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## **Kitchen Hob Protection Review**

Application to Electric Hobs

Issue 02

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## 1.0 INTRODUCTION

This report is intended to identify the risk of kitchen hob fires, identify relevant standards for hob preventive systems and provide information on a suitable product for protecting the kitchen Hob to meet the identified standard, so safe escape can be achieved from the kitchen area.

This report will also provide technical information on the solution product allowing the approval authorities to understand the concept.

## 2.0 ANALYSIS OF THE PROBLEM

Analysis on fires in England is documented by the Department for Communities and Local Government and is based upon statistical information provided by the Local Authority Fire and Rescue Services.

The April 2014 to March 2015 statistics provides the following headlines:

- There were 258 fire fatalities in England in 2014 to 2015.
- 63 per cent of all fire fatalities were in accidental dwelling fires.
- There were 3,235 non-fatal fire hospital casualties.
- Local authority fire and rescue services attended around 154,700 actual fires in England in 2014 to 2015.
- 44 per cent of all incidents attended were fire false alarms.
- There were 28,200 accidental dwelling fires.
- 61 percent of domestic fires occurred in the kitchen.
- 52 percent of domestic fires were caused by the cooking appliances.

It can be concluded from the above that the cooking appliances account for the majority of domestic fires in England. Unfortunately this is not broken down further between hobs and ovens, but from conversation with experienced fire fighters the majority reference hobs as the greater risk. This is further documented on Fire Brigade Organisations web sites which have campaigns for kitchen fires which concentrate on hob fires.

The fires identified in the above statistics would be within domestic properties constructed in accordance with the Building Regulations. This includes kitchen compartmented properties, open plan properties and studio properties.

It is clear from the above statistics that additional measures should be provided to minimise cooking appliance fires, which would reduce the above figures and allow greater trade-offs for open plan and studio properties.

### 3.0 STANDARDS

On reviewing fire systems in England, we were unable to identify a specific approved solution for preventing kitchen hob fires. There are products on the market which claim to extinguish the hob fire once it occurs, but none of these are to a recognised British or European Standard.

Looking wider afield, we came across requirements for hob protection in the Nordic Countries, where they have experienced years of kitchen fires. The Regulators introduced a requirement for protection to be provided to all hobs so as to reduce the number of fires. This was introduced into their Building Regulation and similar Statutory Documents.

On the back of this requirement, a European Standard / British Standards was created that set standards for Household & similar electrical appliances. The BS EN Standard is known as BS EN50615:2015 Household & similar electrical appliances – Safety. Particular requirements for devices for fire prevention and suppression for electric hobs (cooktops).

The standard identified two categories of fire protection devices:

- Category A is concerned with extinguishing and simultaneous power cut off of the appliance.
- Category B is concerned with preventive power cut off of the appliance, preventing a fire occurring.

This report will only be concerned with preventing the fire occurring and therefore the Category B system test requirements will be reviewed below.

The standard requires the device to take measures to ensure that, as a result of unattended operation or excessive temperatures, fires caused by the cooking process are avoided and an alarm is raised locally.

The device should switch off the appliance before the fire starts and incorporate an audible warning device. An alarm of at least 65 dB measured 1m distance in accordance with EN 54-3 shall be generated.

All sensing devices that are only battery supplied shall give a visible and audible warning signal when the battery is approaching the end of life or in the case that they are wrongly mounted. In this situation the cooking appliance cannot be switched on. However, in each case that the user wants to start a cooking process, the error message needs to be confirmed by the user and the appliance is unlocked again.

The detecting device shall be held in place with reliable means, such that the device cannot be easily detached.

After removal for maintenance or cleaning, the fixing means shall be such that the device can only be remounted in the original position. This is to be achieved by a fixed secure back plate with reed switch, which will identify when the unit is in the correct position.

For a product to be certified as BS EN50615 compliant, the tests outlined in the Table 1 below must be carried out by an Accredited Testing House and passed for a Category B system.

## 11.104.2 Tests for Category B devices

	W Preparation	X Test	Y Test criteria / measurement
1	<p>Test 1 - Test device for false alarms</p> <p>Place pans (as in figure 101 of EN 60335-2-6) on all plates. Size of pans should equal size of plates. Fill all pans, except the largest one, with water (according to table 101 of part 60335-2-6). Fill largest pan with a quantity of sunflower oil as in table 11.Z105.</p>	<p>Heat all pans with water until water is boiling. Keep water simmering during the whole test. After all pans with water have been simmering for 20 minutes, start heating the largest pan (with sunflower oil) on full power with the aim to create fire</p>	<p>The device shall not cut off power to the cooktop or activate the extinguishing agent before the sunflower oil temperature reaches 200 °C, but it shall cut the power before the sunflower oil temperature reaches 330 °C.</p>
2	<p>Test 2 - Test device on all plates, one by one.</p> <p>Place pan (as in table 101 of EN 60335-2-6 and with dimension suitable to fit relevant plate) on the plate that is to be tested. Fill pan with a quantity of sunflower oil as in table 11.Z105. Place pans fitting to the diameter of the plates with a height of 15cm ± 2cm on all other plates. All plates should be tested, one at a time.</p>	<p>Set full effect on plate that is under testing with the aim to create a fire.</p>	<p>The device should cut off power to the cooktop before the sunflower oil temperature reaches 330°C (before fire starts). The sunflower oil shall not ignite within 10 minutes after the power to the cooktop has been cut.</p>
3	<p>Test 3 - Test device with cast iron pan (frying pan) on the plate with worst result during test 2.</p> <p>Place cast iron pan with dimension suitable to fit relevant plate on the plate that is to be tested. Fill pan with a quantity of sunflower oil as in table 11.Z105. Place tall empty pans with a height of 15cm ± 2cm on all other plates.</p>	<p>Set full effect on plate that is under testing with the aim to create a fire.</p>	<p>The device should cut off power to the cooktop before the sunflower oil temperature reaches 330°C (before fire starts). The sunflower oil shall not ignite within 10 minutes after the power to the cooktop has been cut.</p>

Table 1 – BS EN50615 Tests for Category B Devices

## 4.0 REVIEW OF THE PRODUCT MARKET

There are a number of solutions on the UK market ranging from fixed temperature sensors, PIR movement detectors and extinguishing units. None conform to the above British Standard.

Following review of suppression systems which require yearly maintenance, it was clear once the properties become occupied, no maintenance is carried out. Experience has also shown, that following a discharge, refilling of the suppressant canister does not occur, even in Student Accommodation which is managed.

With the above in mind it was felt a simple manual resetting system which turned the power supply off would provide a robust solution as it requires no 3<sup>rd</sup> party interaction in private properties, thus the decision to only progress with a Category B system.

As the BS EN50615 is the only reliable standard for hob protection, any product chosen needs to meet this standard in full.

Following a review of various products confirming to this standard, we decided to progress with the 'Hob Guard Safera Airis' here after called Hob Guard Safera'. This product meets all the BS EN50615 requirements and has a proven track record.

### 4.1 Hob Guard Safera Technical

The Hob Guard comes from Finland where they have years of experience of house fires as a result of the mainly timber construction. Their Building Regulations require hob guards to be fitted to hobs to prevent fires for typical cooking processes.

Hob Guard Safera has been tested for compliance with BS EN50615 by SP Fire Research ([www.spfr.no/services/fire-testing/stove-guards](http://www.spfr.no/services/fire-testing/stove-guards)) which is the largest independent research organisation in Norway similar to BRE in England. The unit is also CE marked in accordance with the EC directives.

A copy of the summary test certificate is provided in Appendix AA of this report and the full text report can be made available on request.

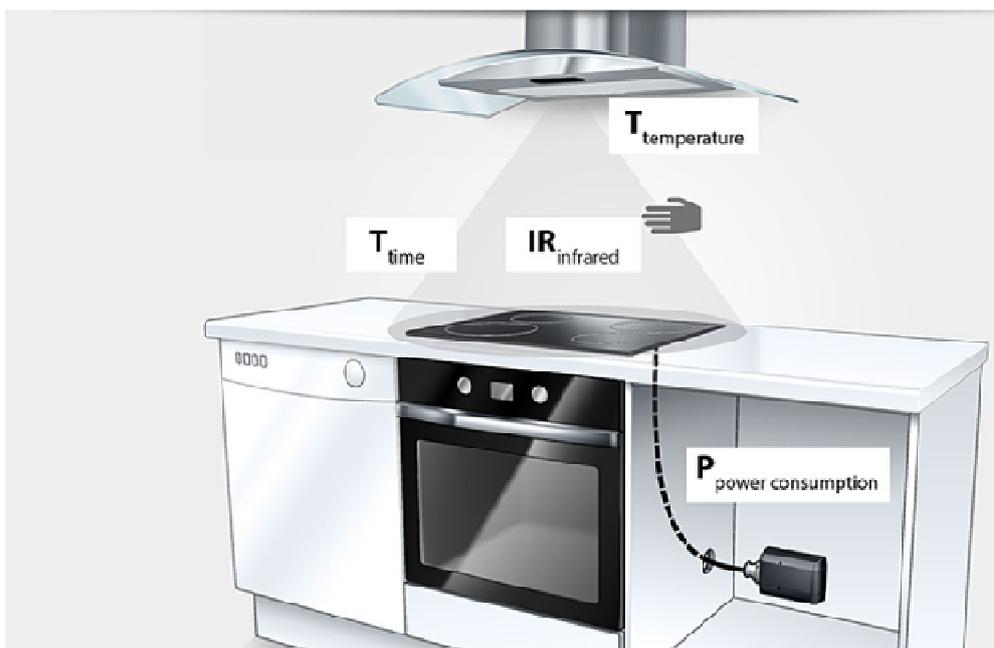
The Hob Guard prevents hob fires occurring by constantly monitoring the hob temperature and movement by sophisticated algorithms which can identify between safe and unsafe cooking practices and avoid false alarms.

The system will initially sound a 15 second sounder at 65dBa if it is getting too hot, temperatures rising too quickly, unusual electrical current change, or the hob is left unattended with no cooking source or hazardous conditions are present. If no action is taken within the 15 seconds, the system will go into shut down mode by automatically turning the hob off with the sounder continuing to operate. Where the sounder activation is due to an unusual cooking process, the Occupant simply presses the reset button on the Hob Guard above the hob allowing the system to be reset and continues monitoring the hob. The Occupant is managing the process with the necessary audible alarm provided warnings as necessary.

Hob Detection works by monitoring the hob constantly for cooking activity as shown in Figure 1 below. This includes infrared for monitoring radiant & conducted energy, time, power consumption, movement combined with sophisticated algorithms as required by the BS EN Standard.

Based on the data from the sensors, the Hob Detection recognises both cooking and hazardous situations and reacts accordingly so as not to interrupt the normal cooking process.

The unit is manually reset after activation and ready to protect the hob again unlike suppressant system which would require recharging, which rarely occurs.



**Figure 1 – Sensing Elements**

A graphical demonstration of the sensors can be seen in the '[Hob Guard Intelligence Video](http://www.dmsolutions.co.uk)'. (www.dmsolutions.co.uk).

A demonstration of the system operating compared to a traditional unmonitored hob, to prevent a fire occurring can be seen in the '[Hob Guard Fire Video](#)'.

Our research indicated the Hob Guard is already installed in thousands of kitchens across Europe and since these installations, none of the owners have ever reported a hob fire. Hob Guard does not interfere with normal cooking and doesn't require any maintenance, other than a quick clean of the sensor from time to time.

The hob sensor AA batteries need to be changed every three-years which isolates the power to the hob until such time as this occurs.

We have also visited the organisation that researched and developed the product to witness the operation.

In summary the Hob Guard is provided to protect the hob, which will isolate the power to the hob prior to ignition occurring in accordance with the British Standard BS EN 50615. As the detection unit is located 600mm above the hob, it provides local detection to the hob. The hob guard unit will sound the unit alarm.

The unit is intended to prevent a hob fire occurring, and provides local detection to raise the alarm earlier unlike the ceiling mounted heat detector resulting in earlier notification of an incident. In an incident this could be minutes and the hob guard will have isolated the power to the hob.

## 4.2 Hob Guard Safera Components

The Hob Guard Safera comprises of two components. One component is located above the hob with the second component located below the worktop as shown in Figure 2 below.



**Figure 2 – Component Locations**

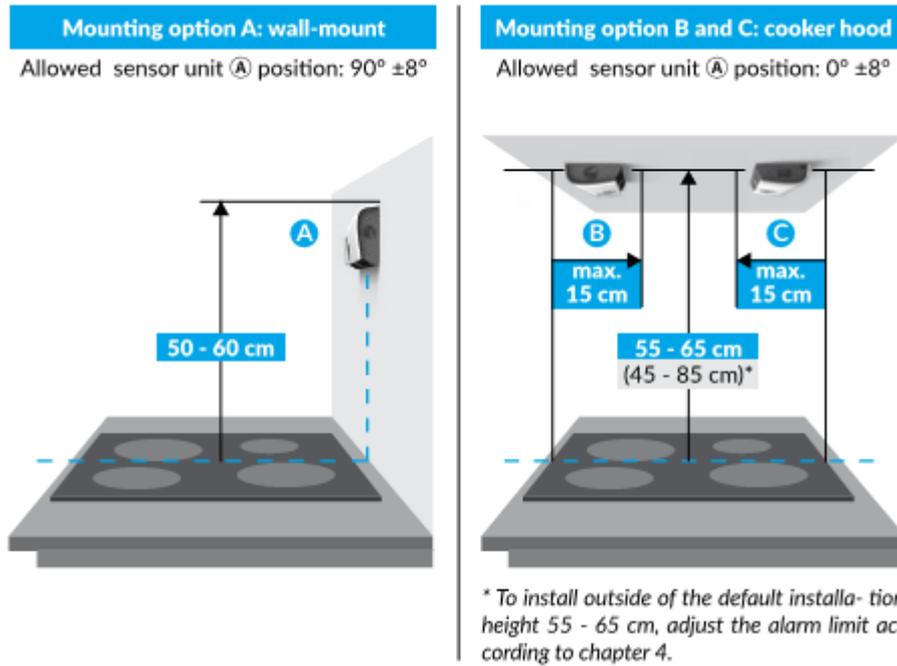
The Hob sensor component can be located above the hob on the extractor unit or fixed to the back wall as shown in Figure 3. The battery operated unit connects with the hob control unit by way of a wireless 2 way connection designed for safety critical applications. If the power supply is lost to the sensor, batteries are removed or the unit is removed during the filter cleaning and not repositioned correctly, the hob will close down within two to three minutes becomes fail safe off.

The hob sensor measures 130mm x 45mm x 20mm deep and comes in 10 different colours.



**Figure 3 – Hob Sensing Element**

The sensing unit mounting criteria are as below.

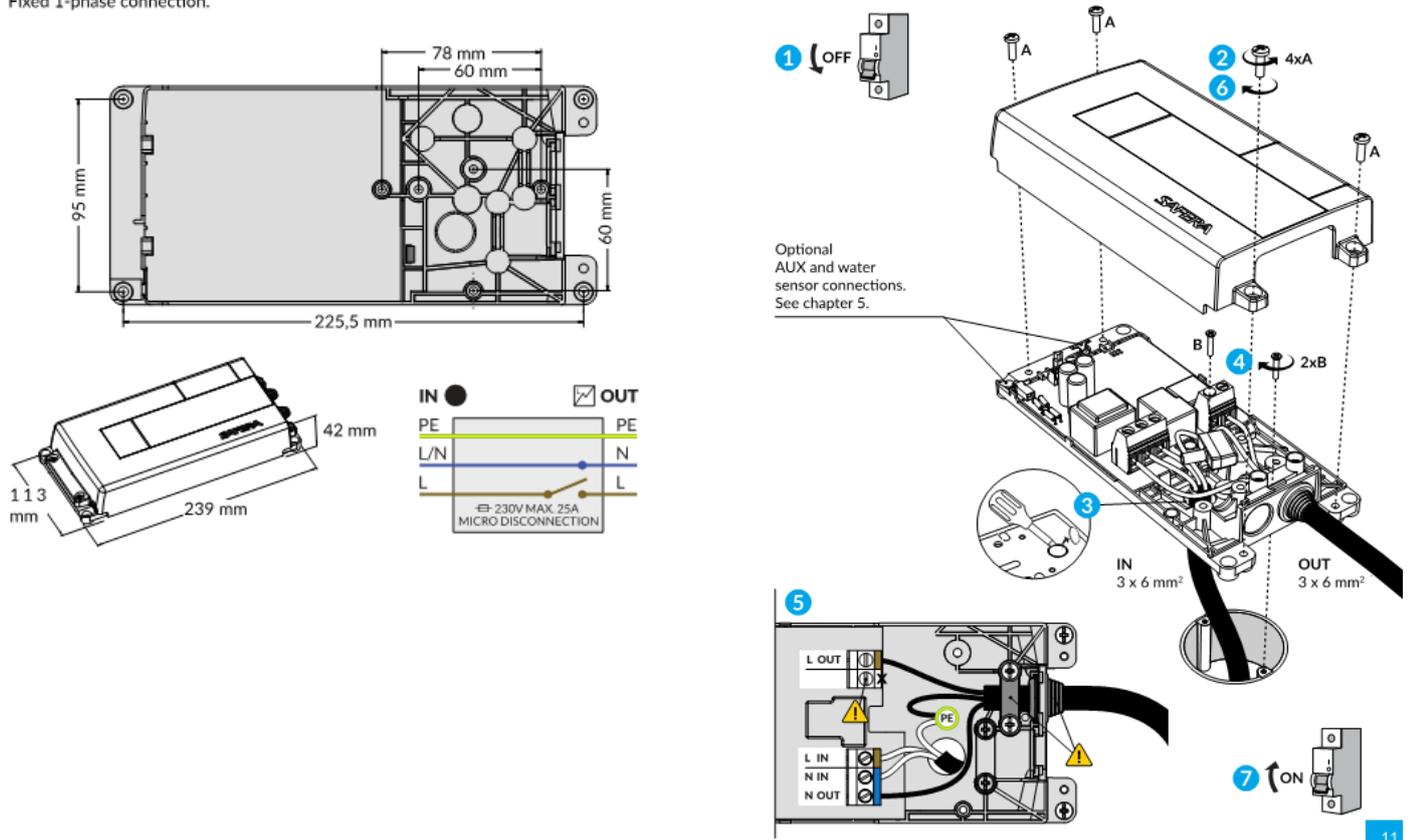


**Figure 4 – Sensing Element Position**

The electrical control component is located below the worktop and is used to monitor the current and isolate the power to the hob in an alarm condition.

The hob mains are wired into the control box with the switched output connected to the hob cable. The device gains the necessary power from the hob cable.

Fixed 1-phase connection.



**Figure 5 – Electric Control Box**

The electrical control unit measures 239 x 113 x 42mm and can be located in cupboard or behind the kick board below.

## 5.0 TYPICAL QUESTIONS

The following identifies typical questions asked about the Hob Guard unit.

### Q: How can the system detect a fire before the ignition of a fuel source takes place?

A: The system is based on four sensors and intelligence system to react quickly to various hazards while cooking, and the best way to understand how the system is working in real life is to look at the tests required to pass in the standard BS EN 50615 and how the system has actually performed in those tests.

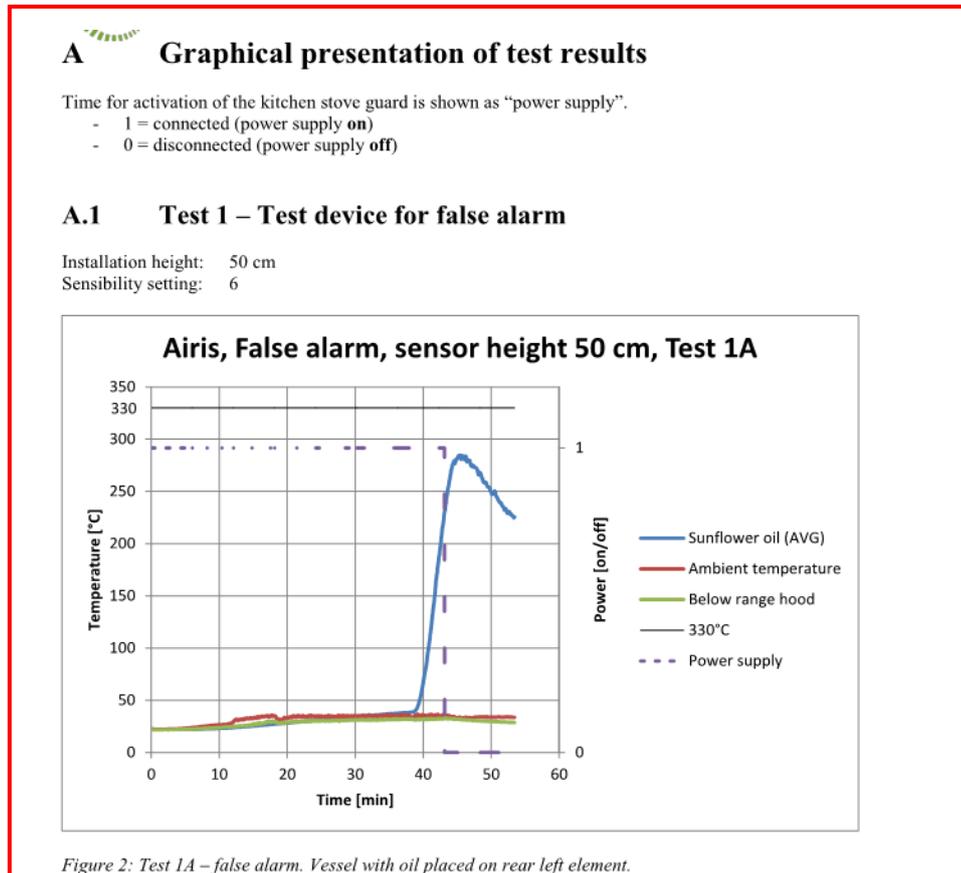
This is best understood by reviewing the test below and Table 1 – BS EN50615 Tests for Category B Devices" where the tests 2 and 3 are explained.

Test results							
<p>The performance of the stove guard was tested according to EN 50615:2015, section 11.104 for Category B devices. The stove guard was tested using a hob with 4 elements.</p> <p>As the sensor is based on infra-red reading of the temperature of the surface of the vessel, the function is dependent on a satisfactory view-factor. Based on this, the lowest height specified in the installation manual was assessed to be the most unfavourable position and therefore all tests were performed with the sensor placed 50 cm above the surface of the hob.</p> <p>In all tests, logging was started when heating of the oil-containing vessel was initiated.</p>							
<h3>3.1 Testing with 4-element hob</h3> <p>Stove guard installation height: 50 cm Sensibility setting: 6</p> <p>All tests were performed with range hood switched on.</p> <p><i>Table 4: Results from testing of Siro Airis with a four element hob.</i></p>							
Test	Test criteria category B	Element	Test ID	Oil temperature at power cut-off [°C]	Ignition within 10 minutes [yes/no]	Criteria met [yes/no]	
1	Test device for false alarm	Rear left	1A	231	No	Yes	
2	Test device on all plates, one by one	Rear left	2A-1	181	No	Yes	
		Rear right	2A-2	192	No	Yes	
		Front right	2A-3	250	No	Yes	
		Front left	2A-4	285	No	Yes	
3	Test device with cast iron pan on plate with worst result from test 2	Front left	3A	255	No	Yes	

Here it can see when the product cuts off the power and how the oil temperature raise has been stopped before it reaches 330°C which is the limit to pass the BS EN 50615 tests (it has been chosen so that there is a safe margin before oil self-ignition temperature).

**Q: Also if the system depends on a rise in temperature around the hob how does it differentiate between the normal rise in cooking temperature for frying or braising and a potential ignition source; has a study been done on the occurrences of false alarms from the system?**

A: There are several algorithms and sensors used to prevent false alarms also because it is critical to user acceptance. In the standard BS EN 50615 there is a specific test for testing the product's ability to avoid false alarms: as shown below.



This test is very good false alarm test but it is also a good test to see the overall performance of the product, because at the end of the test the system is also required to prevent the hazard created with the fourth pot - basically the system is simultaneously avoiding a false alarm and preventing an actual hazard.

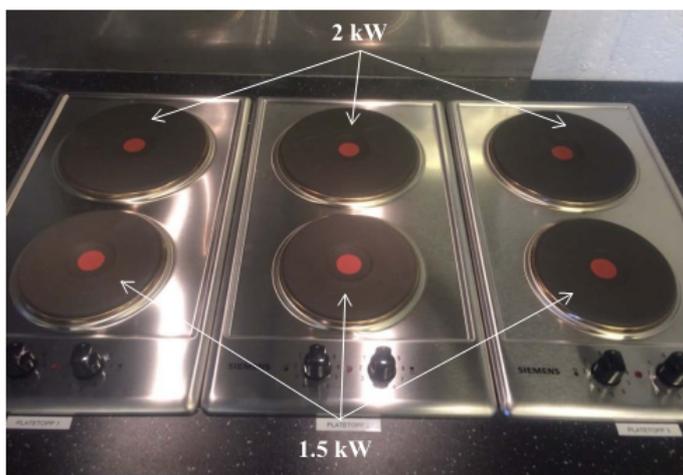
**Q: Also if the system simply cuts of power to the hob, some electric hobs take a time to cool down and could still provide an ignition source to a fuel adjacent to a hob?.**

A: This has been taken care in the standard. Item 2.2 of the test certificate shows the type of the hob used which is cast iron which would continue to hold the heat after power isolation.

## 2.2 Hob

The tests were performed using a hob with cast iron elements as described in EN 60335-2-31, section 11.2 installed in a base cabinet as described in EN 50615. The hob comprise 3 units of the type Siemens ET 13051, each consisting of one 2 kW rear element and one 1.5 kW front element, see Picture 1.

All tests were performed with 2 units forming a 60 cm hob with 4 elements.



Picture 1: Test hob.

The image below shows the pan used in the tests. The hob (cast iron) and the pan (thick cast iron) have been especially chosen to the tests because these type of hobs and cooking vessels create the worst case scenario for the temperature rise after power cut off.



Picture 4: False alarm test with 4 elements. Vessel with oil placed at rear left element.



Picture 6: Cast iron pan used during tests.



Picture 5: Test with cast iron pan placed on front right element.



Picture 7: Test set up with 6 element hob.

## 6.0 CONCLUSION

The Department for Communities and Local Government statistical demonstrate that 52% of domestic fires were caused by the cooking appliances.

The British Standard BS EN50615 is relevant to preventing kitchen hob fires.

The BS EN50615 standard requires the penetrative device to:

- raise a pre warning alarm,
- have the ability to disconnect the hob from the electricity supply before a fire starts,
- have the ability to cut off the hob electricity supply before the temperature reaches a dangerous level,
- ensure that the electricity cut-off is not be triggered by a false alarm.

On reviewing the various systems on the market it was found the Hob Guard Safera proofed to be the most reliable product on the market and meets the BS EN50615 in the prevention of hob fires.

The Hob Guard Safera provides a reliable method of preventing hob fires and removing the hob risk from the space.

The Hob Guard Safera also provides a reliable fast responding means of local detection well before the ceiling mounted heat detector.

Based upon the reliability of the Hob Guard Safera, the hob position becomes irrelevant as part of an engineered solution.

**Appendix AA EN50615:2015 COMPLIANCE TEST REPORT (Summary)**

The full detail Test Report can be made available upon Request.



## Test report – SAFERA Airis

EN 50615:2015 Household and similar electrical appliances – Safety.  
Particular requirements for devices for fire prevention and suppression  
for electric hobs (cooktops)

SP Fire Research AS



SPFR Report 20005-04



## Test report – SAFERA Airis

EN 50615:2015 Household and similar electric appliances – Safety. Particular requirements for devices for fire prevention and suppression for electric hobs (cooktops)

<b>VERSION</b> 1	<b>DATE</b> 2015-09-29	
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### ABSTRACT

Stove guard SAFERA Airis with Power Control Unit PCU5.1-P has been tested and found to comply with the performance requirements according to EN 50615:2015 for Category B devices.

Included in this is also the stove guards Garo SR3 AND Athena Nordic Spisec AddOn.

Sound level of audible warning has been measured and found to comply with the requirements for EN 54-3:2014.

Protection in case of removal/relocation of sensor or important parts of the device has been tested and found to comply with the requirements of EN 50615:2015.

The test results relate only to the items tested

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<b>REPORT NO.</b> 20005-04	<b>CLASSIFICATION</b> Restricted

# EC/EEA DECLARATION OF CONFORMITY



The undersigned, representing the following manufacturer  
 SAFERA Oy, Muuntotie 1 C1 FI-01510 Vantaa Finland

herewith declares that the products  
 SAFERA Airis

are in conformity with the provisions of the following EC directives

Ref. no	Title
2006/95/EC	Low Voltage Directive
2004/108/EC	Electromagnetic Compatibility Directive
1999/5/EC	Radio and Telecommunications Terminal Equipment Directive
2002/95/EC	Directive Regarding the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment
2002/96/EC	Waste Electrical and Electronic Equipment (WEEE)

and that the following standards and/or technical specifications have been applied

Ref. no	Title
EN 50615, category B	Household and similar electrical appliances. Safety. Particular requirements for devices for fire prevention and suppression for electric hobs (cooktops)
EN 301 489-1: 2011 (V1.9.2)	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements
EN 301 489-17: 2009 (V2.1.1)	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment; Part 17: Specific conditions for Broadband Data Transmission Systems
EN 55014-1:2000 / CISPR 14-1	Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission
EN 55014-2:1997 / CISPR 14-2 + Amd.2	Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 2: Immunity - Product family standard
ETSI EN 300 328: 2012 (V.1.8.1)	Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques
EN 60730-1: 2000 + A12 + A13 + A1 + A14 + A16 + A2	Automatic electrical controls for household and similar use, Part 1: General requirements
EN 60730-2-9: 2010	Automatic electrical controls for household and similar use, Part 2-9: Particular requirements for temperature sensing controls
EN 60335-1: 2010 (ed 5.0)	Safety of household and similar electrical appliances, Part 1: General requirements
EN 60335-2-31: 2002 / A1:2006	Safety of household and similar electrical appliances, Part 2-31: Particular requirements for range hoods.

Vantaa Finland 1.5.2015



Henri Andell, CEO

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