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

Part 1: Quality requirements

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

Partie 1: Exigences de qualité

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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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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 of urea solution for quality characteristics, handling, transportation, and storage, as well as the test methods needed by manufacturers of SCR converters, by engine manufacturers, by producers, distributors, 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 1: Quality requirements

1 Scope

This part of ISO 18611 specifies the quality characteristics of the marine NOx reduction agent, aqueous urea solution at 40 % concentration (AUS 40), which is needed to operate so-called SCR (selective catalytic reduction) converters. In marine applications, for example, for engine exhaust gas treatment, SCR converters are particularly suitable for selectively reducing the nitrogen oxide (NOx) emissions of internal combustion engines and boilers.

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

In the remaining parts of ISO 18611, the term “NOx reduction agent” will be abbreviated to “AUS 40”.

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 3675, *Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method*

ISO 12185, *Crude petroleum and petroleum products — Determination of density — Oscillating U-tube method*

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
NOx reduction agent AUS 40
aqueous urea solution, manufactured from technically pure urea – with no addition (see NOTE) of any other substances – and pure water, having a urea content of 40 % and with the quality characteristics defined in Clause 5

Note 1 to entry: With the possible exception of a tracer in accordance with the requirement in Table 1.

3.2
technically pure urea
industrially produced grade of urea with traces of biuret, ammonia, and water only, low in aldehydes or other substances such as anticaking agent, and free of contaminants such as sulphur and its compounds, chloride, nitrate, or other compounds

Note 1 to entry: For the contaminants mentioned above, which are not a result of the urea production process, limit values and analytical methods are not considered, as this definition excludes urea grades usually used in agriculture, which might contain such chemical compounds.

3.3
pure water
grade of water, produced, for example, by single distillation, by de-ionization, by ultra-filtration, or by reverse osmosis

Note 1 to entry: This is based on the definition of water grade 3 of ISO 3696.

4 Designation

AUS 40, in compliance with the requirements of this International Standard, shall be designated with the code AUS 40 and the reference number of this series of International Standards:

AUS 40 ISO 18611

5 Requirements and testing

The quality characteristics of the AUS 40 are specified in Table 1. They shall be continuously monitored by the manufacturer following a valid testing plan.

Compliance with the limits specified in Table 1 shall be verified with the test methods indicated.

NOTE 1 See Annex A with respect to the chemical characteristics of urea and the physical properties of AUS 40.

NOTE 2 See Annex B with respect to precision of the test methods.

Table 1 — Quality characteristics

Characteristics	Unit	Limits		Test methods
		min.	max.	
Urea content[a]	% (*m*/*m*)[d]	39	41	ISO 18611-2, Annex B[e] ISO 18611-2, Annex C[e]
Density at 20 °C[b]	kg/m^3	1 105	1 177	ISO 3675 or ISO 12185
Refractive index at 20 °C[c]	—	1,394 7	1,398 2	ISO 18611-2, Annex C
Alkalinity as NH_3	% (*m*/*m*)[d]	—	0,5	ISO 18611-2, Annex D
Biuret	% (*m*/*m*)[a]	—	0,8	ISO 18611-2, Annex E
Aldehydes	mg/kg	—	100	ISO 18611-2, Annex F
Insoluble matter	mg/kg	—	50	ISO 18611-2, Annex G
Phosphate (PO_4)	mg/kg	—	1	ISO 18611-2, Annex H
Calcium	mg/kg	—	1	ISO 18611-2, Annex I
Iron	mg/kg	—	1	
Magnesium	mg/kg	—	1	
Sodium	mg/kg	—	1	
Potassium	mg/kg	—	1	
Identity	—	identical to reference		ISO 18611-2, Annex J

NOTE 1 Should it be necessary to add a tracer to AUS 40, it shall be ensured that the quality of AUS 40 specified in this table is not impaired and that the tracer does not damage the SCR system.

NOTE 2 In establishment of these limit values, the terms of ISO 4259 have been applied in fixing a maximum and minimum value, a minimum difference of 4 × *R* (*R* is the Reproducibility of the test method) has been taken into account. However, in case of urea content, the 4 × *R* rule has not been applied in order to keep the high quality.

NOTE 3 The values quoted regarding urea content, density, and refractive index are “true values” (see ISO 4259 for the definition of true values).

NOTE 4 The manufacturer of AUS 40 should aim at the target values defined in footnotes a, b, and c.

NOTE 5 Should it be necessary to clarify the questions as to whether a given urea solution meets the requirement of the specification, the terms of ISO 4259 should be applied.

[a] Target value 40 % (*m*/*m*).

[b] Target value 1 110 kg/m^3. The max. value is for the urea solution containing 0,8 % Biuret.

[c] Target value 1,396 5. The max. value is for the urea solution containing 0,8 % Biuret.

[d] For the purposes of this International Standard, the term “% (*m*/*m*)” is used to represent the mass fraction of a material.

[e] Calculated without subtracting nitrogen from ammonia.

6 Marking

Distribution pumps and containers for the distribution of AUS 40, in compliance with the requirements of this part of ISO 18611 shall be marked with the designation as specified in Clause 4.