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Ships and marine technology — Marine NOx reduction agent AUS 40 —

Part 3: Handling, transportation and storage

Navires et technologie marine — Agents réducteurs NOx marins AUS 40 —

Partie 3: Manipulation, transport et stockage

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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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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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 8, *Ships and marine technology*, Subcommittee SC 2, *Marine environment protection*.

ISO 18611 consists of the following parts, under the general title *Ships and marine technology — Marine NOx reduction agent AUS 40*:

— *Part 1: Quality requirements*

— *Part 2: Test methods*

— *Part 3: Handling, transportation and storage*

Introduction

In order to protect the environment and to enhance air quality, exhaust emissions regulations around the world are continuously strengthened. For ships with large combustion engines, particulate matter (PM), nitrogen oxide (NOx) emissions, and sulfur dioxide emissions are the main concern, and efforts have been focused on the development of technology that can reduce them effectively with minimum fuel economy penalty. Selective catalytic reduction (SCR) converters using a urea solution as the reducing agent is considered to be a key technology for reducing NOx emissions. The quality of the urea solution used for that technology needs to be specified to ensure reliable and stable operation of the SCR converter systems. The ISO 18611 series provides the specifications for quality characteristics, for handling, transportation, and storage, as well as the test methods needed by manufacturers of SCR converters, by engine producers, by producers, distributors of the urea solution, and by fleet operators/ship owners.

Efficient expanding of the use of urea SCR technology requires a consolidated framework that can be followed by producers, end users, OEMs, and catalyst suppliers.

Ships and marine technology — Marine NOx reduction agent AUS 40 —

Part 3: Handling, transportation and storage

1 Scope

This part of ISO 18611 describes best practice recommendations and requirements for handling, transportation, and storage of NOx reduction agent AUS 40 (aqueous urea solution), specified in ISO 18611-1. These recommendations and requirements are necessary to preserve the specified quality of AUS 40 from any point of production to the point where it is filled into the on-board tank of the vehicle, in order to ensure the proper function of the selective catalytic reduction (SCR) converter systems.

This International Standard is covering quality requirements and guidelines for AUS 40 for marine applications, irrespective of manufacturing method or technique.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 18611-1, *Ships and marine technology — Marine NOx reduction agent AUS 40 — Part 1: Quality requirements*

ISO 18611-2, *Ships and marine technology — Marine NOx reduction agent AUS 40 — Part 2: Test Methods*

3 Terms and definitions

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

3.1
bulk operation
handling of AUS 40 in large containers

Note 1 to entry: Examples of large containers are road tankers, rail cars, storage tanks, and tank vessels.

3.2
packaged shipment
handling of AUS 40 in small containers

Note 1 to entry: Examples of small containers are drums, cans, bottles, intermediate bulk containers (IBCs).

3.3
production batch of AUS 40
quantity of AUS 40 produced at one operation at a site where the product has (last) been physically or chemically modified to reach compliance with the specifications defined in ISO 18611-1

Note 1 to entry: Mixing of AUS 40 volumes does not constitute a physical or chemical modification, so long as the quality of the volumes before mixing complies with the specifications given in ISO 18611-1.

3.4
shelf life
period of time starting with the completion of the production of the batch in which AUS 40, stored under specific conditions, remains within the specifications defined in ISO 18611-1, Table 1

4 General requirements and recommendations

4.1 Requirements for the use of materials compatible with AUS 40

4.1.1 General

To avoid contamination of AUS 40 and to resist corrosion of the devices used (containers, tubes, valves, fittings, gaskets, hoses, etc.), all materials in direct contact with AUS 40 during handling, transportation, and storage, including sampling, shall be compatible with AUS 40.

It is the responsibility of the user of this International Standard to ensure that the correct materials are used. The list of the materials given in Tables 1 and 2 shall be used for guidance only until such time as more definitive information is established.

Any material with uncertain compatibility with AUS 40 shall be tested. The test conditions should reflect the intended temperature range and contact time, in order to evaluate possible influences on the product quality as specified in this International Standard. In addition, this test shall ensure that the integrity of the material in contact with AUS 40 is maintained. Accelerated tests using higher temperatures can be used, as appropriate.

If a contamination of AUS 40 is detected during handling, transportation, and storage, an investigation shall be carried out to determine the causes of contamination and to take appropriate corrective actions.

NOTE Choice of materials for the purpose of storing/distributing AUS40 on-board a vessel might be subject to special authority and /or certification body requirements.

4.1.2 Recommended materials

Examples of materials recommended for use with AUS 40 are given in Table 1.

NOTE This list has been compiled in accordance with best available knowledge about state-of-the-art materials at the time of publication of this part of ISO 18611.

Table 1 — Examples of recommended materials

Highly alloyed austenitic Cr-Ni-steels and Cr-Ni-Mo-steels, for example, in accordance with EN 10088-1, EN 10088-2, and EN 10088-3 (i.e. 1.4541 and 1.4571), or stainless steel 304 (S30400), 304L (S30403), 316 (S31600), and 316L (S31603) in accordance with ASTM A240, ASTM A276, and ASTM A312
Titanium
Ni-Mo-Cr-Mn-Cu-Si-Fe alloys, e.g. hastelloy c/c-276
Polyethylene, free of additives
Polypropylene, free of additives
Polyisobutylene, free of additives
Perfluoroalkoxyl alkane (PFA), free of additives
Polyfluoroethylene (PFE), free of additives
Polytetrafluoroethylene (PTFE), free of additives
NOTE 1 The sequence given in this list does not constitute a ranking of the recommended materials. NOTE 2 Materials made of plastics can contain various kinds of additives used either for processing or for special kinds of serviceability. These additives can possibly migrate into AUS 40. For this reason, it is advisable that special care be taken for testing the contamination of AUS 40 by additives from plastic materials used in direct contact with AUS 40.

Table 1 *(continued)*

Copolymers of vinylidenefluoride and hexafluoropropylene, free of additives
FIBREGLASS based on a proper resin
NOTE 1 The sequence given in this list does not constitute a ranking of the recommended materials. NOTE 2 Materials made of plastics can contain various kinds of additives used either for processing or for special kinds of serviceability. These additives can possibly migrate into AUS 40. For this reason, it is advisable that special care be taken for testing the contamination of AUS 40 by additives from plastic materials used in direct contact with AUS 40.

4.1.3 Materials not recommended

Examples of materials not recommended are given in Table 2.

NOTE This list has been compiled in accordance with best available knowledge about state-of-the-art materials at the time of publication of this part of ISO 18611.

Table 2 — Examples of materials not recommended

Materials forming compounds as a result of reaction with ammonia, which might negatively interfere with the SCR converter system: carbon steels, zinc coated carbon steels, mild iron
Non-ferrous metals and alloys: copper, copper alloys, zinc, lead
Solders containing lead, silver, zinc, or copper
Aluminium, aluminium alloys
Magnesium, magnesium alloys
Plastics or metals coated with nickel

4.2 Physical conditions during transportation and storage

4.2.1 General recommendation

In order to avoid any impairment of the AUS 40 quality during transportation and storage, the following conditions should be taken into account:

— in order to prevent decomposition of the urea, as well as the evaporation of water in the case of vented containers, prolonged transportation or storing above 25 °C should be avoided;

NOTE 1 Insulation can be required, especially in hot areas of the world.

NOTE 2 In hot areas of the world where there is a real risk of recommended long-term storage temperatures being exceeded, temperature monitoring of the AUS 40 is recommended.

NOTE 3 Prolonged storage at temperatures above 25 °C can reduce the shelf life (see Table 3). However, temporary exposure to higher temperatures does not necessarily influence the quality of AUS 40.

— in order to prevent solidification of AUS 40, storage below 1 °C should be avoided;

NOTE 4 Insulation or means of heating the AUS 40 can be required.

NOTE 5 Solidified AUS 40 has a larger volume than the liquid and, therefore, can cause a fully filled, closed container to burst. Solidified AUS 40, which has been warmed up carefully at temperatures not exceeding 30 °C will not be impaired in quality and can be used as soon as the warmed up solution is free from solids.

— in order to avoid excessive temperature rise, AUS 40 should be protected from sunlight;

— in order to protect AUS 40 from any contamination carried by the air, well-closed containers or vented containers with filters should be used.