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

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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 the member bodies casting a vote.

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

ISO 15027-2 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 162, *Protective clothing including hand and arm protection and lifejackets*, in collaboration with Technical Committee ISO/TC 188, *Small craft*, Subcommittee SC 1, *Personal safety equipment*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 15027-2:2002), which has been technically revised. The main technical changes are:

a) addition of terms and definitions from ISO 15027-1:2012;

b) revision of requirements for buddy lines;

c) revision of requirements regarding conspicuity;

d) addition of Clause 6 “Information supplied by the manufacturer”;

e) revision of consumer information label;

f) revision of requirements regarding thermal protection in water.

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*

Introduction

This part of ISO 15027 has been prepared to meet the needs of persons engaged in certain activities on or near water. Abandonment suits manufactured and maintained according to this part of ISO 15027 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 user 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 part of ISO 15027 are the minimum recommended insulation levels and the associated water temperatures in which they are to be used.

This part of ISO 15027 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 jeopardize 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 user to propel himself in the water and extricate himself from the water without it becoming an encumbrance;

c) to make the user 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 according to the manufacturer's instructions.

An abandonment suit may often be worn with a lifejacket as it will provide extra flotation and may help to bring a user to a face-up position.

Immersion suits —

Part 2:
Abandonment suits, requirements including safety

1 Scope

This part of ISO 15027 specifies performance and safety requirements for abandonment suits in emergency situations in work and leisure activities to protect the body of a user against the effects of cold water immersion, such as cold shock and hypothermia, including head, hand and feet protection.

It is applicable for dry and wet abandonment suits.

Constant wear suits are not covered by this part of ISO 15027. The requirements of constant wear suits are given in ISO 15027-1:2012. Test methods are given in ISO 15027-3:2012.

2 Normative references

The following referenced documents are indispensable for the application 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.

CIE 15:2004, *Colorimetry*[1)]

EN 340, *Protective clothing — General requirements*

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

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

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

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

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

ISO 2411:2000, *Rubber- or plastics-coated fabrics — Determination of coating adhesion*

ISO 3801:1977, *Textiles — Woven fabrics — Determination of mass per unit length and mass per unit area*

ISO 4674-1:2003, *Rubber- or plastics-coated fabrics — Determination of tear resistance — Part 1: Constant rate of tear methods*

ISO 7854:1995, *Rubber- or plastics-coated fabrics — Determination of resistance to damage by flexing*

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

ISO 12401, *Small craft — Deck safety harness and safety line — Safety requirements and test methods*

ISO 12402-2, *Personal flotation devices — Part 2: Lifejackets, performance level 275 — Safety requirements*

ISO 12402-3, *Personal flotation devices — Part 3: Lifejackets, performance level 150 — Safety requirements*

ISO 12402-4, *Personal flotation devices — Part 4: Lifejackets, performance level 100 — Safety requirements*

1) Available from http://www.cie.co.at/main/publist.html.

ISO 12402-5, *Personal flotation devices — Part 5: Buoyancy aids (level 50) — Safety requirements*

ISO 12402-6, *Personal flotation devices — Part 6: Special purpose lifejackets and buoyancy aids — Safety requirements and additional test methods*

ISO 12402-7:2006, *Personal flotation devices — Part 7: Materials and components — Safety requirements and test methods*

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

ISO 12402-9:2006, *Personal flotation devices — Part 9: Test methods*

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

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 15027-3:2012, *Immersion suits — Part 3: Test methods*

Resolution A.658(16)[2] adopted by the IMO[3] Assembly to amend the International Convention for the Safety of Life at Sea (SOLAS), 1974, *Use and fitting of retro-reflective materials on life-saving appliances*

3 Terms and definitions

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

3.1
immersion suit
suit 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 (3.21) and hypothermia (3.14).

[SOURCE: ISO 15027-1:2012, 3.1]

3.2
constant wear suit
immersion suit designed to be routinely worn for activities on or near water in anticipation of accidental immersion in water, but permitting physical activity to such an extent that actions can be undertaken without undue encumbrance and thus, head, hands and feet need not be covered

[SOURCE: ISO 15027-1:2012, 3.2]

3.3
abandonment suit
immersion suit including head, hand and feet protection designed to permit rapid donning in the event of an imminent immersion in water

[SOURCE: ISO 15027-1:2012, 3.3]

3.4
dry suit
immersion suit designed to protect the user against the effect of cold water immersion by precluding the entry of water upon immersion

[SOURCE: ISO 15027-1:2012, 3.4]

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2) Accessible at http://www.imo.org/KnowledgeCentre/HowAndWhereToFindIMOInformation/IndexofIMOResolutions/Pages/Assembly-(A).aspx.

3) IMO is the abbreviation for International Maritime Organization. It is based in London, UK. IMO issues regulations which are then published as laws by the member states.

3.5
wet suit
immersion suit designed to protect the user against the effect of cold water immersion by providing insulation and limiting the entry and exit of water upon immersion

[SOURCE: ISO 15027-1:2012, 3.5]

3.6
primary suit closure
closure used in the donning of the suit

[SOURCE: ISO 15027-1:2012, 3.6]

3.7
secondary suit closure
additional closure which can be operated by the user to enhance the fit of the suit

[SOURCE: ISO 15027-1:2012, 3.7]

3.8
inherent buoyant material
material that provides buoyancy, forming a permanent part of the suit, with a density less than that of water

[SOURCE: ISO 15027-1:2012, 3.8]

3.9
exterior fabric
outer fabric of a suit, either in the form of a single or composite fabric

[SOURCE: ISO 15027-1:2012, 3.9]

3.10
retro-reflective material
material that reflects light beams back to their point of origin

[SOURCE: ISO 15027-1:2012, 3.10]

3.11
sprayhood
cover brought or placed in front of the face of the user in order to reduce or eliminate the splashing of water from waves or the like onto the airways, and thereby promoting the survival of the user in rough water conditions

[SOURCE: ISO 15027-1:2012, 3.11]

3.12
buddy line
length of cord which can be tied or otherwise fixed to another person, or to that person's personal flotation device or other objects, so as to keep a user in the vicinity of that person or object with a view to making location and thus rescue easier

[SOURCE: ISO 15027-1:2012, 3.12]

3.13
clo value
unit to express the relative thermal insulation values of various clothing assemblies

Note 1 to entry: One clo is equal to 0,155 $Km^2 W^{-1}$.

[SOURCE: ISO 15027-1:2012, 3.13]

3.14
hypothermia
condition where body core temperature is below 35 °C

[SOURCE: ISO 15027-1:2012, 3.14]

3.15
working environment
environment in which the user of a suit system would engage in normal work

[SOURCE: ISO 15027-1:2012, 3.15]

3.16
helicopter transit suit
constant wear suit worn by helicopter occupants

[SOURCE: ISO 15027-1:2012, 3.16]

3.17
offshore installation
structure or vessel that is permanently or temporarily sited at sea or away from the shore in a fresh water lake or river and which is not covered under other international regulations

[SOURCE: ISO 15027-1:2012, 3.17]

3.18
suit system
combination of a suit and any other products which are used in conjunction with it

[SOURCE: ISO 15027-1:2012, 3.18]

3.19
underclothing
clothes worn under the suit system

[SOURCE: ISO 15027-1:2012, 3.19]

Note 1 to entry: The underclothing to be worn with the suit system shall be specified by the manufacturer. If not specified by the manufacturer, it shall be according to ISO 15027-3:2012, 3.8.1.3.

3.20
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, nonthermal, regulatory systems

[SOURCE: ISO 15027-1:2012, 3.20]

3.21
cold shock
short transitory phase lasting about 2 to 3 min upon sudden immersion in cold water and characterized by an uncontrollable hyperventilation accompanied by other cardio-respiratory distress

[SOURCE: ISO 15027-1:2012, 3.21]

4 Requirements

4.1 General

4.1.1 The suit system declared to be an abandonment suit shall meet all requirements of this part of ISO 15027. The suit shall not be damaged or fail in its determined function when tested in accordance with all

tests in ISO 15027-3:2012, Clause 3. The test sequence shall start with the temperature cycling in accordance with ISO 15027-3:2012, 3.9, followed by the rotating shock bin test in accordance with ISO 15027-3:2012, 3.6.

4.1.2 The manufacturer shall specify the components of the suit system including underclothing and additional items. The abandonment suit shall cover the whole body with the exception of the face. The hood shall make a tight fit around the face to limit water ingress. Hand covering shall be provided either by integral hand protection or by permanently attached hand protection/gloves. Test by visual inspection.

The abandonment suit may incorporate additional items compliant with ISO 12402-8, none of which shall impair its performance with respect to the rquirements of this part of ISO 15027, either by their presence or their use.

4.1.3 The risk of heat stress and discomfort shall be taken into account in the design and use of the suit system. This should be accompanied in the information supplied by the manufacturer by specific advice or warnings according to Clause 6.

NOTE In general, the higher the protection against cold shock and hypothermia, the higher is the possibility of heat strain. The user of an abandonment suit needs to balance those two effects when choosing a device.

4.1.4 The size of the suit shall fit size(s) of the intended user(s). When multiple size ranges are provided, the size ranges should overlap. If an adult universally sized suit is provided, it shall be sized to fit at least every person between 1,50 m and 1,95 m. Test in accordance with ISO 15027-3:2012.

4.1.5 The rotating shock bin test according to ISO 15027-3:2012, 3.6 shall be performed on each suit before performing the relevant tests according to ISO 15027-3:2012, Clause 3. There shall be no visible migration of insulation material and no visible wear-and-tear damage after the rotating shock bin test.

4.1.6 Unless the suit system has been designed to be used without a PFD, the suit system shall not prevent the donning of a personal flotation device (PFD) in accordance with ISO 12402-2 or ISO 12402-3, and the manufacturer of the suit system shall specify the type of PFD (inflatable and/or inherent) to be used.

4.1.7 The performance requirements shall be met after cleaning in accordance with ISO 15027-3:2012, 3.7.1.1. The cleaning shall be performed according to the specification of the manufacturer.

4.1.8 The suit system shall be designed in such a way as to minimize the risk of snagging. Test in accordance with ISO 15027-3:2012, 3.1.

4.1.9 Materials, fabrics and components shall conform with the requirements of 4.11.

4.1.10 The suit shall not contain or be accompanied by any component likely to injure or impede the user within the context of normal use. Test in accordance with ISO 15027-3:2012, 3.10.

4.1.11 A dry suit requires a tight fit around neck or face, wrists and ankles. This is tested in the leakage test (see 4.9).

4.2 Basic health and ergonomic requirements

4.2.1 Innocuousness

The suit system shall not adversely affect the health or hygiene of the user. The materials shall not, in the foreseeable conditions of normal use, release substances generally known to be toxic, carcinogenic, mutagenic, allergenic, toxic to reproduction or otherwise harmful.

NOTE 1 More information can be found in ISO 13688.