# SLOVENSKI STANDARD
# oSIST prEN 4856:2022

**01-februar-2022**

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

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

Luft-und Raumfahrt - Drehflügler - Notfallbeatmungssystem (EBS) - Anforderungen, Prüfung und Kennzeichnung

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



**Ta slovenski standard je istoveten z:** **prEN 4856**



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|---|---|---|
| 49.095 | Oprema za potnike in oprema kabin | Passenger and cabin equipment |

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# DRAFT
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English Version

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

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

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee ASD-STAN.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.



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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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## European foreword

This document (prEN 4856:2021) 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 document has received the approval of the National Associations and the Official Services of the member countries of ASD-STAN, prior to its presentation to CEN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 4856:2018.

# 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 EBS 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.

# 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 capable of being successfully and reliably deployed in air and underwater, for use by adults only.

This document is applicable to compressed air and hybrid rebreather designs of EBS. It does not apply to EBS that cannot be successfully and reliably deployed underwater.

# 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.

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

EN 4862,[1] *Rotorcraft — Constant Wear Lifejackets — Requirements, testing and marking*

EN 4863:—[2], *Aerospace series — Rotorcraft immersion suits — Requirements, testing and marking*



prEN 4886, *Aerospace series — Rotorcraft — Liferafts for operations in hostile sea areas — 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 CS-25 Amendment 26:2020, *Certification Specifications and Acceptable Means of Compliance for Large Aeroplanes CS-25, Book 1 — Appendix F*

# 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at https://www.iso.org/obp
- IEC Electropedia: available at https://www.electropedia.org/

[1] Under preparation; current stage is: prEN 4862:2021.
[2] Under preparation; current stage is: prEN 4863:2021.

**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**
**lifejacket**
garment or device which, when correctly worn and used in water will provide the user with buoyancy positioned to provide protection from drowning and increase the likelihood of survival and rescue

**3.3**
**helicopter constant wear lifejacket**
lifejacket worn on the body throughout a helicopter flight, provided to protect the user in the event of a ditching or water impact

**3.4**
**immersion suit**
garment designed to protect the user's body from the cooling effects of unintended immersion in water

Note 1 to entry: Cooling effects include cold shock and hypothermia.



Note 2 to entry: An immersion suit may be integrated or worn with a separate constant wear lifejacket.



**3.5**
**integrated immersion suit**

immersion suit that incorporates the functionality of a lifejacket

**3.6**

**buoyancy element**

inflatable chamber incorporated into an integrated immersion suit that, when inflated, provides the suit with the functionality of a lifejacket

**3.7**
**helicopter immersion suit**
immersion suit worn on the body throughout a helicopter flight, provided to protect the user in the event of a ditching or water impact

**3.8**
**immersion suit system**
helicopter immersion suit (with or without thermal insulation) and its components and accessories including either a constant wear lifejacket or buoyancy element and/or emergency breathing system, as applicable

**3.9**
**fully inflated**
inflation of a lifejacket or buoyancy element achieved by using the manual inflation system (stored gas) with no subsequent deflation

**3.10**
**manual inflation system**
means of inflation achieved by a person operating a mechanism that actively releases stored gas into the buoyancy chamber(s) of a lifejacket or buoyancy element

**3.11**
**oral inflation system**
means of inflation achieved by a person blowing expired air into the buoyancy chamber(s) of a lifejacket or buoyancy element

**3.12**
**rotorcraft**
heavier-than-air aircraft that depends principally for its support in flight on the lift generated by one or more rotors

**3.13**
**helicopter**
rotorcraft that, for its horizontal motion, depends principally on its engine-driven rotors

**3.14**
**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

**3.15**
**water impact**
helicopter contact with water that is unintentional or exceeds the ditching capability of the helicopter for water entry



**3.16**
**crew member**
person assigned by an operator to perform duties on board an aircraft

**3.17**
**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



**3.18**
**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.

**3.19**
**demand regulator**
device which consists of a pressure reducer connected to a demand valve

**3.20**
**medium pressure hose**
hose with an interface connection at each end, between the pressure reducer and a demand valve

**3.21**
**breathing hose**
flexible hose connecting a counterlung to the mouthpiece of a hybrid rebreather EBS, at approximately ambient pressure

**3.22**
**pressure indicator**
device to indicate to the user the pressure of gas in a cylinder

**3.23**
**purging device**
part of the demand regulator that can be operated manually to deliver breathable gas, intended to force water out of the mouthpiece

**3.24**
**dead space**
volume of the cavity formed between the mouth and the inhalation and exhalation parts

**3.25**
**activation device**
mechanism which switches breathing from the atmosphere to the counterlung of a hybrid rebreather EBS

**3.26**
**counterlung**
variable volume container for the user to exhale to and inhale from



**3.27**
**breathable gas**
gas that will support life under the intended conditions of use

**3.28**
**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 J/l.

**3.29**
**respiratory pressure**
differential pressure at the mouth relative to the no flow pressures measured at the end of inhalation and exhalation

**3.30**
**hydrostatic imbalance**
difference at end exhalation no flow between the pressure at the mouth and that at the lung centroid reference point

**3.31**
**tidal volume**
volume of breathing gas displaced by the breathing simulator during one half cycle (inhalation or exhalation)

Note 1 to entry: Measured in l.

**3.32**
**respiratory minute volume**
product of the tidal volume and breathing frequency

Note 1 to entry: Measured in l/min.

**3.33**
**useable volume of air**
volume of breathable air available to the user while the demand regulator is operating within the specified breathing performance

**3.34**
**rated working pressure**
maximum working pressure of the respective components

**3.35**
**pressure volume diagram**
diagram generated during one breathing cycle by plotting the respiratory pressure against the displaced (tidal) volume

**3.36**
**elastance**
change in pressure that results from a given volume change of the human lung

Note 1 to entry: Measured in kPa/l.

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



**3.37**
**reference pressure**
equilibrium pressure which exists in the mouthpiece when there is no respiratory flow at the end of exhalation



**3.38**
**escape buoyancy**
buoyancy of an equipment combination, with the lifejacket or buoyancy element uninflated, that must be overcome when escaping from an immersed helicopter

Note 1 to entry: It includes the inherent buoyancy of the components of the immersion suit system and entrapped air but excludes the inflated buoyancy elements.

## 4 Design types

### 4.1 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.

### 4.2 Hybrid 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. 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.



## 5 Performance requirements

### 5.1 General

**5.1.1** EBS covered by this European standard shall be capable of being rapidly deployed and used both in air and underwater. They shall be suitable for use when capsize and/or sinking occurs immediately after the helicopter makes contact with the water.

**5.1.2** Where applicable, EBS shall be tested in combination with associated equipment, including an immersion suit, accessories and/or lifejacket that is intended to be worn with it, 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).

NOTE Helicopter immersion suits are hereinafter referred to as immersion suits. Helicopter constant wear lifejackets are hereinafter referred to as lifejackets.

**5.1.3** 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.