



Advanced Safety Systems Help Drivers Avoid Crashes, Reduce Injuries

January 25, 2012

Bosch Offers Active and Passive Safety Systems, Driver Assistance Technologies for Passenger Safety and Comfort

- Driver assistance systems use the information from surrounding sensors to enable safe and comfortable driving
- Active safety systems intervene before accidents occur, helping to reduce serious injuries and fatalities
- Passive safety systems help to reduce injuries by protecting occupants in crash situations

FARMINGTON HILLS, Mich. – According to the United Nations, worldwide nearly 1.3 million lives are lost in traffic accidents each year and this number could rise to nearly 1.9 million in the next 10 years. Furthermore, estimates show that nearly 90 percent of all crashes are caused by driver error, making advanced safety systems an important focus for automakers and governing agencies. Bosch offers active and passive safety technologies, as well as driver assistance functions that can help reduce the number of accidents and save lives.

“At Bosch, we are focused on developing systems that bring the world closer to accident-free driving,” said Scott Winchip, regional president, Chassis Systems Control North America, Robert Bosch LLC. “Safety technologies, such as predictive emergency braking systems and anti-lock brake systems for motorcycles, can help reduce the number of injuries and fatalities caused by traffic accidents, as well as the associated costs.”

Driver Assistance Systems

Bosch’s driver assistance systems help drivers avoid accidents by using intelligent sensors to detect critical situations. Following are several key driver assistance technologies.

- [Predictive Emergency Braking System \(PEBS\)](#) – Bosch’s PEBS is based on the networking of a radar sensor with Electronic Stability Control (ESC). It can assist in reducing rear-end crashes through its three-stage approach, thus offering drivers advanced warning for improved braking reaction time in critical situations, and assistance in avoiding crashes or reducing the risk of injury in crashes that are unavoidable.

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- Stage One – Predictive Collision Warning (PCW) identifies the risk of a collision and prepares the brake system to ensure the driver has access to full braking power. This preparation is followed by an audible and/or visual signal and an optional haptic alert (i.e., brake pulse), which signals the driver to react by braking or taking evasive action to avoid a rear-end collision. The timing of the warning is calculated using a radar sensor that continuously evaluates the distance and speed to the preceding vehicle.
- Stage Two – Emergency Braking Assist (EBA) extends the warning by providing intelligent braking support. The system's radar sensor continues to evaluate the distance and time to collision to the preceding vehicle and calculates the additional brake pressure required to avoid the collision. If the driver brakes after the collision warning, but fails to apply sufficient brake force, EBA automatically increases the brake pressure.
- Stage Three – Automatic Emergency Braking (AEB) provides braking support on multiple levels to help avoid collisions. First at [low speeds](#) (under 18 mph) often preventing rear-end collisions altogether. Second, when the driver does not react to the collision warning, the function initiates partial braking to decelerate the vehicle and provide additional time for the driver to respond. Finally, in situations where the driver does not react to the collision warning and the system detects the rear-end collision is unavoidable, full braking is triggered. For partial and full emergency braking, Bosch recommends the radar sensor be supplemented with video technology.
- [Adaptive Cruise Control \(ACC\)](#) – This system reduces driver stress by automatically controlling the vehicle's speed and maintaining a predefined minimum distance to the preceding vehicle using a radar sensor. Standard ACC can be activated from speeds of around 20 mph and up and supports the driver primarily on the freeways and long hauls. ACC Stop and Go controls the speed and distance to the preceding vehicle down to vehicle standstill, supporting the driver in heavy traffic situations.

- [Mid-Range Radar Sensor \(MRR\)](#) – The new Bosch MRR sensor supports functions such as ACC and PEBS. Working the same way as the existing long-range radar sensor (LRR3) in the 77 GHz frequency band, it records the distance and position of obstacles with precision and at far less cost. This sensor also can be used in the rear of the vehicle to support functions such as blind spot detection, cross traffic alert and lane change assist.
- [Lane Departure Warning \(LDW\)](#) – Bosch’s LDW uses a video camera to detect lane markings ahead of the vehicle and monitor the vehicle's position in its lane. When the function detects that the vehicle is about to unintentionally leave the lane, it warns the driver through a visual, audible and/or haptic signal (i.e., steering wheel vibration). The function does not issue a warning when the driver activates the turn signal to change lanes intentionally.
- [Lane Keeping Support](#) – This system can actively help the driver remain in the marked lane by using a video camera to detect if the vehicle is getting too close to the side of the lane and then taking action to correct the vehicle’s position. When connected with electric power steering, the system will provide a gentle, but noticeable steering torque to prompt the driver to keep the vehicle in the lane. For vehicles without electric power steering, lane keeping support is achieved by applying braking torque to individual wheels. The driver remains responsible for control of the vehicle and can override the system at any time. When the driver activates the turn signal to intentionally change lanes, the function does not intervene.
- [Driver Drowsiness Detection](#) – Driver Drowsiness Detection identifies when a driver is at risk of falling asleep and sends a warning to remind the driver of the danger of driving while tired, thus assisting in averting a potential crash. The system operates by analyzing the driver’s steering behavior using data collected from a steering angle sensor or electric power steering system. It identifies “deadbands,” or phases where the driver does not steer for a brief period and then makes an abrupt steering correction. The system combines the frequency and strength of these reactions with other data, such as vehicle speed and time of day, to calculate a tiredness index. If this index exceeds a specific value, an audible, visual (i.e., flashing coffee cup) or other alert mechanism can warn the driver that they are tiring and at risk of falling asleep at the wheel.

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Active Safety Systems

Bosch's active safety systems intervene before accidents occur, helping to reduce serious injuries and fatalities. In 2010 Bosch launched the new, more compact generation 9 ABS for motorcycles – the first anti-lock brake system specifically developed for motorcycles. The base version of the system weighs just over 1.5 pounds, making it the smallest system available.

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- [Motorcycle ABS](#) – This system includes speed sensors at both wheels that register the vehicle's speed. If a wheel risks locking during braking, the ABS hydraulic unit controls the pressure applied by the driver and the wheel's braking force and deceleration. This process preserves the rotation of the wheel and keeps the bike stable, even on varying surfaces, helping the rider achieve the shortest and safest stopping distance.

Passive Safety Systems

Bosch's passive safety systems help reduce driver, passenger and pedestrian injuries. The iBolt™ Occupant Classification system is one way Bosch is helping keep passengers safe when accidents occur.

- [iBolt™](#) – Bosch's weight-sensing iBolt™ provides safe deployment of vehicle airbags through the accurate and reliable classification of occupants, including an empty seat, one-year-old infant, three- and six-year old child, 5th percentile female and 50th percentile male. The system uses an electronic control unit coupled with two to four seat-securing bolts with integrated sensors that help determine the weight of the front-seat passenger. These sensors report the weight classification to the airbag control unit, which adjusts the force of deployment based on the occupant's weight – with reduced intensity or turned off completely. Bosch's system meets the Federal Motor Vehicle Safety Standard 208 (FMVSS 208) and supports 5 Star Rating for 2011 U.S. New Car Assessment Program (NCAP).

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