



# VEHICLE DYNAMICS

A factsheet on Volvo Cars'  
Compact Modular Architecture (CMA) chassis technology





# Contents

Driving Confidence	3
Chassis Simulation	4
- Connecting objective testing to human experience	
Testing Facilities	5
- Investing in Volvo Cars chassis development	
A Team of Global Experience	6
Compact Modular Architecture (CMA)	7
- McPherson Strut Front Axle	
- Multi-link Rear Axle	
- Steering System	
- Drive Modes	
- Four-C	
- Tyres	

# Driving Confidence

"We do things differently at Volvo. Everything we do starts with people. Our approach to vehicle dynamics is no different. We are not aiming for the most sporty or the most comfortable driving experience. Our focus is on creating **a feeling of complete confidence** behind the wheel with engaging and predictable handling, and a smooth ride," says Henrik Green, Senior Vice President Research & Development at Volvo Car Group.



Volvo Cars' approach to vehicle dynamics is based on a deep understanding of what our customers want: a confident and engaging driving experience that delivers predictable, yet responsive handling characteristics.

The need for an enhanced feeling of 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.

**The feeling of confidence** best reflects the Volvo approach to vehicle dynamics.

Built on our Scalable Product Architecture, our 90 Series cars, combine that with a truly **relaxed**, comfortable experience, while our 60 Series cars are set up to make you feel **inspired**, emphasizing compactness and an engaging sense of control.

Volvo's 40 Series cars, based on our new Compact Modular Architecture, deliver an **energized** feel – alert, precise, responsive and connected – perfect for winding country roads or busy urban traffic while still delivering Volvo's signature comfort levels.

# Chassis Simulation

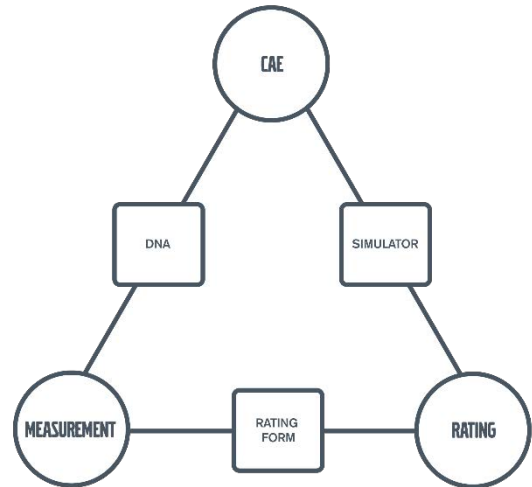
Connecting objective testing to human experience

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.

It allows Volvo Cars to conduct rapid and extremely early stage development work on e.g. high speed stability, balance and individual drive mode settings, producing unprecedented levels of optimization 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.

# Focus and Experience

Volvo Cars' Vehicle Dynamics Team



Confident driving dynamics are built on more than just the latest chassis hardware and simulation technology – they are built upon the knowledge, dedication and focus of real people and years of experience.

Consumed with the passion to deliver a unique driving experience, Volvo's Global Vehicle Dynamics Team's approach and methodology sets it apart from other automakers. A confident feel underlies everything the team does. Without this you can never truly enjoy the driving experience.

Volvo Cars employs some of the best male and female vehicle dynamics engineers in the world, situated in both Gothenburg, Sweden and Shanghai, China.



# Compact Modular Architecture (CMA)



## McPherson Strut Front Axle

The McPherson strut front axle enables Volvo's Vehicle Dynamics engineers to combine a compact suspension installation with careful control of the motion of the wheel throughout suspension travel, controlling such parameters as camber angle, caster angle, toe angle, roll centre height, scrub radius and more.

The front and rear axle have three possible tuning variants:

- Dynamic – standard setting
- Sport (optional) – more controlled body movements by stiffer springs, dampers and anti roll bars.
- Four-C (optional) – electronically controlled dampers



## Multi-link Rear Axle

Volvo's fully-isolated, compact, and light multi-link rear axle contributes to high levels of grip thanks to high camber stiffness and precise wheel control.

Tight wheel control of the rear axle is crucial for steering precision. Tuned in harmony with the front axle it results in agile driving pleasure.

The Sport tuning makes use of mono-tubes in the rear axle which result in faster damper response, enhancing both control and agility.



# Compact Modular Architecture (CMA)

## Steering System

Volvo's CMA-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, it's clever software is optimized 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.

Volvo's new steering system can also be personalised to suit individual driver preferences as part of the optional Drive Modes.



## Drive Modes

Thanks to the versatility of Volvo Cars' new chassis configuration, a selection of optional 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 a range of different driving conditions.



**ECO:** Most efficient drive

**COMFORT:** Default mode, optimized for everyday use

**DYNAMIC:** Optimised for inspired driving

**OFF-ROAD:** Maximised low speed capability.

**INDIVIDUAL:** Driver defined

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

- Steering efforts
- Brake pedal feel
- Throttle response / powertrain characteristics, including ACC, AWD, traction control and hill descent control (where available)
- DIM
- Energy save
- Optional electronically controlled dampers (Four-C)



# Compact Modular Architecture (CMA)

## Four-C

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

Four-C (electronically controlled dampers) on the front and rear axle enhances the 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 individual models.



# VOLVO CARS VEHICLE DYNAMICS

## DRIVING CONFIDENCE



**V O L V O**