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Basic terminology of electronics

Goal:	**Getting to know the basic terminology of electronics**
Conten	**Voltage sources** **Voltage (U)** **Current rating (I)** **Resistance (R)** **Diode** **Capacitor (C)**

To better understand electronic terms, the electricity circuit is illustrated as a water model. This helps to better understand the abstract relationships between electronic components.

Battery

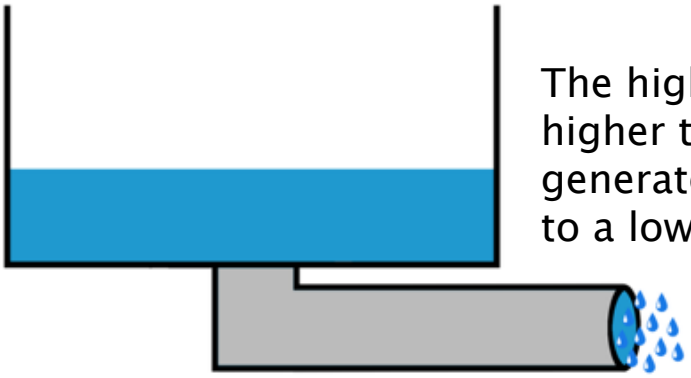
The voltage source (e.g. a battery) can be compared to a water basin in the water model.

The capacity of the water basin is the capacity of the battery. The higher the capacity of the water basin the longer it takes until it is empty.

The capacity of the water basin is the capacity of the battery. The higher the capacity of the water basin the longer it takes to be emptied.

Voltage U

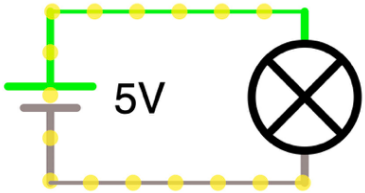
Comparison with water model:
If you hold a hand in front of the pipe, you will feel the pressure of the water.



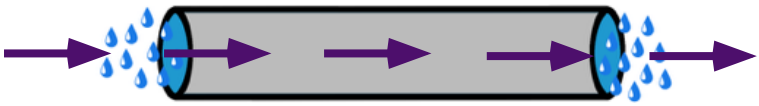
The higher the water level in the basin the higher the pressure. The pressure is generated because the water wants to move to a lower potential due to gravity.

If the water flows out of the basin, the pressure is reduced. This effect also occurs in batteries. Initially, it has a higher voltage which then lowly drops over time.

In electronic circuits, the current flow is also enabled by the electric voltage.



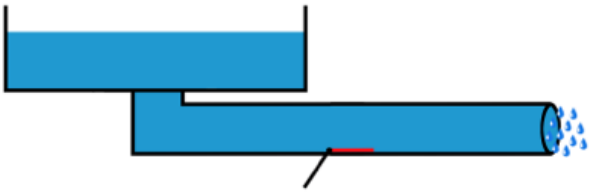
Current rating I



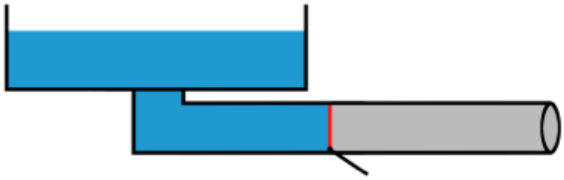
The water (number of water drops) flowing through the pipe in a specific time defines the flow rate of the water. If the cross-section of the pipe is lower, the water flow through the pipe is lower.

The equivalent to this is the current rating [I] in an electric circuit, which defines the flow rate of electrons. In electronics, the current rating specifies the current flow through the electric circuit.

Switch



The switch is open and water flow is possible.



The switch is closed and water flow is not possible.

The same principle applies for electrical circuits.

If the switch is open,  current flow is possible.

If the switch is closed,  current flow is not possible.

Resistor (R)

In the water model, the water flow rate is reduced by reduction of the pipe diameter. 

In contrast to the water model, the diameter of electric lines is not increased/reduced. Electrical currents are restricted by means of an electronic component, the resistor. 

The higher the rating of the resistor the higher the resistance to the current, i.e. the current flow is reduced.

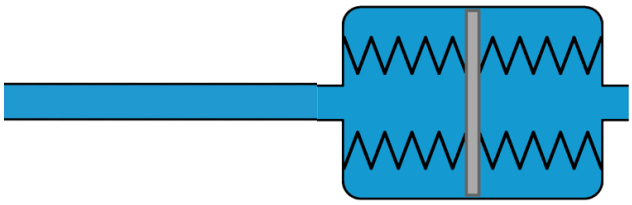
The reduction in diameter of the water pipe corresponds to electric resistance in a circuit.

The water flow through the pipe is restricted to a specific flow rate by the reduction in diameter. In the circuit, the current rating is also reduced.

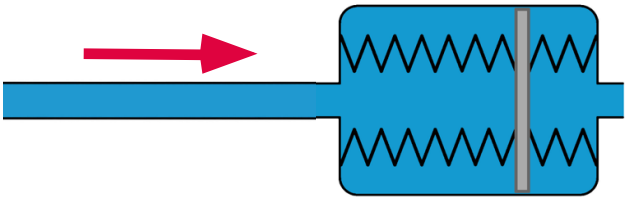
Preview

Detailed information on "Determination of resistance" and the application of "Ohm's Law" are provided in the lesson on "Light-emitting diodes".

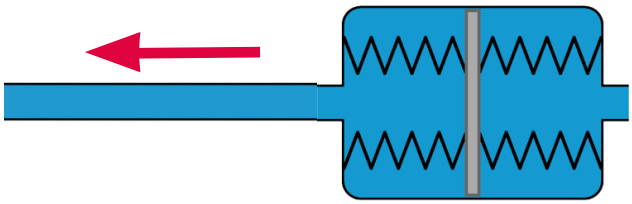
Capacitor (C)



A capacitor is a small storage device for electric charges. In the water model, this phenomenon can be illustrated by a plate attached to springs.



If there is a water flow through the pipe, it passes until the plate has reached the end of the piston. In an electric circuit, the current flow (applied by voltage) is maintained until the capacitor is charged.



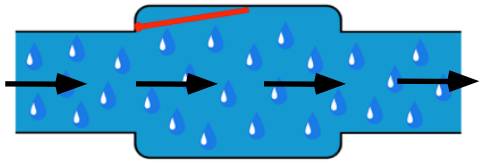
If the water pressure (voltage) on the left side falls below the pressure on the right side, the plate is moved back to its neutral position and the water is pushed out of the line => the

Preview

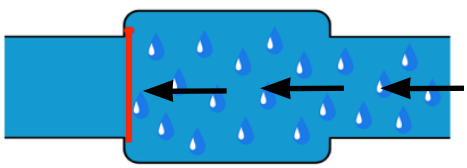
Detailed information and application examples are provided in the lesson on "Capacitors".

Diode

In electronic circuits, diodes are used to ensure that the current flow is restricted to one direction. In the water model, this is realised by a valve.



If the water flow is in the intended direction, the valve is opened and the water flow can pass.

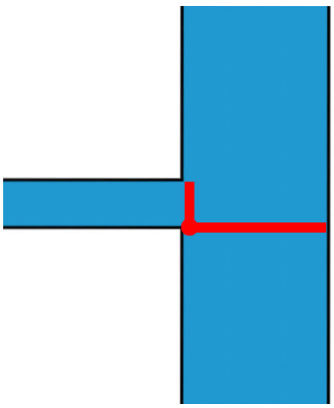


In case of a flow in the locked direction, the valve is closed and the water flow is interrupted.

Circuit symbol of diode 

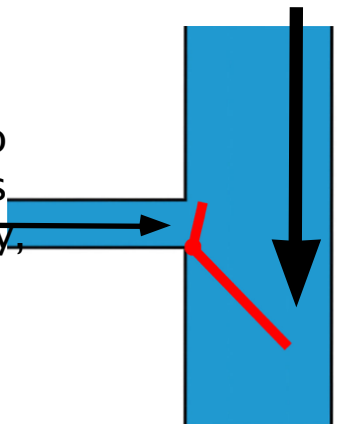
Transistor

Transistors can be used as switches or amplifiers. This phenomenon can also be easily illustrated in the water model.



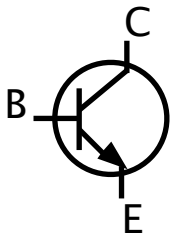
Up to a specific pressure (approx. 0.7V), the small gate remains closed. This way, the main gate also remains closed and the water flow is not possible.

Afterwards, the small gate is opened, which also leads to opening of the connected main gate. As the main gate has a considerably higher capacity, the water flow is amplified.



This amplification effect is also applied by transistors in electric circuits.

Circuit symbol of transistor

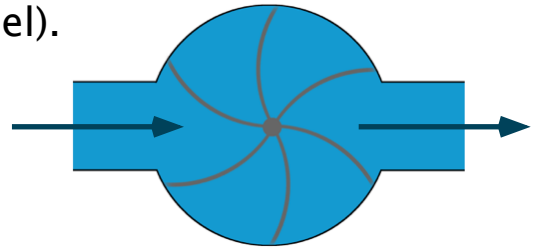


Preview

Further information and application examples are provided in the Lessons on "**Transistors as switches or amplifiers**".

Coil

Coils consist of a number of wire windings. The function of a coil can be illustrated in the water model by means of a fly wheel (water wheel).



If the water flow starts, it is initially counteracted by the inertia of the turbine. The speed of rotation of the turbine is slowly increased until there is no more resistance at all (as if it would not be in place). In this process, rotation energy is stored in the fly wheel. In coils, the energy is stored by means of a magnetic field.

Circuit symbol of coil 

Preview

A known issue and its possible solution around the use of motors (similar to a coil) are provided in the lesson on "Free-wheeling diodes in motors".