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VIAVISION

VOLKSWAGEN SHAPING THE FUTURE OF MOBILITY

BLANKET PROTECTION

Car safety

Index

Safety at Volkswagen

Dr. Heinz-Jakob Neußer on the meaning of vehicle safety

Dr. Heinz-Jakob Neußer, Board Member of Management for the Volkswagen Brand and Head of Powertrain Development.

What safety strategy is Volkswagen pursuing?

Our safety strategy is fundamentally focused on preventing accidents or, at least, ameliorating the circumstances of the accident. Integral safety, the merging of active and passive safety, is of growing importance today. A high-strength passenger compartment, seat belts and airbag belong to the passive elements that mitigate the impact of accidents. Additionally, active systems that prevent accidents like ESC and, increasingly, the multi collision brake are standard components of a Volkswagen. Vehicle safety does not only concern the occupants but also those measures that protect pedestrians.

Are these safety systems, with their extensive use of technology, especially prone to failure?

We are very conscious of this issue. This is why we are developing safety systems that repeatedly monitor and safeguard each other. Should a system failure actually occur, the driver will be immediately informed. Past experience, however, shows that no significant increase has been noted in the failure rate of safety systems, despite their growing complexity.

How can traffic participants be even better protected?

In Germany and other industrial nations, the number of fatal accidents is decreasing much faster than the number of accidents. This shows that modern vehicles are offering better and better protection for occupants. Additionally, authorities have made a significant contribution to mitigating the severity of injuries with the introduction of mandatory seat belts. Ultimately, a modern, safe car can only fully deploy its protective effect if the occupants fasten their seat belts.

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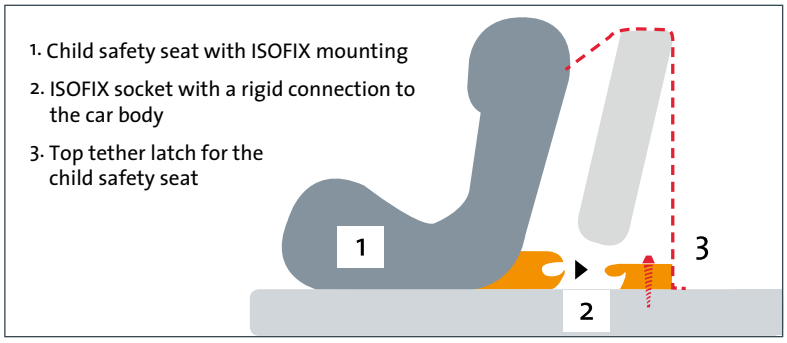
Higher sits safer

Child safety seats protect the smallest

When it comes to car safety, many car drivers think first of assistance systems and seat belts. But children in particular rely on special car safety standards – simple seat belts do not suffice. In Germany, since 1993, children up to twelve years old that are smaller than 150 centimetres have to sit on a child safety seat when in a car. This means either a seat which has its own restraint system for the child, or which increases seat height so that the regular seat belt does not rest on the child's neck but on the shoulder. In addition, the lap seat belts must be fixed in such a way that their body cannot slide below the belt in the event of an accident. The number of fatal accidents involving children has significantly decreased since the introduction of the mandatory child safety seat in Germany: in 1992, according to the German Road Safety Council the figure was 474 children up to 15 years, in 2012 it was just 73.

Systematic fastening



The ISOFIX system is considered an especially safe fitting system for child car safety seats because the seat is connected rigidly to the car body. The system is standardised internationally so that different seat models fit into all cars. In most cases, in addition to this rigid connection, a top tether, a lashing strap which leads back over the back rest and is connected to the car, further secures the seat.

Integral part

Child safety seats that are firmly integrated into the car, as pictured here in the VW Sharan, can be folded out when needed. Therefore, the driver always has the seat with him because it is permanently installed in the vehicle. The regular seat belt system can be used as a seat belt. The child safety seat can simply be folded up and the side headrest switched with the adult headrest, when an adult occupies the rear seat.

Comfortable and safe

Volkswagen is equally concerned with the safety of all occupants – there are not only integrated child safety seats but also those connected with the ISOFIX system. Child safety seats have to match the weight and height of the child to ensure optimal safety. The seats come in eight different categories:

Group 0	up to 10 kilograms
Group 0+	up to 13 kilograms
Group 0+-1	up to 18 kilograms
Group 1	9 to 18 kilograms
Group 2	15 to 25 kilograms
Group 2-3	15 to 36 kilograms
Group 3	22 to 36 kilograms
Group 1-3	9 to 36 kilograms

Infants up to 13 kilograms sit especially safely with the Go plus ISOFIX infant carrier because the seat is mounted rear-facing. An infant's neck muscles and spine are less developed which increases the risk of an accident. During an accident, the rear-facing position of the seat pushes the back of the child's head into the seat instead of propelling it forward.

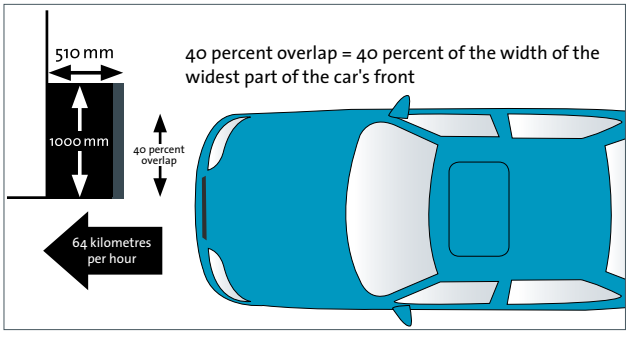
Crash tests

Safety checking new vehicles

The "European New Car Assessment Programme", in short Euro NCAP, was founded in 1996 by numerous European transport ministries as well as automobile associations. This program checks the safety of new vehicle models in standardised tests. Afterwards, the individual test results are converted into stars – a new model can achieve a maximum of five stars.

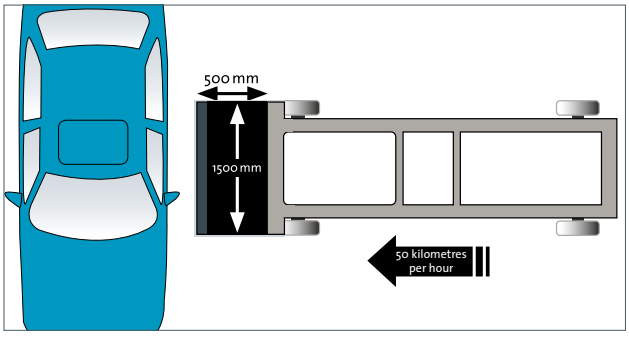
Frontal impact

In order to test the risk of injury in a car during a frontal impact, a test vehicle impacts with a slightly offset deformable barrier at 64 kilometres per hour. The barrier is hit by 40 percent of the car's width. The velocity and the offset impact correspond to the statistical average of these kinds of accidents. The risk of injury for adults is assessed according to the strain measured on the dummies in the front seats. Deformation of the vehicle structure is the main factor that can cause injuries to the occupants. Here, an occupant cell made of high strength materials ensures maximum safety.



Side impact

The car to car side impact test simulates a car being hit by another car from the side. A one and a half metre barrier impacts the driver's door at a speed of 50 kilometres per hour. In another scenario, the impact on a tree or pole is simulated: here, the vehicle is moved towards a pole at a speed of 29 kilometres per hour. The pole is relatively narrow, resulting in a deep penetration of the side of the vehicle. Vehicles with head and side airbags, or combined head and chest airbags, protect optimally against injuries in this scenario.



Protecting children

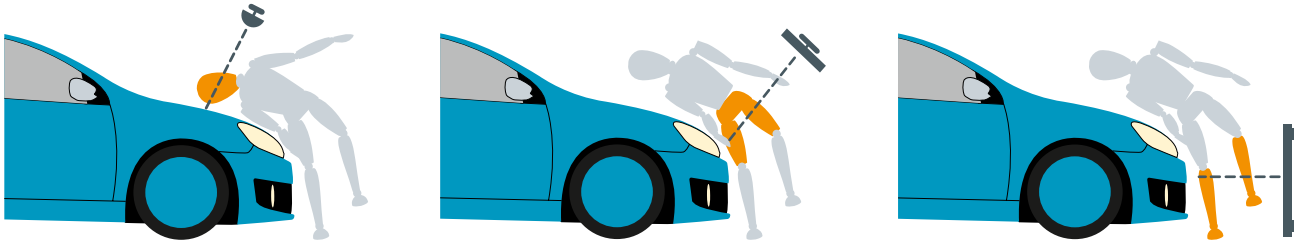
The safety of children is tested in the frontal and side impacts with dummies that represent a one and a half as well as a three year old child. These dummies are positioned in child safety seats on the rear seats with fastened belts. The criteria tested are head movement, strain on the neck and chest acceleration. Euro NCAP also conducts installation tests for child safety seats.

Speed limiter

Many vehicles have systems that inform the driver about speed limits, alerting them when they are exceeded or that simply maintain a set speed. The systems are tested to see whether they are correctly maintaining the set speed and if the warning signals are loud enough to be noticed, while not unnecessarily distracting the driver from traffic.

Pedestrian protection

An impact with a pedestrian at 40 kilometres per hour is simulated in order to assess pedestrian protection. The strain on the lower leg, the upper leg and the head following impact is evaluated by means of different dummies. The whole front of the car is being specifically developed towards pedestrian protection requirements in order to reduce the risk of injury for pedestrians. Front bumper and engine hood, for example, are constructed soft and sufficient space is created between engine and hood.



Seat belt reminder

Seat belt reminders alert the occupants to put on a seat belt in many cars, since the seat belt is still fundamental to the mitigation of the outcome of an accident. Euro NCAP tests these systems on the reliability, loudness and duration of their signal.

Electronic stability control (ESC)

ESC systems are assessed using what are called “sine-with dwell” tests. They are based on a double lane change manoeuvre at a speed of 80 kilometres per hour and steering wheel rotations of up to 270 degrees. These tests are considered passed when the vehicle can be steered sufficiently to avoid a possible obstacle in its own lane, while handling remains stable and safe.

Seats

The adults’ seats are also tested on their mitigation of spinal injuries, which can be caused by a rear collision, by Euro NCAP. There can be permanent damage to the spine if the seat does not sufficiently protect the neck and head. In this test, dummies are put in seats with the belt fastened and accelerated on a horizontal sled, representing the force of a rear collision crash. This simulates another vehicle colliding from the rear with the vehicle being tested.

Autonomous emergency braking

Accident avoidance systems like autonomous braking assistants are categorised by Euro NCAP as low speed, such as the city emergency brake function, and high speed systems. These systems can have two functions: automatic braking, which activates the brakes without driver input, as well as an acoustic collision warning. City emergency brake functions are tested at a speed range of 10 to 50 kilometres per hour. Autonomous emergency brake systems, that operate at higher speeds, are tested in three scenarios; approaching a standing vehicle at speeds between 30 and 80 kilometres per hour; driving close to a slower car in front at speeds between 30 to 80 kilometres per hour; as well as approaching a car in front that brakes abruptly.

Technology for increased safety

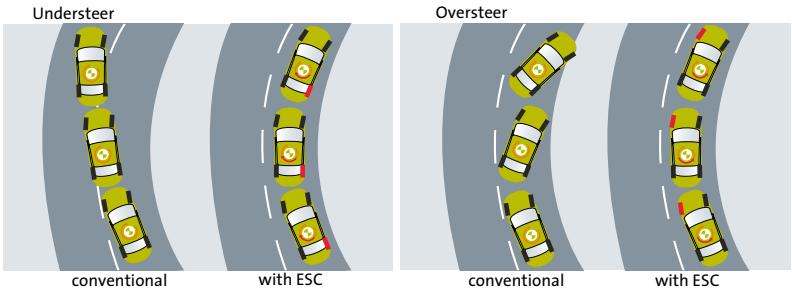
Active and passive safety systems

Avoiding accidents – this is the job of active safety systems. If it nevertheless comes to an accident, passive safety systems facilitate the best possible protection of the vehicle's occupants. Combined, active and passive safety systems help ensure that all vehicle occupants arrive safely and also protect all other traffic participants.

Active safety in the car

All systems in a car that intervene in the driving process in critical driving situations, to defuse them or avoid accidents, are considered active safety systems. Here, driver assistance systems such as the ESC, the brake assistant or the Front and Side Assist play a decisive role.

ESC



ESC stands for electronic stability control and counteracts vehicle swerving during cornering. Moisture, slipperiness or dirt on the road, driving too fast, or evasive manoeuvres, can cause the car to understeer or oversteer. When the car understeers, the driver must steer significantly harder than the corner would normally require because the vehicle seems to drive straight on. In this case, the ESC brakes the inner rear wheel and reduces the engine power until the vehicle has stabilised. Oversteer means that the rear of the vehicle swerves off to the outside of a corner. To prevent this, ESC brakes the outer front wheel and affects the engine and transmission management. The car's steering is corrected via the braking intervention and stays on track. The system is mandatory in all new EU vehicles from November 2014. Future systems can additionally intervene directly in the steering and, in doing so, stabilise the car even better.

Brake assistant

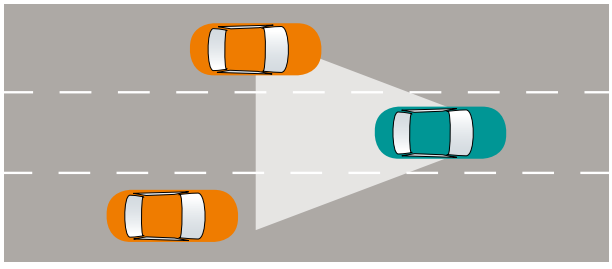
In emergency situations, drivers often do not brake hard enough or they release the pressure on the brake pedal too early. This is when the brake assistant is activated: as soon as the system registers the driver initiating an emergency stop, it increases the brake pressure to the maximum. The brake assistant continues braking until the driver releases the pedal. The brake assistant can recognise if it actually is emergency braking by the initial pedal movement or brake pressure, because the driver first brakes strongly but does not maintain this pressure. This way, at 100 kilometres per hour the stopping distance following emergency braking can be decreased by up to 20 percent.

Front Assist

Front Assist is an environment monitoring system which, using a radar sensor, can detect when the distance to the vehicle ahead is critical. It can help to reduce braking distance. This is done in two stages. Firstly, Front Assist warns the driver with audible and visual signals of sudden, heavy braking or slow vehicles ahead. At the same time the vehicle is prepared for an emergency stop by already applying the brake pads to the brake discs without activating braking. Secondly, if the driver does not react to the warning, the impending collision is indicated by a short jolt on the brakes. If the driver then hits the brakes, full braking power is available immediately. If the driver does not brake hard enough, Front Assist increases the braking pressure to the extent that a collision may be avoided.

Side Assist

This lane change assistant is equipped with two radars in the rear that cover a range of up to around 50 metres behind the vehicle, including the blind spots, which are not visible using the side mirrors. Side Assist can show all vehicles that are in that area and also takes into account their different speeds. The system alerts the driver to these vehicles with a light in the respective outside mirror. If the driver nevertheless activates the turn signal, the corresponding LED light flashes with greater brightness. The lane change assistant works at speeds above 30 kilometres per hour.



Passive safety in the car

The term passive safety includes all the elements of a car's construction that, in the event of an accident, protect the occupants from injuries or, at least, mitigate them. Additionally, it is the goal of passive safety systems to protect any other people involved in an accident. This is called pedestrian protection. The seat belt system, the airbags, the passenger cell, and the crumple zones are the most important achievements of passive safety and are being developed continuously.

Seat belt system

Wearing a seat belt is mandatory in Germany, for passengers in the front seat since 1976 and for those in the back seats since 1986. Ever since, the seat belt has been the most important part of occupant protection. Modern, three-point automatic safety belts, fasten the occupants to their seats in case of an accident so they are slowed down along with the car and not propelled through the vehicle. Belt pretensioners are used so that the belt is already applied firmly at the time of impact. They are activated electrically by the airbag control unit and tighten the seat belt.

Automatic emergency call

From 2015, as required by the European Commission, all new cars have to be equipped with what is called an eCall System for making an automatic emergency call. It is estimated that 2,500 lives can be saved every year by the time saving this will generate. In the event of an accident, the system automatically places an emergency call and transmits the location of the vehicle accident. Additionally, the emergency call centre can establish contact with the occupants. The eCall is activated by crash sensors. As well as these sensors, the car has to be equipped with a GPS receiver for location detection, a GSM antenna to transmit the emergency call, a microphone and a speaker.

Passenger cell and crumple zones

With its rigid structures, the passenger cell forms a safety cage that contains the vehicle's occupants. The passenger cell can barely be deformed and secures the survival space for the occupants in the event of an accident. The crumple zones in the front and rear are also called deformation zones. Their predefined deformability ensures that as much impact energy as possible is absorbed during a collision.

Airbags

Airbags can lower the risk of severe head and thorax injuries during a collision because the head and upper body impact with a larger and softer surface than, for example, the steering wheel. The forces on the body are therefore spread over as large as possible a surface. If the crash sensors register a collision, they transmit this information to the airbag control unit which activates the corresponding gas generators, if required. Those fill up the airbags with gas within 35 to 45 milliseconds. The gas escapes after 120 milliseconds and the airbag collapses. Next to these front airbags, there are side and knee airbags, as well as airbag systems which protect the heads of the occupants.

The airbag system in the new Golf

In the new Golf, up to seven airbags protect the vehicle occupants in the event of a collision. In addition to airbags for the driver and front seat passenger, there is a knee airbag for the driver, and a head airbag system for front and rear seat passengers, as well as side airbags.