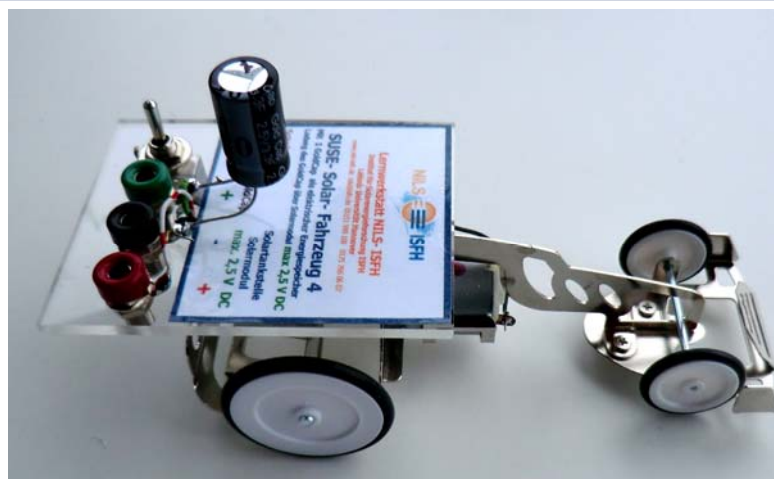


The SUSE solar vehicle 4

Solar vehicle with 1 GoldCap energy reservoir (without an own solar cell)
to be charged at solar filling station $V_{\max} = 2.5 \text{ V}$, Propulsion with solar motor and single-level gear
Technical and operation manual



View from above:

On top there is the circuit board with the electric energy storage (GoldCap), the operating switch and the 3 jacks. To the red-black jack pair lab wires can be connected to charge the GoldCap, the green jack is a test jack for measuring the electric voltage at the GoldCap.

Below the circuit board there is the solar electric motor and the one-level gear for driving the rear axel.

The SUSE solar vehicle 4 with GoldCap energy storage for $V_{\max} = 2.5 \text{ V DC}$

The vehicle does not have an own solar cell, but instead is „refueled“ at a solar filling station, in the process the electric energy storage GoldCap is charged with 2.5 V DC max. , in doing so an electric energy of up to 10 J is stored.

With one charge the car is driving with **high speed for about 50-100m**. Depending on light intensity = irradiance S the charging process takes just a few minutes. This way the vehicle can also be charged with a heavily clouded sky, a pure solar cell vehicle would not be able to drive under these light conditions. With the vehicle extensive experiments (e.g. capacitor charging and discharging) can be conducted.

To charge the GoldCap lab wires are plugged into the jacks, which lead to the solar module.

The **operating switch has 3 positions:**

1. **Charge** (switched to the back)
2. **OFF** (Middle position)
3. **Drive** (switched to the front in driving direction)

The charging or discharging process at the GoldCap can be observed and measured with a measurement of the voltage at the green jack (GoldCap +) or with a measurement of the current at the supply line from the solar module. It is an authentic model for real electromobility.

The **solar module SUSE 4.34** is especially suited. For testing purposes the GoldCap can also be charged with a 1.5 V battery. The vehicle and also the solar module are available as construction kits or finished devices from NILS-ISFH or SUNdidactics.



The **solar vehicle 4** with the solar filling station (solar module) **SUSE 4.34 (2.4V/ 630 mA)**
Below the circuit board the solar electric motor is visible (with wires yellow/black)

The operation manual of the SUSE solar vehicle 4

1. Function:

The GoldCap capacitor is the electric energy storage of the vehicle, from it the electric motor obtains its energy for driving, the capacitor discharges in the process, with real electrically powered vehicles a rechargeable battery is used. An advantage of the GoldCap is the rapid charging, with bright sunshine the charging with a solar module (= solar filling station) takes just about 1 minute. In contrast to the rechargeable battery the GoldCap also doesn't need charging electronics with specific charging currents. The range of the vehicle with fully charged GoldCap and smooth track is 50...100m.

With clouded sky or low irradiation the charging takes longer, the charging can be observed/measured with a voltmeter.

Maximum charging voltage: 2.5 V, with higher voltages the GoldCap is destroyed.

The vehicle has 3 jacks for 4mm lab wires:

Jack red: Positive pole of the supply line from the solar module (solar filling station)

Jack black: Negative pole of the supply line from the solar module and negative pole of the GoldCap

Jack green: Positive pole of the GoldCap and test jack for measuring the voltage

Function of the switch:

The switch has 3 positions:

- a in driving direction to the front: driving mode, the electric motor is connected to the GoldCap
- b middle: OFF Neither driving nor charging mode
- c to the back: charging mode, the GoldCap is connected to the red jack for charging

2. Operation of the vehicle

2.1 Charging

As visible in the photo on page 1, the positive pole of the solar module is connected to the red jack of the vehicle with a lab wire, the negative pole of the solar module to the black jack with another wire. Now the switch is switched to the back on „charging“, the charging process begins. Depending on the light intensity the charging process takes just about <1 up to about 3 minutes. With a voltmeter at the red-black jack pair (measurement range 20 V DC) the charging process can be observed. The voltage increases slowly while charging and reaches the module voltage of the solar module. After a successful charging process the switch is switched to OFF (middle position).

2.2 Driving

The pair of lab wires is removed from the jacks, the vehicle is placed on the ground on a smooth and flat surface. Then the switch is switched to the front on "Drive", the vehicle drives away. While driving the GoldCap discharges, the speed decreases, at about 0.3 V the vehicle stops. If the discharging of the GoldCap while driving is to be observed, the vehicle gets jacked up, so the wheels run freely in the air, a voltmeter is connected to the green-black jack pair (measurement range 20 V DC), the gradual decline of the GoldCap voltage is noticeable.

2.3 Experiments

With the detailed experimentation manual for the solar vehicle 4 extensive experiments with the vehicle can be conducted:

- Driving with varied charging voltages
- Driving with varied light intensity
- Analysis of the GoldCap charging
- Analysis of the GoldCap discharging
- Energy conversion processes