INTERNATIONAL STANDARD

ISO 14451-5

First edition
2013-03-15

Pyrotechnic articles — Pyrotechnic articles for vehicles —

Part 5: Requirements and categorization for airbag gas generators

Articles pyrotechniques — Articles pyrotechniques pour véhicules — Partie 5: Exigences relatives aux générateurs de gaz de sac gonflable et leur classement en catégories

Reference number
ISO 14451-5:2013(E)

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Published in Switzerland

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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 14451-5 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 5:
Requirements and categorization for airbag gas generators

1 Scope

This part of ISO 14451 specifies the types and order of tests to be applied to the airbag gas generators and sets out the 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 — Pyrotechnic articles for vehicles —Part 1: Terminology*

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

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

Airbag gas generators shall meet the requirements specified in 4.2 to 4.9 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

Airbag gas generators shall be tested as specified in ISO 14451-2:2013, 4.2.

4.3.2 Acceptance criteria

No ignition of the airbag gas generator shall occur.

No spill out of the pyrotechnic composition from the airbag gas generator shall occur.

4.4 Vibration and temperature test

4.4.1 Requirements

Airbag gas generators shall be tested as specified in ISO 14451-2:2013, 4.3.

4.4.2 Acceptance criteria

No ignition of the airbag gas generator shall occur.

No spill out of the pyrotechnic composition from the airbag gas generator shall occur.

4.5 Thermal humidity cycling test

4.5.1 Requirements

Airbag gas generators shall be tested as specified in ISO 14451-2:2013, 4.4.

4.5.2 Acceptance criteria

No ignition of the airbag gas generator shall occur.

4.6 Electrostatic discharge (ESD) test

4.6.1 Requirements

Airbag gas generators shall be tested as specified in ISO 14451-2:2013, 4.5.

If all igniters contained within the airbag gas generator are already successfully tested according to ISO 14451-8:2013, 4.5, the ESD test should be considered passed for the airbag gas generator as well.

4.6.2 Acceptance criteria

No ignition of the airbag gas generator shall occur.

4.7 Fire test

4.7.1 Requirements

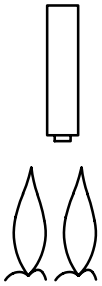
Airbag gas generators shall be tested as specified in ISO 14451-2:2013, 4.6 with the following heating rate and positions:

— **Heating rate**: 50K/min.

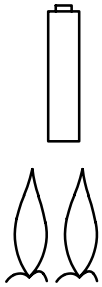
The number of burners shall be adequate to the dimensions of the airbag gas generator to completely engulf the airbag gas generator by the flames.

In case of vertical position (for example position 1 and 2 for tubular airbag gas generator), the horizontal cross section of the airbag gas generator shall be completely engulfed by the flames.

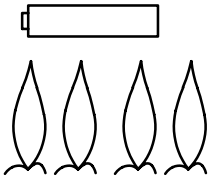
— Positions for airbag gas generators; see Figures 1 to 3:



a) Position 1 — Igniter towards fire

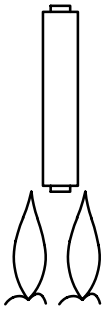


b) Position 2 — Igniter away from fire

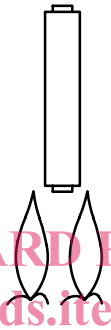


c) Position 3 — Right angle from positions 1 and 2

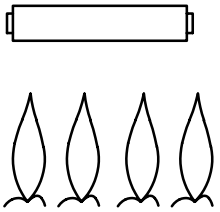
Figure 1 — Positions for tubular airbag gas generators, single stage



a) Position 1 — Igniter stage 1 towards fire

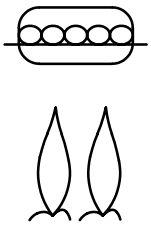


b) Position 2 — Igniter stage 2 towards fire

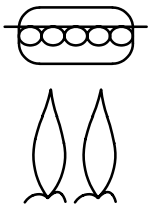


c) Position 3 — Right angle from positions 1 and 2

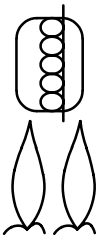
Figure 2 — Positions for tubular airbag gas generators, dual stage



a) Position 1 — Igniter (s) towards fire



b) Position 2 — Igniter (s) away from fire



c) Position 3 — Right angle from positions 1 and 2

Figure 3 — Positions for disc shape airbag gas generators

Airbag gas generators with shapes not mentioned above are subjected to the fire test in three positions corresponding most closely to the above.

4.7.2 Acceptance criteria

Only foreseeable fragmentation or foreseeable opening of the airbag gas generator shall occur.

4.8 Tank test

4.8.1 Requirements

Airbag gas generators shall be tested as specified in ISO 14451-2:2013, 4.8.

4.8.2 Acceptance criteria

Only intended fragmentation or intended opening of the airbag gas generator shall occur.

The performance of the airbag gas generator shall be within the range of performance parameters as specified by the manufacturer.

4.9 Functioning test

4.9.1 Requirements

Airbag gas generators shall be tested as specified in ISO 14451-2:2013, 4.9 with the airbag gas generators in any position without fixation.

When multi-stage airbag gas generators 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.

Functioning tests on exposed article(s) have to be done in the worst case position as observed from the functioning test with unexposed article(s).

4.9.2 Acceptance criteria

Only intended fragmentation or intended opening of the airbag gas generator shall occur.

5 Test matrix for airbag gas generators

Table 1 shows a test matrix which summarizes all tests in an overview. Test samples have been numbered from 1 to 13 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	Require-ments of ISO 14451-5:2013	Unexposed airbag gas gen-erators				Exposed airbag gas generators		
Sample number			1	2 to 4	5	6 to 8	9 to 11	12	13
Possibility to reuse the test from sub-level(s) for the assessment of the airbag gas generator. (See relevant test require-ment.)			NO	NO	YES	NO	NO	NO	NO
Verification of design and documentation	4.1	4.2	I	I	I	I	I	I	I
Drop test	4.2	4.3					II		
Vibration and tempera-ture 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			
Tank test	4.8	4.8	II						
Functioning test	4.9	4.9		II				III[a]	III[a]
[a] Alternatively it is allowed to carry out tank test instead of the functioning test									

6 Categorization

6.1 Airbag gas generators are categorized as follows:

— Category P1: Airbag gas generators that present a low hazard;

— Category P2: Airbag gas generators that are intended for handling or use only by persons with specialist knowledge.

6.2 The assignment to P1 or P2 of the airbag gas generator is done according to the following criteria when tested under functioning test (see 4.9):

— P1 criterion: The distance from the initial location of the article to the first impact on the ground of the airbag gas generator or any fragments shall be not more than 15 m.

— P2 criterion: If P1 criterion is not fulfilled.