

ZF LIFETEC introduces electromechanical seatbelt locking for the first time

- **Semi-autonomous driving increases the demand for safety solutions in comfort positions**
- **LIFETEC makes this possible for the first time with e.Locking - the electrification of the sensor and release system**
- **Easier structural integration of the seat belt into the seat offers advantages in design and production.**

Semi-autonomous driving has led to an increased demand for safety solutions in comfort positions. ZF LIFETEC offers an innovative solution with e.Locking, the electrification of the sensor and release system. This technology allows easier structural integration of the seatbelt into the seat, resulting in significant advantages in both design and production. In the event of a sudden deceleration, the belt reel is mechanically locked so that the belt cannot be unfastened or can only be unfastened against the action of a force limiter. When the driver and passenger are in an upright nominal seating position, the combination of belt, retractor and force limiter reduces the consequences of hard braking or a crash.

Every driver has experienced it: when you pull the seatbelt quickly, it locks and cannot be pulled any further. This restraint function is important in the event of an imminent crash to ensure controlled restraint of the occupants. Until now, two redundant mechanical systems directly on the retractor were required to lock the seat belt. In order to protect occupants in new seating concepts, ZF LIFETEC is now introducing a new electromechanical system to series production. The electrification of the sensor and triggering system is a key function in the latest ACR8.S seatbelt retractor series and offers significantly more design freedom and more comfort for the occupants. It will also be available as an option for the other ACR8 and SPR6 generations. With this new development, ZF LIFETEC is responding to a megatrend in automotive engineering: If autonomous driving functions become more widespread in the future, new seating concepts will become attractive that allow the occupants to adopt a resting position. This requires the seatbelt to be integrated into the seat - which is made much easier by the new e.Locking system from ZF LIFETEC.

Mechanical trigger function with compromises

One mechanical sensor responds to the acceleration of the belt spool movement. The other mechanism detects the acceleration of the entire vehicle. Typically, a ball sensor is used. In the event of a sudden acceleration or deceleration of the vehicle, the inertial body in the form of a ball, preferably a solid steel ball, moves and causes

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the latch lever to oscillate. This can, for example, cause a clutch pawl to engage with the clutch teeth of a locking mechanism, ultimately blocking the belt spool and preventing the belt from being pulled out. "The steel ball sensor in particular requires the retractor to be mounted outside the seat, ideally in the vehicle's B-pillar," explains Harald Lutz, Senior Vice President Global Engineering at ZF LIFETEC. However, this design makes it difficult to integrate the belt into the seat. And this could be in greater demand in the future. Trends that can already be seen are driver and front passenger seats that also allow a so-called relax position, i.e. a flatter position of the occupants, relatively far away from the dashboard - and the B-pillar. Such seating positions are likely to be in greater demand in future model series, as they temporarily enable highly automated and autonomous driving. "To ensure that occupants in these positions are optimally protected by a seat belt system, an integrated belt system is required. We have now made this much easier with our e.Locking function," explains Lutz.

The new e.Locking system, available in the seat-integrated ACR8.S belt retractor from ZF LIFETEC, replaces the 12 to 13 millimeter steel ball previously used with an electromagnetic coil that locks the retractor electromechanically via a signal from a central ECU. The vehicle's acceleration, deceleration, and tilt are measured centrally by sensors in an ECU, evaluated by an algorithm, and a signal is sent to the coil when the belt retractor should be mechanically locked.

Electrification of the seatbelt latch offers many advantages

The e.Locking system makes it easier to integrate the retractor into the seat instead of the B-pillar. In addition, thanks to the electromagnetic coil, the seatbelt locking function can also be triggered by control software. When networked with other vehicle safety systems, such as emergency braking assistants or pre-crash functions, occupant safety can be further enhanced because the seatbelt lock can be triggered immediately, without delay or loss of belt length. The system can also be synchronized with driving programs so that, for example, a locked seat belt provides more support during dynamic cornering. The system can also increase occupant comfort, for example by allowing the belt to extend unhindered on bumpy roads, where today a ball sensor would repeatedly lock briefly. The new e.Locking system from ZF LIFETEC is located directly on the retractor, in the same place as the previous mechanical system; the locking mechanism via a pawl remains unchanged. The release algorithm and the control unit will also be part of the ZF LIFETEC portfolio.

Caption:

ZF_LIFETEC_E-Locking_ACR8.S: "With e.Locking, ZF LIFETEC enables electric belt locking for the first time.

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About ZF LIFETEC

ZF LIFETEC is a leading passive safety technology provider for enhanced protection of vehicle occupants. Employing around 36,000 employees dedicated to the mission of saving lives with a technology driven approach, the company develops, manufactures and distributes a comprehensive product portfolio including airbag, seat belt and steering wheel systems, covering a wide range from small vehicles in the volume segment up to sophisticated luxury vehicles. Featuring a market share exceeding 20 percent in its core product categories, ZF LIFETEC has a worldwide presence at 51 locations across 22 countries. In the fiscal year 2023, the Group generated sales of EUR 4.6 billion. Based on its strong relationships with a diversified customer base of global OEMs, driven by outstanding quality, long-standing R&D collaborations besides a strong global innovation platform, ZF LIFETEC is well positioned for future growth opportunities arising from the automotive megatrends electrification, (semi-) automated driving, smart interior, as well as increasing safety demands and stepped-up safety regulations worldwide.

Learn more at www.zf-lifetec.com

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