WÄRTSILÄ

TECHNICAL BULLETIN

Services, Wärtsilä Netherlands B.V.

Engine section	Engine type	Ref.	Date	Issue	Document No.	Page
99 Service information	Various	Service	19.10.2010	03	TB00/99/2091	1(6) + encl.

D232, D234, D350, D358, D440, D441, D444, D484, D500, D510, D501, D511, D518, D528, D540, D545, D601, D602, D603, D604(B), D616, D618, D620, D628, D640, D645, D716, D816, D2016, D18/22, PA6

Engine coolant for medium and large size engines

Original bulletin TC 0199-99-2091 5th exchange dated 07.01.2004
TC 0199-38-2115 dated 12.02.1999

Change number n/a

The **5th exchange** is issued amongst other things because of a

- Revision of the data on water quality
- Introduction of the DEUTZ protective agent for cooling circuit in 20 litre cans
- Updating of product recommendations, Enclosure.

Issue 02 is issued because of the combination with TC 0199-38-2115.
Issue 03 is issued because of the change, the extension, of applicability.

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1. General

Coolants of liquid-cooled engines must be treated and monitored since damage may be sustained by the engine otherwise due to:

- Corrosion
- Cavitation
- Freezing

2. Water quality

The correct water quality is important for the preparation of the coolant. If no specifications are provided by the manufacturer/supplier, clear and clean water must be used within the following limit values of analysis:

Limit values of analysis		min.	max.
pH value at 20°C		6.5	8.5
Chloride ion content	mg/dm^3	-	100
Sulphate ion content	mg/dm^3	-	100
Total hardness *1	°dGH	3	12

*1 Share of carbonate hardness in the overall hardness min. 3°dGH.

For more information on the water quality please consult your local waterworks or use the DEUTZ test kit, Order No. DZ12130382.

Water treatment is indicated if water qualities differ from the above indicated limit values of analysis.

- **pH value too low**
  Add diluted caustic soda or potash lye and mix.
  Preparation of small sample mixtures is recommended.

- **Total water hardness too high**
  Mix with softened water *2

- **Total hardness and/or carbonate hardness too low**
  Mix with water of a higher hardness *3

- **Chloride and/or sulphate content too high**
  Mix with softened water *2

*2 Softened water is distilled water, pH-neutral condensate or water treated by ion exchangers.
*3 Water of a higher hardness is available in most cases in form of potable water (town water).

Use the DEUTZ test kit (order No. DZ12130382) for a determination, if the limit values of analysis of the water to be admixed are unknown.

For safety reasons it is mandatory to carry out another water analysis after water treatment.

Sea water, river water, brackish water or industrial waste water are in no case suitable for the preparation of the coolant since damage may be sustained by the engine.

3. Protective agents for cooling circuit

The coolant is prepared by adding a protective agent to the cooling water as a protection of the cooling circuit. The following additives are commonly used:

- Chemical anticorrosion agent
- Antifreeze agent with corrosion inhibitors
- Corrosion inhibiting oil

The type of additive can be selected according to the following table:

	Chemical anticorrosion agent	Antifreeze agent with corrosion inhibitors	Corrosion inhibiting oil
Protection against corrosion	Good	Good	Good
Protection against cavitation	Satisfactory	Satisfactory	Good
Protection against freezing	None	Up to -45 ºC according to mixing ratio	None
Maintenance requirement	Low	Low *4	Very high
Operation reliabilty	Good	Good	Insufficient
Costs	Medium	Very high	Medium

*4 Only the antifreeze effect is checked normally, to be exchanged every 2 years.

Enclosure 1 lists up some representative products which are recommended by us and which as indicated by the manufacturers/suppliers are suitable for the processing of coolants. Also other equivalent products of other manufacturer/suppliers may be used as an alternative. Suitability of the protective agent for the cooling circuit must be warranted/guaranteed by the manufacturer/supplier. No liability is accepted by us.

The various protective agents for the cooling circuit are described below.

3.1 Chemical anti corrosion agents

Chemical anticorrosion agents are compounds which by way of chemical reaction form a protective film on the metal surfaces. Their advantage compared to corrosion inhibiting oils lies in the ease of application and monitoring.

Liquid additives may be admixed directly in the engine; additives in powder form are to be pre-mixed. The manufacturer's instructions must be adhered to with regard to the concentration of the chemical anticorrosion agent and subsequent monitoring.

The manufacturer/supplier shall warrant that his additives do not have a detrimental effect on the materials used in the engine (e.g. seals/gaskets).

Be careful with aluminium components in the cooling circuit. Not all chemical anticorrosion agents are suitable in such cases; correct dosing is of particular importance since too low a concentration of the chemical anticorrosion agent will have a damaging effect on the system. Also considered in the list of recommended products (see Enclosure 1) is the suitability of the anticorrosion agent for engines with aluminium components.

Make sure that aluminium components are property grounded , no additional electric currents may be induced by these aluminium components via defective insulations (single pole sensors and monitoring sensors).

Chemical anticorrosion agents containing silicates may have a negative effect on the service life of the axial-face seals. Such products should only be used for engines which separately mounted coolant pumps equipped with seals which are resistant to these chemical anticorrosion agents.

Filter systems are available as an alternative, capable of filtering out solid particles from the cooling circuit in addition to providing a protection against corrosion. These filters contain a chemical anticorrosion agent in solid form which is gradually dissolved in the cooling water.

Chemical anticorrosion agents and antifreezes as per Section 3.2 are compatible.

Not all chemical anticorrosion agents and antifreeze agents are compatible. Carcinogenic nitrosamines will form when mixing amine based chemical anticorrosion agents with nitrate based antifreeze agents. For compatibility please consult the manufacturer/ supplier. Most of the recommended chemical anticorrosion agents may be mixed with the antifreeze agent from DEUTZ antifreeze based on ethylene glycol) without incurring any risk.

3.2 Antifreeze agents with corrosion inhibitors

Antifreeze agents are generally used for DEUTZ engines only if ambient temperatures below zero are likely to occur. The antifreeze agent may be added to the chemical anticorrosion agent (manufacturer/supplier to be contacted for compatibility) or may be added to the water as the only protective agent against freezing and corrosion. Antifreeze agents based on ethylene glycol are used in general. The anticorrosive substances contained in the antifreeze are agents which prevent corrosion by forming a protective film on the surface of the components.

Provide for the following concentrations:

Antifreeze agent	10%	15%	20%	25%	30%	35%	40%	45%	50%
Water	90%	85%	80%	75%	70%	65%	60%	55%	50%
Antifreeze effective up to	-4 ºC	-7 ºC	-10 ºC	-13 ºC	-18 ºC	-22 ºC	-28 ºC	-35 ºC	-45 ºC

When the antifreeze agent is used as the only anticorrosion agent (without any chemical anticorrosion agent) it must be left in the coolant both during winter and summer time; minimum concentration 35%.

Use of antifreeze reduces the heat transfer coefficient (thermal capacity) of the coolant. Check whether the cooling circuit is laid out accordingly.

Admixture of a corrosion inhibiting oil emulsion is not permissible.

Best results are obtained with the **DEUTZ protective agent for cooling circuits** as an antifreeze with anticorrosion inhibitors. This ethylene glycol based protective agent for cooling circuits is matched to the materials used on DEUTZ medium and large size engines and is subject to permanent control and monitoring. This agent is obtainable from the Wärtsilä Netherlands service organisation and is supplied in form of

Description	Material number
5 litre containers	DZ01011490
20 litre containers	DZ01016416
210 litre barrel	DZ12211500

If the DEUTZ protective agent for the cooling circuit should not be available for important reasons such as supply restrictions abroad, other products may be used in exceptional cases. Such alternative products have been grouped together in product groups and are listed up in enclosure 1. Products of the same product group may be mixed. Products of different product groups may not be mixed. The entire cooling circuit must be cleaned thoroughly before a product change.

3.3 Corrosion inhibitors

Use of corrosion inhibiting oils is a problem because of the poor stability of the emulsion, the resulting difficulties in monitoring and the potential damage involved.

Corrosion inhibiting oils are emulsive mineral oils with additives which form a thin protective film on the components of the cooling circuit preventing corrosion and furring.

The emulsion must be prepared in a container outside the engine cooling water circuit adding the specified amount of corrosion inhibiting oil to the water stirring the mixture thoroughly. Concentration as specified by the manufacturer/supplier.

Loss of coolant to be made up for, excessively low concentrations of corrosion inhibiting oil to be compensated by adding a highly concentrated emulsion.

Corrosion inhibiting oils must not be used for:
- Cooling circuits with connection to a comfort heating system
- Gas engines

4. Details on cooling circuit

4.1 Monitoring of cooling circuit

The cooling circuit must be checked regularly (see current Operating Instructions) which includes checking for contamination and checking of the coolant level as well as the concentration of the protective agents of the cooling circuit.

- Chemical anticorrosion agent
  Check concentration; suitable tools for testing such as test rods are supplied by the manufacturers/suppliers.

- Antifreeze agent with corrosion inhibitors
  Check antifreeze and anticorrosion effects with antifreeze tester.

- Corrosion inhibiting oil
  Check concentration of corrosion inhibiting oil with refractometer, check condition of emulsion.

Renew coolant always in case of:
- Ingress of raw water
- Ingress of lube oil
- Pronounced turbidity due to corrosion residues or other suspended matter
- A spent corrosion inhibiting emulsion
- The antifreeze agent to be renewed every 2 years.

4.2 Cleaning of cooling circuit

The cooling circuit must be cleaned if contaminated, corrosion inhibiting oil emulsion is spent or in the case of lube oil or raw water ingress. The entire coolant must be drained in such as case and the cooling circuit must be flushed using a suitable detergent. The cooling circuit must also be cleaned when changing over to another type of protective agent for the cooling circuit.

Suitable detergents are offered on the market, suitability must be guaranteed by the manufacturer/ supplier, however.

4.3 Coolant disposal

The coolant must not be drained into the sewage system. Disposal to be taken care of by a company specialised in waste disposal in accordance with the national legal requirements and the instructions of the manufacturer/supplier.

For disposal of the DEUTZ protective agent for the cooling circuit within the Federal Republic of Germany please refer to Annex 3 (published in German only).

Ordering parts	According the standard ordering procedure as described in the engine specific parts catalogue.
Reporting	Reporting according Wärtsilä guidelines is mandatory. Send your work report to Wärtsilä Netherlands B.V. The adress is mentioned at frontpage bottom.
Applies to	All Wärtsilä – Deutz Marine engines.
Letter distribution	The Wärtsilä Service Network and all users/owners of Wärtsilä – Deutz Marine engines. (No paper copies distributed).
Feedback	E-mail to: service.sales.nl@wartsila.com
Letter validity	Herewith Technical Circular 0199-99-2091 4th exchange of 11.05.2001 has been cancelled.
Enclosure	Encl. 1: Recommended products, Protective agents for cooling circuit. Encl. 2: Technical Circular 0199-38-2115

Enclosure 1

Recommended Products
Protective agents for cooling circuits

Antifreeze Agents with Corrosion inhibitors

Product group A: for medium and large size engines
Product group B: for medium size engines

Product group	Manufacturer / Supplier	Product name	Notes / Available in
A	DEUTZ AG	Cooling system protective agent: Material number DZ01011490 Material number DZ01016416 Material number DZ12211500	 5 litre container 20 litre container 210 litre barrel
	ARAL	Antifreeze Extra	
	AVIA	Antifreeze APN	
	BASF	Glysantin G48/Protect Plus	
	BUCHER (Schweiz)	Motorex Antifreeze Protect Plus G48	
	INA Industrija	INA Antifriz AL Super	
	The Burma OIL	Castrol Antifreeze NF	
	FUCHS EUROPE	FUCHS FRICOFIN	
	TOTAL	ELF Glacelf MDX	
	OMV	OMV coolant plus	
	Shell	GlycoShell	
	VALVOLINE	G48 Antifreeze	
	Veedol	Veedol Antifreeze NF	
	BP	BP antif-frost Code No. X 2270 A	
	Hunold	Kühlerschutz ANF	
	INEOS	Napgel C2270/1	
	Mobil	Frostschutz 600	
B	AGIP	Antifreeze special	
	ARTECO / Texaco	Havoline XLC	Europe, South-America
	CALTEX	Havoline XLC	Asia, Australia
	ChevronTexaco	Chevron Extended Life Coolant	
	Orvema B.V.	Orvema Protex LL	Netherlands
	TOTAL	ELF Glacelf Auto Supra Total Organifreeze	
	Texaco USA	Havoline Extended Life Coolant (HELAC) Extended Life Coolant (TELC)	USA, w/o Nitrit and Molybdenum USA, with Nitrit

Chemical anticorrosion agents				
Manufacturer / Supplier	**Product name**	**Diesel engines:** D232, D234, D518, D601, D602, D603, D604(B), D616, D618, D620, D716, D816, D18/22, D2016	**Diesel engines:** D350, D358, D440, D441, D444, D484, D500, D501, D510, D511, D528, D540, D545, D628, D640, D645, PA6	**Notes**
BEDIA	Bedia Liquid BL1 *	-	X	
	Bedia BS/BT mit BP1 *	-	X	Filter systems
	Bedia BL2	X	X	
DREW AMEROID	DEWT-NC	-	X	Powder
	Liquidewt	-	X	
	Maxiguard	-	X	
Fuchs	FUCHS ANTICORIT S 2000 A		X	
Housemann Limited	Cooltreat 651 *	-	X	
NALFLEET	9-108	-	X	
	9-111 *	-	X	
	9-131 C	-	X	
REICON	ODACON Z	X	X	See enclosure 2
Perry (W. Lösing)	Liquid Perry * Perry Filter *	-	X	Filter systems
Texaco	Havoline XLI	X	X	
Total	Total WT Supra	X	X	
UNITOR ASA	Dieselguard NB Pulver	-	X	Not to be mixed with antifreeze agent
	ROCOR NB Liquid	-	X	
Vecom	CWT Diesel / QC 2	-	X	
* Product contains silicates				

Corrosion inhibiting oils (not for gas engines)			
Manufacturer / Supplier	**Product name**	**Diesel engines:** All Wärtsilä – Deutz Marine engines.	**Notes**
DEUTSCHE Castrol	CASTROL PRODUCT 481/43	X	
Deutsche Shell AG	Shell 9156	X	
ESSO AG	Kutwell 40	X	
Mobil	Coolant inhibitor	X	

Enclosure 2

Original Technical circular 0199-38-2115, dated 12.02.1999

Chemical anticorrosion agent for medium and big engines

The chemical anticorrosion agent **ODACON** ®Z released as alternative to the chemical anticorrosion agents previously approved for all medium and big engines (diesel and gas versions) in accordance with Technical Circular TR 0199-99-2091, 3rd Exchange. This product is obtainable from:

REICON® *Wärmetechnik und Wasserchemie Leipzig GmbH*
Lagerhofstraße 2
D-04103 Leipzig

Telephone	*: +49 (0)341/6491 20*
Fax	*: +49 (0)341/6491 260*
E-mail	*: info@reicon.de*
Internet	*: www.reicon.de*

ODACON ®Z forms a protective film on the metal surfaces and may be used in coo ling circuits without or with aluminium components. The sealing materials installed in DEUTZ medium and big engines are not attacked by **ODACON ® Z.** Simultaneous use of antifreeze agents on ethylene glycol basis (e.g. DEUTZ cooling system protection) is permissible. Mixing with other chemical anticorrosion agents is not permissible.

The agent is to be used and proportioned in accordance with the supplier's instructions. The **ODACON** ® Z active ingredient concentration should be determined by way of extra action analysis with the help of a colour comparison card or photometer. This should be done for the first time about 1 month after initial proportioning. Any replacement of components requires secondary proportioning.

It is mandatory to observe the supplier's instructions for disposal of **ODACON® Z.** It is possible to obtain a safety data sheet.