On test in the Climate centre

We look at efforts from leading heater manufacturer Truma and Coachman Caravans to improve their tourers' all-season credentials

'GRADE 3 CERTIFICATION' – it sounds like a dry subject, but it's a hot topic in the caravan industry right now. Put simply, it refers to the thermal properties of a touring caravan, and caravan manufacturers are keen to claim this high standard in their brochures. But what does it mean and how is it achieved?

Most new UK-built caravans are now accredited with EN1645-1 Grade 3: it's the highest standard for thermal insulation and heating, and implies that they are suitable for use in winter conditions. We've made clear in previous issues that this accreditation can be gained simply by theoretical calculation, based on insulation and heating specifications, or by testing in a climate chamber.

We've also recommended that buyers planning to tour all year and in colder climes opt for tested models. That's not just because it's more reliable than calculation: testing also allows designers to identify heating efficiency and distribution issues, therefore increasing comfort and economy.

Heating system manufacturer Truma opened a new Climate Centre at its UK headquarters in Derbyshire this year, with the declared objective of improving caravan heating and comfort via testing and learning. The underlying message to caravan manufacturers was that they had work to do. Truma's customers have jumped at the opportunity, and the Climate Centre has been fully occupied since it opened.

Truma's UK headquarters and home to the Climate Centre

Heating wars

This initiative by Truma is another move in the battle for market share in the caravan industry. Its primary competitors are Alde, the Swedish company that produces the popular radiator system, and Whale, whose new ducted-air heating is attracting attention. Each season, new vans get upgraded heater performance and control systems as the three vie to prove which is best.

> "The message to van manufacturers was they had work to do"

Coachman was the first manufacturer to use Truma's programmable Combi – a single unit that provides both space and water heating, which was previously supplied by separate appliances. Others followed, and now Truma has uprated its units to give smaller vans 4kW, and larger models 6kW.

Coachman has gone a step further and added isotherm ducting to the blown-air systems in its 2014 Pastiche, VIP and Laser ranges. Isotherm ducting introduces warm air between the seat backrests and walls, improving comfort in a way similar to Alde's radiators.

Just how good is this new system and how are the tests done? To find out, we watched as a 2014 Pastiche 520/4 – with a Truma Combi 6E and isotherm ducting – was put through its paces in the climate chamber.

Record results

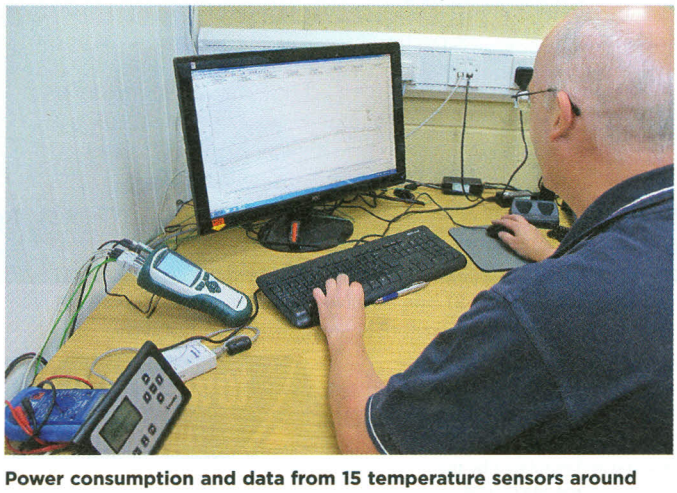
Stepping from pleasant summer temperatures in the mid-20s to the climate chamber's -15C is sharp shock, even when you're snuggled up in a thick coat. There was little to see other than a trace of steam instantly turning to ice below the Pastiche's heater flue – and going inside the caravan would disturb the Grade 3 test. So we retired to the control centre. Here we saw wires from the Pastiche to a central data logger, and a large PC monitor showing continuous plots from temperature sensors, the gas flow rate, and 12V and 230V power consumption.

The previous afternoon, Truma engineers had drained the water from the Pastiche, opened the doors and windows, and had run the chamber at -15C overnight to ensure that the whole van reached the same temperature. On the morning of the test, the van had been sealed, with its curtains and blinds closed (allowed in the test), and the heating system run full-blast.

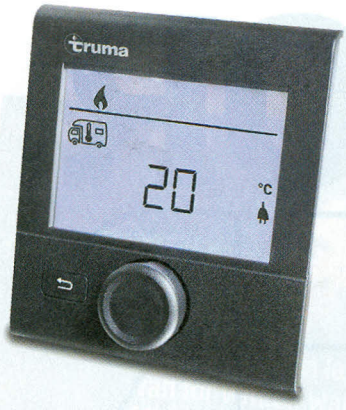
The Combi 6E was then operated continuously at full power, producing 4kW from gas and 1.8kW from its 230V element. Five temperature sensors inside the van are required for the Grade 3 test: all are located 1m from the floor, with one centrally placed and the others in each corner. To pass the first part of the test, the central sensor must reach 20C within four hours of when the heater is started – that's a rise of 35C. At the same time, the four corner probes must be between 13C and 27C.

Turning back to the screen, we watched the readings rise rapidly. The central sensor hit the target in a record time of one hour and 26 minutes. More remarkable still, the four corner probes were each within 1C of this, thanks to even heat distribution and the isotherm ducts behind the backrests.

With the 20C target achieved, the Pastiche's thermostat was remotely adjusted from the control room to keep the central



Power consumption and data from 15 temperature sensors around the caravan during testing are monitored in the control room



Truma's new panel controls the Combi water and space heater

sensor at that temperature for one hour. The graph showed the heater modulating its output. Once conditions were steady, all five main sensors stayed within 3C of each other. It again passed the Grade 3 test. Meanwhile, we were fascinated by the behaviour of additional sensors, but more on them later.

Next came the water test, in which the van's entire water system is run to find cold spots in remote corners. If a van fails a test it is often at this stage. Fortunately, the Coachman was successful, and the system ran steadily for another two hours as gas and electricity consumption were checked.

Big improvements

Next, we compared how the 2014 Pastiche compared with the 2013 model, tested in February 2013, and with other tourers.

The 2013 Pastiche 520/4 had a Truma Combi 4E heater and standard ducting without isotherm sections. It reached 20C in two hours and 40 minutes. That's 74 minutes slower than the new model. The temperatures at the corners were lower than at the centre, the opposite of the 2014 Pastiche, whose new duct layout included the extra isotherms. So people seated in the lounge would be more comfortable in the new Pastiche.

Another revelation was the minimum heater size that would net Grade 3 for the Pastiche by calculation. Coachman engineers put it at just 2.4kW and we would know nothing about the four corner temperatures. That speaks volumes for the potential difference in performance among vans claiming Grade 3.

Beyond Grade 3

Impressive results then, but Coachman's designers also had more work to do. They'd requested 10 extra temperature sensors at critical points in the Pastiche. These recorded interesting results while the system was running that were investigated after the test.

The washroom was about 5C cooler than the rest of the van. Coachman may fit duct baffles to adjust that but, if it doesn't, it's easy for the owner to adjust butterfly outlets to increase the washroom temperature.

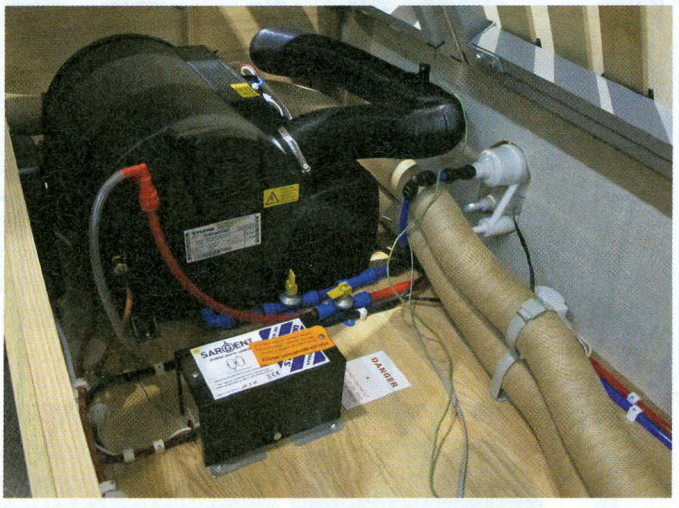
Temperatures under the front seats varied: it was warmer in the offside seat box, where the Combi is housed and twin ducts run rearwards. The short run of duct in the nearside didn't help – it was still below zero there when the van reached 20C and crept to 5C during the rest of the test. Resolving that is simple: a duct running through the seat to the awning warmer could be tapped to increase warmth.

Arguably the most important issue was highlighted by a central floor-level sensor that cooled rapidly when the heater dropped to low output, then warmed again once the fan kicked in. In the van we could feel very cold air around the kitchen floor and into part of the seating area, which would be uncomfortable.

Truma's thermal imaging camera quickly confirmed the source: air at -14C was entering a statutory ventilation inlet under the oven and spreading quickly across the floor. The vent is vital for occupants' safety and should never be blocked, because it ensures that carbon monoxide and other dangerous pollutants are dispersed. We understand Coachman will look at resiting the vent to where the incoming air can be preheated.

So, we learned that uprating heater power from 6kW to 4kW has a big impact on warm-up time and that adding isotherm ducting offers comfort levels similar to Alde's radiator system.

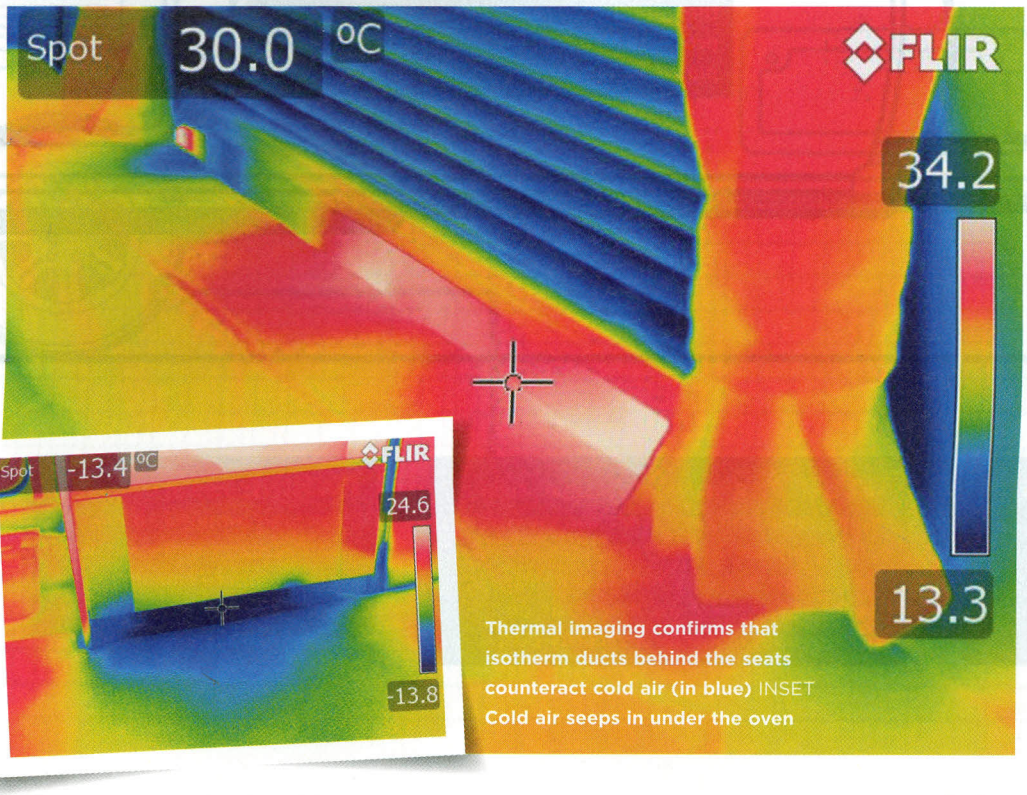
Vitally, climate chamber testing reveals opportunities to improve even the best-performing vans for winter use, and it's obvious from the whole experience of our day at Truma that caravans certified as Grade 3 by calculation only are unlikely to be the ideal choice for really cold conditions. PC



The Combi heater and double ducts are sited in the offside seat base

At -15C, ice forms below the Pastiche's heater exhaust

The central sensor in this van recorded a 35C rise in record time



Thermal imaging confirms that isotherm ducts behind the seats counteract cold air (in blue) INSET **Cold air seeps in under the oven**