



# Electric water heaters

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Electric water heaters are fixed appliances for hot water production. When in operation, i.e. during the heat-up phase, they are the source of low-frequency magnetic fields. These fields occur in immediate proximity to the appliance and diminish rapidly with increasing distance.

It is not known whether the long-term impact of low-frequency magnetic fields presents a health risk. No effects are expected from short-term exposure to low-frequency emissions from electric water heaters.

Nevertheless, the following precautions will help to minimise exposure to the magnetic fields generated by electric water heaters:



- A minimum distance of 50 cm should be maintained between the electric water heater and sleeping places or spaces occupied for longer periods.

## **NB**

- Adjust the heater such that the water is heated up to a temperature of 60 °C at least once a day in order to prevent the formation of pathogens (Legionella). In this regard take note of the FOPH recommendations
- Particular cantonal specifications may exist for electric heaters. Special cantonal regulations may apply to electric heaters. Please contact the responsible cantonal energy departments for more information.

[Legionellosis \(Legionnaires' disease\)](#)

[Kantonale Energiefachstellen — Aktuelles](#)

[Verbot & Sanierungsfrist für Elektroheizungen und Elektroboiler /](#)



## 1 Technical data

Voltage: 230 V / 400 V

Output: up to approx. 10 kW

Frequency: 50 Hz

Electric water heaters comprise an insulated water cylinder, made from steel, austenitic stainless steel or copper alloy sheet, with an integrated electric heating system. Depending on the size of the cylinder, the heating system may incorporate one or more heating elements. Heat is generated by the flow of electric current through heating wires in the heating elements. This current generates a low-frequency magnetic field around the heating wires.

The water temperature can be manually set to up to around 80°C, the recommended setting being 60°C. Higher temperatures promote scaling, corrosion and heat loss [1]. The water should be heated up to a temperature of 60°C at least once a day to prevent the proliferation of pathogenic agents (Legionella bacteria). Further information on Legionella bacteria (German only) is provided on the following FOPH webpage: [Legionellosis \(Legionnaires' disease\)](#)

To minimise heat loss from pipe runs, electric water heaters tend to be placed near the hot-water draw-off points (kitchen and bathrooms), i.e. within the living environment. Depending on their storage capacity and the electricity provider's tariff system, the heaters may be run only on nighttime off-peak electricity or may need topping up during the daytime with on-peak or flat-tariff energy. The heat-up times, which depend on the water temperature, water quantity and heat output, can last up to several hours.

## 2 Exposure to low-frequency magnetic fields

A survey commissioned by the FOPH (Federal Office of Public Health) set out to measure the magnetic fields generated by five different electric water heaters. The magnetic fields were observed to diminish rapidly with increasing distance from the appliance and, at 50 cm, are negligible. (Figure 1)

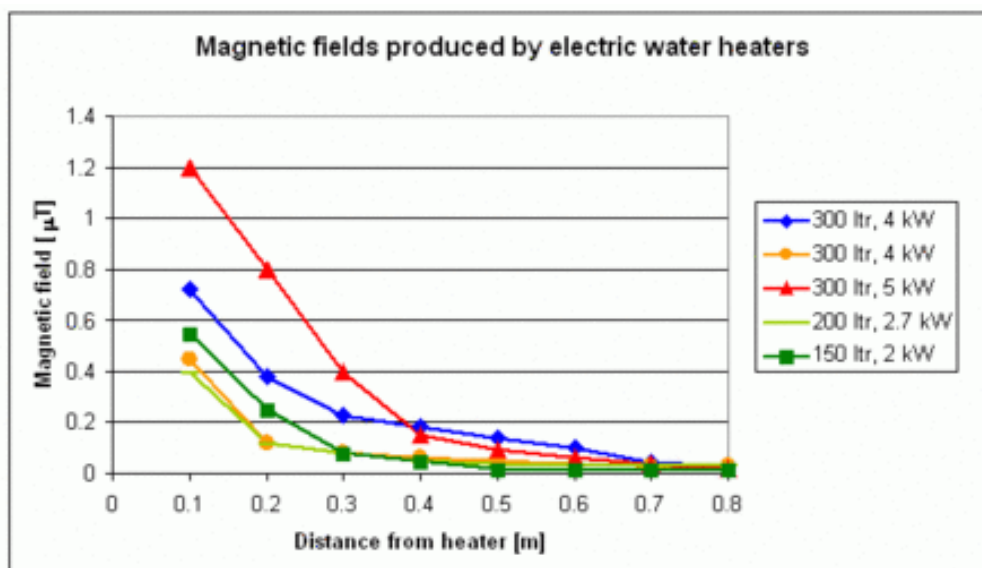


Figure 1: Magnetic fields generated by water heaters as a function of distance from the appliance:



Measurements taken in front of four floor-mounted models (capacity: 200-300 ltr, power: 2.7-5 kW) and one wall-mounted model (capacity: 150 ltr, power: 2 kW)

### 3 Impact on health

Low-frequency magnetic fields can penetrate and induce electric current within the human body. When these currents exceed a certain value the central nervous system can be directly excited. The European threshold values for magnetic fields have therefore been set such that the current flowing in the body is at most one-fiftieth of the excitation threshold [2]. The magnetic fields (maximum 1.2  $\mu\text{T}$ ) from electric water heaters are much smaller than the threshold value of 100  $\mu\text{T}$ . No effects are expected from short-term exposure as the present threshold values preclude acute damage.

In 2002 the International Agency for Research on Cancer (IARC) classified static and low-frequency magnetic fields as possibly carcinogenic (Group 2B) [3]. This was based on epidemiological studies that suggest that long-term and durable exposure to magnetic fields in the low-dosage area of 1  $\mu\text{T}$  or even lower ( $< 0.4 \mu\text{T}$ ) could increase the risk of Alzheimer's disease [4, 5] or of childhood leukaemia [6, 7]. Magnetic fields of 0.4  $\mu\text{T}$  or more occur at a distance of up to 30 cm around electric water heaters. The possible risk can be eliminated by keeping 50 cm away from the appliance.

### 4 Regulation in law

Electric water heaters are low-voltage appliances which are regulated in Switzerland by the Ordinance on electrical low-voltage equipment ([SR 734.26 - Ordinance of 25 November 2015 on electrical low-voltage equipment | Fedlex](#)). It stipulates that low-voltage appliances may only be marketed if they comply with the safety objectives of Annex I of the European (EC) Low Voltage Directive ([Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits \(recast\) Text with EEA relevance](#)). The European directive states that low-voltage appliances must be designed and created in such a manner that protection against hazards is guaranteed when they are used as intended and adequately maintained. To this end, technical measures, among other things, must be defined to ensure that no hazardous radiation is emitted. Manufacturers of low-voltage appliances must obtain a Declaration of Conformity for a product from the time at which it is brought onto the market; this declaration states that the product complies with these requirements. The requirements for individual products are specified in the technical standards.

The conformity criteria for compliance with the requirements correspond to the limit recommended by the EU ([1999/519/EC: Council Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields \(0 Hz to 300 GHz\) - Publications Office of the EU](#)). Manufacturers are responsible for ensuring that their appliances comply with the conformity criteria. In Switzerland, no authority checks whether electric water heaters meet these standards ([23.4244 | Mobile phones emit more radiation than permitted. The time has come to check the NIR limits in Switzerland too! | Item of business | The Swiss Parliament](#) – available in German, French and Italian).



## 5 Literature

1. Borstelmann P, Rohne P. Handbuch der elektrischen Raumheizung. Heidelberg: Hüthig, 1993
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4. Huss et al. Residence near power lines and mortality from neurodegenerative diseases: longitudinal study of the Swiss population. American Journal of Epidemiology. 169(2):167-75. 2009
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## Contact

Federal Office of Public Health FOPH  
str@bag.admin.ch