International Standard 6185

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Shipbuilding and marine structures — Inflatable boats — Boats made of reinforced elastomers or plastomers

Construction navale et structures maritimes — Bateaux pneumatiques — Bateaux construits en élastomères ou plastomères renforcés

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 6185 was developed by Technical Committee ISO/TC 8, *Shipbuilding and marine structures*, and was circulated to the member bodies in March 1980.

It has been approved by the member bodies of the following countries:

Austria	Ireland	Poland
Belgium	Italy	Romania
Brazil	Japan	Spain
China	Korea, Dem. P. Rep. of	Sweden
Czechoslovakia	Korea, Rep. of	United Kingdom
France	Mexico	USSR
India	Netherlands	

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Australia
Germany, F. R.
Norway

Printed in Switzerland

Shipbuilding and marine structures — Inflatable boats — Boats made of reinforced elastomers or plastomers

1 Scope

This International Standard specifies the minimum safety characteristics required for the design, materials to use, manufacture and testing of inflatable boats.

2 Field of application

This International Standard is applicable to inflatable boats made of reinforced plastomers and elastomers capable of carrying at least one person weighing 75 kg without dimensional limitation.

For the purpose of this International Standard, an inflatable boat is one which achieves its intended shape and buoyancy through the medium of inflation. Buoyancy is chiefly ensured by the tanks which make up the hull. The boat may be propelled by sails, engine or manual means.

This International Standard is not applicable to inflatable life rafts.

3 References

ISO 1817, *Vulcanized rubbers — Resistance to liquids — Methods of test.*

ISO 2411, *Fabrics coated with rubber or plastics — Determination of the coating adhesion.*

ISO 3011, *Fabrics coated with rubber or plastics — Determination of resistance to ozone cracking under static conditions.*

ISO 4646, *Rubber or plastics coated fabrics — Low temperature impact test.*

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

4 General requirements

4.1 Maximum load capacity

The maximum load which may be carried by the boat shall be rated in kilograms at not greater than 0,75 of the inflated buoyancy chamber volume, at the design working pressure (see 4.4) calculated at a proportion of 1 000 kg/m^3 of chamber volume, less the mass of the boat.

Example of calculation :

$$m = (0{,}75 \times V \times 1\,000) - M$$

where

m is the maximum load capacity, in kilograms (total mass on board including persons, equipment, motor and fuel);

V is the volume, in cubic metres, of the inflated buoyancy chambers;

M is the total mass, in kilograms, of the boat as supplied by the manufacturer (inclusive of all equipment supplied with the boat; hull, fittings and similar items but without engine and fuel).

NOTE — In the calculation of the maximum load capacity, account should be taken of the keels, thwarts and any similar inflatable compartments meeting the following three requirements :

— they provide useful buoyancy for the boat in flooded conditions;

— they are permanently attached to the hull and inflated independently of it;

— their construction and the material used are in conformity with the requirements of this International Standard.

4.2 Passenger accommodation — Passengers carried

The number of passengers carried shall be calculated as a function of buoyancy and accommodation.

As far as buoyancy is concerned, allowance shall be made for a mass of 75 kg per passenger.

As far as accommodation is concerned, sufficient space shall be provided for each passenger without taking into account the area available on the floats but taking account of the area included under the spray hood. For adults, a minimum area of 0,3 m^2 is provided per passenger.

The maximum number of passengers carried shall be at most equal to the smaller of the following two figures :

— the quotient of the internal available area, in square metres, divided by 0,3. The value shall always be rounded down to the nearest integer but, if the first decimal place is greater than 5, one child shall be added to the number (N) of adults thus determined : the number of passengers will then become $N + 1$ child. Children over 10 years are considered as adults;

— the quotient of the maximum load capacity, in kilograms (less the maximum recommended mass of engine and fuel) divided by 75.

NOTES

1 For the calculation of the internal available area, account shall be taken of the internal surface defined by a plane tangent to the boat side and perpendicular to the floor.

2 According to service requirements, the number of passengers may be reduced to suit national regulations.

4.3 Compartmentation

The minimum number of compartments is specified in the table below.

Maximum permissible power, kW \ $F(d)$	below 5	5 to 9	over 9
7,36	2	2	3
18,37	2	3	3
> 18,37	3	3	4

$F(d)$ is the dimensional factor.

$F(d) = L \times b$

L is the boat length, overall, in metres, from the bow to the extremity of the rear float (excluding hand-holds or other fittings).

b is the boat width, overall, in metres (excluding hand-holds or other fittings).

An inflatable boat loaded to the maximum load capacity shall be capable, even upon sudden deflation of any of its compartments, of retaining sufficient buoyancy to ensure the safety of embarked passengers and of being propelled.

4.4 Design working pressures

They shall be specified by the manufacturer for each compartment (including air chambers, keel, seats, awning, etc) of the fully inflated boat. These pressures shall be indicated either on the appropriate compartment or in the instruction manual.

In order that the user may ascertain that the specified working pressure has been reached, the manufacturer shall provide appropriate equipment or a pressure gauge for this purpose.

Alternatively, instructions shall be included in the manual supplied (see 4.5.6) which will enable a sufficiently close estimate to be made.

The working pressure shall be expressed in bars.

4.5 Hull fittings

4.5.1 General

Any load-bearing fitting attached to the inflatable hull shall not cause any impairment in the inflated buoyancy of the boat when the fitting is loaded to failure point.

The materials and construction used shall be compatible with that of the hull itself, taking into account the conditions of contact with salt or fresh water.

4.5.2 Valve assemblies

The assemblies shall be of corrosion resistant materials and shall not be capable of damaging the boat material.

The type and arrangement of the inflation valves fitted on an inflatable boat shall ensure

a) that the valves will be readily accessible for connection of the inflation device whether the boat is on land or in the water;

b) that the valves will not inconvenience the persons in their predetermined seating positions;

c) that the valves will not interfere with the operation of the boat;

d) that the valves will not interfere with loading and unloading of the boat;

e) that the valves cannot be damaged or torn off by suddenly tightening line loops or movable components of the boat construction.

All inflation valves shall be capable of being closed manually independently of their sealing or non-return systems, to give an airtight-seal. If the valve shutting device is arranged to be detachable, it shall be connected with the valve in such a manner as to be adequately safe against tearing off and loss.

Each inflation valve shall offer the possibility of a controlled pressure reduction and of measuring the inflation pressure with the aid of a pressure gauge.

4.5.3 Holding and lifting handles and lifelines

The gripping surfaces of such devices may not exert undue scuffing action upon the palm of the hand and they shall be unpolished, slip-resistant and free from any irregularities and from acute and indenting edges. The smallest radius of curvature shall be at least 4 mm. The diameter of lines and materials of circular section shall be not less than 8 mm. Webbing shall be made of soft and flexible material and shall be not narrower than 16 mm and not wider than 30 mm.

Each holding and each lifting handle and lifeline shall withstand a minimal breaking load of 1 000 N.

An inflatable boat shall be equipped with adequate means (such as handles, safety ropes) offering a firm hold to each of the admissible number of persons when occupying the seating positions provided or when outside in the water, even if the boat has capsized. All these lifelines shall ensure by their nature and arrangement that the admissible number of persons can hold fast to them even for a long period without any risk of injury.

4.5.4 Rowlocks

If rowlocks are provided, the material shall be free from flaws and the bearing surfaces in contact with the oars and rowlocks shall be free from any roughness likely to cause wear.

4.5.5 Towing ring

Each boat shall have at the bow a towing ring suitable for securing a towline capable of towing the boat at a speed of 4 knots in calm water and under full load conditions with a towline of length equal to at least three times the boat length.

4.5.6 Instruction manual

The manual shall be drafted in a suitable language and in simple terms, sufficient to enable the user to prepare the boat for use afloat. Guidance shall also be given on drying, storage and servicing of the boat.

5 Specifications and testing

5.1 General

The materials used shall have good weatherability and be suitable for a marine environment. They shall also offer proper resistance to ageing and to oil.

5.2 Raw materials

The raw materials used shall comply with the following specifications :

5.2.1 Coated fabrics or similar materials making up the hull

5.2.1.1 General

The materials shall be selected by the manufacturer according to the stresses to which the craft is to be subjected (shape, dimensions, maximum load, installed power), and also to the planned service conditions (tender, runabout, speed). Use under normal sea-going conditions shall not materially impair their performance.

NOTES

1 For the purpose of this clause, the hull should be taken to include all inflatable chambers which contribute to the displacement of the boat in the fully loaded condition.

2 Attention is drawn to the existence in some countries of national regulations applying to the types and tests of materials composing the hull.

5.2.1.2 Testing of the materials used for the floats

Such testing shall be carried out with test pieces taken from the constituent materials prior to making the boat. Should the boats be vulcanized after being made, the test pieces shall also be vulcanized.

5.2.1.3 Tear strength testing

Testing shall be carried out as provided in ISO 4674, method A2. The minimum value of tear resistance, in newtons, is given by the formula :

$$0{,}375\ d\ (1{,}14\ p + 0{,}14)$$

where

d is the maximum tube diameter, in millimetres, measured within the straight sections of the buoyancy tube system;

p is the service pressure measured, in bars, at 20 °C.

In all cases, the minimum value shall be not less than 75 N with transom, 40 N without transom.

5.2.1.4 Resistance to liquids

The test shall be carried out on the external side or the sides in contact with the ambient environment as specified in ISO 1817.

In both cases a) and b) below, the change in mass per unit area shall not exceed 100 g/m^2 following the stipulated period of contact with the test fluid at a temperature of 70 ± 2 °C.

	a)	b)
Test liquid	Oil N° 1[1]	Salt water[2]
Period of contact	22 ± 0,25 h	336 h (minimum)

1) Characteristics of oil N° 1 in ISO 1817.

2) Components of salt water : distilled water + 30 g of sodium chloride per litre.

5.2.1.5 Resistance to ozone

The test shall be carried out on the external side or the sides in contact with the ambient environment as specified in ISO 3011.

- Exposure time : 72 h
- Temperature of test : 30 ± 2 °C
- Concentration : 50 pphm
- Mandrel diameter : 5 times the material thickness

There shall be no signs of cracking on completion of the test when test samples are examined under a magnification of between 5 X and 10 X.

5.2.1.6 Resistance to cold

The material shall satisfy the requirements of ISO 4646 at a temperature of −20 °C.

5.2.1.7 Determination of the coating adhesion

Testing shall be carried out in accordance with ISO 2411 at room temperature and a machine rate of 100 ± 10 mm/min. The minimum adhesion value shall be 40 N/25 mm.

Test strip shall be prepared in accordance with sub-clause 5.2.2.1 of ISO 2411. Alternatively, it is permissible to cut a test strip 25 mm wide by extending cuts A and B and ignoring cut C. In order for the test strip to be gripped, 50 mm shall be left unbonded at one end. The test piece is "peeled" at 100 ± 10 mm/min and the surface coating cut back to the fabric and allowed to run down the fabric/rubber interface. The test shall be carried out in a correct manner for 25 mm.

5.2.1.8 Resistance to bacteriological attack

All components of the inflatable boat shall be rot-proof.

5.2.1.9 Seam strength testing of buoyancy chambers

A 50 mm wide test piece consisting of 2 portions jointed according to marine practice (methods, materials used, width) shall be subjected to a static load applied at 60 °C over a 4 hour period.

The value of this load, in newtons, is given by the formula

$$3{,}75\ d\ (1{,}14\ p + 0{,}14)$$

where

p is the working pressure, in bars, at 20 °C;

d is the maximum tube diameter, in millimetres, measured within the straight section of the buoyancy tube system.

There shall be no slipping or like failure at any part of the seam.

5.2.2 Timber and plywood

The types of timber and plywood chosen shall be suitable for the application, and shall be given lasting weather-tight protection for normal conditions at sea.

5.2.3 Metal and synthetic material parts

Metal components and synthetic material parts shall be suitable for marine application.

5.3 Testing of the bottom and floor boards of the boat

Depending on the type of boat, some inflatable subdivisions, acting as floats, include bottom boards. The materials used shall therefore be selected according to the shape and type of boat and constructional techniques. They may be wood, glass reinforced plastics, aluminium alloys, coated textiles or other materials, provided that these can be proved to be equally suitable for the purpose and fully able to meet the rigours of marine environment.

5.4 Transom

The transom or motor mount and its attachment to the boat shall be designed to withstand, under normal use, the maximum stresses arising from

— the output power of the motor(s) specified by the manufacturer;

— the weight of such motor(s).

5.5 Motor maximum power rating

The maximum motor power rating depends on

a) the hull shape;

b) the construction strength;

c) the rigidity of the assembly;

d) the dimensional factor $F(d)$.

This power is determined by the manufacturer and shall be shown on the rating plate. This power is specified in the annex.

5.6 Air retention

5.6.1 General

The manufacturer shall test the air tightness of each boat on production and according to his own methods. The completed boats shall meet the following test requirements :

5.6.2 Air tightness testing

The inflatable boat shall be inflated for 30 min to a pressure 20 % in excess of designed working pressure in order to prestretch the boat. The pressure shall then be reduced to working pressure and after 24 h, the pressure drop shall not be greater than 30 %, allowing for a temperature variation of 0,004 bar/°C. Atmospheric pressure variation during the test shall not exceed ± 1 %.

Temperature variation during the test shall not exceed 3 °C.

5.6.3 Overpressure testing

Each compartment shall be inflated to 1,5 times the normal designed working pressure for 30 min.

When separate compartments have common envelope parts (for example partitions), these compartments shall be tested not simultaneously but one after the other.

Contiguous compartments or compartments in relation with those tested shall then be deflated.

No damage or rupture shall then be allowed.

6 Marking

The following information shall be included on one or two rating plates.

a) number of this International Standard : ISO 6185;

b) name of manufacturer or other means of identification;

c) type of boat;

d) serial number and/or date of manufacture;

e) motor maximum rated power;

f) maximum load capacity (including motor);

g) maximum number of persons;

h) maximum motor(s) mass.

The rating plate shall be permanently secured to the boat. The marking method is, however, left to the manufacturer's discretion.

Annex

Motor power

The motor power determined by the manufacturer (in kilowatts) shall in no case exceed the following values :

a) without transom :

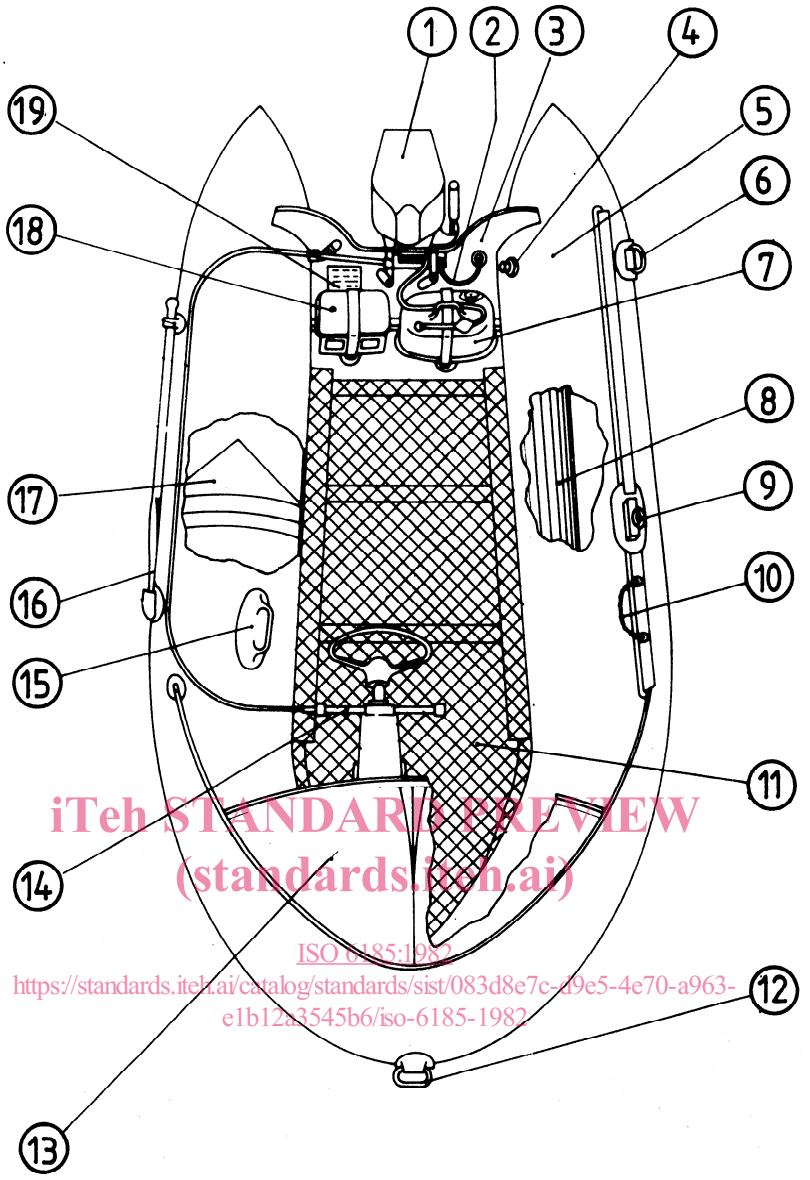
$P = 0{,}9\ F\ (d)$ up to a maximum of 7,5 kW

b) with transom :

$F\ (d)$	P (kW)
$< 3{,}3$	$0{,}6\ F\ (d) + 2{,}9$
$3{,}3 < F\ (d) < 7$	$10\ F\ (d) - 28{,}1$
> 7	$6\ F\ (d)$

NOTE — Pending an International Standard, the power which should thus be determined should be the power given by the motor manufacturer on the crankshaft. The attention of users of this International Standard is drawn to the fact that the power is different if it is measured on the crankshaft or the propeller shaft.

In all cases, users must comply with rules and regulations of national authorities.



(1) Motor

(2) Connection line for securing of motor

(3) Transom

(4) Inflation valve

(5) Air chambers forming the hull

(6) Lifting handles

(7) Fuel container

(8) Partition bulkhead. Example of longitudinal partition

(9) Rowlocks

(10) Lifeline

(11) Cross-hatched area = floor space utilizable for seats

(12) Towing ring

(13) Spray cover

(14) Remote steering

(15) Holding handle

(16) Paddle

(17) Partition bulkhead. Example of transverse partition

(18) Battery

(19) Rating plate

Figure — Example of inflatable boat