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Mountaineering equipment — Avalanche airbag systems — Safety requirements and test methods

bsi.

National foreword

This British Standard is the UK implementation of EN 16716:2017.

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Mountaineering equipment - Avalanche airbag systems - Safety requirements and test methods

Équipement d'alpinisme et d'escalade - Systèmes de sac gonflable anti-ensevelissement lors d'une avalanche - Exigences de sécurité et méthodes d'essai

Bergsteigerausrüstung - Lawinen-Airbag-Systeme - Sicherheitstechnische Anforderungen und Prüfverfahren

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Contents

Page

European foreword

This document (EN 16716:2017) has been prepared by Technical Committee CEN/TC 136 “Sports, playground and other recreational facilities and equipment”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2017, and conflicting national standards shall be withdrawn at the latest by August 2017.

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For relationship with EU Directive, see informative Annex ZA, which is an integral part of this document.

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Introduction

This European Standard is one of a package of standards for mountaineering equipment, see Annex A.

1 Scope

This European Standard specifies safety requirements and test methods for avalanche airbag systems to reduce the risk of being buried by a snow avalanche.

This European Standard does not consider personal protection against impact or cold temperature.

2 Normative references

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

EN 12277, *Mountaineering equipment — Harnesses — Safety requirements and test methods*

EN 55014-1, *Electromagnetic compatibility — Requirements for household appliances, electric tools and similar apparatus — Part 1: Emission (CISPR 14-1)*

EN 55014-2, *Electromagnetic compatibility — Requirements for household appliances, electric tools and similar apparatus — Part 2: Immunity — Product family standard (CISPR 14-2)*

EN 60335-1, *Household and similar electrical appliances — Safety — Part 1: General requirements (IEC 60335-1)*

EN 60335-2-29, *Household and similar electrical appliances — Safety — Part 2-29: Particular requirements for battery chargers (IEC 60335-2-29)*

EN 60335-2-30, *Household and similar electrical appliances — Safety — Part 2-30: Particular requirements for room heaters (IEC 60335-2-30)*

EN 60335-2-80, *Household and similar electrical appliances — Safety — Part 2-80: Particular requirements for fans (IEC 60335-2-80)*

EN 60529, *Degrees of protection provided by enclosures (IP Code) (IEC 60529)*

EN 61000-6-2, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments (IEC 61000-6-2)*

EN 61000-6-3, *Electromagnetic compatibility (EMC) — Part 6-3: Generic standards — Emission standard for residential, commercial and light-industrial environments (IEC 61000-6-3)*

EN 61558-2-16, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V — Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units (IEC 61558-2-16)*

EN 62133, *Secondary cells and batteries containing alkaline or other non-acid electrolytes — Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications (IEC 62133)*

EN ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests (ISO 9227)*

EN ISO 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2015)*

EN ISO 13934-1, *Textiles — Tensile properties of fabrics — Part 1: Determination of maximum force and elongation at maximum force using the strip method (ISO 13934-1)*

EN ISO 13937-2, *Textiles — Tear properties of fabrics — Part 2: Determination of tear force of trouser-shaped test specimens (Single tear method) (ISO 13937-2)*

ISO 7000, *Graphical symbols for use on equipment — Registered symbols*

ASTM F2153, *Standard Test Method for Measurement of Backpack Capacity*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
activation system
device to initiate the deployment of the avalanche airbag system (e.g. deployment handle)

3.2
airbag
part of the avalanche airbag system which changes the shape for increasing the volume of the avalanche airbag system

3.3
airbag volume
volume of the fully inflated airbag which changes shape during deployment

3.4
avalanche airbag system
personal protective equipment worn by the user, which reduces the probability of being buried in a snow avalanche by rapidly increasing the volume of the user in combination with the device

3.5
carrying system
part of the avalanche airbag system attaching the activation system, inflating system and airbag to the user

EXAMPLE back pack, vest

3.6
detachable airbag system
avalanche airbag system where the inflation system, activation system and airbag can be removed as a unit from the carrying system by the user by design

3.7
fully inflated airbag
airbag inflated to a point that it achieves its intended shape and maintains that shape under its own weight

3.8
inflation system
part of the avalanche airbag system which deploys the airbag after the activation system has been used

EXAMPLE Gas cylinder with venturi valve

3.9
inflation time
time between initiation of deployment and fully inflated airbag

3.10
non-refillable cartridge
pressurized gas cartridge for single use or refillable only by the manufacturer or someone authorized and trained by the manufacturer to do these refills

3.11
operating pressure
maximum pressure above atmospheric pressure in the airbag achieved during deployment of the airbag at ambient temperature

3.12
refillable cartridge
pressurized gas cartridge with a technical application for making a refill by qualified personnel

4 Safety requirements

4.1 Function

4.1.1 Activation system

4.1.1.1 General

Components of the avalanche airbag system should comply with applicable EU Directives (e.g. Transportable pressure equipment (TPED) – Directive 2010/35/EU).

4.1.1.2 Activation force

When tested in accordance with 5.2, the activation force for a mechanical activation system shall be between 50 N and 150 N.

4.1.1.3 Activation distance

When the mechanical activation system is tested in accordance with 5.3, the maximum activation distance of 100 mm shall be met.

4.1.1.4 Airbag inflation

When tested in accordance with 5.4, full inflation of the airbag (see 3.7) shall be achieved within 5 s after activation and the airbag shall remain fully inflated for at least 3 min.

4.1.1.5 Airbag volume

The fully inflated airbag shall achieve a minimum volume of 150 l. The volume test of the airbag is specified in 5.5.

4.1.1.6 Rated number of deployments

When tested in accordance with 5.6, the device shall be able to withstand twice the rated number of deployments stated by the manufacturer. The rated number of deployments shall at least be 20. All deployments of the avalanche airbag system shall meet the requirements in 4.1.1.2 and 4.1.1.4.

4.1.1.7 Condensation effects

When tested in accordance with 5.7, the avalanche airbag system shall meet the requirements of 4.1.1.2 and 4.1.1.4 and condensation effects shall not lead to malfunction or damage.

4.1.1.8 Working time span

The avalanche airbag system shall work at least over a time period of 24 h at −30 °C without any external support (e.g. power supply, pressure support). When tested in accordance with 5.8 the avalanche airbag system shall meet the requirements of 4.1.1.2 and 4.1.1.4.

4.1.1.9 Temperature range

Airbag systems shall achieve full inflation within the temperature range given by the manufacturer or between −30 °C and +50 °C, whichever is greater, without damage. Testing shall be carried out in accordance with the relevant clauses of 5.8, 5.9 and 5.10. The requirements of 4.1.1.2 and 4.1.1.4 shall be met and there shall be no damage to the airbag system.

4.1.1.10 Battery reserve time of electronic components

Electrically powered avalanche airbag systems shall have an integrated indication system which shows when the battery for the activation and inflation is low. When this occurs, the activation and inflation systems shall still be able to be deployed within the next 6 h. When tested in accordance with 5.11, the requirements of 4.1.1.2 and 4.1.1.4 shall be met.

4.1.1.11 Pressure performance

When tested in accordance with 5.12, all components of the airbag system that will be pressurized during full inflation shall withstand at least a pressure of the operating pressure plus 0,1 bar for 30 min without damage. Leakage shall be compensated. After that, the airbag system shall be able to perform a further activation. The test requirement of 4.1.1.4 shall be met.

When tested in accordance with 5.13, all components of the airbag system that will be pressurized during full inflation shall withstand at least a pressure of the operating pressure plus 0,25 bar without bursting.

4.1.1.12 Airbag impact

When tested in accordance with 5.14, the airbag impact test shall not damage the airbag.

The airbag shall still meet the minimum inflation requirement as described in 4.1.1.4.

4.1.1.13 Airbag fabric strength

The airbag fabric shall meet the following minimum requirements:

— tensile strength according to EN ISO 13934-1: warp: (1 500 N/5 cm)/ weft: (1 500 N/5 cm);

— tearing strength according to EN ISO 13937-2: warp: (70 N (−2))/ weft: (70 N (−2)).

Verification may be carried out by airbag fabric manufacturer's certificate (not older than 1 year) or test.

4.1.1.14 Snow influence

When tested in accordance with 5.15, the air intake components of the airbag shall not be negatively affected by snow during deployment and full inflation shall be achieved. The requirements of 4.1.1.4 shall be met.

4.1.1.15 Practical deployment

When tested in accordance with 5.16, the avalanche airbag system shall meet the requirements of 4.1.1.4 after deployment.

4.1.2 Carrying system

4.1.2.1 General

The carrying system shall keep the avalanche airbag system firmly connected to the user during the avalanche, including the potential where the person could slip out of the carrying system.

4.1.2.2 Connecting strength

When tested in accordance with 5.17 the avalanche airbag system shall withstand a load of 3 kN for at least 1 min. The avalanche airbag system shall not become detached from the dummy, and the airbag shall not become detached from the avalanche airbag system.

The avalanche airbag system and airbag shall remain in their original intended position.

4.1.2.3 Pull-off-strength

When tested in accordance with 5.18, slippage of the carrying system above the head of the user shall be prevented. If a leg loop or vest is used, it shall withstand a load of 800 N applied in the direction of use for at least 1 min. The leg loop shall not break and its fixation buckles shall not slip ≥ 20 mm. The vest shall not break and its fixation buckles shall not slip ≥ 20 mm.

When other systems are used to prevent slippage of the carrying system over the head of the user, they shall be tested in the same manner.

4.2 Design

4.2.1 Performance

The following requirements shall be verified by visual/practical evaluation. Where required, tests shall be performed in accordance with 5.19.

The avalanche airbag system shall be easy for the user to put on in the proper position and keep in their position during wearing under the consideration of external impacts such as necessary movements and postures. It shall have a simple adjustment to provide a correct fit for the user. It shall be easy to put on and take off.

The inflation system, activation system and airbag shall not be affected by anything that the avalanche airbag system is intended to carry (e.g. residues of food, drinks, sweet gels, snow shovel, probe, crampons).

Avalanche airbag systems shall be designed so that the user, under the intended conditions, can effectively perform the risk-related activity (skiing, ski touring, snowshoeing, snowmobiling, etc.) while having appropriate protection of the highest possible level.

If the bag is intended to carry outside devices like ice axes or skis, as recommended by the manufacturer, the inflated airbag shall not be damaged and the deployment of the airbag shall not be blocked.

When the airbag is deployed the user shall be able to continue their relevant activity (e.g. skiing, snowboarding, snowshoeing, snowmobiling) without losing sense of orientation, affecting field of vision or having movement restricted due to the inflated airbag in order to escape an avalanche.

Adequate measures in the construction of the device shall be taken to protect components of the airbag system from damage, when used in accordance with the manufacturer's recommendations.

To prevent accidental deployment, the activation system shall be able to be deactivated by the user (e.g. for storage or transport reasons) as stated by manufacturer.

The activation system shall be able to be temporarily disabled and enabled by the user without removing the carrying system with a method stated by the manufacturer.

The manual activation system shall be able to be placed in a way to be easily reached by a right- or left-handed user during an avalanche scenario. The form of the manual activation system shall make it easy to be grasped by the user in an avalanche scenario: solid form, usable with mittens.

When deploying the airbag, the activation system shall require only one action.

4.2.2 Material requirements

The chemical innocuousness shall be proved for the used materials in contact with the user. This may be carried out by the manufacturer through chemical test reports, which are not older than one year, or by accredited laboratories.

Any part of the avalanche airbag system in contact or in potential contact with the user when it is worn shall be free of roughness, sharp edges, projections and the like which could cause excessive irritation or injuries. Verification shall be carried out by a visual check.

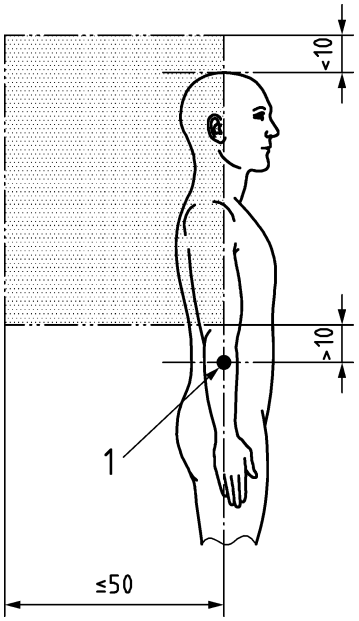
The outer shell of the airbag shall be of a signal colour (not black or white). Verification shall be carried out by a visual check.

Avalanche airbag systems shall be provided with adequate corrosion protection. The corrosion resistance test is specified in 5.20.

4.2.3 Ergonomic requirements

The centre of volume of the airbag (see Figure 1, shaded area) shall always be more than 10 cm above the centre of gravity of the user's body (here 1,80 m person) but not more than 10 cm above the height of the user's body. The airbag shall be symmetric in lateral direction to the user's body. The front-back axis of the centre of gravity of the user's body shall have a maximum distance of 50 cm to the relevant centre of volume line of the airbag (see Figure 1). Verification shall be carried out by a visual check and measurement on a person of 1,80 m with a tolerance of ± 0,05 m.

Dimensions in centimetres



Key

1 centre of gravity of user

allowed area for centre of volume of airbag

Figure 1 — Allowed area for centre of volume of airbag

4.2.4 Detachable airbag systems

For detachable airbag systems, system installation errors shall be prevented by means of design (e.g. colour or shape coded applications). Verification shall be carried out by a visual check.

4.2.5 Electric airbag systems

The device shall be equipped with an integrated indication system which indicates to the user if the system is on and if the energy supply of the device is outside of its normal operating capabilities. The indicator(s) shall be visible to the user when worn in accordance with the information supplied by the manufacturer. Verification by practical check.

For electronic airbag activation and inflation system the following standards shall be met:

a) Electronic: EN ISO 13849-1: Performance Level PLc;

b) Software: EN ISO 13849-1:2015, 4.6.2 (Requirements for safety-related embedded software);

c) Charger: EN 61558-2-16; EN 60335-2-29;

d) Battery: EN 62133 (EC 2006/66);

e) Motor: EN 60335-1; EN 60335-2-30; EN 60335-2-80;

f) Controller: EN 60335-1; EN 60529 (IP 65);

g) EMC: EN 55014-1, EN 55014-2; EN 61000-6-2; EN 61000-6-3 E.

5 Test methods

5.1 General

Pressure measurements shall be conducted at an altitude between 0 m and 1 000 m and at an air pressure (reduced to sea level) between 980 hPa and 1 020 hPa. All tests shall be made within an ambient temperature and humidity if not stated otherwise.

Non-refillable cartridges for cold tests shall be supplied at the lowest end of the fill range. Non-refillable cartridges for hot tests shall be supplied at the highest end of the fill range.

5.2 Test of activation force

The avalanche airbag system is installed on a person and deployed as described in the information supplied by the manufacturer.

Activate the device as described in the information supplied by the manufacturer and measure the activation force by measurement device with an accuracy of ± 2 N.

5.3 Test of activation distance

The avalanche airbag system is installed on a person and deployed as described in the information supplied by the manufacturer.

Activate the device as described in the information supplied by the manufacturer and measure the activation distance (distance between unloaded manual activation system and deployed manual activation system) measured in the direction of pull with an accuracy of ± 5 mm.

5.4 Test of airbag inflation

The avalanche airbag system shall be deployed and the time shall be measured from activating the activation system until the airbag is fully inflated with an accuracy of ± 0,1 s. It shall be checked (see 3.7) if the airbag is still fully inflated after 3 min.

5.5 Test of airbag volume

The volume shall be determined by filling the airbag with hollow plastic balls having a single diameter between 15 mm and 20 mm and measuring the volume according to ASTM F2153.

Alternatively the following test may be carried out:

Construct a cylindrical container with vertical walls large enough to hold an upright fully inflated airbag leaving at least 10 cm of clearance between system and edges of container. Reference measurement tool and calibration method defined in ASTM F2153. Place a fully deployed airbag into the container and then fill with hollow plastic balls having a single diameter between 15 mm and 20 mm in diameter, making sure the spheres are occupying all the voids. Tamp and fill the container until the container is full and the airbag is totally covered with hollow plastic balls. Remove the airbag, being careful not to remove any of the hollow plastic balls with it. Calculate the volume of the airbag.

5.6 Test of rated number of deployments

The airbag system is put on a person as described in the information given by the manufacturer. The airbag system is deployed as described in the information given by the manufacturer. The system is then reloaded again, as described in the information given by the manufacturer. Then again the airbag system is deployed. This process shall be repeated until double the number of deployments, given as rated number of deployments by the manufacturer, is reached.

5.7 Test of condensation effects on the activation system

Sprinkle the avalanche airbag system (all pockets and compartments closed, hanging in upright position) for 2 min with normal tapped water of 10 °C (± 5 °C) at 5 l/min. Let the water drop off for 1 min. Freeze this avalanche airbag for at least 4 h at −30 °C (± 2 °C) in the upright position. Remove the device from the freezer to ambient temperature for 10 min, then put it back into the freezer (– 30 °C) for at least 1 h. Then remove the device from the freezer and deploy the system at ambient temperature.

5.8 Test of working time span/low temperature test

a) For refillable cartridge systems:

The cartridge shall be filled to the minimum of the manufacturer recommended filling pressure (filled under ambient climate) under consideration of the tolerance of the filling gauge.

b) For non-refillable cartridge systems:

Perform this test for non-refillable cartridges with those filled to the lower end of the filling range (see 5.1).

c) For electrical systems:

Electrical systems shall be fully charged before being placed into the climate chamber and switched on for the whole storage time.

Put the avalanche airbag system into a freezer for 24 h (± 30 min) at – 30 °C (± 2 °C). Then put the device out of the climate chamber and deploy the system at ambient climate.

5.9 Test of high temperature damage

a) For refillable cartridge systems:

The cartridge shall be filled with maximum of the manufacturer recommended filling pressure (filled under room temperature) under consideration of the tolerance of the filling gauge.

b) For non-refillable cartridge systems:

Perform this test for non-refillable cartridges with a cartridge filled to the upper end of the filling range (see 5.1).

c) For electrical systems:

Electrical systems shall be fully charged before being placed into the climate chamber and switched on for the whole storage time.

The airbag system shall be conditioned at + 50° C (± 2 °C) / for at least 10 h. The airbag shall be deployed. Test at ambient temperature.

5.10 Cold temperature deployment

The airbag system shall be conditioned at – 15 ° C (± 2 °C) / for at least 10 h. The airbag shall be deployed. Test at – 15 °C (± 2 °C).

5.11 Test of minimum battery reserve time

Utilize the electrical avalanche airbag system at normal climate until the electronic indicator system switches to “recharge” or “replace” as mentioned in the instructions for use. Then put the device in a freezer at – 15 °C (± 2 °C) and leave it there for 6 h (± 10 min). Then deploy the system at – 15 °C (± 2 °C).

5.12 Test of Airbag Pressure

Determine the operation pressure (see 3.11) of the airbag system (for cartridge systems by using a cartridge filled to the highest end of the fill range).

The airbag shall be prepared with a pressure measurement device to measure the operating pressure of the airbag. The maximum operating pressure of the airbag when deployed at ambient climate shall then be measured. After that the airbag is prepared with an external source of compressed air. The airbag shall be pressurized to the operational pressure plus 0,1 bar (± 0,01 bar) as test pressure for 30 min. Leakage shall be compensated. For this purpose the test airbag may be modified with a pressure measurement and filling adapter.

After that the pressure measurement devices shall be removed and the airbag system shall be re-packed and deployed again.

5.13 Test of airbag burst pressure

The airbag shall be prepared with a pressure measurement device and filled with the operating pressure plus 0,25 bar (± 0,01 bar) to measure the total pressure of the airbag. For this purpose, the test airbag may be modified with a pressure measurement and filling adapter. The test shall be carried out at ambient climate.

5.14 Impact test of the airbag

Position a fully inflated avalanche airbag system on a hard, level and smooth surface such that the airbag is in contact with the surface.

Carry out an impact test onto the middle of the fully inflated airbag, using a cylindrical steel mass of 10 kg (± 0,1 kg), Ø 120 mm (± 2 mm), edge radius 1 mm (± 0,1 mm), dropped vertically from a height of 2 m (± 5 cm). The airbag shall withstand the impact test without damage. The airbag shall still meet the minimum inflation requirement of 150 l.

5.15 Test of influence of snow during deployment

If the airbag system is an open system, which sucks air from the environment to fill the airbag(s), then deployment function tests shall be performed in different types of snow as listed below:

— snow with a density between 50 kg/ m^3 and 200 kg/ m^3 (dry powder snow);

— snow with a density between 300 kg/ m^3 and 500 kg/ m^3 (big crystal snow).

The avalanche airbag system with all compartments closed shall be laid on flat ground with the back panel opposite to the ground. Then all outer air intake(s) shall be covered adequately with a layer of at least 10 cm of the above mentioned particular types of snow. The device is deployed.

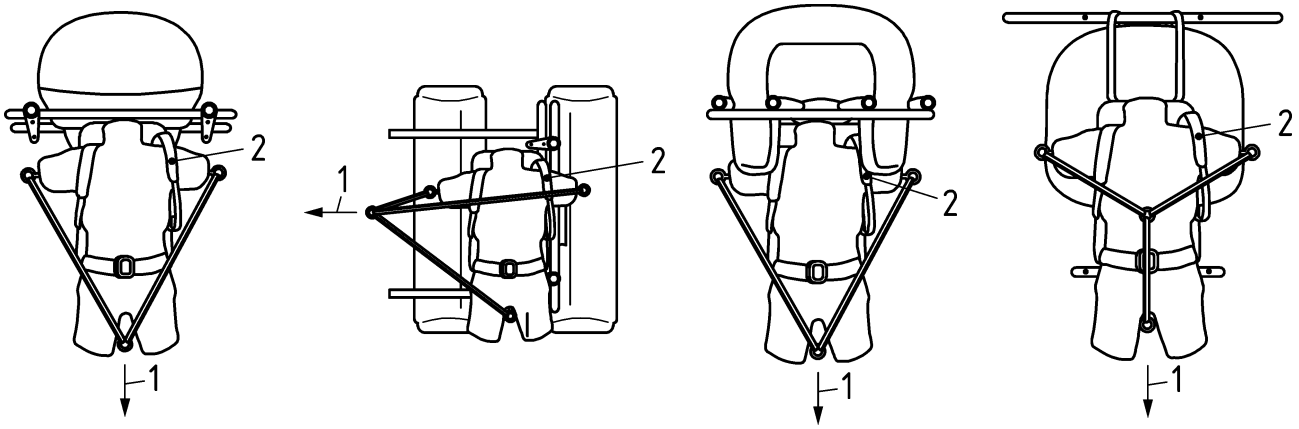
5.16 Test of practical deployment

The avalanche airbag system shall be attached to a person of 80 kg to 90 kg as described in the information supplied by the manufacturer. On a slope with an inclination of 30° (± 2°) and a snow density of 100 kg/m^3 to 300 kg/m^3 (settled snow), the test person shall lay (no dynamic effect) on the snow face down, face up, on the right side and on the left side with the head up the slope (4 tests). The test shall be repeated on the snow face up with the head down the slope (head/feet axis of test person always in fall line of slope). Within 10 s the avalanche airbag system shall be deployed in each position and deployment time until full inflation shall be measured.

Slight motion restricted to the torso of the test person is allowed during deployment.

5.17 Test of carrying system

The avalanche airbag system shall be installed on an EN 12277 test dummy as described by the manufacturer (including leg loops). The shoulder strap opposite to load direction shall be loosened. A load of 3 kN (± 0,1 kN) shall be applied to the test dummy for 1 min (± 5 s) while the fully inflated airbag is held fixed as shown in Figure 2.



a) **b)** **c)** **d)**

Key

1 direction of pull

2 loose shoulder strap

Figure 2 — Examples of load application for carrying system test

5.18 Test of pull-off-strength

The avalanche airbag system shall be installed on a fixed EN 12277 test dummy in accordance with the instructions supplied by the manufacturer. If a leg loop is used it shall be loaded with a load of 800 N ± 10 N for 1 min (± 5 s) against the test dummy (head to feet direction).

5.19 Practical tests

If not mentioned otherwise in this standard, the practical tests shall be performed in adequate powder snow area and old snow area.

5.20 Corrosion resistance test

On an avalanche airbag system with closed compartments but exposed activation system (skiing situation) a corrosion resistance test shall be carried out in accordance with EN ISO 9227 with 2 cycles, each cycle having a duration of 24 h. The avalanche airbag system shall show no signs of corrosion. Superficial tarnishing is allowed.

6 Marking

The avalanche airbag system shall be marked clearly, indelibly and durably with at least the following information:

a) name and address of the manufacturer or its authorized EU representative;

b) the number of this European Standard;

c) type name (if more than one);

d) year of manufacture;

e) safety recommendations for use (e. g. folding instruction, zipper closure);

f) graphical symbol (see Figure 3), which advises the user to read the information given by the manufacturer.

Additional markings for detachable airbag systems:

g) description, how to install and remove detachable airbag system;

h) visible warning, when detachable airbag system is not installed, that the device shall be installed before entering an avalanche area;

i) identification, which detachable airbag system shall be installed.

Figure 3 — Operator's manual (according to ISO 7000, Symbol No. 1641)

7 Information supplied by the manufacturer

The information supplied by the manufacturer shall contain the following information:

a) manufacturer (name, address);

b) model;

c) cleaning / maintenance;

d) lifetime and maximum number of deployments;

e) required action when maximum number of deployments is reached;

f) safety recommendations for use;

g) reloading, activation and deactivation of the airbag;

h) training, checks before and after use;

i) number of this standard;

j) storage, carrying and transportation limitations of the relevant energy supply;

k) explanation of markings;

l) description of the function check;

m) scope / limitations;

n) for electric system: explanation of the recharge indicator;

o) advice to carry an avalanche beacon, a probe and a shovel when in terrain with risk of snow avalanche.

Additional information for detachable airbag systems:

p) description, how to install and remove the detachable airbag system;

q) 'WARNING: Do not use with unauthorized carrying systems (backpack, vest, etc.)".

Annex A
(informative)

Standards on mountaineering equipment

Table A.1 — List of standards on mountaineering equipment

No	Document	Title
1	EN 564	Mountaineering equipment — Accessory cord — Safety requirements and test methods
2	EN 565	Mountaineering equipment — Tape — Safety requirements and test methods
3	EN 566	Mountaineering equipment — Slings — Safety requirements and test methods
4	EN 567	Mountaineering equipment — Rope clamps — Safety requirements and test methods
5	EN 568	Mountaineering equipment — Ice anchors — Safety requirements and test methods
6	EN 569	Mountaineering equipment — Pitons — Safety requirements and test methods
7	EN 892	Mountaineering equipment — Dynamic mountaineering ropes — Safety requirements and test methods
8	EN 893	Mountaineering equipment — Crampons — Safety requirements and test methods
9	EN 958	Mountaineering equipment — Energy absorbing systems for use in klettersteig (via ferrata) climbing — Safety requirements and test methods
10	EN 959	Mountaineering equipment — Rock anchors — Safety requirements and test methods
11	EN 12270	Mountaineering equipment — Chocks — Safety requirements and test methods
12	EN 12275	Mountaineering equipment — Connectors — Safety requirements and test methods
13	EN 12276	Mountaineering equipment — Frictional anchors — Safety requirements and test methods
14	EN 12277	Mountaineering equipment — Harnesses — Safety requirements and test methods
15	EN 12278	Mountaineering equipment — Pulleys — Safety requirements and test methods
16	EN 12492	Mountaineering equipment — Helmets for mountaineers — Safety requirements and test methods
17	EN 13089	Mountaineering equipment — Ice-tools — Safety requirements and test methods
18	EN 15151-1	Mountaineering equipment — Braking devices — Part 1: Braking devices with manually assisted locking, safety requirements and test methods
19	EN 15151-2	Mountaineering equipment — Braking devices — Part 2: Manual braking devices, safety requirements and test methods
20	EN 16716	Mountaineering equipment — Avalanche Airbag systems — Safety requirements and test methods

Annex ZA
(informative)

Relationship between this European Standard and the essential requirements of Directive 89/686/EEC aimed to be covered

This European Standard has been prepared under a Commission's standardization request M/031 "Personal Protective Equipments" to provide one voluntary means of conforming to essential requirements of Directive 89/686/EEC "Personal Protective Equipment".

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Article(s) of Directive 89/686/EEC

Essential Requirements of Directive 89/686/EEC		**Clause(s)/sub-clause(s) of this EN**	**Remarks/ Notes**
1.1.1	Ergonomics	4.2.1	
1.2.1.1	Suitable constituent materials	4.2.2	
1.2.1.2	Satisfactory surface condition of all PPE parts in contact with the user	4.2.2	
1.2.1.3	Maximum permissible user impediment	4.2.1	
1.3.2	Lightness and design strength	4.1.1.13, 4.1.2	
2.1	PPE incorporating adjustment systems	Clause 7	
2.4	PPE subject to ageing	Clause 7	
2.8	PPE used in very dangerous situation	4.1.1.8, 4.2.1	
2.9	PPE incorporating components which can be adjusted or removed by the user	4.2.1	
2.12	PPE bearing identification or recognition marks directly or indirectly related to health and safety	4.2.2	
2.13	PPE signalling the user's presence visually	4.2.2	
1.4	Information supplied by the manufacturer	Clause 7	
3.4.	Prevention of drowning	4.1.1.1 to 4.1.1.12, 4.1.1.14, 4.1.1.15	

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

Bibliography

[1] EN ISO 10297, *Gas cylinders — Cylinder valves — Specification and type testing (ISO 10297:2014, Corrected version 2014-11-01)*

[2] ISO 11119-3, *Gas cylinders — Refillable composite gas cylinders and tubes — Design, construction and testing — Part 3: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450L with non-load-sharing metallic or non-metallic liners*

[3] 89/686/EEC, Council Directive of 21 December 1989 on the approximation of the laws of the Member States relating to personal protective equipment

[4] Directive 2010/35/EU of the European Parliament and of the Council of 16 June 2010 on transportable pressure equipment and repealing Council Directives 76/767/EEC, 84/525/EEC, 84/526/EEC, 84/527/EEC and 1999/36/EC

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