



Service Bulletin

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Diesel Exhaust Fluid (DEF) Specifications for Cummins® Selective Catalytic Reduction (SCR) Systems	

Diesel Exhaust Fluid (DEF) Specifications for Cummins® Selective Catalytic Reduction (SCR) Systems

This document provides specifications, usage, and handling requirements of Diesel Exhaust Fluid (DEF). Other names for DEF are listed below.

- UreaAqueous
- Aqueous Urea Solution (AUS 32)
- AdBlue™
- NOx Reduction Agent
- Catalyst Solution
- Stableguard™ 32

The following topics are included in this document:

1. DEF Characteristics and Specifications
2. Handling, Storage, and Shelf Life of DEF
3. DEF Cleanliness Practices
4. Contamination and Incorrect Fluid
5. Testing
6. Disposal and Cleaning of DEF
7. First Aid

DEF used on Cummins® engines **must** meet the requirements as outlined in the specifications section of this document.

For further information, reference the DEF manufacturer's Material Safety Data Sheet.

Note : Cummins Inc. is **not** responsible for failures or damage resulting from what Cummins Inc. determines to be abuse or neglect, including but **not** limited to: operation without correctly specified DEF, lack of maintenance of the aftertreatment system, improper storage or shutdown practices, and unauthorized modifications of the engine and aftertreatment system. Cummins Inc. is also **not** responsible for failures caused by incorrect DEF or by water, dirt, or other contaminants in the DEF.

1. DEF Characteristics and Specifications

⚠ WARNING ⚠

Diesel exhaust fluid (DEF) contains urea. Do not get the substance in your eyes. In case of contact, immediately flush eyes with large amounts of water for a minimum of 15 minutes. Do not swallow internally. In the event the diesel exhaust fluid is ingested, contact a physician immediately. Reference the Materials Safety Data Sheet (MSDS) for additional information.

⚠ CAUTION ⚠

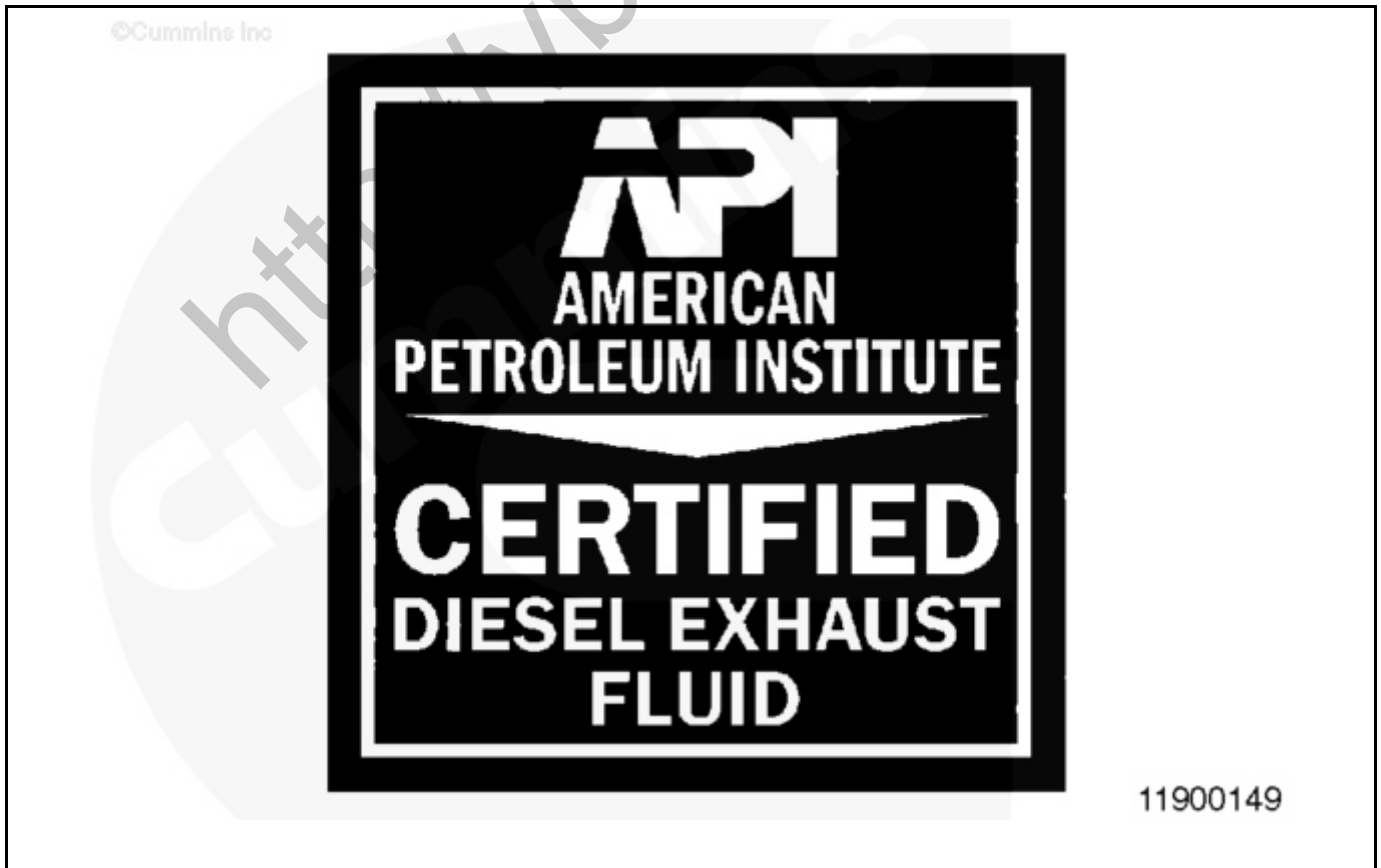
Never attempt to create DEF by mixing agricultural grade urea with water. Agricultural grade urea does not meet the necessary specifications required and the aftertreatment system may be damaged.

DEF has the following characteristics:

- Nontoxic and nonpolluting
- Nonflammable
- Stable and colorless
- Odor of slight ammonia
- Composed of urea and water
- Biodegradable

The urea content of DEF solution **must** be 32.5 percent \pm 1.5 percent by weight. It **must** meet the International Standard ISO 22241-1 for diesel engines. There is no acceptable substitute.

For engines using SCR operating in the United States and Canada, DEF certified by the American Petroleum Institute (API) is recommended for use. A symbol on the container or dispensing system will indicate certification. See image below.



Never add water, or any other unauthorized fluid, to the DEF tank. The Aftertreatment system may be damaged and the DEF solution quality will be compromised.

⚠ CAUTION ⚠

Do not add any chemicals/additives to the diesel exhaust fluid in an effort to prevent freezing. If chemicals/additives are added to the diesel exhaust fluid, the aftertreatment system may be damaged.

DEF freezes at approximately -11°C [12°F]. The DEF system is designed to accommodate these temperatures and does **not** require any intervention by the owner or operator.

2. Handling, Storage, and Shelf Life of DEF

For detailed information on handling, transportation, and storage of DEF, reference ISO 22241-3.

Handling:

DEF is **not** hazardous but short-term exposure can cause acute irritation. Proper personal protective equipment should be utilized when handling DEF. For more information, refer to the First Aid section of this document.

Select materials may become corroded if contact with DEF occurs for an extended period of time. See the list of materials below.

- Carbon steel, zinc coated carbon steel, and mild iron
- Nonferrous metals and alloys: copper, copper alloys, zinc, and lead
- Solder containing lead, silver, zinc, or copper
- Aluminum alloys
- Magnesium and magnesium alloys
- Plastics or metals coated with nickel

If material contact with DEF occurs, clean the surface immediately. Reference the Disposal, Cleaning and Contamination/ Incorrect Fluid of DEF section of this document for additional information.

Storage:

Only approved containers should be utilized to transport and store DEF. Containers made of polyethylene, polypropylene and stainless steel (Grade 316) are recommended.

Some DEF containers include a paper seal under the cap. The seal will degrade over time and will contribute to DEF contamination. These containers **must** be identified and inspected regularly once opened to prevent contamination.

Shelf Life:

Many factors effect DEF shelf life. Temperature and duration are major contributors. **Always** check the concentration of DEF or replace DEF with new if DEF quality or expiration are questionable.

DEF has an expected shelf life of 18 months minimum when stored under the following conditions.

- Storage temperature between -5°C to 25°C [23°F to 77°F]
- Sealed containers
- Avoiding direct sunlight

Shelf life is reduced by 6 months for each 5°C [9°F] increment above recommended temperatures. For example, 30°C [86°F] = 12 month shelf life, 35°C [95°F] = 6 month shelf life, etc.

Long term storage in a vehicle (in excess of 6 months) is **not** recommended. If long term storage is necessary, periodic testing of the DEF is recommended to make sure the concentration does **not** fall out of specification. See the Testing section of this document.

3. DEF Cleanliness Practices

Materials that come into contact with DEF **must** be free from any contamination, oil, fuel, dust, detergents, and any other chemicals.

Containers, funnels, and other equipment that will handle or store DEF should be cleaned before use. Wash thoroughly and rinse with distilled water. If distilled water is unavailable, rinse with tap water then rinse with DEF.

Follow these recommended practices to avoid contaminating DEF during routine maintenance tasks.

- Clean the DEF tank prior to opening the DEF tank for filling.
- Clean the dispensing nozzle prior to filling the DEF tank.
- Ensure the dispensing nozzle is kept in the DEF tank during filling to minimize drops and mishandling.
- Ensure proper filtration is used for DEF tank venting to atmosphere.
- Close DEF ports during operation or repair.
- Clean out dust and debris before using a coupler/insert connection.
- Ensure a proper DEF storage container is being utilized and inspected as necessary. Refer to Handling, Storage and Transporting of DEF section of this document.
- Conduct periodic inspections and eliminate areas where DEF has crystallized.

4. Contamination and Incorrect Fluid

Never add water, or any other unauthorized fluid, to the DEF tank. The Aftertreatment system may be damaged and the DEF solution quality will be compromised. This may effect DEF in the following ways.

- Change the DEF concentration levels
- Introduce contaminants
- Change DEF chemical properties
- Alter the freeze point of DEF
- Alter characteristics of the DEF solution

If an unauthorized fluid is added to the DEF tank, contact a local Cummins® Authorized Repair location to determine the appropriate repair direction.

If water has been added to the DEF tank perform the following steps.

- Drain the DEF tank
- Flush with distilled water
- Refill the DEF tank with new or quality DEF
- Check the DEF concentration

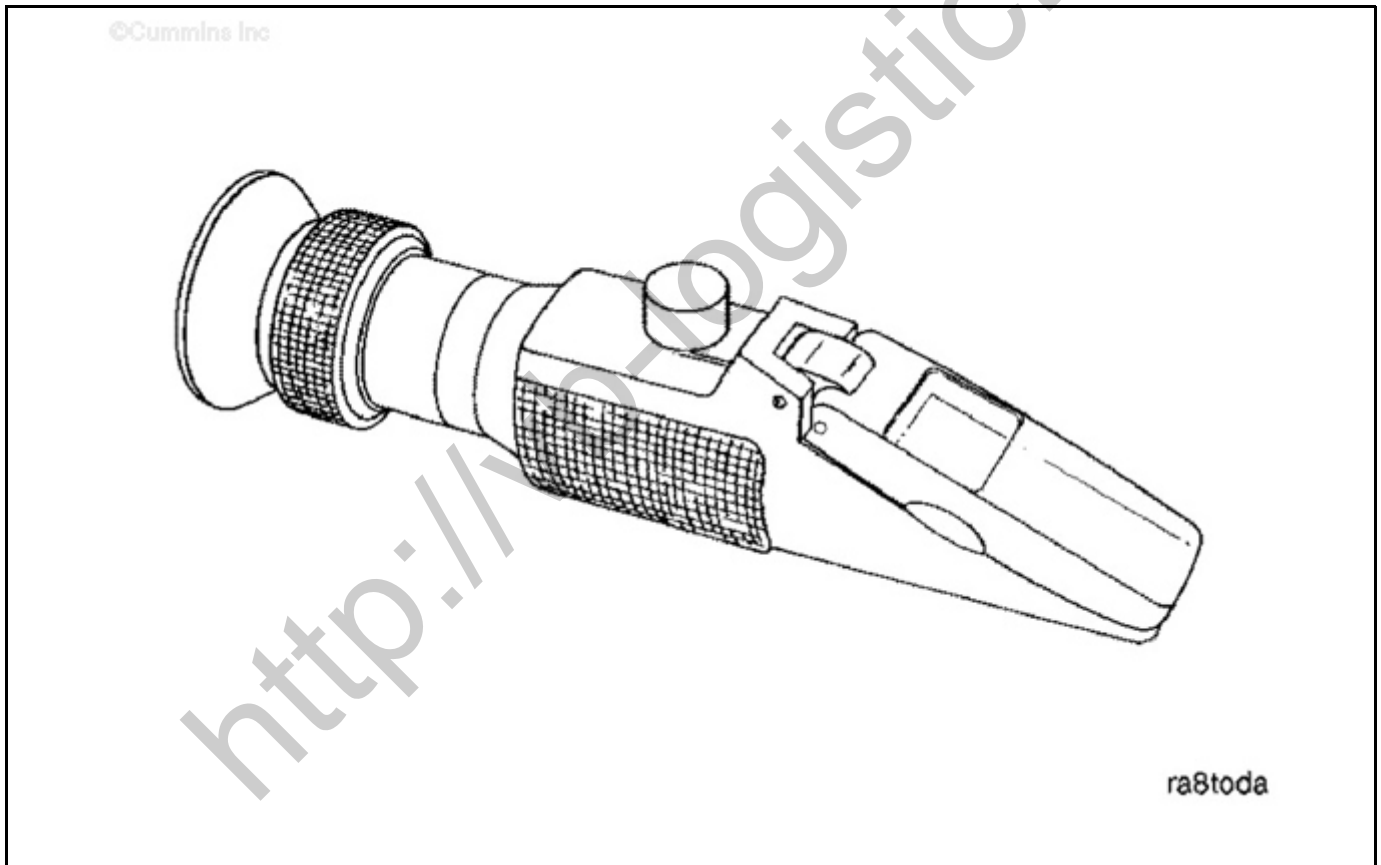
5. Testing

The correct concentration of DEF is critical to engine and aftertreatment system health and performance.

To test the concentration of DEF, use Cummins® DEF refractometer, Part Number 4919554. Follow the instructions provided with the service tool.

For detailed instructions on testing DEF, reference ISO 22241-2.

Note : When using the Cummins® DEF refractometer service tool, the acceptable DEF measurement specification is 32.5 +/- 1.5 percent. This specification takes into consideration the refractometer tool tolerances, variability, and calibration when measuring DEF concentration.



6. Disposal and Cleaning of DEF

If a small amount of DEF is spilled, rinse and clean immediately with water. Spilled DEF, if left to dry or wiped away with a cloth, will leave a white residue. Failure to clean spilled DEF from a surface may result in an incorrectly diagnosed leak of the DEF dosing system.

If a large amount of DEF is spilled, perform one of the following.

- Transfer it into a suitable container. Label the container correctly.

- Cover it using an absorbent material.

Dispose of DEF according to local environmental regulations. Do **not** empty into the drainage system. Do **not** empty/release into surface water.

7. First Aid

Follow these recommended practices when working with DEF. For additional information regarding the proper handling of DEF, refer to the manufacturer's Material Safety Data Sheet.

DEF is **not** hazardous but short-term exposure can cause acute irritation.

- Avoid breathing vapor or mist.
- Protect eyes. In case of contact with eyes, flush with water for a minimum of 15 minutes.
- Protect skin. In case of contact with skin, wash with soap and water.
- Do **not** ingest. If ingested, contact a physician immediately.

Document History

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xxxx-xx-xx	Module Created
2012-3-5	QSOL Quick Fix Reason: Spelling Error Notes: none
2012-8-27	Urea content spec change
2015-1-8	Reformatted. Updated DEF cleanliness practices.
2015-2-5	none
2016-9-13	Updated Urea Solution (AUS 32) to Aqueous Urea Solution (AUS 32)

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