

TECH: SPECIALIST

CARGRAPHIC

For over two decades Cargraphic has supplied its own British-made exhaust systems and other Porsche tuning equipment. We paid a visit to their Landau headquarters and drove three of their cars in the beautiful Pfalz countryside

Words: Johnny Tipler Photography: Antony Fraser



Sooner or later you'll need to replace your exhaust system. Or you'll be seduced by the notion of upgrading for the sake of performance increase, or merely making more noise. Chances are, as you surf the net for suppliers, you'll hit on Cargraphic. Based in Landau, a historic town in the heart of the southwest German wine-growing Pfalz region, the firm has been marketing Porsche exhausts for over 20 years, since patron Thomas Schnarr went into partnership with Simon Young, who manufactures Cargraphic's own manifolds, catalytic converters, silencers (with or without integrated flaps), and Active Sound exhausts for diesel engines at his Cullompton factory in Devon, GB.

Cargraphic's aftermarket Porsche accessories catalogue also features performance components such as its own three-piece wheels and AirLift kit – a front-axle lift system for cars with lowered suspension and limited ground clearance – as applied to my colleague's 996 GT3 but, alas, not my slammed 996 C2.

One of the most positive characters you could hope to meet, Thomas Schnarr is constantly upbeat: 'Our best business at the

moment is with the 981 Boxster and Cayman engine, particularly the 981 GT4; we must have sold 250 manifold sets already, and there's a race series that we have built a special exhaust system for which they all have to run, so this is really good business.' He tells us that the Cayman GT4 manifold also fits the regular Cayman, so that's beneficial. 'There are three models in that bracket,' he continues: 'the normal Cayman and Boxster, which run a smaller diameter 45mm manifold because of the engine capacity and a combination of power and torque; and then we have the GT4 and the Spyder which have the 3.8, and they are on a 51mm primary pipe size; and also we have the race header for the race track or the Club Sport cars, and that is a long, primary race header which Simon developed on a car.'

The exhaust side of the business represents around three-quarters of the firm's turnover, and more recently the new Active Sound System has become Cargraphic's second most popular product line. Next up comes the company's own series of road wheels, available in six different styles – including Motorsport split-rims which we observe being assembled at Landau – and, last but not least,

performance upgrade components such as throttle bodies, intake plenums and lightweight flywheels.

Over in the Cullompton factory, 32 skilled craftsmen hand-build a variety of Cargraphic exhaust systems for the entire Porsche range. It's a cavern of alcoves, inner recesses lit by flashing welding torches, accompanied by a diverse soundtrack of clanking pipes, fizzing welders, machine tools, lathes, polishers and pop music, decorated by girlie calendars and intersected by shelves overflowing with segments of exhaust systems. In adjoining workshops sheet stainless steel is cut and curved and filled with a baffling variety of sound absorption materials prior to mating up with associated cats and pipework. 'All our silencers are assembled in the same way, wrapping two or three layers of stainless steel wire-wool around the baffle, plus a layer of needle mat which is glass-fibre blanket around the inside of the insulator case, and then we fill the void with glass robing, which is like glassfibre in a continuous filament so it doesn't break down. This is then pushed into the silencer under pressure, and these machines will squash the case to the right shape for the baffle so the internals retain the shape.'

A mixed bag in Cargraphic's workshop although with more classic than modern machinery as befitting of Cargraphic's move into the classic world as tuning and modifying the current generation becomes more restrictive. There will always be room for exhausts, though!

A full trophy cabinet is always a reassuring sign because winning anything always involves being at the top of your game. Middle: Cargraphic systems shout quality. Right: Cargraphic fit and recommend Bilstein



All parts are test-fitted, dyno-tested and TÜV approved in Germany. 'We have a prototype system or a component part made in England, then we get type approval; we receive an order and the finished article is produced and despatched. Our business is divided 80 per cent through dealers and 20 per cent private orders. We are constantly expanding, and we have a lot of growth potential in new markets like South America, South Africa and India, and we're doing a lot in Australia and New Zealand now. China has declined a little bit, but India and Malaysia are doing very well. India is a very big growth market, because they have loads of Cayennes and SUVs, if not sports cars.'

Cargraphic has a register of agents worldwide, including Parr Motorsport in the UK, and runs the mail-order operation from its Landau premises. The despatch department where orders are boxed up is in the main building with a staff of 12. The way dealers order items and components has altered radically: 'Whereas before we had dealers in America who bought containers full of stuff and kept a stock of it, this is no longer the case; they buy items as and when they need them, and that's because distribution systems like UPS and FedEx mean we have competitive freight rates, so we can send, for instance, a 997 Turbo

system today to the East Coast of the USA overnight for about 150 euros, and because everything goes via Memphis, Tennessee it takes another day to reach the West Coast, but it would be there within two days for 175 euros. Then the dealers despatch to the customers.'

Meanwhile, if you happen to be in the Landau area, Cargraphic has a spotless workshop run by three technicians, with three hoists and state-of-the-art equipment to carry out virtually any task on your

not so much 'why,' as 'how?' Up on the hoist Thomas points out a pair of bulbous speakers mounted just before the tail pipes, which are programmed to emit a petrol V8 rumble, which you can modulate to high- or low-pitch V8 via a smartphone app. But that's the exception. As Thomas says, 'we try to make our systems fit with OE parts, whereas other makes won't do, and in some cases you can't just replace the tail pipes or rear box because their systems won't match with the existing parts. Design-wise, with the

“ We try to make our systems fit with OE parts, where other makes don't ”

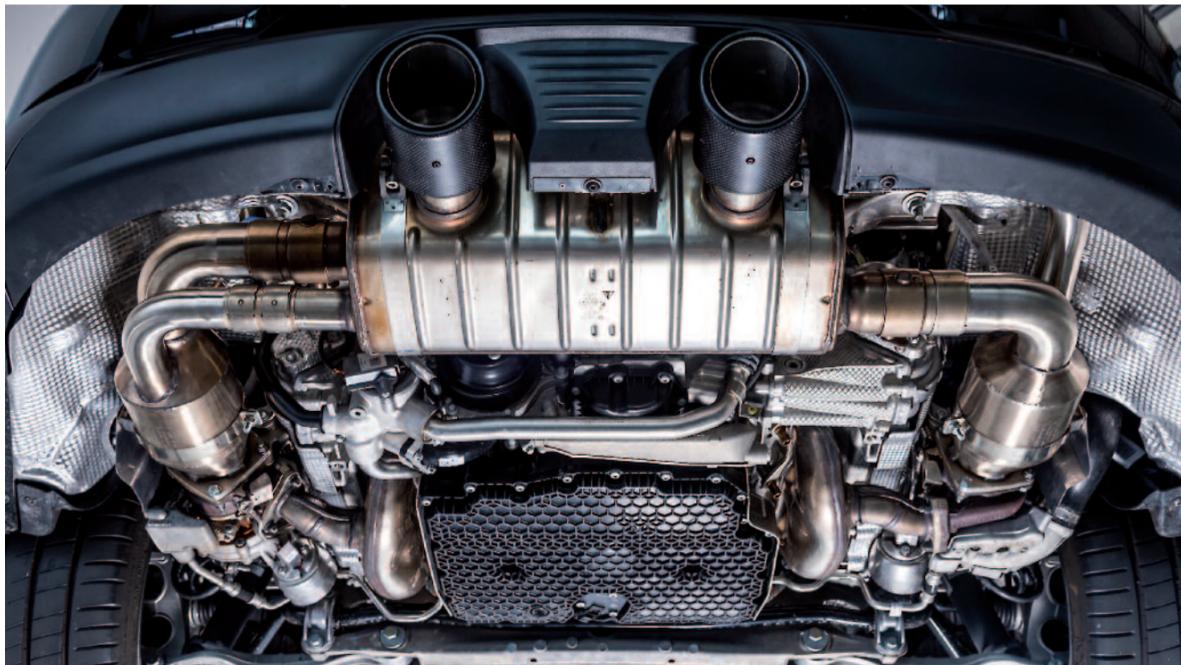
Porsche. By way of demonstrating the Cargraphic range, Thomas has three cars for us to try, each featuring very different Cargraphic apparatus. First up is a Macan diesel; not especially dear to Porsche aficionados, maybe, but nevertheless an extremely capable vehicle. A diesel, did I say? Well, when the techie fires it up I'm transported to the US-of-A, because this sounds like nothing other than a big-block American V8 petrol guzzler. The question is,

Cargraphic products, we always try to maximise flow, maximise power but still keeping it within a respectable – and legal – sound level. Because of the constraints with TÜV in Germany we can't have a system that's absolutely unfettered, so there has to be a compromise between the level of sound and the performance that can be gained, but our systems do tend to be more driveable and more user friendly as a result. You don't have that horrible droning in the

Cargraphic chief, Thomas Schnarr, has been at the forefront of Porsche tuning for over 20-years. Right: 2.7 RS replica is based on a Carrera 3.2 and is a wonderful drive



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Seems a shame to hide such quality workmanship away. Porsche exhaust systems are complicated things and quality aftermarket systems have to be of exceptional quality

It's not just exhausts. Cargraphic also produce wheels, with split-rims of varying sizes and widths a speciality



back of your head over long distances.' How they gauge whether a particular configuration of silencer and header and tailpipes, plus catalytic converter and heat exchangers is going to enhance the car's performance is, according to Thomas, 'very much an experience based thing. We have a decibel meter and we measure the car as standard and then we can do our own work

palladium Cargraphic exclusive cats, and there's an immediate gain to be had in fitting those when the factory parts are usually 600-cell, so immediately you've increased the flow by three times. If you're going for maximum power you should consider those, as a lot of the factory headers are particularly restrictive. And there are good gains to be made in replacing the stock

in full boom. Cargraphic's piece-de-resistance though is a 1987 3.2 Carrera, finished in Blood Orange and backdated accurately, aesthetically at least, to a 2.7 RS lookalike, complete with Carrera graphics on the lower flanks. 'I like the F-programme models,' says Thomas. 'I wanted a rust-free American late G50 car for this project, and I got this one three years ago: no accidents, no rust, and since then we've completely done it up.' The revised bodywork consists of carbon front wings, long-bonnet carbon front lid, steel doors, carbon ducktail and carbon rear bumper panel, the whole package weighing in at 1025kg. Suspension includes Bilstein Clubsport dampers with Weltmeister bushes, and retains the 3.2's torsion-bars. It's running Michelin TB15 classic racing tyres on 15in replica Fuchs wheels. The 3.2 Carrera-based flat-six is Cargraphic's RSC 3.2 power kit unit, rated at 283bhp, with top speed calculated at 267kph, and containing Cargraphic's own modified 964 cams and head porting. It's running a big air mass flow

“ There are good gains to be made in replacing the stock headers ”

and then measure the car.' That's done static and drive-by, rather than rolling road. Increasing bhp is also down to past experience: 'It's what we've learned over the years; we can work out primary diameters, primary lengths, and cats we know always give an improvement with the modern 200-cell, tri-coated T38 platinum, rhodium,

headers with our free-flowing headers.' Another car to benefit in this way is the 991 gen 2 Carrera 3.0 turbo Cabriolet which I sample out in the picturesque Pfalz vineyard countryside, featuring state-of-the-art Cargraphic exhaust and cat sections – a wonderful car on a sunny afternoon. I'm Johnny-look-at-me with the Sport system



Cargraphic exhausts are marketed and sold from the company's German base, but made in the UK – Devon, to be precise

sensor and BMC air filter, which forms a very neat arrangement, having been installed by Cargraphic's in-house technicians. The sparkling exhaust system, the Cargraphic GT exhaust with EURO2 catalytic converters and integrated flaps. There are three different grades of internal baffling for a Cargraphic 911 silencer, effectively, so you could have what would be considered an OE sound, which is identified as an ET, and then the TÜV box which is a little louder than standard and called an ETR, and then the non-TÜV export version which is an ETS. The orange car's comprehensive pipework includes the ET flap system, fitted with special flaps, pressure-less closed, with the advantage that the car always starts in quiet mode, and that is controlled by a vacuum that will open the flaps so the car can be driven quietly at low revs. Two further configurations can be specified for classic 911s. 'We have built this system with two versions for the earlier cars,' says Thomas, 'with a modified heat exchanger like this system that's fitted on the orange car, or with our full GT system which has the heat exchangers over the

catalytic converter; that works just as well, but you have more variations with the inlet pipe diameter so you can go bigger than the heat exchangers, so it's more powerful. In fact, we actually sell more GT systems than heat exchangers.' The orange 3.2 backdate reflects where Thomas sees the trend going in 911 ownership: 'I see the direction as classic,

991s, but for classic Porsches the possibilities are limitless. We have so many classic parts in store on the first and second floors of our main building, and this is in addition to our range of exhausts and tuning equipment.' Cargraphic's next project cars are a 964 and another 3.2: 'We are building two cars at present, a 964 WTL America Roadster in

“ The 3.2 backdate reflects where Thomas see the trend going for 911s ”

Cargraphic diesel Macan makes a V8 burble, thanks to exhaust and hidden speaker trickery, which can be controlled via a phone app! What will they think of next? 991 Cabrio is fully fitted with Cargraphic exhaust and wheels

especially as new cars become more and more tightly regulated. So I want to have a baseline for the next 20 years, and with our facility and our knowledge and what we can produce, I see the direction heading towards classic cars, because the next generation of regulations will make it very difficult for us, especially in this range. OK, there will always be people who want to upgrade their performance or maybe want a performance exhaust sound from their 996s or 997s or

white – it's a factory Turbo-look, one of 326 built, with all our goodies on it, including air-lift and the new flap system for the 964. We are also working on a 1987 G-model G50 3.2 Carrera which will have the '74-'75 3.0 Carrera RS look, which will be finished in Continental Orange.' Personally, I can't wait to get back to Landau, where I'll be sampling the local Dorfelder as well as Cargraphic's upgraded 911s, though, of course, not simultaneously. **PW**

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Many thanks to Eurotunnel for the swift transit to Le Shuttle aboard Le Shuttle eurotunnel.com

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TECH: PROJECTS

THE ART OF NOISE

Bent tubes and baffled boxes: who knew the subtleties and complexities inherent in an exhaust system, plus the variations in volume and sound quality available to the roar connoisseur. Pig Energy gets the Cargraphic treatment



JOHNNY TIPLER
996 C2
Occupation: Freelance writer, author
Previous Porsches: Carrera 3.2, 964 C2, Boxster 986
Current Porsches: 996 C2
Mods/options: Modified induction set up/K&N filters, remapped ECU, Dansk exhaust
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This month: Blowing exhaust replacement and a trip to Devon

Tipler's 996 C2 looking good with its new Turbo style nose

Noise sells cars; that is, if you subscribe to the notion that a vehicle's exhaust note is a powerful draw when it comes to coveting that car. Pig Energy has just received a pair of Cargraphic silencers, and the resulting soundtrack is achingly, lustfully strident.

Having spent most of January at Autofarm having its IMS bearing sorted as well as a lengthy list of renewables fitted and fettled, it wasn't long before I detected the exhaust was blowing. It grew louder, a gradual basso profundo crescendo. I stopped by at Autofarm again and the left-hand concertina section of the silencer pipe was ripped by corrosion. They kindly offered to weld in a new section, but a fresh pair of silencers was the preferred option. Enter our Landau-based friend Thomas Schnarr at Cargraphic. His range of specialised Porsche exhaust systems is manufactured in partnership with his Cullompton, Devon-based, associates Simon and Jon Young, and arrangements were made for me to take Pig Energy to their factory and get a pair of 996 Cargraphic silencers fitted. Handily, my wife's cousins live nearby at Bickleigh in wonderful rolling Exmoor countryside, so I overnighted with them and presented the car for silencing first thing in the morning.

Simon Young and Thomas Schnarr have been in partnership for 21 years, and their association goes back ten years before that when Simon worked for another exhaust firm that went into liquidation. 'Thomas wanted to keep our flow of products going, and we would have been producing systems for the

993 at the time.' So, while Simon's right-hand man Keith gets stuck into dismantling the 996's old silencers, Simon gives me a tour of their operation. There are three main workshops. As well as the individual fabrication booths there's a machine shop, pipe-bending machine, the polishing room, an area where brackets are made, and the chamber where silencers are assembled, where there's a guillotine and a machine tool that seam-welds cases. We walk past racks of pattern systems for all manner of Porsches, beside which technicians in curtained-off booths labour on work benches fashioning convoluted pipework, stainless-steel cylinders and panels, with welding torches flickering here and there, accompanied by the brouhaha of angle grinders, polishers and pipe benders. There's the usual hubbub of pop music, and I compliment Simon on his workforce's obvious dedication to their wives, whose photographs are pinned up at every workstation – all of whom seem very attractive, though why they wear so few clothes, if any at all, is a mystery.

Simon provides a commentary. 'We always try to make our systems fit with OE parts, whereas other makes won't, so in some cases you can't just replace the tail pipes or rear box because their systems won't match with the existing parts. Design-wise, with the Cargraphic products, we always try to maximise flow, maximise power but still keeping it within a respectable – and legal – sound level. Because of the constraints with TÜV in Germany we can't have a system that's absolutely unfettered, so there has to be a compromise between the level of sound and

the performance that can be gained, but our systems do tend to be more driveable and more user friendly as a result. You don't have this horrible droning in the back of your head over long distances.' Which is what I've been hearing with my 996 pipe blowing over the last few weeks. How they gauge whether a particular configuration of silencer and header and tailpipes, plus catalytic converter and heat exchangers is going to enhance the car's performance is, according to Simon, 'very much an experience based thing. We have a decibel meter and we measure the car as standard and then we can do our own work and then measure the car.' That's done static and drive-by, rather than rolling road. Increasing bhp is also down to past experience: 'It's what we've learned over the years; we can work out primary diameters, primary lengths, and cats we know always give an improvement with the modern 200-cell, tri-coated cats and there's an immediate gain to be had in fitting those when the factory parts are usually 600-cell, so immediately you've increased the flow by three times. If you're going for maximum power you should consider those, as a lot of the factory headers are particularly restrictive. And there are good gains to be made in replacing the stock headers with our free-flowing headers. Our best selling item at the moment is probably the Cayman GT4 manifolds; we do a cat version and a non-cat version. We can't make these parts quickly enough! Which begs the question why the factory don't fit something similar: 'They are starting to produce their own sports equipment but the key is that they need to produce an exhaust system that is legal in



Above left: Simon Young has been bending pipes and manufacturing exhaust systems for many years and has been making Cargraphic systems for 21-years. Above: Completed back boxes and pipe bending equipment

all countries and, given the worst case scenario, probably California where they have to comply with all regulations, where we are probably side-stepping some regulations.'

In practice, Cargraphic receives an order in Landau, the parts are made in Devon then shipped to Landau, and dispatched to the customer from there. 'Anywhere in the world,' says Simon, 'and if we had a globe we could put a flag in every country where we've supplied a Cargraphic system I don't think there would be many left where we haven't supplied one.' The time scale for manufacturing a complete exhaust system is difficult to quantify because everything is produced to order in small batches. 'For instance, Keith is currently developing the cat sections for the 991 gen 2 turbo, and it will probably take us about a week to produce a working set and a pattern set,' estimates Simon. 'The process is to jig the original parts and then to build our part in that jig, so our part will then fit with an OE rear silencer, but if we were producing manifolds, cat sections, centre section, rear boxes and tail pipes, that could be three- to four-weeks' work, particularly if we're building it on the car, by the time we've built our patterns and then jigged our patterns and then produced one out of the jigs to make sure it fits the car and that could be as much as a month's work. It may need refining, but hopefully it's perfect first time.' That sounds almost like the creation of a prototype system, and at very least they're refining the OE equipment. I ask Simon which he regards as the most impressive exhaust system that he produces:

'Probably our 911 flat-six system for the earlier cars, the 3.2 Carrera maybe, and I also like our 996 GT3 race system, or our 991 Turbo system that features on the Cargraphic video with flames coming out of the tail pipes.' It's a real eye-opener to see just how many different facets there are to creating an exhaust system; we tend to take it for granted, but it's amazing what complexities go into its creation. Cargraphic exhausts are fabricated from 304 stainless-steel, which is an austenite or gamma-iron, so it's non-magnetic, whereas cheaper grades of stainless-steel like 409 which is a steel with a high chromium content and not much nickel, but which is magnetic, and over a period of time it will rust. As Simon says, 'it will probably last ten years, and that's the gamble; most stainless manufacturers offer a lifetime guarantee to the original purchaser, but the likelihood that somebody keeps their car more than ten years is not that great. It depends if it's somebody's everyday runner or whether it's just a high days and holidays car, in which case it will last equally as long as 304.'

Here's the methodology. The steel arrives on a palette in 2m x 1m flat sheets, and the tube comes in a range of diameters, in 1/8th increments in 6.1m lengths, and they cut, roll, bend and polish everything from the raw material into a finished exhaust system. 'We machine all our sensors, flanges, olives and system parts, using the manual lathe where we can modify the flanges, and there's a milling machine where we can do things like boring at an angle or counter boring, or

machining grooves, and our bending machine can bend up to 3in diameter pipe, and we can bend anything from 35mm, which is 1 3/8th, right the way up to 76mm. It's a very good British machine and it's got all these flexible knuckles that sit inside the pipe whilst the pipe is being bent, and it's attached to a hydraulic ram, and after the bend is finished the ram will draw back and iron out any wrinkles or any imperfections in the bend, so we end up with as near to the full diameter of the tube as possible whilst it's being bent.' Some parts for flanges and brackets are bought in, again in 304, but basically everything is made in-house. 'We have a dummy 993 engine that we have developed several different systems on, and it's a matter of taking off the relevant parts which put it back to this 3.2 state, and the manifolds were 964 manifolds we'd already produced, so we've got that as a starting point so from there we can then hook up a rear silencer onto our engine and then basically plumb in between. It would be nearly impossible to do that on a bench; you either need a car, an engine or an original part to copy.' So, for example, 'when an order comes in for a set of 964 manifolds, the technician refers to the pattern section, and we've all the bending information and the cutting information saved on spread-sheets, so we'll print out the spread-sheet for three sets of 964s; the material is then cut, then bent, and at that stage that particular job would then go to one of the final assembly welders, and they would get the jig and the pattern, and trim and self-assemble all the pipes, because it's not possible to bend all the pipes in one piece. So

Below: Systems are assembled and welded on a jig. All systems are made from 304 stainless-steel and as such should last the lifetime of the car



TECH: PROJECTS



the welders would then trim all those pipes, tack them together in the jig, group them altogether as they then go to the polishing shop, and then the pipes would come back into the jigs to be finally assembled and welded. That's the tip of the iceberg really.' Air-cooled versus water-cooled? 'The water-cooled systems tend to be simpler, purely because they're more conventional, whereas the air-cooled car with rear engine and lack of space seems to set up a lot more vibration within the system, which I'm not sure what the reasons are for that, but it's another factor that we have to always be aware of when doing air cooled parts, for fear of them failing and fracturing. As far as quantities are concerned, it's very difficult to put a number on how many systems we make in a given period because the systems are so different.' This is an eye-opener, which would cause the average KwikFit customer to need a lie-down. I had very little idea that the internals of a silencer were so complex, nor indeed that aural volumes are deliberately altered according to the amount of material contained within the silencer box.

As for my 996 silencers, that's one of the more impressive stages of the process. 'For the silencers, we produce everything ourselves, the baffles, the cases, the whole thing is produced in-house.' The baffles start off as a perforated blank plate that's sculpted to form the centrepiece of the silencer box. It's then wrapped in steel wool, placed inside the silencer chamber, which is then wadded with fibreglass string, pumped in by a modified air gun system. A similar process is used for all silencers, including the classic flat-six's banana. 'All our silencers are assembled in the same way, wrapping two or

three layers of stainless steel wire-wool around the baffle, we put a layer of needle mat which is a blanket glass-fibre around the inside of the case to the insulator case, and then we fill the void with material which is called glass robing which is like fibreglass in a continuous filament so it doesn't break down. This will then get pushed into the silencer under pressure by this machine, and these machines will squash the case to the right shape for the baffle and then the internals will retain the shape.' Variations on the theme include the vacuum flap silencer, which enables the driver to modulate the volume of sound the car is making at the press of a switch. 'When the vacuum flap is open the gases can go straight to the tail pipe, and when the vacuum flaps close and when the vacuum flap is closed the gases are forced down the spur pipe into the long run on the silencer so they then go into the centre return and drop back in onto the tail pipe outlet.' I also notice that some systems employ spring attachments: 'where there's a risk of fracture, the springs allow the system to expand and to vibrate, and when the springs are attached it gives the system a tremendous amount of flexibility and the ability for the system to expand when it gets very hot without the risk of fracture. They're important on our race and trackday systems.'

There are three different grades of internals for a wheel-arch silencer such as the 996's. 'Three different variations of sound, effectively, so you have what would be considered an OE sound, which we call an ET, and then our TÜV box which is a little louder than standard and called an ETR, and then the export version is an ETS, so each one of them has slightly different box

internals, one is a little bit more powerful than the others, and obviously they are packed differently as well. And from the outside you couldn't tell which is which, without looking at the type plate. There's a type plate on each silencer with the part number on, so for your car it would be Car P96ET and then a TÜV number, and then the TÜV box would be Car P96ETR, and the last one would be Car P96ETS which would have no TÜV number.'

Back to the hoist. As Keith installs the shiny new 996 Cargraphic silencers I examine the abandoned old ones. Clearly the concertina-join sections were the Achilles' heel, and in fact belonged on a Tiptronic rather than a manual car. 'Maybe the previous owner got them on eBay,' jokes Keith. 'Apparently the flexies absorb some vibrations and frequencies that are produced by the Tiptronic, which aren't found in the manual gearbox car.' A single silencer is quite heavy, and as Keith hoists one of them into position he needs a second person to hold it in place while he slots the header and tailpipes on and bolts it up onto the mounting bracket to the side of the engine, which are very awkward to access. Job done, he lowers the ramp and fires up the engine. An appreciable growl rises to a vociferous snarl at 3000rpm. We part company and I hit the dualled A36. Pig Energy gives voice: a harsher bellowing rasp than at any time in the past: this is a new vocabulary. Power delivery is smoother, swifter, too. An amazing transformation. I bask in the welter of sound that reverberates off walls, barriers and bridges. For now this will do, but someday I can picture a full Cargraphic system. **PW**

Above: Shiny new v rusty and old. Old silencer split around the concertina-join section. Indeed such a style of back box is actually for a Tiptronic 996 and not a manual, like JTs

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