

Proposal for Supplement 4 to the 06 series of amendments to UN Regulation No. 16

This text below was produced by the experts of the supply industry to propose an amendment to regulation ECE-R 16 with focus on the uniform provisions on safety belts. The modification is marked with bold letters.

A. PROPOSAL

Paragraph 6.2.5.3.2., amend to be read:

"6.2.5.3.2. When tested in accordance with paragraph 7.6.2., an emergency locking retractor with multiple sensitivity, including strap sensitivity, shall comply with the specified requirements and also lock up when strap acceleration measured in the direction of unreeling is not less than **[3.0]** g."

B. JUSTIFICATION

Safety belts are broadly accepted as one of the major contributors to road safety. Buckling up is seen as an obligatory process after entering a vehicle by most of the car users, not only due to enforcement, but also due attitude. Wearing and handling comfort play an important role in increasing such a positive perception.

Most of the actually installed safety belt systems represent emergency locking retractors. In the case of multiple sensitivity, strap sensitivity must not lock at an acceleration of less than 0.8 g and shall lock up at an acceleration of 2.0 g when measured in the direction of the extraction of the strap.

Devices with a strap sensitivity threshold in the area towards 0.8 g result in frequent locking phenomena already during pulling out the strap while buckling up. To prevent car user criticism and effects of refusing the safety belt wear at all, strap sensitivities are usually defined in an area close to 2.0 g. Anyhow this is not preventing the locking phenomena during buckling up entirely.

It is proposed to increase the strap sensitivity to a range of up to [3.0]g to allow the installation of a user friendlier safety belt system.

In the normal use case, locking of a retractor is dominantly initiated by vehicle sensitivity. Strap sensitivity can be seen as a redundant mechanism to enable the locking function even with failing vehicle sensitivity.

Numerous studies with switched off vehicle sensitivity have shown that the proposed increase of strap sensitivity is not negatively affecting the performance of safety belts.

- Investigation in numerical simulation on a synthetic Euro NCAP sled pulse with variation of strap sensitivity

Vehicle sensitivity or strap sensitivity are switched off each to understand its solely influence to the belt forces. The seen onset of shoulder belt force shows no difference due to differently chosen levels of strap sensitivities (WS). The diagram incorporates

additionally for reference purpose the upper shoulder belt force with a vehicle sensitivity of 1.0 g (CS).

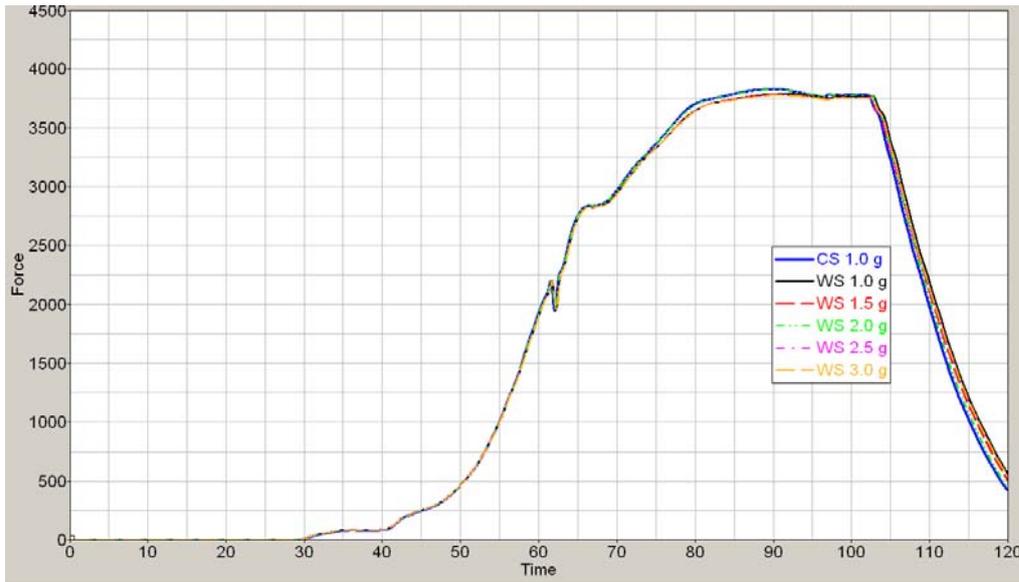


Diagram 1 - Upper Shoulder Belt Force versus Time with Strap Sensitivities (WS 1.0 g up to 3.0 g)

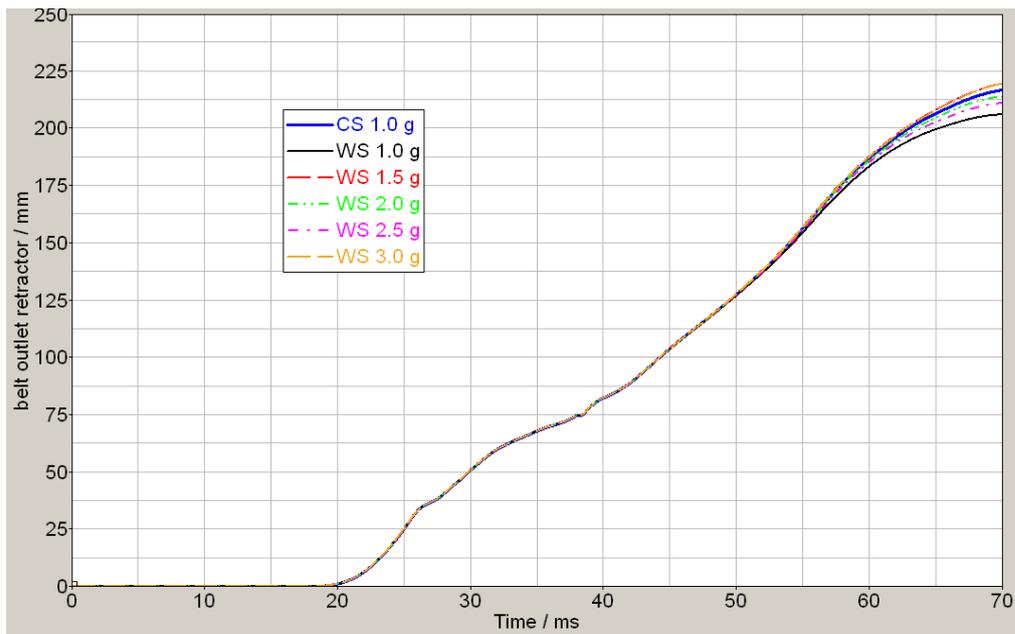


Diagram 2 – Belt movement measure above the Retractor

The consequently appearing belt movement analyzed above the retractor housing, which represents the belt spending for the occupant kinematics and finally maximum forward displacement is shown in the diagram 2. The variation visible after 55 ms is affected by the restraint system (air bag deployment, air bag to I/P contact, etc.). It can be demonstrated that different sensor layouts, in this case up to a webbing sensitivity of 3.0g do not show any evidence for a change in the occupant kinematics.

- Investigation with ECE-R 16 sled tests with variation of strap sensitivity
 Another study performed on a ECE-R16 sled was set up to demonstrate potential differences between sensor layout 2.0g and 3.5g. To eliminate any kind of influence coming from the vehicle sensitivity, these elements were detached from the retractor. Diagram 3 shows the shoulder belt forces versus time, specifically with a webbing sensitivity of 2.0g and 3.5g. There is no relevant difference visible.

The same counts for the forward displacements of the TNO-10 dummies, which are shown in Diagram 4. The kinematics with both sensitivities can be described as equal.

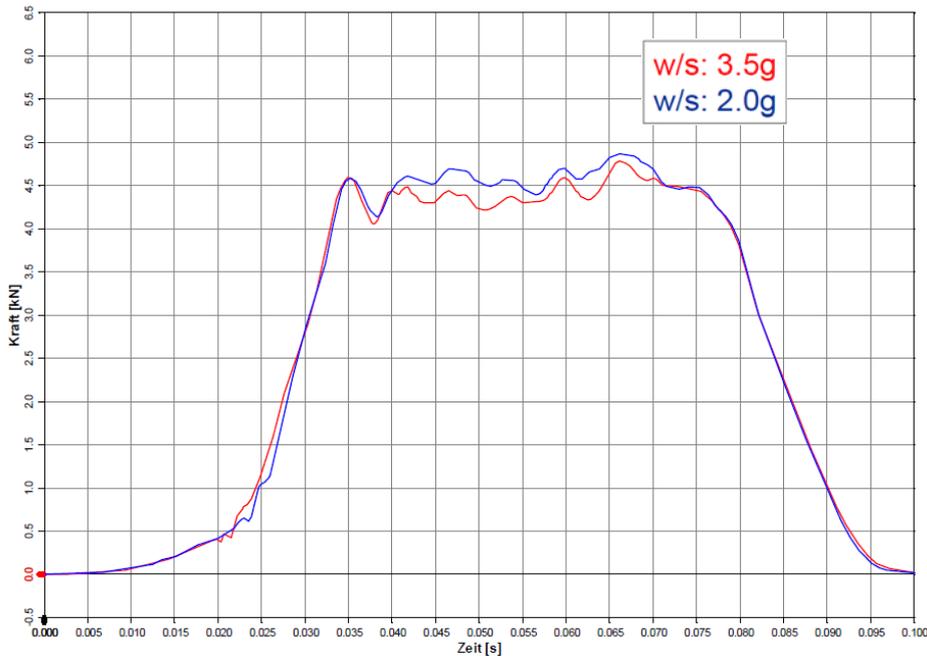


Diagram 3 – Shoulder Belt Force versus Time with Strap Sensitivity 2.0g and 3.5g

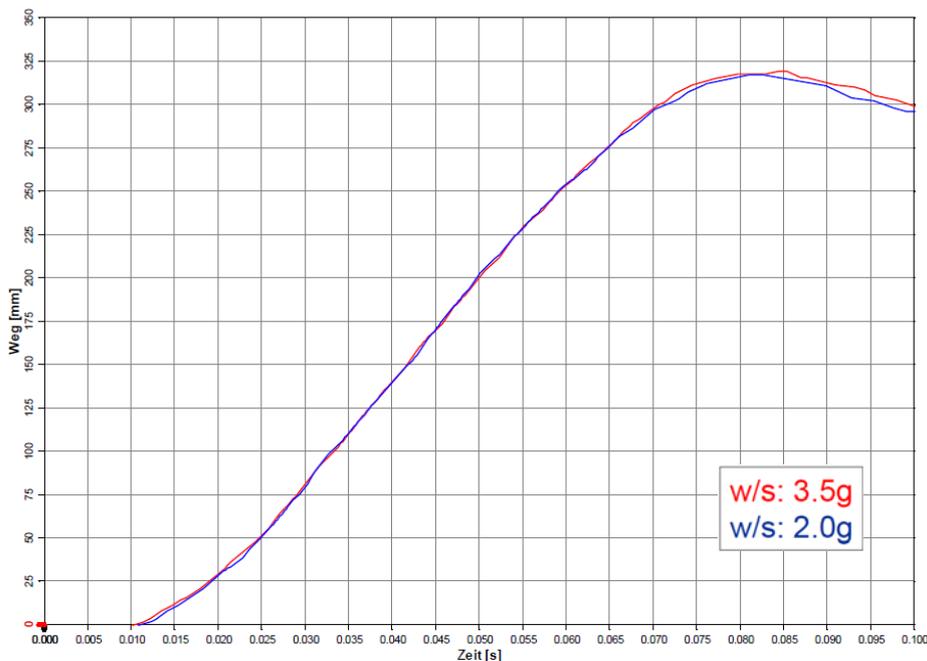


Diagram 4 – Forward Displacement TNO-10 on ECE-R 16 sled with Strap Sensitivity 2.0g and 3.5g