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Ships and marine technology — Aquatic nuisance species —

Part 2: Ballast water sample collection and handling

Navires et technologie maritime — Espèces aquatiques nuisibles —

Partie 2: Prélèvement et manipulation des échantillons d'eau de ballast

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Contents

Page

Foreword ..... **v**
Introduction ..... **vi**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Sample collection process **5**
4.1 General 5
4.2 Fundamental principles 6
4.2.1 General 6
4.2.2 Sample collection flow, duration, and volume 6
4.3 Preparation 7
4.3.1 General 7
4.3.2 Measurement requirements and purpose of the sample 7
4.3.3 Ship access and sampling facilities in machinery spaces 7
4.3.4 Coordination with the ship's crew 8
4.4 Maintenance of sampling apparatus 8
4.5 Quality management 8
5 Sample probe **8**
5.1 General 8
5.2 Design of the sample probe 9
5.2.1 Sample probe sizing and flow rates 9
5.2.2 Sample probe geometry 10
5.2.3 Sample probe structural design and materials 12
5.2.4 Installation and removal considerations 12
5.3 Hot-tap sample probe assembly 13
5.3.1 General 13
5.3.2 Configuration 13
5.3.3 Design criteria 14
5.3.4 Typical operations 14
6 Sample collection device **15**
6.1 Initial considerations 15
6.1.1 General 15
6.1.2 Open system 15
6.1.3 Closed system 15
6.1.4 Open loop configuration 15
6.1.5 Closed loop configuration 15
6.1.6 Concentration methods ≥50 µm (filtered samples) 16
6.1.7 Collection methods for whole water samples 16
6.1.8 Sample retrieval and rinsing 17
6.1.9 Sample volumes by size class 18
6.2 Sample collection device control system 18
6.2.1 General 18
6.2.2 Parameters monitored 19
6.3 Sample transfer piping 20
7 Handling and identification of the sample **21**
7.1 Sample handling 21
7.2 Sample identification 21
7.3 Neutralization agents 22
7.4 Filling the container 22
7.5 Sample storage 23
7.6 Chain-of-custody 23
7.7 Transport 24

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Annex A (informative) **Example configurations of sample collection devices and ballast piping connections** **25**
Annex B (informative) **Shipboard sample collection worksheet** **28**
Annex C (normative) **Sample probe lookup tables** **33**
Bibliography **41**

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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.

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).

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For an explanation of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*.

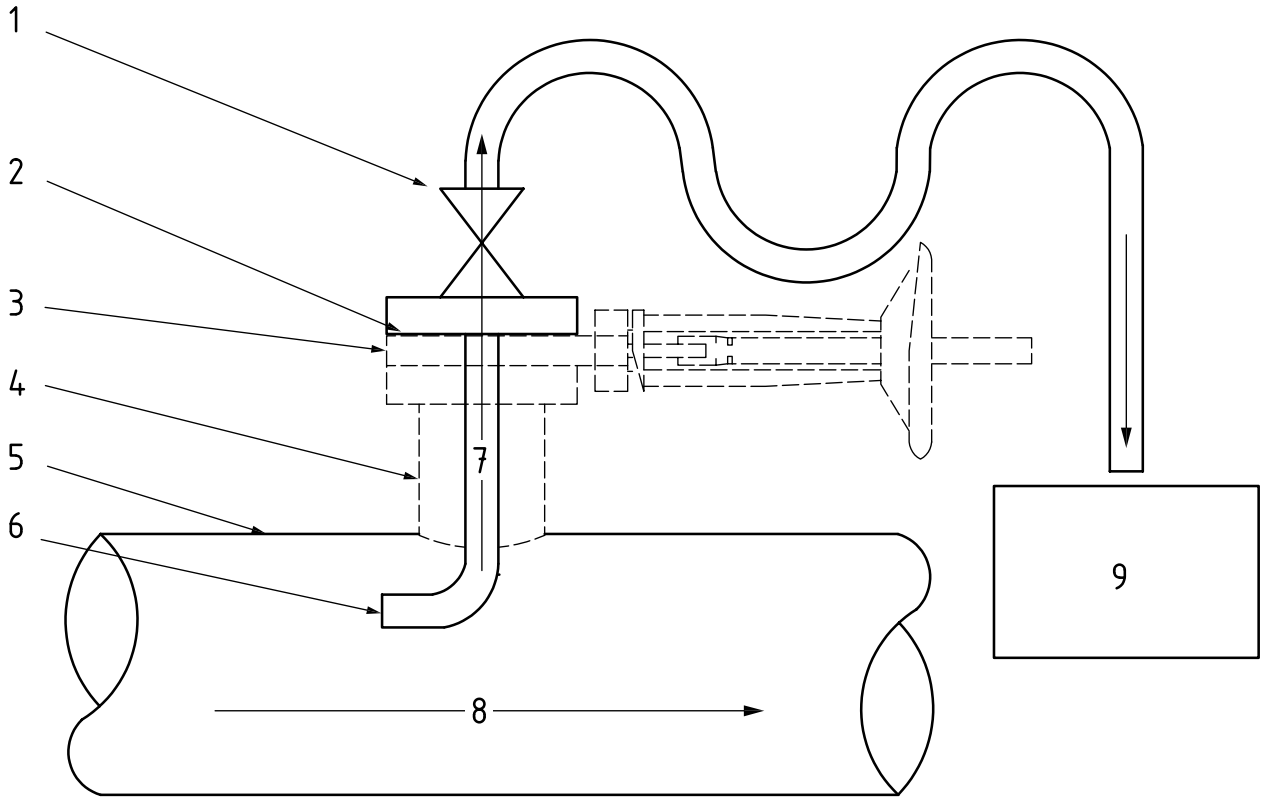
A list of all parts in the ISO 11711 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The sampling guidance provided by the ISO 11711 series is intended to standardize the measurement of organism concentrations through sampling of a ship's ballast discharge consistent with the requirements of the International Maritime Organization (IMO) Regulation D-2[1]. The ISO 11711 series currently includes two parts, where ISO 11711-1 provides guidance on the shipboard arrangements for piping and fittings necessary for sampling and return ports, and standardizes the presentation of the sampling port to accommodate various sampling probe configurations. This document addresses the process of collecting and processing ballast water samples for subsequent analysis such as required for type approval, according to IMO Resolution MEPC.300(72) (BWM Code)[2]. It provides guidance to ballast water sampling teams and other concerned parties on the apparatus, installation, and procedures required to obtain representative samples of ballast water discharges from sample ports on a ship. These concepts are illustrated in Figure 1.



Key

1	sample collection device isolation valve	6	sample probe
2	sample port access flange	7	sample water flow
3	sample port valve	8	ballast water flow
4	sample port	9	sample collection device
5	ballast discharge pipe		

ISO 11711-1 Ballast water sample port - fitting arrangements

ISO 11711-2 On-board ballast water sampling and sample processing

NOTE 1 Figure not to scale.

NOTE 2 The figure shows a sample port arranged perpendicular to the main ballast flow.

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NOTE 3 See Annex A for examples of configurations of sample collection devices and their connection to ballast piping.

Figure 1 — Illustration of the scopes of ISO 11711-1 and 11711-2

Specifically, this document defines appropriate sample probe and sample flow control to achieve representative sampling and minimize measurement uncertainty consistent with measurement requirements. Appropriate sample volumes and collection times provide statistical confidence for viable organism counts at the discharge limit. Regulation D-2[1] requires the measurement of two organism size classes: ≥10 µm and <50 µm (<10 organisms ml^{-1}) and ≥50 µm (<10 organisms m^{-3}), and three indicator microbes: toxigenic *Vibrio cholera*e (serotypes O1 and O139, <1 cfu 100 ml^{-1} or <1 cfu g^{-1} wet weight zoopl.), *Escherichia coli* (<250 cfu 100 ml^{-1}), and intestinal enterococci (<100 cfu 100 ml^{-1}). Sampling approaches for each are provided, where both indicative and detailed analyses of viable organisms are supported, as defined by BWM.2/Circ.42/Rev.2 [3], as may be amended, and considering the criteria in ISO 17025 for quality management, measurement uncertainty, and standardized procedures. The ISO 11711 series does not intend to add any requirements to the BWM Convention or related documents of IMO but provides supplemental guidance for sampling of ballast water.

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Ships and marine technology — Aquatic nuisance species —

Part 2: Ballast water sample collection and handling

1 Scope

This document provides requirements and recommendations to ballast water sampling teams or other concerned parties on the selection and use of sampling apparatus to collect and process ballast water discharge samples aboard a ship from sample ports installed in accordance with ISO 11711-1. It includes an overview of the sampling process, and a discussion on the design and maintenance of sample probes, the necessary sample flow rates, the sample collection devices that incorporate sample flow control to maintain representative sampling conditions, and the handling of samples for subsequent analyses.

This document primarily addresses the collection of ballast water discharge samples. However, it can also be applied to uptake samples with consideration of appropriate sample volumes given anticipated organism concentrations in ambient (as opposed to treated) waters.

NOTE While this document is focused on installations aboard a ship, it can be used for land-based facilities.

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.

MEPC.173(58), *Guidelines for Ballast Water Sampling* (G2)

ISO 5667-3, *Water quality — Sampling — Part 3: Preservation and handling of water samples*

ISO 11711-1:2019, *Ships and marine technology — Aquatic nuisance species — Part 1: Ballast water discharge sample port*

ISO 17602, *Ships and marine technology — Metal valves for use in flanged pipe — Face-to-face and centre-to-face dimensions*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

3 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
absolute pore size
pore size based on empirical measurements of the pores in a *filter* (3.9)

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3.2
capture efficiency
measurement of organism retention in a sample collection apparatus, typically expressed as a percentage

3.3
closed loop configuration
sampling arrangement that returns the filtered water to the ballast discharge pipe

3.4
closed system
sample collection device (3.23) that houses a *filter* (3.9) within a sealable container having inlet and outlet connections

Note 1 to entry: The filter used to concentrate organisms is typically made of metal or nylon mesh (see 6.1.3).

Note 2 to entry: A closed system can be operated in either *open loop configuration* (3.19) or *closed loop configuration* (3.3).

3.5
collection container
container used to obtain, hold, and transport water samples

3.6
concentration factor
ratio of *filtrate* (3.11) volume to *filtrand* (3.10) volume

3.7
depth filtration
filtration method where particles are captured within the filter media rather than on the surface of the *filter* (3.9)

3.8
effective surface area
filter (3.9) area available for filtration

3.9
filter
barrier that is introduced to retain organisms and particles of a given size while smaller particles are allowed to pass through

3.10
filtrand
concentrated sample, used in whole or in part for analysis, that is collected during the concentration process

3.11
filtrate
water that passes through a *filter* (3.9)

3.12
filtration velocity
flow velocity (3.13) through *filter* (3.9) pores

Note 1 to entry: In SI units, this parameter is expressed in metres per second.

3.13
flow velocity
distance travelled by a fluid per unit time (independent of any pipe dimensions)

Note 1 to entry: In SI units, this parameter is expressed in metres per second.

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3.14
hot-tap sample probe assembly
sample probe assembly that can be installed into and removed from a water-filled, pressurized ballast pipe

3.15
maximum allowable working pressure
MAWP
maximum pressure that the weakest component in a pressurized system is designed to withstand

3.16
measurement requirement
specific requirement needed to support the purpose of the measurement, including sample timing, volume, duration, a specific ballast tank or sampling location, and acceptable measurement uncertainty

Note 1 to entry: See 4.3.2.

3.17
nominal pore size
pore size specified by the *filter* (3.9) manufacturer to identify the size of particles typically retained by the filter

3.18
open loop configuration
sampling arrangement that returns the filtered water to an unpressurized container (e.g. a bilge)

3.19
open system
sample collection device (3.24) that houses a *filter* (3.9) within an open container, e.g. an open tank with a *plankton net* (3.21)

3.20
operation, maintenance, and safety manual
OMSM
reference manual supplied by the manufacturer for a ballast water management systems (BWMS) product that identifies factors that affect the operation of the BWMS, including any warm-up or other requirements that must be completed to achieve operational stability

Note 1 to entry: The OMSM specifies what constitutes stable operating conditions for the BWMS, factors that can affect operating conditions, and any adjustments required to reach or to maintain a stable operating condition.

3.21
plankton net
conical *filter* (3.9) device that collects organisms in a removable cod endNote 1 to entry: the filter material is a fabric net with a specific pore size, and the device can be towed in open waters or used as a filter in an *open system* (3.19) for organism concentration

3.22
representative sampling
sampling methodology that obtains concentrations and compositions of constituent materials and organisms that are in the proportions and physical state of the source volume of interest

Note 1 to entry: In the case of ballast water sampling, representative conditions are considered under fully turbulent flow, where an appropriate sited sample probe obtains a sample at a *flow velocity* (3.13) of 0,25 to 1 times the flow velocity of the water in the ballast discharge pipe, thus sample flow is isokinetic or sub-isokinetic [4], [5].

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3.23
sample collection device
device that can concentrate and collect the larger class of organisms [via a *filter* (3.9) or *plankton net* (3.21)], collect a whole water sample, or both

Note 1 to entry: A sample collection device can consist of multiple individual systems, e.g. multiple *closed systems* (3.4), each housing a filter.

[SOURCE: ISO 11711-1:2019, 3.13, modified — Note 1 to entry has been added]

3.24
sample collection team
personnel responsible for setting up the *sample collection device* (3.23), collecting and retrieving the ballast water samples

3.25
sample collection device isolation valve
full port valve used to isolate the *sample collection device* (3.23) from the ballast discharge pipe

3.26
sample flow control valve
valve used to regulate the sample flow rate

3.27
sample hold time
duration between end of sample collection and start of analysis

3.28
sample probe bend radius
radius of the curvature in the sample probe, as measured at the centreline

3.29
sample probe insertion length
distance from the diametric centre of the sample probe entrance to the sample port access flange when installed into the ballast discharge pipe

3.30
sample probe opening
entrance through which the water from the ballast discharge pipe enters the sample probe

3.31
test cycle
testing iteration (including uptake, treatment, holding and discharge, as appropriate) under a given set of requirements used to establish the ability of a ballast water management system (BWMS) to meet the set discharge standards

[SOURCE: IMO MEPC.300(72), BWMS Code, 3.15]

3.32
testing organization
company, corporation, firm, enterprise, authority or institution, or part or combination thereof, whether incorporated or not, public or private, that has its own functions and administration, that conducts the testing of ballast water

[SOURCE: IEC 62507-1:2010, 3.17]

3.33
volumetric flow rate
volume of fluid passing per unit time, calculated from *flow velocity* (3.13) and cross section area

Note 1 to entry: In ballast water operations, this parameter is typically expressed in cubic metres per hour.

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