

---

---

**Floating leisure articles for use on and  
in the water —**

**Part 1:  
Classification, materials, general  
requirements and test methods**

**iTeh STANDARD PREVIEW**  
*Articles de loisirs flottants à utiliser sur ou dans l'eau —*  
*Partie 1: Classification, matériaux, exigences et méthodes d'essai*  
*générales*  
(standards.iteh.ai)

[ISO 25649-1:2017](https://standards.iteh.ai/catalog/standards/sist/6a5a9159-9e02-411a-9498-7942f2d3991c/iso-25649-1-2017)

<https://standards.iteh.ai/catalog/standards/sist/6a5a9159-9e02-411a-9498-7942f2d3991c/iso-25649-1-2017>



**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

ISO 25649-1:2017

<https://standards.iteh.ai/catalog/standards/sist/6a5a9159-9e02-411a-9498-7942f2d3991c/iso-25649-1-2017>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2017, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
copyright@iso.org  
www.iso.org

# Contents

	Page
Foreword .....	v
Introduction .....	vi
<b>1 Scope .....</b>	<b>1</b>
<b>2 Normative references .....</b>	<b>1</b>
<b>3 Terms and definitions .....</b>	<b>2</b>
<b>4 Classification and criteria to distinguish floating leisure articles from aquatic toys .....</b>	<b>4</b>
<b>5 General safety requirements and test methods related to all classes .....</b>	<b>6</b>
5.1 General .....	6
5.2 Body entrapment .....	6
5.2.1 General .....	6
5.2.2 Requirements on body entrapment .....	8
5.2.3 Test procedure .....	8
5.2.4 Depths of gaps and openings .....	8
5.2.5 Method of measuring .....	9
5.3 Torso entrapment on safety line with regard to children .....	9
5.3.1 Requirements .....	9
5.3.2 Test method .....	9
5.4 Accessible protruding parts causing entanglement .....	9
5.4.1 Requirements .....	9
5.4.2 Test method .....	9
5.5 Human subject testing .....	10
5.5.1 General .....	10
5.5.2 Test panel .....	10
5.5.3 Assessment panel .....	11
5.5.4 Positioning and posture of test subjects for testing floating stability (if applicable) .....	11
5.5.5 Basic test postures .....	11
5.6 Design working pressure .....	12
5.6.1 Requirements .....	12
5.6.2 Test method .....	12
5.7 Load bearing components .....	12
5.7.1 Requirements .....	12
5.7.2 Test method .....	12
5.8 Towing device .....	12
5.8.1 Requirements .....	12
5.8.2 Test method .....	12
5.9 Valves and valve adapters .....	12
5.9.1 Requirements .....	12
5.9.2 Test method .....	13
5.9.3 Numbering of air chambers .....	13
5.10 Edges, corners and points .....	13
5.10.1 Requirements .....	13
5.10.2 Test method .....	13
5.11 Shearing and crushing points .....	13
5.11.1 Requirements .....	13
5.11.2 Test method .....	14
5.12 Strength of the hull and test conditions .....	14
5.12.1 Requirements .....	14
5.12.2 Pressure test .....	14
5.12.3 Heat test (not applicable to Class D devices) .....	15
5.12.4 Air tightness test for inflatables made from unsupported material .....	15

5.12.5	Air tightness test for inflatables made from reinforced or fabric covered material .....	16
5.13	Buckles and other fixings .....	16
5.13.1	Requirements .....	16
5.13.2	Test methods .....	16
<b>6</b>	<b>Material requirements and test methods .....</b>	<b>16</b>
6.1	General .....	16
6.1.1	Requirements .....	16
6.1.2	Test method .....	16
6.2	Chemical requirements for materials making up the hull, unsupported or reinforced .....	17
6.2.1	General .....	17
6.2.2	Resistance to mineral oil .....	17
6.2.3	Resistance to chlorinated salt water .....	17
6.3	Physical requirements .....	17
6.3.1	Resistance to cold .....	17
6.3.2	Resistance to heat .....	17
6.4	Mechanical requirements of unsupported hull materials .....	18
6.4.1	General .....	18
6.4.2	Resistance to puncturing .....	18
6.5	Mechanical requirements for reinforced hull materials .....	18
6.5.1	General .....	18
6.5.2	Adhesion of coatings (if applicable) .....	18
6.6	Other materials .....	19
6.6.1	Wood .....	19
6.6.2	Metal and synthetic material parts .....	19
6.7	Threads .....	19
6.7.1	Requirements .....	19
6.7.2	Test method .....	19
<b>7</b>	<b>Durability of warnings and markings .....</b>	<b>19</b>
7.1	Resistance to perspiration .....	19
7.1.1	Requirements .....	19
7.1.2	Test method .....	20
7.2	Resistance to chlorinated salt water .....	20
7.2.1	Colour fastness .....	20
7.2.2	Test liquid .....	20
7.2.3	Apparatus .....	20
7.2.4	Test method .....	20
7.3	Adhesion of markings .....	20
7.3.1	Requirements .....	20
7.3.2	Test method .....	20
7.4	Provision of repair means .....	20
	<b>Annex A (normative) Templates .....</b>	<b>21</b>
	<b>Annex B (informative) Examples of openings .....</b>	<b>23</b>
	<b>Bibliography .....</b>	<b>29</b>

iTech STANDARD PREVIEW  
(standards.itech.ai)

[ISO 25649-1:2017](https://standards.itech.ai/catalog/standards/sist/6a5a9159-9e02-411a-9498-7942f2d3991c/iso-25649-1-2017)

<https://standards.itech.ai/catalog/standards/sist/6a5a9159-9e02-411a-9498-7942f2d3991c/iso-25649-1-2017>

## 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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

ISO 25649-1 was prepared by the European Committee Standardization (CEN) Technical Committee CEN/TC 136, *Sports, playground and other recreational facilities and equipment*, in collaboration with ISO Technical Committee TC 83, *Sports and other recreational facilities and equipment*, in accordance with the agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all the parts in the ISO 25649- series can be found on the ISO website.

## Introduction

### 0.1 Motives, problems, risk assessment, methods

Investigations in statistical data related to drowning accidents and near-drownings create a new awareness about the enormous relevance of drownings in many countries. In particular, during childhood drowning is the second most common cause of death. Due to a lack of exactness of the available statistical data, they do not reveal details concerning the relation between drowning accidents and the involvement of certain products. Such links can be shown only for segments of the wide range of water activities related products. Consumer protection needs to rely on conclusions by risk analysis, experience and analogy to known cases. Considerations based on probability and the precautionary principle is the second access to the problem. That applies in particular for the product group “Floating leisure articles for use on and in the water” as this group is constituted here and now as a market segment to be addressed by standardization for safety reasons. Beyond the statistical deficiencies, relations between certain products and an increased risk of drowning are plausible. A risk analysis undertaken by WG 13 shows what the partial and final risks are.

Until now, standardization has addressed the risks through a wide series of standards aiming at the protection against drowning and covering a number of products used in leisure activities on and in the water. There are standards covering the relevant products for activities like playing in the water, water sports, boating, diving, learning to swim and even the emergency devices as buoyancy aids and life jackets. Beyond these typical and traditional activities and products, there is a new tendency for the creation and marketing of more and more new products. They are all aiming to increase pleasure and entertainment on the water but also more speed, action and thrill as far as the new adventurous activities as “tubing”, “white water rafting” etc. is concerned. The new products are partly modified traditional core products or they are derived from them and further developed to something new. Additionally, there is a clear trend to bring more and more formerly land based playground equipment on the water. The term “amphibiation” is justified as in many cases the original function of the product is maintained, i.e. they can be used both ways. Typical examples for the first mentioned kind of new products are modifications of inflatable boats into a bathing raft in fantasy shape or the further development of the earlier swim-ring into a flotation seat. Examples for “amphibians” exist in inflatable trampolines, climbing installations being put on the water for action and fun. Inflatable floating armchairs and sun loungers including the mini bar and sun shade rather serve for more comfort and relaxation when bathing. This trend is clear and very likely to continue.

It can be shown that the nature of these new products provide an equal or even higher risk potential than the original core products. In parallel, the number of these products override the number of the core products. In cases of collective use, the frequency of use is considerably increased which in turn increases the likelihood of accidents — drownings. Drowning is the final risk of the mentioned product related activities, there are other somewhat lesser evils — partial risks — which are likely to happen too independently or in combination with the final risk.

Having in mind the existing safety related standardization, an evident discrepancy emerges. Standardization in the past was focused on the core products and has neglected the huge amount of products forming the so called “grey zone”. We always were aware of this fact, but the “grey zone” was so disturbingly complicated and never really considered and investigated. The triggering incident to change this was the swim seat case, its interaction with aquatic toys and all the many related products mentioned above. The fact of negligence highlights the reason. It was due to this inconsistency, variety and complexity that these products were usually excluded from the scopes of related standards. Experts involved in this standardization work therefore invented the term “grey zone products”. A systematic risk analysis or an investigation in drowning accidents was never made. What matters today is not so much the fact of a disturbing gap in the series of existing standards but the knowledge that there are a number of coincidences:

- all in all the main user groups of these products are children and adolescents who in turn are the main victims of drowning;
- the main areas where drowning happens are identical with the areas of use for such products (rivers, lakes, pools, bathing beaches);

- the risks can be easily identified partly proven, the increase in numbers and frequencies were already mentioned.

## 0.2 Equal risk, equal requirement

- Equality of risks shall lead to an equality of technical rules (risk-/rule-alignment);
- closing the standardization gap, completeness;
- setting of clear boundaries between the product areas in order to avoid incorrect certification (e.g. unjustified CE-Mark), “standard jumping” including escape from tougher standards into weaker ones, contributing to overcome the problems of an extremely wide and vague definition of aquatic toys according to European Directive 2009/48/EC and the distinction of shallow and deep water as dividing criterion;
- avoidance of individually established testing procedures by the various test houses in the absence of a unified technical rule.

## 0.3 Risks and need for prevention

- Relevance of drowning is proven (age groups, places, partly product involvement);
- new products increase frequency of use and amount of products likely to contribute to accidents;
- theoretical risk analysis shows additional risks below the final risk of drowning;
- plausibility and likelihood of harm to users is evident, so is the probability of adequate safety standards to avoid or minimize this;
- to contribute positively to the basic problem of parental supervision which is needed and claimed with regard to child activities but in many cases weak, not existing or neglected;
- safety by utmost inherent safety by design from the product in addition to this technical safety shall be supplemented through supervision it is recommended for younger children;
- we should recognize that there are new trends to bring more and more former land based products on the water, as well as trends to adventure activities increasing the thrill of water related leisure activities and entertainment;
- need for prevention.

## 0.4 Body dimensions by the USA-population

Body entrapment, human tests subjects and USA anthropometric data: ISO 25649-1 includes test procedures based on human test subjects. The anthropometric data for the worst case human test subject – the heaviest and biggest person representing the 95th percentile of a population – have been derived from European body measurement data. With the current internationalization of this European standard to an ISO 25649 series it is necessary to adapt these European data to international circumstances. The international worst case regarding body dimensions is constituted by the USA-population. The 95.% body weight for the USA population has to be increased from 90 kg to 110 kg and the Body Mass Index (BMI) should be specified between 35 and 40. This corresponds to a body height of 170 cm to 175 cm. Accordingly the rigid test probe has to be modified too. An amendment concerning this subject is in process and will be launched immediately after the formal vote procedure.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

ISO 25649-1:2017

<https://standards.iteh.ai/catalog/standards/sist/6a5a9159-9e02-411a-9498-7942f2d3991c/iso-25649-1-2017>



# Floating leisure articles for use on and in the water —

## Part 1:

# Classification, materials, general requirements and test methods

## 1 Scope

This document specifies safety requirements and test methods related to materials, safety, performance for classified floating leisure articles for use on and in water in accordance with [Clause 4](#) (see [Table 1](#)).

This document is only applicable with ISO 25649-2 and the relevant specific parts (ISO 25649-3 to ISO 25649-7).

NOTE 1 Specific safety requirements are specified in ISO 25649-3 to ISO 25649-7.

NOTE 2 The specific parts can include exclusions from the general requirements specified in this document and/or ISO 25649-2.

This document is not applicable to:

- aquatic toys according to European Directive 2009/48/EC (use in shallow waters/use under supervision);
- inflatable boats with a buoyancy > 1800 N according to European Directive 94/25/EC;  
<https://standards.iteh.ai/catalog/standards/sist/6a5a9159-9e02-411a-9498-1800-1800-1800>
- buoyant aids for swimming instructions according to European Directive 89/686/EEC;
- air mattresses which are not specifically designed or intended for use on the water (e.g. velour bed, self inflating mattress and rubberized cotton air mattress);
- floating seats for angling purposes;
- surf sports type devices (e.g. body boards, surf boards);
- water ski, wakeboard or kite surfing board;
- devices made from rigid materials e.g. wood, aluminium, hard or non-deformable plastic;
- devices which are kept in shape by permanent air flow;
- rings intended for use on water slides;
- wading devices.

## 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.

ISO 105-E03:2010, *Textiles — Tests for colour fastness — Part E03: Colour fastness to chlorinated water (swimming-pool water)*

ISO 105-E04, *Textiles — Tests for colour fastness — Part E04: Colour fastness to perspiration*

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

ISO 868, *Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness)*

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

ISO 3696:1995, *Water for analytical laboratory use — Specification and test methods*

ISO 4675, *Rubber- or plastics-coated fabrics — Low-temperature bend test*

ISO 25649-2, *Floating leisure articles for use on and in the water — Part 2: Consumer information*

EN 71-1:2005, *Safety of toys — Part 1: Mechanical and physical properties*

EN 13138-3:2014, *Buoyant aids for swimming instruction — Part 3: Safety requirements and test methods for swim seats to be worn*

EN 16051-1, *Inflation devices and accessories for inflatable consumer products — Part 1: Compatibility of valves and valve adapters*

EN 20105-A02, *Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour (ISO 105-A2:1993)*

EN 20105-A03, *Textiles — Tests for colour fastness — Part A03: Grey scale for assessing staining (ISO 105-A03:1993)*

## **iTeh STANDARD PREVIEW**

### **3 Terms and definitions**

**(standards.iteh.ai)**

For the purposes of this document, the terms and definitions given in EN 16051-1 and the following apply.

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

— ISO Online browsing platform: available at <http://www.iso.org/obp>

— IEC Electropedia: available at <http://www.electropedia.org/>

#### **3.1**

##### **buoyancy**

resultant upthrust of a body when totally submerged in water with its uppermost part just below the water surface

Note 1 to entry: For the purpose of measuring, the buoyancy of boats (see ISO 25649-7) is measured as the volume of any chamber, which forms the inflatable hull including components which are permanently fixed to it. This buoyancy is measured by calculation or water filling and measuring the amount of water.

#### **3.2**

##### **residual buoyancy**

provision of remaining buoyancy in case of a defect of any buoyancy chamber

#### **3.3**

##### **inflatable system**

components (parts) of a device which contribute to stable floating conditions and/or safety

#### **3.4**

##### **component**

subgroup of the entire device which contributes to buoyancy, function and safety, integrated or detachable

**3.5****static use**

use which requires little action with regard to the user

Note 1 to entry: Product is mainly used for relaxing, sun bathing, laying, sitting, etc.

Note 2 to entry: In accordance with intended use.

**3.6****dynamic use**

use during which the user is in full action

Note 1 to entry: Product is mainly used for activities like jumping, climbing, rollicking (horse playing, rocking), sliding, swinging in and out from the water into or onto the inflatable, etc.

Note 2 to entry: In accordance with intended use.

**3.7****positional use**

product is used within a limited area

Note 1 to entry: This area is supposed to be in safe proximity to the shore, pool edge, etc.

Note 2 to entry: In accordance with intended use.

**3.8**

**means of propulsion**  
devices used to generate the movements of a manually operated floating article

EXAMPLE Manually operated floating articles could be equipped with a paddle wheel, swing flipper, oar or paddle.

**3.9****test panel**

group of test subjects

**3.10****assessment panel**

group of independent experts checking process to establish compliance with the requirements specified in this document

**3.11****conditioning**

process to which the complete device is submitted prior to testing

**3.12****load**

human subjects and other items carried on or in an inflatable structure

**3.13****floating stability**

capability of a non-moving buoyant structure to withstand internal and external forces which tend to capsize it and maintaining a stable floating position

Note 1 to entry: Internal forces leading to capsizing can result from uneven load distribution, external forces leading to capsizing can result from wind or waves.

**3.14****stable floating position**

in-water position of a buoyant structure safeguarding upright floating and the on-board position of all passengers in sitting posture but in a position most likely to cause capsizing

**3.15**

**load capacity**

value stated by the manufacturer representing the maximum load on a buoyant structure under which a safe floating position is assured

**3.16**

**permanent sealed buoyancy**

sealed airtight compartment(s) filled with air, gas or inherent buoyant material

**3.17**

**reinforced material**

material which consists of a basic fabric and coated or laminated layer which ensure the air tightness

**3.18**

**permissible maximum working pressure**

permissible maximum overpressure indicated by the manufacturer which is measured immediately after the first inflation of the boat using a defined measuring device

Note 1 to entry: Where the permissible maximum working pressure is given by a range, the upper limiting value is decisive.

## **4 Classification and criteria to distinguish floating leisure articles from aquatic toys**

Floating leisure articles shall be classified by their intended use, means of propulsion and design as set out in [Table 1](#).

ITC STANDARD PREVIEW  
(standards.iteh.ai)  
ISO 25649-1:2017  
<https://standards.iteh.ai/catalog/standards/sist/6a5a9159-9e02-411a-9498-7942f2d3991c/iso-25649-1-2017>