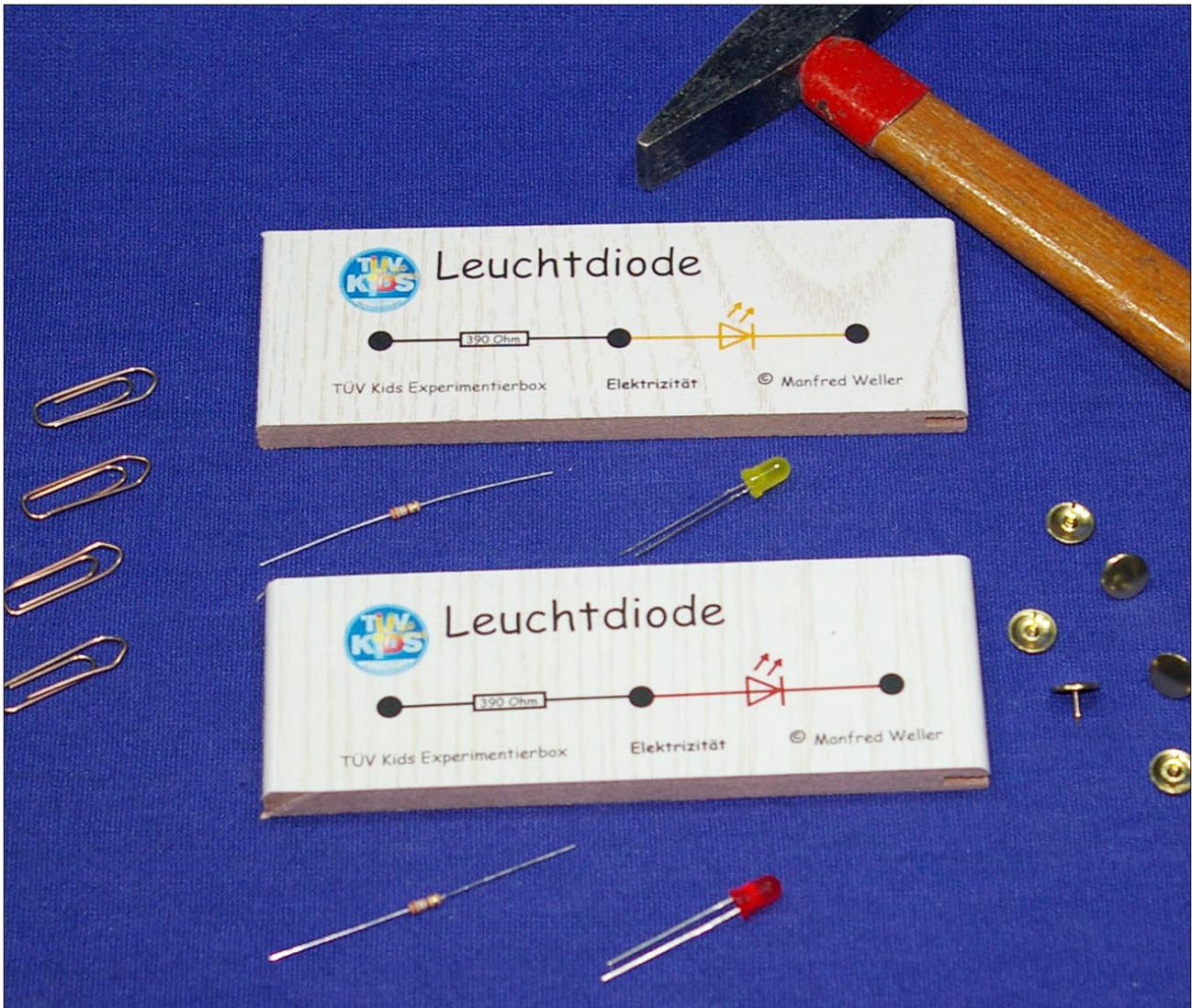


118.004

# Extension Electricity TÜV Hessen Kids



## Tools

1 Hammer

## Material

3 1/4 Base Plate

3 Resistor (390 ohm)

1 Light Emitting Diode LED yellow

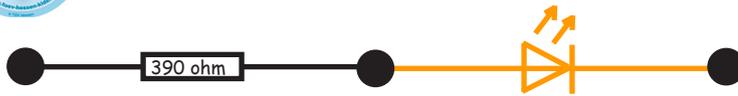
6 Thumbtacks

1 LED red

4 Paper Clips



# LED



TÜV Kids Experimental Kit **Electricity** © Manfred Weller

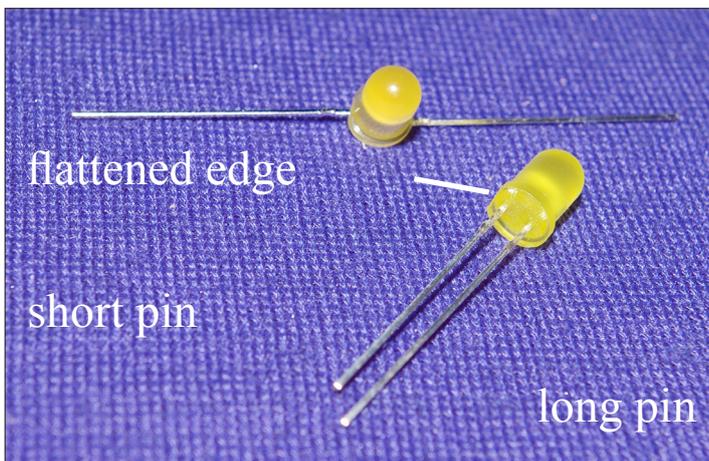


# LED



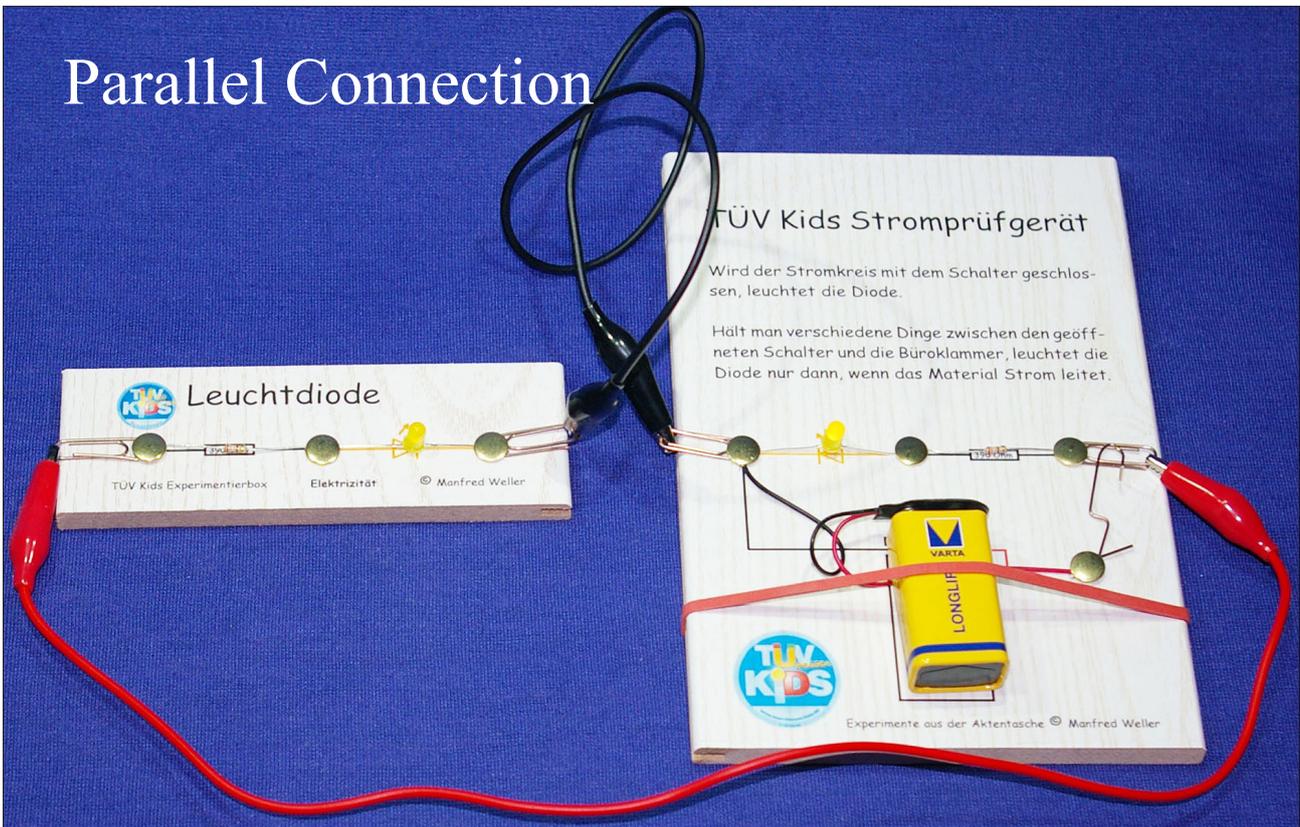
TÜV Kids Experimental Kit **Electricity** © Manfred Weller

Glue the templates on the base plates. Place all components on the base plates as shown on the templates and fix them with thumbtacks using a hammer.



LEDs conduct electricity only in one direction. Mount the diode in the correct direction. The short pin and the side with the flattened edge must point to the resistance.

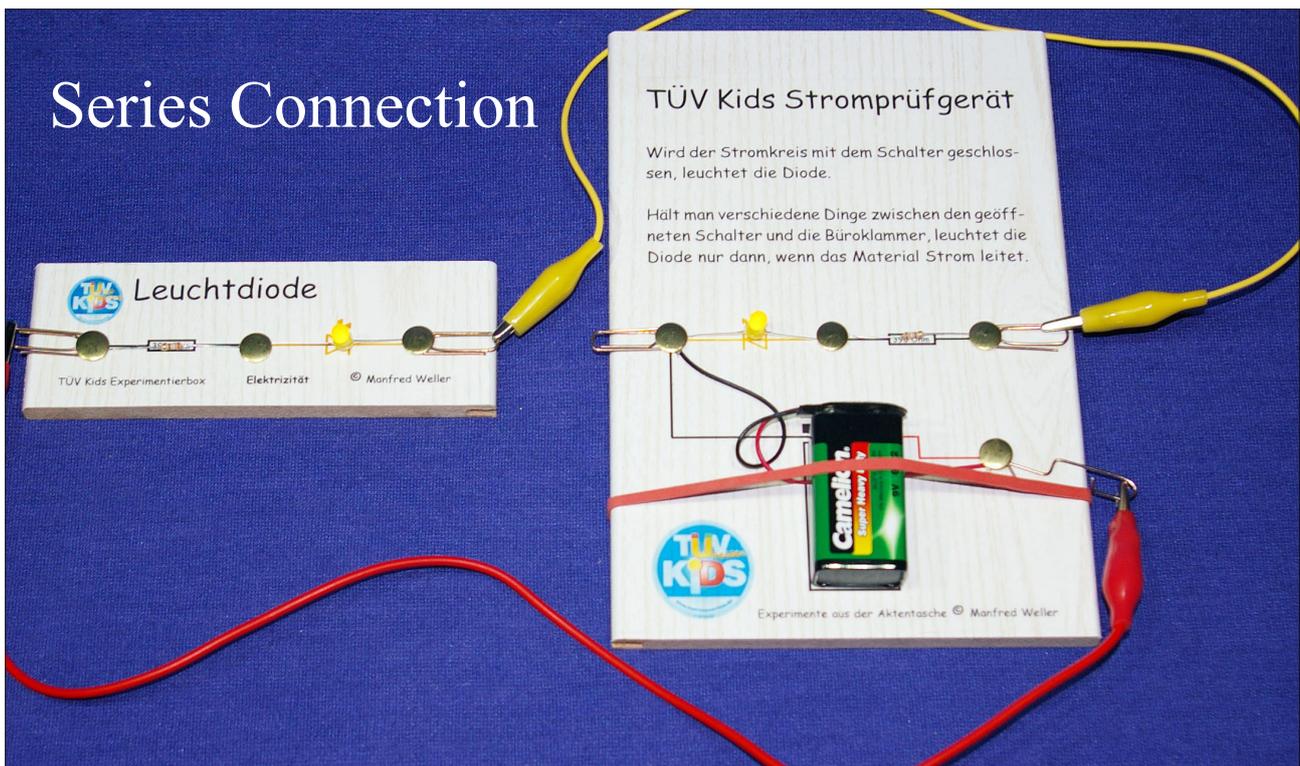
# Parallel Connection



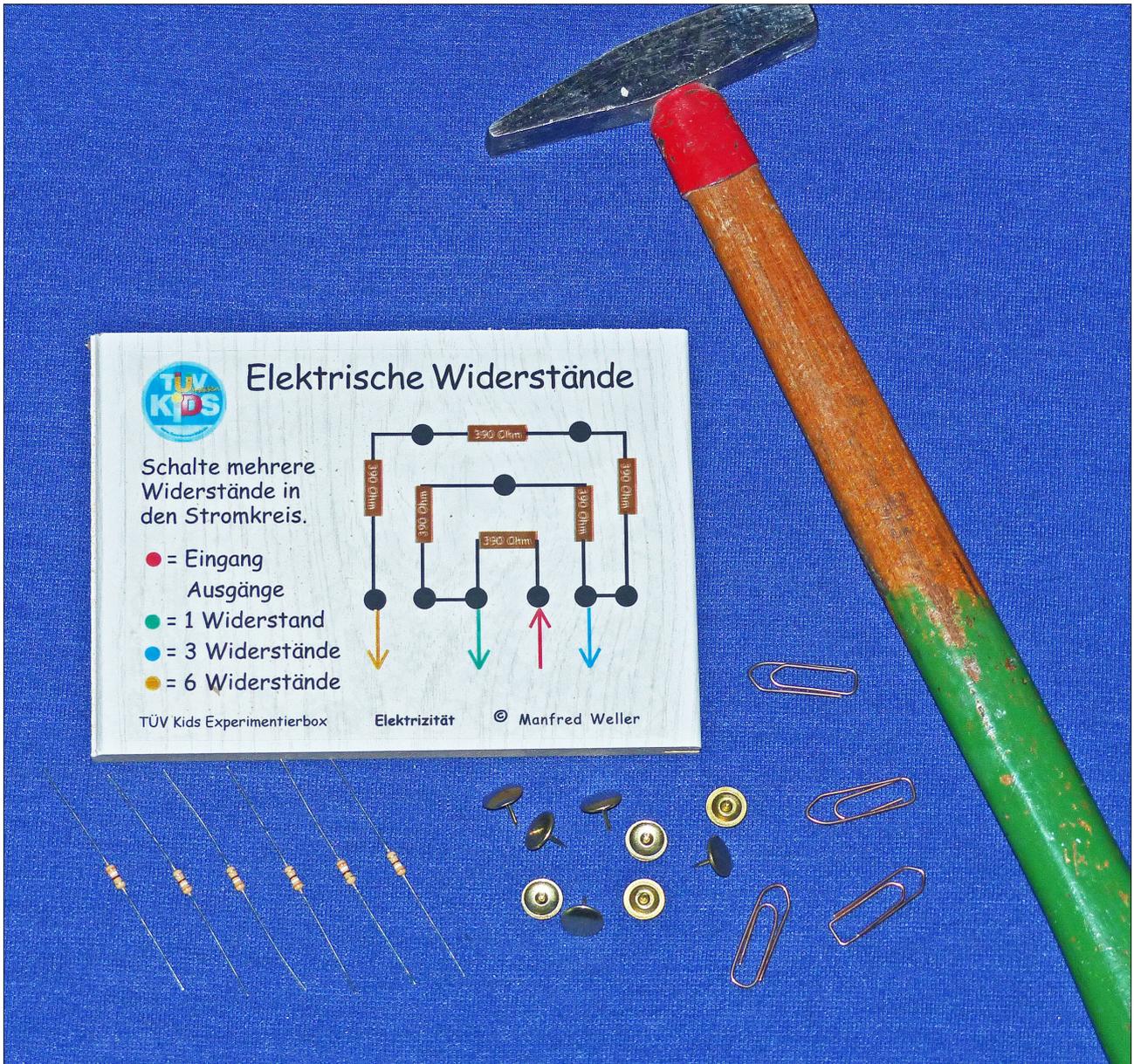
Use the TÜV Kids Current Tester as power source. With test lead cables you can connect your LEDs.

In a series connection the current is conducted through the diodes and the resistors one after the other.

# Series Connection



# Resistors



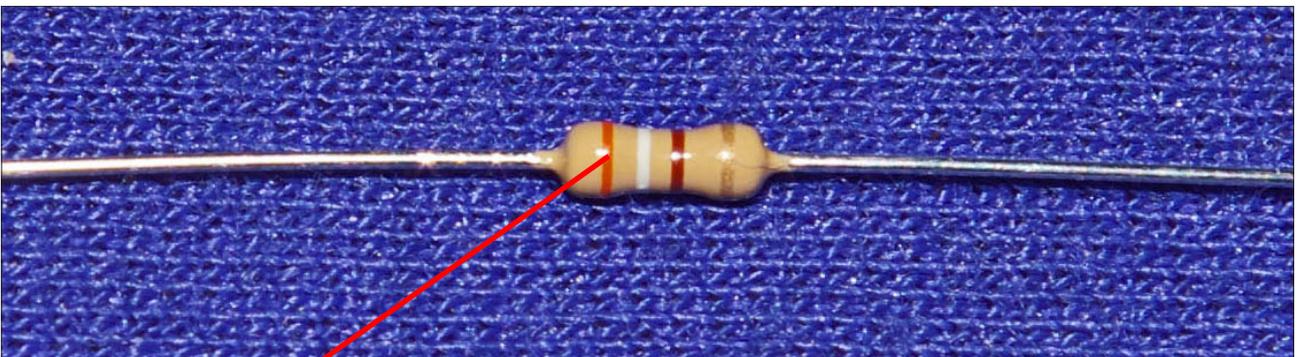
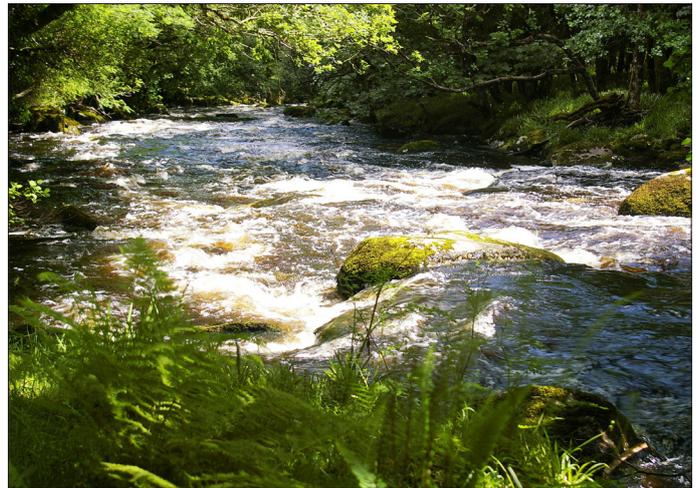
Tools			
1	Hammer		
Material			
1	1/2 Base Plate	9	Thumbtacks
6	Resistor (390 ohm)	4	Paper Clips



If there is an electric voltage in a cable the electrons can flow. In a good electrical conductor they can move well like these boats.

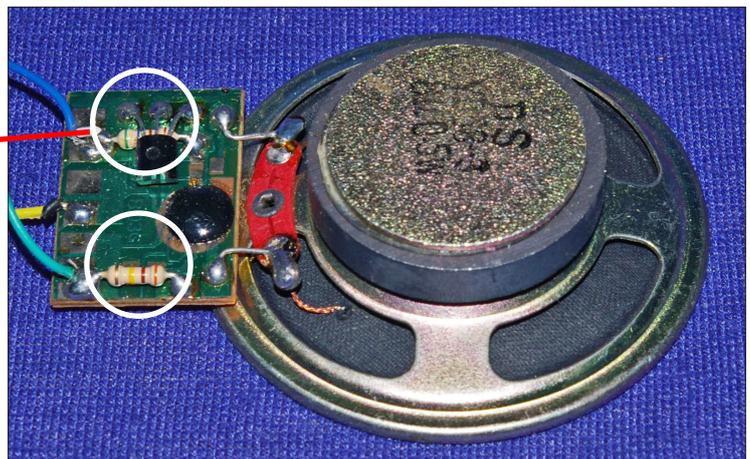
However if there are large rocks in the water, the boats have to move more slowly to avoid the rocks.

An electrical resistor works in a similar way. it does not matter in which direction it is mounted.



From the **coloured rings** the electronic engineer will know the resistor's power rating

**Resistors** are used in many electronic components. They protect against a current that is too strong.

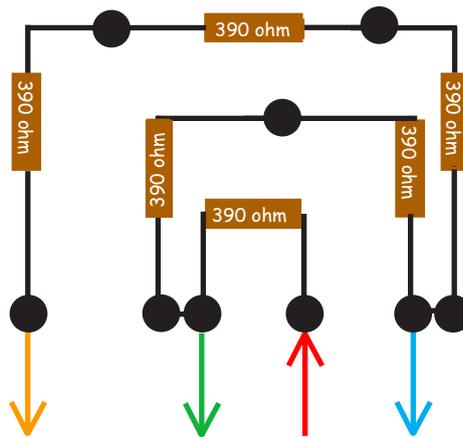




# Electrical Resistors

Add various resistors to the circuit.

- = Entrance
- = Exits
- = 1 Resistor
- = 3 Resistors
- = 6 Resistors



TÜV Kids Module 1 Electricity

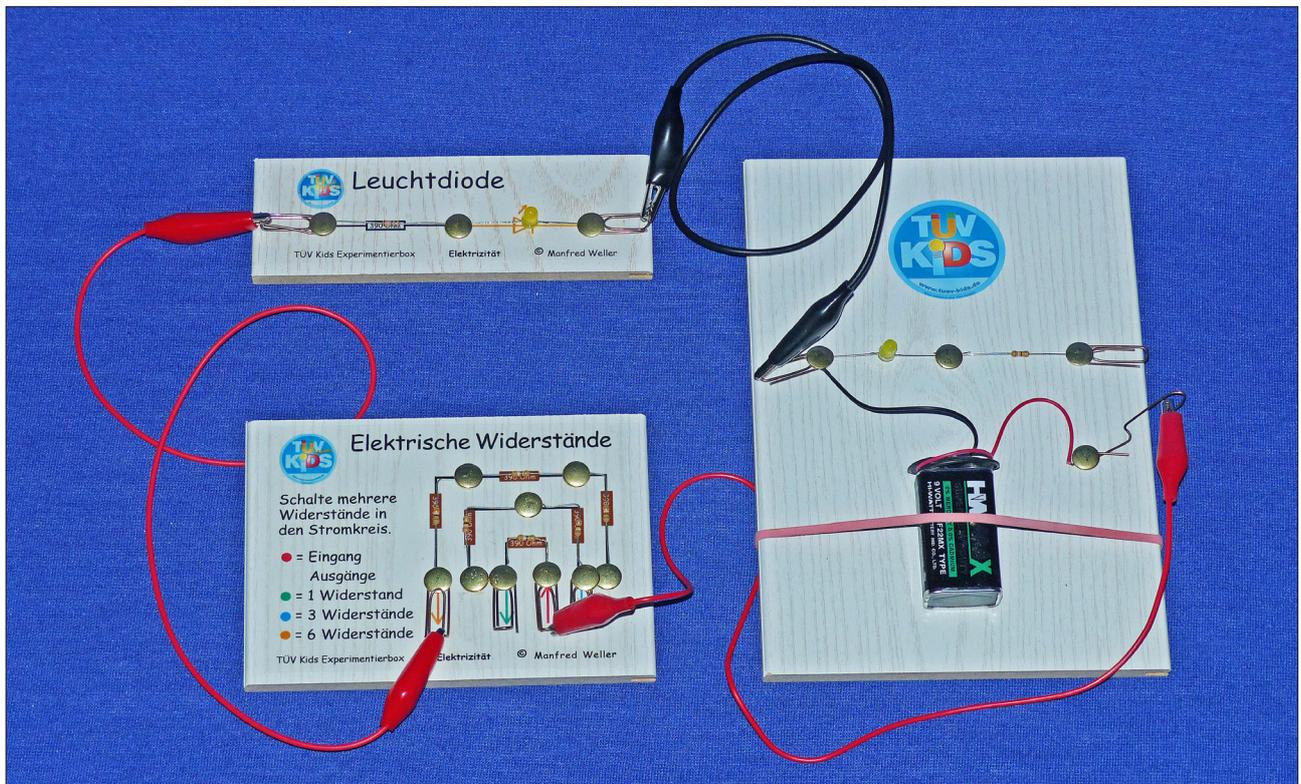
© Manfred Weller

Glue the template on the base plate.

Place the resistors and the paper clips on the marked points and fix them with thumbtacks using a hammer.

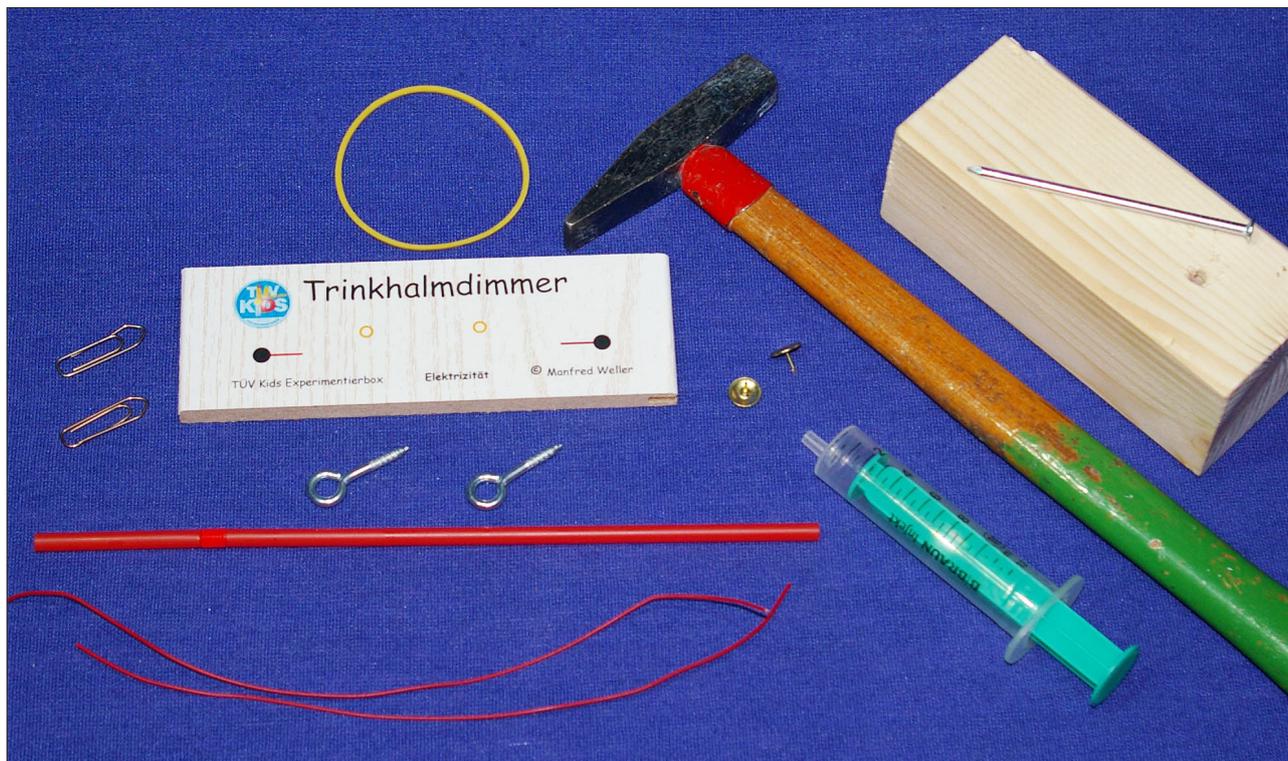
Connect the current tester to the paper clip "Entrance" (red cable). Connect the LED with the return line of the current tester (black cable).

Connect the current tester to the paper clip "Entrance" (red cable). Connect the LED with the return line of the current tester (black cable).



If you connect the diode with the green exit, you have a resistor connected in between. At the blue exit there are three and at the orange exit six resistors.

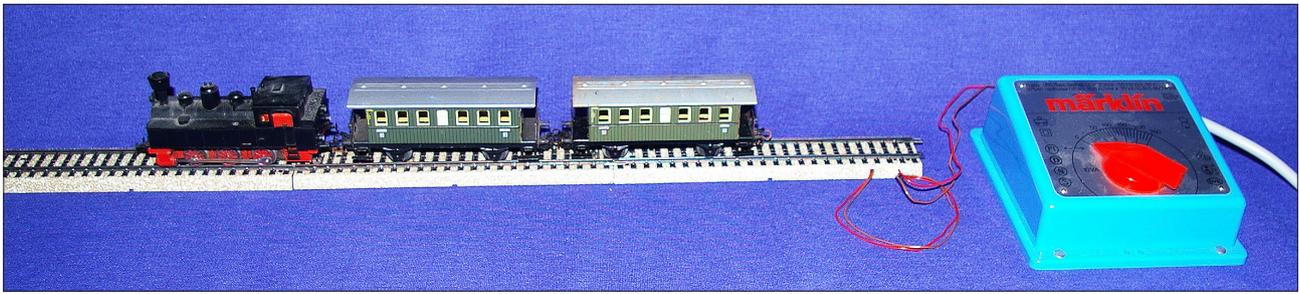
# Drinking Straw Dimmer



Tools			
1	Hammer	1	Nail
1	Syringe	1	Wooden Block
Material			
1	1/4 Base Plate	1	Rubber Ring
1	Drinking Straw	2	Thumbtacks
2	Ring Screw	2	Paper Clips
2	Cable red 20 cm		



With a dimmer you can regulate the intensity of light. If you want it cosy turn the dimmer down. With a drinking straw we make a dimmer for our current tester.

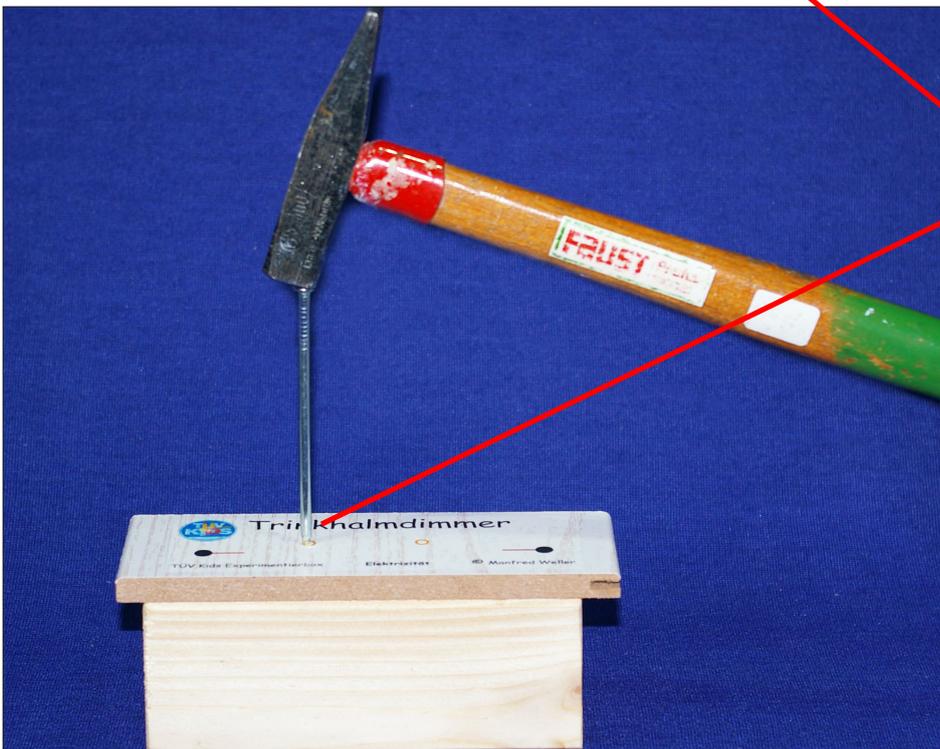


For an electrical railway you can regulate the velocity of the locomotive. In electrical engineering this is called a potentiometer, which is a little more complicated than your drinking straw dimmer.



The drinking straw is supported by the eyelets of two ring screws.

Place the base plate on top of a wooden block.

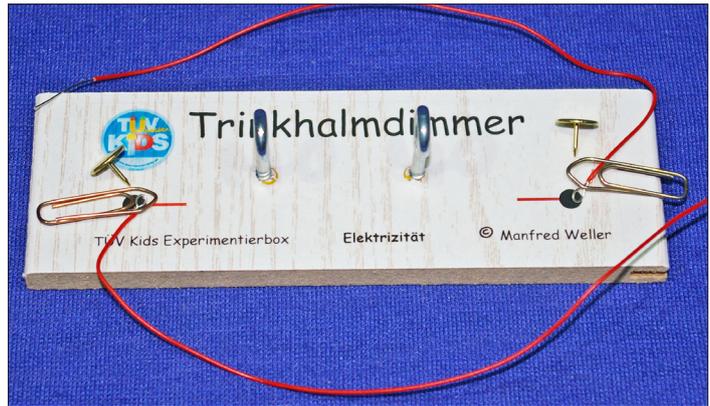


With a nail make holes at the points marked for the ring screws using a hammer. Screw the ring screws not too deep into the base, they should not come out on the back side.



Use a nail as a lever or pliers, then it is easier to screw the ring screws into the board. Take care that they don't come out at the back.

Remove the insulation approx. 2 cm on both cable ends. Make an **eyelet on both ends**.



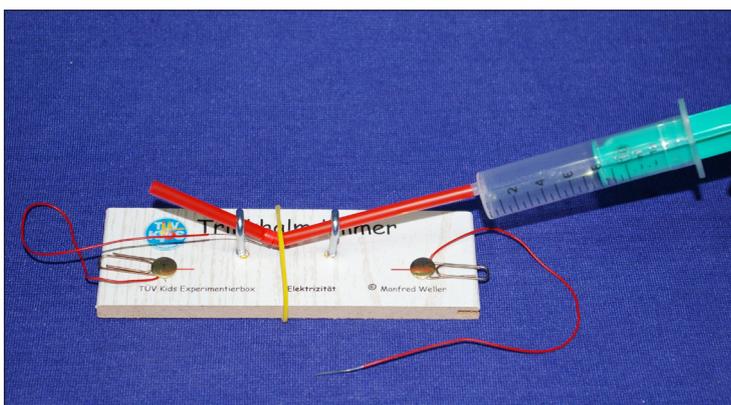
Put a thumbtack through the cable eyelet and the paper clip.

On both sides hammer cable and thumbtacks to the board.

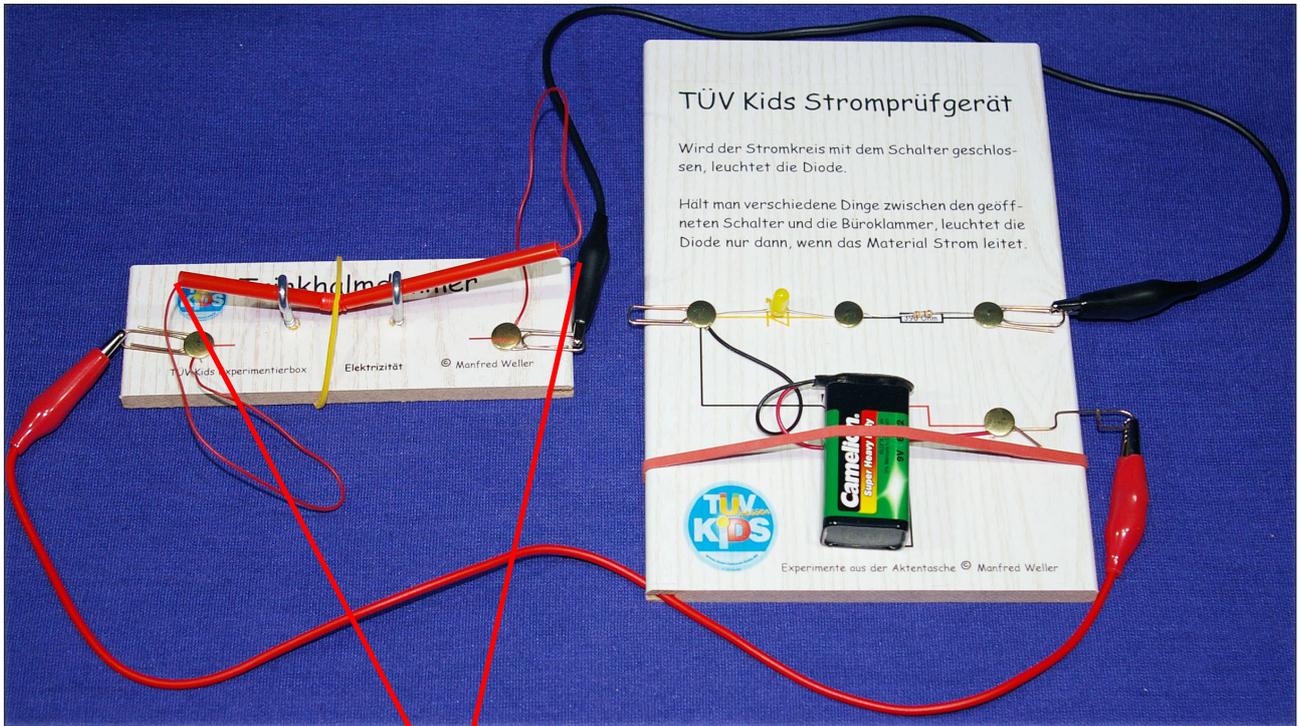
Push the drinking straw through the eyelets of the ring screws. The rubber ring keeps the drinking straw down at the bend.



Cut the drinking straw **here**.



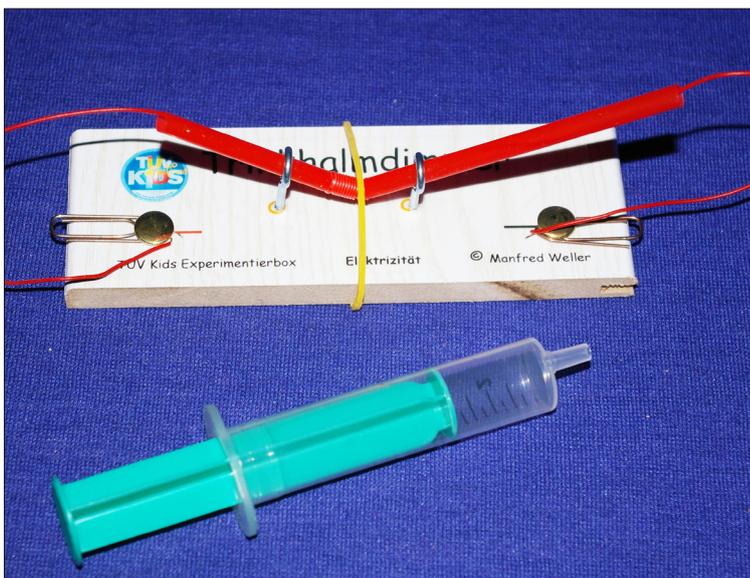
With a syringe fill water into the drinking straw. Take care not to have air bubbles in the water. With some grains of salt in the water it works better.



Push the two red cables into the drinking straw.

Connect the drinking straw dimmer to the current tester.

When now you push the two red cables back and forth inside the drinking straw, the brightness of the diode on the current tester will change.



Water doesn't conduct current as well as metal. The water acts like an electrical resistor.

With the two cables you can regulate the rating of the resistor.

The longer the distance the current has to pass inside the water, the higher is the resistance.

# Switch



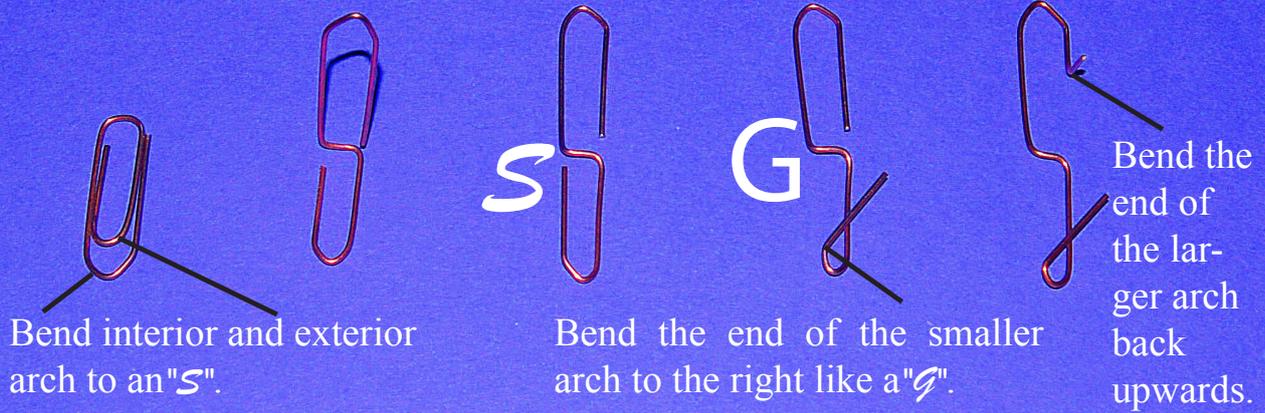
## Tools

1	Hammer		
---	--------	--	--

## Material

2	1/4 Base Plate	10	Thumbtacks
2	Red Cable 10 cm	8	Paper Clips

From a paper clip bend a switch.



Switch



TÜV Kids Experimental Kit **Electricity** © Manfred Weller



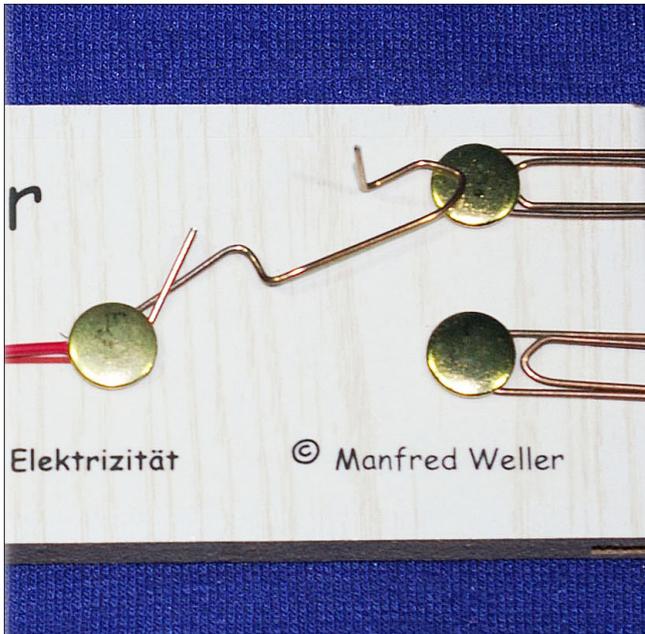
Switch



TÜV Kids Experimental Kit **Electricity** © Manfred Weller

Glue the templates on the base plates. Place all components on the base plate as shown on the template and fix them with thumbtacks using a hammer.

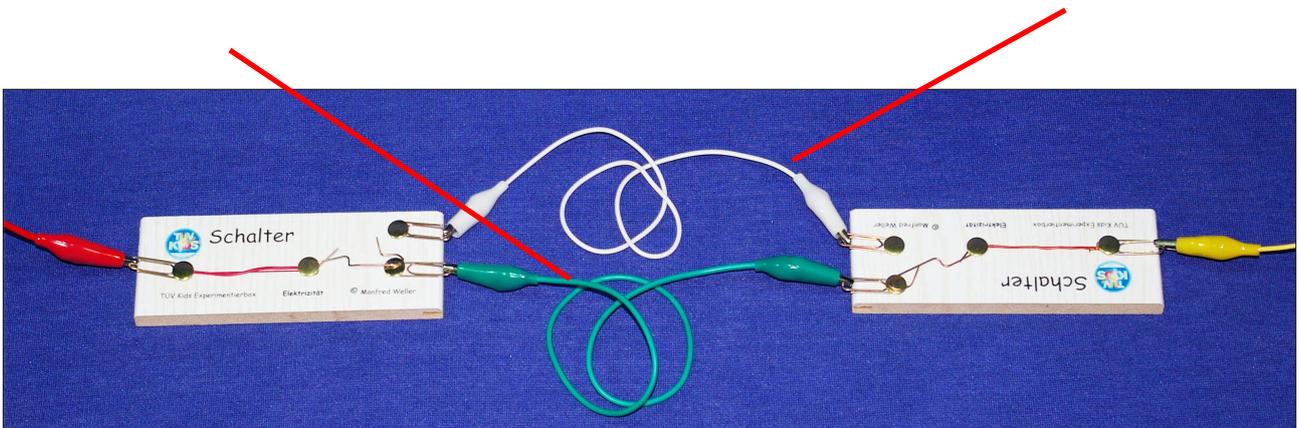




The two switches are selector switches. You can connect two electricity circuits and when you use the switch you can decide, which circuit you want to activate.

Here the current flows to the upper connection. The circuit at the lower connection is switched off.

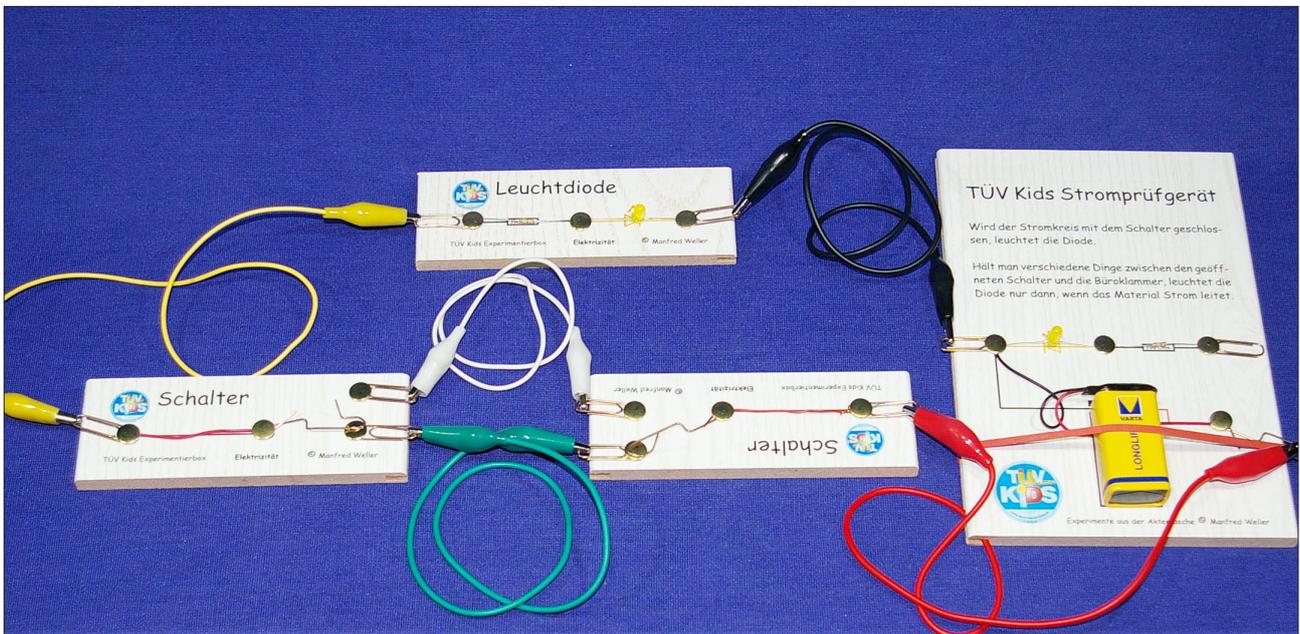
The second switch you need to build a toggle switch. Connect the two switches with two cables, here a white and a green one.



# Toggle Switch



In the sleeping room you have a switch at the door and another one next to your bed. With each of the two switches you can put on and off the light independently from the other one.



This is the circuit we want to build. Both switches are connected by two cables.

At each switch you can decide independently, if you want the light on or off. Both switches are simply added to the circuit between current tester and LED.

# Traffic Light Control and LED (green)



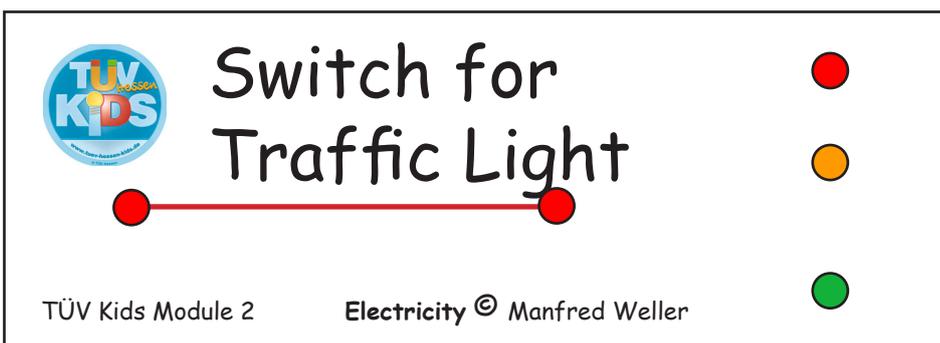
Tools			
1	Hammer		
Material			
2	1/4 Base Plate	1	Resistor (390 ohm)
1	LED green	8	Thumbtacks
1	Red Cable 10 cm	7	Paper Clips



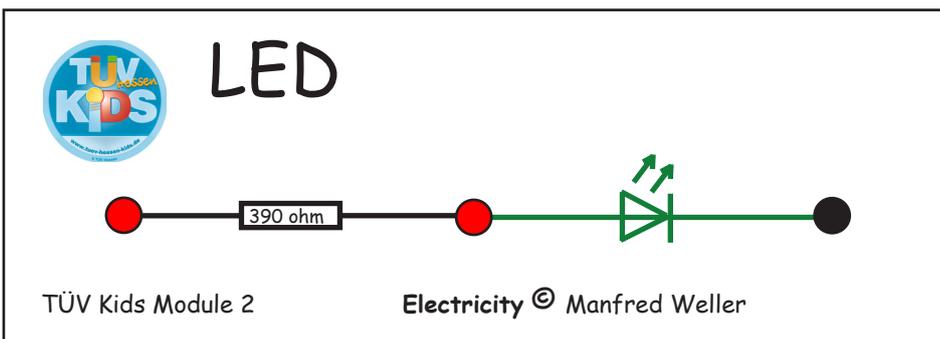
# Traffic Light Control

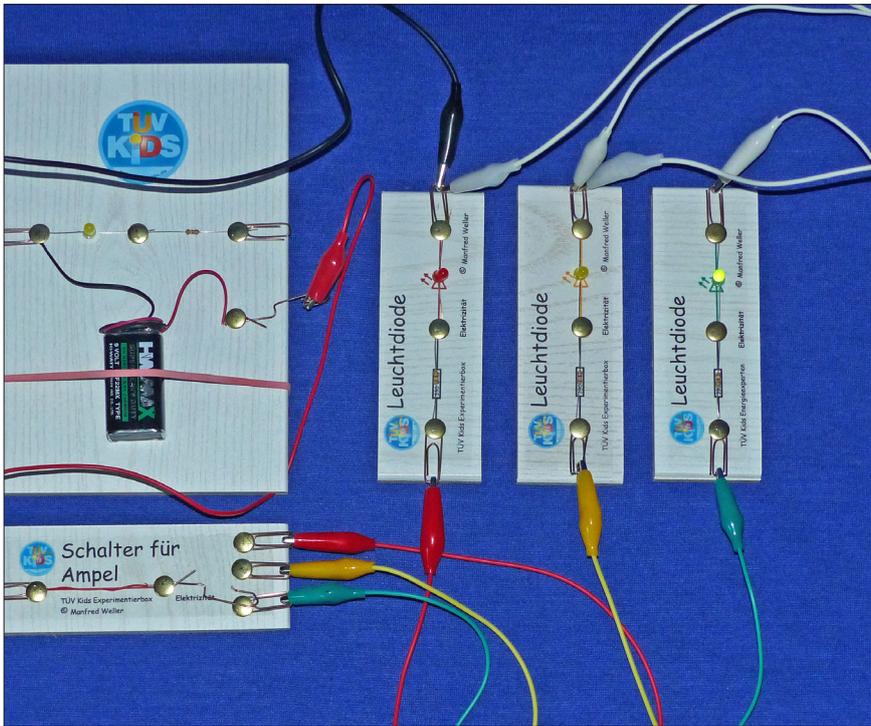
Traffic lights regulate the traffic flow. They switch between red, yellow and green.

We make a traffic light control illuminating a red, yellow and green diode.



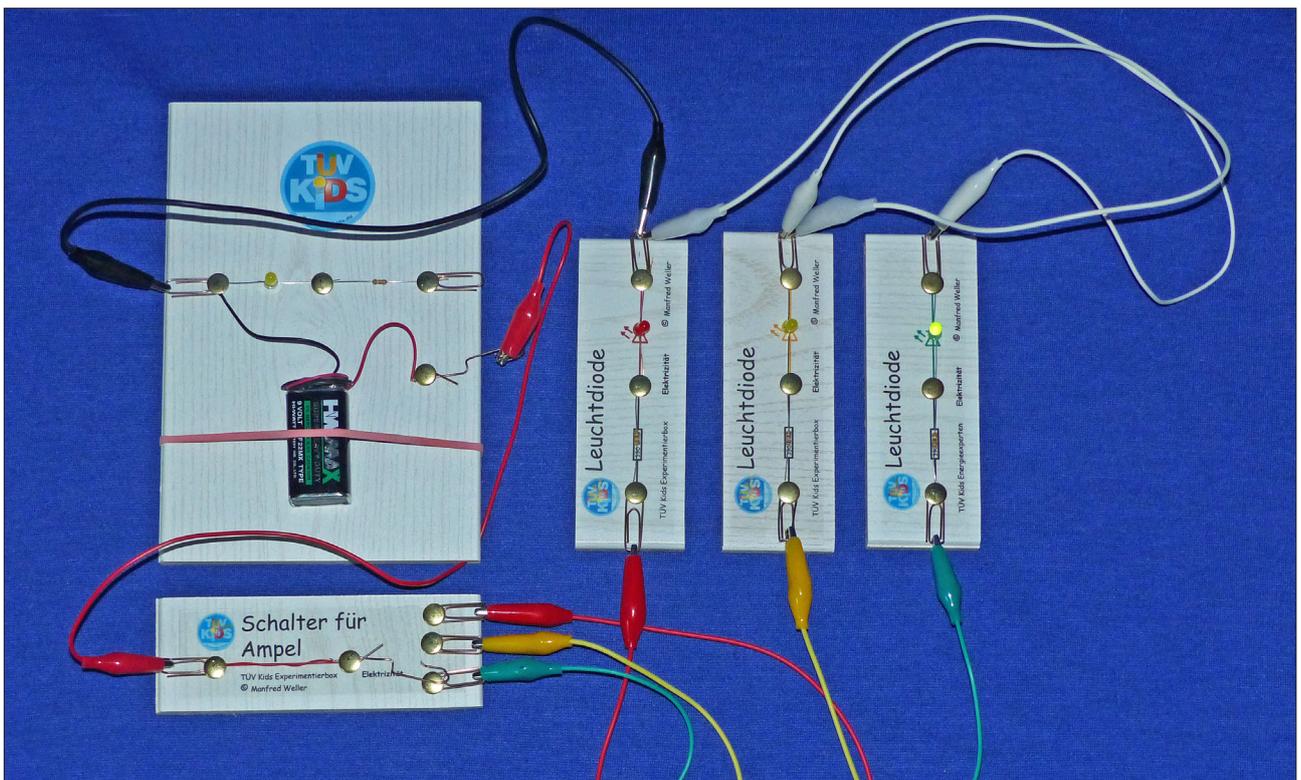
For this we will build a switch, which is able to operate the three diodes. Furthermore we need a green LED.





If you want to build a traffic light control circuit, you need a switch, which can activate three different diodes. The thumbtacks for the red and yellow diode are placed close to each other for to be able to glow at the same time.

Connect the switch with the entrance cable of the current tester. At the three switch exits connect the red, yellow and green diode respectively.



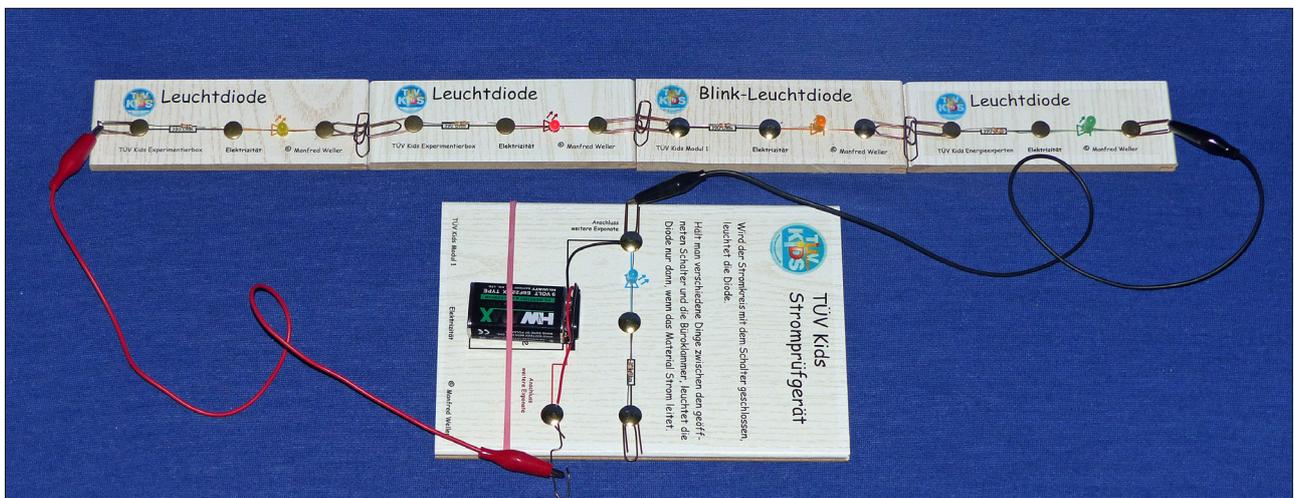
Connect the return lines of the diodes with the current tester. Now you can operate your traffic light like the original.

# Disco Light and Power Distribution

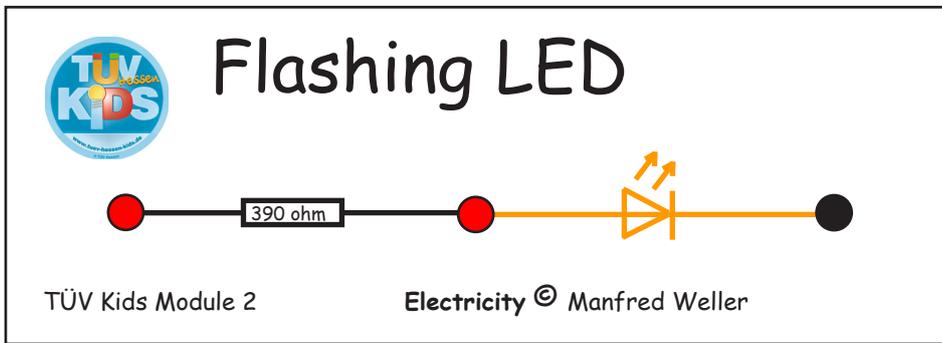


Disco illumination is needed for every party.

There is an optical and an electrical method for disco illumination. We use our LEDs.

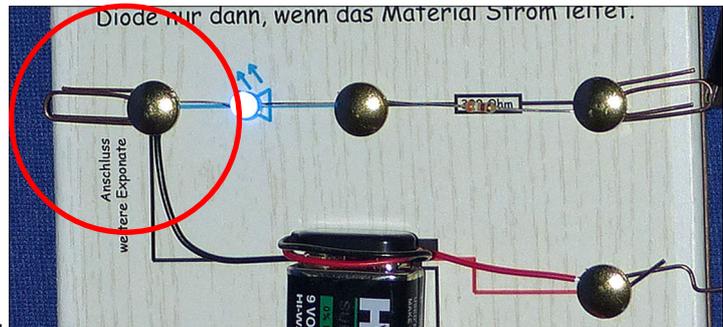


Tools			
1	Hammer		
Material			
1	1/4 Base Plate	3	Thumbtacks
1	Flashing LED	8	Paper Clips
1	Resistor (390 ohm)		



Build a yellow flashing LED on a base plate. You already know the assembly instruction.

Insert to your current tester an **additional paper clip** as connector. You can take the current there directly from the battery.



You have four LEDs on small boards and a diode on the current tester. Furthermore you have a power distribution from the traffic light control.

With these diodes make the disco illumination. The individual components you can **connect electrically** with paper clips.



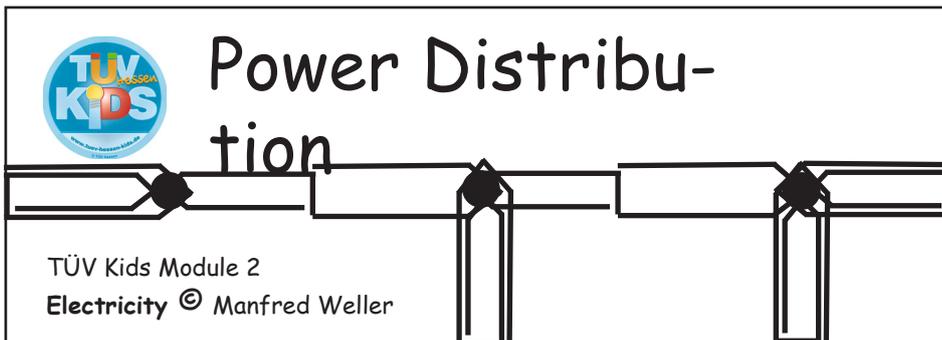
There are various possibilities to connect the diodes together into an electricity circuit. Find out how to mount the flashing diode for all the LEDs to flash.

Find out how many diodes you can add to the circuit for all of them to glow or flash.



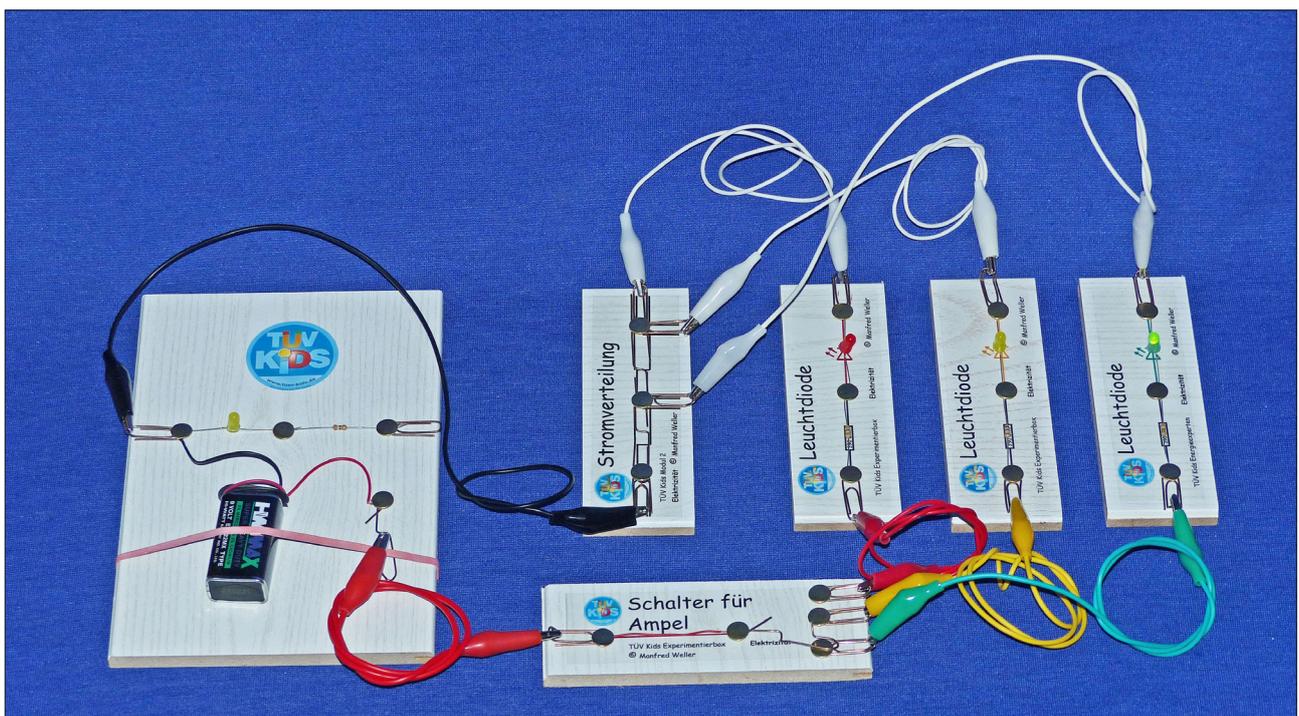
With a power distribution you can assemble the disco illumination even better.

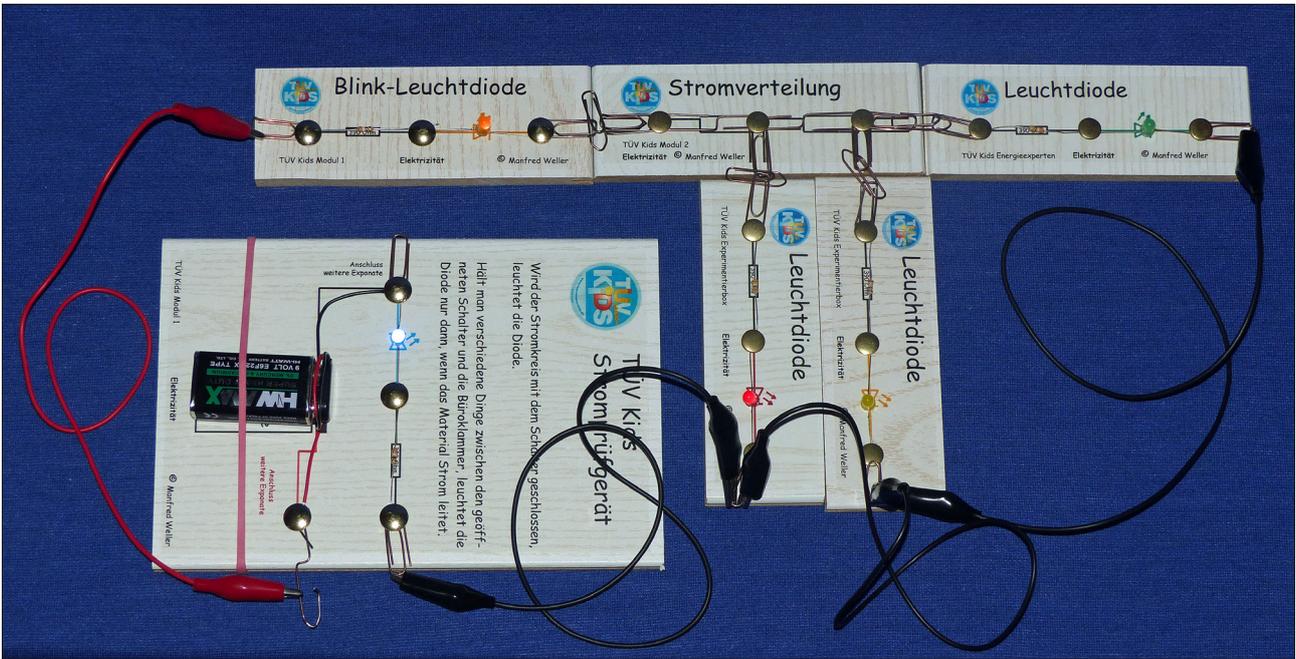
You won't save cable in this case, but the design will become clearer with the power distribution.



Additionally you can use this power distribution also for other circuits, for example for the traffic light control (see further down).

Construction of the power distribution is easy: Bend up two paper clips to an "S". Place all paper clips on the board and fix them with three thumbtacks using a hammer.





Here an example for the use of the power distribution: in this circuit some diodes are connected in series and some are connected in parallel.

You also can design a circuit, where some diodes glow always and others flash.



The power distribution helps to save many test lead cables.

Check if the individual components are really electrically connected with the paper clips.

Not sure if a connection



**Drinking Straw Dimmer**

TÜV Kids Module 1

Electricity © Manfred Weller

**LED**

TÜV Kids Module 2

Electricity © Manfred Weller

**LED**

TÜV Kids Module 1

Electricity © Manfred Weller

**LED**

TÜV Kids Module 1

Electricity © Manfred Weller

**Switch**

TÜV Kids Module 2

Electricity © Manfred Weller

**Switch**

TÜV Kids Module 2

Electricity © Manfred Weller

**Electrical Resistors**

Add various resistors to the circuit.

- = Entrance
- Exits
- 1 Resistor
- 3 Resistors
- 6 Resistors

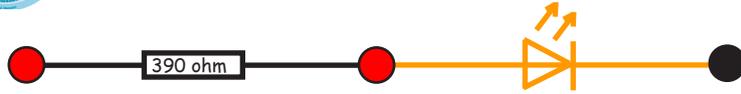
TÜV Kids Module 1

Electricity © Manfred Weller





# Flashing LED

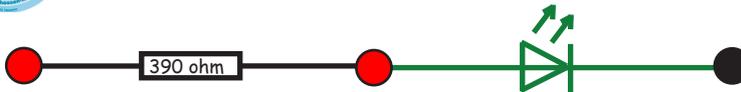


TÜV Kids Module 1

Electricity © Manfred Weller



# LED

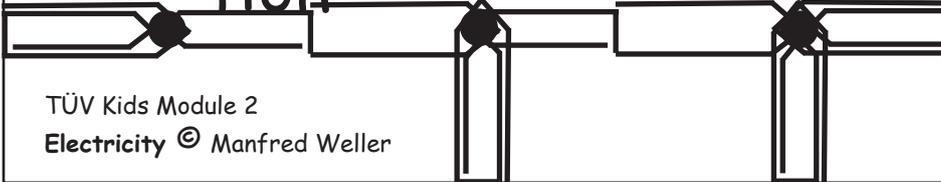


TÜV Kids Module 2

Electricity © Manfred Weller



# Power Distribu- tion



TÜV Kids Module 2

Electricity © Manfred Weller



# Switch for Traffic Light



TÜV Kids Module 2

Electricity © Manfred Weller

