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**Small craft — Airborne sound emitted  
by powered recreational craft —**

**Part 2:  
Sound assessment using reference craft**

*Petits navires — Bruit aérien émis par les bateaux de plaisance  
motorisés —*  
*Partie 2: Évaluation du bruit à l'aide de bateaux de référence*

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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 14509-2 was prepared by Technical Committee ISO/TC 188, *Small craft*.

ISO 14509 consists of the following parts, under the general title *Small craft — Airborne sound emitted by powered recreational craft*:

— *Part 1: Pass-by measurement procedures*

— *Part 2: Sound assessment using reference craft*

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The following part is under preparation:

— *Part 3: Sound assessment using calculation and measurement procedures*

## Introduction

The development of this part of ISO 14509 became necessary in order to provide an assessment procedure which would satisfy the needs of the European Union Directive 2003/44/EC (Amendment to Directive 94/25/EC). The reason for the inclusion of this type of assessment procedure in the Directive is to try to minimize the economic impact of the Directive on the boating industry, in particular small European boat builders, while still providing an environmental benefit to the community through lower sound levels.

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# Small craft — Airborne sound emitted by powered recreational craft —

## Part 2: Sound assessment using reference craft

### 1 Scope

This part of ISO 14509 specifies the procedures to assess the maximum sound emission of powered mono-hull recreational craft of up to 24 m length according to one of the two alternative methods defined in Annex A and Annex B.

This part of ISO 14509 is not applicable for the type testing of outboard motors and of stern drives with integral exhaust systems.

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### 2 Normative references (standards.iteh.ai)

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.

ISO 8665, *Small craft — Marine propulsion reciprocating internal combustion engines — Power measurements and declarations*

ISO 8666:2002, *Small craft — Principal data*

ISO 14509-1:—<sup>1)</sup>, *Small craft — Airborne sound emitted by powered recreational craft — Part 1: Pass-by measurement procedures*

IEC 60942, *Electroacoustics — Sound calibrators*

IEC 61672-1, *Electroacoustics — Sound level meters — Part 1: Specifications*

### 3 Terms and definitions

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

#### 3.1

##### **recreational craft**

any craft, regardless of the means of propulsion, intended to be used for sports and leisure purposes

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1) To be published.

3.2

**stern drive with integral exhaust**

any stern drive powered boat where the exhaust gases are expelled through the transmission or drive

3.3

**bottom type configuration**

construction type of the bottom of a craft

3.3.1

**hard-chine bottom**

bottom of a boat with an abrupt intersection between the hull side and the hull bottom

3.3.2

**flat bottom**

hard-chine bottom with a deadrise angle  $\beta \leq 5^\circ$  at the transom

3.3.3

**round bottom**

bottom of a boat with a round bilge hull form

3.3.4

**multi-chine bottom**

hard-chine bottom with more than one chine

3.4

**performance test mass**

$m_p$

mass of the craft that includes all permanently attached standard items of equipment and all items of loose equipment needed for the safe operation of the boat, and additionally the mass of the number of persons needed for the safe operation of the boat and the mass of the fuel (i.e. at least at 25 % but no more than 50 % of the tank capacity of permanently installed fuel tanks, or one portable tank per engine at least 50 % full at the beginning of each test trial), but excludes the mass of fresh water, waste water, provisions and other loose equipment

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NOTE 1 This definition is in conformity with ISO 8666:2002, 6.4.

NOTE 2 Loose equipment needed for the safe operation of the boat includes warps, anchors/chain/ropes, working sails, engine(s) and batteries; other loose equipment includes cutlery, crockery, kitchen utensils and spare parts.

3.5

**insertion loss**

reduction of the exhaust-outlet sound power level due to the insertion of the vessel's silencing system in place of a substitution duct

NOTE Insertion loss is expressed spectrally in decibels and is dependent upon the source impedance of the engine.

3.6

**substitution duct**

duct with the same length as the vessel's silencing system and with as constant a cross-sectional area as possible, that is designed to be fitted in place of the vessel's silencing system

4 Symbols

The following symbols are used in this part of ISO 14509:

$B_{WL}$  beam at the waterline, as defined in ISO 8666:2002, 5.3.4, expressed in metres (m);

$F$  freeboard, as defined in ISO 8666:2002, 5.4.3, expressed in metres (m);



$L_{WL}$	length of the waterline, as defined in ISO 8666:2002, 5.2.3, expressed in metres (m);
$L_{pAS, max}$	maximum AS-weighted sound pressure level of the reference boat, as measured according to ISO 14509-1, expressed in decibels (dB);
$m_P$	performance test mass, as defined in ISO 8666:2002, 6.4, expressed in kilograms (kg).

## 5 Reference boat

Any boat which has been tested in accordance with ISO 14509-1 may be used as a reference boat provided that the key parameters required for the relevant assessment method (according to Annex A or Annex B) have been recorded for the boat as tested.

## 6 Sound assessment method

The key parameters of any boat/engine/propulsion system combination to be assessed shall be compared with those of an appropriate reference boat, according to the assessment method selected, which is either the “insertion loss measurement method” defined in Annex A or the “sound pressure level over stern measurement method” defined in Annex B.

If the key parameters are within the stated tolerances for each and every item listed in the relevant annex (indicating “yes” in every line of Table A.1 or Table B.1), the maximum AS-weighted sound pressure level of the boat is assessed to be not more than 2 dB higher than that of the reference boat.

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## 7 Assessment report

The assessment report shall include the following:

- a) reference to this part of ISO 14509;
- b) a declaration that all of its requirements are met;
- c) the assessor, the date of the assessment, the signature of the responsible person;
- d) the maximum AS-weighted sound pressure level,  $L_{pAS, max}$ , of the reference boat used;
- e) data for the assessed boat:
  - 1) manufacturer, boat model, boat model year,
  - 2) engine manufacturer, engine type;
- f) the declaration that, according to the result of the sound assessment method,  $L_{pAS, max}$  is assessed to be not more than 2 dB higher than that of the reference boat;
- g) the completed key-parameter data table, either Table A.1 or Table B.1 depending on the chosen assessment method.

## Annex A (normative)

### Insertion loss measurement method

This annex may be used alternatively to Annex B.

**Table A.1 — Key parameters**

	Key parameter	Unit	Reference boat	Boat to be assessed	Tolerance level with respect to reference boat	Compatibility established? yes/no
<b>1 Boat</b>						
1.1	Primary material (e.g. wood, steel, fibre-reinforced plastic)				same	
1.2	Length of the waterline, $L_{WL}$ , as defined in ISO 8666:2002	m			± 10 %	
1.3	Beam at the waterline, $B_{WL}$ , as defined in ISO 8666:2002	m			± 10 %	
1.4	Bottom type configuration (hard-chine, multi-chine, flat, round)				same	
1.5	Propeller tunnel geometry				same	
1.6	Performance test mass, $m_p$ , as defined in ISO 8666:2002	kg			± 25 %	
1.7	Stern shape (plan view): square, round or specify				same	
1.8	Stern shape (elevation): vertical, raked or specify				same	
1.9	Beam at primary exhaust outlet station measured at centre of outlet	m			± 10 %	
1.10	Freeboard, $F$ , as defined in ISO 8666:2002, measured at exhaust outlet station	m			± 10 %	
1.11	Stern swim platform (yes or no)				same	
1.12	Stern swim platform construction (solid or open)				same	
1.13	Breadth of stern swim platform	m			± 10 %	
1.14	Minimum height from underside of stern swim platform to design static waterline according to ISO 8666:2002	m			± 10 %	

Table A.1 (continued)

	Key parameter	Unit	Reference boat	Boat to be assessed	Tolerance level with respect to reference boat	Compatibility established? yes/no
<b>2 Engine/propulsion</b>						
2.1	Number of engines				same	
2.2	Engine make, build type and type number				same	
2.3	Declared power according to ISO 8665	kW			same	
2.4	Declared engine speed according to ISO 8665	min <sup>-1</sup>			same	
2.5	Propulsion type (conventional, surface drive, jet drive)				same	
<b>3 Exhaust system</b>						
3.1	Insertion loss of silencer and/or baffle system and/or water injection into the exhaust stream to the primary exhaust outlet. This may be calculated or measured	dB			same or higher	
3.2	Insertion loss of silencer and/or baffle system and/or water injection into the exhaust stream to the secondary exhaust outlet <sup>a</sup> . This may be calculated or measured	dB			same or higher	
3.3	Primary exhaust outlet location (stern, side or quarter)				same	
3.4	Primary exhaust outlet location related to water line in running condition or in condition as specified by the boat builder (above, at, below)				same or below waterline	
3.5	Secondary exhaust outlet <sup>a</sup> location (stern, side or quarter)				same	
3.6	Secondary exhaust outlet <sup>a</sup> location related to water line (above, at, below)				same	
<sup>a</sup> Secondary exhaust outlet is typically an idle relief to minimize exhaust tube pressure.						