



Reward 2011

## Volkswagen City Emergency Brake



Volkswagen City Emergency Brake is a lidar-based emergency Brake system designed to help a driver avoid a low-speed crash or to reduce its severity. At vehicle speeds between 5km/h and 30km/h, City Emergency Brake monitors an area 10m ahead of the car for vehicles which might present a threat of collision. If a collision is likely, City Emergency Brake first pre-charges the brakes and makes the Emergency Brake Assist system more sensitive: if the driver should notice the risk, the car is ready to respond more quickly to his Brake action. However, if the driver still takes no action and a collision becomes imminent, City Emergency Brake independently applies the brakes very hard. In ideal conditions, the car will be able to brake such that the collision is avoided if the relative speed between the car and obstacle is less than around 20km/h. At higher relative speeds, City Emergency Brake will not be able to prevent the collision but will reduce the impact speed.

If the driver intervenes to try to avoid the accident, either by accelerating hard or by steering, City Emergency Brake will deactivate and allow the driver to complete the avoidance manoeuvre. City Emergency Brake does not give the driver a warning of the impending collision, and brakes very hard, very late. This is intentional: the way in which the system intervenes is not comfortable and drivers will not become reliant on it to avoid around-town accidents.

## **What is the safety benefit?**

Volkswagen City Emergency Brake is a technology designed to mitigate and, in certain circumstances, avoid low speed rear-end collisions with vehicles which are stationary or travelling in the same direction. Rear end collisions are extremely common. According to some estimates, around a half of all accidents involve a rear-end collision. City Emergency Brake operates only up to 30km/h so focuses on the sorts of rear end collisions which take place during urban driving. Fatal and severe injuries are not common for car occupants in accidents below 30km/h. However, soft tissue 'whiplash' injuries are frequent, not only for the occupants of cars struck from behind but also for those in the striking vehicle. It is estimated that City Emergency Brake could help to avoid or mitigate some 22 percent of injuries caused by longitudinal accidents against other road vehicles.

## **How has City Emergency Brake been assessed?**

Volkswagen undertook extensive laboratory HiL (hardware-in-the-loop) simulations to establish ensure the robustness of design of City Emergency Brake. On the test track, the efficiency of the system was established: cars were driven at different speeds and with different degrees of overlap at 'dummy' vehicle rear ends. In each case, it was established whether or not the system had responded correctly: whether the Brake system was pre-charged at the correct time and whether the collision was avoided or the desired speed reduction achieved before impact. Extensive road tests were also done to ensure that the system did not perceive a threat and apply the brakes in benign situations.

## **What are the limitations?**

City Emergency Brake can be switched off by the driver but defaults back to 'on' at the start of the next journey.

City Emergency Brake functions only between 5km/h and 30km/h, so will not assist in accidents at 'highway' speeds. Its lidar can detect vehicles which are at a standstill or which are travelling in the same direction and works at night as well as during the day. However, the sensor is compromised if it is covered by dirt or snow, or in adverse weather conditions such as thick fog or heavy rain. To mitigate this, the sensor is sited in the area which is swept by the windscreen wipers.



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