



Technical Circular

0199-99-01164/4 EN

This Circular supersedes: 0199-99-01164/3

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DEUTZ engines

Engines with SCR system

(SCR = Selective Catalytic Reduction)



NOx reducing agent for SCR exhaust gas treatment

Alterations

In comparison to TR 0199-99-01164/3, the following changes have been made:

- Updating
- Introducing DEUTZ PowerBlue

General

Compliance with current and forthcoming emissions legislation (EURO 4, 5, 6, EU stage IIIB, IV and V, US EPA Tier 4 interim and US EPA Tier 4 final) requires the use of exhaust treatment technology.

In this area, DEUTZ uses, among other things, the so-called SCR principle (SCR = **S**elective **C**atalytic **R**eduction).

This is a process in which the nitrogen oxide emissions which arise in the engine during combustion, which has been optimised for efficiency, are converted into harmless substances (nitrogen) as a post-combustion process in a ceramic catalyst with the help of the reducing agent ammonia.

Ammonia is a very aggressive gas which is dangerous to health and for reasons of safety and protection of the environment could hardly be controlled in road traffic. Therefore a 32.5 % urea solution (hereafter in the text also called AUS 32, AUS = **A**queous **U**rea **S**olution) is used as an initial substance.

The high temperatures in the exhaust flow cause the AUS 32 to be hydrolysed into ammonia and carbon dioxide. The ammonia reacts with the nitrogen oxides on the surface of the SCR catalyst and produces nitrogen and water.

The advantage of this is that the urea solution is not subject to any particular health and safety regulations, although contact with skin and eyes as well as swallowing the solution should be avoided. Furthermore, the urea solution must not enter the sewage system or groundwater (water hazard class 1). The urea solution is not a hazardous substance, but degradation at high storage temperatures (> 30 °C) can lead to a faint smell of ammonia.



ATTENTION

The urea solution must only be filled in the urea tank provided for this.

Operation with an unintended operating medium (for example through mistakenly filling the urea tank with diesel fuel) leads to irreparable damage to the SCR system.



If the tank is accidentally filled with water, the On-Board Diagnostics (OBD) system issues an error message.

The freezing point of the urea solution is -11 °C. Therefore the urea tank and the urea lines are pre-heated when ambient temperatures are low.



Brand name

The 32.5% urea solution is sold on the market and in petrol stations for example using the following brand names.

- AdBlue®

AdBlue® is a registered trademark of the Verband der Automobilindustrie e.V (VDA - German Association of the Automotive Industry).

- AUS 32 = Aqueous Urea Solution
- DEF = Diesel Exhaust Fluid
- ARLA 32 = Agente Redutor Liquido de Óxido de Nitrogênio Automotivo

Specifications of the urea solution

Optimised control of low nitrogen oxide emissions can only be achieved if the urea solution used complies with quality requirements of the specification ISO 22241-1, DIN 70070 or ASTM D 7821.



ATTENTION

Only NOx reducing agents that satisfy the quality requirements in Table T1 may be used in DEUTZ engines with an SCR exhaust gas treatment system.

Standard solutions with the trade name AdBlue® or DEF are to be preferred. Further information can be found in the operating manual.

Quality requirements

Inspection feature	Unit	Limit value		Test method
		min.	max.	
Urea content ^a	% (m/m) ^d	31.8	33.2	ISO 22241-2 appendix B ISO 22241-2 appendix C
Density at 20 °C ^b	g/cm ³	1.087	1.093	EN ISO 3675 or EN ISO 12185
Refractive index at 20 °C ^c	—	1.3814	1.3843	ISO 22241-2 appendix C
Alkalinity as NH ₃	% (m/m) ^d	—	0.2	ISO 22241-2 appendix D
Biuret	% (m/m) ^d	—	0.3	ISO 22241-2 appendix E
Aldehyde	mg/kg	—	5	ISO 22241-2 appendix F
Insoluble components	mg/kg	—	20	ISO 22241-2 appendix G
Phosphate (PO ₄)	mg/kg	—	0.5	ISO 22241-2 appendix H

^a Target value: 32.5 % (m/m)

^b Target value: 1.090 g/cm³

^c Target value: 1.3829

^d % (m/m) = % by weight

Inspection feature	Unit	Limit value		Test method
		min.	max.	
Calcium	mg/kg	—	0.5	ISO 22241-2 appendix I
Iron	mg/kg	—	0.5	
Copper	mg/kg	—	0.2	
Zinc	mg/kg	—	0.2	
Chrome	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 sample		ISO 22241-2 appendix J
^a Target value: 32.5 % (m/m) ^b Target value: 1.090 g/cm ³ ^c Target value: 1.3829 ^d % (m/m) = % by weight				

T1: ISO 22241-1 (Diesel engines - NOx reducing agent AUS 32, Part 1: Quality requirements)



The limit values of ISO 22241-1 are identical to the limit values of DIN 70070 or ASTM D 7821.

The quality requirements of the reducing agent are described in Table T1. The requirements apply to the supply of the product to the end user and must be complied with at the filling pump or at the refill canister.

The quality requirements must be continually monitored by the manufacturer in accordance with a valid test plan. The limit values determined must be complied with when the specified testing procedure is applied.

Additive reducing agents / DEUTZ PowerBlue

Low exhaust gas temperatures, which occur due to a low engine capacity, can impair the thermal decomposition of the NOx reducing agent. For optimal functioning of the SCR exhaust gas treatment, the urea solution must be injected in the form of a spray into the exhaust gas treatment system and vaporised with sufficient exhaust gas temperatures. Otherwise, crystalline deposits can form on the mixing system and in the SCR catalyst lines.

To prevent this, additive urea solutions are offered which enable a finer distribution of the spray through the addition of special additives. This supports the thermal decomposition of the urea solution and reduces the risk of crystallisation when exhaust gas temperatures are low. The use of additive urea solutions is permissible in DEUTZ engines with SCR exhaust gas treatment only if they fulfil the quality requirements of NOx reducing agents according to ISO 22241-1, DIN 70070 or ASTM D 7821.



DEUTZ recommends using DEUTZ PowerBlue, an NOx premium reducing agent with special additives, for the highest possible volume rates and the longest possible life of the SCR catalysts.



DEUTZ PowerBlue	
Part number	Container
01016546	10 litre canister
01016547	208 litre barrel
01016548	1000 litre canister

T2: DEUTZ PowerBlue (NOx reducing agent with additives)

Notes on safe handling when working with AUS 32

Notes on safe handling, storage and transport are described in ISO 22241-3. All barrels, transport and storage containers should be used exclusively for AUS 32.



More information on potential hazards, risks and safety measures to be taken into account when working with AUS 32 can be found on the AdBlue® safety data sheet.

Safety data sheets for DEUTZ products can be downloaded online.



– Safety data sheets
<http://www.deutz-sdb.com/de/sdb-de.html>

Dangers

- There are no particular known dangers for people and the environment.
- The urea solution is neither a hazardous substance nor a dangerous good in the sense of the regulations. It is classified as harmless in accordance with the EU dangerous substances directive 67/548/EEC.
- The urea solution is slightly hazardous to water (water hazard class 1) according to the Administration Specification for Water-Hazardous Substances (Verwaltungsvorschrift wassergefährdende Stoffe - VwVwS), appendix 2
- The urea solution is not combustible. Measures taken to extinguish any fire should be appropriate to the surroundings. Ammonia can be released as a hazardous substance.
- The urea solution is not subject to the specific labelling requirements of EC directives or national legislation.

General note

- Contact with skin should be avoided. If possible, latex gloves should be worn. Wash hands thoroughly before taking breaks and at the end of shifts.
- If the substance comes into contact with eyes, rinse thoroughly with water.
- If swallowed, rinse out mouth with a lot of water, drink plenty of water and seek medical advice.
- If discomfort or illness continues, seek medical advice.
- Product can pose danger of slipping if spilled. It is essential to remove spilled liquid. Make sure when doing so that it does not get in the sewage system or groundwater/surface water. The contaminations must be collected mechanically and disposed of in suitable containers. Minimal amounts of remaining liquid may be rinsed away with a lot of water.

disposal of parts and consumables

AUS 32 must be disposed of properly in accordance with waste recycling / disposal regulations. The waste must be classified according to its origin in accordance with the European Waste List regulation (EWL).



The following classification is recommended as the waste code to be used:

Waste code	Waste description
06 10 99	Waste from manufacture, preparation, sales and application of nitrogenous chemicals from nitrogen chemical processes and the manufacture of fertilisers Waste otherwise unnamed

T3: AUS 32, waste code

Packaging which has been contaminated with the urea solution and can no longer be used should initially be treated like the substance itself. After it has been emptied properly and cleaned thoroughly, it may be reused, as long as regulations are followed.

Storage stability

The length of time that the urea solution can be kept without losing quality depends on the conditions of its storage. Temperature in particular can greatly impact storage stability.

The urea solution freezes at temperatures below $-11\text{ }^{\circ}\text{C}$, so that its volume increases by up to 9 % (V/V). As a result, containers and tanks can be damaged if not stored properly due to expansion of the fluid. In addition, the hydrolysis reaction sets in at temperatures above $30\text{ }^{\circ}\text{C}$. This means that it begins to slowly decompose into ammonia and carbon dioxide.

To ensure a high quality of AUS 32 during storage in the storage tank, the following conditions must be met:

- The containers must be stored cool, clean and dry.
- The storage temperature should be between $-11\text{ }^{\circ}\text{C}$ and $25\text{ }^{\circ}\text{C}$.
- Fluctuation of the storage temperature should be avoided.
- Tanks and containers must be sealed airtight after parts removal in order to protect the solution inside from contamination.
- Direct sunlight and UV radiation on exposed storage containers must always be avoided.

Constant storage temperature [$^{\circ}\text{C}$]	Minimum shelf life (months)
< 10	36
10 to < 25	18
25 to < 30	12
30 to < 35	6
≥ 35	Check goods before use

T4: AUS 32, minimum shelf life

Once the stated storage life has expired, the urea solution must be checked before application to see if it is still suitable for use.

Determination of the urea concentration with the DEUTZ refractometer is recommended for assessing the urea quality.



Special tools:

- Refractometer
02937499



- TR 0199-49-01214
Refractometer

Storage in the vehicle tank also impacts the quality of AUS 32. When the vehicle or the AUS 32 pump is shut down, the urea solution may remain in the vehicle for up to 4 months under the following conditions:

- Shut down up to 2 months:



Ambient temperature must be kept between -40 °C and 40 °C .

- Shut down up to 4 months:

Ambient temperature must be kept between -40 °C and 25 °C .

- The vehicle should not be parked in a dry location (garage or hangar) if it will not be used for a long period of time.

Material compatibility

All materials for the construction of tanks and containers, as well as pipes, valves and screws for storage, transport and handling must be compatible with the urea solution in order to avoid contamination and corrosion of the machinery used. Sampling equipment, sample storage containers and all containers used for shipping must be made of materials which are compatible with the urea solution.

Recommended materials for direct contact with AUS 32:

- High-alloy austenitic chromium nickel steel and chromium nickel molybdenum steel in accordance with EN 10088-1 to -3 (i.e. 1.4541 and 1.4571) manufactured according to industry standards
- HD polyethylene
- HD polypropylene
- Polyfluorethylene
- Polyvinylidene fluoride
- Poly(perfluoroalkoxy) PFA
- Polyisobutylene
- Titanium
- Viton

All other materials not listed in this appendix must be tested for their resistance to corrosion and possible influence on the abovementioned product specifications.

The urea solution must never come into contact with copper or zinc, their alloys, or aluminium.

Contact

If you have questions about any of the topics mentioned here, please contact us using the details given below:

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or

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