SLOVENSKI STANDARD
SIST EN 4863:2023

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Aeronavtika - Potopne obleke za posadko v rotoplanu - Zahteve, preskušanje in označevanje

Aerospace series - Rotorcraft immersion suits - Requirements, testing and marking

Luft- und Raumfahrt - Drehflüglerschutzkleidung gegen Unterkühlung im Wasser - Anforderungen, Prüfung und Kennzeichnung

Série aérospatiale - Combinaisons de protection thermique en cas d'immersion de giravion - Exigences, essais et marquage

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Luft- und Raumfahrt - Eintauchanzüge für Drehflügler - Anforderungen, Prüfung und Kennzeichnung

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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European foreword

This document (EN 4863:2023) 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 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of an identical text or by endorsement, at the latest by November 2023, and conflicting national standards shall be withdrawn at the latest by November 2023.

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Introduction

This document prescribes the minimum standards of design and performance for rotorcraft immersion suits, used to reduce cold shock on initial immersion and provide thermal protection following evacuation or escape from a rotorcraft.

The document aims to ensure that the equipment user is able to perform normal activities during flight and to carry out the necessary emergency procedures, whilst being provided with an appropriate level of protection under foreseeable conditions of use. It 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.

It is assumed for the purpose of this document that the immersion suit is donned prior to boarding the rotorcraft.

Rotorcraft immersion suits may be designed to be worn with an approved rotorcraft constant wear lifejacket or may be designed to incorporate the functionality of a lifejacket in which case the wearing of a separate lifejacket is not required.

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

1 Scope

This document specifies requirements for immersion suits for use by helicopter crew members and passengers in the event of a ditching or water impact, to ensure minimum levels of performance. It applies to immersion suits for use by adults only.

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 4856, *Aerospace series — Rotorcraft — Emergency Breathing Systems (EBS) — Requirements, testing and marking*

EN 4862:2023, *Aerospace series — Rotorcraft constant wear lifejackets — Requirements, testing and marking*

EN 4886,[1] *Aerospace series — Rotorcraft life raft — Requirements, testing and marking*

EN 14225-1:2017, *Diving suits — Part 1: Wet suits — Requirements and test methods*

EN ISO 105-E02, *Textiles — Tests for colour fastness — Part E02: Colour fastness to sea water (ISO 105-E02)*

EN ISO 105-X12, *Textiles — Tests for colour fastness — Part X12: Colour fastness to rubbing (ISO 105-X12)*

EN ISO 811, *Textiles — Determination of resistance to water penetration — Hydrostatic pressure test (ISO 811)*

EN ISO 1421, *Rubber- or plastics-coated fabrics — Determination of tensile strength and elongation at break (ISO 1421)*

EN ISO 2411, *Rubber- or plastics-coated fabrics — Determination of coating adhesion (ISO 2411)*

EN ISO 4674-1, *Rubber- or plastics-coated fabrics — Determination of tear resistance — Part 1: Constant rate of tear methods (ISO 4674-1)*

EN ISO 7854, *Rubber- or plastics-coated fabrics — Determination of resistance to damage by flexing (ISO 7854)*

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

EN ISO 11092, *Textiles — Physiological effects — Measurement of thermal and water-vapour resistance under steady-state conditions (sweating guarded-hotplate test) (ISO 11092)*

EN ISO 12402-7, *Personal flotation devices — Part 7: Materials and components — Safety requirements and test methods (ISO 12402-7)*

EN ISO 12402-8, *Personal flotation devices — Part 8: Accessories — Safety requirements and test methods (ISO 12402-8)*

1 Under preparation.

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

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 13935-2, *Textiles — Seam tensile properties of fabrics and made-up textile articles — Part 2: Determination of maximum force to seam rupture using the grab method (ISO 13935-2)*

EN ISO 13937-4, *Textiles — Tear properties of fabrics — Part 4: Determination of tear force of tongue-shaped test specimens (Double tear test) (ISO 13937-4)*

EN ISO 14116:2015, *Protective clothing — Protection against flame — Limited flame spread materials, material assemblies and clothing (ISO 14116:2015)*

EN ISO 15025:2016, *Protective clothing — Protection against flame — Method of test for limited flame spread (ISO 15025:2016)*

ISO 105-A02, *Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour*

ISO 188, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 3801, *Textiles — Woven fabrics — Determination of mass per unit length and mass per unit area*

ASTM D1655, *Standard Specification for Aviation Turbine Fuels*

CIE 015, *Colorimetry*

DEF STAN 91-091, *Turbine Fuel, Kerosene Type, Jet A-1; NATO Code: F-35; Joint Service Designation: AVTUR*

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

EASA, ETSO-C85b, *Survivor Locator Lights*

IATA, *Guidance Material (Kerosene Type), NATO Code F-35*

IMO, Resolution A.658(16), *Use and Fitting of Retro-Reflective Materials on Life-Saving Appliances*

IMO, International Life-Saving Appliance (LSA) Code, adopted by Resolution MSC.48 (66), (as amended)

IMO, Resolution MSC.81(70), (adopted on 11 December 1998) *Revised recommendation on testing of life-saving appliances*

MIL-STD-3009, *Lighting, Aircraft, Night Vision Imaging System (NVIS) Compatible*

SAE ARP 5825, *Design Requirements and Test Procedures for Dual Mode Exterior Lights*

SAE AS 4492A, *Survivor Locator Lights*

3 Terms and definitions

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

ISO and IEC maintain terminology 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/

3.1
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

3.2
helicopter constant wear lifejacket
lifejacket worn on the body throughout a helicopter flight over water, provided to protect the user in the event of a ditching or water impact

3.3
buoyancy chamber
inflatable component of a lifejacket or integrated immersion suit

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) including a constant wear lifejacket or buoyancy element and its components and accessories with or without an emergency breathing system

3.9
hood
covering for the head and neck with an opening for the face, worn for protection against cold

3.10
glove
covering for the hand which may have separate parts for each finger and the thumb, worn for protection against cold

3.11
thermal insulation
material layer used in an immersion suit to reduces heat flow, thus provided protection against cold

3.12
underclothing
clothes worn under a helicopter immersion suit

3.13
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

3.14
rotorcraft
heavier-than-air aircraft that depends principally for its support in flight on the lift generated by one or more rotors

3.15
helicopter
rotorcraft that, for its horizontal motion, depends principally on its engine-driven rotors

3.16
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

3.17
water impact
helicopter contact with water that is unintentional or exceeds the ditching capability of the helicopter for water entry

3.18
crew member
person assigned by an operator to perform duties on board an aircraft

3.19
hardware
lifejacket components such as structural closures and adjusters and multi-eyelet guides used with lacing

3.20
manual inflation system
means of inflation achieved by a person operating a mechanism that actively releases stored gas into the buoyancy chamber(s)

3.21
fully inflated
inflation achieved by using the manual inflation system (stored gas) with no subsequent deflation

3.22
oral inflation system
means of inflation achieved by a person blowing expired air into the buoyancy chamber(s)

3.23
overpressure relief valve
safety device used to limit the pressure in an inflatable system, to avoid the likelihood of destruction caused by excessive pressure

3.24
sprayhood
cover that can be brought in front of the face, incorporating an area of transparent material, used to protect the airways from water and wave splash, intended to increase the likelihood of survival in rough water conditions

3.25
survivor locator light
device which emits light intended to aid in the location of the user in an emergency

3.26
whistle
device which, when blown by mouth, produces an audible sound intended to aid in the location of the user

3.27
lifting loop
device which facilitates manual recovery of a person from water

3.28
buddy line
length of cord or webbing which can be tied or otherwise fixed to another person or to that person's lifejacket or other objects, so as to keep the user in the vicinity of that person or object, aiding in the location of the user

3.29
retroreflective material
material that reflects light beams back to their point of origin with a low level of scattering

3.30
infrared
IR
electromagnetic radiation at the red end of the spectrum at wavelengths from 800 nm to 1 mm (longer than those of visible red light but shorter than microwaves)

3.31
personal locator device
PLD
device carried on the body that is able to transmit a signal to enable electronic detection and location of a person in the water

Note 1 to entry: In the maritime environment a PLD may be known as an Autonomous Maritime Rescue Device (AMRD).

3.32
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.

3.33
hypothermia
condition where body core temperature is below 35 °C

3.34
cold shock
short transitory phase lasting about 2 min to 3 min upon sudden immersion in cold water and characterized by reduced breath-holding ability and an uncontrollable hyperventilation accompanied by other cardio-respiratory distress

3.35
heat strain
increase of body temperature induced by sustained heat stress which cannot be fully compensated by temperature regulation or activation of thermoeffective activities in response to heat stress, which cause sustained changes in the state of other, non-thermal, regulatory systems

3.36
thermal resistance
insulation
R_{ct}
temperature difference between the two faces of a material divided by the resultant heat flux per unit area in the direction of the gradient

Note 1 to entry: The dry heat flux may consist of one or more conductive and radiant components. Thermal resistance R_{ct}, expressed in square metres kelvin per watt, is a quantity specific to textile materials or composites, which determines the dry heat flux across a given area in response to a steady applied temperature gradient.

4 Classification

There are four categories of immersion suit system with different thermal insulation, specified in Table 1.

Table 1 — Helicopter immersion suit system categories

	Category 1	Category 2	Category 3	Category 4
Insulation level	Immersion suit system without inherent insulation	Immersion suit system with low inherent insulation	Immersion suit system with medium inherent insulation	Immersion suit system with high inherent insulation
Sea temperatures relating to intended use (°C)	≥ 12	≥ 7	≥ 2	< 2

NOTE Helicopter immersion suits are hereinafter referred to as immersion suits.

Protection from drowning is provided either by the use of a helicopter constant wear lifejacket worn with the immersion suit, or by the immersion suit incorporating a buoyancy element that has the functionality of a lifejacket (integrated immersion suit).

Guidance and background relating to the use of immersion suits and the different categories of protection is provided in Annex A (informative).

5 Requirements

5.1 General

5.1.1 Immersion suits may be designed for dedicated use by crew members only, for dedicated use by passengers only, or for use by crew members and passengers.

5.1.2 The immersion suit system shall not adversely affect the health or hygiene of the user.

5.2 Design

5.2.1 The immersion suit shall comprise at least the following:

— a dry coverall garment;

— wrist seals;

— neck and/or face seal;

— a closure system;

— integral socks or boots.

5.2.2 A combination of an immersion suit and accessories shall not impair the performance of the system. This shall be established by testing the immersion suit and accessories in combination, in accordance with 6.1, 6.10, 6.11, 6.12 and 6.13 as applicable.

The requirements for accessories are identified in Table 2.