil has an adhesive effect and stops the car from moving! The car should be stored in a dust-free environment. The smallest pollution can stop the motor from functioning. The adjustments are in the H7-area. All mobile mechanical parts should be free-moving or the motor will not run! Be careful when disassembling – some parts have thicknesses of less than 0,25 mm.

In case of problems visit the following link http://www.boehm-stirling.com/tl_files/stirling-technik.de/images/Antwort%20 Wartungshinweise%20Deutsch.pdf or read yellow Note in the box.

In case of technical questions please contact us at
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The propulsion principle of the Stirling motor
The burner heats the air contained in a closed circuit. Due to thermal expansion, the working cylinder and the flywheel are kept in motion. As the working cylinder moves in direction of the wheels, the displacing cylinder is pushed from the seat block into the heating cylinder. Since the displacement body has no seal, the hot air is moved past its outer wall into the front part of the seating block. Since the temperature there is approx. 300°C lower (volume reduction), the cooled air creates a vacuum that sucks the working cylinder back out and maintains the flywheel's motion. The rotating movement pulls the displacing cylinder back into the cooling rib part, allowing for a quick streaming of the cooled air from this chamber into the heating cylinder. The air heats again, expands and provides work once again.

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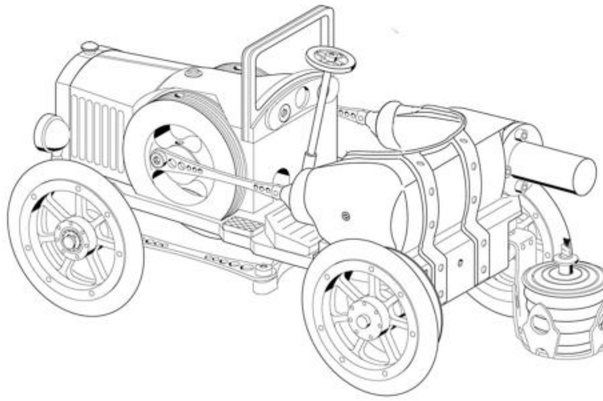
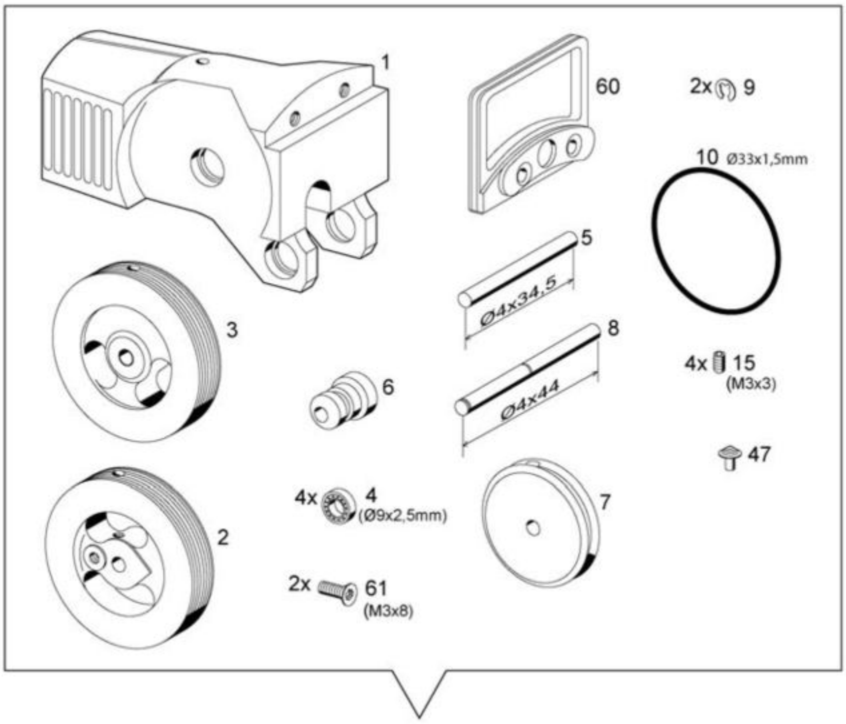
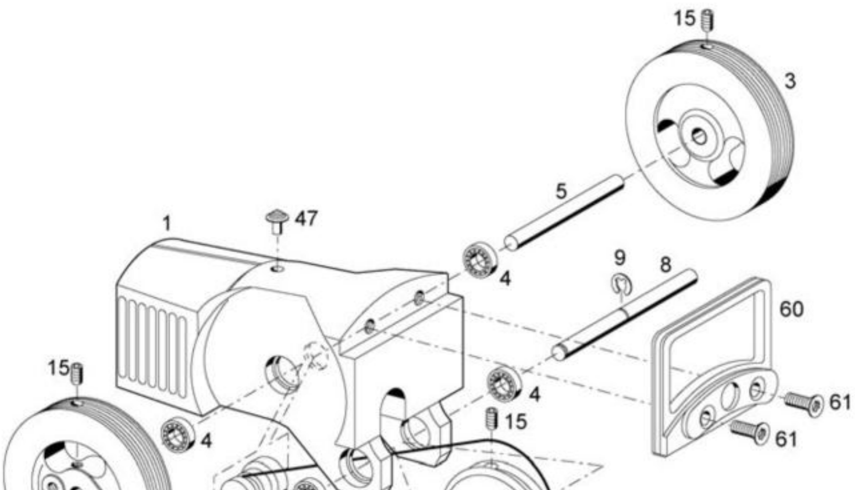
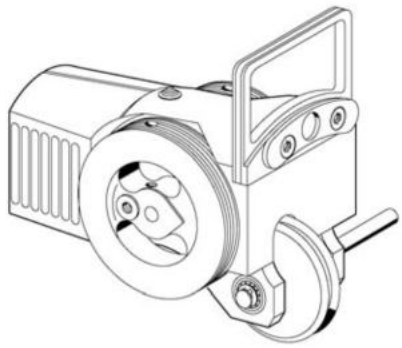


1 Baugruppe Motorblock
Assembly engine block







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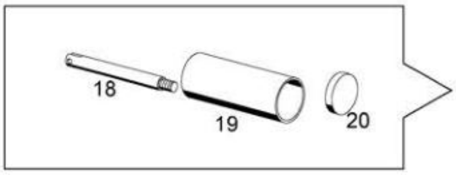
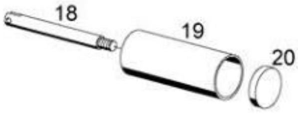
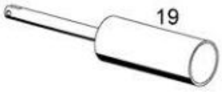
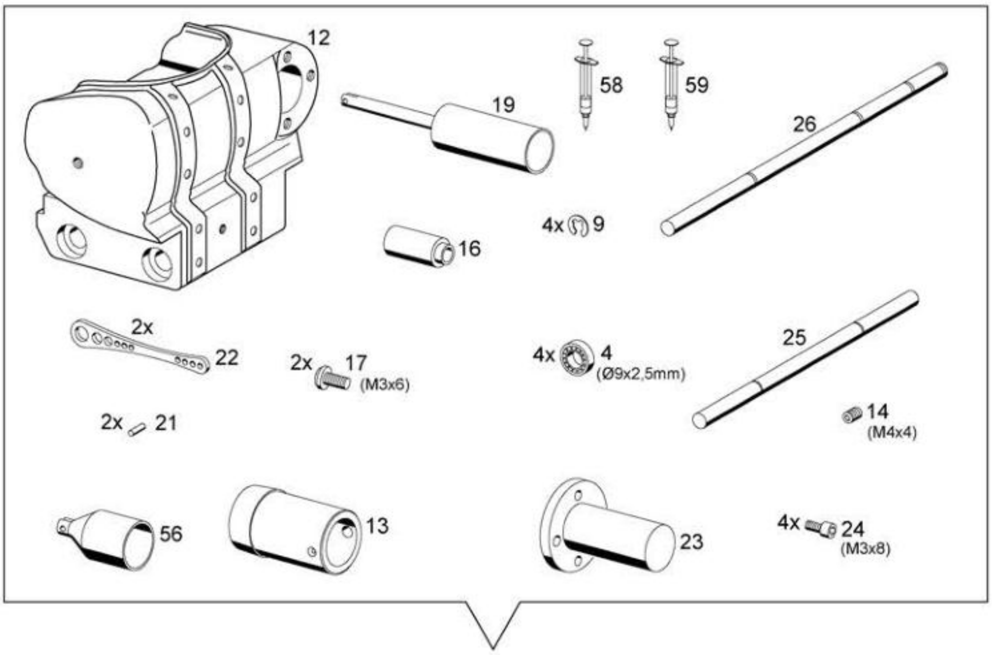
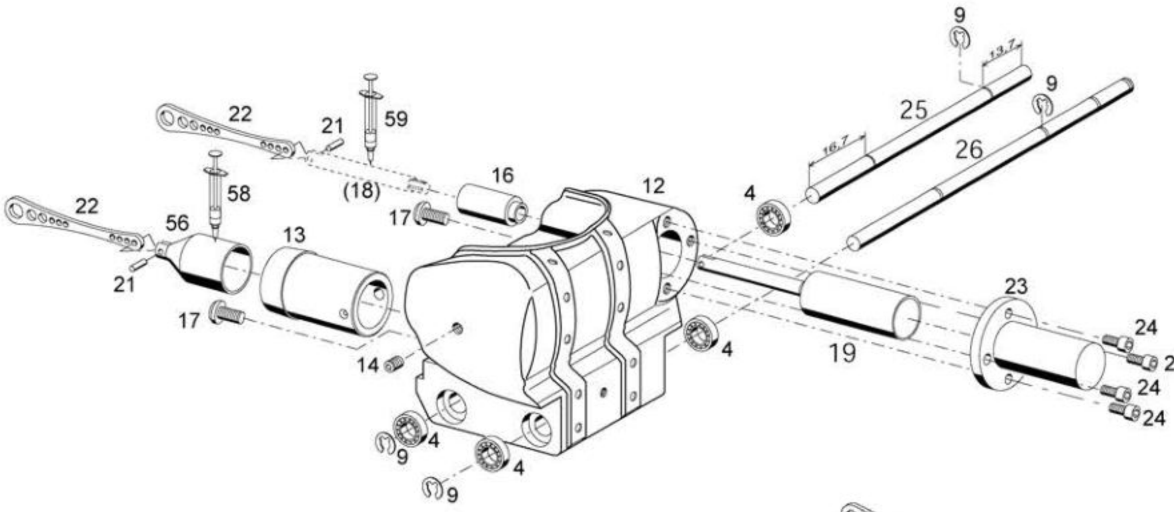
2 Baugruppe Sitzblock
Assembly seat block

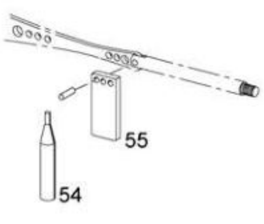


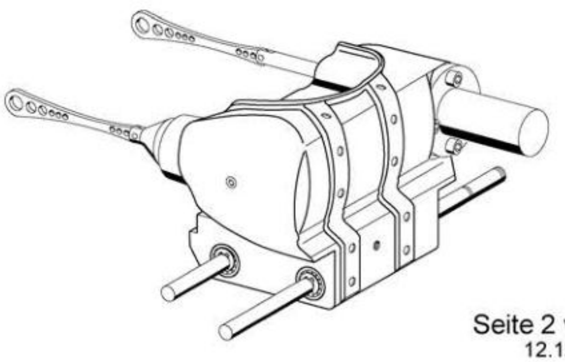












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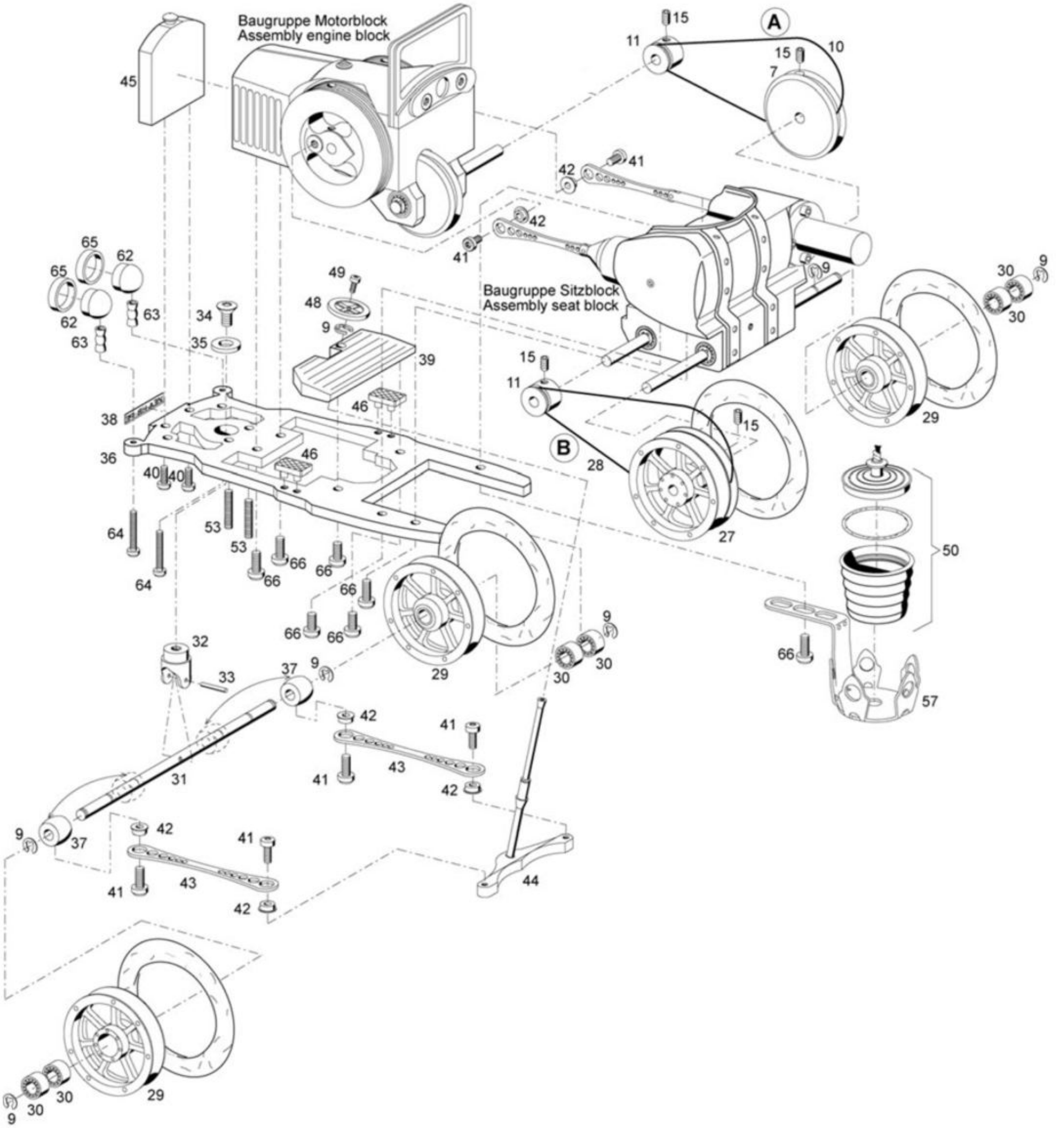
3 Baugruppe Endmontage Rahmen
Final assembly frame



12.12.2016

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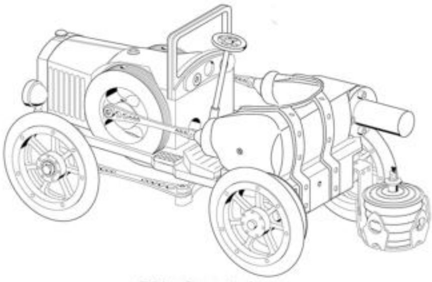

Stückliste/Ersatzteilliste AP172-Modell		Bill of material AP172-Modell		
Bild/Nr. Ill. No.	Benennung Part No.	Abm. Bemerk. Diment. Remarks	Stück Pieces	Denomination
1	Motorblock		1	Engine block
2	Schwungrad 180°		1	Flywheel, brass
3	Schwungrad 90°		1	Flywheel, brass
4	Kugellager	∅9x2,5mm	8	Ball bearing
5	Radachse	∅4x34,5mm	1	Axle
6	Antriebsrad A Radachse	∅10x14mm	1	Drive gear
7	Antriebsrad B	∅29x5mm	2	Drive gear
8	Übertragungsachse B1	∅4x44mm	1	Axle
9	Sicherungsring		13	Lock washer
10	O-Ring A	∅33x1,5mm	2	Belt drive
11	Antriebsrad C	∅10x7mm	2	Drive gear
12	Sitzblock Alu		1	Seat block
13	Hülse Arbeitskolben MS	∅18x27,3mm	1	Working piston bush
14	Madenschraube	M4x4mm	1	Grub screw
15	Madenschraube	M3x3mm	8	Grub screw
16	Hülse Verdrängerachse MS	∅8x16,5mm	1	Displace axle bush
17	Linsenkopfschraube	M3x6, TX10	2	Head screw
18	Verdrängerachse	∅4x33mm	1	Displace axle
19	Verdrängerkolben	∅12x27mm	1	Displace piston
20	Verdrängerkolben Deckel	∅11,6x2,5	1	Displace piston cover
21	Passstift	∅1,5x4mm	2	Pin
22	Pleuel	39,5	2	Connecting rod
23	Heizzylinder	∅25x28mm	1	Heating cylinder
24	Inbusschraube	M3x8mm, SW2,5	4	Sockethead screw
25	Übertragungsachse	∅4x66,5mm	1	Axle
26	Antriebsachse	∅4x89,5mm	1	Drive axle
27	Antriebsrad mit Gummi	62mm	1	Drive wheel
28	O-Ring B	∅41x1,5mm	1	Belt drive
29	Laufrad mit Gummi		3	Wheel
30	Kugellager	∅9x4mm	6	Ball bearing
31	Vorderradachse	∅4x89,5mm	1	Front wheel axle
32	Zentrallenkstück	∅11,7x13,75mm	1	Central steering
33	Passstift	∅1,5x10mm	1	Pin
34	Senkschraube	M4x6	1	Counter-sunk screw
35	Beilegscheibe	∅11,7x1,5mm	1	Shim
36	Rahmen	125x51x4mm	1	Frame
37	Lenkhaltestück	Messing	2	Steering holder
38	Nummernschild (NEA-HB-PE)	Klebefolie	1	Numberplate
39	Trittbrett Alu	40,5x17mm	1	Tread
40	Linsenkopfschraube	M2,5x8, TX8	2	Head screw
41	Linsenkopfschraube	M2,5x5, TX8	6	Head screw
42	Büchse Weiss		6	White plastic bush
43	Pleuel Lenkung	61,5mm	2	Connecting rod steering
44	Lenksäule	Messing	1	Steering column
45	Kühlergrill	Messing	1	Radiator grille
46	Trittbrett		2	Tread
47	Verschlusskappe Motorblock	Alu	1	Locking cap
48	Lenkrad	Messing	1	Steering wheel
49	Linsenkopfschraube	M2x4, TX6	1	Counter-sunk screw
50	Spiritus-Brenner		1	Burner case with wick
53	Anschlagstift	M3x16mm	2	Positioning pin
54	Durchschlag ∅ 1,5	lösen Passtift	1	Drive punch
55	Halteplättchen Passstift Weiss	4x16	1	Holder plate
56	Arbeitskolben	∅11,5mm	1	Working piston
57	Brennerhalterung		1	Burner holder
58	Keramikpaste weiss (fest)		1	White ceramic grease
59	Öl für Verdrängerachse		1	Oil
60	Windschutzscheibe	Alu	1	Front shield
61	Senkschraube	M3x8, TX10	2	Counter-sunk screw
62	Scheinwerfer		2	Head light
63	Distanzstück		2	Spacer
64	Linsenkopfschraube	M2x14, Kreuzschlitz	2	Head screw
65	Scheinwerfer Ring MS	∅12x8,5x3	2	Head light ring
66	Linsenkopfschraube	M3x8, TX10	7	Head screw