



SLOVENSKI STANDARD SIST EN 4856:2019

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Rotoplani - Sistem prezračevanja v sili (EBS) - Zahteve, preskušanje in označevanje

Rotorcraft - Emergency Breathing Systems (EBS) - Requirements, testing and marking

Rotorkraft - Notfallbeatmungssystem (EBS) - Anforderungen, Prüfung und Kennzeichnung

Giravion - Système de ventilation d'urgence (EBS) - Exigences, essais et marquage

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Ta slovenski standard je istoveten z: **EN 4856:2018**

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ICS:

49.095

Oprema za potnike in
oprema kabin

Passenger and cabin
equipment

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EUROPEAN STANDARD

EN 4856

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English Version

Rotorcraft - Emergency Breathing Systems (EBS) - Requirements, testing and marking

Giravion - Système de ventilation d'urgence (EBS) -
Exigences, essais et marquage

Rotorkraft - Notfallbeatmungssystem (EBS) -
Anforderungen, Prüfung und Kennzeichnung

This European Standard was approved by CEN on 8 July 2018.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 4856:2018) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

This document shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2019, and conflicting national standards shall be withdrawn at the latest by June 2019.

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

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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Introduction

This document prescribes the minimum standards of design and performance for rotorcraft emergency breathing systems (EBS), used to reduce the risks of drowning in the event of submersion. An emergency breathing system is a form of personal protective equipment that provides the user with a means to breathe underwater, thereby improving the probability of successfully escaping from a submerged rotorcraft cabin. If used correctly, EBS should mitigate the risk of drowning.

This document aims to ensure that the equipment user is able to carry out the necessary emergency procedures whilst being provided with an appropriate level of protection under foreseeable conditions of use. It also aims to ensure that the equipment presents a minimal hazard in relation to escape from the rotorcraft, and that the equipment has no detrimental effect on the health and safety of the user or on the performance of other equipment.

This document is applicable to all rotorcraft. Rotorcraft include helicopters, tilt rotor/wing and gyroplanes. For the purpose of this standard the term helicopter is used generically hereinafter.

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1 Scope

This document specifies requirements for Emergency Breathing Systems (EBS) for use by helicopter crew and passengers in the event of a ditching or water impact, to ensure minimum levels of performance. It applies to EBS for use by adults only.

Two categories of EBS are addressed by this standard; Category A EBS capable of being successfully deployed in air and underwater and Category B EBS capable of being successfully deployed in air but not underwater.

This document is applicable to compressed air, rebreather and hybrid rebreather designs of EBS.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

International standards

EN 250, *Respiratory equipment — Open-circuit self-contained compressed air diving apparatus — Requirements, testing and marking*

EN 12021, *Respiratory equipment — Compressed gases for breathing apparatus*

EN 14143:2013, *Respiratory equipment — Self-contained re-breathing diving apparatus*

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

EN ISO 12894, *Ergonomics of the thermal environment — Medical supervision of individuals exposed to extreme hot or cold environments (ISO 12894)*

EASA publications

EASA, *Certification Specifications and Acceptable Means of Compliance for Large Aeroplanes CS-25, Book 1 — Appendix F*

EASA, ETSO-2C502, *Helicopter crew and passenger integrated immersion suits*

EASA, ETSO-2C503, *Helicopter crew and passenger immersion suits for operations to or from helidecks located in a hostile sea area*

EASA, ETSO-2C504, *Helicopter constant-wear lifejackets for operations to or from helidecks located in a hostile sea area*

NOTE In the near future it is anticipated that ETSO-2C502, ETSO-2C503 and ETSO-2C504 will be revised and that the revised documents will make reference to two new standards: prEN/EN 4862 *Rotorcraft — Constant Wear Lifejackets — Requirements, testing and marking* and prEN/EN 4863 *Rotorcraft — Immersion Suits — Requirements, testing and marking*. It is intended that when these new documents are published they should be used in place of the ETSO documents currently referenced.

EN 4856:2018 (E)**Other publications**

World Medical Association Declaration of Helsinki — *Ethical principles for medical research involving human subjects* (as amended): URL <https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/>

3 Terms and definitions

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

3.1**Emergency Breathing System****EBS**

system that allows a person to breathe underwater, overcoming the need to breath-hold for the complete duration of an underwater escape from a helicopter, that can be deployed under emergency conditions

3.2**rotorcraft**

heavier-than-air aircraft that depends principally for its support in flight on the lift generated by one or more rotors

3.3**helicopter**

rotorcraft that, for its horizontal motion, depends principally on its engine-driven rotors

3.4**ditching**

controlled emergency landing on water, deliberately executed in accordance with Rotorcraft Flight Manual procedures, with the intent of abandoning the rotorcraft as soon as practical

3.5**water impact**

helicopter contact with water that is unintentional or exceeds the ditching capability of the helicopter for water entry

3.6**mouthpiece**

device that goes into the mouth of the user, usually held by the teeth, sealing against the lips and through which a breathable gas is inhaled and exhaled

3.7**nose occlusion system**

means of preventing water from entering the nose

Note 1 to entry: A nose clip is one example of a nose occlusion system.

3.8**demand regulator**

device which consists of a pressure reducer connected to a demand valve

3.9**medium pressure hose**

hose with an interface connection at each end, between the pressure reducer and a demand valve

3.10**breathing hose**

flexible hose connecting a counterlung to the mouthpiece of a rebreather EBS, at approximately ambient pressure

3.11**pressure indicator**

device to indicate to the user the pressure of gas in a cylinder

3.12**purging device**

part of the demand regulator that can be operated manually to deliver breathable gas, intended to force water out of the mouthpiece

3.13**dead space**

volume of the cavity formed between the mouth and the inhalation and exhalation parts

3.14**activation device**

mechanism which switches breathing from the atmosphere to the counterlung of a rebreather EBS

3.15**counterlung**

variable volume container for the user to exhale to and inhale from

3.16**breathable gas**

gas that will support life under the intended conditions of use

3.17**work of breathing**

work expended during one breathing cycle which is proportional to the area bounded by the pressure volume diagram divided by the tidal volume

Note 1 to entry: Measured in Joules per litre.

3.18**respiratory pressure**

differential pressure at the mouth relative to the no flow pressures measured at the end of inhalation and exhalation

3.19**hydrostatic imbalance**

difference at end exhalation no flow between the pressure at the mouth and that at the lung centroid reference point

3.20**tidal volume**

volume of breathing gas displaced by the breathing simulator during one half cycle (inhalation or exhalation)

Note 1 to entry: Measured in litres.

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EN 4856:2018 (E)**3.21****respiratory minute volume**

product of the tidal volume and breathing frequency

Note 1 to entry: Measured in litres per minute.

3.22**useable volume of air**

volume of breathable air available to the user while the demand regulator is operating within the specified breathing performance

3.23**rated working pressure**

maximum working pressure of the respective components

3.24**pressure volume diagram**

diagram generated during one breathing cycle by plotting the respiratory pressure against the displaced (tidal) volume

3.25**elastance**

change in pressure that results from a given volume change of the human lung

Note 1 to entry: Measured in $\text{kPa}\cdot\text{L}^{-1}$

Note 2 to entry: This is a typical term for the elastic behaviour of a breathing system.

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3.26**reference pressure**

equilibrium pressure which exists in the mouthpiece when there is no respiratory flow at the end of exhalation

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3.27**escape buoyancy**

buoyancy of the combination of an EBS, uninflated lifejacket and immersion suit (as appropriate) to be overcome when escaping from an immersed helicopter

Note 1 to entry: Escape buoyancy includes the inherent buoyancy of the components of the suit system and entrapped air but excludes the inflated buoyancy of an inflatable buoyancy element when fitted to the suit.

3.28**crew member**

person assigned by an operator to perform duties on board an aircraft

4 Classification**4.1 Design types****4.1.1 Compressed air EBS**

A compressed air EBS is a system where air or some other breathable gas is supplied to the user on demand from a high pressure gas cylinder, the period of breathing being limited by the volume of useable gas.

The apparatus shall comprise at least the following components:

- mouthpiece;
- medium pressure hose;
- gas cylinder;
- demand regulator;
- pressure indicator;
- purging device;
- nose occlusion system.

4.1.2 Rebreather EBS

A rebreather EBS is a system with a counterlung which allows the user to move air out of and back into their lungs, the period of rebreathing being limited by a build-up of carbon dioxide and a reduction in oxygen concentration.

The system shall comprise at least the following components:

- mouthpiece;
- breathing hose;
- counterlung;
- activation device;
- nose occlusion system.

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4.1.3 Hybrid rebreather EBS

A hybrid rebreather EBS is a rebreather system that incorporates a compressed gas cylinder, allowing a small volume of air or other breathable gas to be introduced into the counterlung, the period of rebreathing being limited by a build-up of carbon dioxide and a reduction in oxygen concentration.

The system shall comprise at least the following components:

- mouthpiece;
- breathing hose;
- counterlung;
- gas cylinder with gas release system;
- activation device;
- nose occlusion system.

EN 4856:2018 (E)**4.2 Performance levels****4.2.1 Category A EBS**

Category A systems have the capability to be rapidly deployed and used both in air and underwater. These designs of EBS are suitable for use when capsizing and/or sinking occurs immediately after the helicopter makes contact with the water.

4.2.2 Category B EBS

Category B systems have the capability to be deployed in air and used both in air and underwater. These designs of EBS are suitable for use where there is sufficient time to deploy the equipment prior to any subsequent submersion. Category 'B'B systems have limited capability in water impact accidents as capsizing and/or sinking is likely to occur immediately after the helicopter makes contact with the water.

5 Performance requirements**5.1 General**

5.1.1 Where applicable, EBS shall be tested in combination with associated equipment, including a constant wear aviation lifejacket and/or constant wear immersion suit that it is intended to be worn with, in accordance with 6.8. It shall be deployed in the same manner as it would be in normal service, and from the intended stowed position (6.1 and 6.8.3).

5.1.2 If a compressed breathable gas other than air is used, additional assessment and testing might be required. This shall be determined following visual inspection in accordance with 6.1.

5.2 Design

5.2.1 The EBS shall be practicable in use and light in weight without prejudice to the design strength and performance. Testing shall be carried out in accordance with 6.1 and 6.8.

5.2.2 The EBS shall be simple to deploy and capable of being operated with either hand. The number of deployment actions shall be minimized; for example, no more than one action should be required to activate a rebreather system on submersion, i.e. opening the valve of the counterlung. Testing shall be carried out in accordance with 6.1, 6.8.3 and 6.8.4.

5.2.3 The equipment shall not have any sharp edges or protruding parts which might injure the user, or damage the lifejacket, immersion suit or other emergency equipment. Testing shall be carried out in accordance with 6.1 and 6.8.

5.2.4 Compressed air EBS shall provide the user with a minimum useable volume of air of 50 L Standard Temperature and Pressure Dry (STPD), meeting the requirements of EN 12021. Testing shall be carried out in accordance with 6.1 and 6.5.

5.2.5 Where a counterlung is incorporated into a rebreather system, the counterlung shall have sufficient breathable capacity to accommodate an expired volume of at least 6 L (STPD). In the case of a hybrid rebreather EBS, additional capacity shall be provided equivalent to the volume of breathable gas discharged into the counterlung from the gas cylinder. The counterlung shall be designed to prevent collapse, taking panic breathing into account. Testing shall be carried out in accordance with 6.1 and 6.6.