

# How to measure electric current

## Energy consumption

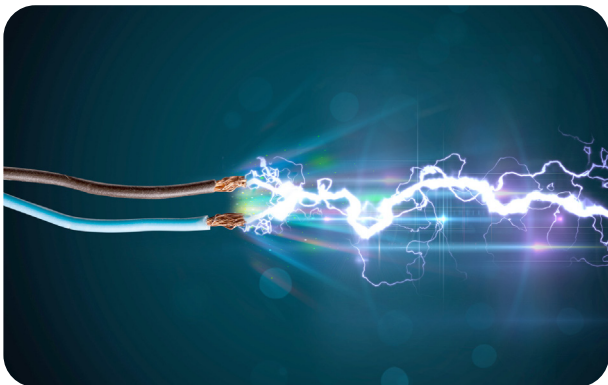
The modern home uses a lot of electric power. Decades ago, it was simply lighting and common household appliances such as radios, TVs or fridges. Today, it's all that and much more: computers, phones that are recharging, routers, security systems or smart speakers – to name just a few. All of these devices make use of a vast amount of energy to operate, especially because most of them are usually turned on even when they are not working. Leaving them on stand-by mode all day long leads to consumption and a waste of electric power.

## A definition of electric power

Electric power is the rate at which work is done or energy is transformed in an electrical circuit. Simply put, it is a measure of how much energy is absorbed or generated in a given **timespan**. A source of energy such as a battery will produce or deliver power while the connected loads, such as light bulbs or heaters, absorb it and convert it into either light or heat.

## How to measure electric power

The unit of measurement of electric power is the watt (W), named to honour James Watt, the inventor of the steam engine. A **Watt** is the unit of electrical **power** (P), which is equal to the **voltage** (V) multiplied by the **current** (I): in other words, it is equal to one **ampère** (A), which measures the electric current, under the pressure of one volt, which, in turn, measures the potential difference.



Most common household appliances include a **compliance badge**, which indicates the amount of electrical power that an item needs to work properly. Normally, small devices only need a few Watts to work: modern LED light bulbs, for instance, can have just a 6 Watt-rating, whereas a microwave oven could use 850 to 1,800 • Watts.

## Electricity use over time

Multiplying the Watt – or the unit of energy required – by the duration of its usage will give us the amount of total electricity consumed. This amount is measured in Watt-hour (Wh) which is equal to the energy of one Watt steadily supplied to or taken from an electric circuit over the period of one hour. This means that if a 850 watt oven is turned on for one hour, it will use 850 watt-hours of electricity••.

## The electricity bill

The total consumption of electricity over a certain period (usually three months) is used to calculate the pricing of an electricity bill, which customers receive from their utility company. Smart meters placed in every building that is supplied with electric power measure the consumption in real time. Utility companies have wireless access to this data and can easily calculate the energy costs of each user: the bill they send lists the kWh used, the rate they charge and the amount of money owed to the company for using their electricity.

*Adapted from: <https://www.eia.gov/energyexplained/electricity/measuring-electricity.php>*

**compliance badge:** *etichetta, marchio di conformità*  
**timespan:** *arco di tempo*

The electric power of larger devices is measured in kilowatts (kW) which is equal to 1,000 Watts. Multiples of kilowatts are megawatts (MW), equal to 1,000 kW; and gigawatts (GW) equal to 1,000 MW.

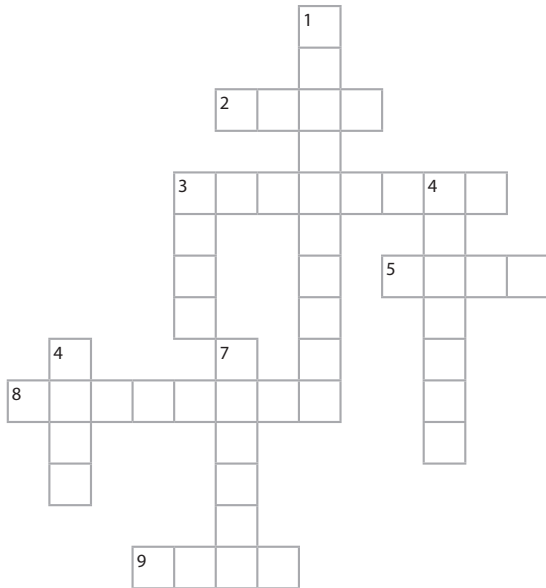
The energy E in kilowatt-hours (kWh) is equal to the power P in watts (W), multiplied by the time period t in hours (hr) divided by 1000:

$$E_{(kWh)} = P_{(W)} \times t_{(hr)} / 1000$$

**1**  **Answer the questions.**

1. What happens if we leave household appliances in stand-by mode?
2. What does electric power measure?
3. How do we measure electric power?
4. Who was James Watt?
5. What information does a compliance badge give us?
6. How do utility companies get information about the energy consumption of their customers?
7. Do customers receive an electricity bill monthly?

**2**  **Complete the crossword.**



**Down**

1. An electronic device that records information related to energy consumption.
3. The unit of measurement of electrical power.
4. A company that provides basic energy services.
6. The measurement unit of potential difference.
7. The measurement unit of electric current.

**Across**

2. A component in a circuit that consumes electric power.
3. It measures the amount of energy used over a period of time.
5. A written statement of money that you owe for goods or services.
8. A person who buys goods or services from another.
9. A common kitchen appliance used for baking.

**3**  **PAIR WORK** Calculate how much electricity (in kWh) these items use over the given timespan.

1. A 1,200-Watt corded drill over a period of a quarter of an hour. ....
2. A 2,400-Watt vacuum cleaner over a period of one and a half hours. ....
3. A 60-Watt light bulb over a period of 7 hours. ....
4. A mobile charger using 5 Watts for 3 hours. ....
5. A 6-Watt Wi-Fi router for 24 hours a day. ....

**4**  **Match the two parts of these sentences to obtain some tips to become more energy efficient.**

- |   |  |
|---|--|
| 1. When using your washing machine,                 | <input type="checkbox"/> a. unplug your phone charger.                             |
| 2. When you are not using them,                     | <input type="checkbox"/> b. instead of a conventional oven.                        |
| 3. Use energy-saver lights,                         | <input type="checkbox"/> c. rather than leave it on with a screen saver.           |
| 4. Automate your appliances with a smart assistant, | <input type="checkbox"/> d. so you can switch them on and off remotely.            |
| 5. If you are not recharging your mobile,           | <input type="checkbox"/> e. at their ideal temperature.                            |
| 6. Keep your fridge and freezer                     | <input type="checkbox"/> f. never set it higher than 30°C.                         |
| 7. Set your PC to a sleep mode,                     | <input type="checkbox"/> g. because they have a lower wattage and use less energy. |
| 8. Use a microwave or toaster                       | <input type="checkbox"/> h. don't leave devices on stand-by mode.                  |