
**Ships and marine technology —
Ballast water management systems
(BWMS) —**

**Part 2:
Risk assessment and risk reduction of
BWMS using electrolytic methods**

Navires et technologie maritime — Systèmes de gestion de l'eau de ballast (BWMS) —

Partie 2: Appréciation du risque et réduction du risque des BWMS qui utilisent des procédés électrolytiques



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Contents

| | Page |
|-----------------------------------------------------------------------------------------------------------------------|-----------|
| Foreword..... | v |
| Introduction..... | vi |
| 1 Scope..... | 1 |
| 2 Normative references..... | 1 |
| 3 Terms and definitions..... | 1 |
| 4 Strategy for risk assessment and risk reduction..... | 3 |
| 5 Risk assessment process..... | 4 |
| 5.1 General..... | 4 |
| 5.2 Information for risk assessment..... | 4 |
| 5.3 Determination of the limits..... | 5 |
| 5.3.1 General..... | 5 |
| 5.3.2 Use limits..... | 5 |
| 5.3.3 Space limits..... | 5 |
| 5.3.4 Time limits..... | 6 |
| 5.3.5 Environmental limits..... | 6 |
| 5.4 Hazard identification..... | 7 |
| 5.4.1 General..... | 7 |
| 5.4.2 Human interaction with the equipment over the entire life cycle of a BWMS using the electrolytic method..... | 7 |
| 5.4.3 Possible states of BWMS using the electrolytic method..... | 8 |
| 5.4.4 Unintended behaviour of the operator or reasonably foreseeable misuse..... | 9 |
| 5.5 Risk estimation..... | 9 |
| 5.5.1 General..... | 9 |
| 5.5.2 Elements of risk..... | 9 |
| 5.5.3 Aspects to be considered during risk estimation..... | 10 |
| 5.6 Risk evaluation..... | 11 |
| 6 Risk reduction..... | 12 |
| 6.1 General..... | 12 |
| 6.2 Inherently safe design..... | 12 |
| 6.2.1 General..... | 12 |
| 6.2.2 Considerations during the initial design..... | 12 |
| 6.2.3 Choice of appropriate technology..... | 13 |
| 6.2.4 Applying inherently safe design measures to control systems..... | 13 |
| 6.3 Safeguarding and/or complementary protective measures..... | 14 |
| 6.3.1 General..... | 14 |
| 6.3.2 Safeguarding measures..... | 14 |
| 6.3.3 Complementary protective measures..... | 14 |
| 6.4 Information for use..... | 16 |
| 6.4.1 General..... | 16 |
| 6.4.2 Installation guide..... | 16 |
| 6.4.3 Commissioning procedure..... | 16 |
| 6.4.4 Operation, maintenance and safety manual (OMSM)..... | 17 |
| 6.4.5 Maintenance scheme..... | 17 |
| 6.4.6 Calibration manual..... | 17 |
| 6.4.7 Warning indication..... | 18 |
| 6.4.8 Training plan and documentation..... | 18 |
| 7 Documentation of risk assessment..... | 18 |
| Annex A (informative) Example of a risk estimation matrix table in accordance with ISO/ TR 14121-2..... | 19 |
| Annex B (informative) Example of a risk assessment and risk reduction worksheet — Filtration unit..... | 20 |

| | |
|------------------------------------------------------------------------------------------------------------------|-----------|
| Annex C (informative) Example of a risk assessment and risk reduction worksheet — Electrolysis unit | 22 |
| Annex D (informative) Example of a risk assessment and risk reduction worksheet - Neutralization unit | 26 |
| Annex E (informative) Example of a training plan for BWMS using the electrolytic method | 27 |
| Bibliography | 28 |

Foreword

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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*.

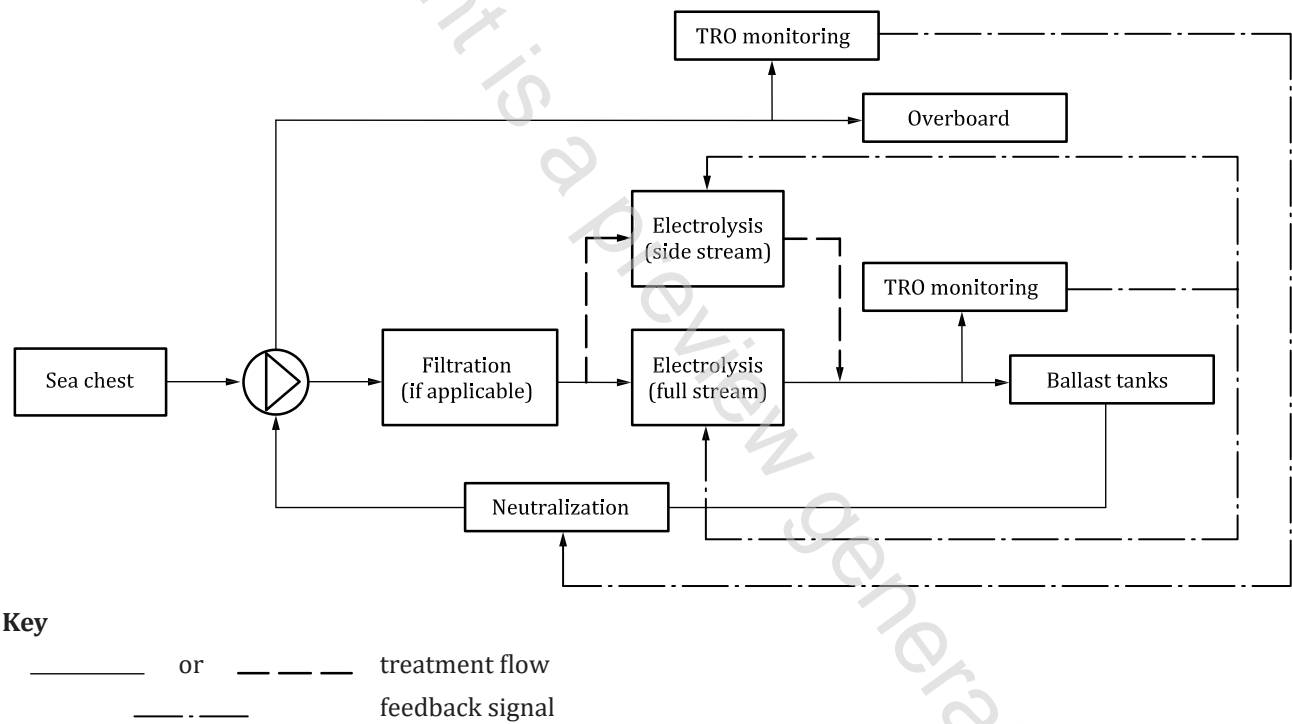
A list of all parts in the ISO 23314 series can be found on the ISO website.

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.

Introduction

A ballast water management system (BWMS) using the electrolytic method applies a combination of filtration (if applicable), electrolysis and a neutralization process to treat ballast water to meet Regulation D-2 of the International Maritime Organization (IMO) BWM Convention^[19], or the ballast water discharge standard (BWDS) requirements of port state administrations, e.g. the U.S. Coast Guard (USCG)^[31].

At the uptake of ballast water, the BWMS utilizes filtration (if applicable) and injection of active substances (e.g. sodium hypochlorite) generated by an electrolysis process. The active substance can be generated within the full flow of the ballast pipe (full stream) or generated from a smaller side stream (either extracted from the ballast pipe or sourced from a brine tank) and then mixed with the full ballast flow. The active substance in the ballast pipe is measured as total residual oxidants (TRO) and the BWMS regulates the TRO level to ensure ballast water is treated to the threshold level. During discharge, the residual TRO is monitored and neutralized prior to discharge overboard to ensure that the amount of residual active substance entering the receiving environment is acceptable. The treatment process is shown in [Figure 1](#).



Ships and marine technology — Ballast water management systems (BWMS) —

Part 2:

Risk assessment and risk reduction of BWMS using electrolytic methods

1 Scope

This document provides requirements and recommendations for designers of BWMS using electrolytic methods to document the risk assessment and risk reduction process over the lifecycle of the equipment, and to support its approval for use on ships by administrations and classification societies. Specifically, this document provides basic terminology, principles and a methodology to identify and subsequently minimize the risk of hazards in the design of BWMS using electrolytic methods. It specifies the procedures for risk assessment and risk reduction following the guidance in ISO 12100. Risks considered include: human health and safety; marine environment related to conditions on board; and ship installation, operation, maintenance and structural integrity.

This document does not address the methodology for the risk assessment of corrosion effects, toxicity and ecotoxicity of active substances, relevant chemicals and/or other chemicals generated or used by BWMS using electrolytic methods, which is evaluated by the IMO GESAMP-Ballast Water Working Group as prescribed in the document IMO GESAMP, Methodology for the Evaluation of Ballast Water Management Systems using Active Substances^[26].

This document does not address risks associated with the end of life disposition of the BWMS.

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 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100 and the following 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

active substance

substance or organism, including a virus or fungus, that has a general or specific action on or against harmful organisms and pathogens

Note 1 to entry: For *BWMS* (3.3) using *electrolytic methods* (3.8), it means reaction products that are generated by the electrolytic method for the ballast water treatment.

[SOURCE: IMO G9]