

PUBLICLY  
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SPECIFICATION

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22241-1

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**Diesel engines — NOx reduction agent  
AUS 32 —**

**Part 1:  
Quality requirements**

*Moteurs diesel — Agent AUS 32 de réduction des NOx —  
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.

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.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

- an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;
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An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

ISO/PAS 22241-1 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 5, *Engine tests*.

ISO/PAS 22241 consists of the following parts, under the general title *Diesel engines — NO<sub>x</sub> reduction agent AUS 32*:

- *Part 1: Quality requirements*
- *Part 2: Test methods*

## Introduction

In order to protect the environment, keeping the air quality as clean as possible, exhaust emissions regulations in the world have been strengthened considerably. In heavy-duty commercial road vehicles powered by a diesel engine, particulate matters (PM) and nitrogen oxide (NOx) emissions are the main concern and efforts have been focused on the development of technology which can reduce them effectively with minimum fuel economy penalty. Selective catalytic reduction (SCR) converters using urea solution as the reduction 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. ISO 22241 provides the Publicly Available Specifications and test methods needed by the manufacturers of heavy commercial road vehicles and their engines, by converter manufacturers, by producers and distributors of the urea solution and by fleet operators.

The urea solution as specified in this Publicly Available Specification is commercially available under the registered trademark AdBlue®. ISO takes no position concerning the evidence, validity and scope of this trademark right.

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# Diesel engines — NO<sub>x</sub> reduction agent AUS 32 —

## Part 1: Quality requirements

### 1 Scope

This Publicly Available Specification specifies the quality characteristics of the NO<sub>x</sub> reduction agent AUS 32 (aqueous urea solution) which is needed to operate converters with selective catalytic reduction, so-called SCR (Selective Catalytic Reduction) converters, in motor vehicles with diesel engines. SCR converters are particularly suitable for selectively reducing the nitrogen oxide (NO<sub>x</sub>) emissions of diesel engines.

In the remaining parts of this Publicly Available Specification, the term “NO<sub>x</sub> reduction agent AUS 32” will be abbreviated to “AUS 32”.

### 2 Normative references

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 22241-2, *Diesel engines — NO<sub>x</sub> reduction agent AUS 32 — Part 2: Test methods*

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

ISO 4259, *Petroleum products — Determination and application of precision data in relation to methods of test*

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

### 3 Terms and definitions

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

#### 3.1

##### **NO<sub>x</sub> reduction agent AUS 32**

aqueous urea solution, manufactured from technically pure urea (with no addition of any other substances) and pure water, having a urea content of 32,5 % and with the quality characteristics defined in Clause 5

#### 3.2

##### **technically pure urea**

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

**NOTE** 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 Based on definition of water grade 3 of ISO 3696.

**4 Designation**

AUS 32 in compliance with the requirements of this Publicly Available Specification shall be designated with the code AUS 32 and the reference number of this Publicly Available Specification:

**AUS 32 ISO 22241-1**

**5 Requirements and testing**

The quality characteristics of the AUS 32 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 32.

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

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**6 Packaging, transportation and storage**

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Recommendations for the logistics chain from the factory to the vehicle in order to maintain the high quality of the product, are given in Annex C.

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**7 Marking**

Distribution pumps and containers for the distribution of AUS 32 in compliance with the requirements of this Publicly Available Specification shall be marked with the designation as specified in Clause 4.



Table 1 — Quality characteristics

Characteristics	Unit	Limits		Test methods
		min	max	
Urea content <sup>a</sup>	% (m/m) <sup>d</sup>	31,8	33,2	ISO 22241-2, Annex B <sup>e</sup> ISO 22241-2, Annex C
Density at 20 °C <sup>b</sup>	kg/m <sup>3</sup>	1 087,0	1 093,0	ISO 3675 or ISO 12185
Refractive index at 20 °C <sup>c</sup>	—	1,3814	1,3843	ISO 22241-2, Annex C
Alkalinity as NH <sub>3</sub>	% (m/m) <sup>d</sup>	—	0,2	ISO 22241-2, Annex D
Biuret	% (m/m) <sup>d</sup>	—	0,3	ISO 22241-2, Annex E
Aldehydes	mg/kg	—	5	ISO 22241-2, Annex F
Insoluble matter	mg/kg	—	20	ISO 22241-2, Annex G
Phosphate (PO <sub>4</sub> )	mg/kg	—	0,5	ISO 22241-2, Annex H
Calcium	mg/kg	—	0,5	ISO 22241-2, Annex I
Iron	mg/kg	—	0,5	
Copper	mg/kg	—	0,2	
Zinc	mg/kg	—	0,2	
Chromium	mg/kg	—	0,2	
Nickel	mg/kg	—	0,2	
Aluminium	mg/kg	—	0,5	
Magnesium	mg/kg	—	0,5	
Sodium	mg/kg	—	0,5	
Potassium	mg/kg	—	0,5	
Identity	—	identical to reference		ISO 22241-2, Annex J
<p><sup>a</sup> Target value 32,5 % (m/m).</p> <p><sup>b</sup> Target value 1 089,5 kg/m<sup>3</sup>.</p> <p><sup>c</sup> Target value 1,3829.</p> <p><sup>d</sup> For the purposes of this Publicly Available Specification, the term “% (m/m)” is used to represent the mass fraction of a material.</p> <p><sup>e</sup> Calculated without subtracting nitrogen from ammonia.</p> <p>NOTE 1 In establishing these limit values, the terms of ISO 4259 have been applied in fixing a maximum and minimum value, a minimum difference of <math>4 \times R</math> (<math>R</math> is the reproducibility of the test method) has been taken into account. However, in case of urea content, the <math>4 \times R</math> rule has not been applied in order to keep the high quality.</p> <p>NOTE 2 The values quoted regarding urea content, density and refractive index are “true values” (see ISO 4259 for definition of true values).</p> <p>NOTE 3 Notwithstanding this measure, which is necessary for statistical reasons, the manufacturer of AUS 32 should nevertheless aim at the mean value between minimum and maximum, i.e. 32,5 % in the case of urea content, 1,3829 in the case of refractive index and 1 089,5 kg/m<sup>3</sup> in the case of density.</p> <p>NOTE 4 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.</p>				