

# HOW A TOURER IS TESTED FOR EXTREME CARAVANNING

Measuring temperature, thermal efficiency and cost is a fascinating scientific process, as we discovered when we spent a day finding out how a caravan is analysed

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**t**ouring in sub-zero temperatures is an every-year occurrence for many caravanners; in Britain that can mean -8°C or -9°C. Few of us may aspire to caravanning in near-Arctic conditions. But it's comforting to know that many of today's caravans are manufactured to withstand extreme temperatures.

Grade 3 thermal insulation is now an industry standard. But how is it tested? We spent a day at Britain's first caravan-specific Climate Centre to find out.

Truma opened its Climate Centre in December last year. The first caravan inside it was a Coachman. And we were there, too. Coachman's

designers were keen to test that, in practice, the figures that they have achieved by calculation are accurate.

### How Grade 3 Thermal Insulation is calculated

A mathematical equation takes into consideration the number of windows, thickness of insulation, floor size, and heater output. Thermal losses are calculated in order to establish whether a caravan meets Grade 2, or 3, standard.

### The Climate Centre test

The climate centre chamber is basically a giant refrigerator. The

evening before its test day the Coachman Pastiche 520/4 was reversed into the "fridge" and the giant doors were closed. Ten overnight hours allowed the temperature in the chamber to sink to -15°C and every component in the Pastiche to become "soaked" (Truma's term) in the cold temperature.

To set up the Grade 3 test, Truma attaches a minimum of five temperature probes to the inside of the caravan. They have to be in very specific locations: two at the front corners, two at the rear corners and one in the centre; all



## CLIMATE CENTRES

Truma has had climate centres at its headquarters at Putzbrunn, near Munich, since the 1970s, because winter camping on the continent has been the norm for many years, relating to skiing in particular.

"These climate centres have always been open to UK caravan manufacturers to use but there is a massive cost in getting a caravan there, and a difficulty over timing. When a new model year's prototypes emerge, there is a window of only few days for testing, so a queue will form and opportunities are missed," Martin Fitzpatrick told *Caravan Buyer*.

For these reasons, Truma and Alde got together in a joint project to bring the facility of climate centre testing into the UK. Martin explained: "Truma and Alde each contributed significantly over six figures to build this centre." It opened in December 2012.



ABOVE The Pastiche is reversed into the Climate Centre for the test

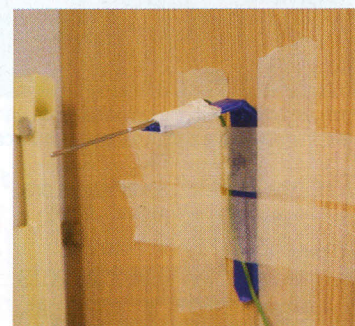
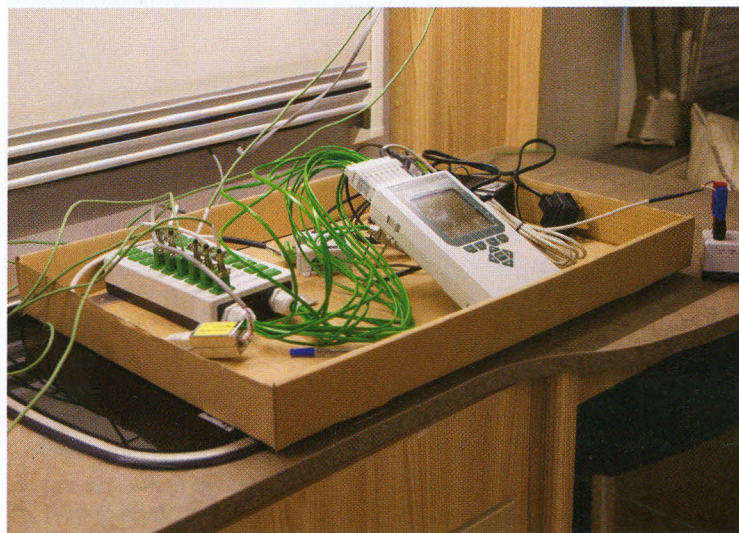
LEFT During the test, showing the temperature variations, taken with Truma's thermal imaging camera



ABOVE It's -15°C and Truma has equipped me with a special jacket for the experience!

LEFT A mass of probes and connections, to measure the temperature in various parts of the Coachman

RIGHT This probe measures air temperature in the area of the side dining table



must be one metre above the floor.

The probes feed information through the cold chamber wall into a data logger in the climate centre's control room.

Five probes are the minimum required to meet the standard for testing but Truma's test facility has the ability have up to 25 probes in place, which can then produce a vast array of information for the research and development department of a caravan manufacturer to aid improvement in future models. Truma's sales manager Martin Fitzpatrick explained: "It's not about

just proving the mathematical calculations that establish Grade 3; it's about highlighting any area where there are temperature differences and cold spots.

### A CULTURE OF TESTING

*Testing is very much part of the Coachman culture, and the company wanted to prove the efficacy of the maths. Jim Hibbs, managing director of Coachman Caravans, told Caravan Buyer: "The goal at Coachman is to produce the perfect caravan. Our team of designers and engineers work closely with our suppliers to ensure that only the very best components are used. Testing of prototype caravans at each stage of development is a fundamental part of the whole design process."*

"Coachman has insisted on probes in various places in addition to the standard five, in that company's desire to make a uniformly warmed product." Extra probes were placed in the head-height lockers and bedding lockers of the Pastiche.

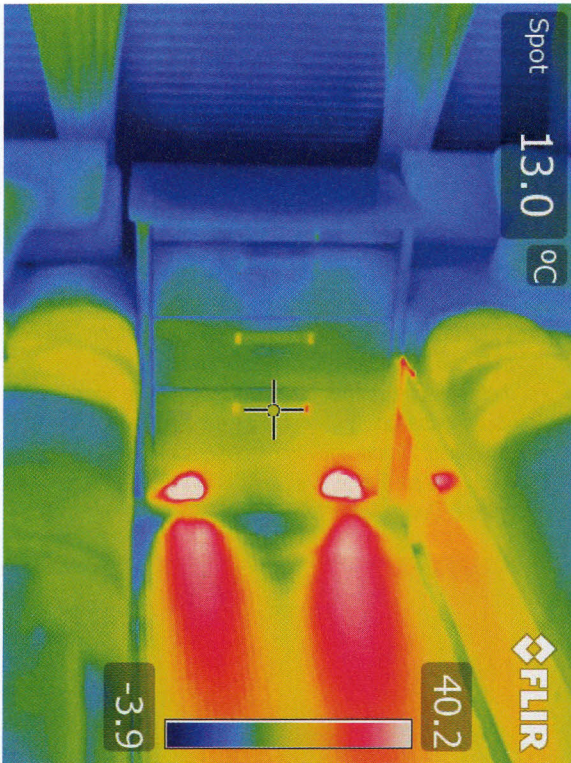
### The testing procedure

Each caravan has to be in the cold chamber for two days, including 10 hours overnight, before the test day.

All the windows and locker doors are opened to ensure the whole caravan is at -15°C. With the caravan thoroughly chilled down to



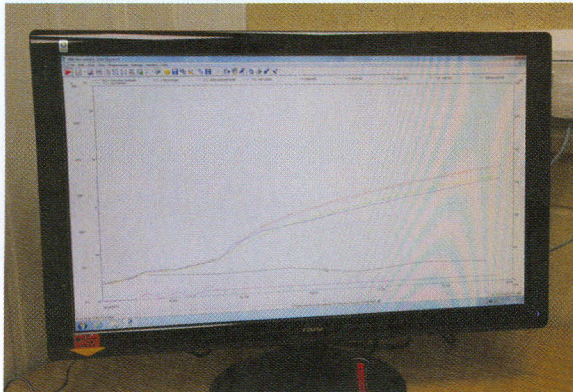
# Advice ▶ Thermal efficiency and heating speed



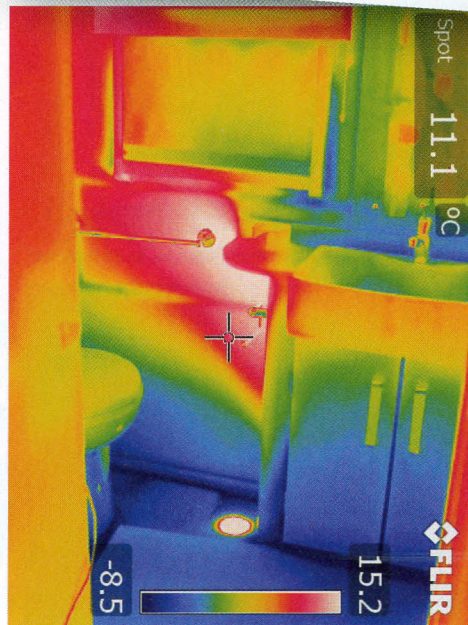
From -3.9C to +40.2C, where warm air is being pumped out from the vents



The measurements enter the control room through this device and are transmitted to the graph we see on the screen



Inside the control room, the temperature rise is tracked on a graph as the measurements come in from the probes in the caravan



One of the many probes measuring the temperature inside the caravan

-15°C, the windows and lockers are then closed and the heating is turned on. The highest setting is used, which, in the case of the 2013 Coachman Pastiche, is 4kw on gas, (it's 3.8kw using gas and electricity, that is 1.8 electricity and 2 gas.)

The test is continually monitored by the data logger in the control room. No access to the caravan is needed, so its controlled temperature environment is not disturbed.

The test allows for a maximum of four hours to warm the caravan from -15°C to 20°C.

And the result? The test established that the 520/4 warmed from -15°C to 20°C in 2 hours 40 minutes.

## The second part of the test

The test has a second part to it: the temperature must stabilise for

another hour, at 20°C at the centre reference point in the caravan. For this part of the test, the heating stays on, at the same setting, allowing the automatic control to take over.

## The water test

The last part of the test is water. The test states that after the four-hour test period we should be able to turn the water on at both the sink and the shower, testing to ensure none of the pipes are frozen. This part of the test proves that the heating is consistent all over the caravan and that piping running within the under-bed lockers and under furniture has not been affected by the extreme temperature.

After water is introduced, the test continues for two hours to

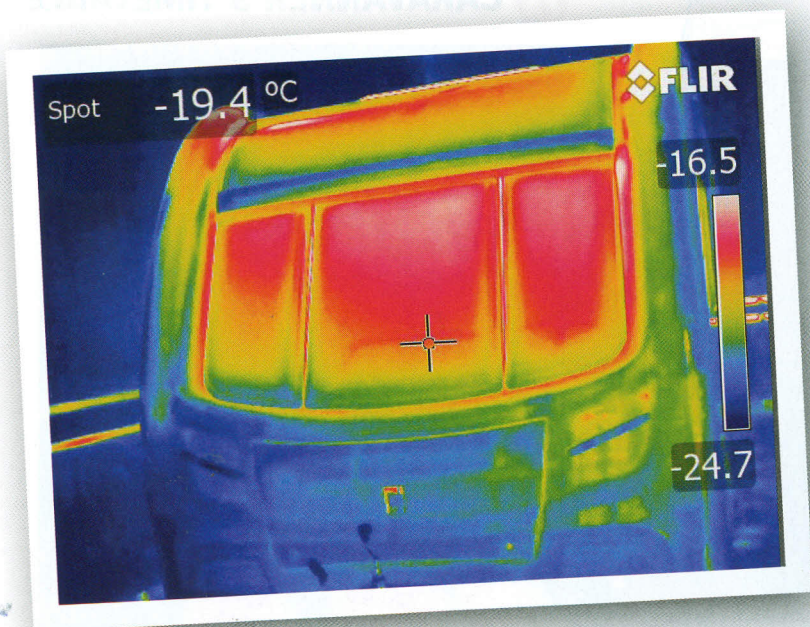
From -8.5C to +15C, showing the temperature variation in the shower room; Caravan Buyer is grateful to Truma for taking these thermal imaging camera pictures during our test day

monitor thermal losses, through consumption of gas, 230v and 12volt power for the fan.

There are two messages to emerge from this stage of the test. One is how quickly the caravan warms and the second is how much gas and electricity is used in the process. A flow metre is put on gas system. Blinds are closed before test starts.

The last two hours of the test recorded the energy use. In the Pastiche, when the heating system was on dual fuel, over that two-hour period, it used 277g of gas and 2.04kw hours of electricity and 1.6Ah of 12v. The temperature outside the caravan was still -15°. The Truma Combi system measures temperature; it balances the use of gas and electricity use to maintain the

## Advice ▶ Thermal efficiency and heating speed



The well-chilled Pastiche; the temperature has now reached -19.4°C

temperature. As the caravan cools slightly, the system switches on the gas to boost the warmth, and then goes back to electricity to maintain that temperature.

Normally when it's switched to its 4kw gas mode, the system would use 320grams of gas an hour; over 2 hours, therefore it would have used 640grams. But, by also using electricity as it detects temperature and switches from one to the other automatically, what it actually achieved, during the test that we witnessed, was a consumption of only 277grams.

So how does this science relate to owners and buyers of caravans,

kept to be assured of warmth? Martin Fitzpatrick explained: "It relates in two ways. What you want to know, as a caravan buyer, is whatever the temperature is outside, when you put the heating on, you get a quick result. The second thing a caravan owner needs to know is how efficient or economic to run the system is going to be and, while we can't put an exact daily figure on it, what we can tell is that the better insulated and well built the caravan is, coupled with how efficient the heating system is, and how intelligent it is, the lower the fuel bills will be."



Behind closed doors, the Pastiche is chilled down to -15°C



Photographer John, attired in a Truma freeze-protective jacket, poses for Truma's thermal image camera with the Coachman in the cold chamber

### HOW A TRUMA COMBI HEATER WORKS

*A Truma Combi has dual fuel capability. And intelligence. When set in this mode this means it can use gas and electrical power together to warm the caravan quickly. When the desired temperature is reached, the Combi will automatically switch to electricity, to maintain the temperature inside the caravan and, importantly, preserve your gas.*

*How that works: Imagine you have set a room temperature of 20°C. When the Combi decides it's almost there, (approximately 2 degrees below this setting) it switches from gas and electricity to electricity only. The mains power will then keep it going, to reach and maintain your target temperature.*

*If you open the door and let a significant amount of heat escape, the Combi will sense that, and will turn the gas back on. It uses gas for speed and power, and electricity for maintaining the temperature.*

*When the Combi starts to work, using either gas or electricity or both (selected on the control panel), it will heat the central core heat exchanger and, once this gets up to temperature, it will turn on the circulation fan to distribute warm air around the caravan. Temperature probes within the Combi can detect if the fan can be speeded up or slowed down to achieve the optimum result automatically.*



The inside of a Truma heater unit, showing the central core heat exchanger