



HOW LONG ARE WE EXPECTED TO WAIT FOR  
**INSTANT**  
BOILING WATER?

# AT LAST, THE TECHNOLOGY TO

## **The time has come for a brand new way to generate freshly, boiling water**

Existing instant boiling water taps are not instant. They have slow heaters that take a long time to bring cold water to the boil - so to overcome this handicap they all have reservoirs of pre-heated water to create the illusion of 'instant'. What this means for the user is that the water is never freshly boiled – something that serious tea and coffee drinkers would notice at once.

## **Full temperature in two seconds and then hot water by the sink full**

Because the heating is direct and immediate, a Cressall RapidHeater can produce a steady flow of hot water at any desired temperature: 90-95° for making tea and coffee, 35-40° for washing. If a RapidHeater is built in to a drinks machine the compact size of the heater and the elimination of the need for a hot water reservoir means savings in both size and materials.



*A proposed design for domestic application.*

# MATCH CONSUMER DEMANDS

## **Instant cost, space and energy savings**

An instant boiling water tap is convenient, saves time and saves energy when compared to the alternative of a kettle or stored supply. The new Cressall RapidHeater heats only the water immediately needed and heats it as it flows.

RapidHeat technology, which is new for this application, can create heaters that are superior to existing designs in size, weight and cost and the output that they produce. The market potential is obvious.

## **New materials and new technology lead to a new solution**

What has made this breakthrough possible is the use of a novel heat transfer technology created and patented by Cressall Resistors, making use of the most advanced ceramic materials to create a heater with almost no time lag between turning it on and the output of water at the desired temperature.

Traditional metal-sheathed mineral-insulated heaters are tubular in form, needing two separate layers of material between the wire heating element and the water to be heated: stainless steel for physical separation and magnesium oxide for electrical insulation. By contrast a RapidHeater uses a single thin layer of advanced ceramic between the element and the water, one that combines the traditional excellent insulation characteristics of most ceramics with an unusually high heat transfer coefficient that puts it in the same class as the more conductive metals such as aluminium and copper.

The very high power density achievable by using this material is what makes a RapidHeater responsive and compact.

## **A market of millions**

The Instantaneous electric water heater market in Europe alone is estimated to be 1.15 million units per year. RapidHeater's small size, low cost and energy efficiency opens up even more opportunities in both domestic and commercial fields such as laboratories, food processing, catering, hospitals, hygiene, vending machines and plumbing. These, and other markets, are just waiting to be explored and exploited. Which is why Cressall are looking for partners for next exciting stage of RapidHeat development.

**Advanced technology transferred from the aircraft carrier to the kitchen.**



Even the most traditional products and technologies are subject to innovation with new materials, processes and concepts. This is true even for such basic electrical components as resistors. For example, the recent trend for electric propulsion in large ships (from cruise ships to aircraft carriers such as the Royal Navy's new Queen Elizabeth class) has created a need for high power water-cooled resistors.

For this new market Cressall developed innovative products such as the EV2 - the most compact water-cooled brake resistor of any type - and the same development programme later gave rise to the RapidHeater concept as described in this leaflet.



## High conductivity *and* high resistivity: the contradiction behind the breakthrough.

The new ceramic material used in the EV2 has properties that individually are found in many materials but rarely together in the same one.

### These key properties are:

Very high thermal conductivity (140-180 W/m<sup>2</sup>K): comparable to aluminium, better than most common metals, enabling very high heat transfer at low temperature differences.

Very high electrical resistivity (>10<sup>14</sup> Ω.cm): comparable to most ceramics, enabling construction of high voltage (up to 7.2kV) heaters.

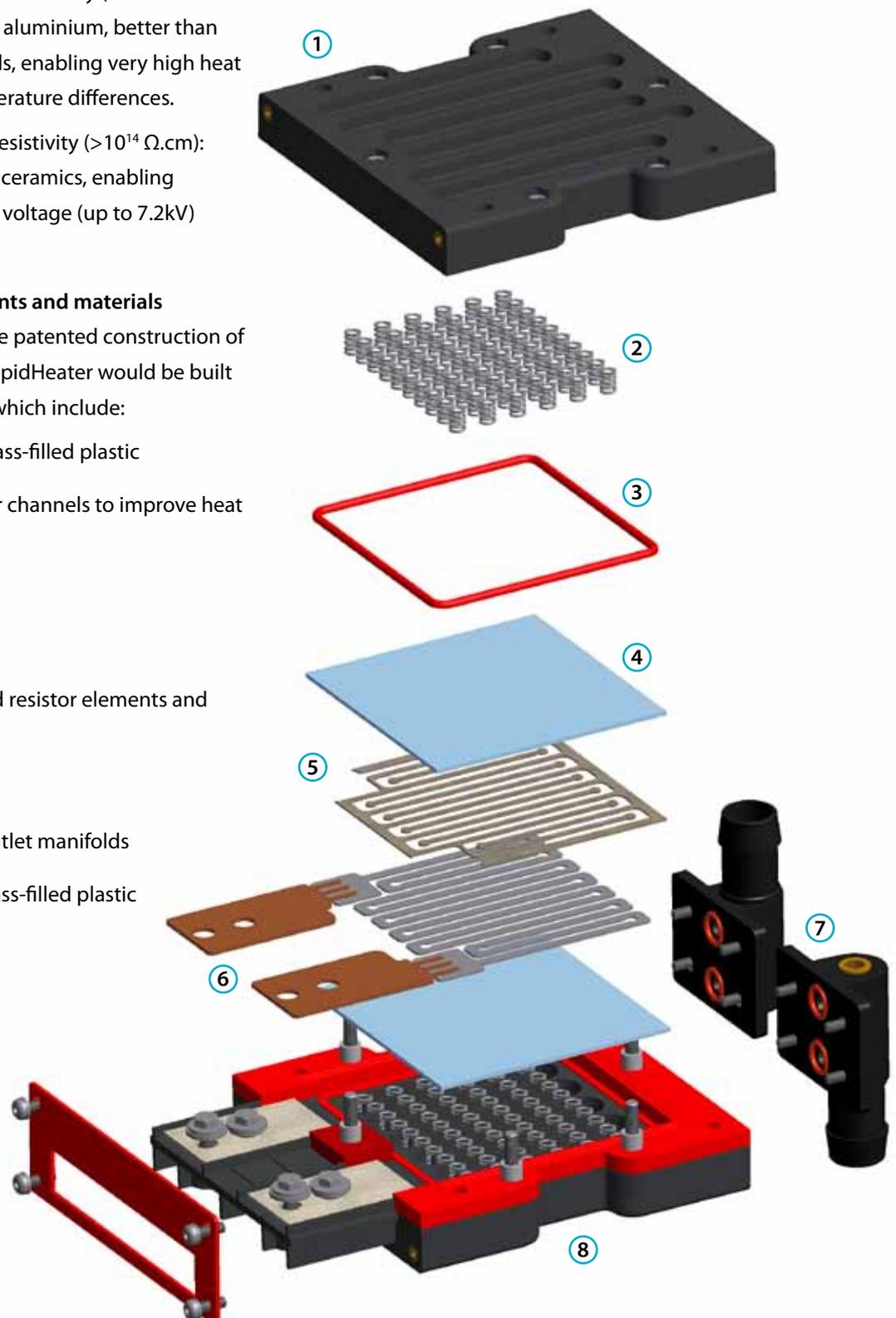
### Construction, components and materials

The illustration shows the patented construction of the 25kW rated EV2; a RapidHeater would be built on the same principles, which include:

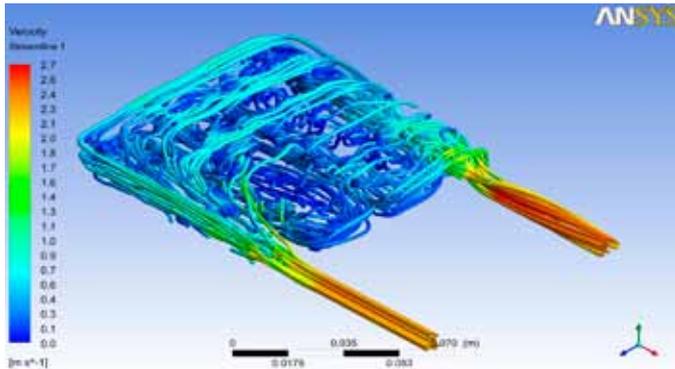
1. Heater cover in glass-filled plastic
2. Spring-filled water channels to improve heat transfer
3. O-ring seal
4. Ceramic plate.
5. Fully encapsulated resistor elements and spacers
6. Copper terminals
7. Water inlet and outlet manifolds
8. Heater body in glass-filled plastic

### Ingress protection

IP56 to BS-EN 60529

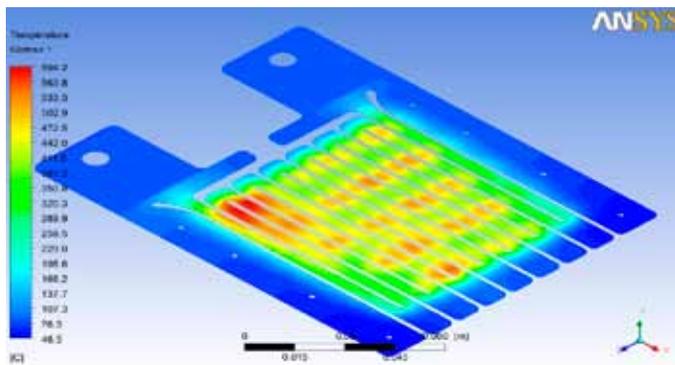


## The current EV2 unit performance



Water flow FEA

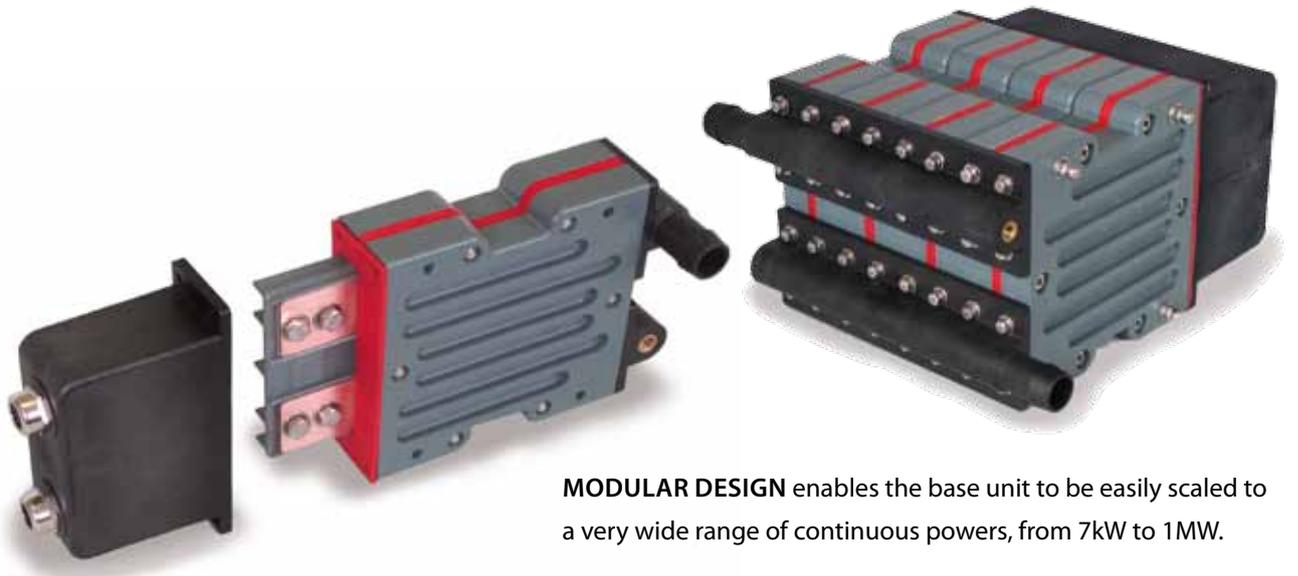
**COMPUTER MODELLING** has included extensive modelling and full-scale testing of the fluid flows, heat transfer and stresses within the component materials. The design has been through numerous iterations before reaching its present standard.



Grid temperature FEA



**SHOCK AND VIBRATION TESTING** with simultaneous power cycling was carried out in our own laboratories to current automotive and traction standards (spectrum to Jaguar Land Rover specification, five hours in each axis).



**MODULAR DESIGN** enables the base unit to be easily scaled to a very wide range of continuous powers, from 7kW to 1MW.

# THE NEXT STEP: JOIN THE PARTNERSHIP

Visit [www.cressall.com](http://www.cressall.com) and you'll see that our expertise and experience are in the design and manufacture of industrial resistors, which is why we are looking for partners to develop the market for, and profit from this revolutionary water heater.

Initial development was completed in 2015, with funding from the EU Research Executive Agency. The RapidHeat consortium of five companies and two research institutes



now need collaborators to commercialise the RapidHeat technology recently patented in Europe, North America and Asia.

If you are already marketing your products to the scientific research, medical, public hygiene, food processing and heating industries, then you should investigate how the RapidHeater can help you improve your current product range.

If you supply the domestic hot water or hot drinks markets, then the RapidHeater could be the competitive breakthrough you've been waiting for.

Or if you can imagine a completely new application for a compact, energy efficient water heater then we're keen to help you develop your idea further.

To find out more about the RapidHeater and see it in action contact us now.

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