Acceleration Sensitivity of the Safety Belt Buckle

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. The purpose is to check that the buckle remains locked when exposed to the high acceleration levels the pretensioner produces when activated.

1.2 Applicability. This test procedure is applicable for all vehicle safety belt buckles in a safety belt system with any type of pretensioner.

1.3 Remarks. Not applicable.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

None

2.3 Additional References.

None

3 Resources

3.1 Facilities. The facility must be approved for pyrotechnical pretensioner firing activities, e.g., sufficient ventilation, noise protection, etc.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment.

3.2.1 Test rig where seat and seat belt can be mounted in actual car model geometry.

3.2.2 Anthropomorphic Test Device (ATD) Dummy 5th percentile female.

3.2.3 High speed camera 10 000 frames per second.

3.2.4 Spotlights with concentrated beam.

3.2.5 Electronics to synchronize camera and pretensioner trigger.

3.2.6 Small accelerometer ~1G three axis for buckle acceleration measurement.

3.2.7 Data acquisition system.

3.3 Test Vehicle/Test Piece.

3.3.1 Safety belt with pretensioner.

3.3.2 Car seat for actual car model.

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3.4 Test Time. As needed.

Calendar time:	days
Test hours:	hours
Coordination hours:	hours

3.5 Test Required Information. See 5.3.

3.6 Personnel/Skills. Skilled test engineers/technicians.

4 Procedure

4.1 Preparation. Reference 4.3.2.

4.2 Conditions.

4.2.1 Environmental Conditions. Not applicable.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions.

4.3.1 Mount seat and safety belt in the test rig in the geometry of the car that the seat belt is designed for (see Appendix A, Figure A1).

4.3.2 Cut the buckle cover open so that the latch mechanism will be visible but without disturbing the function. Suitable contrast color shall be painted on the outside of the cover. The buckle shall thereafter be mounted on the sled (see Appendix A, Figure A2 and Figure A3).

4.3.3 The camera shall be adjusted so that the latch mechanism can be seen during the whole test sequence.

4.3.4 Adjust the seat to its normal position and place the dummy.

4.3.5 Buckle up and make sure it is as loose as possible to simulate worst case for buckle movement when the pretensioner is activated.

4.3.6 Turn on the light, start the camera and activate the pretensioner.

4.3.7 Record the acceleration signals on the data acquisition system.

5 Data

5.1 Calculations. The acceleration signal is to be evaluated via any suitable software that can convert the accelerometer signals from the data acquisition system to a resultant acceleration graph. The signals shall be filtered with channel frequency class 1000.

5.1.1 The film shall be evaluated regarding movements of the latch mechanism to make sure it has been locked during the whole sequence.

5.2 Interpretation of Results. If the latch mechanism has been partly or fully open during the film sequence, the tested buckle has failed the test even if it is fully locked after the test.

5.2.1 The acceleration measurement is aimed to be information only for the buckle designer when designing acceleration insensitive buckle mechanisms.

5.3 Test Documentation.

5.3.1 The test material shall be presented with manufacturer, type, generation (prototype material) and manufacturing date.

5.3.2 The acceleration shall be presented as curve plots.

5.3.3 Observations from the latch mechanism shall be noted, for prototype material a copy of film shall be sent to the manufacturer together with the report.

6 Safety

This standard may involve hazardous materials, operations, and equipment. This standard does not propose to address all the safety problems associated with its use. It is the responsibility of the user of this standard to

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