

## ZF LIFETEC integrates active belt tensioner into the seat

- **Active seat-integrated belt tensioner ACR8.S compact design requires little installation space**
- **More comfort and driving pleasure: minimizes belt pressure on the body during normal driving situations, but can gently pull the driver into the seat when cornering**
- **Tactile warnings: Seat belt interacts and communicates with the driver**
- **High level of safety: belt tensioner can bring occupants into a better protected seating position before a crash**

Alfdorf, Germany. As with the current, fourth generation of the ACR8 active belt tensioner, ZF LIFETEC is also supporting the trend towards connected and automated driving with the new ACR8.S seat-integrated version. The possibility of integration into the seat allows new design freedom for the vehicle interior. In addition, the restraint system can bring the occupants into a better protected seating position before a possible crash (repositioning). Thanks to its electric drive unit, the ACR8 system enables further safety functions, for example by tightening the seat belt during critical driving maneuvers such as automatic emergency braking. Such reversible belt tensioning can also increase driving pleasure by giving the person behind the wheel better support during dynamic driving. In addition, the belt can be used for highly automated driving by means of tactile warnings, for example to prompt the driver to take over the driving task.

If the vehicle sensors detect an unavoidable crash, a pyrotechnic belt tensioner is activated, and the belt pulls the occupant's upper body back towards the seat backrest in a fraction of a second. During the course of the crash, the person is then guided towards the airbag, which then absorbs the impact energy even further to prevent serious injuries. This tightening is irreversible and is triggered in conjunction with the airbag - only once and only in the event of a correspondingly serious accident.

### Basic functions of the ACR8.S

The idea behind all ACR8 variants is to improve the pre-crash behavior of a vehicle's occupant protection systems. To this end, the belt slack is reduced and the occupants are held or placed in an ideal seating position. Depending on the car manufacturer's philosophy and the sensors available in the vehicle, the active belt tensioner from ZF LIFETEC can become active in the milliseconds before a potential collision. "With the ACR8 series active belt tensioners, conventional pyrotechnic functions can be combined with reversible electrical tensioning to further increase safety in the pre-crash phase. However, the electronic control options of the

ACR8 are also suitable for offering additional safety and comfort functions,” explains Harald Lutz, Head of Development at ZF LIFETEC.

### **Modularity ensures functional diversity**

Apart from the functions just described, the ACR8.S offers a range of options in a modular system. Nine different setup combinations are currently available. The webbing motion sensor and the electric drive unit are particularly noteworthy in this context. Both components are central building blocks for many optional functions. For example, they enable haptic warnings: In automated driving, the active belt tensioner can help to alert the driver to the need to take over the driving task by means of belt vibration. In other situations, high-frequency pulsation of the seat belt webbing can signal to the occupants that active intervention is necessary. “In these situations, the belt system's pulses close to the body are more efficient warning signals than displays or LEDs and minimize the reaction time,” emphasizes Lutz.

Many functions go far beyond the belt's function as a pure safety device. As the seat belt is a constant companion during the journey, it should fit snugly but not restrict the occupants. The optional comfort function of the ACR8.S allows a lower tension level throughout operation. This means that the belt only rests lightly against the body. The innovation can also improve handling during sporty driving. To do this, the ACR8.S accesses navigation data in the vehicle and can tighten the belt to offer the occupants more support during dynamic driving.

### **Next level of autonomous driving**

The functions described apply to the current fourth generation of the ACR8 as well as to the ACR8.S. The more compact ACR8.S design is ideal for seat-integrated applications. Today, this offers advantages, for example, in convertibles and coupes without a B-pillar, but it will also be advantageous in the future with regard to automated driving. The latter is one of the most important drivers in the development of new interior concepts. If the seatbelt is located in the seat instead of the B-pillar, this opens up new design freedoms for interior design, allowing vehicle seats to be moved and rotated more freely.

#### Caption:

The active seat belt tensioners of the ACR8 series can be reversibly tensioned with their electric motor and also with a conventional pyrotechnic ignition in the event of a crash.

Image: ZF LIFETEC

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**About ZF LIFETEC**

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