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## SUNdidactics Solar Systems

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### Construction manual for the solar runabout turbo ST

**Solar vehicle with supercapacitor for energy storage  
 for the operation with external solar filling station  
 SUSE CM330ST**

english version



german version



### The solar runabout turboST

The photo shows the solar vehicle SUSE solar runabout turboST, connected to the solar filling station SUSE CM330ST via the charging cable (there is a separate construction manual for the solar filling station CM330ST). The vehicle is based on the construction kit for the solar runabout, complemented by additional electronic parts.

The energy storage consists of a supercapacitor with 3.3 F, which is connected to a switch.

The construction is challenging and should not be undertaken by inexperienced students.

**The vehicle is available as a construction kit as well as a finished product.**

#### Technical Data:

#### Vehicle

Vehicle length: 80 mm

Vehicle width: 65 mm

Vehicle height: 35 mm

#### Drive

Mini electric motor with transmission gear, Energy storage SuperCap

### The construction manual:

**1. The components:** 1x basic construction kit solar runabout, green chassis plate with mounted charging socket and switch, 4x soldering eyelets M3, 4x silver screws M2 + silver nuts M2, supercapacitor 3.3 F or 5 F.

**2. Necessary tools:** Phillips-tip screwdriver (included in the construction kit), tweezers, long-nosed pliers, soldering station with lead-free tin solder.

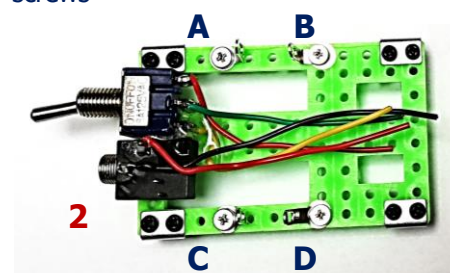
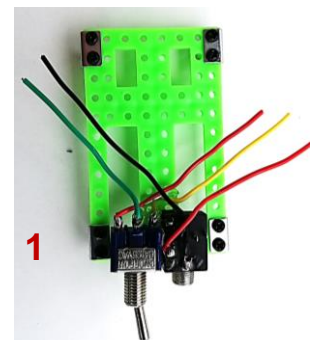
### 3. The construction in 5 work steps:

#### 3.1 Work step 1: Assembly of the brackets (Photo 1)

Screwing on of the 4 axle brackets with 2 black screws and nuts each. Fasten the screws tightly, if necessary secure the nuts with the long-nosed pliers while tightening the screws! Also visible are the pre-assembled switch and charging socket with 5 hookup wires.

#### 3.2 Work step 2: Assembly of the soldering eyelets A, B, C, D (see photo 2)

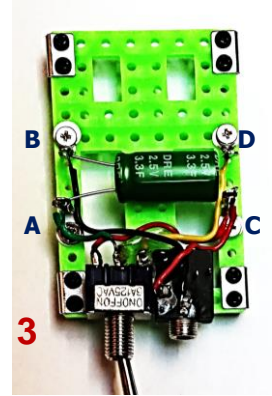
Into the 4<sup>th</sup> and 8<sup>th</sup> hole (counted from the switch) on both sides of the green plate, 4 soldering eyelets A-D are mounted. The soldering eyelet is placed over the hole, a little silver screw M2 is stuck through from the top and a silver nut M2 is fastened from the bottom, fasten the screw tightly. Afterwards bend the soldering eyelets to 90° upwards!



### 3.3 Work step 3: Soldering work (see photo 3)

Now the 5 hookup wires and the supercapacitor are soldered to the soldering eyelets. Run the wires neatly (see photo 3), shorten them to fit and strip the ends!

- Both the red wires are soldered to the soldering eyelet C.
- The yellow wire is soldered to the soldering eyelet D.
- The green wire is soldered to the soldering eyelet A.
- The black wire is soldered to the soldering eyelet B.
- The supercapacitor is soldered to the soldering eyelets A and B in the right polarity, negative pole to B, positive pole to A, the negative pole is marked on the capacitor!

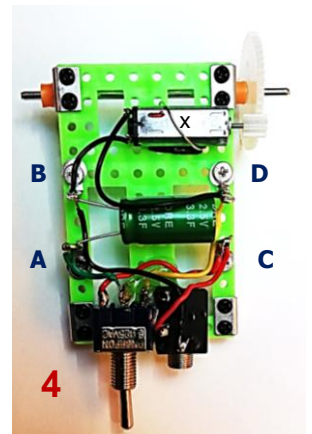


### 3.4 Work step 4: Assembly of the front axle and the motor (Photo 4)

The front axle is mounted as shown in figure 4, **ensure a smooth run of the axle!**

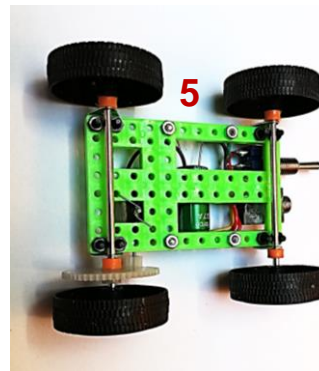
The two wires connecting solar motor and solar cell are soldered off of the solar cell. Attention, before doing that, mark the positive wire on the motor (red line in the picture, the positive wire runs from the motor to + of the solar cell and is marked there!). This little solar cell is not needed anymore and can be used for other experiments. The red protective sheet of the double-faced adhesive tape is removed from the solar motor and – as shown in photo 4 – the motor is secured to the base plate **so that the little white cogwheel engages well with the big white cogwheel and is spinning easily!**

Optional: With the wire loop x around the motor and the base plate below, the motor can be further stabilized mechanically.



### 3.5 Work step 5: Assembly of the rear axle and the wheels (Photo 5)

The rear axle is stuck through both brackets, afterwards the orange rings are placed on the axle from both sides, don't secure those too tightly, **the axle has to be able to always move freely!!** Now the wheels are stuck on all 4 ends of both axles, **the axles need to spin smoothly after the assembly of the wheels!!**



<b>3.6 Positions of the switch:</b>	<b>Left (red dot or F):</b>	<b>Drive</b>
	<b>Center:</b>	<b>Off</b>
	<b>Right (green dot or L):</b>	<b>Charge</b>

### Test drive:

Place the switch on **off** and plug in the charging cable of the solar filling station SUSE CM330ST, putting the plug into the charging socket of the vehicle. Hold the solar cell towards the sun, the bright sky, or indoors towards a halogen spot lamp or a red light lamp.

Now place the switch on **charge**, the capacitor is charged, the process takes about 2 minutes and can be recorded with measurements (see experimentation manual).

Now place the switch on **off**, disconnect the plug from the socket, place the car on a smooth surface and move the switch to **drive**, the car has to quickly drive away now! If it doesn't drive away quickly, check the smooth run of the axles, the electric contacts, or the fit and movement of the two cogwheels! The cogwheels and the axle passage through the brackets can be covered with a little silicone spray to improve the ease of motion.

### 3.7 Measurements:

With the experimentation manual for this vehicle and the solar filling station, extensive experiments can be conducted.