INTERNATIONAL STANDARD

ISO 15027-2

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Immersion suits —

Part 2: Abandonment suits, requirements including safety

Combinaisons de protection thermique en cas d'immersion —
Partie 2: Combinaisons d'abandon, exigences y compris la sécurité

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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 member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 15027 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 15027-2 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO Technical Committee TC 188, *Small craft*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this standard, read "...this European Standard..." to mean "...this International Standard...".

ISO 15027 consists of the following parts, under the general title *Immersion suits*:

— *Part 1: Constant wear suits, requirements including safety*

— *Part 2: Abandonment suits, requirements including safety*

— *Part 3: Test methods*

Annex A of this part of ISO 15027 is for information only.

Annex ZZ provides a list of corresponding International and European Standards for which equivalents are not given in the text.

For the purposes of this part of ISO 15027, the CEN annex regarding the fulfilment of European Council Directives has been removed.

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Foreword

This document (EN ISO 15027-2:2002) has been prepared by Technical Committee CEN/TC 162 "Protective clothing including hand and arm protection and lifejackets", the secretariat of which is held by DIN, in collaboration with Technical Committee ISO/TC 188 "Small craft".

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of an identical text or by endorsement, at the latest by September 2002, and conflicting national standards shall be withdrawn at the latest by September 2002.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

The annex A is informative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard : Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This European Standard has been prepared to meet the needs of persons engaged in certain activities on or near water. Abandonment suits manufactured and maintained to this standard will provide protection from cold shock and delay the onset of hypothermia.

The complete immersion system (suit and clothes worn under the suit) should be able to keep the wearer alive long enough for the rescue services to find and recover them. An individual's estimated thermal protection time will depend on water temperature and wave state as well as their physiology. Detailed in this standard are the minimum recommended insulation levels and the associated water temperatures in which they are to be used.

This standard is intended to serve as a minimum performance requirement for manufacturers, purchasers and users of such safety equipment and seeks to ensure that the equipment provides effective performance in use. The abandonment suit should not jeopardise safety by causing undue discomfort which could result in a degradation of performance.

The abandonment suit shall have no features which will be likely to have any detrimental effect on the operation of other life saving equipment that may be used. In particular, any part of the suit which might pose a snagging hazard shall be suitably covered, protected or restrained.

The primary aims in wearing an abandonment suit are:

a) to reduce the risk of cold shock and delay the onset of hypothermia;

b) to enable the wearer to propel himself in the water and extricate himself from the water without it becoming an encumbrance;

c) to make the wearer sufficiently conspicuous in the water so as to aid his recovery.

Many circumstances may alter the performance of the suit, such as wave action, or the wearing of additional equipment. Users, owners and employers should ensure that equipment is correctly maintained to manufacturer's instructions.

The use of a lifejacket/suit combination during testing does not confer approval status for that combination. An abandonment suit may be worn with a PFD as it will provide extra flotation and will help to bring a person to a face up position.

1 Scope

This standard specifies the requirements for the construction, performance and safety and the test methods for immersion suits.

This part of the standard is applicable to the requirements for abandonment suits.

For the requirements of constant wear suits see EN ISO 15027-1 and for the test methods see EN ISO 15027-3.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 340, *Protective clothing — General requirements.*

EN 1095, *Deck safety harness and safety line for use on recreational craft — Safety requirements and test methods*.

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 : 1999).*

EN ISO 13934-2, *Textiles — Tensile properties of fabrics — Part 2: Determination of maximum force using the grab method (ISO 13934-2 : 1999).*

ISO 105-B04, *Textiles — Tests for colour fastness — Part B04: Colour fastness to artificial weathering: Xenon arc fading lamp test.*

ISO 188, *Rubber, vulcanised or thermoplastic — Accelerated ageing and heat-resistance tests.*

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

ISO 2411 : 1991, *Rubber- or plastics-coated fabrics — Determination of coating adhesion.*

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

ISO 4674, *Fabrics coated with rubber or plastics — Determination of tear resistance.*

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

ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests.*

prEN ISO 12402-2:2000, *Personal flotation devices — Part 2: Class B (offshore lifejackets, extreme conditions — 275 N), safety requirements (ISO/DIS 12402-2:2000).*

prEN ISO 12402-3:2000, *Personal flotation devices — Part 3: Class C (offshore lifejackets — 150 N), safety requirements (ISO/DIS 12402-3:2000).*

prEN ISO 12402-4:2000, *Personal flotation devices — Part 4: Class D (inland/close to shore lifejackets — 100 N), safety requirements (ISO/DIS 12402-4:2000).*

prEN ISO 12402-5:2000, *Personal flotation devices — Part 5: Class E (buoyancy aids — 50 N), safety requirements (ISO/DIS 12402-5:2000).*

prEN ISO 12402-8:2000, *Personal flotation devices — Part 8: Additional items, safety requirements and test methods (ISO/DIS 12402-8:2000)*.

EN ISO 15027-1, *Immersion suits — Part 1: Constant wear suits, requirements including safety (ISO 15027-1:2002)*.

EN ISO 15027-3:2002, *Immersion suits — Part 3: Test methods (ISO 15027-3:2002).*

AATCC Method 30 : 1981, *Fungicides, evaluation on textiles: mildew and rot-resistance of textiles*[1].

International Convention for the Safety of Life at Sea (IMO), 1974, amendment 1983[2]

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions of EN ISO 15027-1 apply.

4 Requirements

4.1 General

4.1.1 The suit system declared to be an abandonment suit shall meet all requirements of this standard nor shall be damaged or fail in its determined function when tested in accordance with all tests in accordance with clause 3 of EN ISO 15027-3:2002, nor materials, fabrics or components when tested in accordance with 4.13.

4.1.2 It shall be established by inspection that the abandonment suit covers the whole body with the exception of the face and that the hood makes a good fit around the face, and that hand covering is provided by means of permanently attached gloves.

The abandonment suit may incorporate additional items, none of which shall impair its performance with respect to this standard, either by their presence or their use. Testing in accordance with 3.1 of EN ISO 15027-3:2002.

4.1.3 Where an universally sized suit is provided, it shall be sized to fit every person between 1,50 m and 1,95 m. Testing in accordance with 3.1 of EN ISO 15027-3:2002.

4.1.4 Insulation material shall be prevented from migrating when tested in accordance with 3.6 of EN ISO 15027-3:2002.

4.1.5 The suit system shall not restrict the donning of a reference PFD in accordance with prEN ISO 12402:2000, unless the suit system meets or exceeds the performance requirements of a lifejacket. Testing in accordance with 3.1 of EN ISO 15027-3:2002.

4.1.6 The suit system shall be capable of being readily cleaned when tested in accordance with 3.7.1 of EN ISO 15027-3:2002.

4.1.7 The suit system shall be designed in such a way as to minimise the risk of snagging. Testing in accordance with 3.1 of EN ISO 15027-3:2002.

4.1.8 Materials, fabrics and components shall conform with the test methods of 4.13.

4.1.9 The suit shall not contain or be accompanied by any component likely to injure or impede the user within the context of normal use. Testing in accordance with 3.1 of EN ISO 15027-3:2002.

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1) Available from American Association of Textile Chemists and Colorists (AATCC) one Davis Drive, PO Box 12215, Research Triangle Park, NC 27709-2215 US

2) IMO is an institution with domicile in London issuing regulations which are then published as laws by the member states

4.2 Additional items

If the suit is provided with additional items, such as a sprayhood, safety harnesses or safety lines, whistles, lights or buddy lines, they shall comply with EN 1095 and prEN ISO 12402-8:2000 and the relevant clauses of this standard.

If the suit is intended to be worn without a PFD, the suit shall be provided with a permanently attached whistle and a light.

4.3 Buddy lines

Buddy lines in accordance with prEN ISO 12402-8:2000 shall have an attachment point, capable of withstanding a vertical load not less than 750 N. Buddy lines shall not affect the performance of the suit when attached. Testing in accordance with 3.1 of EN ISO 15027-3:2002.

4.4 Colour

The coloured portions of the suit exposed above the water surface when in use shall be predominantly in the colour range from yellow to red, excluding such components as webbing, zips and other fittings. The colour shall be checked against colour samples from the NCS colour atlas, and comparisons shall be made in daylight. The exposed portions of the suit shall have easily visible colours within the tolerances defined by the following ranges:

0070 —
1070 — in tones
0080 — Y 30R to Y 80R
1080 —
0090 —

and

0070 —
0080 — in tones
0090 — Y to Y 20R

and the corresponding fluorescent colours.

4.5 Expanded polymeric material

Any expanded polymeric material used to assist the performance of the suit system, shall be compression resistant without sustaining significant loss of buoyancy when tested in accordance with 3.12 of EN ISO 15027-3:2002.

Any expanded polymeric material used to assist the performance of the suit system shall be shown to have thermal stability under the conditions of the test described in 3.13 of EN ISO 15027-3:2002, in which the maximum loss of buoyancy in any sample shall not exceed 5 %.

4.6 Flammability

When tested in accordance with 3.5 of EN ISO 15027-3:2002, an abandonment suit shall not sustain burning or continue melting 6 s after being removed from the flames.

4.7 Fuel resistance

An abandonment suit shall withstand the tests in accordance with 3.4 of EN ISO 15027-3:2002.

4.8 Temperature cycling

The suit shall be resistant to changes in ambient temperature. When tested in accordance with 3.9 of EN ISO 15027-3:2002, the weight of water which has leaked into a dry suit shall not exceed the results of the test of 3.7 of EN 15027-3:2002.

4.9 Leakage

The leakage of a dry suit system shall be measured in accordance with 3.7 of EN ISO 15027-3:2002 and the amount of measured water shall be used as threshold value to thermal testing in 3.8 of EN ISO 15027-3:2002.

4.10 Thermal protection

Means shall be provided to protect the wearer from heat loss. The full suit system shall be assembled in the fashion in which it is intended to be used and tested for thermal insulation in accordance with EN ISO 15027-3.

The suit shall demonstrate thermal performance not less than the figure for its intended class as shown in Table 1.

Table 1 — Thermal protection classes

Class of suit	A	B	C	D
Immersed Clo	0,75	0,50	0,33	0,20

There are two options for measuring the thermal protection provided by a suit:

a) using a thermal manikin: tested in accordance with 3.8.1 of EN ISO 15027-3:2002;

b) using human subjects: tested in accordance with 3.8.2 of EN ISO 15027-3:2002.

NOTE It has to be stated, that for the time being no manikin is available giving sound test results. Therefore the performance of a suit system has to be proved by tests with human subjects. As soon as a manikin showing a sound performance the testing laboratories have the option to go forward and choose one of both methods. This will be accompanied also by an intensive exchange of experience between the testing laboratories, round robin testing and the correlation of results between the tests with human subject and manikin.

4.11 Conspicuity

For search and rescue purposes, a passive light system of retroreflective material shall be provided. This shall conform to the specification detailed in IMO 83, Chapter III, Resolution A.658(16), Annex 2. If it is the only light system, then a total area of not less than 400 cm^2 shall be provided. At least 100 cm^2 of the material shall be affixed to the hood and at least 250 cm^2 shall be clear of the water and visible in the suit's normal in-water position as tested in 3.11.6.4 of EN ISO 15027-3:2002. At least one piece of 50 cm^2 shall be affixed to the back of the suit so as to be visible when the wearer is floating in the face-down position.

The performance of the retroreflective material shall not be degraded by its application. Testing e. g. in accordance with 3.11.6.4.2 of EN ISO 15027-3:2002.

An active light system may also be provided. This shall conform to the standard for emergency lights in prEN ISO 12402-8:2000. When an active light system is provided, the area covered by the passive light system may be reduced by an equivalent amount but a minimum of 300 cm^2 of passive light system should always be provided. At least 100 cm^2 of which should be affixed to the hood and 150 cm^2 clear of the water and visible in the suits normal in-water position as tested in 3.11.6.4 of EN ISO 15027-3:2002. At least one piece of 50 cm^2 shall be affixed to the back of the suit so as to be visible when the wearer is floating in the face down position.

Alternative systems to provide conspicuity to assist search and rescue operations, such as combinations of active light systems (emergency lights) and passive light systems (retroreflective material) will be acceptable if they meet the specifications for both emergency lights and retroreflective material as defined above.

4.12 Performance requirements

4.12.1 Walking

A person wearing the suit system correctly donned shall be able to walk easily as tested in accordance with 3.11.3 of EN ISO 15027-3:2002.

4.12.2 Climbing

A person wearing the suit system correctly donned shall be able to climb freely as tested in accordance with 3.11.4 of EN ISO 15027-3:2002.

4.12.3 Donning

The suit shall be able to be donned with all primary closures are secured within 2 min, including any associated lifejacket (if required), at (20 ± 2) °C and in within 5 min at a temperature of (– 30 ± 2) °C when tested in accordance with the methods described in 3.11.2 of EN ISO 15027-3:2002.

4.12.4 Dexterity

The suit, when correctly donned and adjusted, shall not prevent the wearer from bending over (without squatting), picking up a rope, passing it around his/her waist and tying a double overhand knot in front of him/her, picking up a pencil and writing something, when tested in accordance with 3.11.5 of EN ISO 15027-3:2002.

4.12.5 Hand protection

A person wearing a suit system correctly donned shall be able to remove it from storage and done the hand protection when tested in accordance with 3.11.6.5 of EN ISO 15027-3:2002.

4.12.6 Jumping

A person wearing a suit system correctly donned shall be able to jump vertically into water from a height of not less than $(4{,}5\,^{+0{,}5}_{0})$ m without any damage to the suit or injury to the wearer. The wearer shall be able to secure any secondary suit closures within 2 min of entering the water. This shall be tested in accordance with 3.11.6.1 of EN ISO 15027-3:2002.

4.12.7 Boarding a platform

A person wearing the suit system correctly donned, with both primary and secondary closure systems activated, shall be able to swim and to board a platform. This shall be tested in accordance with 3.11.6.2 of EN ISO 15027-3:2002.

4.12.8 Flotation and righting

A person wearing the suit system correctly vented in accordance with the manufacturer's instructions and worn with a PFD in accordance with prEN ISO 12402:2000, shall be able to actively turn face up in the water within 5 s. The angle of the body shall not be greater than 60° from the horizontal, when tested in accordance with 3.11.6.3 of EN ISO 15027-3:2002.

Where the suit system is claimed to provide flotation, the freeboard shall meet the requirements of the related standards prEN ISO 12402-2:2000, prEN ISO 12402-3:2000, prEN ISO 12402-4:2000 or prEN ISO 12402-5:2000.

4.12.9 Field of vision

The suit, when correctly donned and adjusted, shall not prevent the wearer from having an acceptable field of vision, as tested in 3.11.6.6 of EN ISO 15027-3:2002.

4.13 Requirements on materials, fabrics and components

4.13.1 General

Materials, fabrics and components shall not be damaged by storage at temperatures of (– 30 ± 2) °C and (65 ± 2) °C when tested in accordance with 3.9 of EN ISO 15027-3:2002 nor shall they be damaged by salt water when tested in accordance with ISO 9227 for a period of 96 h nor by fuel when tested in accordance with 3.4 of EN ISO 15027-3:2002.