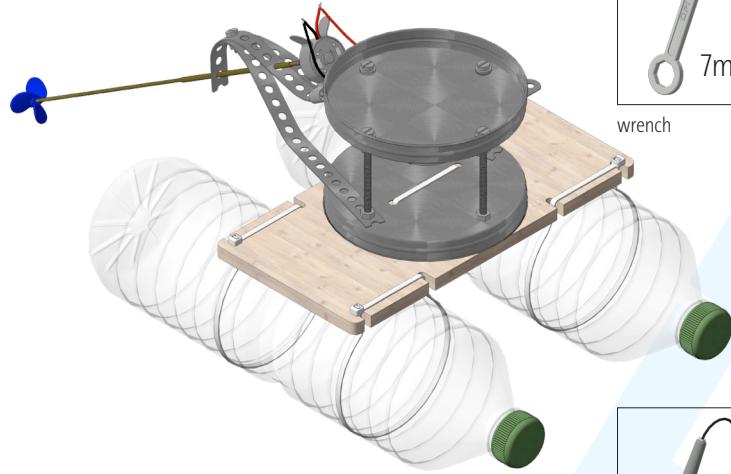


126,261

# Recycling bottle catamaran with Peltier element



Tools Needed:



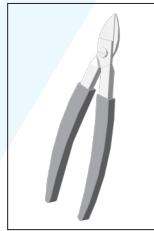
wrench



pliers



side cutter



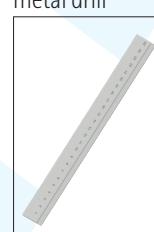
Metal Scissors



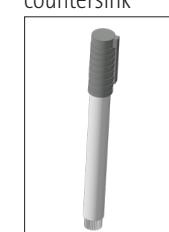
Soldering iron (optional)



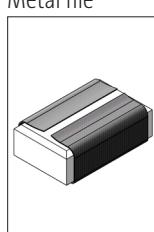
$\varnothing 4$   
 $\varnothing 5$



metal drill



Foil pen



Metal file

ruler



Cutter knife



jigsaw



screwdriver

**Please Note:**

After completion, the OPITEC factory packs are not toys that are generally commercially available, but teaching and learning materials to support educational work. This kit may only be built and operated by children and young people under the guidance and supervision of knowledgeable adults. Not suitable for children under 36 months. Danger of suffocation!

parts list	number of pieces	Dimensions (mm)	Description	Part No.
plywood	1	220x110x8		1
Can lid	2	$\varnothing 115 \times 11$		2
Perforated tape	5	180x12x0.7	Perforated tape	3
Motor Holder	1	40x30x10	Motor Holder	4
Peltier element	1	30x30x4	Peltier element	5
Cylinder Head Screw	4	M4x60		6
Cylinder Head Screw	2	M4x10		7
nut	20	M4		8
washer	20	$\varnothing 9 \times \varnothing 4.3$		9
brass tube	1	$\varnothing 3 \times 0.45 \times 100$	Stern tube	10
Brass round rod	1	$\varnothing 2 \times 245$	Steven wave	11
silicone tube	1	$\varnothing 3 \times \varnothing 1$	Engine coupling	12

**Assembly instructions 126.261**  
**Recycling bottle catamaran with Peltier element**

parts list	number of pieces	Dimensions (mm)	Description	Part No.
propeller	1	Ø30x10	propeller	13
engine	1	Ø25x13	engine	14
Tealight holder	1	40x5	Tealight holder	15
cable ties	6	345x3.5	cable ties	16
PVC hose	1	Ø6 x Ø4 x 100	gasket	17

**Additionally required:**

2 PET bottles (with lid), 1 - 1.5 liters

1 tealight

water

Ice cubes (optional)

Table salt (optional)

**WARNINGS:**

Never leave candles burning unattended!

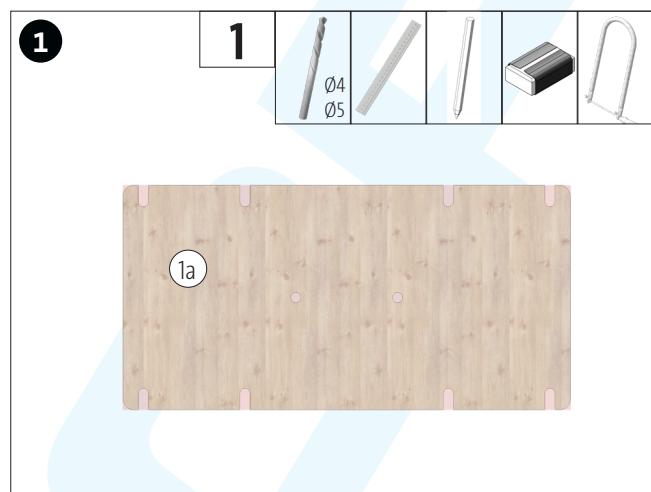
Keep away from easily flammable objects!

Do not use on open waters.

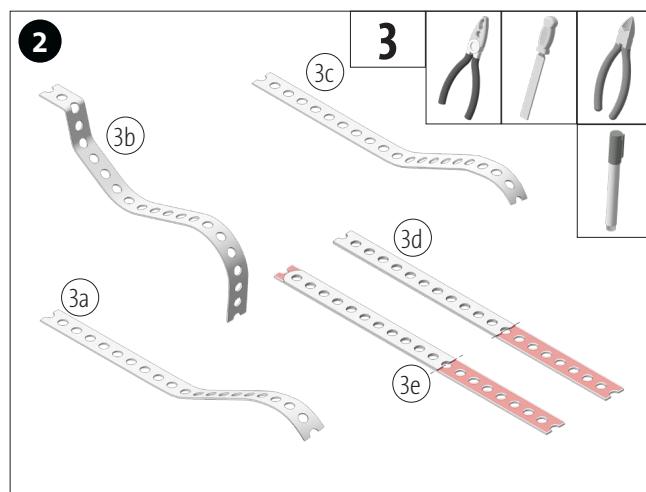
Recommended waters: garden pond, paddling pool, pool.

Never operate without water cooling.

Not suitable for continuous operation.

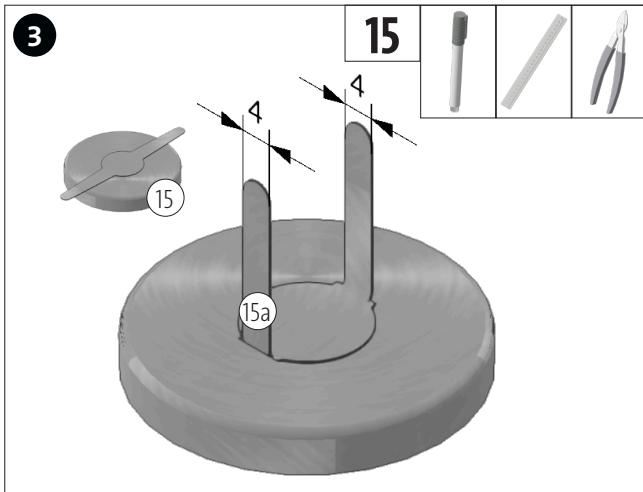


Transfer the template (1a) to the wooden board (1), drill holes and cut out the cutouts.

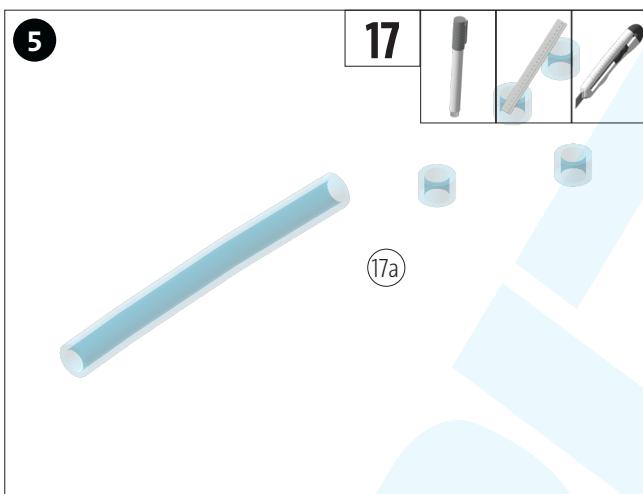


Bend one perforated strip (3) according to templates 3a, 3b and 3c. Also cut one perforated strip to length according to templates 3d and 3e. Label the parts and deburr any sharp edges with a file.

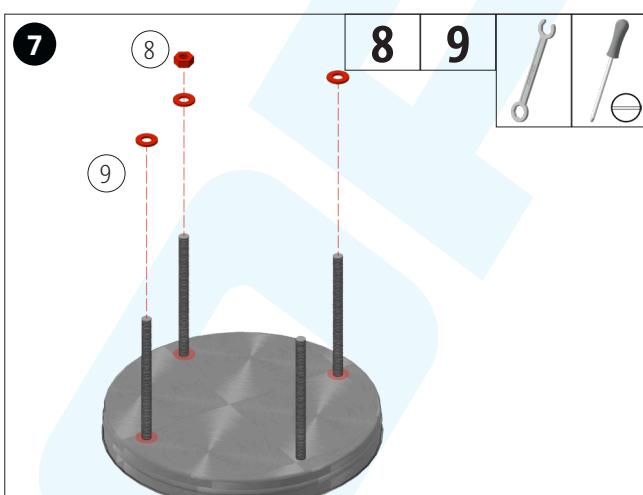
**Assembly instructions 126.261**  
**Recycling bottle catamaran with Peltier element**



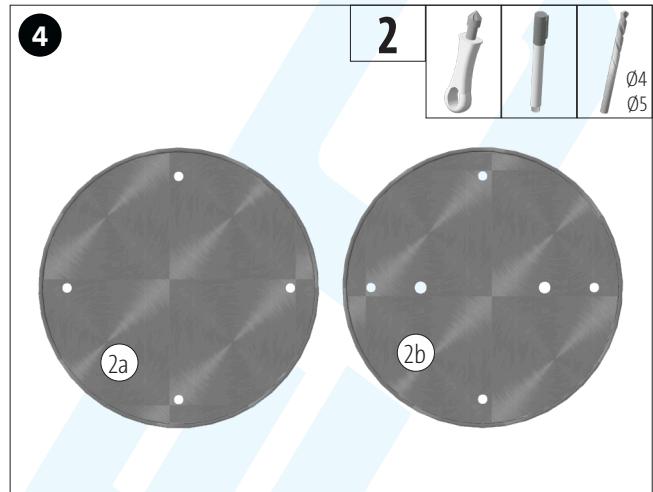
Bend the flags of the tealight holder (15) 90° upwards and cut to a width of 4mm.



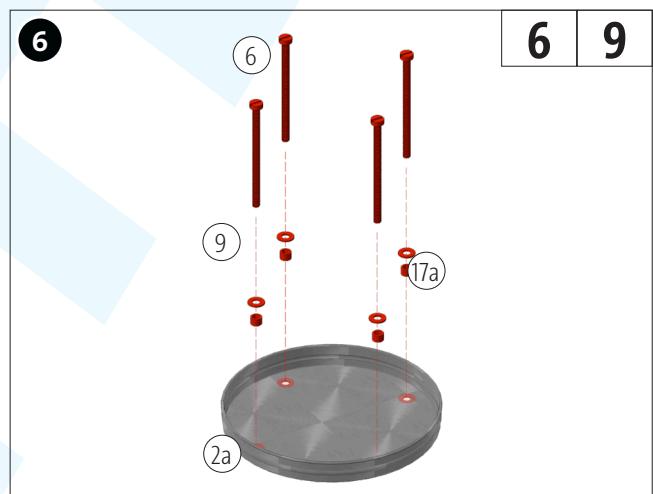
Cut 4 pieces of 5mm length each from the PVC hose (17).



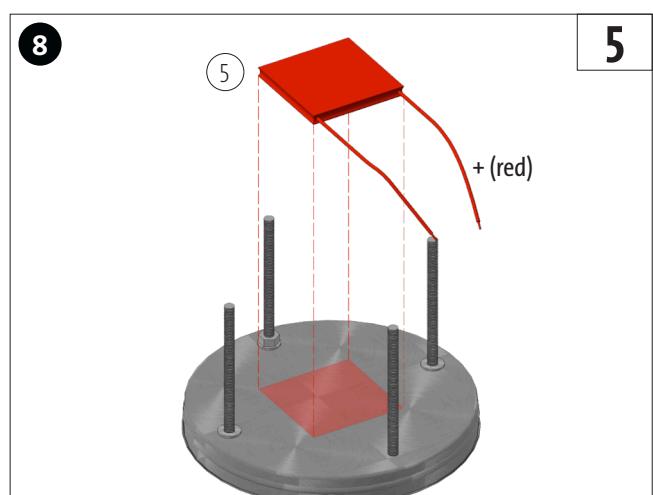
Turn the lid over and from the other side put on 3 washers (9) and a nut (8) as shown or screw them lightly.



Drill one cover (2) each according to template 2a and 2b. Drill carefully and place a piece of scrap wood underneath! Deburr the holes with a countersink!

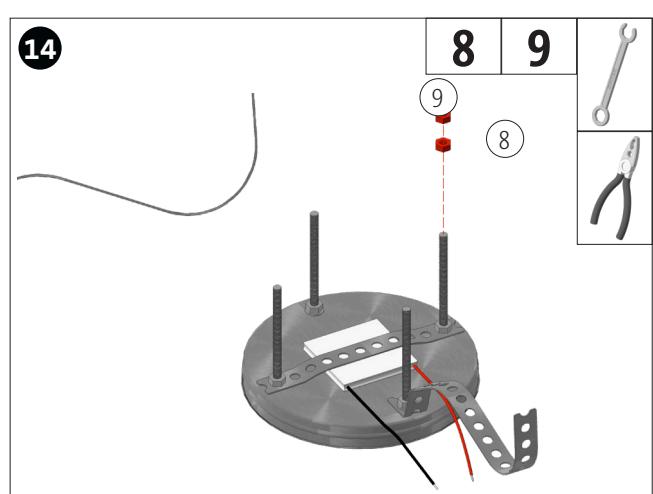
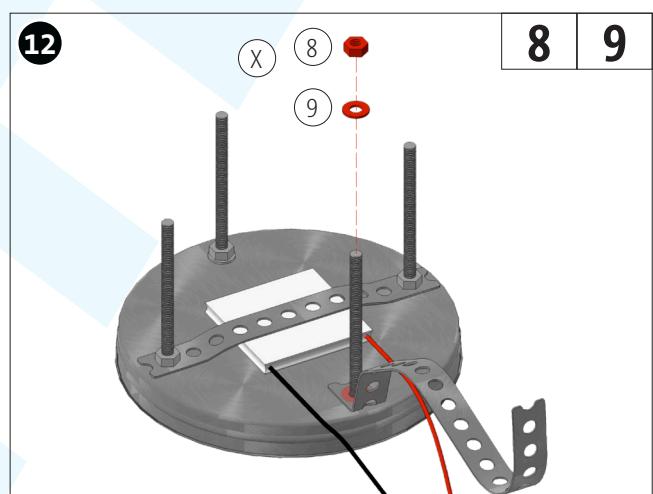
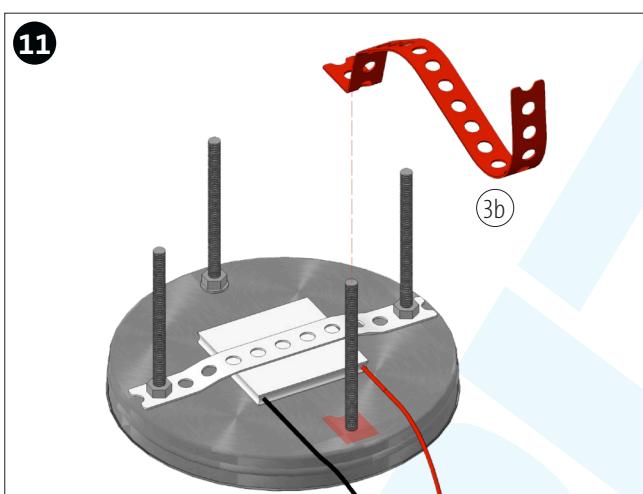
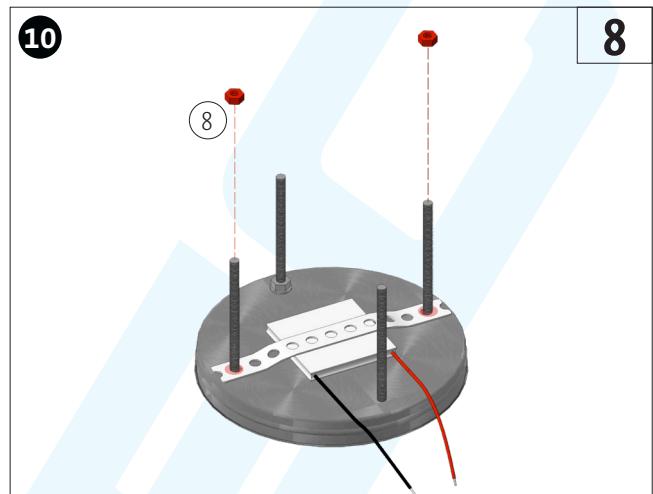
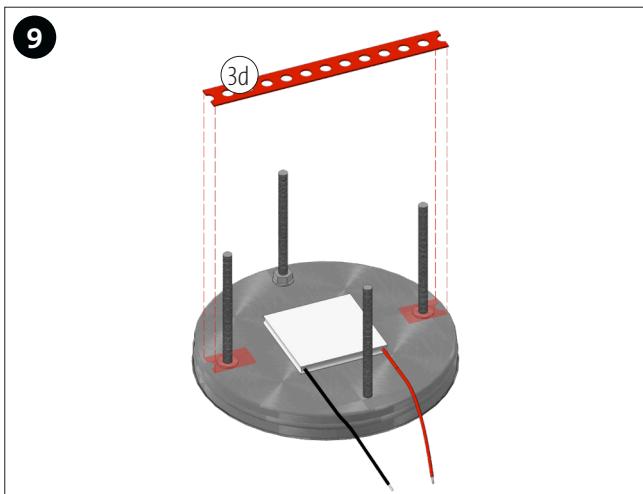


Insert 4 screws (6), 4 washers (9) and 4 hose pieces (17) through the holes in the cover (2a) as shown in the picture.

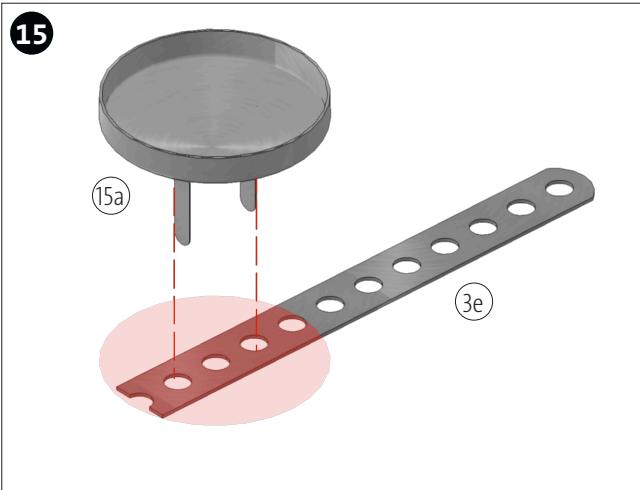


Place the Peltier element in the middle of the lid, with the red cable (positive pole) on the right side.

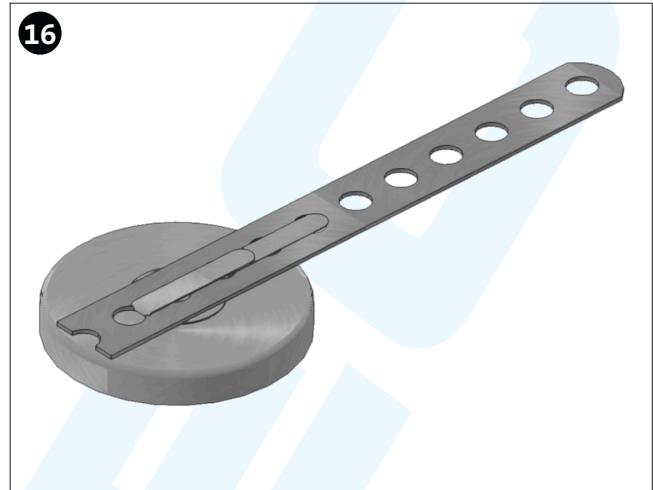
**Assembly instructions 126.261**  
**Recycling bottle catamaran with Peltier element**



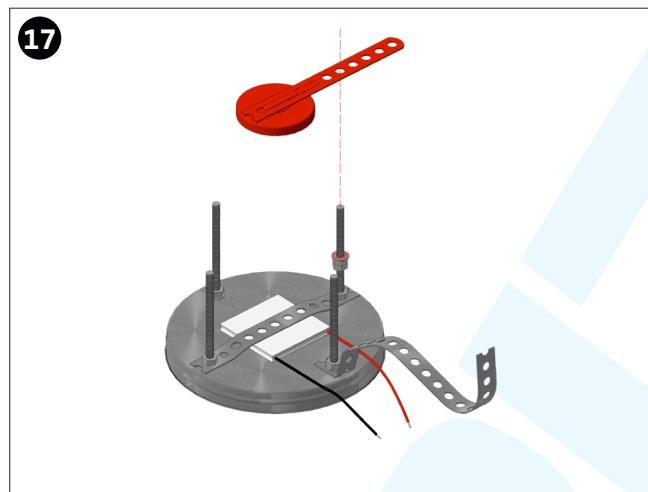
**Assembly instructions 126.261**  
**Recycling bottle catamaran with Peltier element**



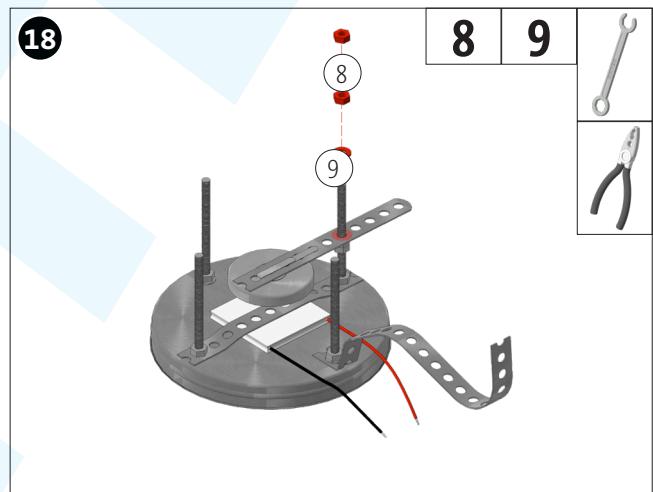
Insert the flags of the tealight holder (15a) through these two holes in the perforated tape (3e)...



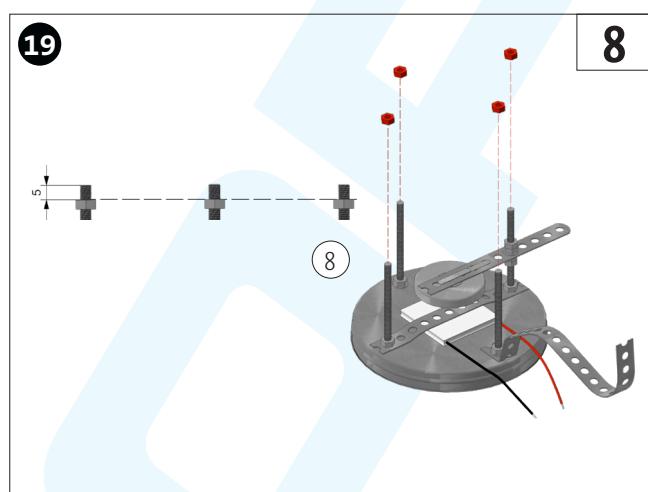
... turn it over and bend it tightly as shown in the picture.



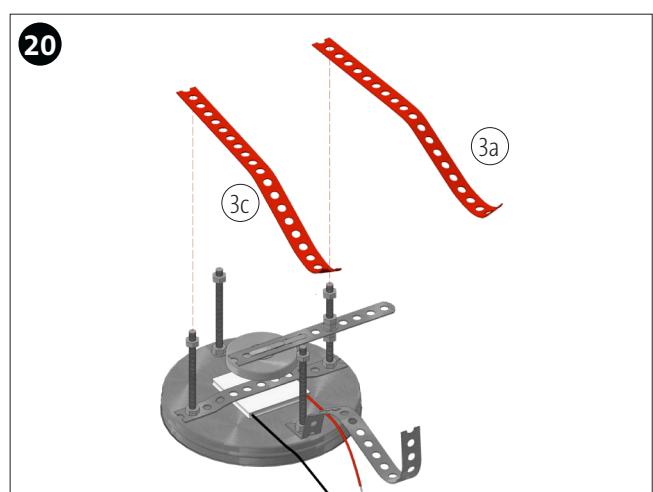
Place this tealight holder onto the washer so that the "pan" is centered over the Peltier element.



Now put on another washer (9). Lightly screw on two nuts (8) ("pan" should remain rotatable) and lock.

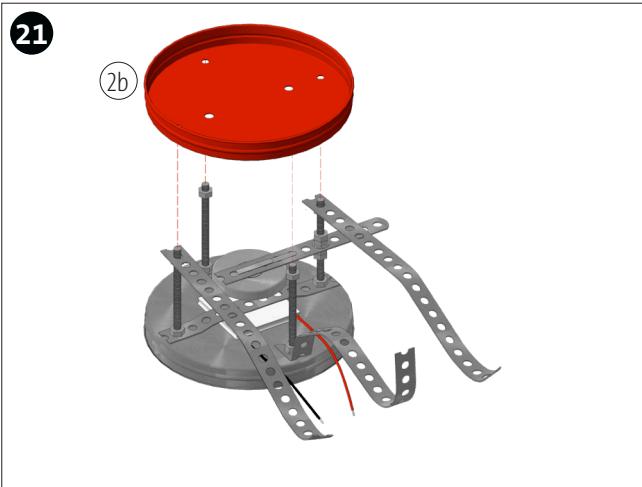


Screw four more nuts (8) onto the four screws, keeping a distance of 5 mm from the upper edge.

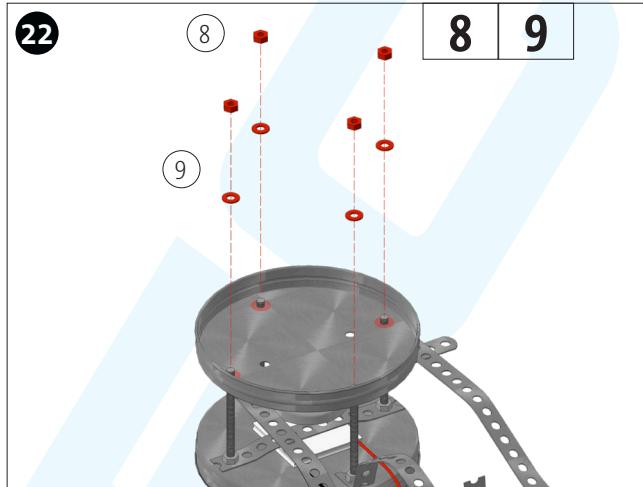


Place perforated strips (3a) and (3c) onto these screws.

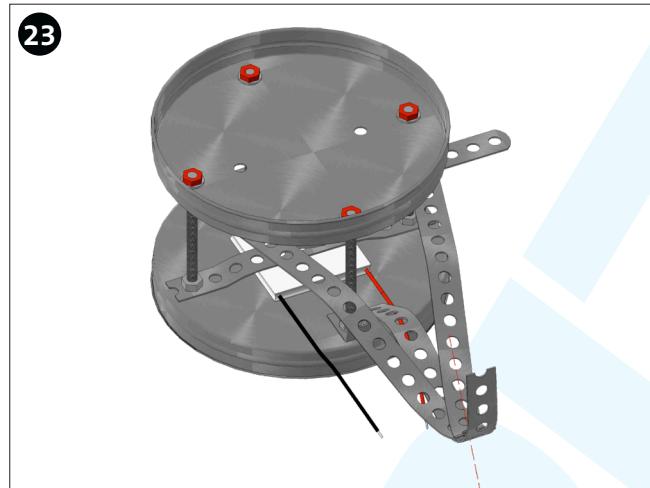
**Assembly instructions 126.261**  
**Recycling bottle catamaran with Peltier element**



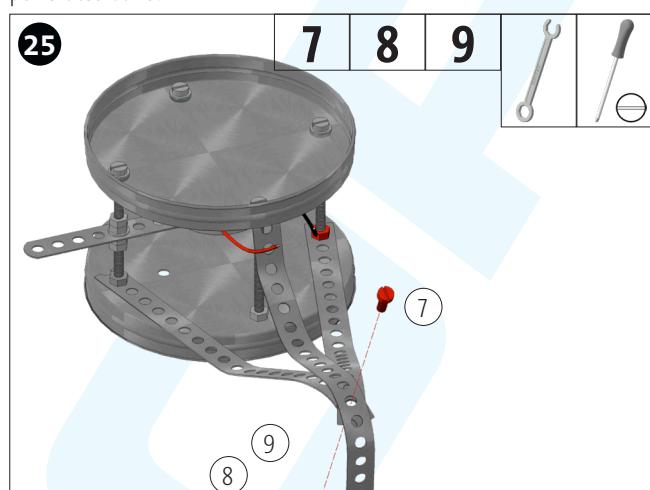
Put the second cover (2b) on as shown in the picture...



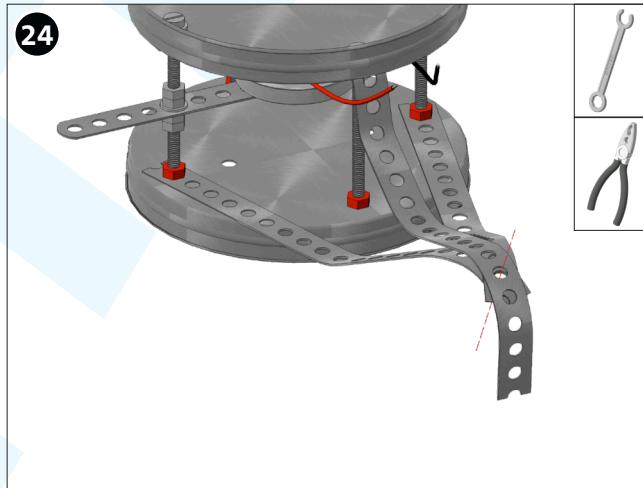
...and screw lightly with four washers (9) and nuts (8) each (see also Figure 23).



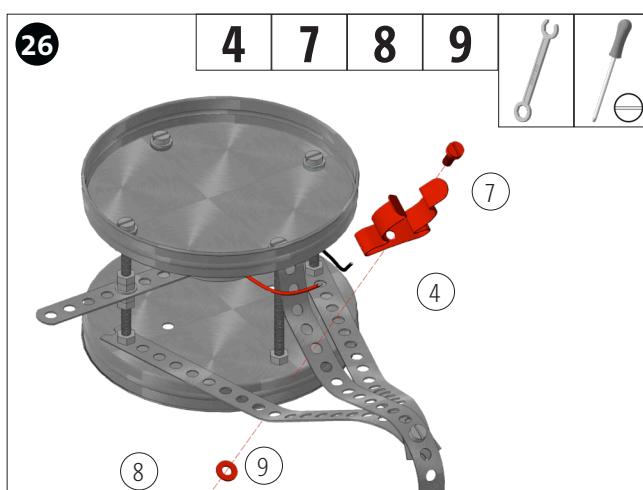
Screw in the nuts so far that the threads of the screw do not protrude, at the same time turn the outer perforated bands over the middle perforated band.



Insert screw (7) through the hole and tighten with nut (8) and washer (9).

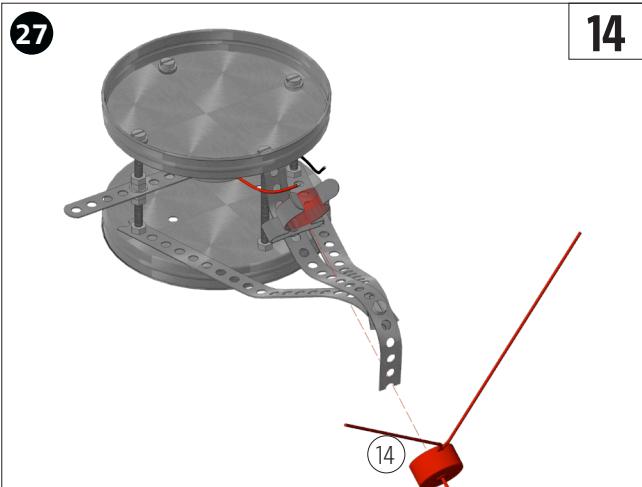


Now turn the assembly over, align the perforated strips (leave this hole through, bend it if necessary) and tighten the previously screwed nuts.

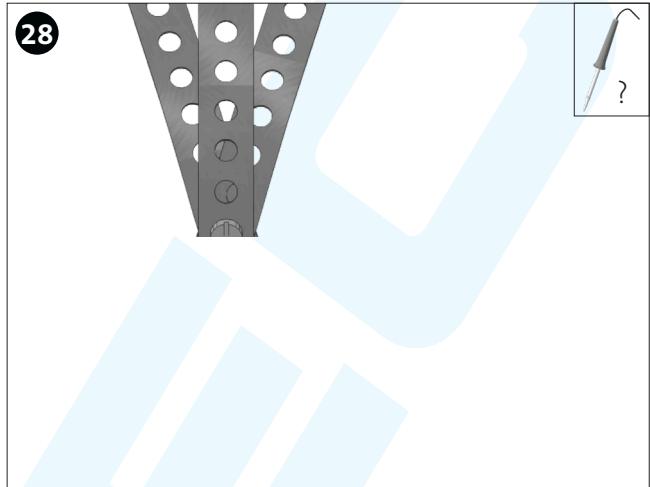


Fasten the motor mount (4) here with a screw (7), a nut (8) and a washer (9).

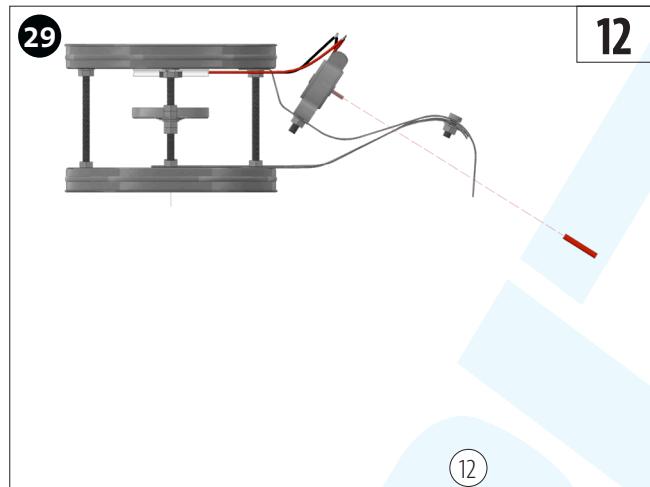
**Assembly instructions 126.261**  
**Recycling bottle catamaran with Peltier element**



Clamp the motor (14) into the motor holder.



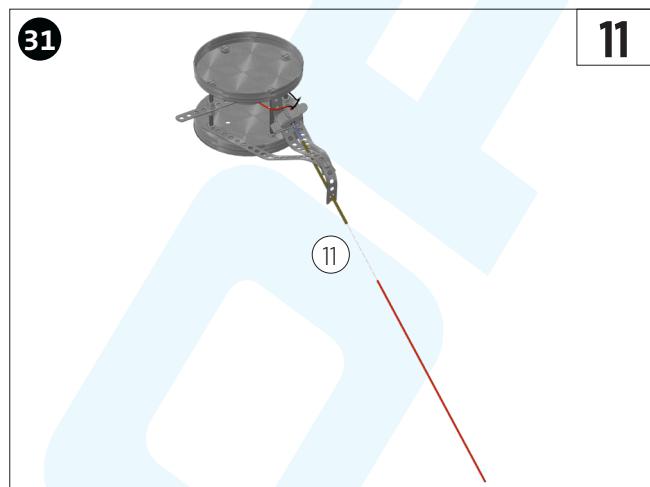
Connect the Peltier element cable to the motor cables (we recommend soldering, but twisting is also possible)



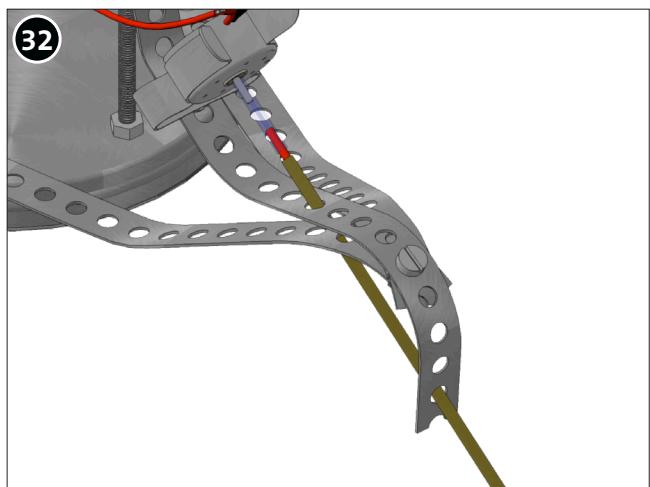
Place the motor coupling (silicone hose) (12) onto the motor shaft



Insert the stern tube (10) in the extension of the motor shaft (aligned) through the perforated strips



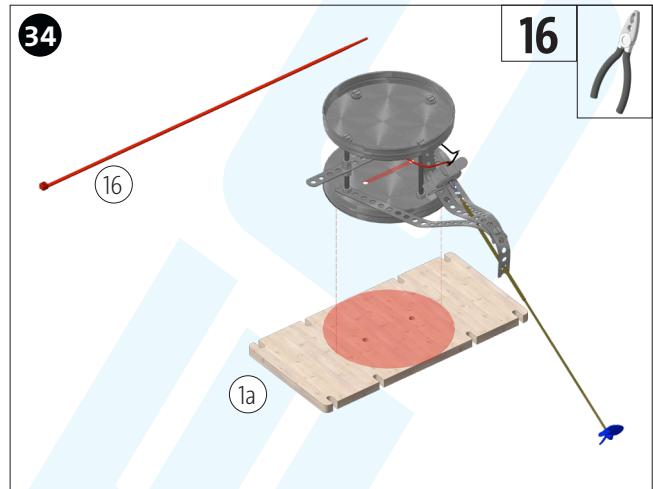
Insert the stem shaft (11) through the stern tube...



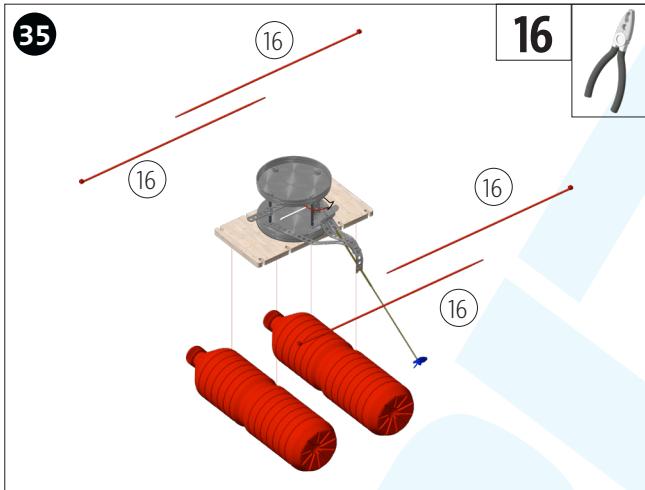
**Assembly instructions 126.261**  
**Recycling bottle catamaran with Peltier element**



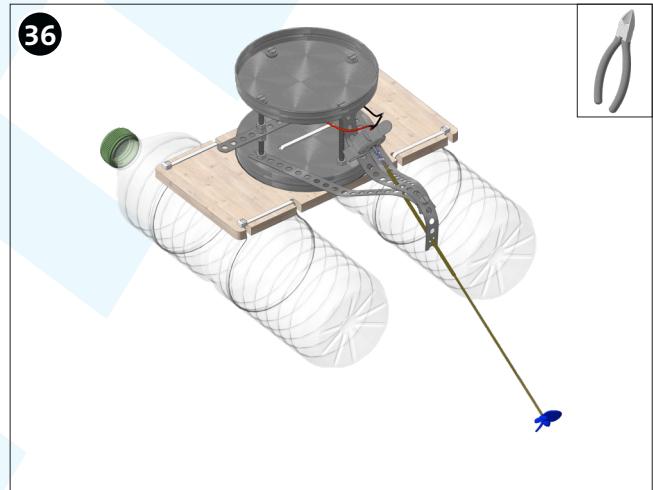
Carefully place the propeller (13) onto the other end of the stem shaft.  
Do not bend the shaft!



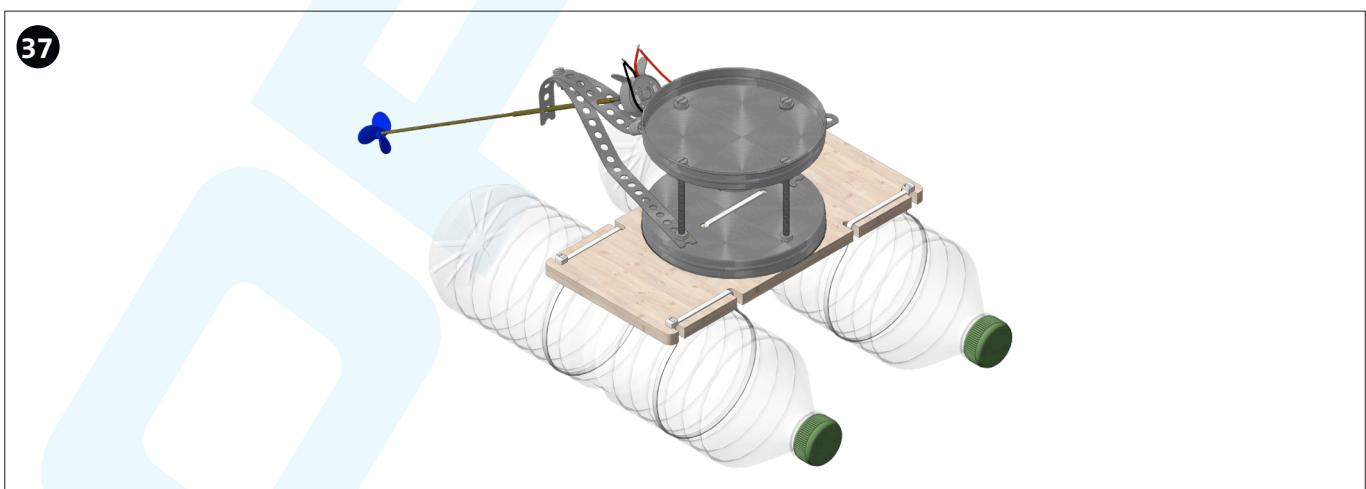
Place the assembly on the wooden plate (1a), thread a cable tie (16) through the holes in the wooden plate and the lower cover and tighten it.



Fasten two closed PET bottles to the wooden board using the other cable ties (16), see also next picture.

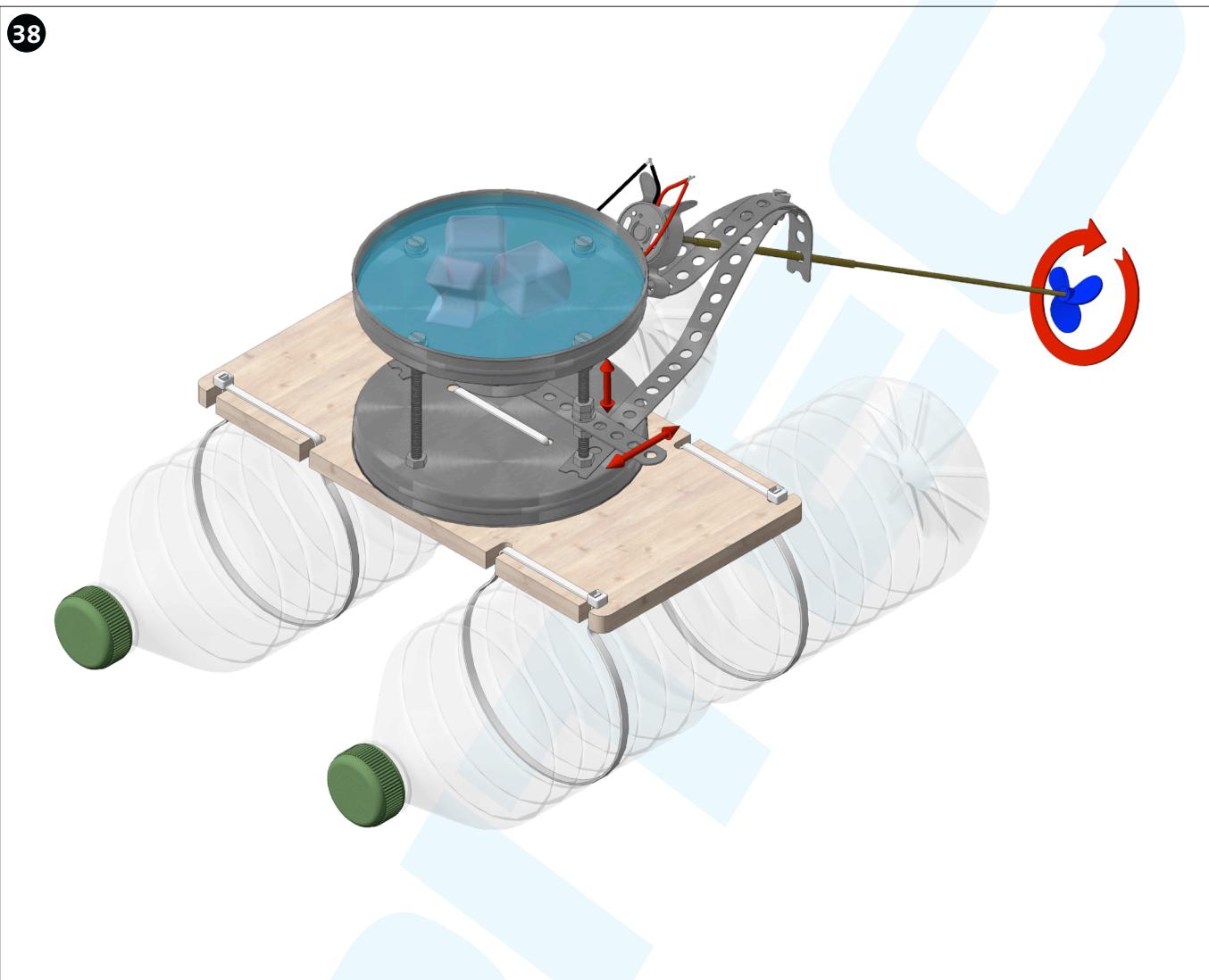


Cut off any protruding cable tie ends.

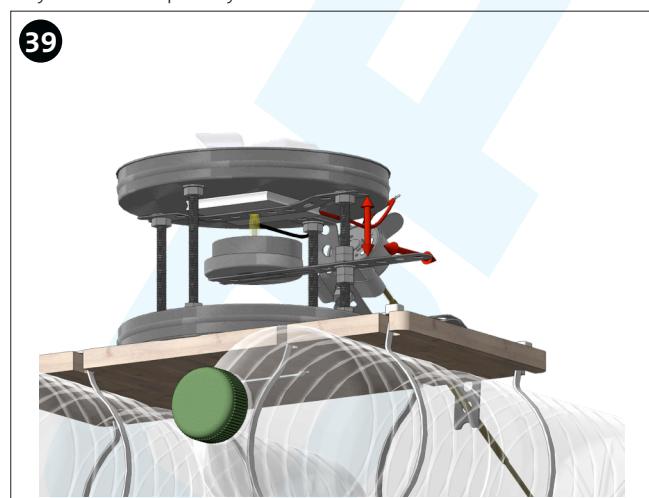


Done!

**Assembly instructions 126.261**  
**Recycling bottle catamaran with Peltier element**



Functional test: Place the model on a table so that the propeller can rotate freely. Pour cooling water into the top lid, place a tea light in the candle holder and light it. Position the candle holder centrally under the Peltier element. After a short time, the propeller should rotate. If it rotates the wrong way: Reverse the polarity of the motor cable.



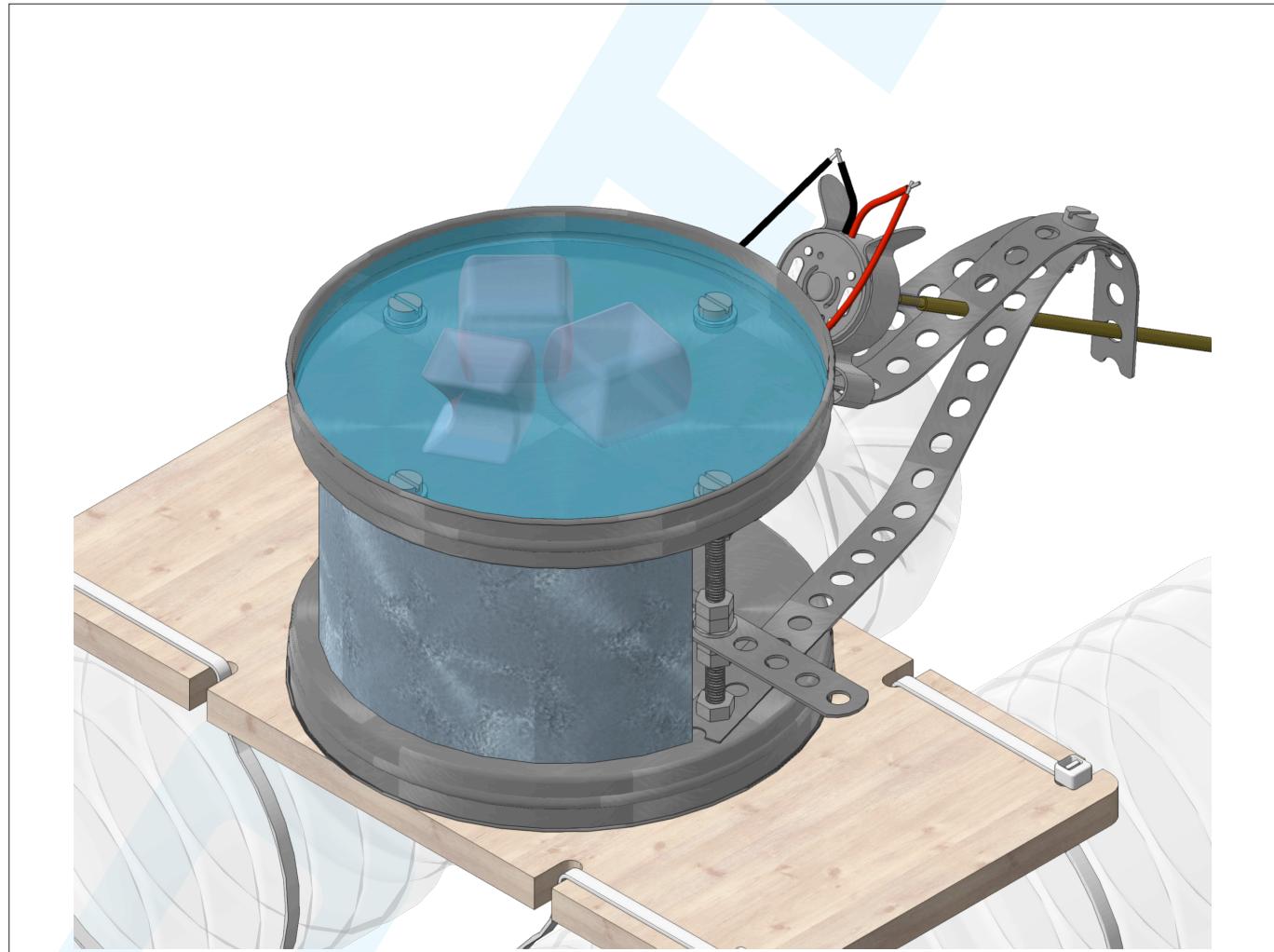
Detail: Adjustment of the candle holder

Fill the upper bowl with cold water. The greater the temperature difference between the "hot" and "cold" side of the Peltier element, the more voltage is applied to the motor and therefore the higher the speed. You can also add ice cubes. With a 1:1 mixture of water and ice you can reach 0°C. A mixture of ice and table salt (sodium chloride) in a ratio of 3:1 (e.g. 100g ice and 33g table salt) can reach temperatures of up to -20°C!

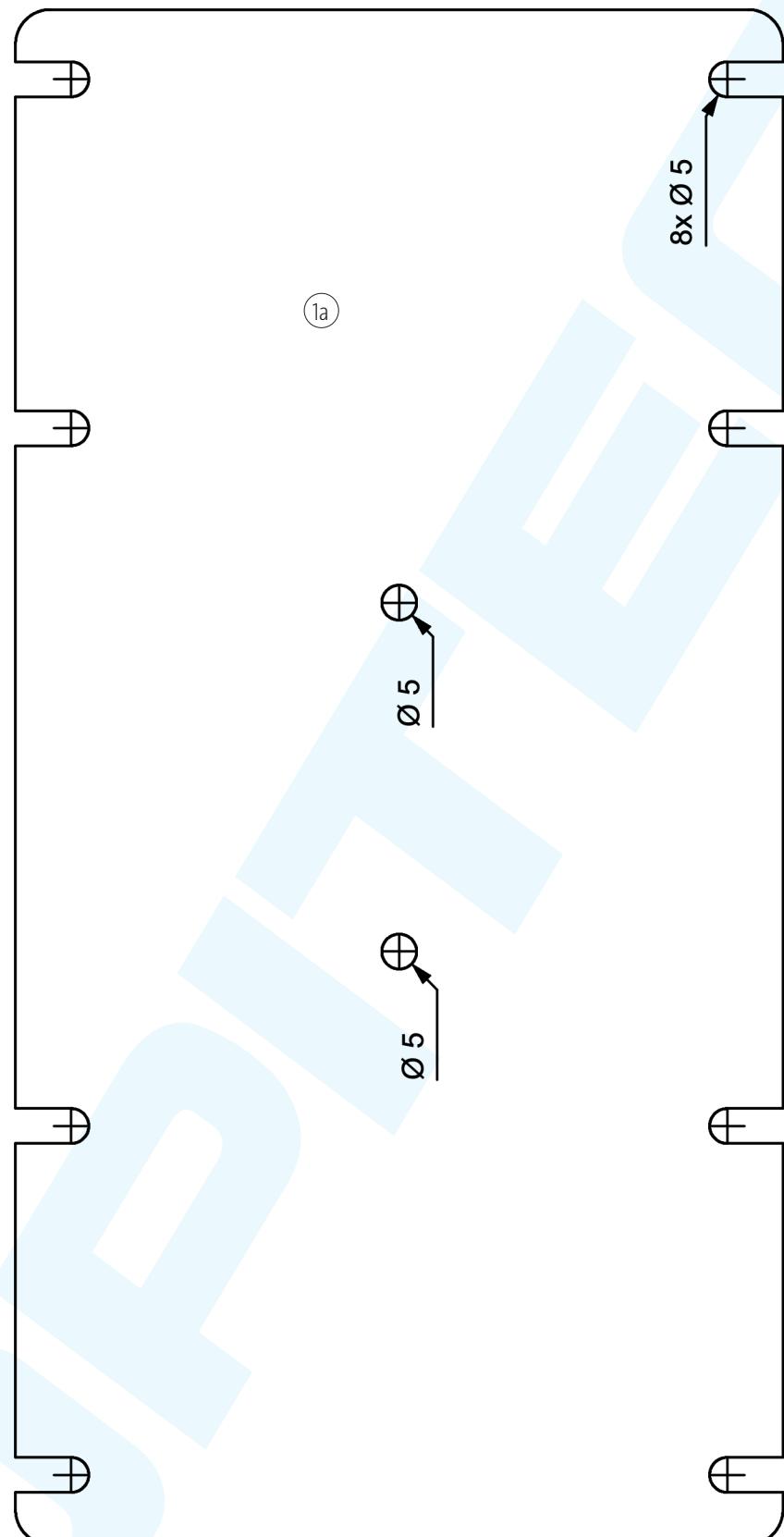
Now the candle is inserted and lit; the candle holder can be turned for this purpose. It is also possible to adjust the distance between the candle flame and the Peltier element using the lock nuts on the candle holder.

Now the boat can be launched. After a short time the propeller should start turning and the boat should start moving.

Tip: If the flame is disturbed by wind outdoors, you can easily make a windbreak out of aluminum foil!



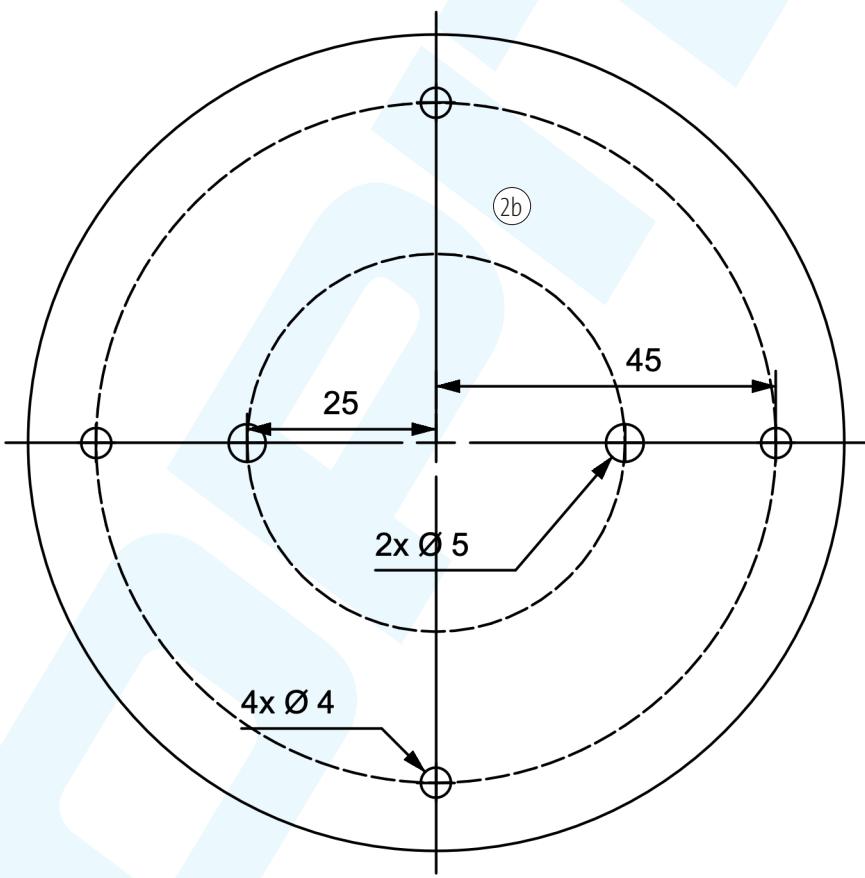
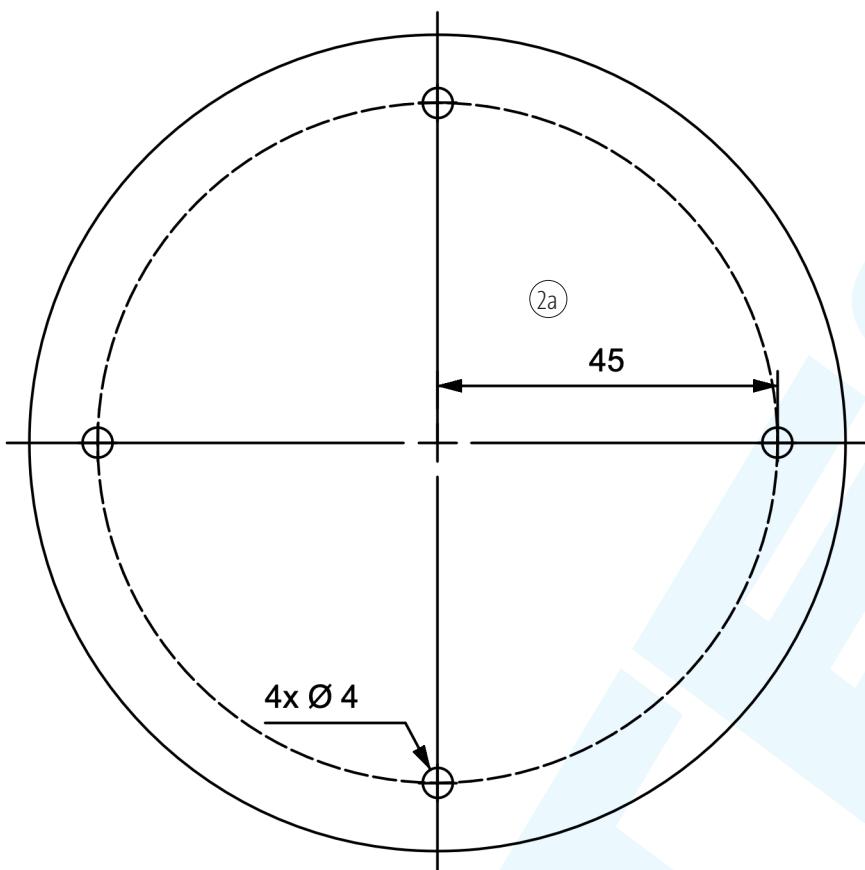
Detail: Wind protection





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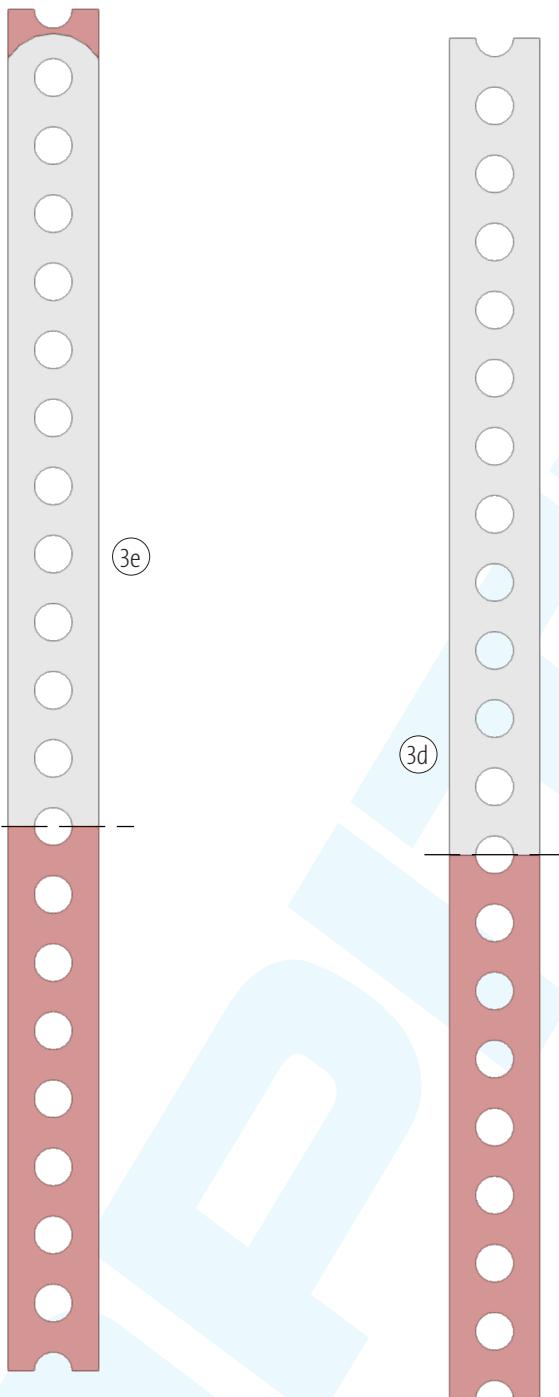
Template cover drilling



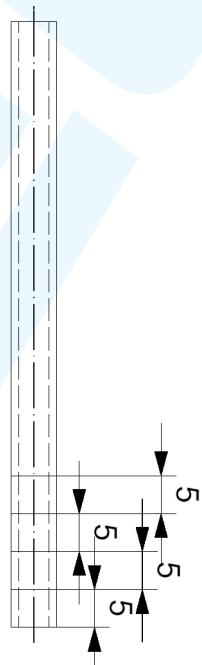


**OPITEC**

Template perforated tapes



PVC hose template





**OPITEC**

Bending template perforated bands

