



# SUPERCHARGED

**VOLKSWAGEN'S NEW POLO G40  
AND CORRADO G60**

Advertisement Feature

# G CHARGER

## THE INSIDE STORY

USED SUCCESSFULLY IN THE '30S, SUPERCHARGED CARS ALL BUT DIED OUT OWING TO TECHNICAL PROBLEMS. BUT NOW VOLKSWAGEN'S REVOLUTIONARY G-CHARGER OFFERS PERFORMANCE WITHOUT THE SNAGS

**T**he art of supercharging internal combustion engines goes back almost a century. The very name 'supercharger' is reminiscent of '30s racing — of huge, blown Mercedes, Alfas, Bentleys and Bugattis taking the race circuits of Europe by storm.

Yet in contemporary cars, superchargers have been overshadowed by turbochargers. Why? It's because superchargers have their snags, mainly in the areas of efficiency and noise. The solution, then, is a supercharger in which those snags are reduced to insignificant proportions... and that's where Volkswagen's G-Charger comes in.

But why use a supercharger at all? The greater the amount of air that can pass through an engine, the greater the power produced. That's why a big engine is usually more powerful than a small one. But big engines don't fit into smaller cars, and some countries have taxation structures that penalise larger engines. So the solution is to squeeze extra air into a smaller engine under pressure, to make it equal the power of a bigger one. There are two ways of doing this: turbocharging or supercharging.

A turbocharger uses the flow of the engine's exhaust gases to drive a turbine wheel. However, the gases need to be flowing quickly before the turbo can work. This, and the time it takes for the turbine wheels to spin fast enough to be effective, create the dreaded turbo lag and a poor low-speed response, the two main problems of turbos.

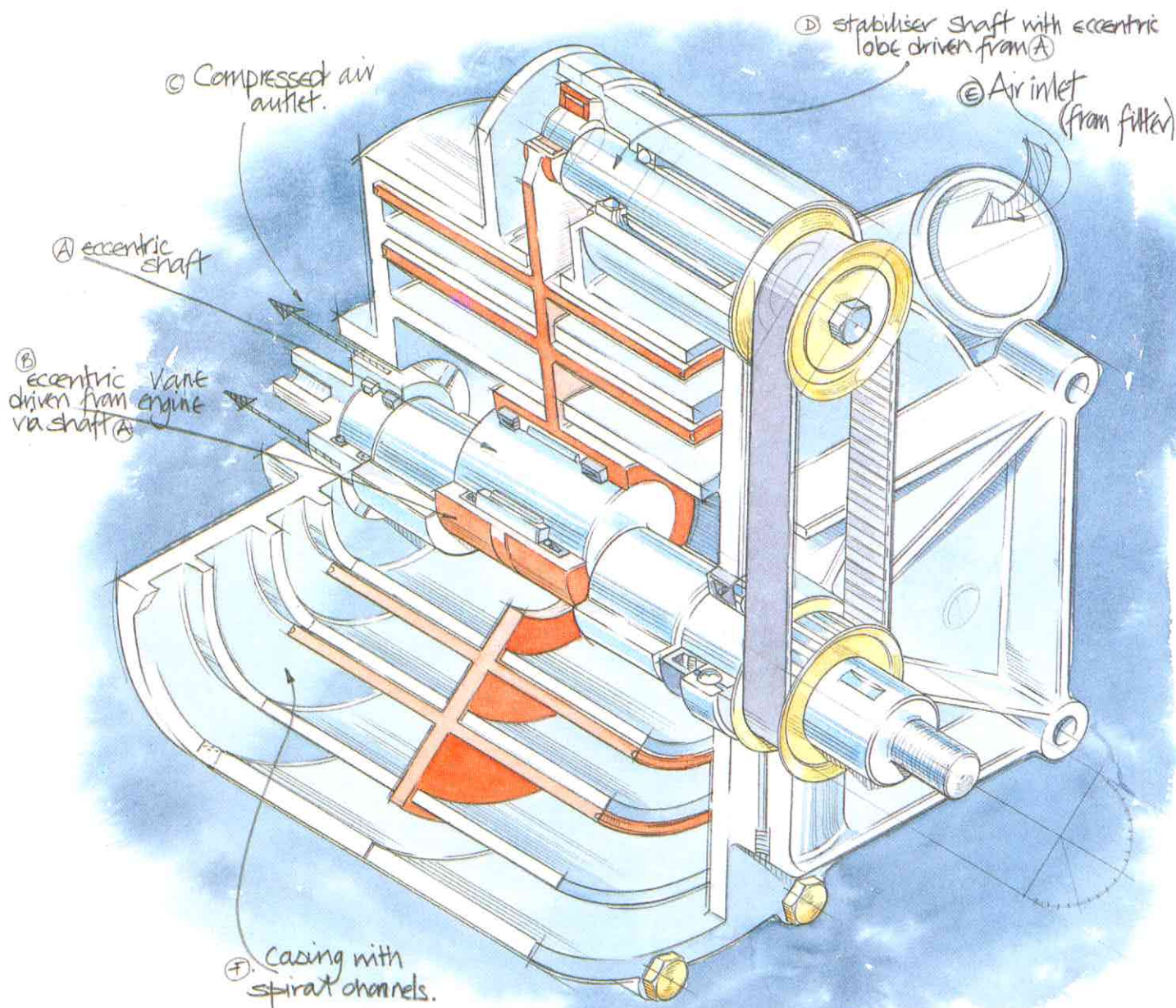
Unlike a turbo, a supercharger is driven from the engine's crankshaft, which means it's always working. Its ability to compress the intake air doesn't depend on exhaust flow, so it can produce dramatic power increases, particularly at low engine speeds. What's more, a supercharged engine responds immediately to the throttle; the feeling is of having a bigger engine.

So why haven't superchargers been used more in modern times? There are two main reasons. The first is the poor efficiency (and hence poor fuel economy) of the designs we've seen up to now. The compressed air escapes through gaps around the pumping elements and the drive mechanism saps power. The second reason is noise, which comes from the drive gears and the pressure pulses of the air as it is sucked into the supercharger.

Cue, then, the G-Charger. An air inlet on the outside of its circular casing leads into a pair of parallel, spiral channels which wind from the inlet inwards to an air outlet in the centre of the spiral. The whole assembly resembles a letter G, hence the supercharger's name. There are two sizes; the G40 which is used on Volkswagen's Polo, and the G60 for the Corrado.

Fitting very snugly within this double spiral is another, smaller double spiral mounted on an eccentric shaft. Each time the shaft rotates, this movable spiral forces two wedge-shaped pockets of air (one in each spiral channel and 180deg apart) from the outer, open end of the spiral channels round to the centre of the unit. It takes half a turn for the air wedge to complete its journey, so each rotation of the shaft delivers two pulses of air. Or, more accurately, it delivers two pairs of pulses from four air wedges, because the movable spiral is double-sided.

Because the radius of the channels decreases towards the centre, the volume of the air similarly decreases. By the time the air is forced through the air outlet in the G-Charger's centre, its pressure has increased by up to 0.8bar. In the case of the 1.3-litre



**G-Charger's eccentric spirals send pulses of air into engine**

Polo engine, this is enough to raise output from the regular GT's 75bhp to the G40's 113bhp. Low-speed torque goes up by around 50 per cent, too.

But what happens when you close the accelerator? The engine is still spinning, so the G-Charger is still blowing. That now-unwanted, pressurised air has to go somewhere — so, after it has passed through the intercooler, it is diverted via a bleed-off valve back to the G-Charger's inlet, where it loses its pressure.

The movable spiral doesn't touch the casing, but accurate machining brings it close enough for the air gap to be very small. Nor does its motion sap much power — under 5bhp in the G40 — because its movements are small.

So the G-Charger is efficient; around 65 per cent of the energy used to drive it is transformed into the intake air's pressure increase, a far higher percentage than in any other supercharger system. It's quiet, too, thanks to the gentle air pressure fluctuations at the G-Charger's inlet that result from the smooth airflow and low air speeds involved. All in all, it really does solve supercharging snags rather well.

### INSTANT RESPONSE

The supercharged G-Charger engine has everything, says Volkswagen's research and development chief, Professor Ulrich Sieffert (right).

It has spontaneous torque for rapid overtaking, much better fuel efficiency than a turbo engine as well as impressive reliability and durability.

Supercharging gives instant response at low engine rpm and that means safe, quick overtaking. It's ideally suited for today's heavy traffic conditions, according to Professor Sieffert.

And driving a supercharged car demands no special techniques.

In fact, with the new 1.3-litre Polo G40, the G-Charger engine offers the same kind of performance as a much larger capacity unit, he explained. Yet the fuel economy is that of an ordinary 1.3.

And compared with turbo engines, supercharging means better fuel economy. As the turbo engine produces its power at higher rpm, it demands a



different driving style and that tends to result in more fuel being used.

When it comes to reliability, G-Charger engines have proven to be even more reliable than VW's 16-valve motors.

# RED

## LEADER

### PILOTING THE G-CHARGER

**B**rian Lecomber is a former motoring journalist who has been working as a professional aerobatic display pilot for the past 13 years. Flying his lightweight, high performance Pitts S2B Special bi-plane he gives spectacular displays of loops, rolls and spins all over the country at air shows and race meetings.

Driving a car might seem tame by comparison but he claims to still enjoy his motoring. 'For me flying an aeroplane is always work; driving can still be purely for fun.'

We asked him to have some fun with Volkswagen's new G-Charger models and give us his impressions.

**Brian with his Pitts meets the G-Chargers**



PILOT BRIAN LECOMBER COMES DOWN TO EARTH TO TEST VW'S NEW SUPERCHARGED CARS, AND TAKES THE POLO G40 FOR A SPIN

**I**t's obvious as soon as you drive the Polo that it is going to be a lot of fun. Let the clutch out and the car just snaps forward. If I didn't know, I would never think the engine was only 1272cc — it feels much more like a 1600 or 1800 unit.

That's the desired effect. A supercharged engine is supposed to feel like a bigger capacity conventional unit, and the Polo's G40 engine does just that.

As in the Corrado, the effects of the G-charger are conspicuous only by their

absence. In other words, if you didn't know, you would not think that there was anything out of the ordinary under the bonnet.

It revs enthusiastically to 6500rpm which is impressive enough but you only really come to appreciate the engine's strength in country road driving.

It's a really gutsy power unit, a sort of combination of all that is best in turbocharged and normally aspirated engines. Throttle response is terrific, which you don't find in a turbo but the mid range pull is fierce too — and that is normally a great turbo strength. The torque curve is virtually flat all the way from 3000 to 5000rpm and it certainly feels that way in the flexible manner the Polo drives.

Compared with so many other small hot hatchbacks, the nice thing about the G40 is that you don't have to keep revving it ferociously and working away at the gear lever to extract the full performance. Rather, it feels like a bigger-engined car to drive; a bit more relaxed and less frantic.

It handles nicely, too. The front wheels seem to spin and squeal a mite easily if you happen to start off rather too smartly but I'd put that down to the tyres which are slightly narrower than some of the Polo's contemporaries.

Tyre squeal apart, it is very tidy and predictable to drive, with a nice, forgiving chassis set up that is more than a match for the engine. You can enjoy the performance without any danger of the car getting you into



trouble around the corners.

The steering is precise and sensibly weighted for enjoyable cornering, too, and — given the engine's sizeable output — there is a welcome absence of any real steering tug.

Not surprisingly, the ride is on the firm side — you'd expect that in a sporty hatchback — but it certainly isn't as stiff and jolty as that of some of its rivals. The sports type front seats are comfortable and very supportive, the driving position is straightforward, all-round vision is good and the instrument layout is excellent. I like the small diameter sports steering



**G40's stylish looks are reflected in its sporting interior**

wheel, too. There seems to be plenty of rear seat room, given the Polo's small overall dimensions and the boot is decent, too.

In short, it seems a very practical little performance package.

I can imagine that some people will perhaps criticise its looks. It certainly doesn't have the boy-racer stripes and badges you find a lot elsewhere — in fact, all I can see are a couple of very subtle G40 badges — but given its performance, I would rate that as an advantage.

I'm happy for people to watch me having fun in the air, but on the ground I think I prefer to keep a lower profile.

### **SPECIFICATION G40**

<b>Engine</b>	1272cc, supercharged, 4 cyl, 113bhp
<b>Performance</b>	122mph, 0-60mph 8.1sec
<b>Mpg at 56mph</b>	51.4
<b>Equipment</b>	Alloy wheels, seat height adjuster, front sports seats, rev counter, internally adjustable door mirrors, sports steering wheel, removable stereo radio/cassette, rear wash/wipe.

**T**he Corrado's power unit is very, very smooth. For a small capacity four cylinder engine, it really is excellent with a turbine-like power delivery. There's an unusual and very distinctive engine note as well, which I imagine is a feature of its being a supercharged unit.

Of course, being supercharged there's none of that irritating turbo-lag you find in turbocharged cars; throttle response is immediate and that is what you want in a sports car.

It's quite a deceptive engine, though. Because it is supercharged there isn't the obvious, coming-to-the-boil performance you'd get from, say, a turbo. The forced induction system is crankshaft driven so things are quite the opposite, in fact. The pressure is there from very low revs so you don't really notice the supercharger working — it just feels like a cammy conventional engine.

And, again, unlike a turbo which tends to be rather weak at the bottom end because it is exhaust gas driven, the Corrado has useful performance from around 2500rpm, with the engine really starting to come into its own at about 3500 revs.

Of course, the G-Charger unit is quite a contrast to the flat six Lycoming engine in my Pitts. That is 9.0 litres in capacity and produces 260bhp at 2700 revs. It has a special lubrication system, too, so it will run just as happily upside down!

Apart from the G60 engine, however, what really impresses me about the Corrado is its handling. It appears to be one of those cars that you just dial into a corner and round you go.

It handles very neutrally and very securely — even lifting off in mid-corner just makes the



**G60 at speed feels solid on the road and very precise**

nose tuck in and doesn't cause any problems. It's very nice to drive — solid feeling, square on the road, very precise and with accurate steering.

There's a bit of front-wheel drive kick-back when accelerating hard but it is never a problem. Certainly the steering is another impressive feature; it is very taut and responsive and even though it has power assistance it still manages to convey the feeling of connecting one's hands directly with the front wheels.

The ride is quite firm but that is exactly what you would expect from a car like this — you wouldn't want a soft, floaty ride — and the roadholding more than makes up for any tautness in the ride; it really is a very exhilarating car to drive.

Equally, though, I'm impressed by its refinement. Compared to previous generations of small performance cars, it is very quiet — far, far better than ones of even three or four years ago. For

such a small car, it is very civilised at high speed. Again, that's an important plus point; those rorty sounding sports cars can be very tiring on a long run.

It is a good looking car, too; quite small overall but roomy enough inside by coupé standards. The front seats are supportive — though I find I'm sitting a bit low even with the benefit of seat and steering column height adjustment. The instrumentation is clear and straightforward and I like the column stalk operated computer.

There's reasonable room in the back — though headroom is limited which is understandable — and the boot is very generously sized. It would be good enough to carry bits of aeroplane around in, which is what I do most of the time.

Overall, it is a very exciting little car to drive with a terrific chassis. As far as I can see there's only one thing wrong: you get to 75mph, pull the stick back and nothing happens...

# BLACK CHARGER

BRIAN FINDS THE CORRADO G60'S SUPERCHARGED 160BHP PERFORMANCE AND TAUT HANDLING EXHILARATING. BUT HE'S EQUALLY IMPRESSED WITH THE CAR'S REFINEMENT



**Corrado is roomy for a coupé and**



**seats are supportive**

#### **SPECIFICATION G60**

<b>Engine</b>	1781cc, supercharged, 4cyl, 180bhp
<b>Performance</b>	140mph, 0-60mph 7.3sec
<b>Mpg at 56mph</b>	46.3
<b>Equipment</b>	Central locking, adjustable driver's seat, trip computer, power steering, split/fold rear seat, stereo radio/cassette, alloy wheels, electric door mirrors, electric windows, internally adjustable mirrors, sunroof



**Instrumentation is clear and switchgear logical**



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