
**Pyrotechnic articles — Pyrotechnic
articles for vehicles —**

Part 7:
**Requirements and categorization for
seatbelt pretensioners**

*Articles pyrotechniques — Articles pyrotechniques pour véhicules —
Partie 7: Exigences relatives aux prétensionneurs de ceinture et leur
classement en catégories*



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 14451-7 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 212, *Pyrotechnic articles*, in collaboration with Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 12, *Passive safety crash protection systems*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

ISO 14451 consists of the following parts, under the general title *Pyrotechnic articles — Pyrotechnic articles for vehicles*:

- *Part 1: Terminology*
- *Part 2: Test methods*
- *Part 3: Labelling*
- *Part 4: Requirements and categorization for micro gas generators*
- *Part 5: Requirements and categorization for airbag gas generators*
- *Part 6: Requirements and categorization for airbag modules*
- *Part 7: Requirements and categorization for seatbelt pretensioners*
- *Part 8: Requirements and categorization for igniters*
- *Part 9: Requirements and categorization for actuators*
- *Part 10: Requirements and categorization for semi-finished products*

Pyrotechnic articles — Pyrotechnic articles for vehicles —

Part 7:

Requirements and categorization for seatbelt pretensioners

1 Scope

This part of ISO 14451 specifies the types and order of tests to be applied to the seatbelt pretensioners and sets out the associated acceptance criteria and means of categorization.

This part of ISO 14451 applies to type tests.

This part of ISO 14451 is not applicable to articles containing military explosives or commercial blasting agents except for black powder or flash composition.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14451-1, *Pyrotechnic articles — Pyrotechnic articles for vehicles — Part 1: Terminology*

ISO 14451-2:2013, *Pyrotechnic articles — Pyrotechnic articles for vehicles — Part 2: Test methods*

ISO 14451-4:2013, *Pyrotechnic articles — Pyrotechnic articles for vehicles — Part 4: Requirements and categorization for micro gas generators*

ISO 14451-5:2013, *Pyrotechnic articles — Pyrotechnic articles for vehicles — Part 5: Requirements and categorization for airbag gas generators*

ISO 14451-8:2013, *Pyrotechnic articles — Pyrotechnic articles for vehicles — Part 8: Requirements and categorization for igniters*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14451-1 apply.

4 Requirements and acceptance criteria

4.1 General

Seatbelt pretensioners shall meet the requirements specified in [4.2](#) to [4.8](#) taking into account the test matrix of [Clause 5](#).

4.2 Verification of design and documentation

Documentation shall be complete as specified in ISO 14451-2:2013, 4.1.

4.3 Drop test

4.3.1 Requirements

Seatbelt pretensioners shall be tested as specified in ISO 14451-2:2013, 4.2.

If all gas generators/igniters contained within the seatbelt pretensioner are already successfully tested according to ISO 14451-4:2013, 4.3 and ISO 14451-5:2013, 4.3, these tests should be considered passed for the seatbelt pretensioner as well.

4.3.2 Acceptance criteria

No ignition of the seatbelt pretensioner shall occur.

No spill out of the pyrotechnic composition from the seatbelt pretensioner shall occur.

4.4 Vibration and temperature test

4.4.1 Requirements

Seatbelt pretensioners shall be tested as specified in ISO 14451-2:2013, 4.3.

If all gas generators/igniters contained within the seatbelt pretensioner are already successfully tested according to ISO 14451-4:2013, 4.4, ISO 14451-5:2013, 4.4 and ISO 14451-8:2013, 4.3, these tests should be considered passed for the seatbelt pretensioner as well.

4.4.2 Acceptance criteria

No ignition of the seatbelt pretensioner shall occur.

No spill out of the pyrotechnic composition from the seatbelt pretensioner shall occur.

4.5 Thermal humidity cycling test

4.5.1 Requirements

Seatbelt pretensioners shall be tested as specified in ISO 14451-2:2013, 4.4.

If all gas generators/igniters contained within the seatbelt pretensioner are already successfully tested according to ISO 14451-4:2013, 4.5, ISO 14451-5:2013, 4.5 and ISO 14451-8:2013, 4.4, these tests should be considered passed for the seatbelt pretensioner as well.

4.5.2 Acceptance criteria

No ignition of the seatbelt pretensioner shall occur.

4.6 Electrostatic discharge (ESD) test

4.6.1 Requirements

Seatbelt pretensioners shall be tested as specified in ISO 14451-2:2013, 4.5.

If all gas generators/igniters contained within the seatbelt pretensioner are already successfully tested according to ISO 14451-4:2013, 4.6, ISO 14451-5:2013, 4.6 and ISO 14451-8:2013, 4.5, these tests should be considered passed for the seatbelt pretensioner as well.

4.6.2 Acceptance criteria

No ignition of the seatbelt pretensioner shall occur.

4.7 Fire test

4.7.1 Requirements

Seatbelt pretensioners shall be tested as specified in ISO 14451-2:2013, 4.6 with the following heating rate and positions:

- Heating rate: 80K/min.

The number of burners shall be adequate to the dimensions of the seatbelt pretensioner to completely engulf the seatbelt pretensioner by the flames.

- Position for seatbelt pretensioners:

The seatbelt pretensioner shall be tested in two positions. From all possible positions where the seatbelt pretensioner remains at rest without further support, one position shall be chosen with the pyrotechnic component closest to the grid and a second position shall be chosen with the pyrotechnic component farthest away from the grid.

4.7.2 Acceptance criteria

Only foreseeable fragmentation or foreseeable opening of the seatbelt pretensioner shall occur.

4.8 Functioning test

4.8.1 Requirements

Seatbelt pretensioners shall be tested as specified in ISO 14451-2:2013, 4.9 with the seatbelt pretensioner in any position without fixation.

When multi-stage seatbelt pretensioners are tested, the delay between ignition of stage 1 and the following stages shall be 5 ms or in accordance with the product specification or requirements.

4.8.2 Acceptance criteria

Only intended fragmentation or intended opening of the seatbelt pretensioner shall occur.

5 Test matrix for seatbelt pretensioners

[Table 1](#) shows a test matrix which summarizes all tests in an overview. Test samples have been numbered from 1 to 11 for easier reference. The roman numbers in the Table indicate in which sequence the same sample will undergo different examinations.

Table 1 — Test matrix

	Test methods of ISO 14451-2:2013	Requirements of ISO 14451-7:2013	Unexposed seatbelt pretensioners			Exposed seatbelt pretensioners		
			1 to 3	4	5 to 6	7 to 9	10	11
Sample number			1 to 3	4	5 to 6	7 to 9	10	11
Possibility to reuse the test from sub-level(s) for the assessment of the seatbelt pretensioner. See relevant test requirement.			NO	YES	NO	YES	YES	YES
Verification of design and documentation	4.1	4.2	I	I	I	I	I	I
Drop test	4.2	4.3				II		
Vibration and temperature test	4.3	4.4					II	
Thermal humidity cycling test	4.4	4.5						II
Electrostatic discharge (ESD) test	4.5	4.6		II				
Fire test	4.6	4.7			II			
Functioning test	4.9	4.8	II				III	III

6 Categorization of seatbelt pretensioners

6.1 Seatbelt pretensioners are categorized as follows:

- Category P1: Seatbelt pretensioners that present a low hazard;
- Category P2: Seatbelt pretensioners that are intended for handling or use only by persons with specialist knowledge.

6.2 The assignment to P1 or P2 of the seatbelt pretensioner is done according to the following criteria when tested under functioning test (see 4.8):

- P1 criterion: The distance from the initial location to the first impact on the ground of the seatbelt pretensioner or any fragments shall be not more than 15 m.
- P2 criterion: If P1 criterion is not fulfilled.