

VIAVISION

VOLKSWAGEN GROUP

• SHAPING THE FUTURE OF MOBILITY

NO 05
June 2012

Editorial – Dr. Ulrich Hackenberg

Wind, Sun, Cabrio – On Tour with the Top Down

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Open Top

Sun and Wind in the Car

4 percent
of all cars in Germany
are convertibles.

22 components
facilitate in the opening
and closing of the top.

Editorial



Dr. Ulrich Hackenberg, Member of the Board of Management of Volkswagen Brand with responsibility for Research and Development.

As can be seen on the roads during the summer months, as well as read about in this issue of *VIAVISION*: convertibles are becoming increasingly popular in Germany. On the following pages you will find out how manufacturers and component suppliers steadily improve on their tops and top mechanisms.

Happy reading.

Wind, Sun, Cabrio

On Tour with the Top Down

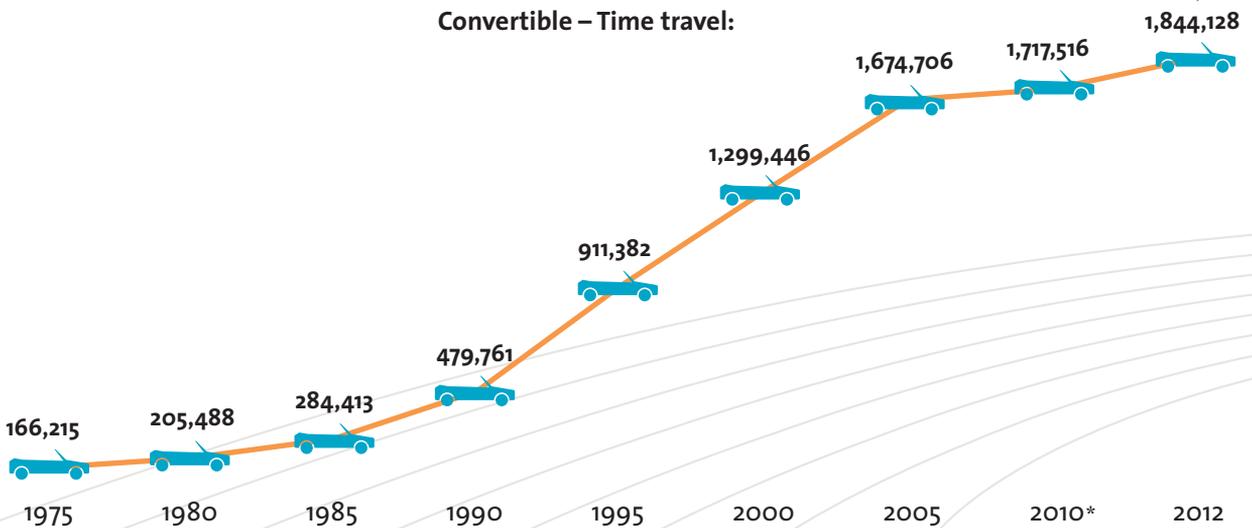
At the dawn of automobile history, open top vehicles were the rule and not the exception. At that time, having a roof over your head was a luxury car drivers sought after. The desire for open top driving has re-emerged in the past 30 years. Today around four percent of all cars on German roads are convertibles – models range from two to five seaters, from metal hard tops to flexible soft tops.

1.8

million convertibles were on German roads at the beginning of 2012 – out of 42.9 million cars at that time in total.

Source: Federal Motor Transport Authority of Germany, KBA

Convertible – Time travel:

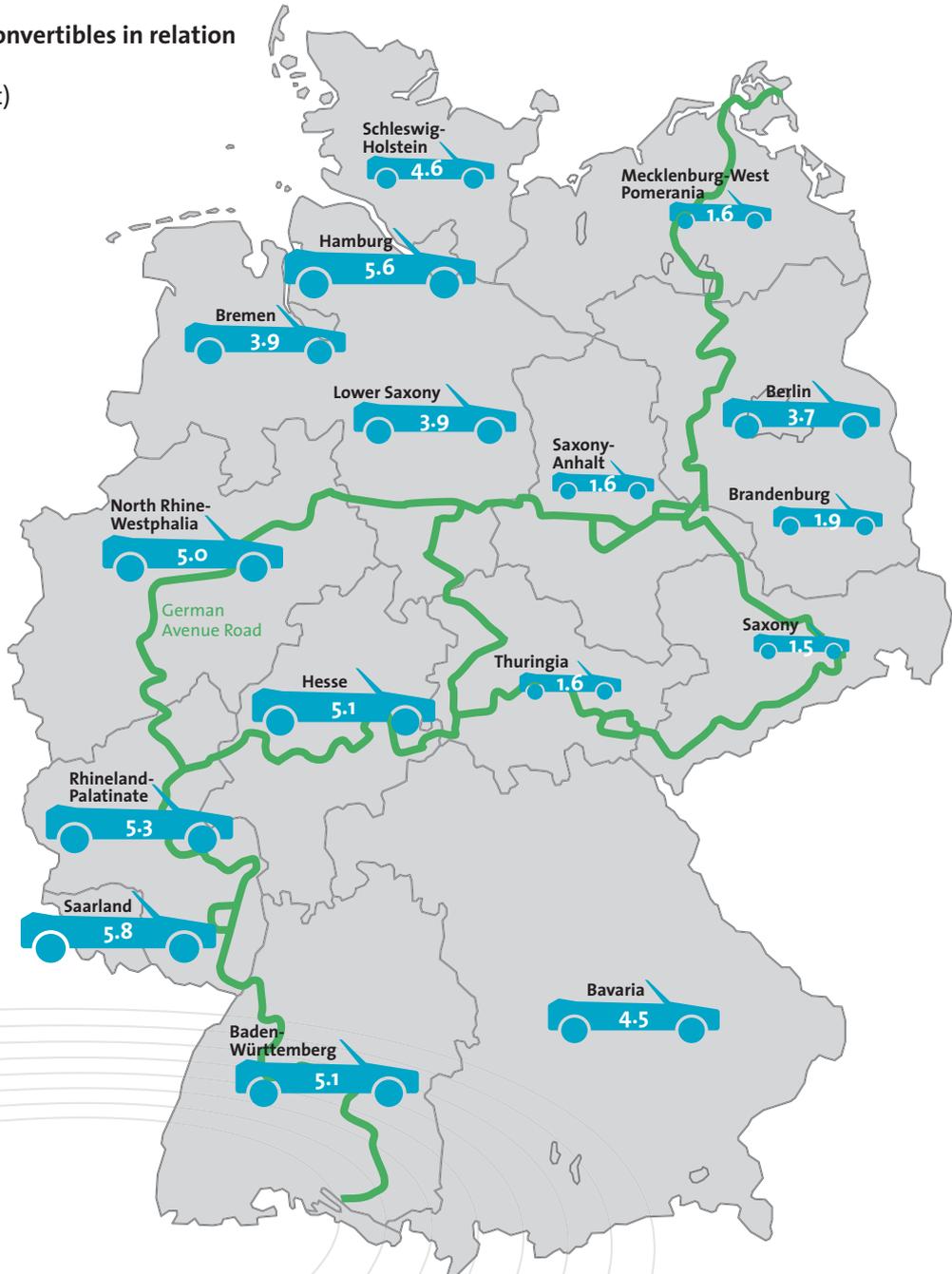


The convertible is becoming increasingly popular: this trend can be seen most clearly in the first half of the '90s, during which time numbers almost doubled.

Source: Federal Motor Transport Authority of Germany, KBA

* Since January 1st 2008 figures include only fully registered cars.

Share of convertibles in relation to all cars: (in percent)



Car drivers in the south west and the north particularly like to drive convertibles: the highest proportion is in Saarland, where 5.8 percent of cars on the road are convertibles, closely followed by Hamburg with a 5.6 percent share – according to the January 1st 2012 registration figures. There are fewer convertibles on the roads in the east of the republic, even though one of the nicest convertible routes starts at Rügen: the German Avenue Road stretches over 2,900 kilometres across Germany to Lake Constance.

Source: Federal Motor Transport Authority of Germany, KBA; ADAC

Golf Cabrio chronicles

The most popular open top Volkswagen is the Golf. From its first generation onwards it was produced in greater numbers than its predecessor, the Beetle convertible. The Golf I Cabriolet featured an innovation when presented in 1979 at the Geneva Motor Show: the fixed-mounted anti-roll bar earned the car the nickname “Erdbeerkörbchen” (little strawberry basket). It was covered with a soft top that, from 1990, could also be opened electro-hydraulically. The Golf III Cabriolet, which entered the market in 1993, kept the anti-roll bar. Additionally, it had front airbags and side collision protection. Finally, in 2012, the Golf VI was presented at the Geneva Motor Show: it premiered without the strawberry basket handle, instead having automatically extending roll-over protection. Since the beginning of 2012 the Cabriolet is also available with a GTI-engine. Its top opens in just nine seconds – in the Golf III it took almost 20 seconds.

1.4 million cabriolets were sold by the Volkswagen Group by 2012; thus placing the company among the most successful manufacturers of open top cars. In total 720,000 Golf Cabriolets have been distributed since 1979 as well as 332,000 of the Beetle Cabriolet.

Source: Volkswagen

Roof Overhead

Hard Shell or Soft Cloth

Whilst the first cabriolets were built with a cloth top, the so-called soft top, nowadays you can also choose hard tops made of steel and synthetic materials. Both types of tops have their advantages and disadvantages. Soft tops are light and flexible, but require special care, while hard tops are more robust but make the car heavier.

Semi-convertible roofs

Sliding and lifting roofs, which are available in different sizes, count among the semi-convertible roofs. Some panoramic roofs can also be opened. They usually extend from the windscreen to the rear window and are equipped with shutters made of transparent or opaque cloth. Take so-called electro-chromic darkening: here glass is coated with oxides which darken under electrical tension. This is activated either manually with a button or by sunlight sensors.

Sources: Webasto (as of 2012); Projekt EcoSol, Institute Technology and Education of the University Bremen (as of 2004)

Open roofs

Classic cabriolet covers are available with soft or hard top. Soft tops are folding covers made of flexible materials like PVC or cloth, while hard top roofs are retractable roofs made of steel and synthetic materials. While there are some practical advantages in favour of choosing a hard top, many consider the soft top the more aesthetic solution. New developments are improving both alternatives: the soft top cloth panels are reinforced with natural rubber to increase robustness; the hard tops are fitted with lightweight construction materials, such as synthetic polymers, to reduce their weight.

Source: ADAC Motorwelt (as of 2010); Webasto (as of 2012)

Soft or hard top?

An overview of the advantages and disadvantages

Soft top

The cloth soft top of the new VW Golf Cabriolet consists of three layers in total which render it inherently stable.

Source: Volkswagen (as of 2012)

Hard top

The metal hard top of the VW Eos is the world's first convertible roof that consists of five individual roof sections.

Sources: Volkswagen; Webasto (both as of 2012)

- +

Weight

A soft top is around 20 to 30 percent lighter than a hard top. Less weight always means less fuel consumption, too.

-
- +

Space saving accommodation

Soft tops made of flexible materials can be stored more easily in the boot than the rigid sections of the hard top.

-
- +

Design opportunities

A top made of cloth can be designed significantly more flexibly than a hard top made of steel and synthetic materials.

-
- **Care needs**

Hard tops may enter a car wash. Most cloth tops however have to be hand treated with special top cleaners.

+
- **Driving noise level**

Hard tops better protect the driver from surrounding noise, especially wind noise, than soft tops.

+
- **Life span**

The ADAC indicates a ten year average life span for a soft top. They therefore wear faster than the more robust hard tops.

+

Sources: ADAC; Webasto; *auto motor und sport* (all as of 2012)

Revelation

How the Top Gets into the Boot

For the driver opening and closing of the roof is easy and straightforward, but the technology behind it is complex. How many sections is the roof separated into? At which angle do they have to be turned to accommodate them into the boot, whilst saving as much space as possible? Only the perfect interaction of sensors, electric motors and roof elements permits the top to disappear elegantly in the boot.

Opening and closing of the electrical top:



1. The driver activates the switch for opening the top. The central control device then gives the signal for unlocking the locking mechanism at the windscreen.



2. The locking mechanism reports the unlocking to the central control device. It then engages the hydraulic pump – the top opens.

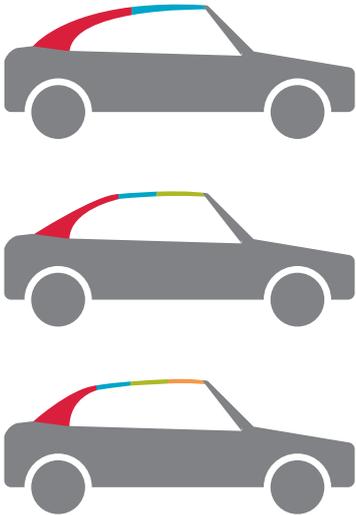


3. The top is deposited into the rear of the car. As soon as this process is finished a sensor reports this information to the central control device. It then activates the convertible top case closing mechanism. The case closes and is locked.



Around 22 components are involved in opening and closing the top. In some convertible models at the electric opening point, the windows are also lowered to a preset level or the windscreen heating is switched off. Source: Audi (as of 2012)

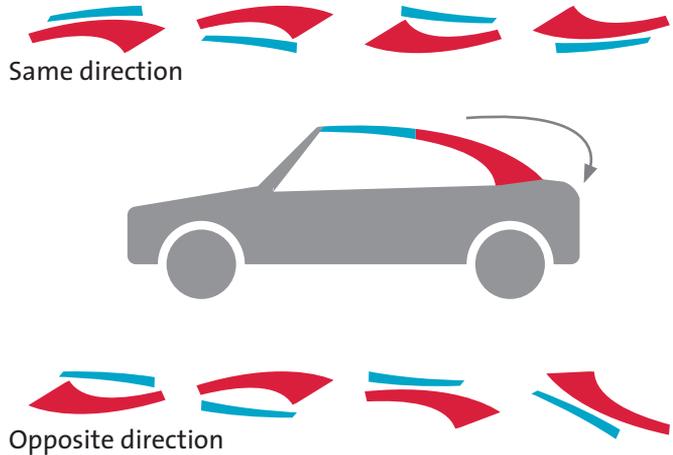
Roof division:
(for hard and soft tops)



A convertible roof, no matter whether it is made from cloth or steel, can be divided into two, three or four sections. There are now even tops with five segments.

Source: RWTH Aachen, Department of Mechanism Theory and Dynamics of Machines (as of 2003)

Deposition options of the two-part top:



The roof elements of a two part hard top can be stored in the boot, either in the same or the opposite direction. Those with a soft top can only be stored in the same direction because the cloth top remains a connected roof section which is folded. The parts cannot be slid into one another, as the hard top can.

Source: RWTH Aachen, Department of Mechanism Theory and Dynamics of Machines (as of 2003)

Golf GTI Cabriolet

The Golf Cabriolet is a classic. Its successor, the first Golf GTI Cabriolet, premiered at the Geneva Motor Show this year. The most powerful Golf Cabriolet achieves top values with the GTI engine: it reaches 100 kilometres per hour in 7.3 seconds; the closed GTI Cabriolet reaches a top speed of 237 kilometres per hour. The cloth top has been adapted exactly from the Golf Cabriolet, it is controlled electro-hydraulically as standard and is designed for high speeds. The boot is also fully usable when the top is down.



9 seconds are needed for the top to open fully – no Volkswagen cabriolet has opened this fast before.

30 kilometres per hour is the top speed at which the roof of the Golf Cabriolet can be opened.

Inner Values

Special Components of the Cabriolet



Wind deflector

The wind deflector is made of a closed-meshed net or an acrylic glass panel. It directs the air turbulence that originates behind the windscreen away from the driver during driving.



Airbags

Special side airbags are installed in cabriolets because airbags cannot be fitted in the roof area: they improve upper body protection and are either installed in the door panels or stored in the arm rests.

A cabriolet is not just a car without a roof. The cabriolet has to be manufactured stably and safely using other methods because the roof and the side pillars of a car provide great stability and protect the passengers. This is achieved using specially reinforced bodywork and additional elements such as anti-roll bars and airbags.

Rollover bar

Cabriolets have either a fixed mounted – or extending – rollover protection, the later only shoots out if the car tips over a certain angle of inclination. Both prevent the passengers from making contact with the ground in the event of a rollover.



Reinforced bodywork

A cabriolet without a roof is like a shoe-box without a lid: the side walls are less stable because the whole underbody can be twisted much more easily. This is why a cabriolet's bodywork is reinforced. The wind-

screen frame for instance is built significantly thicker and the chassis is equipped with diagonal supports.

Sources: *Automobiltechnische Zeitschrift*; Volkswagen (both as of 2011)

Imprint

www.viavision.org.uk, www.viavision.org

Edited by

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Published by

Verlag Rommerskirchen GmbH & Co. KG
Mainzer Straße 16 -18, Rolandshof,
53424 Remagen
Phone: +49 (0)2228/931-0
www.rommerskirchen.com

Printed by

L.N. Schaffrath GmbH
Marktweg 42-50, 47608 Geldern