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07.08.2002

∅ H.van Bokhoven

APPROVAL Q8 MOZART KV SAE 40

Dear Mr. Hensen,

The results, obtained during the test run between 2000 and 2002 onboard the fishing vessel "GO-22" in our TBD 645 L6F engine operating on distillate fuels are positive.

So we are able to grant approval status (see Technical Circular 0199-99-2090, enclosed) for the lubricant Q8 Mozart KV SAE 40 to be used in all Deutz engines operating on distillate fuels and mentioned in enclosure 1 of the a.m. Technical Circular.

We intend to include your product in our lubricant list, see Technical Circular at the next update.

Please take into account that this approval is only valid as long as the formulation remains unchanged.

Best Regards,

i.V. Hartmut Haury

i. A. Sonja Adorf

enclosure: Technical Circular

DEUTZ AG
Deutz-Mülheimer Straße 147-149
51063 Köln

Technical Circular

0199 - 99 - 2090 en

5th Exchange

Product :

Medium-sized and large engines

Date : 28.03.2002

This Circular supersedes TC : *1

Copies to : 0080

- Service- Partners At Home and Abroad (subsidiaries, agencies, dealers)
- Service Centers At Home
- Pocket Book Holders
- Company Departments (02)
- Original equipment manufacturers (OEM) or end customers

Address:

Drawn up by : VS-TII 1 Phone: (0221) 822 - 3687
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Note : The part numbers indicated in this document serve technical explanation purposes. Exclusively the spare parts documentation is binding for the definition of spare parts.

Lube oil

The 5th exchange is being issued on account of:

- Complete revision, inclusion of the 1st supplement TBD 620 dated 04.04.2001
- Adaptation of the lube oil specifications
- Determination of the TBN value for engines with top ring
- Updating of the lube oil tables

Scope of application:

This Technical Circular applies to the following DEUTZ medium and big engines engines:
D/TBD 234, TBD 616, S/BAM 816, TBD 604, TBD 604B, TBD 620,
S/BVM 628, R/S/BVM 640, TBD 645

Please proceed analogously for engines no longer included in the build program. In case you need further clarification, please contact your nearest DEUTZ SERVICE.

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*1 This TC supersedes TC 0199-2090, 4th Exchange from 22.11.1996, and the 1st supplement of the 4th exchange from 04.04.2001

Printed in Gemany 0312 0401

1 Lube oil grade

For the engines of series D/TBD 234, TBD 616, S/BAM 816, TBD 604, TBD 604B and TBD 620, lube oils according to the existing specifications have been determined. In Enclosure 2, some reference oils are indicated, with which positive operating results have been achieved.

For the use in engines of series S/B/BVM 628, R/S/BVM 640 and TBD 645, Enclosure 1 comprises reference lube oils. Here, The assignment depends on the fuel type of the engine.

Lube oils not indicated but having the same capacity level as those mentioned in Enclosure 1 and 2 can be used upon agreement with the oil producer and – compulsory during the warranty period – with the approval of DEUTZ.

The indicated lube oil grades are minimum requirements. Higher quality levels can be used.

It lies within the responsibility of the lube oil producer to guarantee a constant quality of the lube oil.

1.1 Engine series D/TBD 234, TBD 616, S/BAM 816, TBD 604, TBD 604B, TBD 620

The lube oils must at least meet the following lube oil specifications:

Engine	Lube oil specifications *2 ACEA	API
D/TBD 234 **S/BAM 816** **TBD 604** **TBD 604B**	E2-96, E3-96 E4-99, E5-99	CF, CF-4, CG-4, CH-4

TBD 616	Engine speed n > 2100/min	Lube oil quality grade **I**
	Engine speed n ≤ 2100/min	Lube oil quality grade **II**

TBD 620

Power group	Power range	eff. average pressure p_{me}	
Genset engines in cont. operation > 4 000 op. h/year	50 Hz: > 100 kW/cyl. 60 Hz: > 120 kW/cyl.	> 18,0 bar > 18,0 bar	Lube oil quality grade **I**
Genset engines in peak load operation > 1 000 op. h/year	50 Hz: > 110 kW/cyl. 60 Hz: > 126 kW/cyl.	> 19,8 bar > 19,0 bar	
Ship drive in rapid ferries and rapid commercial boats > 3 000 op. h/year	> 124 kW/cyl. n=1860/min > 120 kW/cyl. n=1800/min > 110 kW/cyl. n=1650/min	> 18,0 bar > 18,0 bar > 18,0 bar	
Ship drive for non-commercial ships (official ships, yachts) > 1 000 op. h/year	> 130 kW/cyl. n=1860/min > 127 kW/cyl. n=1800/min	> 19,0 bar > 19,0 bar	
All other engines			Lube oil quality grade **II**

Lube oil quality grade	Lube oil specifications *2	
I	ACEA E4-99	
II	ACEA E3-96, E5-02	API CF-4, CG-4, CH-4

*2 It is sufficient, if one of the mentioned specifications is met.

Some reference lube oils of lube oil quality grades **I** and **II** can be taken from Enclosure 2.

☞ In lube oil quality grade I, only fully or partly synthetic oils are permitted to be used.

1.2 Engine series S/BVM 628, R/S/BVM 640, TBD 645

For engines of series S/BVM 628, we recommend the use of fuels with a sulphur content of less than 0.2 % by weight to avoid the formation of glazing in the cylinder liners, preferably the use of lube oils of quality class API CG-4.

For operation with mixed fuel

- for engines with top ring, a TBN is absolutely required, i.e.
  TBD 645 = 50 mg/KOH/g
  R/S/BVM 640 = 40 mgKOH/g

- for all engines whose used oil analysis showed a low TBN, an oil with a TBN of 40 mgKOH/g or 50 mgKOH/g can be refilled, see section 3.2.

When the engine runs on mixed oil (heavy oil) whose sulphur content is > 0.2 % by weight, we recommend to contact the parent company as to whether a lube oil with lower TBN can be used.

When using anti-corrosive oil (emergency genset), contact the parent company.

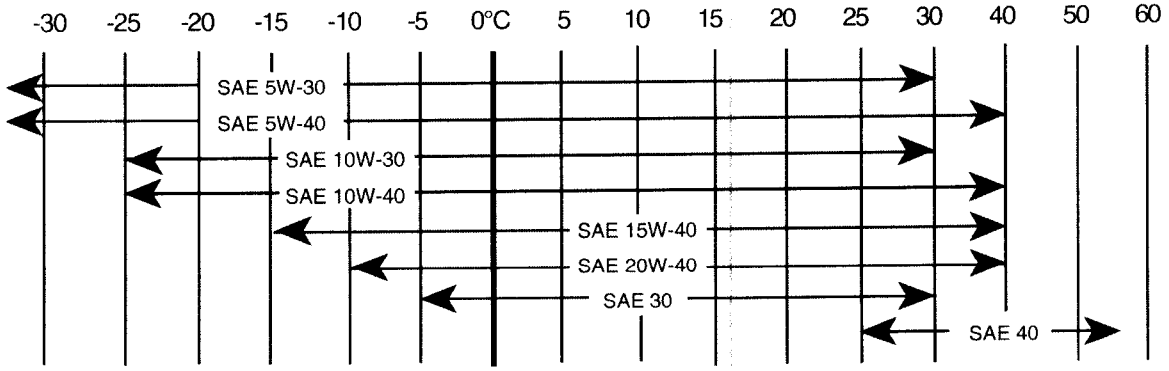
2 Lube oil viscosity

Selection of the lube oil viscosity shall be based on SAE-classification J 300 9/87 (Society of Automotive Engineers). Selection of the SAE-class does not give any indication of the oil grade.

2.1 Engine series D/TBD 234, TBD 616, S/BAM 816, TBD 604, TBD 604B, TBD 620

The ambient temperature is decisive for selection of the proper SAE-class. Multi-grade oils may be used for all-year application (summer and winter), e.g. SAE 15W-40.

Viscosity specification:



2.2 Engine series S/BVM 628, R/S/BVM 640, TBD 645

Generally for these engines viscosity class SAE 40 is specified. All-temperature oils SAL 10W-40 or 15W-40 can also be used, provided these oils are indicated in the list of lube oils or are equivalent.

The BVM 628 engines in operation, which were previously operated with a lube oil viscosity of SAE 30 (previous version: oil cooler upstream of charge air cooler), may be operated with SAE 40 or SAE 10W-40 or SAE 15W-40 as from now on.

3 Lube oil change intervals

The oil should be changed only with the engine warmed up to service temperature; the oil is then highly fluid and drains off much better.

3.1 Engine series D/TBD 234, TBD 616, S/BAM 816, TBD 604, TBD 604B, TBD 620

The first lube oil change after initial commissioning or re-commissioning following major repair work shall be effected after 50 running hours at the latest. Thereafter the following lube oil change intervals shall be adhered to:

Engine	Mounted centrifugal lube oil filter without		with	
	Type of fuel			
	Distillate fuel	MDF mixed oil ISO 8217 DMB	Distillate fuel	MDF mixed oil ISO 8217 DMB
D 234	500 op. hrs.	250 op. hrs.		
TBD 234	250 op. hrs.	125 op. hrs.		
TBD 616	250 op. hrs.	125 op. hrs.	500 op. hrs.	250 op. hrs.
S/BAM 816	250 op. hrs.		500 op. hrs.	
TBD 604/B	250 op. hrs.	125 op. hrs.	500 op. hrs.	250 op. hrs.
TBD 620	250 op. hrs.	125 op. hrs.	500 op. hrs.	250 op. hrs.

Oil change once a year at a minimum

The oil change interval may be extended depending on the engine operating mode and the lube oil grade. This must be determined by a series of used-oil analyses. The lube oil must be changed in any case if one of the following limit values is not reached or exceeded:

Kinematic viscosity at 100°C (DIN 51 562)	
Lube oil SAE 30, SAE ... W-30	min. 9,3 mm^2/s (cSt)
Lube oil SAE 40, SAE ... W-40	min. 12,5 mm^2/s (cSt)
Viscosity increase	max. 25% of value when new
Flash point (DIN EN 22719)	min. 180°C
Total contamination (DIN 51365 $\hat{=}$ centrifuge)	max. 2.0% by mass
Water content (DIN 51777)	max. 0.2% by mass
Total base number (DIN ISO 3771)	min. 50% of value when new

3.2 Engine series S/BVM 628, R/S/BVM 640, TBD 645

In the case of these engines, a lube ol change always takes place after a previous used oil analysis. Upon agreement with the mineral oil producer, the lube oil must be partly replaced or exchanged, if one of the limit values is exceeded or fallen below. For engines S/BVM 628 operated with distillate fule (entire oil volume in the oil pan), we generally recommend a lube oil change after 5 000 op. hours, irrespective of the result of the used oil analysis.
If, upon operation with mixed fuel, the TBN-value should fall below the indicated minimum value, refilling is possible with a lube oil having a TBN-value of 40 mgKOH/g or 50 mgKOH/g (freshening up), see section 1.2.

Kinematic viscosity at 100°C (DIN 51 562)	
Lube oil SAE 40	min. 12,5 mm^2/s (cSt)
Viscosity increase	max. 25% of value when new
Flash point (DIN EN 22719)	min. 180°C
Total contamination (DIN 51365 $\hat{=}$ centrifuge)	max. 1.5% by mass
Water content (DIN 51777)	max. 0.2% by mass
Total base number (DIN ISO 3771)	
with distillate fuel	min. 6 mgKOH/g
with mixed fuel with a sulphur content S $\leq$ 1% by wt.	min. 12 mgKOH/g
with mixed fuel with a sulphur content S > 1% by wt.	min. 18 mgKOH/g

3.3 Used-oil analysis

The oil sample shall be representative of the entire oil filling and shall be taken in good time before the oil change becomes due (see operation manual). It is best to start a series of analyses during or shortly after commissioning so as to define a possible variation of the lube oil depending on the duration of engine operation.
The oil analysis must be made for engines S/BVM 628 and R/S/BVM 640 at least every 500 operating hours, for engines TBD 645 at least every 1000 operating hours.

The used-oil analysis can be carried out in the laboratories of the oil producers, institutes or at DEUTZ.

The DEUTZ test kit allows quick determination of the lube oil grade. This quick test permits a trend definition of the lube oil variation. The DEUTZ test kit with part No. 1213 0382 is obtainable from your DEUTZ SERVICE.

4 Servicing of the engine-mounted lube oil filters

Lube oil filter servicing is to be carried out as follows (see also relevant operation manual):

• **D/TBD 234**	
Changing oil filter element	50 running hours after commissioning of new or overhauled engine, thereafter every 500 running hours, after 1 year at the latest
• **TBD 616**	
Changing oil filter element	50 running hours after commissioning of new or overhauled engine, thereafter every 500 running hours,
Cleaning centrifugal lube oil filter	50 running hours after commissioning of new or overhauled engine, thereafter every 250 running hours, at least after 1 year
• **TBD 604, TBD 604 B, TBD 620**	
Cleaning strainer Changing throw-away filter/element	} 50 running hours after commissioning of new or overhauled engine, thereafter every 500 running hours, at least after 1 year
Cleaning centrifugal lube oil filter	50 running hours after commissioning of new or overhauled engine, thereafter every 250 running hours, at least after 1 year
• **S/BAM 816**	
Cleaning strainer Changing throw-away filter/element	} 50 running hours after commissioning of new or overhauled engine, thereafter every 500 running hours
Cleaning centrifugal lube oil filter	50 running hours after commissioning of new or overhauled engine, thereafter every 250 running hours
• **S/BVM 628**	
Lube oil filter combination:	
- Operating edge-type filter	daily
- Cleaning filter chamber	every 1,500 running hours
- Paper filter: Changing paper element	50 running hours after commissioning of new or overhauled engine, thereafter when the permissible differential pressure is exceeded, at the latest after every 3,000 running hours with distillate fuel oper. 1,500 running hours with intermediate fuel oper.
Cleaning centrifugal lube oil filter	50 running hours after commissioning of new or overhauled engine, thereafter every 250 running hours

- **R/S/BVM 640, TBD 645**
  Cleaning strainer candles — 500 running hours after commissioning of new or overhauled engine, thereafter every 6000 running hours *

* For engine BVM 640 in standby < 300 op. hs./year after all 150 op. hs. at the latest 0,5 years.

The quoted service intervals are guide values. The service intervals may have to be reduced depending on the type of application and mode of operation of the engine.

5 Lube oil for seal oil system

For engines which are provided with a separate seal oil system (S/BVM 628, R/S/BVM 640) a lube oil with a low TBN should be used. Suitable lube oils may be taken from Enclosure 1. Lube oils conforming to comparable specifications not listed here are also permissible.

DEUTZ AG
Service-Technik

i.V. Sonntag
- Sonntag -

i.A. Asselborn
- Asselborn -

Lube oil table
S/BVM 628, R/S/BVM 640, TBD 645

Enclosure 1
TR 0199 - 99 - 2090
5th Exchange
03/2002

Producer	Engine lube oil				Lube oil for seal oil system	
	Fuel type *3					
	Distillate fuel and Mixed fuel (MDO; MDF) (Viscosity SAE 40 bzw. ...W-40)	TBN →	Mixed fuel (Heavy fuel) (Viscosity SAE 40)	TBN →	(Viscosity SAE 30) TBN →	
Agip	Agip CLADIUM 120	12	Agip CLADIUM 300 Agip CLADIUM 400	30 40	Agip ACER 100 Agip CLADIUM 50	- 5
Aral	Aral Turboral BM	15				
BP	BP Energol HPDX 40 BP Vanellus C3	12 10,5	BP Energol IC-HFX 304 BP Energol IC-HFX 404 BP Energol IC-HFX 504	30 40 50	BP Energol OE - HT 30	6
Castrol	Castrol MHP 154 Castrol CRD-DB 40 Castrol Seamax Extra 40	15,5 10,6 12	CASTROL TLX 304 CASTROL TLX 404 CASTROL TLX 504 CASTROL TLX 554	30 40 50 55	Castrol Marine CDX30	5
CEPSA			CEPSA Troncoil 3040 plus CEPSA Troncoil 4040 plus CEPSA Troncoil 5040 plus	30 40 50		
Chevron Caltex	Delo 1000 MARINE 40 *1	12	Delo 3000 MARINE 40 *1 Delo 3400 MARINE 40 *1	30 40	CHEVRON VERITAS 800 MARINE OIL SAE30	5
ESSO	ESSOLUBE XT 401 (SAE15W-40) EXXMAR CM Super 40	13,3 15	EXXMAR 30 TP 40 EXXMAR 40 TP 40	30 40	EXXMAR XA	6
TOTALFINAELF	Antar Traxolia Z Elf Performance Super D Elf Disola MT Fina Kappa Super Elf Disola M 4015 Fina Disola M 4015	11 11 11 11 14	Elf Aurelia 4030 Elf Aurelia 4040 Fina Aurelia 4030 Fina Aurelia 4040	30 40 30 40	FINA ALCANO 308	5
Fuchs Europe	Titan SDX Titan HD Superior	11 11			Renolin MR 30	4
Mobil	Mobilgard ADL Mobilgard HSD	16 10,5	Mobilgard 430 Mobilgard 440 Mobilgard 50 M Mobilgard SP 55	30 40 50 55	Mobilgard 300	6
Repsol YPF			Repsol YPF Neptuno NT 3000 Repsol YPF Neptuno NT 4000	30 40		
Shell	Shell Sirius FB Öl	13	Shell Argina T Öl 40 Shell Argina X Öl 40	30 40	Shell Melina S Öl 30	
Texaco	Taro 16 XD 40 Taro 16 XD 15W-40	16 16	Taro 30 DP 40 Taro 40 DP 40 Taro 50 XL 40	30 40 50	Doro AR 30	6

*3 Classification of the fuels as per TC 0199-99-2089

DEUTZ	**Lube oil table** **TBD 616, TBD 620**	Enclosure 2 TR 0199 - 99 - 2090 5th Exchange 03/2002

Lube oil quality grade	Lube oil specifications *4	Recommended lube oils
I	ACEA E4-99	Shell Rimula Ultra Super *5 Mobil Mobilgard 1 SHC *5 Mobil Delvac 1 SHC
II	ACEA E3-96, E5-02 API CF-4, CG-4, CH-4	Shell Rimula X Shell Sirius X BP Energol HPDX 40 Mobil Delvac XHP Texaco Ursa Super TD

*4 It is sufficient, if one of the indicated specifications is met.

*5 These oils are still being tested for engines TBD 616. Contact parent company