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Federal Department of Home Affairs FDHA
Federal Office of Public Health FOPH

Induction cookers

Date: 1 February 2026

Induction hobs are built directly into kitchen units. Induction cookers are combination appliances consisting of an induction hob and an oven. This fact sheet uses the term ‘induction cooker’ when referring to both types of cookers.

An induction cooker generates a magnetic field that passes through the glass ceramic plate of the appliance with virtually no resistance and penetrates the electrically and magnetically conductive bases of the pans standing on it. In the pan bases, the magnetic field generates both electric currents and magnetisation, which heat the pans very quickly and energy-efficiently. However, pans cannot capture and utilise the entire magnetic field. Some of it remains unused near the induction cooker and can penetrate people standing directly at the cooker.

According to studies commissioned by the FOPH, the magnetic field exposure from induction cookers is within or above the magnetic field limit designed to prevent health risks to the population. As the magnetic field limit includes a safety margin, it cannot be conclusively assessed whether the magnetic fields from induction cookers pose a health risk. There are a few studies on the health effects of cooking stoves on mothers, their foetuses or their newborns. Most studies found no such effects in mothers who had cooked with induction cookers before giving birth.

When used optimally, induction cookers operate with magnetic fields that are below the applicable limits. The following recommendations will help you achieve this:

- Familiarise yourself thoroughly with the operating and safety instructions in the user manual and follow them.
- Where possible, keep a distance of 15 cm or more from the induction cooker or kitchen unit in which the induction hob is installed to minimise exposure to magnetic fields.
- If you stand very close to the induction cooker while cooking or if you touch the kitchen unit with the built-in induction hob with your body, for example if you are pregnant, it is advisable to use the rear part of the cooker or the front part of the hob at reduced (half) power.
- Adjust the size of the pan to the marked cooking zone, if the cooking zones are marked on the glass ceramic hob. Do not place small pans on large cooking zones; instead, cover the cooking zone completely with a pan of the appropriate size. Always place the pan in the centre of the cooking zone.
- Do not use defective pans with warped bases, even if they can still be heated without any problems.
- Only use pans that are designated by the manufacturer as suitable for induction cooking.
- Consult your doctor about using an induction cooker if you have a pacemaker, defibrillator or

other electronic implant.

- Do not use metal cooking spoons for stirring to prevent stray currents from flowing through the body. Avoid stirring in two pans at the same time with metal cooking spoons. Wooden or plastic cooking spoons do not cause stray currents.

Detailed information

Induction cookers generate heat directly in the pan and not in the cooking zone of the hob, as is the case with conventional cookers. This offers several advantages: fast response times, rapid boiling, shorter cooking times, energy-saving heat generation, no hot cooking zones and, consequently, a lower risk of burns from the hob surface. However, as with other cooker technologies, there are still risks associated with hot food, such as:

- food burning, e.g. hot oil.
- the hot contents of pans causing burns.

1 Design / Technology

1.1 Design

Induction cookers can have two different designs. An induction cooker consists of an induction hob that is built into an appliance together with an oven. All controls are usually located on the front of the appliance. A built-in induction hob, on the other hand, is not combined with an oven but is installed directly into the kitchen worktop. The controls are built directly into the hob. Both designs have a glass ceramic panel with the cooking zones. Appliances for domestic use can have different arrangements of cooking zones:

- Mobile induction hobs, usually with one or two marked cooking zones.
- Induction hobs with several cooking zones with different power ratings and diameters. Typically, the edges of the cooking zones or their centres are marked on such hobs.
- Bridge induction hobs with several adjacent cooking zones that can be combined into one larger cooking zone for large cookware. Typically, the edges of the cooking zones or their centres are marked on these hobs.
- Full-surface induction hobs without marked cooking zones. They consist of several small coils. The individual coils detect when a pan is placed on them and then switch on automatically.
- Special designs such as induction woks, induction rice cookers or food processors with induction heating are not covered in this fact sheet.

1.2 Principle of induction cooking

Induction cookers work according to the principle of induction: under the glass ceramic plate of induction cookers are electric induction coils consisting of wound wire. A medium frequency alternating current with a frequency of 20 to 100 kilohertz (kHz) flows through the wire, generating a magnetic field with the same frequency. The magnetic field passes unimpeded through the glass ceramic plate and penetrates the base of any pans standing on it. (Figure 1). It generates (technical term “induces”) a circular medium-frequency alternating current (eddy current) in the electrically conductive base of the pan. Due to its frequency, this current flows mainly in the outer layers of the pan base (skin effect with medium and high-frequency alternating currents). The increased current density in these layers

causes the pan base to heat up quickly. In addition, the magnetic field in the magnetic pan bases causes magnetisation, which also contributes to heat generation (hysteresis losses) [1].

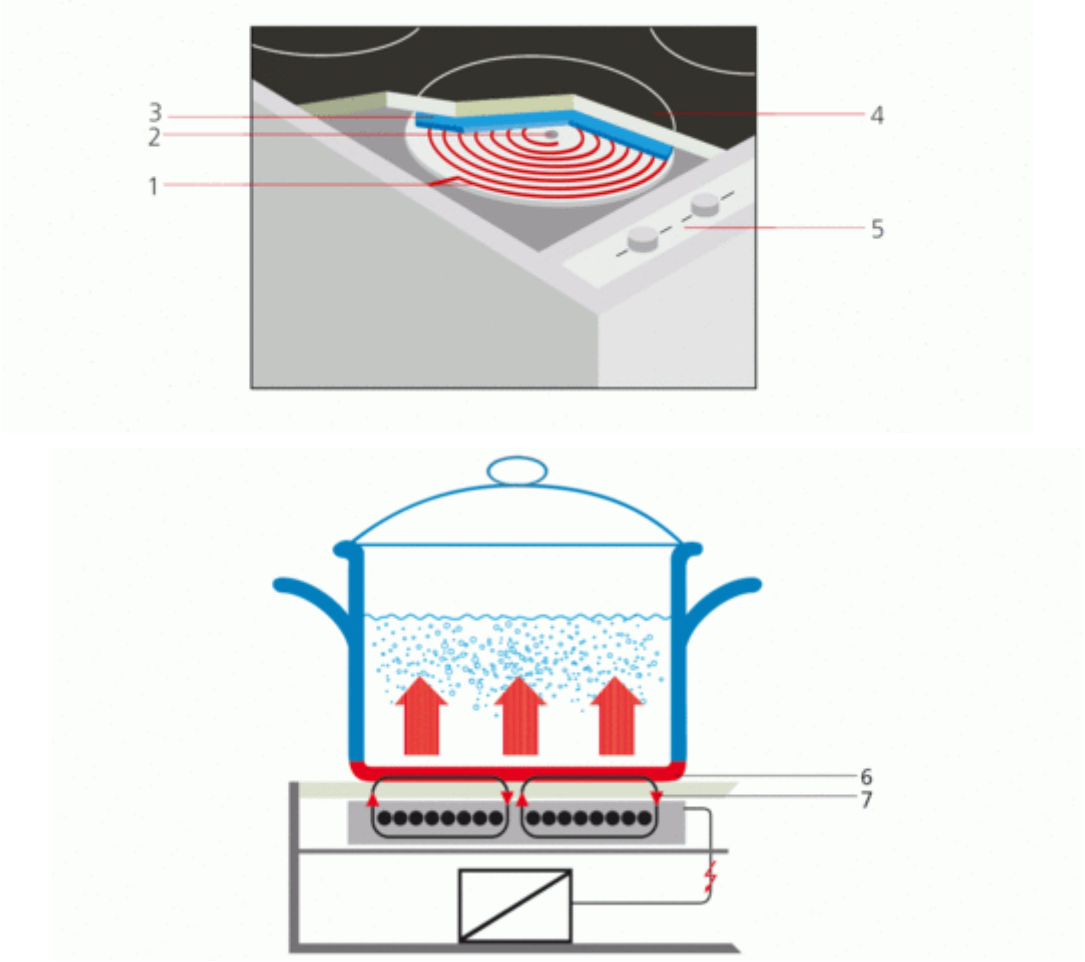


Figure 1 Principle of induction cooking

1 Induction coil
2 Temperature sensor
3 Thermal insulation
4 Glass ceramic plate
5 Indication of operation
6 Base of pan made of ferro magnetic material
7 Alternating electromagnetic field

1.3 Regulating heating power

Heating power can be regulated using various methods. Common methods include:

– Regulation using the frequency of the alternating current: The induction hob constitutes an electrical oscillating circuit which carries the maximum current at resonant frequency. If the frequency deviates from the resonant frequency, both current and output are reduced. (Example: full output at the resonant frequency of 17.5 kHz, output is four times lower at 41.7 kHz.)

- Regulation using pulse-amplitude modulation: This process periodically switches the magnetic field on and off at lower cooking settings, so that the heating power is greater or lower depending on the length of time the field is switched on or off. Such a cooker generates maximum power when the magnetic field is switched on continuously.
- To cook food quickly or heat water quickly, individual or all cooking zones have a booster or power function with increased power.

2 Exposure limits

Electric and magnetic fields can generate electric currents in the human body which, above a certain strength, acutely stimulate nerves and thus also muscles. The limits for electric and magnetic fields are therefore set so that the currents flowing in the body are at least 50 times lower than this value. This safety factor considers that individual people can react differently to magnetic fields. The limits therefore apply to the general population. The limits do not consider any long-term effects for which it is not clear, based on current knowledge, whether they are causally related to electric or magnetic fields. Nor do they include additional precautionary safety factors. They also do not consider the fault-free functioning of active electronic implants such as pacemakers, which are worn by some members of the population.

For induction cookers, the limits set out in the Council Recommendation of 12 July 1999 on the limitation of exposure of the public to electromagnetic fields (0 Hz to 300 GHz) 1999/519/EC [2] apply. The newer ICNIRP limits from 2010, which are less strict in the frequency range of induction cookers, have not been implemented in an EU recommendation for the general population and are not legally binding for the assessment of product safety.

2.1 Basic restriction values

The basic restriction values restrict the current density in body tissue. It is measured in amperes per square metre and describes the current flow per cross-sectional area. The permissible current densities are set 50 times lower than the value at which nerve and muscle irritation occurs. They must be observed in the central nervous system. They are as follows

- Low-frequency fields at 50 Hz: current density of 2 mA/m^2
- Medium-frequency fields: the permissible current density depends on the frequency and ranges from 50 mA/m^2 at 25 kHz to 140 mA/m^2 at 70 kHz.

2.2 Reference levels

Electric current densities cannot be measured directly in the body. They can either be simulated mathematically using electrical models of the human body or dealt with using reference levels. Reference levels are derived from the basic limit values and can be measured in the absence of the body as the strength of the electric and magnetic fields. However, they are only meaningful if the entire body is exposed to electric and magnetic fields uniformly. The reference levels guarantee that the corresponding basic limits are complied with. If the electric or magnetic fields of a device exceed the reference limits,

body models must be used to simulate whether the basic limits are complied with. The reference levels are

- Low-frequency magnetic flux density: 100 µT
- Medium-frequency magnetic flux density: 6.25 µT
- Low-frequency magnetic field: 80 A/m
- Medium-frequency magnetic field: 5 A/m

3 Exposure of persons to stray fields

The stray field is the part of the electromagnetic field of an induction hob that does not heat the pan and is located in the immediate vicinity of the hob. Stray fields depend, among other things, on the eddy current flowing in the base of the pan. This eddy current generates a secondary magnetic field that counteracts and weakens the original magnetic field of the hob. Larger stray fields can occur if

- the induction coil of a marked or centrally marked cooking zone is not centred or is too small or is not completely covered by a pan.
- a pan or large piece of cookware activates several induction coils on bridge or full-surface induction hobs but does not cover them completely.

On behalf of the FOPH, the IT'IS Foundation in Zurich has investigated the maximum electromagnetic fields of four different induction hobs [3]:

- Device A: Hob with four marked cooking zone.
- Device B: Hob with bridge function, marked in the centre of the four cooking zones.
- Device C: Full-surface induction hob with eight medium-sized induction coils.
- Device D: Full-surface induction hob with 32 small induction coils.

3.1 Stray fields as a function of pan brands and pan sizes

The characteristics of the pans determine, among other things, the maximum stray field (H field in amperes per metre A/m) of an induction hob. To measure this, the hobs were operated with a selection of different pans. The following were used

- 17 different pans with different diameters from different manufacturers
- an oval cooking piece of cookware
- one rectangular piece of cookware

There is a tendency for smaller pans or cast-iron pans to cause higher loads on cookers with marked cooking zones (Figures 2 and 3). This effect is no longer pronounced on full-surface induction hobs (Figures 4 and 5).

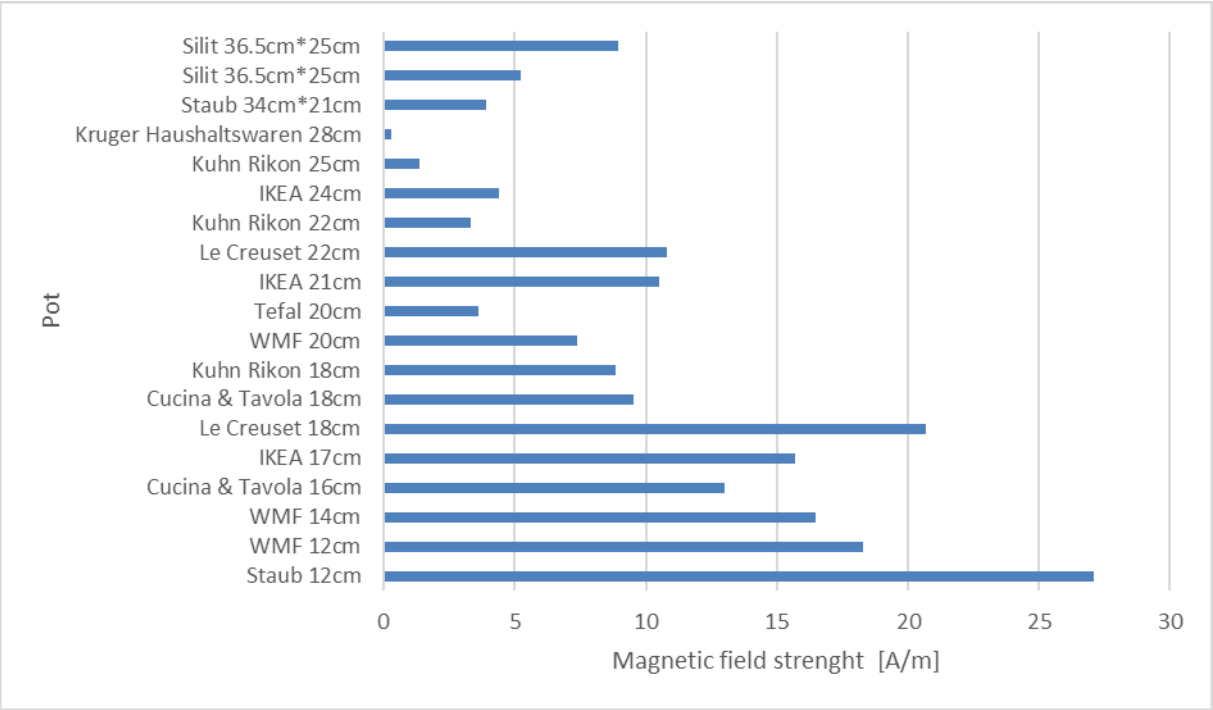


Figure 2 Device A Hob with cooking zones. Maximum stray fields (as magnetic field strength) depending on the pans at maximum power. Measurement taken 4 cm in front of the hob, centred on the measured cooking zone. The reference level for the medium-frequency magnetic field is 5 A/m.

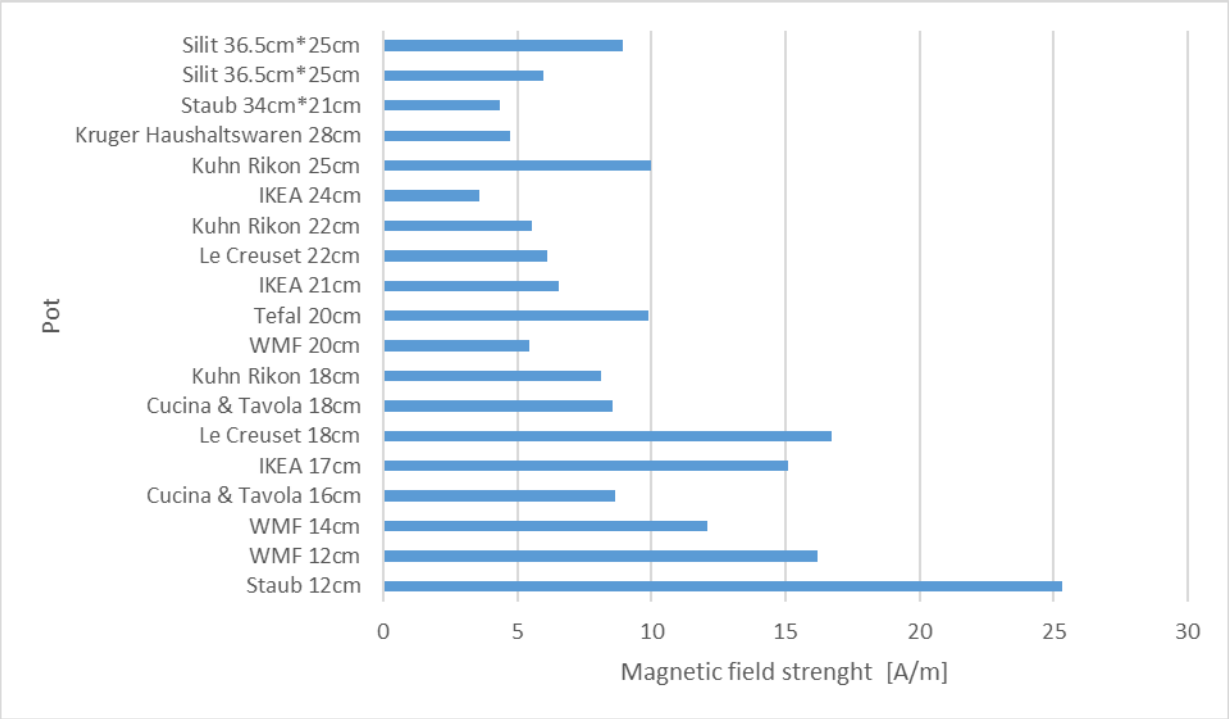


Figure 3 Device B Hob with bridge function: Maximum stray fields (as magnetic field strength) depending on the pans at maximum power. Measurement taken 4 cm in front of the hob, centred on the measured cooking zone. The reference level for the medium-frequency magnetic field is 5 A/m.

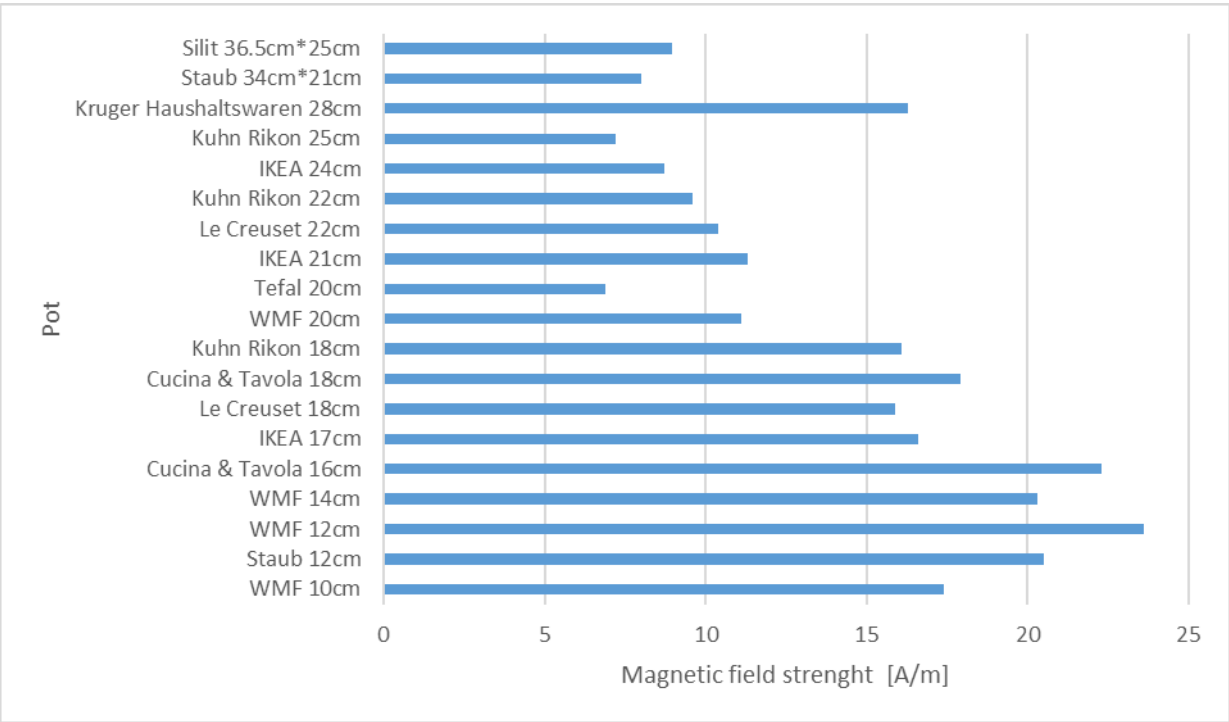


Figure 4 Device C Full-surface induction hob: Maximum stray fields in A/m depending on the pans. Maximum stray fields (as magnetic field strength) depending on the pans at the highest power setting. Measurement taken 4

cm in front of the hob, centred on the pan being measured. The reference level for the medium-frequency magnetic field is 5 A/m.

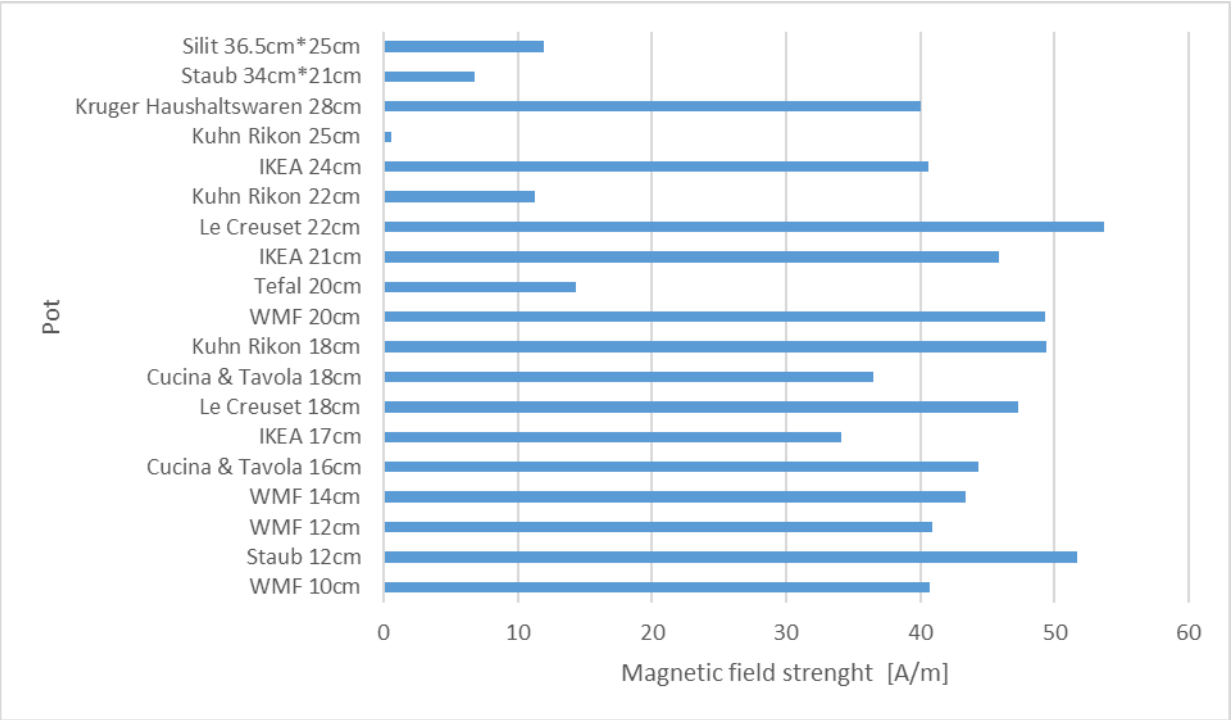


Figure 5 Device D Full-surface induction hob: Maximum stray fields (as magnetic field strength) depending on the pans at maximum power. Measurement taken 4 cm in front of the hob, centred on the pan being measured. The reference level for the medium-frequency magnetic field is 5 A/m.

3.2 Stray fields when operating with multiple pans

Stray fields are at a small scale and usually decrease rapidly with increasing distance from the hob. As a result, they do not usually depend greatly on whether one or more pans are on the hob at a specific location in front of the hob. However, this statement cannot be generalised: The results for appliance A (Table 1) and appliance B (Table 2) are shown below. The measurements for appliance A show that, in contrast to appliance B and the other appliances, the stray fields in front of the hob increases by an additional 60% when a pan is also placed on the rear part of the hob. Such effects are not as pronounced with the other appliances (example: appliance B).

Table 1 Device A Magnetic fields with different pan arrangements (dimensions and power of the hobs: front right 21 cm 3700 W, rear right 14.5 cm 2200 W, front left 18 cm. 3100 W, rear left 18 cm 3100 W Distance between centre of measuring probe and edge of hob 4 cm, measuring probe aligned with centre of front right cooking zone)

Case	One pan on the hob		Two pans on the hob		Three pans on the hob		Four pans on the hob		
	Product	Position	Product	Position	Product	Position	Product	Position	Magnetic field strength [A/m]
1	Staub ∅12 cm	Front right	-	-	-	-	-	-	27.8
2	Staub ∅12 cm	Front right	WMF ∅10 cm	Front left	-	-	-	-	27.3
3	Staub ∅12 cm	Front right	WMF ∅12 cm	Front left	-	-	-	-	27.5
4	Staub ∅12 cm	Front right	WMF ∅14 cm	Front left	-	-	-	-	27.6
5	Staub ∅12 cm	Front right	Le Creuset ∅18 cm	Front left	-	-	-	-	28.8
6	Staub ∅12 cm	Front right	WMF ∅10 cm	Rear right	-	-	-	-	42.9
7	Staub ∅12 cm	Front right	WMF ∅12 cm	Rear right	-	-	-	-	44.8
8	Staub ∅12 cm	Front right	WMF ∅14 cm	Rear right	-	-	-	-	45.4
9	Staub 12 cm	Front right	WMF ∅10 cm	Front left	WMF ∅12 cm	Rear right	-	-	45.9
10	Staub 12 cm	Front right	WMF ∅10 cm	Front left	WMF ∅14 cm	Rear right	-	-	45.3
11	Staub ∅12 cm	Front right	WMF ∅10 cm	Front left	WMF ∅12 cm	Rear right	Le Creuset ∅18 cm	Rear left	45.2
12	Staub ∅12 cm	Front right	WMF ∅10 cm	Front left	WMF 12 cm	Rear right	WMF ∅14 cm	Rear left	45.1
13	Staub 12 cm	Front right	WMF ∅10 cm	Front left	WMF ∅14 cm	Rear right	WMF ∅12 cm	Rear left	45.1
14	Staub ∅12 cm	Front right	WMF ∅10 cm	Front left	WMF ∅14 cm	Rear right	Le Creuset ∅18 cm	Rear left	45.3

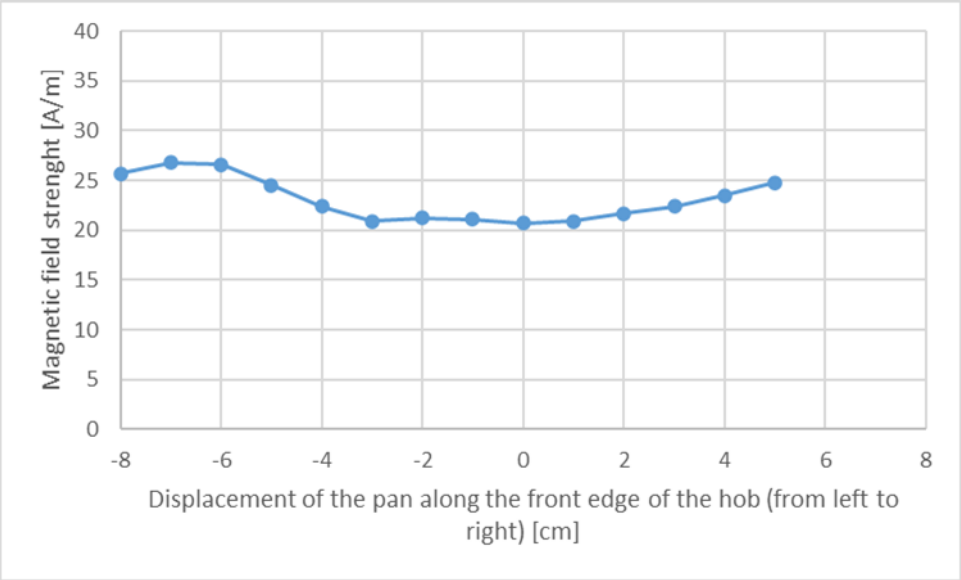
Table 2 Device B Magnetic fields with different pan arrangements (dimensions and power of the hobs: front right 18x21 cm 3200 W, rear right 18x21 cm 3200 W, front left 18x21 cm 3200 W, rear left 18x21 cm 3200 W, distance between centre of measuring probe and edge of hob 4 cm, measuring probe aligned with centre of front right cooking zone). The reference level for the medium-frequency magnetic field is 5 A/m.

Case	One pan on the hob		Two pans on the hob		Three pans on the hob		Four pans on the hob		
	Product	Position	Product	Position	Product	Position	Product	Position	Magnetic field strength [A/m]
1	Staub ∅12 cm	Front right	-	-	-	-	-	-	24.1
2	Staub ∅12 cm	Front right	WMF ∅12 cm	Front left	-	-	-	-	24.3
3	Staub ∅12 cm	Front right	WMF ∅14 cm	Front left	-	-	-	-	24.2
4	Staub ∅12 cm	Front right	Le Creuset ∅18 cm	Front left	-	-	-	-	23.8
5	Staub ∅12 cm	Front right	Ikea 365+ ∅21 cm	Front left	-	-	-	-	24
6	Staub ∅12 cm	Front right	WMF ∅12 cm	Rear right	-	-	-	-	24.1
7	Staub ∅12 cm	Front right	WMF ∅14 cm	Rear right	-	-	-	-	23.8
8	Staub ∅12 cm	Front right	Le Creuset ∅18 cm	Rear right	-	-	-	-	22.7
9	Staub ∅12 cm	Front right	Ikea 365+ ∅21 cm	Rear right			-	-	23.4
10	Staub ∅12 cm	Front right	WMF ∅12 cm	Front left	WMF ∅14 cm	Rear right	-	-	24.1
11	Staub ∅12 cm	Front right	WMF ∅12 cm	Front left	WMF ∅14 cm	Rear right	Le Creuset ∅18 cm	Rear left	24.3
12	Staub ∅12 cm	Front right	WMF ∅12 cm	Front left	WMF ∅14 cm	Rear right	Ikea 365+ ∅21 cm	Rear left	23.7
13	Staub 34x21 cm	Right bridged	-	-	-	-	-	-	15.7
14	Staub 34x21 cm	Right bridged	Staub ∅12 cm	Front left	-	-	-	-	18.8
15	Staub 34x21 cm	Right bridged	Silit 36.5x25 cm	Left bridged	-	-	-	-	16

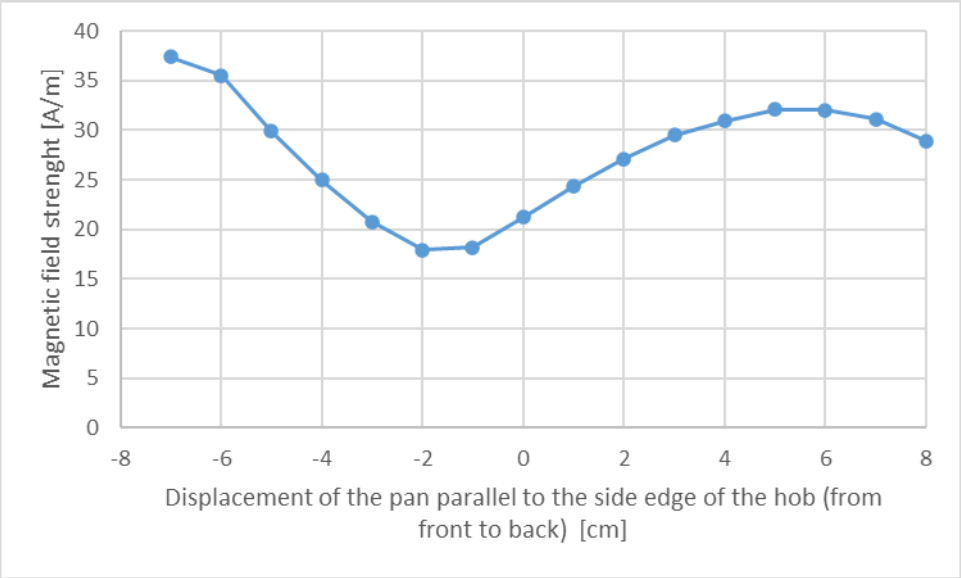
3.3 Stray fields of centred or non-centred pans

Pans that completely cover their induction coils produce the smallest stray fields. With marked cooking zones, sufficiently large pans can be placed in the centre of the cooking zone. This optimisation option is not available for cookers without marked cooking zones.

Figures 6, 7, 8 and 9 show the results for appliances A, B, C and D. The stray fields tend to be smallest for appliance A (figure 6) and appliance B (figure 7) when the pan is in the centre of the cooking zone.



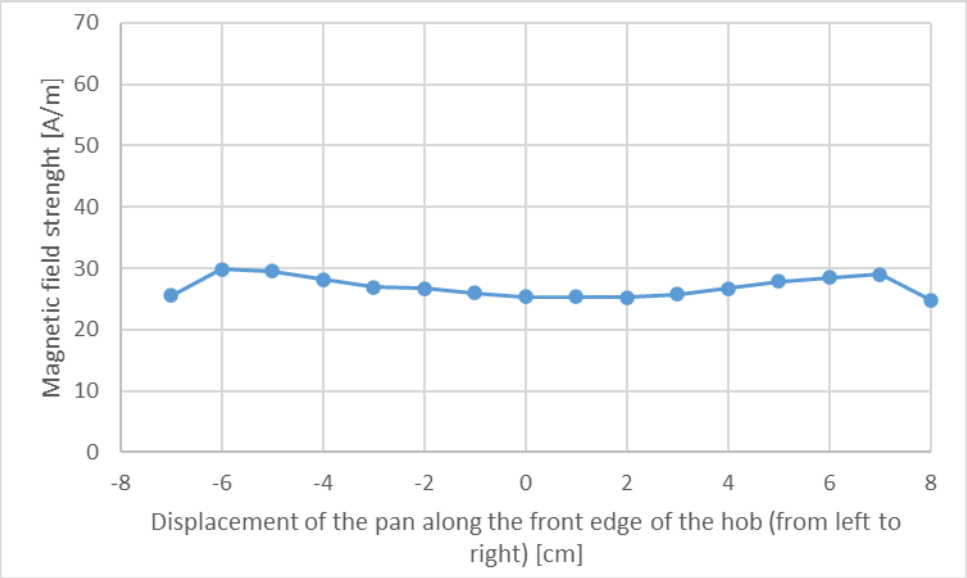
0 cm corresponds to the centre of the hob, negative distances correspond to a shift of the pan to the left, positive distances correspond to a shift of the pan to the right.



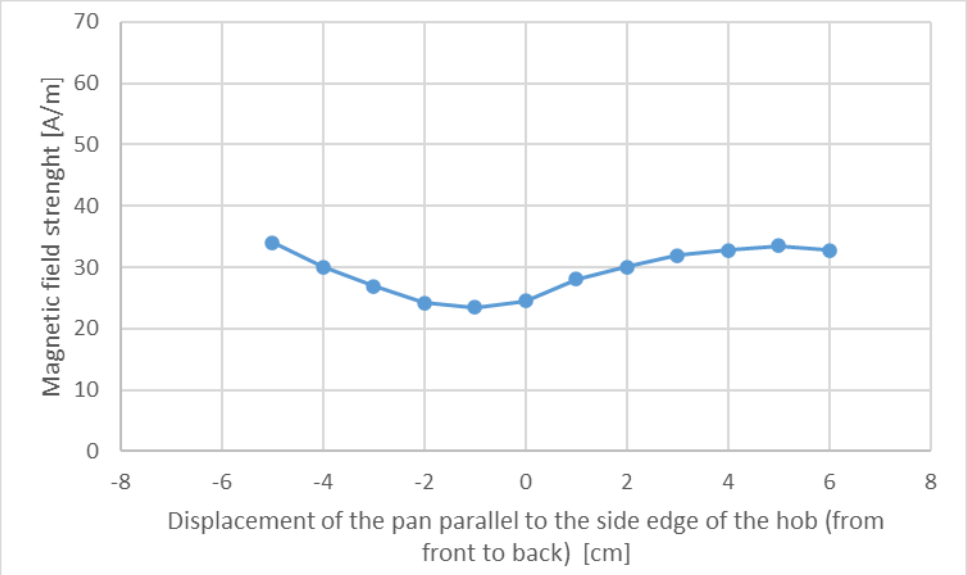
0 cm corresponds to the centre of the hob, negative distances correspond to a shift of the pan to the front, positive distances correspond to a shift of the pan to the rear

Figure 1 Appliance A: A pan with a diameter of 18 cm is placed on the round cooking zone at the front right, the

centre of which is 17.7 cm from the front edge of the appliance. Measurement at 4 cm in front of the appliance. The reference level for the medium-frequency magnetic field is 5 A/m.

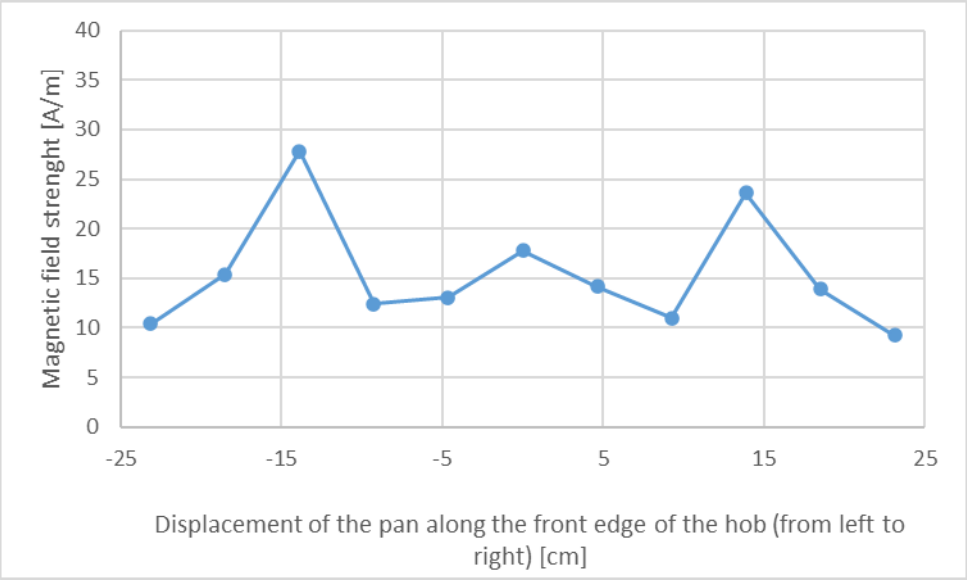


0 cm corresponds to the centre of the pan, negative distances correspond to a shift of the pan to the left, positive distances correspond to a shift of the pan to the right

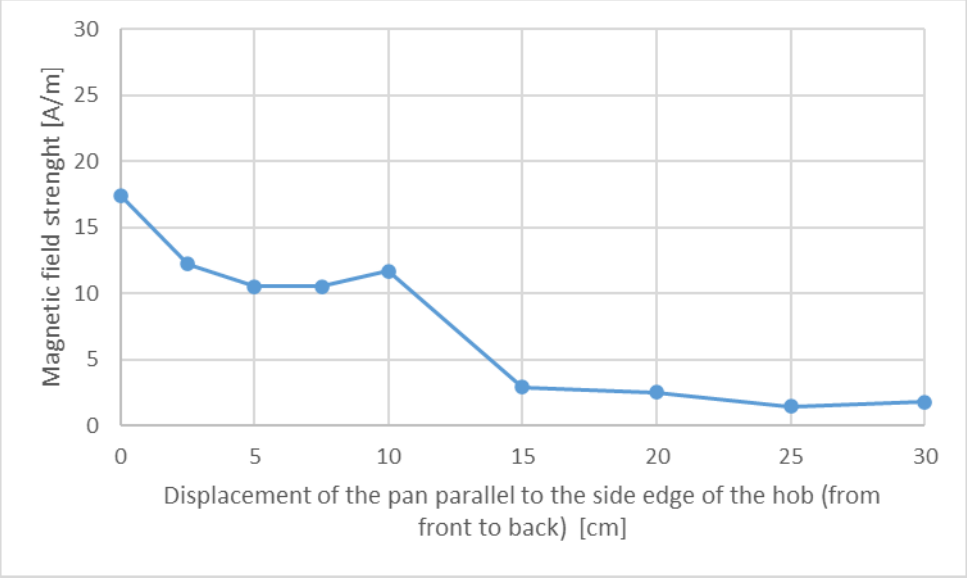


0 cm corresponds to the centre of the pan, negative distances correspond to a forward displacement of the pan, positive distances correspond to a backward displacement of the pan

Figure 2 Appliance B. A saucepan with a diameter of 12 cm is positioned at a distance of 18.8 cm (centre of pan) from the front edge of the hob on the flex zone on the left. Measurement at a distance of 4 cm in front of the appliance. The reference level for the medium-frequency magnetic field is 5 A/m

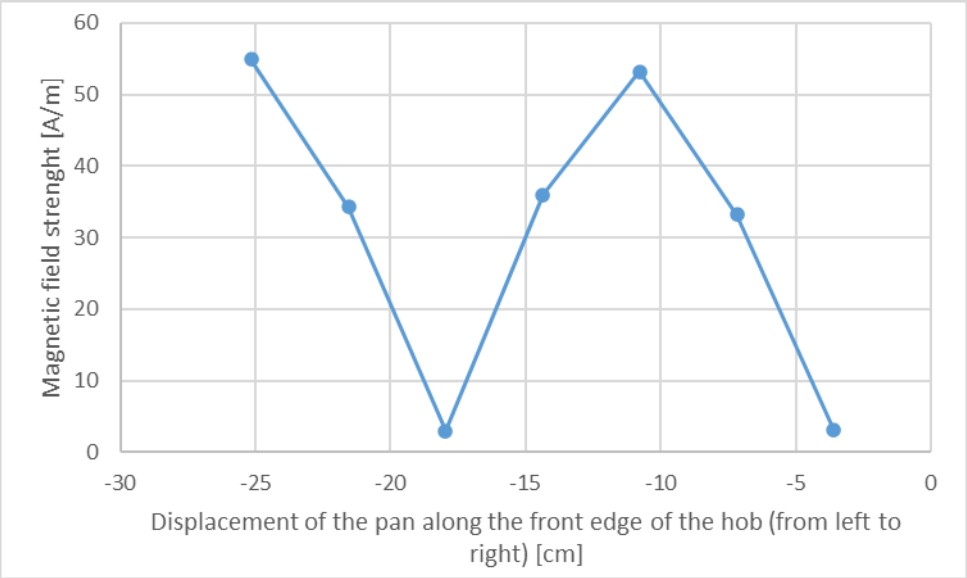


0 cm corresponds to the centre of the hob, negative distances correspond to a shift of the pan to the left, positive distances correspond to a shift of the pan to the right.

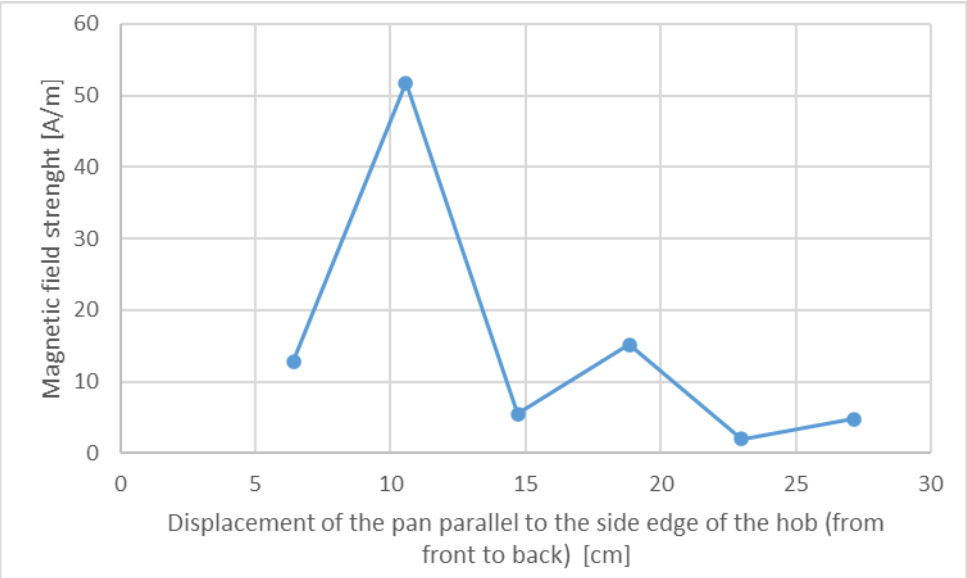


0 cm corresponds to the centre of the pan, positive distances correspond to a shift of the pan to the rear

Figure 3 Appliance C. A cooking pot with a diameter of 12 cm is positioned at a distance of 11.05 cm (pan centre) from the front edge on the Full-surface induction hob. Measurement at a distance of 4 cm in front of the appliance. The reference level for the medium-frequency magnetic field is 5 A/m



0 cm corresponds to the centre of the pan, negative distances correspond to a shift of the pan to the left



0 cm corresponds to the centre of the pan, positive distances correspond to a shift of the pan to the rear

Figure 9 Appliance D. A cooking pot with a diameter of 12 cm is positioned at a distance of 10.55 cm (pan centre) from the front edge on the Full-surface induction hob. Measurement at a distance of 4 cm in front of the appliance. The reference level for the medium-frequency magnetic field is 5 A/m

With Full-surface induction hobs as appliances C and D (Figures 8, 9), it is not possible to position the pans so that the stray fields are small.

3.4 Stray fields as a function of the distance from the hob at maximum and medium power

The magnetic field strength decreases with increasing distance from the induction hob, both at full and reduced power. At small distances from the cooker, the magnetic field load can be reduced by reducing the power. The reference level is maintained from 15-20 cm from the cooker (Figures 10 and 11).

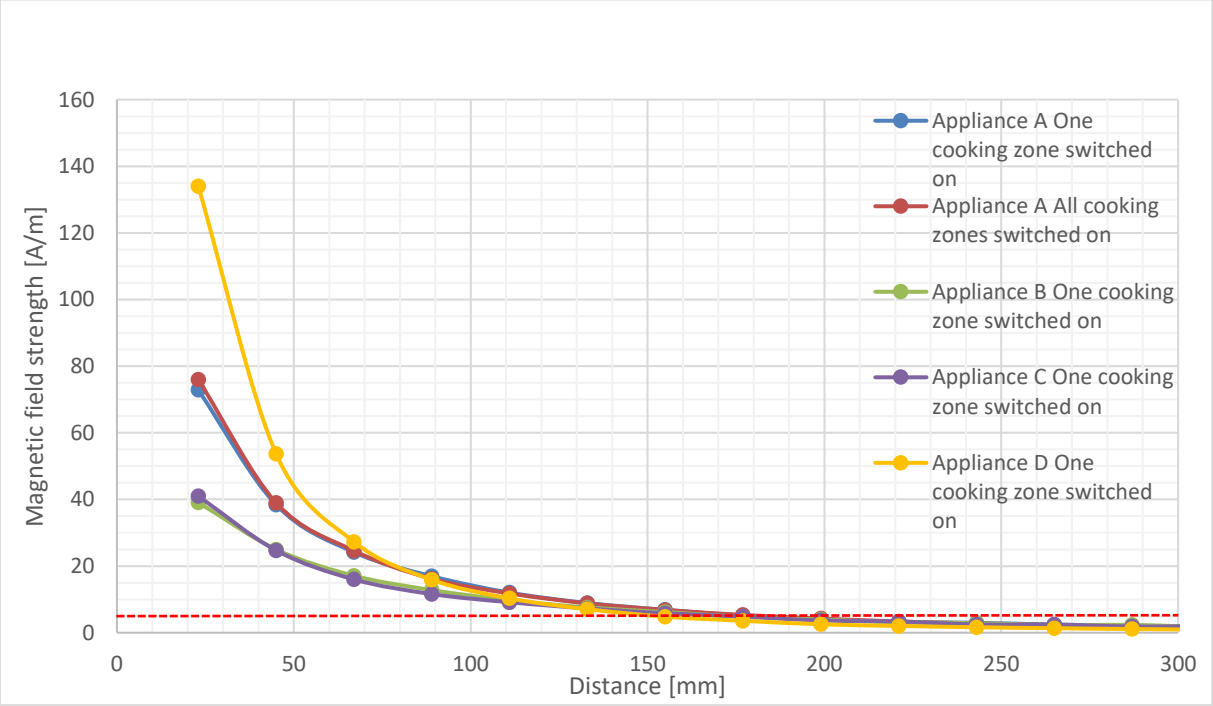


Figure 10 Magnetic field strength of the stray fields at maximum cooking level. The reference level of 5 A/m is shown in dashed red

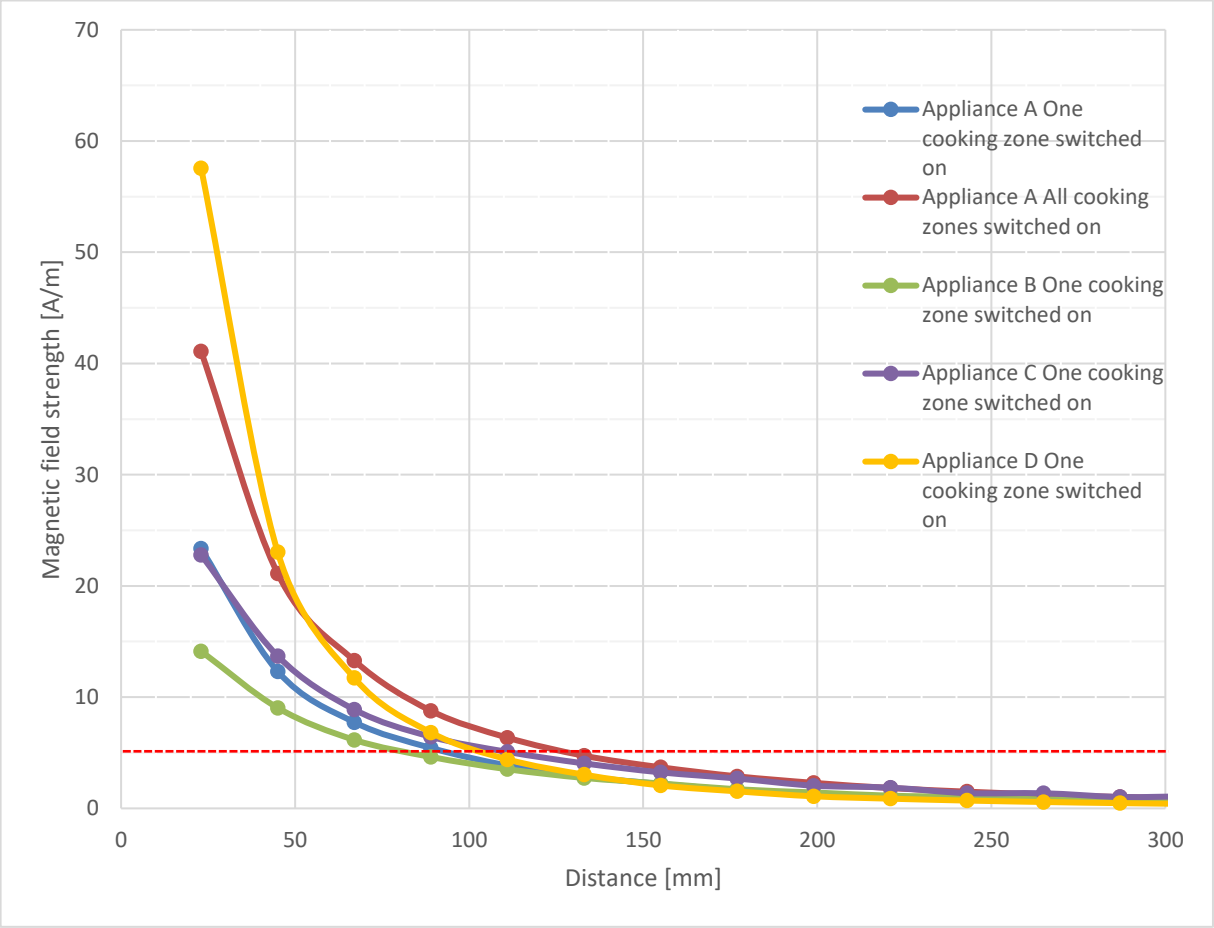


Figure 11 Magnetic field strength of the stray fields at medium cooking level. The reference level of 5 A/m is shown with a red dashed line

3.5 Stray fields as a function of the selected power

In general, the stray fields increase with increasing power (Figures 11, 12, 13 and 14). Reducing the power by 2 levels already has a strong effect on the magnetic field

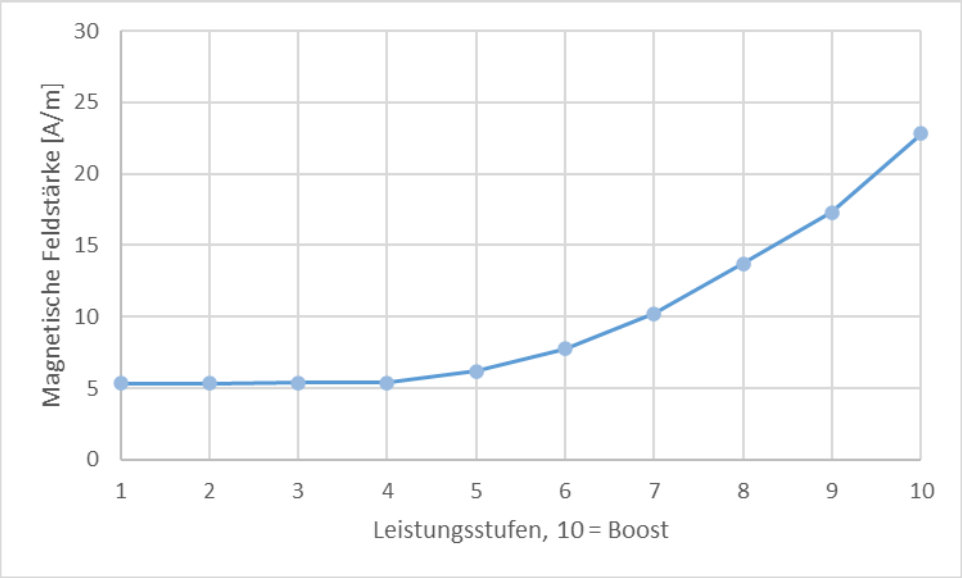


Figure 12 Appliance A: Stray field at 4 cm from the hob as a function of power. Operation with pan (12 cm diameter). The reference level for the medium-frequency magnetic field is 5 A/m

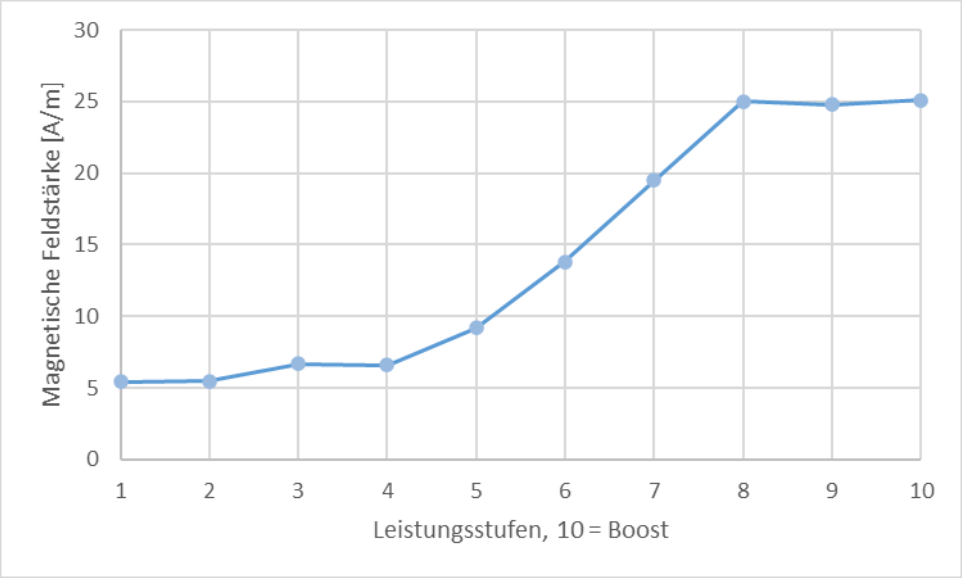


Figure 4 Appliance B: Stray field at 4 cm from the cooker as a function of power. Operation with pan (12 cm diameter). The reference level for the medium-frequency magnetic field is 5 A/m

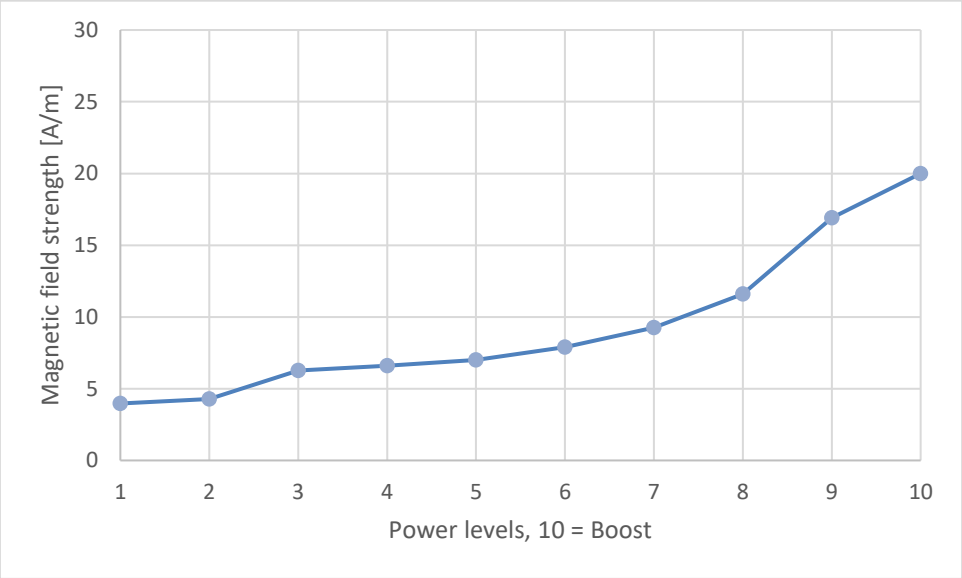


Figure 5 Appliance C: Stray field at 4 cm from the cooker as a function of power. Operation with pan (12 cm diameter). The reference level for the medium-frequency magnetic field is 5 A/m

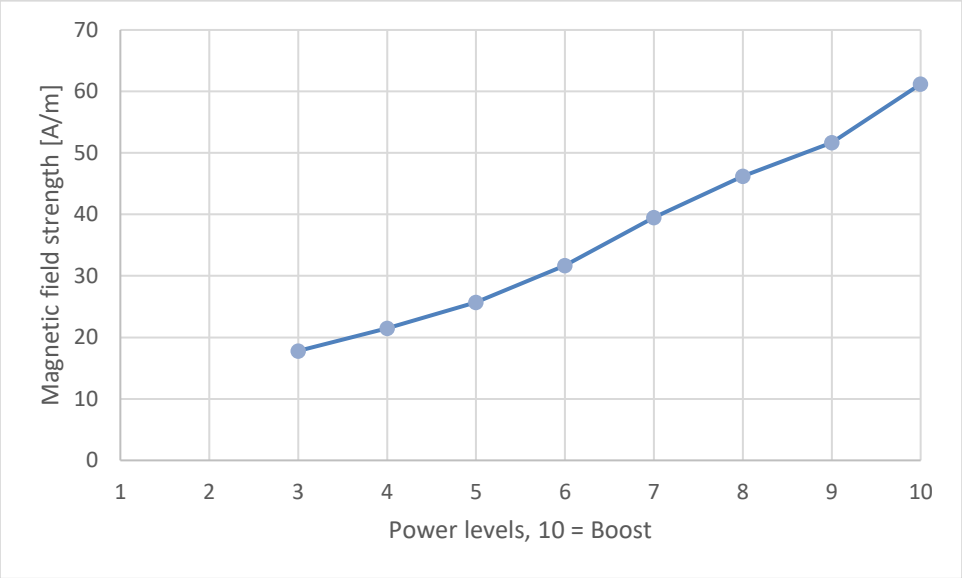


Figure 6 Appliance D: Scattering field at 4 cm from the hob as a function of power. Operation with pan (12 cm diameter). The reference level for the medium-frequency magnetic field is 5 A/m

4 Simulation of induced currents in body models

The stray fields around induction cookers penetrate the bodies of people standing directly in front of the cooker and induce (generate) electric and magnetic fields inside the body. Measurements have shown that they exceed the reference levels in the vicinity of induction cookers. For this reason, it

must be investigated whether the current densities in the body comply with the basic restrictions intended to prevent health effects. As the current densities cannot be measured in living persons, they are mathematically simulated in electrical models of the human body. These models describe the electrical properties of 300 different human tissues and organs with a resolution of 0.5×0.5×0.5mm. In relation to induction cookers, the anatomical models represent virtual people standing in front of virtual cookers whose virtual stray fields are identical to the previously measured stray fields (Chapter 3) of real induction cookers.

The IT'IS research foundation in Zurich has carried out such simulations on behalf of the FOPH [3]. It used its virtual family, which consists of anatomical models of different people of different gender, stature and age. The virtual persons are standing directly at the edge of the kitchen unit in whose worktop the induction hob is installed. The distance between the front edge of the worktop and the induction hob is 23 mm for appliance A and 45 mm for appliances B, C and D. The total of 20 simulations involved both individual people and situations that can typically occur when cooking in private kitchens (Figure 16):

- Woman, 26 years old
- Hand of a woman, 26 years old, above a hob
- Boy, six years old
- Woman, 26 years old, nine months pregnant
- Foetus in the 9th month
- Woman, 26 years old, seven months pregnant
- Foetus in the 7th month
- Woman, 26 years old, three months pregnant
- Foetus in the 3rd month
- Boy, eight years old
- Girl, eleven years old
- Girl, eight years old
- Girl, five years old
- Girl, three years old
- Girl, three years old on a stool stirring a pan
- Woman, 26 years old, carrying a three-year-old girl on her hip
- Girl, three years old, being carried on a woman's hip
- Woman, 26 years old, carrying an eight-week-old baby in a frontal baby carrier
- Baby, eight weeks old, being carried in a frontal baby carrier
- Man, 37 years old

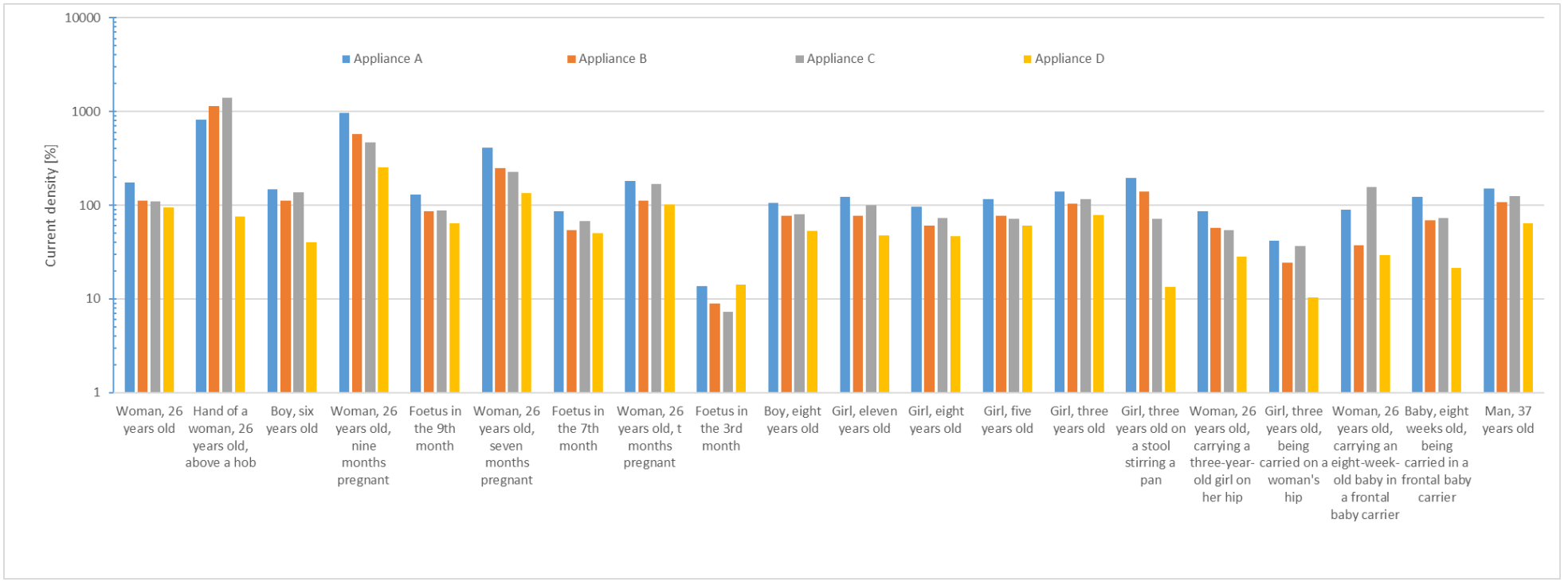


Figure 7 Current densities in persons in front of the appliances A, B, C and D in percents of the basic restriction

A basic restriction value of up to 100% means that the basic restrictions are met. Limit values were exceeded in several simulations for all appliances.

- Device A: 13 simulations
- Device B: 9 simulations
- Device C: 9 simulations
- Device D: 2 simulations

Table 3 lists the simulated persons and situations affected by limit value exceedances

Table 1 Simulated persons and situations affected by limit value exceedances

With four devices	With three devices	With two appliances	With one cooker	With no cooker
– Woman, 26 years old, 9 months pregnant – Woman, 26 years old, 7 months pregnant – - Woman, 26 years old, 3 months pregnant	– Woman, 26 years old – Hand of a woman, 26 years old, above a hob – Boy, 6 years old – Girl, 3 years old – Man, 37 years old	Girl, 3 years old, standing on a stool	– Foetus in the 9th month – Boy, 8 years old – Girl, 5 years old – Girl, 11 years old – Woman, 26 years old, carrying a baby in a baby carrier – Baby, eight weeks old, being carried in a frontal baby carrier (Figure 18)	– Foetus in the 7th month – Foetus in the 3rd month – Girl, 8 years old – Woman, 26 years old, carrying a girl on her hip (illustration 17) – Girl, 3 years old, carried on a woman's hip

The results show that in all cookers, the model of the pregnant woman was affected, but not her foetus at three and seven months of age.

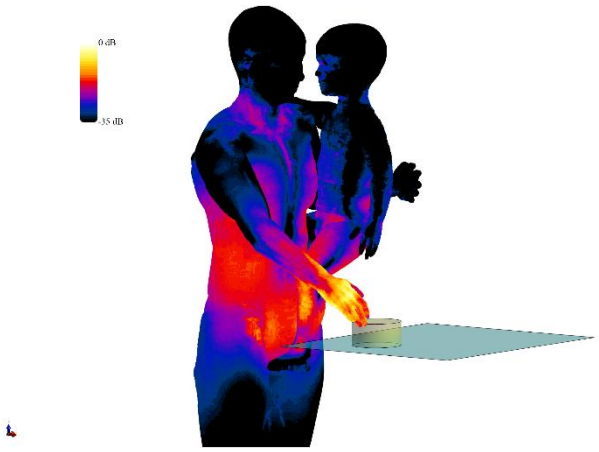


Figure 8 Current densities in the body model of a woman and the 3-year-old child carried on her hip (dark areas smallest current densities, yellow areas highest current densities. 0 dB = maximum value, -35 dB = approx. 2% of the maximum value)

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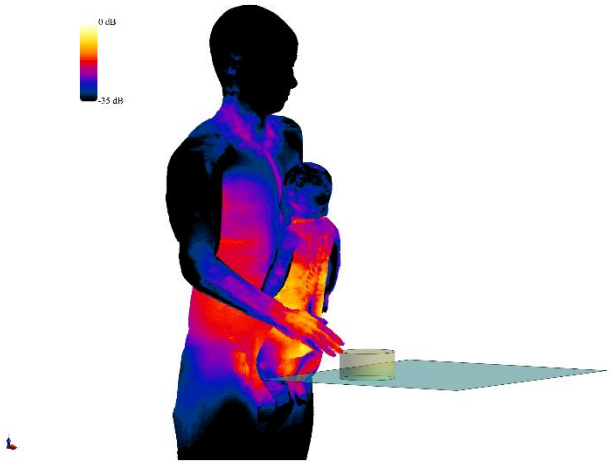

Figure 9 Current densities in the body model of a woman and the 2-month-old child carried by her in the baby carrier (dark areas smallest current densities, yellow areas highest current densities. 0 dB = maximum value, -35 dB = approx. 2% of the maximum value)

5 Exposure of persons to leakage currents

A leakage current through a person's body occurs when they touch several electrically conductive objects that do not have the same electrical potential. In many cases, the floor/earth is one of these conductive "objects". In such a case, if a hand touches an electrically charged object, the leakage current flows via the hand, arm, body and legs into the ground. If two hands touch two different conductive objects, an additional current flows from one hand via the chest to the other hand.

With induction hobs, the electrically conductive objects are not only the base but also the pans. Their electrical potentials arise because, together with the hob, they form an electrical capacitor that is capacitively charged by the electric field component of the electromagnetic field. The strength of this charge depends on the characteristics and size of the pans, the characteristics of the hob surface and the strength of the electric field component. If several pans are placed on an induction hob, they can be charged to different potentials.

If a person stirs in a pan with metal kitchen utensils or touches it with their hand, the pan discharges via a leakage current. As a switched-on cooker continuously charges the pans, the leakage current flows for as long as the touch lasts or until the cooker is switched off. No leakage currents flow if the person stirs in pans with plastic or wooden spoons or touches pans on insulating plastic handles or grips.

In the 2024 study from IT'IS [3], the leakage currents were measured on four different induction cookers with different pans (small, medium and large) using a measuring system that simulates a person. The following situations were investigated and compared with the limit value for leakage currents

– A person touches electrically conductive parts (pan, metal handle or grip) of a pan with one hand

or stirs in a pan with a metal cooking spoon with one hand. The leakage current flowing through the hand via the body into the floor was measured.

– A person touches electrically conductive parts (pan, metal handle or grip) of two pans with two hands or stirs in two pans with two hands using metal cooking spoons. The leakage current flowing through the hand via the body into the other hand was measured.

The results show that the leakage currents are not systematically dependent on the size of the pan. While in situation 1 the leakage currents are in the range of the limit value or below, in situation 2 they exceed the limit value by up to 50% in three out of four induction hobs.

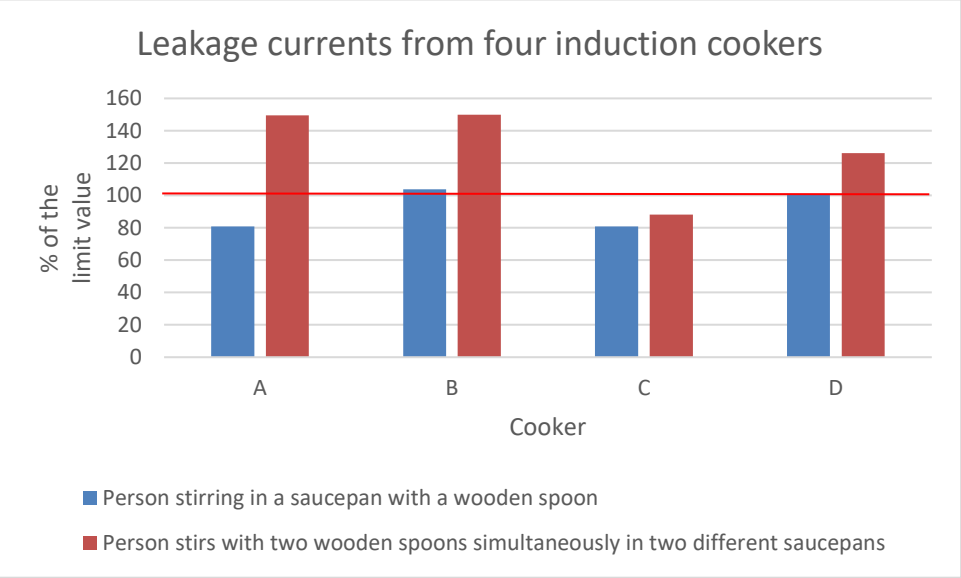

Figure 10 Appliance A: with marked cooking zones; Appliance B: with marked cooking zones and bridge function; Appliance C: Full-surface induction hob; Appliance D: Full-surface induction hob

The biological effect of leakage currents depends on their frequency and strength. Excessively high low-frequency leakage currents can stimulate affected nerves and muscles, while excessively high high-frequency leakage currents heat the person's skin or affected tissue. Leakage currents can be a particular problem for people who wear electronic implants such as pacemakers.

6 Health effects

6.1 Short-term acute effects

Magnetic fields can penetrate the human body and cause electrical currents in it. If these currents exceed a certain value, immediate excitation of the central nervous system can occur. The European limit values for magnetic fields are therefore set so that the currents flowing in the body are at least 50 times lower than this value [2]. You can use the tips listed under "Health risks and precautions" to ensure that these limits are adhered to.

6.2 Long-term effects of medium-frequency magnetic fields

According to the World Health Organisation (WHO), there is generally no convincing evidence of long-term health effects of medium-frequency magnetic fields [4]. However, it also notes that relatively few studies have been published in this frequency range. No conclusions can be drawn from the few animal studies that have been conducted in the medium-frequency range. The human studies, which have been conducted primarily in connection with screens, show no health effects. It is not clear to what extent the results can be transferred to induction cookers, as these appliances have different characteristics in terms of both the radiation and the size of the magnetic fields.

6.3 Epidemiological studies on induction cookers

In recent years, various epidemiological studies have been carried out, particularly in China and Japan, in which the effects of the use of various cooking sources such as induction cookers or gas cookers on the foetus, the newborn, premature births or pregnant women were investigated [5-12]. The studies were each conducted with a large sample, but all of these studies have various limitations in terms of exposure assessment, study design and consideration of other influencing variables.

In most of the studies, the authors were unable to identify a significant association between the use of induction cookers and the above-mentioned endpoints [5-8]. In a study that investigated the relationship between the use of an induction cooker and the week of pregnancy in which the child was born, it was shown that women who use induction cookers have a significantly increased risk of having a premature birth (birth before 37 weeks of pregnancy), but no increased risk of a lower birth weight was seen. The authors of this study therefore conclude that this significance in preterm births is not due to the magnetic fields of the induction cookers. Two studies [11, 12] investigated the influence of induction cookers on congenital heart defects. Both studies showed an effect, but the studies have major qualitative shortcomings. For example, the results were not adjusted for all influencing variables and therefore it cannot be ruled out that the effect is not due to other influencing variables. In a large cohort study, Pan et al [8] investigated the influence of induction cookers and house ventilation on foetal weight, birth weight and birth size. The study was able to show that the use of induction cookers during pregnancy had a negative effect on the three parameters mentioned. However, the study did not include all important influencing variables in the statistical models and it can therefore not be ruled out that the effect stems from other influencing variables.

6.4 Influence of electronic implants

The limit values for the population for protection against harmful electromagnetic fields do not guarantee that active electronic implants, such as pacemakers, will function faultlessly. Studies show that electromagnetic fields from electrical appliances, such as stray fields from induction cookers, can influence and interfere with electronic implants at short distances [13]. The studies show

- that the implants function without interference in people at distances of 20-35 cm from the cooker. However, it remains unclear whether the implants also function correctly at smaller distances.
- that malfunctions depend on how far an implant is from the induction hob, whether there is a saucepan on the hob and how the saucepan is positioned.

People with electronic implants should always follow the manufacturer's safety instructions and discuss with their doctor how they can use induction cookers.

7 Legal regulation

Induction hobs 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 [15]. 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. For the electromagnetic fields created by domestic appliances, the standard “SN EN 62233:2008 Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure”, which refers to the standard “ICE 62233:2005” of the same name, applies. According to the standard SN EN 62233:2008, the conformity criteria for compliance with the requirements correspond to the limit recommended by the EU [2]. In addition to other specifications for intended use, the standard IEC 62233:2005 defines a distance of 30 cm between the appliance and the person using it. Manufacturers are responsible for ensuring that their appliances comply with the conformity criteria. In Switzerland, no authority checks whether induction hobs 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).

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Contact:

Federal Office of Public Health

str@bag.admin.ch