

VOLVO S40

MARKET POSITIONING

When the Volvo S40 range was unveiled in 1995, it heralded the start of a new era of style and design for Volvo Cars. Here was a car that brought a new level of style and sophistication to the upper medium saloon sector, without sacrificing Volvo's core values of safety and the environment.

As a compact premium saloon in a market dominated by mainstream, mass-market alternatives, the Volvo S40 mixes a stylish exterior with a generous specification and premium quality. A comprehensive chassis upgrade in 2000 improved the ride without compromising the handling, and for 2003 the range was further enhanced. The Volvo S40 also boasts impressive safety, security and environmental standards.

When the Volvo S40 range was originally unveiled in 1995, it heralded the start of a new era for Volvo Cars. Here was a car that brought a new level of style and sophistication to the upper medium saloon car sector normally dominated by mainstream alternatives, without sacrificing Volvo's core values of safety and the environment.

As a compact premium saloon in a market dominated by more mundane volume models, the Volvo S40 holds a unique position and has attracted customers who would not necessarily have been able to previously consider a Volvo. As the sister car to the Volvo S60 and the Volvo S80, it also provides Volvo with a competitive vehicle in each of the major saloon car market segments.

The Volvo S40 has been subject to a continuous development process throughout its life and the heavily revised Phase II model was introduced in 2000. This gave the classic styling a stronger, more purposeful feel and introduced a redesigned fascia with switchgear that echoed the design of the larger Volvo

saloons. And for the 2003 model year, it was revised again with a new black egg-crate grille, three-spoke steering wheel and revised instrument cluster that emphasises the car's dynamic appeal, plus a further safety upgrade.

Four different trim levels are available – S, Sport, SE and Sport Lux – all with superior levels of standard specification, and no fewer than eight different engines. Four of the petrol units belong to Volvo's 'RN' engine family and range from the 109bhp 1.6 to the potent 200bhp T4. These are joined by a 1.8i direct-injection petrol engine with low emissions of just 164g/km, which develops 122bhp and achieves an average of 40.9mpg on the official Combined cycle.

A pair of modern, direct injection, common rail turbodiesels joined the revised S40 Phase II range in 2000, which boast 102 and 115bhp and have been designed to combine strong performance with low emissions of 142g/km and fuel consumption of 52.3mpg on the Combined cycle.

The 1.8 litre gas/petrol powered Bi-Fuel engine is also environmentally friendly and offers impressive savings in fuel costs, especially for companies who can 'bunker' their own fuel.

The Phase II facelift in 2000 debuted a comprehensively reworked chassis with a longer wheelbase and new front suspension incorporating a wider front track. This provided the Volvo S40 with dramatically improved ride and handling characteristics, making an important contribution both to driver enjoyment and active safety.

As soon as it was launched, the Volvo S40 was the first car in its sector to be awarded full marks in the EuroNCAP crash test rating and regular detail improvements have been introduced throughout the model's life. The addition of a side Inflatable Curtain (IC) head protection system and 'WHIPS' whiplash protection, for example, brought the Volvo S40 into line with the rest of the Volvo

range. A comprehensive security package including alarm and immobiliser, and remote control central locking also protects occupants against unwanted attention.

In common with every other Volvo, the S40 benefits from the company's 'clean inside and out' environmental programme. Several engines in the range already meet the stringent EU 2005 and ULEV (Ultra Low Emission Vehicle) emissions requirements and each new Volvo is backed by an Environmental Product Declaration examined and verified by Lloyd's Register Quality Assurance Limited (LRQA) of London.

EXTERIOR DESIGN CONCEPT

The Volvo S40 was the first Volvo to be developed under the direction of Volvo's British Design Director, Peter Horbury. With its soft curves and handsome silhouette, it introduced a new Volvo design language and set the tone for the introduction of its sister cars, the Volvo S80 and, more recently, the Volvo S60.

But it was also instantly recognisable as a Volvo and the V-shaped bonnet and upright grille are synonymous with the brand. Changes to the Phase II car of 2000 gave the Volvo S40 a stronger, more imposing stance. It was revised again for 2003, with the introduction of a black egg-crate grille, plus body-coloured side mouldings and larger alloy wheels for SE and Sport Lux models.

- First Volvo to be developed under the direction of Volvo's British designer, Peter Horbury – now Executive Design Director for the Premier Automotive Group
- Introduced new Volvo design language
- Premium compact saloon with classic styling in a market dominated by mainstream alternatives

- Phase II in 2000 gave it a stronger, more purposeful stance
- Enhancements for 2003 introduced a black egg-crate grille, three-spoke steering wheel, new instrument cluster, and body-colour side mouldings
- Drag coefficient of 0.31

From the moment of its launch in 1995, the design concept for the Volvo S40 met with critical and public acclaim. It was praised for the manner in which it introduced a new design language, while remaining instantly recognisable as a Volvo product. The Volvo S40's success also set the tone for the introduction of its sister saloon cars, the Volvo S80 and, more recently, the Volvo S60.

The Volvo S40 was the first model to be introduced under the direction of Volvo's British Design Director, Peter Horbury. Horbury believes that Volvo's cars should reflect their roots and that as a non-Swede, he is better placed to assess the national design characteristics. "Looking for Swedish design cues, you see a purity and a simplicity in their furniture and their architecture," he says. "Our cars reflect that aesthetic appreciation. The cleverness is in the function of the car."

This inspiration can clearly be seen in the Volvo S40's subtle harmonisation of modern and traditional design themes. The V-shaped bonnet, for example, is a classic Volvo feature and highlights the rugged, durable qualities with which the brand is synonymous. The strident grille is also instantly recognisable and for the 2003 model year, it was given a black egg-crate look, which underlines the car's dynamic potential.

But while the Volvo S40 was clearly a product of Gothenburg, it also ushered in a new design language distinct from Volvos of the past. Flowing, softly curving lines that reflected the lifestyle aspirations of its customers replaced the straight-edged, 'set-square', look of traditional Volvos. "We reflected the history but in a modern way," explains Horbury. "It gives the car so much more character and attracts people who are governed by emotion." This bold stance has also helped

the Volvo S40 stand out as a premium choice in a sector dominated by mainstream alternatives.

The design of the Volvo S40 was refreshed as part of a comprehensive Phase II facelift in 2000. This introduced restyled front and rear bumpers and revised front wings, which gave the car a stronger, more purposeful stance. New side mouldings, freshly styled wheels, clear glass headlamps and larger side marker lights also created the impression of a car that's larger than it actually is. Further revisions for the 2003 model year included body-coloured side and bumper mouldings and larger 16in alloy wheels for the SE and Sport Lux models.

The end product is a shape that's as efficient as it is handsome. Excellent aerodynamic characteristics (the CD figure is 0.31) help to minimise crosswind sensitivity and wind noise, as well as reducing fuel consumption. At Volvo, form and function really do go hand in hand.

DRIVING DYNAMICS

ENGINES

The Volvo S40 range is available with a wide range of engines that accommodate every motoring need. From the entry-level 1.6 to the potent T4, every engine uses the latest technologies to combine low running costs with a high level of performance and refinement. There are six petrol engines in total, including a 1.8i direct injection petrol unit, which offers 122bhp and emissions of just 164g/km.

In addition, two direct injection, common rail turbodiesels, boasting 102 and 115bhp. They combine strong performance with low fuel consumption and exhaust emissions. These qualities are also a highlight of the LPG-powered 1.8 litre Bi-Fuel, which reaffirms Volvo's commitment to improving the environment.

- Eight different engine options
- Four 'RN'-series petrol engines ranging from 109bhp 1.6, to 200bhp T4
- Direct-injection 1.8i petrol engine with 122bhp and emissions of 164 g/km
- Modern, 1.9 direct-injection, common-rail turbodiesel engines with 102bhp or 115bhp
- Gas/petrol-powered 1.8 Bi-Fuel engine reaffirms Volvo's commitment to improving the environment

The Volvo S40 range is available with a wide range of engines that accommodate every motoring need. From the entry-level 1.6 to the potent T4, every engine uses the latest technologies to combine low running costs with a high level of performance and refinement. The relatively recent addition of Bi-Fuel and common rail turbodiesel models to the range also confirms Volvo's commitment to protecting the environment and reducing motoring costs.

With the exception of the 1.8 litre direct injection unit, all the petrol engines have four cylinders and belong to Volvo's 'RN' family. They feature an aluminium block and twin cam cylinder head, with four-valves per cylinder and centrally mounted spark plugs. Recent revisions to the engine management systems have also resulted in lower emissions and improved economy, making them particularly attractive to company car drivers seeking to reduce their tax burden.

The entry-level 1587cc engine offers power of 109bhp and torque of 145Nm, delivering adequate performance – 0-62mph takes 12.0sec – with a Combined cycle consumption of 36.7mpg. The 1783cc version achieves 36.2mpg on the same cycle yet has an increase in power and torque to 122bhp and 170Nm respectively, results in improved performance and a 0-62mph time of 10.5sec.

The most powerful normally aspirated engine in this range is the 1948cc (2.0) unit, which develops 136bhp and 190Nm. When equipped with a five-speed manual gearbox, it offers 0-62mph in 9.7sec and reaches 127mph, with an

average fuel consumption of 34.9mpg on the Combined cycle.

The two turbocharged, 2.0T and T4, 2.0 litre petrol engines share this blueprint, but add continuously variable valve timing (CVVT), which operates on the exhaust cam and helps to minimise emissions, especially when the engine is cold. The system works by allowing the camshafts to be turned by up to 20 degrees, making it possible to vary the timing between the inlet and outlet phases of the unit. By closing the inlet valves earlier in relation to the opening of the outlet valves, higher torque is generated at lower speeds.

The 2.0T model uses a low-pressure turbo fitted to the familiar 1948cc engine. It develops 163bhp and 240Nm of torque, which powers the Volvo S40 from rest to 62mph in 8.5sec and on to 137mph. The performance flagship of the range, though, is the T4, which employs a more efficient twin scroll turbocharger, combining dramatic performance with instantaneous throttle response. The 1984cc engine produces a mighty 200bhp and 300Nm of torque, propelling the Volvo S40 T4 from 0-62mph in just 7.3sec and on to 146mph. But despite its performance potential, the Volvo S40 T4 still manages an average of 31.7mpg, while the 2.0T returns 35.8mpg.

The RN petrol engine range is complemented by the 1.8i 122bhp direct injection petrol engine, which offers an exceptional Combined consumption of 40.9mpg with low emissions of 164g/km. The system varies the fuel intake according to the driving conditions: at low speeds it runs on a very lean mixture of fuel and air, decreasing consumption, but for more active driving, the engine automatically switches to a high-power mode, giving full access to its resources. The direct injection engine's torque output of 174Nm is actually greater than that of the 1.8 litre RN engine and despite its economy, it delivers sprightly performance, as the 0-62mph time of 10.5sec testifies.

A pair of 1870cc common rail, direct injection turbodiesels boast 102 and 115bhp

respectively. Common rail technology enables the fuel to be distributed under very high pressure via a single 'common' fuel line or 'rail.' The combustion can be controlled very precisely, reducing emissions and ensuring maximum performance. The 102bhp version offers 215Nm of torque and a 0-62mph time of 12.0sec with a combined consumption of 52.3mpg. The latter figure is matched by the 115bhp version, which combines a torque output of 265Nm with a 0-62mph sprint of 10.5sec.

An additional fuel source alternative is provided by the 1783cc, 120bhp Bi-Fuel engine. This runs on Liquefied Petroleum Gas (LPG) as well as conventional petrol. The benefits to the environment are obvious – the Bi-Fuel emits just 168g/km of carbon dioxide in LPG mode, compared with 193g/km for the petrol alternative, and have lower levels of other harmful emissions. Due to its low emissions, LPG is taxed less heavily than petrol or diesel and is around half the price of petrol or diesel (or more if companies 'bunker' their own fuel), reducing fuel costs and, in the case of company car drivers, Benefit in Kind tax bills.

Unlike most of its rivals, the Volvo S40 Bi-Fuel is built in the same factory on the same production line as the rest of the range, so benefits from full Type Approval, is fully crash tested, and has a three-year warranty from Volvo Car UK.

By cleverly accommodating the LPG fuel tank in the boot floor, Volvo's engineers have also ensured that there is only a marginal reduction in luggage capacity and a clear loadspace through the car.

In petrol form it has a torque output 170Nm, which is reduced slightly to 167Nm when the car is operating on LPG. Against the clock, there's a 0.5sec in the 0-62mph sprint between the two power sources (10.5sec verses 11.0sec) but the difference in real world driving conditions is negligible and the cost and environmental savings are ample compensation.

CHASSIS

The chassis of the Volvo S40 was given a comprehensive upgrade in 2000. The Phase II revisions widened the front track and increased the wheelbase which, when coupled with changes to the springs and dampers, provides a more cosseting ride without compromising the handling.

For drivers who prefer an even more dynamic drive, Volvo offers the 'sports chassis' option, which is standard on the T4 and provides even sharper responses. Also standard on the T4 and the 2.0T is Dynamic Stability Assistance (DSA), which maximises traction in slippery conditions.

- Heavily revised chassis introduced with Volvo S40 Phase II in 2000
- Revisions included wider front track and longer wheelbase, coupled with new springs and dampers. This improved the ride quality without compromising the handling
- Self-levelling rear suspension available as an option
- Stiffer 'sports chassis' provides sharper responses. Standard on the T4
- Dynamic Stability Assistance (DSA) maximises traction in slippery conditions. Standard on T4 and 2.0T and available as an option on every model

Volvo's engineers spent three years re-engineering the chassis to combine extra comfort with sharp handling. The fruits of their labour were unveiled in 2000, when the Volvo S40 Phase II range was introduced.

The front suspension and chassis set-up were extensively revised. New lower wishbones and a redesigned steering assembly joined modified McPherson struts and revised control arms allowed the spring and damper systems to work more freely and effectively. The dampers were softened to provide a more cosseting ride, while the springs were stiffened to improve the road holding.

The revisions also resulted in a 12mm increase in the wheelbase and an extension of the front track by 16mm, which contributes to the exceptional high speed stability enjoyed by every Volvo S40 owner. These changes and the new front wing design also permitted the fitment of a larger wheel and tyre combination, with the old 195/55 tyres being replaced by 195/60 tyres for greater comfort. And from the 2003 model year onwards, all SE and Sport Lux models have been supplied with 16in alloy wheels as standard, providing increased grip and stability.

The rear suspension was left largely unchanged by the revisions and benefits from a sophisticated fully independent multi-link set-up with trailing arms, upper and lower camber control links and a toe control link. The latter provides passive rear steering, which helps provide exceptional stability throughout the turn.

For customers used to carrying large loads, Volvo's engineers have developed self-levelling rear suspension, which maintains a consistent ride height irrespective of the cargo. This optional feature is also incorporated in the lowered, dynamic 'sports chassis' option (standard on T4), which also stiffens the springs and dampers to provide the enthusiastic driver with swifter steering response and even sharper handling.

Standard on the 2.0 litre petrol turbo cars is a Dynamic Stability Assistance (DSA) system, which increases vehicle stability in slippery conditions. If the sensors detect a loss of traction in one or both of the driven wheels, the engine's torque is automatically restricted until grip is restored. As well as making an important contribution to safety, the system increases driving pleasure by helping to counter understeer. It can be specified as an option on 1.6, 1.8 and 2.0 litre models.

STEERING, BRAKES AND TRANSMISSIONS

The Volvo S40's steering and braking systems have been tuned to maximise driver enjoyment and safety. The rack and pinion steering is linear in response and offers plenty of feedback, while the anti-lock brakes are boosted by Electronic Brakeforce Distribution (EBD), which varies the braking power to minimise stopping distances.

A five-speed manual gearbox is standard across the range, providing a firm, positive shift action. But for those who prefer to let a computer take the strain, Volvo offers an adaptive, five-speed automatic. This system uses an array of sensors to adjust its shift points according to the road conditions and the driver's style. It also features a winter mode for slippery conditions.

- Power assisted rack and pinion steering offers plenty of driver feedback
- All round disc brakes (ventilated at the front) feature ABS and EBD
- Five-speed manual gearbox fitted as standard to every model
- Five-speed adaptive auto available as an option. Automatically adjusts its shift points to suit driver's style and road conditions

The Volvo S40 benefits from a precise rack and pinion steering system, which is fitted with power assistance as standard. It offers plenty of feedback, which enhances the driving pleasure and makes an important contribution to active safety.

The steering has also been tuned to complement the braking system. All-round disc brakes (ventilated at the front) combine impressive stopping power with plenty of pedal feel, allowing careful modulation of the braking pressure. As you'd expect from Volvo, a sophisticated anti-lock braking (ABS) system is fitted as standard and this is joined by Electronic Brakeforce distribution (EBD). EBD constantly distributes braking power between the front and rear wheels to ensure

maximum retardation regardless of road conditions or the cargo load.

All models feature a slick-shifting, five-speed manual gearbox as standard, but for those who prefer to let a computer take the strain, Volvo offers a five-speed adaptive automatic transmission available on 1.8 and 2.0 as well as the 2.0T and T4 turbocharged petrol models. The system automatically analyses the road conditions and the driver's style, and adjusts its shift points to suit. A special winter mode can be manually selected, which starts the car in a higher gear to reduce the risk of wheelspin on slippery surfaces.

INTERIOR DESIGN CONCEPT

The interior of the Volvo S40 underlines its position as a premium alternative in the upper medium sector. The style of the fascia, coupled with the quality of the fixtures and fittings and excellent standard specification, brings a new level of sophistication to this market.

With the introduction of the Phase II Volvo S40 in 2000, the fascia was restyled to echo the design of the luxury Volvo S80. The typically Swedish, stylish, chunky switchgear is ergonomically efficient, and the seats were revised for 2003 to provide increased comfort and support. Rear passengers are equally well catered for and there's a versatile, 415 litre boot.

- Style reflects Volvo S40's position as a premium alternative
- Stylish, chunky, ergonomically-efficient switchgear shared with Volvo S60 and S80
- New, more supportive seats for 2003 offer supreme comfort
- Multi-adjustable driving position suits wide range of drivers
- Practical storage solutions including rear waste basket
- Well-shaped, 415 litre boot with handy storage bins
- Be-spoke, premium audio system with CD and six speakers

The interior of the Volvo S40 underlines its position as a premium alternative in the upper medium sector. The style of the fascia, coupled with the quality of the fixtures and fittings and excellent specification, brings a welcome level of sophistication compared to its rivals in this market.

As part of the introduction of the Phase II Volvo S40 in 2000, the fascia was redesigned to bring it into line with the rest of the Volvo range. The typically Swedish, minimalist style of the chunky switchgear is shared with the Volvo S60 and Volvo S80 and careful consideration has been paid to the ergonomics. The controls for the audio system, air-conditioning and dynamic systems are grouped independently and fall easily to hand. A high standard of in-car entertainment is the hallmark of a premium brand and the Volvo S40's bespoke system is fully integrated into the fascia design, combining great sound quality with simple, logical controls.

For 2003, the fascia underwent another subtle tweak with the introduction of a four-dial instrumentation and a three-spoke steering wheel shared with the Volvo S60. The seats were also re-engineered with improved lumbar support and thinner head restraints. Orthopaedically designed, they feature adjustable lumbar control and variable height settings, which, when coupled with a rake adjustable steering wheel, provides a comfortable driving position for drivers of all shapes and sizes.

Volvo places an equal importance on the comfort of rear seat passengers. Peter Horbury explains: "Nobody rides tourist class in a Volvo; everybody rides at least business class. All five seats are a priority." There's therefore ample space for three adults in the rear and full three-point safety belts are provided for every occupant.

While maximising comfort, Volvo's technicians have also provided the interior

with kind of 'surprise and delight' features that makes family motoring more bearable. The centre console, for example, features a large stowage box with a coinholder and a 12volt power supply that also doubles as an armrest.

Evidence of a similar attention to detail is to be found in the luggage compartment of the Volvo S40. Sensibly shaped with a low load lip, it offers a maximum capacity of 415 litres (352 litres in the Bi-Fuel). Its versatility is also enhanced by a couple of handy storage bins, which are fitted as standard to every model in the range.

QUALITY AND EQUIPMENT

A passion for quality lies at the heart of the Volvo brand and in the Volvo S40, this is reflected in the build quality and the choice of trim materials.

The standard specification is equally impressive with every model featuring alloy wheels, air conditioning, electric windows and mirrors, a premium audio system with CD player and six speakers, plus front fog lights. There's also a wide range of options and accessories, reflecting the multifarious lifestyles of Volvo owners.

Additional peace of mind is provided by a comprehensive warranty package that includes a full three year/60,000 mileage warranty.

- High standard of trim and build quality
- Excellent standard specification includes alloy wheels, air-conditioning, all-round electric windows, and a premium audio system with CD player and six speakers
- Satellite navigation system available as an option
- Volvo's range of accessories to meet lifestyle requirements
- Three year/60,000 mileage warranty package
- S, Sport, SE and Sport Lux trim levels

A passion for high quality lies at the heart of any definition of the Volvo brand. It's inherent not only in the build quality that reflects the durability and reliability for which the marque is renowned, but also in the choice of body and trim materials. From the exquisitely crafted door handles to the leather-wrapped gearstick, the Volvo S40 exudes a feeling of quality and well-being. The switchgear has a solid, chunky feel and the fascia is awash with soft-touch plastics, reminding occupants that they are enjoying a prestige product.

Premium brand customers also demand a certain level of standard equipment and the Volvo S40 does not disappoint. Four trim levels are on offer – S, Sport, SE and Sport Lux. Every model features air-conditioning, all-round electric windows and electric/heated door mirrors, together with a CD player, six speakers and front fog lights.

Customers upgrading to the SE or Sport Lux models also benefit from Electronic Climate Control with Multifilter, an Information Centre (trip computer), an upgraded speaker system, leather upholstery, body-colour side mouldings and larger, 16in Telesto alloy wheels.

Volvo owners are also encouraged to give their car a personal touch by choosing from a vast range of optional extras. An electric sunroof could be combined with electric controls for the driver's and passenger's seat, for example, while heated front seats join a headlamp wash/wipe system and luxury carpet mats in a comprehensive Winter Pack.

Business drivers in particular, may be interested in the optional navigation system, which is integrated into the fascia and included mapping for the whole of the UK. Another useful feature, especially for town-based drivers, is Volvo's optional reversing sensor system, which activates automatically when reverse gear is selected. The system produces a pulsating buzzing note that rises when

the obstacle is about 25cm from the rear bumper.

There's also the Volvo for Life range of accessories to accommodate the varying lifestyles of Volvo S40 owners. A shopping bag holder, for example, can be integrated into the boot. The bags stand upright and secure in a recess and are held in place by hooks. Other accessories include towbars, roof boxes and bike, ski and snowboard carriers.

Hands free kits can also be supplied to fit most types of mobile phone and a broad range of load carrying systems cater for customers with an active lifestyle. To protect the new generation, Volvo has developed a range of seat booster cushions, which can be supplied either as a separate entity, or integrated into the seat.

Volvo's employees are justifiably proud of the quality of their products, but they're equally determined to offer the best customer service. In 2001, Volvo's management set a target of becoming the 'Customer satisfaction no. 1' in the premium sector by 2004. To fulfil this ambitious target, the company has initiated a series of Quality Forums, which scrutinise information from a combination of internal and external sources, including independent rankings by companies such as JD Power. Having analysed the data, the Forum's initiate action plans to improve performance in specific areas.

This quality assurance package is backed up by a comprehensive warranty. The standard mechanical warranty is three years/60,000 miles, there's a three year unlimited mileage warranty on the paintwork and eight years cover against rust perforation. In addition, all Volvo's are covered by one year's free RAC cover, which provides full breakdown and recovery assistance, anywhere in Europe, 24 hours a day.

SAFETY

The Volvo S40 was the first car in its class to receive a top score in the EuroNCAP crash test rating, when tested, and it features an extensive safety package that has been regularly updated throughout the model life.

The SIPS (Side Impact Protection System) includes side and Inflatable Curtain (IC) airbags that protect both front and rear occupants. In frontal impacts, 'intelligent' airbags work in unison with the safety belts, while the WHIPS (Whiplash Protection System) reduces the risk of back and neck injuries in a rear impact.

In the rear of the car, all three passengers benefit from three-point safety belts with tensioners and there are ISOFIX fittings for child seats.

- First car in its class to attain full marks in EuroNCAP crash test rating
- Regular safety upgrades throughout the model life
- SIPS (Side Impact Protection System) incorporates side airbags
- IC (Inflatable Curtain) airbags for front and rear occupants
- Twin front 'intelligent' airbags
- Five three-point safety belts with pre-tensioners. Load limiters for front occupants
- WHIPS (Whiplash Protection System) fitted as standard
- ISOFIX fittings for child safety seats in the rear

Volvo's commitment to safety is as old as the company itself. As, Assar Gabrielsson, one of the founders of Volvo declared: "Cars are driven by people. The guiding principle behind everything we make at Volvo therefore, is – and must remain – safety." It's a commitment that's more than fulfilled with the Volvo S40, which was the first car in its class to attain a top score EuroNCAP crash test rating, when tested, and features an extensive safety package that has been updated throughout the car's life.

A quarter of all impacts are from the side, which is why Volvo developed the Side Impact Protection System (SIPS). A large part of the force of a collision that would otherwise penetrate through the side of the car, is dissipated by SIPS via beams, pillars, the floor, the roof and other parts of the car body.

The side impact airbags then play an important role in protecting the chests of the occupants. They are fitted in the outer edge of the front seats, not in the door, which ensures that they're always securely positioned next to the occupant's side, whatever the position or angle of the seat.

Further protection is provided by the side IC (Inflatable Curtain) airbag, which was enlarged as part of the 2003 model year revisions. It sits in the headlining and protects occupants in the front and rear. In the event of a side impact the IC inflates in a few thousandths of a second and then remains inflated for about three seconds in order to provide maximum protection throughout complex collision sequences. The curtain is effective whether the window is open or shut and it absorbs up to 75 per cent of the energy developed when the head is thrown sideways in a crash.

The two front airbags are 'intelligent' and deploy in two stages according to the severity of the accident, alleviating the risk of facial injuries caused by the occupant's faces impacting with the airbag. They are complemented by three-point seatbelts with tensioners, which are fitted for all passengers. The tensioners activate within a few thousandths of a second in the event of a collision and tighten the belt for maximum protection. The front seat safety belts then release a little so that the driver and passenger are cushioned by the airbags in a controlled manner.

The Volvo S40 also features the WHIPS (Whiplash Protection System), which helps prevent neck and back injuries in a rear impact. In the event of a collision,

the entire backrest moves rearwards to reduce the strain on the occupant's back and neck. Then, when the entire back has been safely restrained by the backrest, it reclines in order to reduce the force that would otherwise throw the head forwards. WHIPS reduces acceleration forces on the neck by about a half.

Volvo's engineers have also made special provision for protecting the next generation. Every Volvo S40 is fitted as standard with the provision for the fitment of ISOFIX child seats and a range of child seats or booster cushions are available.

ENVIRONMENT

Volvo's commitment to the environment is reflected in its 'clean inside and out' programme. An air filter prevents dust, pollen and exhaust particles reaching the interior and Volvo S40's fitted with Electronic Climate Control also feature a carbon filter to purify the incoming air. All interior textile and leather trim are free from health-impairing textiles to reduce the risk of any allergic reaction.

Several of Volvo's engines already meet the stringent EU 2005 and ULEV (Ultra Low Emission Vehicle) emission requirements. Little wonder that each new Volvo is backed by an Environmental Product Declaration from Lloyd's Register Quality Assurance Limited (LRQA).

- 'Clean inside and out' programme
- Cabin air filter removes pollen and soot particles
- Active Carbon filter purifies the air in variants fitted with Electronic Climate control
- Interior trim materials conform to Öko-Tex standards and are allergen-free
- Several of the engines already meet stringent EU 2005 and ULEV (Ultra Low Emission Vehicle) emission requirements

- Each new Volvo is backed by an Environmental Product Declaration examined and verified by Lloyd's Register Quality Assurance Limited (LRQA)

According to the 2001 RAC Report on Motoring, the typical private motorist drives for over 250 hours each year, while in the same period, a company car driver spends an average of 425 hours inside their vehicle.

But while most of us are aware of vehicle emissions and air quality issues, how many drivers know that the air inside their cars may also be harmful? Or that the metals, textiles and leathers used in car interiors can emit volatile substances, which activate allergies and cause skin problems?

Many motorists don't realise that their car could be increasing their risks of asthma, eczema, headaches, eye irritation or even a heart attack. In recent years, the number of people suffering from allergies and other forms of hypersensitivity has been growing rapidly.

Volvo's 'clean inside and out' programme to create emission-free cars is a healthy solution to the problem.

All models feature a sophisticated air-conditioning system with a particle filter that removes pollen and soot particles on their way into the car. In addition, SE and Sport Lux models provide a carbon filter that uses active carbon to purify the incoming air and reduce the risks posed by nitrogen oxides, ground-level ozone and hydrocarbons.

The interior of the Volvo S40 complies to a strict standard called Öko-Tex, which sets maximum levels for dangerous substances contained in textiles and trim materials. All the leather upholstery and the trim fitted to the Volvo S40 meets Öko-Tex standards. The components on the Volvo S40 that most frequently

come into contact with the skin – the door handle, ignition key and seat belt locks – are also compliant with Öko-Tex and allergen-free.

Recent changes to the engine management systems of many of the petrol cars have further reduced their emissions of carbon dioxide. The Volvo S40's impressive aerodynamics (Cd 0.31) and sophisticated catalyst and engine management systems help to keep fuel consumption and exhaust emissions low.

Several of the engines in the range already meet the stringent EU 2005 and ULEV (Ultra Low Emission Vehicle) emission requirements and the Bi-Fuel models, in particular, make a major contribution to improving environmental standards. Liquid Petroleum Gas (LPG) powered cars cut the emissions of carbon dioxide – which contributes to the greenhouse effect – by about 10% when compared with the petrol-fuelled equivalent.

But Volvo's commitment also extends beyond the car's immediate environment. It was one of the first manufacturers to use tools to evaluate the life-cycle environmental impact of all its products. The system, known as EPS (Environmental Priority Strategies in product design) enables Volvo to evaluate the impact of its products and processes on natural resources, ecosystems and human health. This information is available to the public at www.volvocars.co.uk.

It's a strategy that's clearly paid dividends – emissions of solvents from Volvo's Torslanda plant in Sweden have been reduced by over 90% since 1972 and virtually the entire car can be recycled at the end of its life. Little wonder that each new Volvo is backed by an Environmental Product Declaration examined and verified by Lloyd's Register Quality Assurance Limited (LRQA) of London.

SECURITY

Volvo is committed to protecting the car, its occupants, and their possessions. Every version of the Volvo S40 is fitted as standard with a

sophisticated alarm and immobiliser system that can be switched on and off using the remote controller on the key fob. Deadlocks make the Volvo S40 difficult to break in to and a visible VIN number in the windscreen acts as a further deterrent to would-be intruders.

Likewise, a tweak of the headlight stalk activates the Home Safe system, switching on the headlamps for thirty seconds after the occupants have left the vehicle.

- Electronic immobiliser fitted as standard
- Visible VIN deters would-be thieves
- Alarm and deadlock system operated from remote control key fob
- Approach and Home Safe Lighting system fitted to every model

Volvo's passion for safety also extends to issues of personal security. The Volvo S40 is fitted as standard with a wide range of features designed to protect occupants from burglary, theft and assault.

An electronic immobiliser makes it impossible to start the car without the correct key, and the outer lock cylinder rotates, making it difficult to break in. If the thief does manage to get in, via a window, for example, the deadlock system makes it impossible to open a door from the inside. A visible VIN number in the front windscreen also acts as a deterrent to would-be intruders.

The deadlock system is activated and deactivating using the remote control key fob, which allows the driver to open the car as they approach. A separate button opens the tailgate, which is a useful deterrent to opportunist thieves.

The same remote control system switches on the alarm system, which is fitted as standard to every Volvo S40. The alarm is triggered if anyone attempts to open the doors, the bonnet or the boot lid. It also reacts to movement inside the car or

if a window is broken. As an option, this system can be upgraded to include a level sensor that is triggered if the car is jacked up in any way.

An important contribution to personal security is provided by the Approach and Home Safe lighting system. By pressing a button on the remote controller as they approach the car, the driver is able to turn on the inside lights, the side marker lights and the lights in the rear-view mirrors. On leaving car, a tweak of the headlight stalk activates the dipped beam headlamps for 30 seconds, lighting a path to the door. It's a simple system that offers considerable peace of mind.

DID YOU KNOW?

- 1 Volvo started racing the S40 in the Auto Trader RAC British Touring Car Championships (BTCC) in 1997 using 2.0-litre, five-cylinder engine with 6-speed gearbox and 19in wheels.
- 2 Rickard Rydell won the BTCC driving an S40 in 1998.
- 3 The S40 is made in Holland.
- 4 The S40 is sold across the world, as far afield as Australia, North and South America and the Far East.
- 5 The top hobbies of S40 owners are:
 - Watching football/rugby (32.06%)*
 - Gardening (22.8%)*
 - Walking/hiking/hill climbing (22.3%)*
 - Reading (21.8%)*

* Source: New Car Buyers Survey 2002