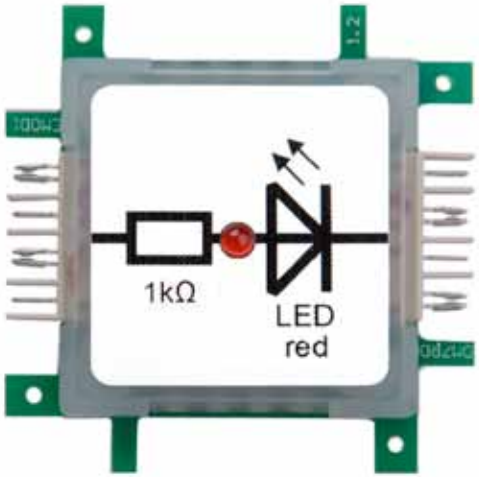
Brick 'R' knowledge

Brick Challenge

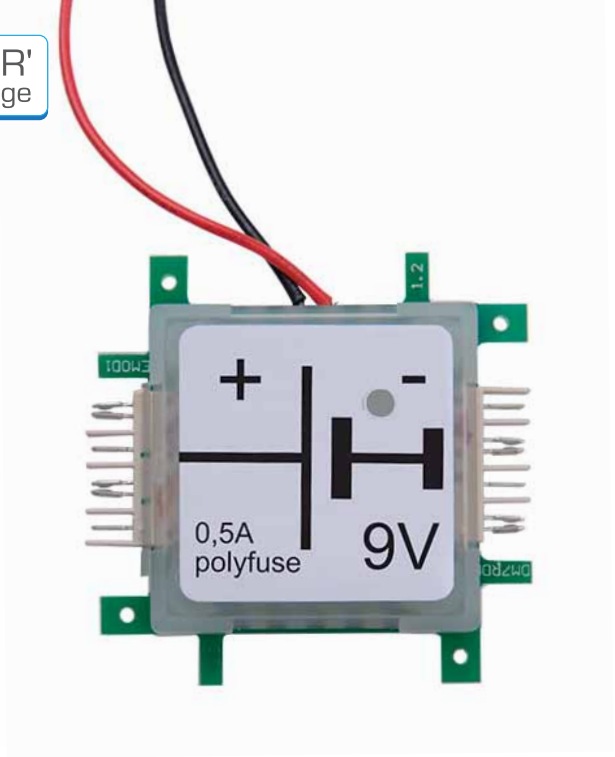
Now you have the chance to get to know our bricks a little better.
We have gathered information on each brick that you can use when doing the brick challenge: in case you don't know the answer to one of the questions you can easily look it up in the cards that explain each brick's function. In our brick challenge, we assign different tasks to you. Some are easy, others are demanding. You can either solve the tasks on your own or as a group. To make sure that the cards last long enough you can cut them out and laminate them.

Have fun doing the experiments!



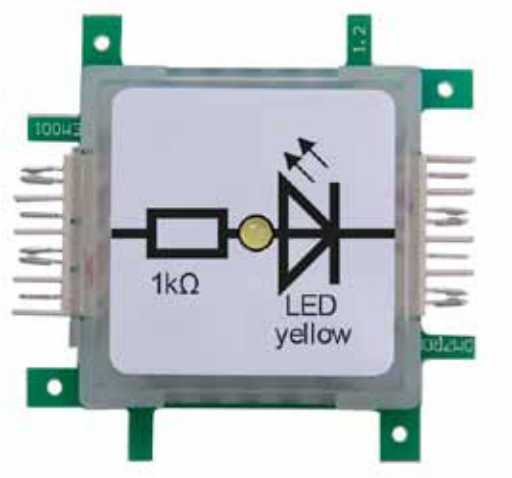
LED red

These LED bricks have different colors – this one is red. But you need to do something for it to be red: you can only see the LED's color when you connect the LED brick with a battery. Inside the brick there is a red light diode including a series resistor of 1kΩ. There will be a power connection only if there is a minimum voltage of 1,5V. The minimum voltage of a light diode depends on the color.



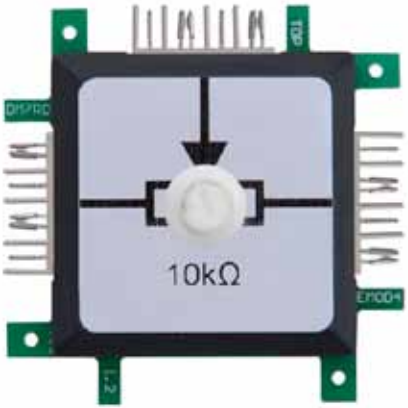
Battery with LED and ground

This brick provides all other components in your experiment with power. It makes the LED light up. Tip: You should always use this brick as the last one. Internal, self-healing fuse. Notification: when over-loading LED turns red.



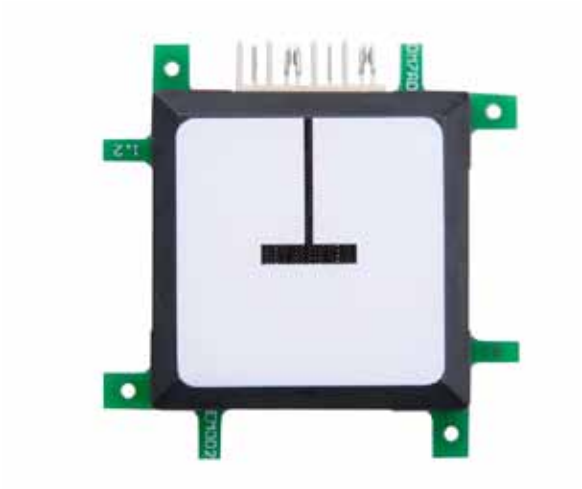
LED yellow

The LED bricks have different colors and this one is yellow. But you have to do something for it: you can only see the color when you connect the LED bricks with a battery. Inside the brick there is a red light diode including a series resistor of 1kΩ. There will be a power connection only if there is a minimum voltage of 1,5V. Inside this brick, there is a yellow light diode with a series resistor of 1kΩ.



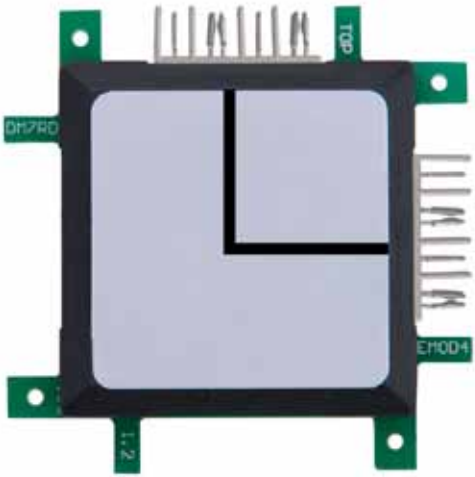
Potentiometer

This brick has a knob that you can turn in different directions. With it, you can control the LED bricks from dark to light and vice versa. The potentiometer is a resistor that you can change manually. A third contact, namely, a grinder changes the height of the electrical resistance value at its contact. It can be adjusted between 0Ω to 10kΩ.



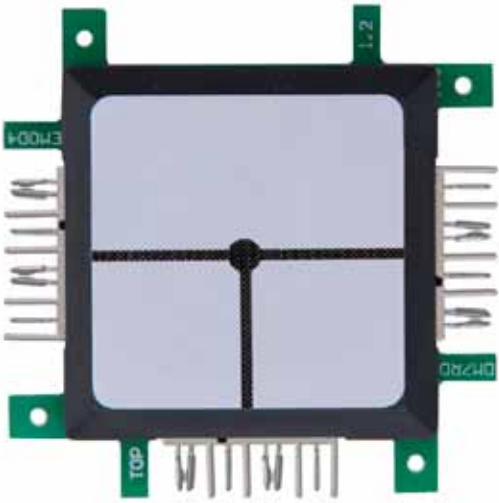
Ground

You will probably remember this brick very quickly as it is important for all our experiments. With it, it is very easy to build an electric circuit. You can use more than one in one experiment. The ground brick connects the pin of the port in the middle with the two ground lines on the outside.



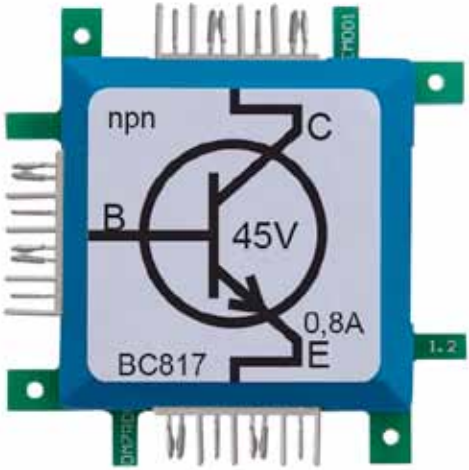
Corner brick

This brick looks like a corner. With it, you can connect your bricks “across the corner” by adding a further brick to each sides of the brick. The corner’s angle is 90°.



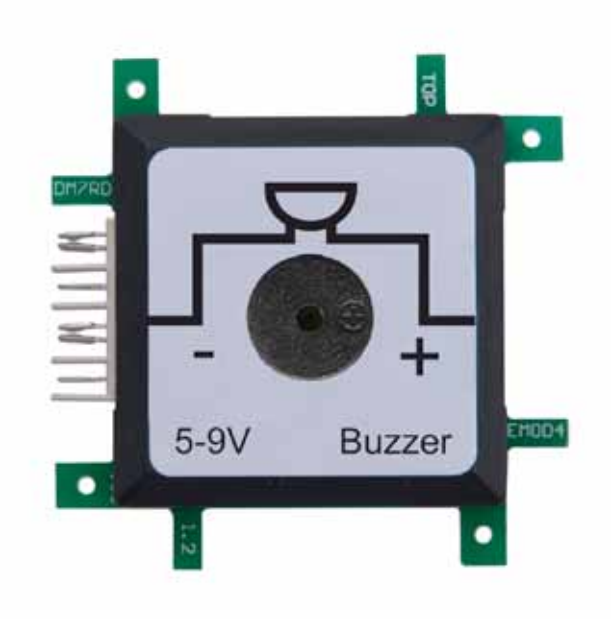
T-cross

This brick looks a little like the letter “T” (that is why we used the name for it). You can connect all your bricks similar to a T and build junctions. It is used a lot for projects on our website – just check them out.



Transistor npn BC817

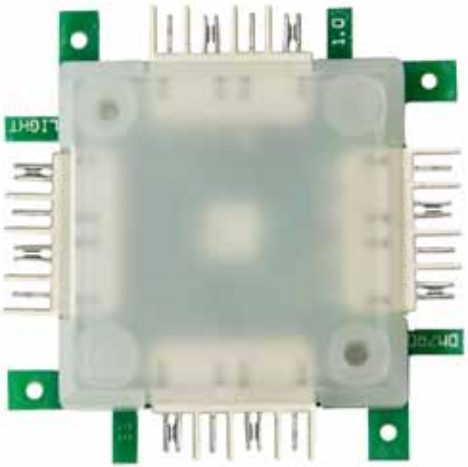
This brick is one of the most important bricks in many experiments. It is the "helmsman" that needs to drive a big ship – in our case, it doesn't drive the ship but it coordinates the voltage that flows through the bricks. Tip: On this brick, you see the direction of arrow in which the current flows, that is, from C to E. For advanced users: It navigates the current between collector (C) and emitter (E) via the smaller current flow at its basis contact (B).



Buzzer

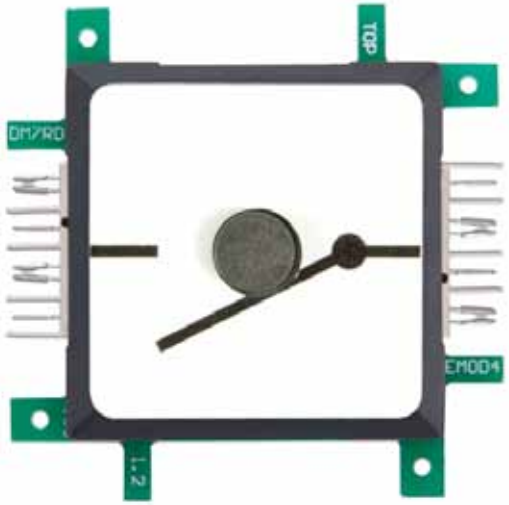
With the buzzer, you can create quiet and loud noises. It is similar to a loudspeaker but cannot be as loud. You can use the buzzer for a motion detector, for example: when someone enters the shop, the buzzer makes noise.

For advanced users: The buzzer converts electrical into acoustic signals. Compared to a loud speaker it does not possess such a wide frequency spectrum. It is not possible to create differentiated audio signals but the buzzer can do simple acoustic noises. It consists of a piezo element or an electromagnet and is used with alternating voltage. We built in an electronic circuit that is why you have to observe the correct polarity of plus and minus!



RGB LED

You can lighten up this brick, connect several of them in a row and build your own lamp. RGB stands for the primary colors red, green and blue.
For advanced users: LEDs correspond to the electrical characteristics of a diode. When current flows through the diode, it emits light. The RGB colors are adjusted with 3 potentiometers on the back of the brick.



Button

This button brick has a button and a symbol that looks a little like a barrier. You can imagine the button brick exactly like this: By pushing the button you establish a connection and the barrier is closed. When letting go of the button, the connection is interrupted and the barrier is opened again.
For advanced users: The button is an electromechanical operating element that enables a conductive connection only when being pushed. In the moment of letting go of it, the connection opens up and the button returns to its starting position.

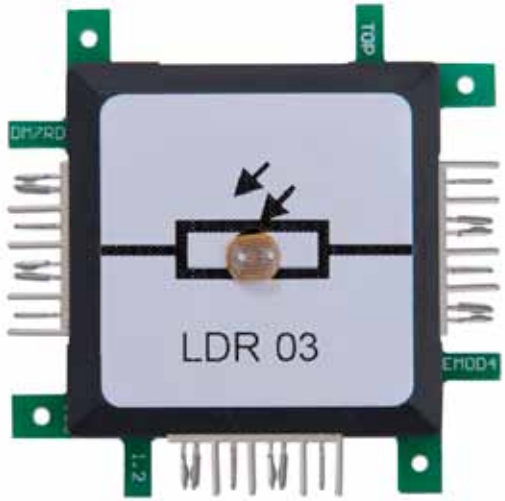
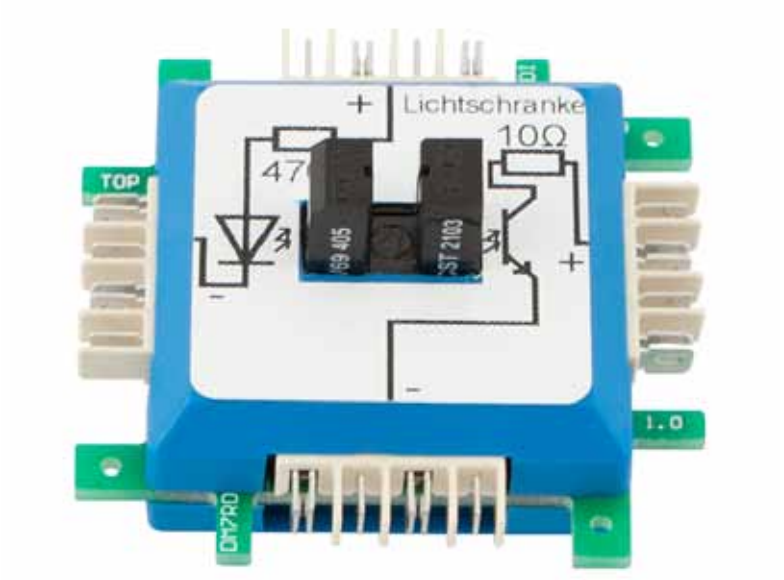


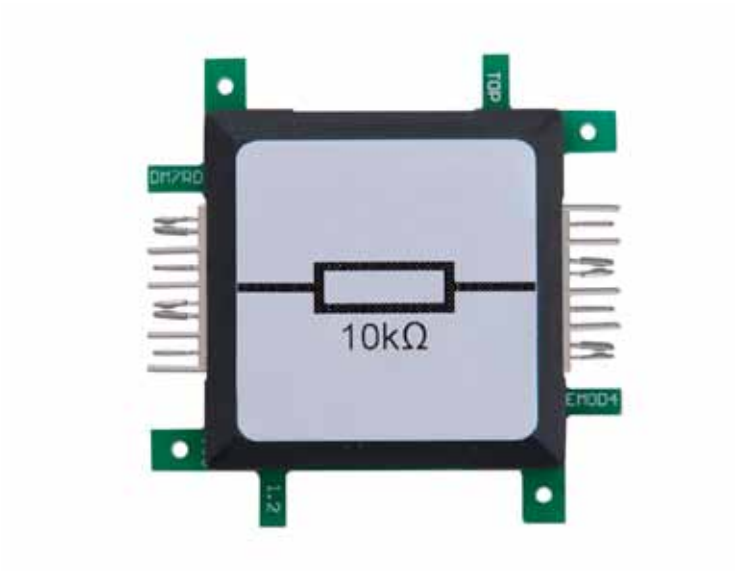
Photo resistor LDR 03

This brick is very light-sensitive. That means, the more light falls on to the small sensor, the less is the resistance.
For advanced users: Data varies between some 100 Ohm when it is light and some kilo-Ohm when it is dark. There is a constant change of resistance value. You can use this brick as a sensor for a light barrier, for example.



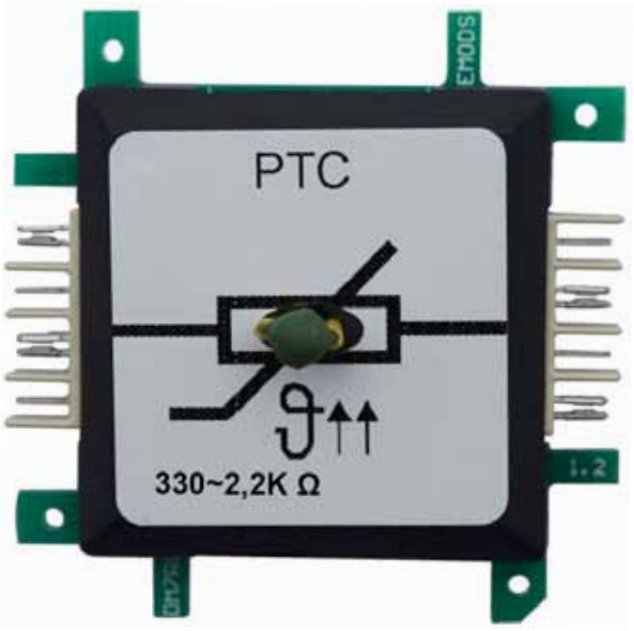
Light barrier

This brick includes a light barrier. It works like this: an LED irradiates a phototransistor. When the optical connection between LED and phototransistor is interrupted, the transistor is blocked. Light barriers are used in alarm systems or in the industry. As the signal transmission is exclusively visual, information can be separated electronically and can be transferred from one electric circuit to another without mechanical abrasion.



Resistor 10k Ohm

Resistors have the task to control and regulate currents and voltages in an electronic circuit. The higher the resistor, the worse it conducts current. For advanced users: A resistor possesses a defined conductivity that determines the current at an applied voltage. The maximum power that is converted into heat is important – it should not be more than 1/8 watts for our resistors.

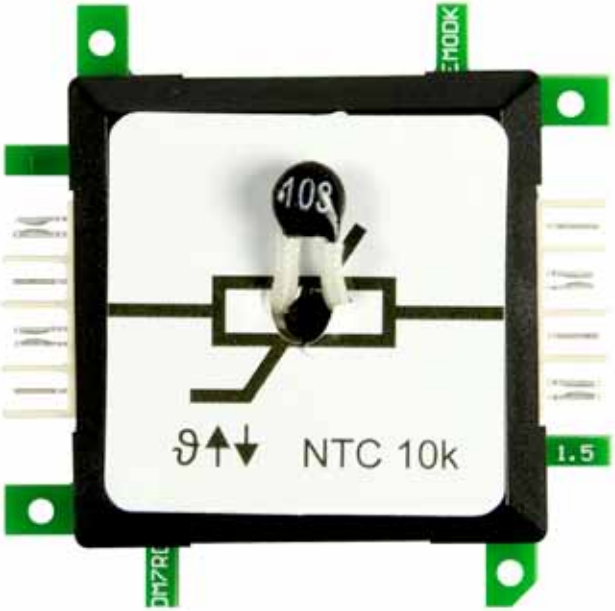


PTC resistor

This PTC resistor measures temperature and can be used as a thermometer.
For advanced users: The PTC resistor changes its conductivity according to temperature and can be used for reliable measuring of temperature from -10 to 40°C. The electrical resistance increases when temperature rises.

Motion detector

You can build an alarm system with this brick that shows you when someone crosses an invisible barrier. Thanks to its passive infrared technology (PIR) the motion detector brick provides a reliable recognition of movement and an extremely high interference resistance. This way, it can be perfectly integrated into light switching.

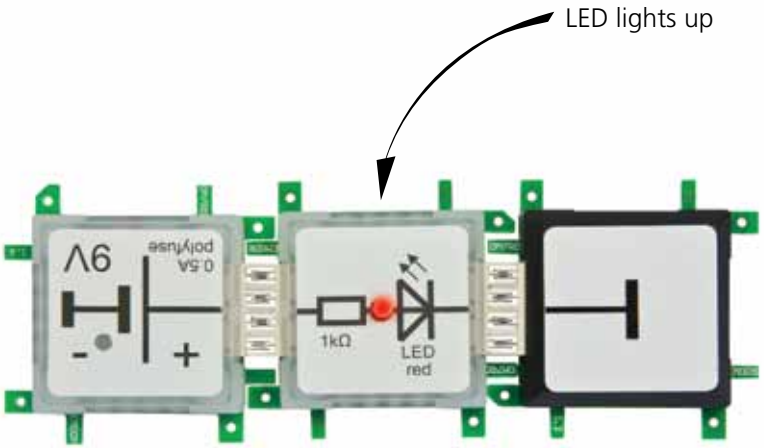


NTC resistor

Would you like to know how many degrees there are outside and if you can leave your winter coat at home? Then you totally need the NTC resistor brick with which you can easily implement temperature measurements. For advanced users: The NTC resistor changes its conductivity according to temperature and can be used for reliable measurement of temperature. Electrical resistance decreases when temperature rises.

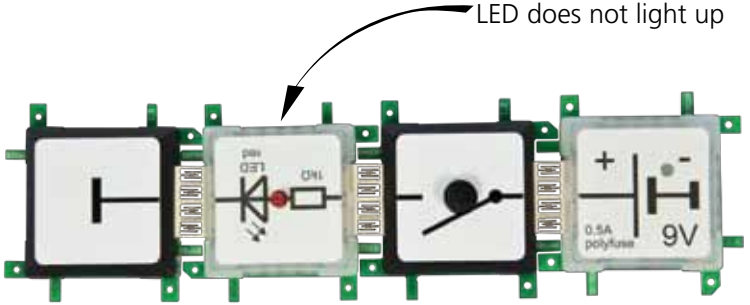
Challenge 1

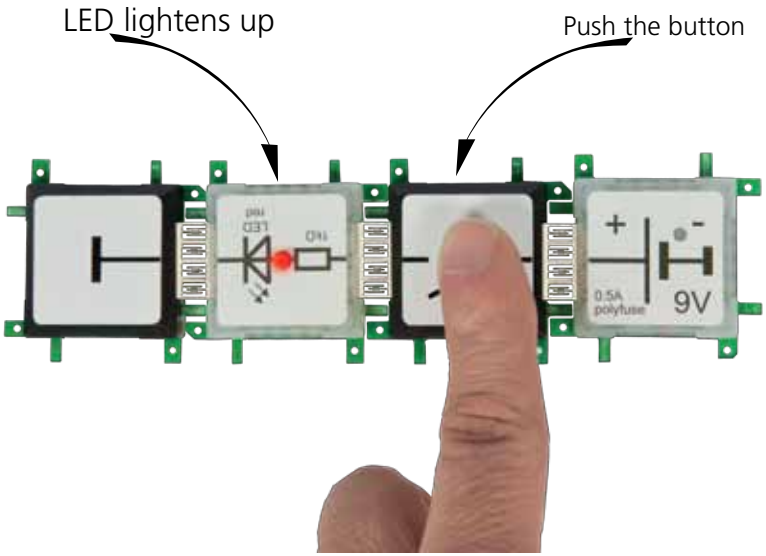
Lets start with something easy: Find the red LED brick and try to lighten it up. Tip: It will only lighten up when you connect the brick the right way around.



Challenge 2

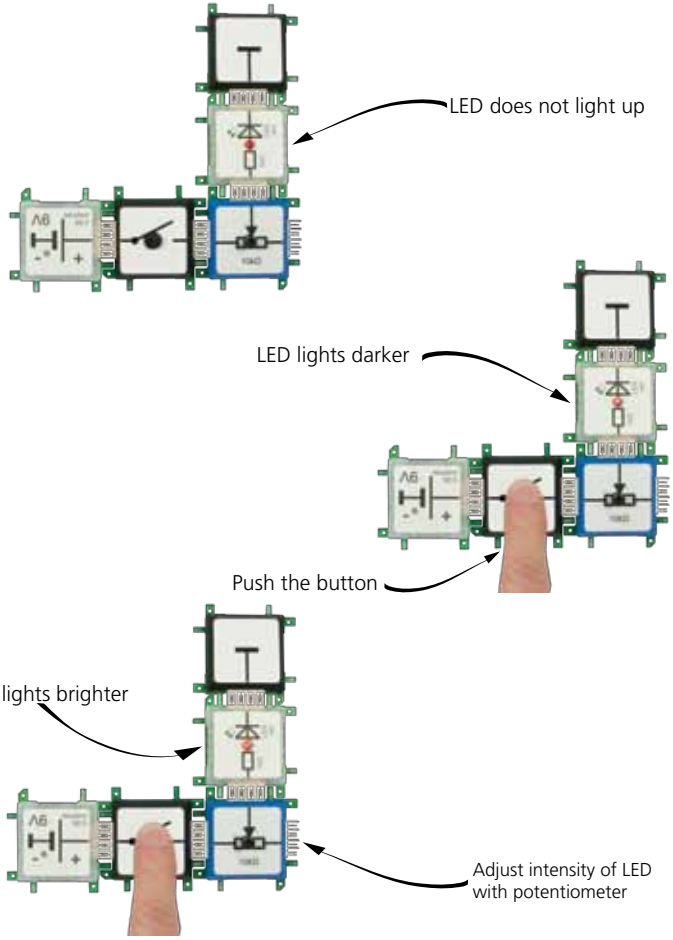
Our LED lightens up now! When we want to build a flashlight, we don't want the light to be turned on the whole time. Find a brick with which you can turn your flashlight on and off.





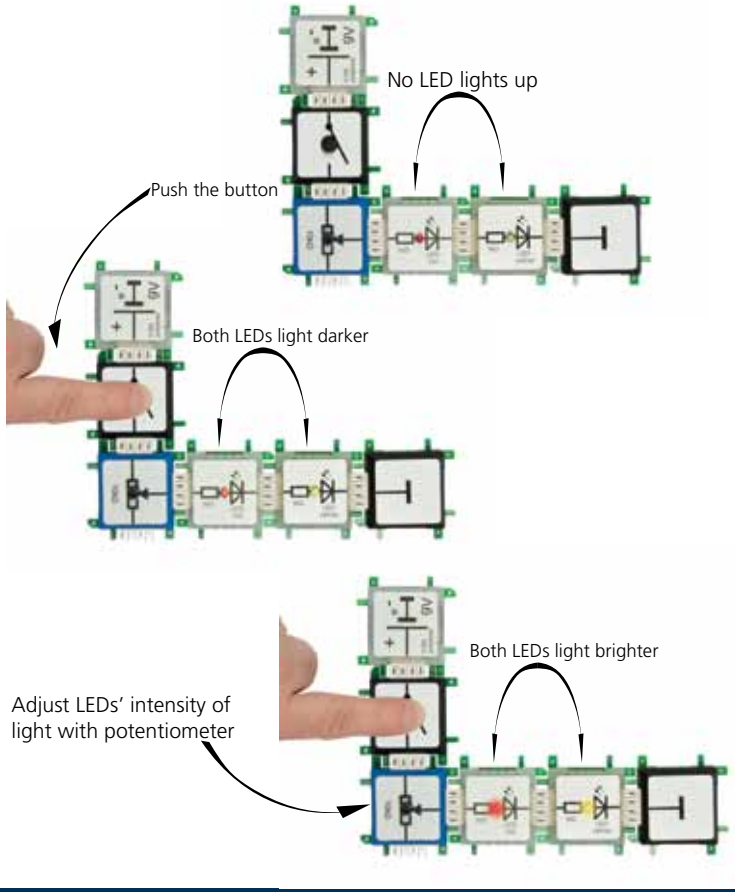
Challenge 3

Now we already built a flashlight!
Sometimes we need more light, sometimes less as it is not always equally dark outside. Find a brick with which you can change your flashlight's intensity of light. Tip: This brick has a knob.



Challenge 4

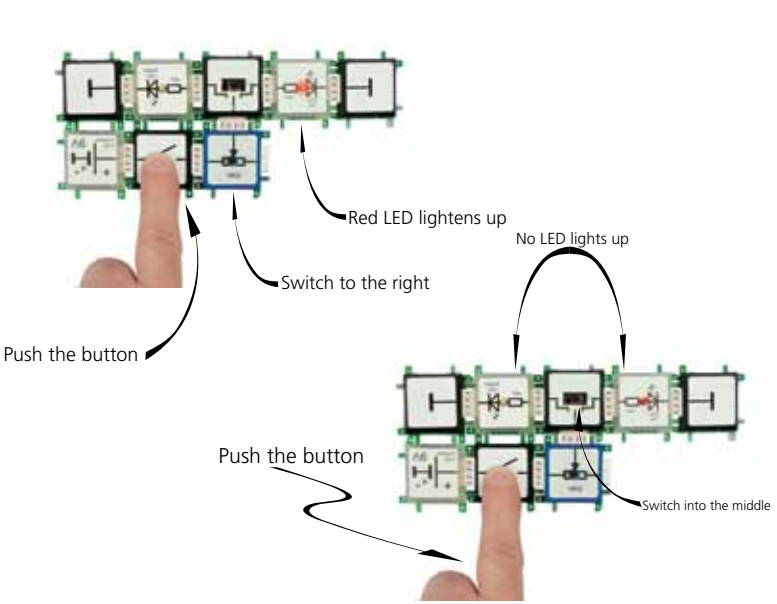
It would be nice to have our flashlight light in two different colors. Find two LED bricks, a yellow and a red one.

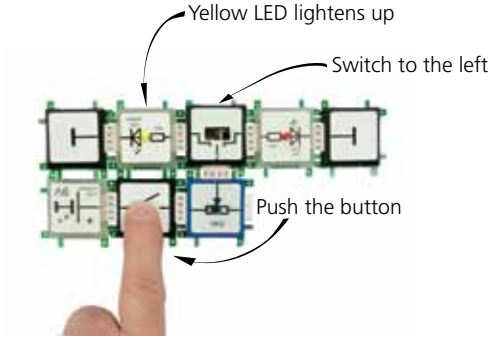


Brick 'R' knowledge

Challenge 5

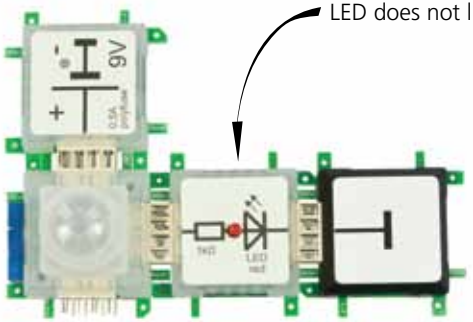
Both of our flashlight's LEDs lighten up equally but we can rebuild them in a way that only one of the LEDs lightens up. Build a switch with which you control which of the two LEDs is going to lighten up.



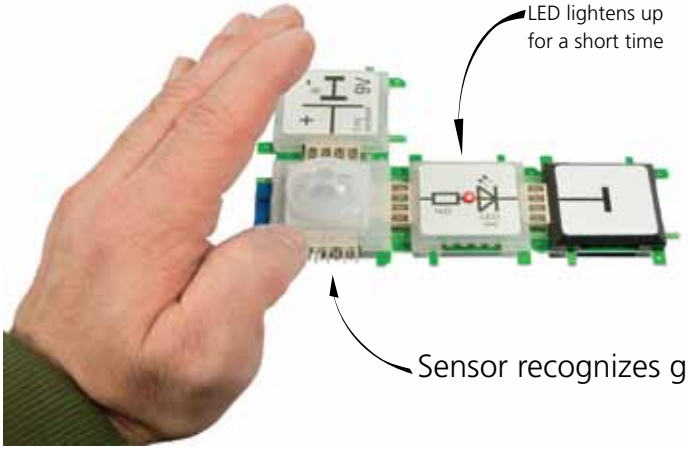


Challenge 6

Now we think of something else. We will build an alarm system. For that we need a LED and a brick that has a motion detector. Tip: This brick looks like a big white dome.

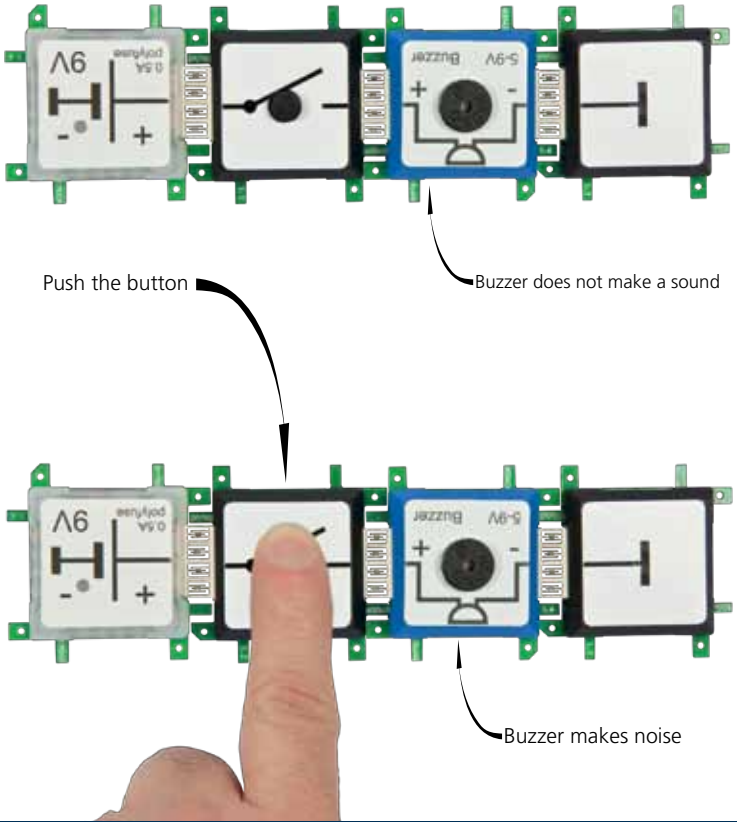


Don’t move now



Challenge 7

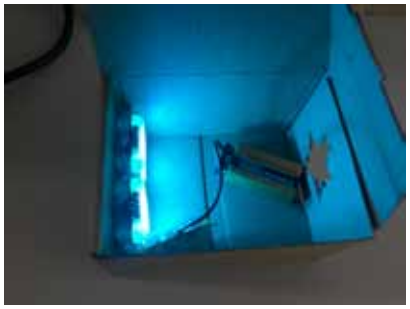
Instead of a LED, we'll use a buzzer now. With it, you can send a secret signal to a friend. You probably know the international emergency signal "SOS". It works like this: three times short, three times long, three times short. Why don't you try it?



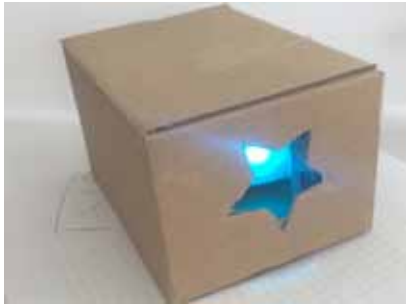
Brick 'R' knowledge

Challenge 8

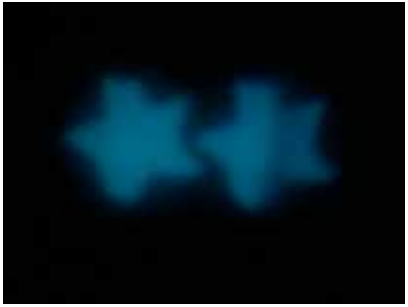
What about a projector? You need a little box, if possible, out of cardboard (for example, an empty toilet roll or a crisp roll). Important: There has to be enough room for the battery, the battery brick and two LEDs. We don't take the usual LEDs for this experiment but the RGB LEDs. Tip: You recognize them for the fact that they have a transparent shell. Your parents can help you with cutting your favorite form into one part of the cardboard box. We cut a star into the box, for example. Then you put the LED into the box and connect the battery. When you close the box and turn off the light, you will see your star shining on the wall.



Connect two RGB LEDs and cut out a star



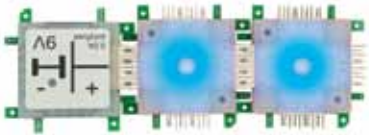
Projector shell made out of cardboard



You can see the stars shining on the wall when it is dark

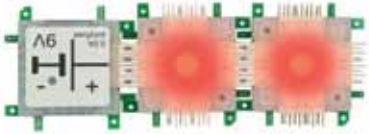
Challenge 9

RGB stands for red, green and blue. That means, you can change the LEDs' colors and adjust your favorite color. When you turn around the RGB LEDs you see three small holes. Get the help of your parents when adjusting the screws according to your favorite color. When you connect the LEDs with the battery now you will recognize that they changed color. For your next task, you need to make sure that both RGB LEDs have the same color. That is pretty difficult. Tip: Try to completely adjust the three screws in the holes in one direction and then do the same for both RGB LEDs.



RGB LEDs light up in blue color

Carefully adjust the color with a screwdriver

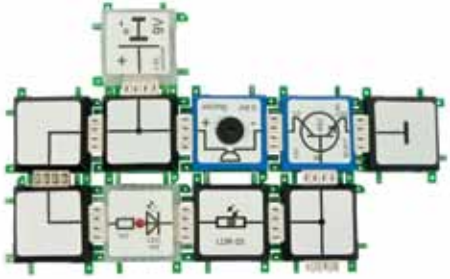


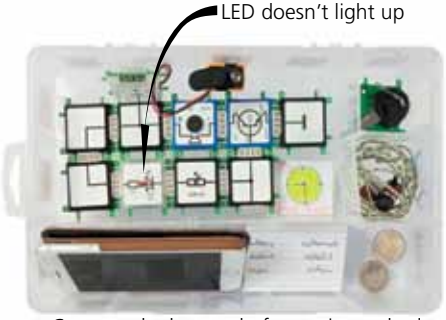
RGB LEDs light up in red color

Challenge 10

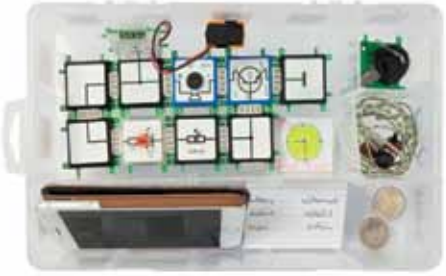
How cool would it be to build your own alarm clock? With our bricks this is not a problem at all.
You need a battery brick and a battery, a buzzer (for a loud alarm tone) and you need a new brick: the LDR that is a light depending resistor. You additionally need some corner bricks and a T-brick. Tip: These bricks only have black lines printed on the cover. You can also rebuild a brick basic set box and put stickers on it. Now you can put the alarm clock circuit into the box and all kinds of things that you shouldn't forget in the morning.

Always take care of the transistors' polarity





Connect the battery before going to bed

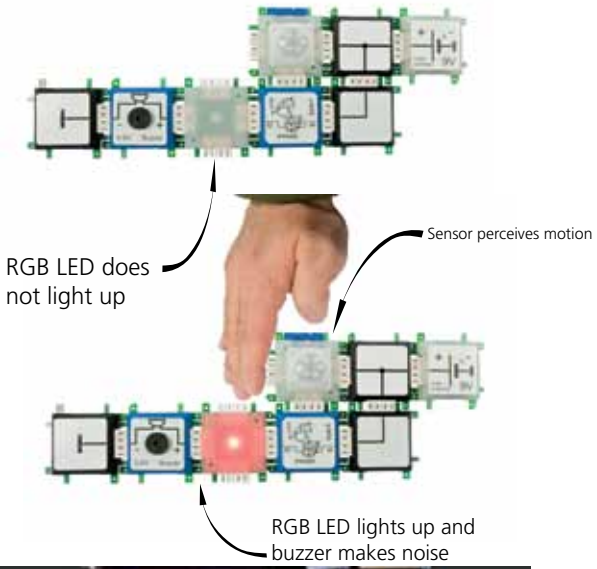


Buzzer makes noise and LED lights up

Brick 'R' knowledge

Challenge 11

You already built a little alarm system for a different task. We will now build a circuit that will discourage unauthorized persons even more: with light and sound! For this we need the buzzer, a RGB LED and the motion sensor. If you put this circuit into your drawer, for example, and an unauthorized person opens it, the LED will light up and the buzzer will make noise.



Your drawer is secure now

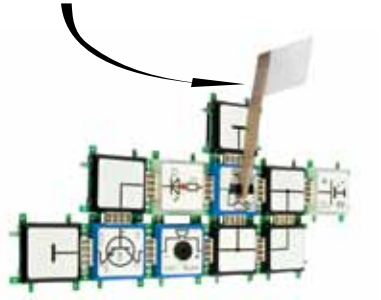
Brick 'R' knowledge

Challenge 12

Monitoring a drawer is cool but we will build an alarm circuit now with which you can protect your room from unwanted visitors. You need a new brick for it that is called light barrier and that does exactly what is sounds like. You might also need some adhesive tape or a glue to fix the circuit onto the door case. Each door is different but you will surely find a way how to fix the circuit on your door case. When you slide, for example, a piece of paper through the light barrier the current flow is interrupted and buzzer and LED will stay still. As soon as someone opens the door, the paper is pulled out of the light barrier and buzzer and LED will turn on. We built the counterpart on the door with components of the basic set and a piece of cardboard. From now on, you will know about it as soon as someone enters your room!

As long as the door is closed the buzzer won't make a sound and the LED won't light

We built the counterpart on the door with components of the basic set and a piece of cardboard



When a person enters your room, the buzzer will make noise and the LED will turn on

Challenge 13

A flowerpot is usually brown, round and boring – but we will make an artwork out of it. For this circuit, you need the switch brick, two RGB LEDs and the battery brick. In addition, you need a plastic flowerpot and a plastic bowl that fits into the pot. Now you probably need your parents' help: we need a hole for the switch as well as some holes for the light to shine through. As we need to fold the bricks now you can simply remove the covers of all of them but the battery brick. Then you put the switch through the hole in the flower pot and attach it on the outside with a little metal or plastic piece by putting it into the switch's little gap. Careful: Now you can move the switch only down or into the middle. Put the plastic bowl into the flowerpot and add a little soil. Then you can start planting flowers. Pay attention: the circuit must not get in touch with water!

For the circuit to fit in the bowl you need to build it like a cube

You can switch the LEDs on and off now

This is how the flowerpot looks like at night