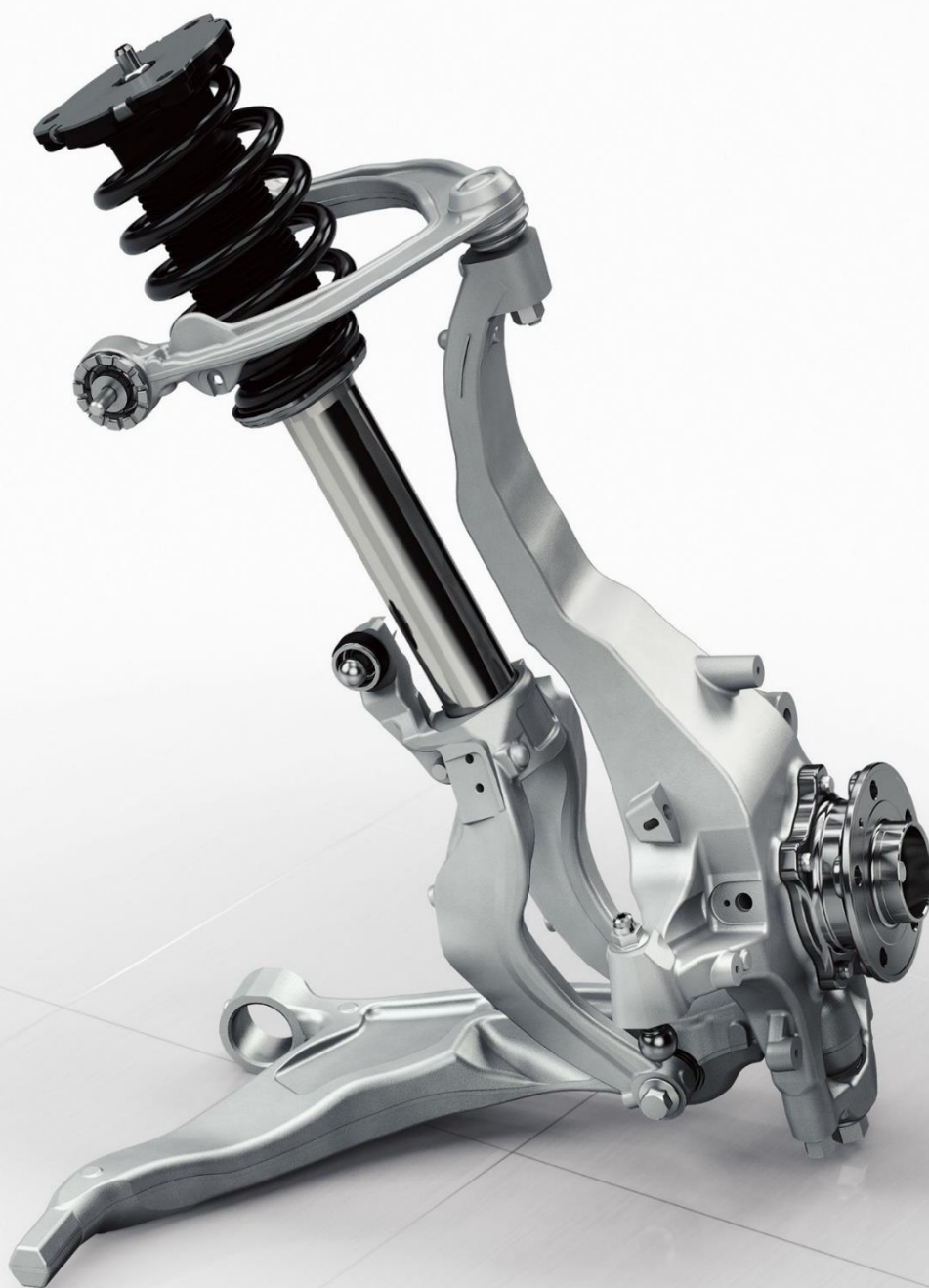




# VEHICLE DYNAMICS

A factsheet on Volvo Cars'  
Scalable Product Architecture chassis technology



# Contents

Driving confidence	3
Chassis simulation	4
- Connecting objective testing to human experience	
Testing facilities	5
- Investing in Volvo Cars' chassis development	
Scalable Product Architecture (SPA)	6
- Double wishbone front axle	
- Integral link rear axle	
- Steering system	
- Drive modes	
- Air Suspension with Four-C	
- Tyres	

# Driving confidence

“At Volvo, we do things differently. Everything we do starts with people, including our approach to vehicle dynamics. Our focus is on creating **a feeling of complete confidence** behind the wheel with engaging and predictable handling, and a smooth ride. New chassis technology on our Scalable Product Architecture, and our advanced tuning facilities, deliver the confident driving experience our customers desire.”

- Henrik Green, Senior Vice President Research & Development at Volvo Car Group.

CONTROLLED PREDICTABLE COMFORTABLE



Volvo Cars' approach to vehicle dynamics is based on a deep understanding of peoples' real-life driving wants and needs.

Our customers want a confident and engaging driving experience that delivers predictable, yet responsive handling characteristics.

The need for enhanced wellbeing and comfort during long journeys or everyday commuting is also quite clear.

To achieve this unique blend of characteristics, our vehicle dynamics engineers have defined a Volvo

driving character – utilising the multiple variables of ride, steering, handling and braking – to deliver a recognisable and consistent driving experience across the model range.

While **the feeling of confidence** best reflects the Volvo approach to vehicle dynamics, our 90 Series cars combine that with a truly **relaxed**, comfortable experience. Our 60 Series cars are set up to make you feel **inspired** and confident, emphasising the compactness and the engaging sense of control.



# Chassis simulation

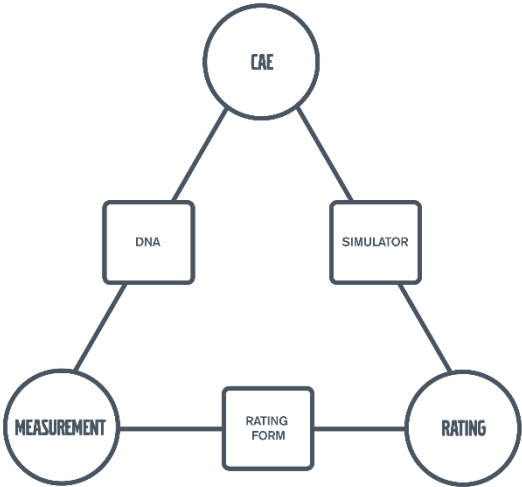
Connecting objective testing to human experience

Volvo Cars' state-of-the-art driving and chassis simulation rig, from Vi-Grade, is one of the most advanced in the auto industry.

The simulator offers exciting virtual environments, including Germany's renowned Nürburgring, as well as test tracks at Volvo Cars' own secret testing facility in Sweden.

This allows us to conduct rapid and extremely early stage development work – on aspects such as high speed stability, balance and individual drive mode settings – to produce unprecedented levels of optimisation of all sub-systems and the integration between them. The starting point for tuning in later stages has never been better.

**A physical and virtual world approach to vehicle dynamics**



# Testing facilities

Investing in Volvo Cars' chassis development



Compliance rig

Once model characteristics are added to the base Volvo driving profiles in the simulator, it is time to begin real-world testing using pre-production cars or early stage testing 'mules'.

Chassis testing takes place at advanced proving grounds in northern Sweden, the United States and in other locations when required, to ensure consistent behaviour in a wide range of environments and climate conditions.



Shake rig

Based on the results of track testing, characteristics are continually refined using the simulator and other calibration methods to ensure stability, ease of manoeuvrability, precision and predictability.



# Scalable Product Architecture (SPA)

## Double wishbone front axle

A double wishbone enables our in-house Vehicle Dynamics engineers to carefully control the motion of the wheel throughout suspension travel, controlling such parameters as camber angle, caster angle, toe pattern, roll centre height, scrub radius, scuff and more.

Among the many benefits are: increased grip because of high camber gain and small king pin angle; reduced disturbances because of small king pin offset; parallel roll because of low roll centre height migration; and low unsprung mass because of many aluminium parts.



## Integral link rear axle

Our integral link rear axle helps to deliver high levels of grip due to high camber stiffness and precise wheel control. Tight wheel control of the rear axle is crucial for steering precision.

The benefits of matched roll centre height migration to the front ensures a level of smooth parallel roll.

The integral link solution is light due to the use of many aluminium parts and the new Volvo composite transverse leaf spring solution.

# Scalable Product Architecture (SPA)

## Steering system

Our Volvo SPA-based cars have a rack-assisted electro-mechanical rack and pinion steering system.

This system delivers high precision thanks to its innate stiffness. As you would expect from a Volvo, the clever software is optimised for all weather conditions, including winter.

Standard speed-dependant assistance makes tight manoeuvres such as parking a lot easier while retaining confident feedback at all speeds.

Our new steering system can also be personalised to suit individual driver preferences.



## Drive modes

Thanks to the versatility of Volvo Cars' new chassis configuration, a selection of Drive Modes have been developed to deliver the refined and personal feedback that individual customers can enjoy. Each mode is designed to offer a variation on Volvo's driving dynamics to support the driver in different driving conditions.



**ECO:** Most efficient drive.

**COMFORT:** Default mode.

**DYNAMIC:** Optimised for inspired driving.

**OFF-ROAD:** Maximised low speed capability. XC90 and V90 Cross Country and XC60 models only.

**INDIVIDUAL:** Driver defined.

Depending on equipment level, all Drive Modes utilise available systems, adjusting individual parameters tailored to each mode. This includes:

- steering efforts
- brake pedal feel
- throttle response and/or powertrain characteristics, including ACC, AWD, traction control and hill descent control (where available)
- DIM
- Energy save
- computer controlled dampers and air suspension ride height (where available).

# Scalable Product Architecture (SPA)

## Air Suspension and Four-C

This optional system delivers a number of real-world benefits for the driver.

Air Suspension adds to increased comfort thanks to its automatic levelling capability, ensuring a stable and smooth ride on all kinds of surface.

Four-C – computer controlled dampers add yet another level of comfort and handling capability, offering tailored damping control to every situation.



## Tyres

As with every Volvo car, new tyres are developed in close cooperation with tyre manufacturers to ensure a stable, high-performance driving experience for each car.





# VOLVO CARS VEHICLE DYNAMICS

## DRIVING CONFIDENCE



**V O L V O**

Published by Volvo Car Group © 2018. All rights reserved.