Technical Circular

0199-99-01228/4 EN

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DEUTZ engines

- All DEUTZ engines

Cooling system protective agent

The following change has made it necessary to replace this documentation:

- Updates
  - New engine series
    G 2.2 / TCD 9.0 L4 / TCD 12.0 L6 / TCD 13.5 L6 / TCD 18.0 L6
  - Introduction of new DEUTZ cooling system protective agent DQC - CC

General information

This Technical Bulletin applies to all liquid-cooled DEUTZ engines belonging to the newly developed series with exhaust aftertreatment systems.

Modern engines place very high demands on the cooling system protective agent used.

The specific engine performances increased constantly in recent years lead to increased thermal stress.

Since the engine and its components are not able to emit the comparatively high amount of heat to the environment very quickly, optimum heat dissipation via the engine cooling system using modern cooling system protective agents is essential so that the engine is not damaged due to overheating.

For this reason, DEUTZ has introduced the new DEUTZ cooling system corrosion protection DQC-CB and DQC-CC in order to meet the aforementioned requirements and increase the service life of the engines.

Using unsuitable coolants often leads to:

- Leakage of the cooling system as a result of corrosion and due to incompatibility with the sealing materials
- Pitting corrosion on the aluminium components and flocculation, which attacks and blocks the cooling channels

ATTENTION
These damages may cause the engine to overheat and lead to severe engine damage as a result.

Cooling system protective agents consist of a base liquid (usually a polyvalent alcohol such as ethylene glycol for protection against cold) and an additive package. In liquid-cooled engines the coolant must be prepared by mixing a cooling system protective agent with the fresh water and testing it within the given maintenance intervals.

The most important duties of a cooling system protective agent are:

- Cooling of the engine to protect from overheating
- Prevention of corrosion and cavitation
- Prevention of deposits
- Antifreeze

ATTENTION
Damages can be expected when using products which have not been released and failing to observe the maintenance intervals as well as the quality of fresh water.
Examples for such damage profiles can be found in the appendix to this bulletin.
Damage due to failure to observe this bulletin is strictly excluded from the warranty.

All details refer to the current state of knowledge and apply exclusively to the components and engines for which DEUTZ is responsible.
They do not release the owner or the equipment manufacturer from their own obligations for caution due to the possible impacts when using these products.
The cooling system protective agent must be used exclusively for the specified purpose, any other use above and beyond this is considered improper use.
The user will be liable exclusively for damages resulting from this. Relevant country-specific legal conditions must be observed by the user under their own responsibility.

Fresh water quality

The right quality of fresh water is important for preparing the cooling system protective agent. Clear, clean, fresh water within the following analysis values should always be used:

Analysis values of the fresh water	
pH value at 20 °C	6.5 to 8.5
Chloride-ion content	max. 100 mg/l
Sulphate-ion content	max. 100 mg/l
Total content of chloride and sulphate ions	max. 150 mg/l
Water hardness (ion content of calcium and magnesium) Conversion to other units: German degrees English degrees French degrees mg/l $CaCO_3$ (ppm)	max. 3.56 mmol/l max. 20 °dH max. 25 °eH max. 35.6 °fH max. 356
Bacteria, fungi, yeast	Unverifiable

T1: Analysis values

The measuring methods for determining the limit values must be applied according to the respectively valid water standards.

Data on the fresh water quality can be provided by the local water boards.

If the analysis values of the fresh water are unknown, these must be determined by means of a water analysis.

Never use sea water, river water, brackish water, industrial waste water or seepage water for conditioning the coolant.

The fresh water must be conditioned if the analysis values deviate.

- **pH value too low**

  A too low pH value can lead to corrosion of metal parts.

  – Remedy by adding diluted caustic or potassium soda.

    It is advisable to make small test mixtures.

- **Water too hard**

  Water which is too hard leads to deposits of limescale which prevent heat conduction. This can lead to overheating problems.

  – Remedy by mixing with soft, distilled or completely desalinated water.

- **Chloride and/or sulphates too high**

Too high a chloride or sulphation content leads to dissolution of the protective layer and thus to corrosion of the metal parts.

– Remedy by mixing with distilled or completely desalinated water.

A new analysis should be made after conditioning the fresh water.

Product recommendation

We recommend the following DEUTZ cooling system protective agents for use in DEUTZ engines.

Advantages:

- extensive tests in DEUTZ engines
- adapted to the materials in DEUTZ engines
- extended coolant change interval
- supplied by the DEUTZ sales organisation
- price advantage
- long-term supply guaranteed

A1: Original DEUTZ cooling system protective agents

DEUTZ cooling system protective agent			
DEUTZ specification	**Container**		**Part number**
DQC-CB*	Canister	5 litres	01017990
		20 litres	01017991
	Barrel	210 litres	01017992
DQC-CC**	Canister	20 litres	01091264
* not suitable for the following DEUTZ engines: TCD 9.0 L4 / TCD 12.0 L6 / TCD 13.5 L6 / TCD 18.0 L6 ** suitable for all all liquid-cooled DEUTZ engines			

T2: Original DEUTZ cooling system protective agents

Safety data sheets for DEUTZ products can be downloaded online.

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

ATTENTION
When switching field engines from the previous product (DEUTZ cooling system corrosion protection) to the new products (DEUTZ cooling system protective agent DQC-CB) or DQC-CC), the cooling system must be flushed once before filling in order to prevent flow malfunctions due to incompatibility.
Mixing of the products or filling up with the new product is not permitted.
Before the product switch between the groups, the entire cooling system must be cleaned, see TR 0199-99-01116.
Does not apply to new engines or first-time filling.

DEUTZ Quality Class (DQC)

Use of the DQC release list should make the choice of cooling system protective agents for DEUTZ engines easier for the customer and ensure a quality level that is tailor made for the requirements of DEUTZ engines.

Further information is available on the DEUTZ homepage.

– DQC cooling system protective agent release list
– DQC release procedure
https://www.deutz.com/service/wartung/betriebsstoffe/kuehlsystemschutz/freigabesystem-kuehlsystemschutz//

ATTENTION
Manufacturers of cooling system protective agents change the cooling system protective agent formulation at regular intervals. Previous release lists (for example according to TR 0199-99-01115 or older operating instructions) are invalid.
Only cooling system protective agents from the DQC cooling system protective agent release list on the DEUTZ homepage may be used. Ready-Mix products are to be preferred here.
DEUTZ is not liable for damage caused by the use of cooling system protective agents that have not been released.

If DEUTZ cooling system corrosion protective agents DQC-CB or DQC-CC are not available for any reason (e.g. delivery limitations abroad), alternative products approved by DEUTZ can be used.

Products released are recorded according to the following DEUTZ cooling system protection specifications.

DEUTZ cooling system protective agent specifications	
DEUTZ specification	**Remark**
DQC CA-14	Siliceous on the basis of MEG suitable for all all liquid-cooled DEUTZ engines **except** TCD 9.0 L4 / TCD 12.0 L6 / TCD 13.5 L6 / TCD 18.0 L6 and LPG engines (G 2.2)
DQC CB-14	Free of silicates on the basis of organic acids (OAT) and MEG suitable for all all liquid-cooled DEUTZ engines **except** TCD 9.0 L4 / TCD 12.0 L6 / TCD 13.5 L6 / TCD 18.0 L6 with extended coolant change intervals
DQC CC-14	Siliceous on the basis of organic acids and MEG suitable for all all liquid-cooled DEUTZ engines **including** TCD 9.0 L4 / TCD 12.0 L6 / TCD 13.5 L6 / TCD 18.0 L6 with extended coolant change intervals
DQC = DEUTZ Quality Class	
MEG = Monoethylene glycol (1,2-Ethanediol)	
OAT = Organic Acid Technology	
Other cooling system protective agents are currently being tested	

T3: DEUTZ cooling system protective agent specifications

Mixing ratio

To ensure adequate corrosion protection the cooling system protective agent must be used all year round.

The following cooling system protective agent concentration must not drop below or be exceeded:

Cooling system protective agent	Mixing ratio Fresh water	Cold protection up to approx.
min. 35 %	65 %	- 22 °C
40 %	60 %	- 28 °C
45 %	55 %	- 35 °C
max. 50 %	50 %	- 41 °C

T4: Mixing ratio: cooling system protective agent / fresh water

When using the cooling system protective agent the heat transfer value of the coolant is reduced. EUTZ cooling systems are designed for a percentage of maximum 50 % cooling system protective agent (up to -41 °C).
At temperatures below - 41 °C:
Consult your responsible DEUTZ agent.
In permanent Arctic temperatures under -30 °C, the proportion of cooling system protective agent can be increased to 55 %. The reduced cooling performance due to the cooling system protective agent's reduced thermal capacity compared with water can thereby be disregarded due to the Arctic ambient temperatures.

Dropping below the minimum concentration:

- In addition to the frost protection, the corrosion protection capacity is also reduced. The protection effect is therefore lost abruptly and not gradually.
- The reduction in the ethylene glycol content increases the risk of cavitation (especially on the coolant pump and on the cylinder liners).

ATTENTION
For these reasons, a sufficient amount of cooling system protective agent is also necessary, even in warm countries.
The use of a chemical corrosion protective agent (without antifreeze) for DEUTZ engines is not permitted.

Exceeding the maximum concentration:

- If the maximum concentration is exceeded by a large amount, the amount of engine heat that needs to dissipate will not be able to do so.
- From a concentration of 67 % ethylene glycol (corresponds to frost protection down to -68 °C), the freezing point cannot physically be lowered any further.

  Undiluted cooling system protective agent can therefore freeze again at higher temperatures (-22 °C).

Mixing cooling system protective agents

ATTENTION
Mixing cooling system protective agents of different specifications (for example DQC CA-14 with DQC CB-14) is not permitted. Cooling system protective agents of various specifications have a different chemical basis. Mixing cooling system protective agents of different specifications may cause incompatibilities and thus flow malfunctions.

- All cooling system protective agents within a specification group (for example DQC CA-14) may be mixed with one another.

- In the event of a change of product or supplier within a specification group, DEUTZ generally recommends that the cooling system corrosion protective agent be replaced completely.
- When switching field engines from a specification group to another specification group (for example from DQC CA-14 to DQC CB-14), the cooling system must be flushed once before filling in order to prevent flow malfunctions due to incompatibility.

TR 0199-99-01116
Cleaning of the engine coolant system

Specifications of the cooling system

- The cooling system must be tested constantly and maintained at regular intervals (see the maintenance schedule in the operation manual).
  - Checking the coolant level
  - Checking the coolant for contamination
  - Checking the cooling system protective agent concentration

    See also:

    TR 0199-49-01214

    Refractometer
- Contains fluoride as a result of flux residues in the cooling system
  - Fluoride is a component of modern flux agents such as K3AlF6, K2AlF5 and KAlF4, which are used for the soldering of heavy and light metals in the so-called CAB process (CAB = Controlled Atmosphere Brazing). Flux residues can fall off during the soldering process in the manufacture of coolers and add-on parts. The presence of CAB flux residues can lead to a decomposition of the fluid and adversely affect the service life and the function of the cooling system.

DEUTZ advises the installation customer to have the previous supplier confirm that the fluoride content is kept as low as possible in customer components within the cooling system by using suitable flushing measure DEUTZ recommends not exceeding the limit value of 50 mg/l for fluoride content in the entire system.
For additional attachment parts in the cooling system, which are set up or installed with OEM and where it cannot be ensured that the fluoride input is minimal, further approval tests must be carried out on the entire system if necessary in order to determine that no replacement impacts between the engine, coolant, heat exchanger and other components occur.

- The coolant must be renewed and the entire cooling system cleaned if necessary, see TR 0199-99-01116
  - in case of heavy turbidity due to corrosion residue or other floating particles,
  - in case of penetration by lubricating oil,
  - when changing to a different cooling system protective agent specification
  - in accordance with the maintenance plan of the operating instructions, at the latest upon reaching the replacement interval

Coolant change interval

Replacement interval		Cooling system protective agent specification
Previous	Current	
Every 2 years	Every 3000 operating hours or after 2 years at the latest	DQC CA-14
	Every 6000 operating hours or after 4 years at the latest	DQC CB-14
		DQC CC-14

T5: Coolant change intervals

Please make a note of the new/changed specifications in your documentation.

Specifications in our documentation will be changed accordingly in the next edition.

Special tags for operating media are available to document the change and for the used cooling system protective agent. These can be stuck to the engine.

– TR 0199-99-01236
  Tags for operating media

Disposal / safe handling:

The respectively valid national regulations and all necessary safety / environmental regulations specified on the safety data sheet or canister are to be considered for disposal.

Coolant may not be poured down the drain.
It must be disposed of properly according to legal regulations and specifications of the supplier.

Contact

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

e-mail: lubricants.de@deutz.com
or
DEUTZ Ticket System (DTS): https://www.dts-deutz.com (for registered users only)
or
Email: service-kompaktmotoren.de@deutz.com

For the America region:
e-mail: service.usa@deutz.com

For the Asia region:
e-mail: dapservice@deutz.com

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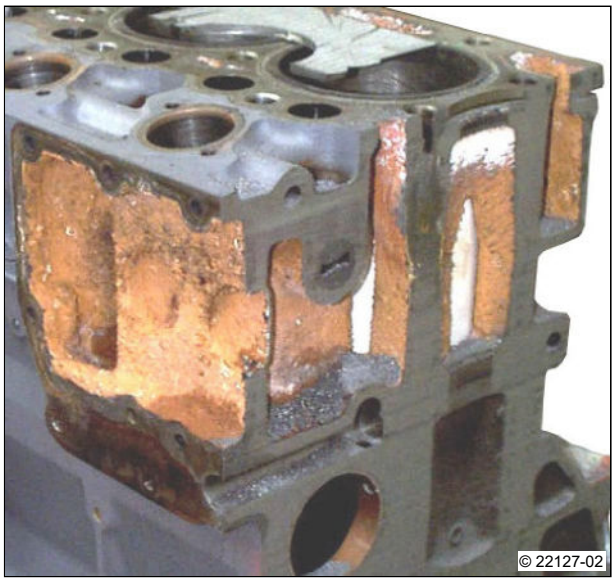
Appendix

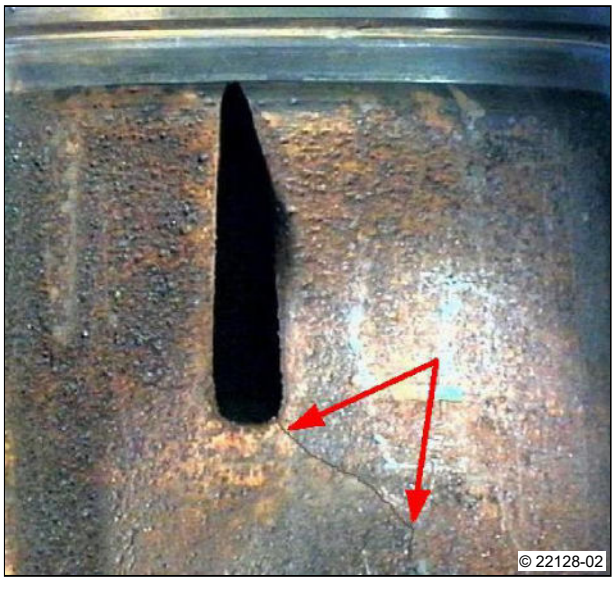
Typical damage profiles

Examples of damage due to failure to observe the recommended instructions

Damage description	Causes
corrosion	pH value too low
	Chloride and/or sulphates too high
	Operation with too low a concentration of the cooling system protective agent



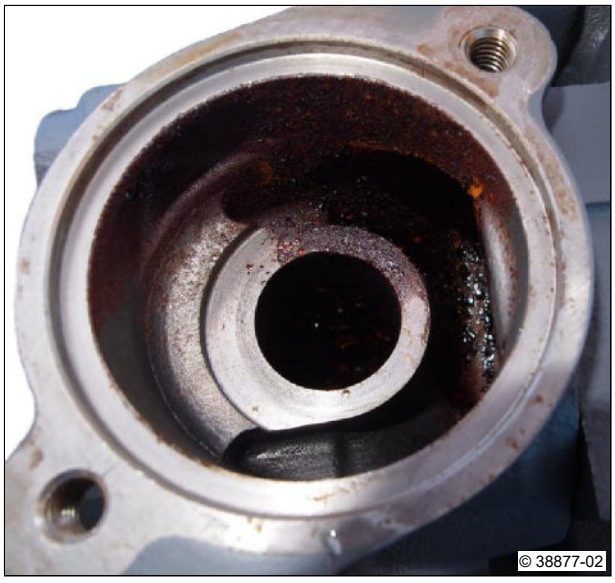
A2: Crankcase



A3: Crankcase crack in the area of the cylinder liner

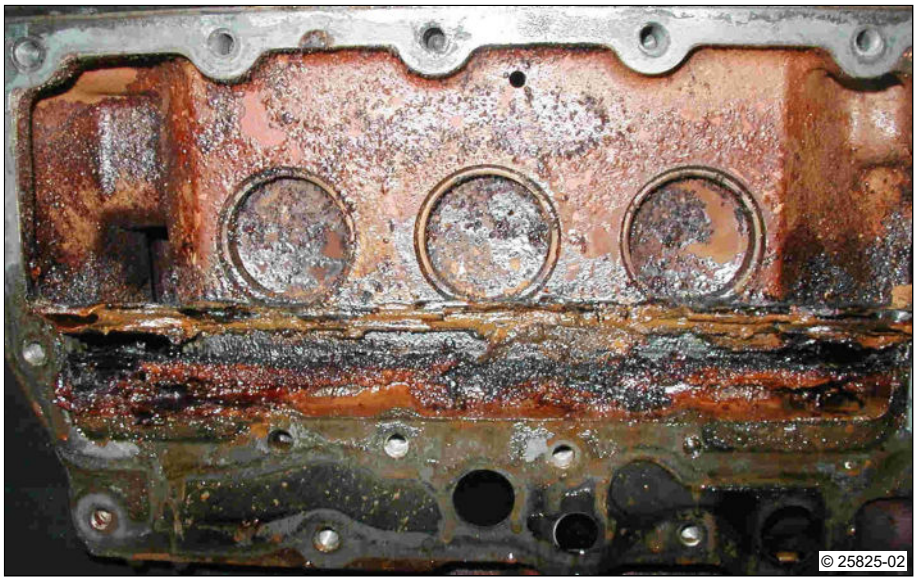
A4: Cylinder liner

A5: Cylinder liner

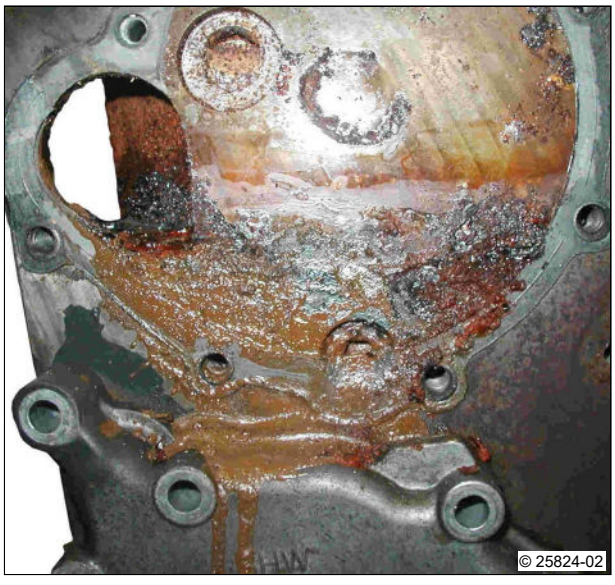


A6: Thermostat housing

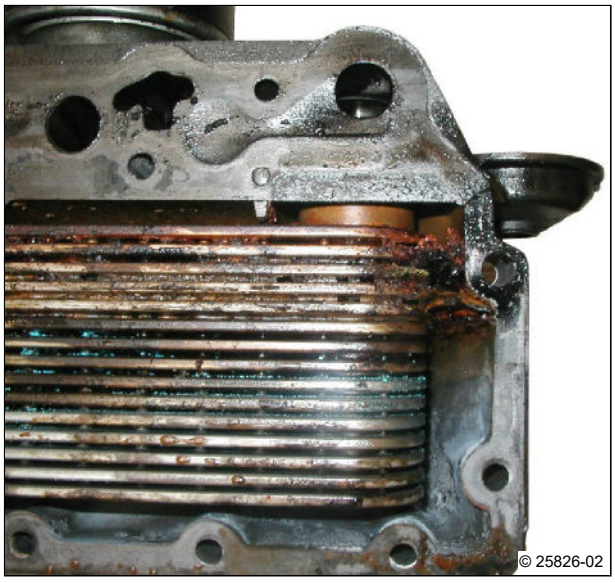
A7: Crankcase in the area of the lubricating oil cooler housing



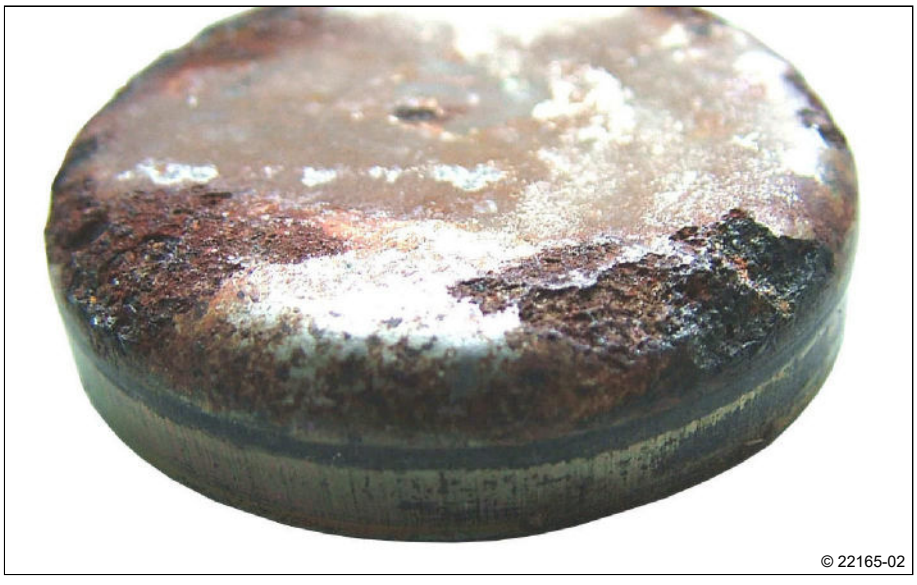
A8: Crankcase in the area of the lubricating oil cooler housing



A9: Coolant pump seat on the crankcase



A10: Lubricating oil cooler housing



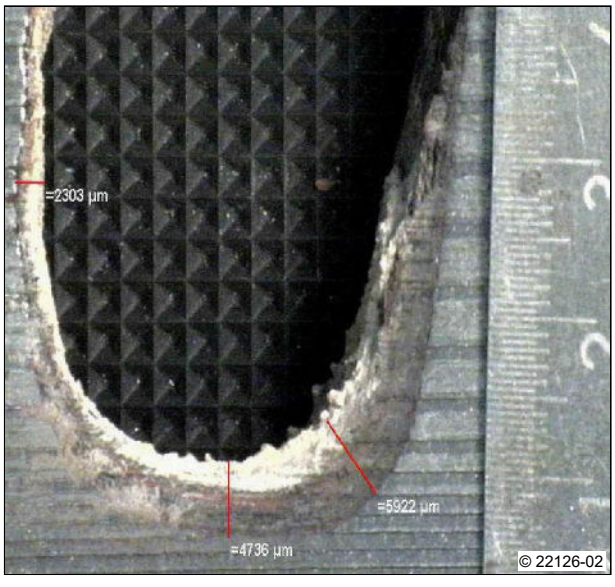
A11: Sealing cover, corroded

Damage description	Causes
corrosion	Chloride and/or sulphates too high

A12: Aluminium thermostat cover, corroded

Damage description	Causes
Limescale deposits	Water too hard

A13: Limescale deposits on a cylinder liner



A14: Thickness of limescale deposits in a cooling channel of a crankcase

Damage description	Causes
Cavitation	Operation with too low a concentration of the cooling system protective agent Unsuitable cooling system protective agent Unsuitable fresh water for conditioning the coolant

A15: Flywheel of the coolant pump, cavitated

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