Operation manual

DEUTZ
DT43 DTA43
DT64 DTA64
DT67 DTA67
Operation manual

Serial numbers

Engine serial number Vetus: ____________________________

Deutz: ____________________________

Gearbox serial number: ____________________________

Please enter the serial numbers here. These numbers should be quoted when inquiring about Customer Service, Repairs or Spare Parts (see page 6).

We reserve the right to make any changes without previous notice.
Please read and observe the information given in this operation manual. This will enable you to avoid accidents, preserve the manufacturer’s warranty and maintain the engine in peak operating condition.

This engine has been built exclusively for the application specified in the scope of supply and is to be used only for the intended purpose. Any use exceeding that scope is considered to be contrary to the intended purpose. The manufacturer will not assume responsibility for any damage resulting therefrom. The risks involved are to be borne by the user.

Use in accordance with the intended purpose also implies compliance with the conditions laid down by the manufacturer for operation, maintenance and servicing. The engine should only be operated, maintained and serviced by persons which are familiar with the former and the hazards involved.

The relevant accident prevention guidelines and other generally accepted safety and industrial hygiene regulations must be observed.

Unauthorized engine modifications will invalidate any liability claims against the manufacturer for resultant damage.

Manipulations of the injection and regulating system may also influence the performance of the engine, and its emissions. Adherence to legislation on pollution cannot be guaranteed under such conditions.
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Dear customer,

Vetus Deutz engines are designed both for pleasure and commercial craft. Consequently, a wide range of variants are offered to meet the requirements of specific cases.

Your engine is appropriately equipped for your vessel, which means that not necessarily all components described in this manual are mounted to your engine.

We have endeavored to highlight any differences so that you will able to locate the operating and maintenance instructions relevant to your engine quickly and easily.

Please read this manual before starting your engine and always observe the operating and maintenance instructions.

We are available to help with any additional inquiries.

Sincerely,

Vetus den Ouden n.v.
Introduction

Safety measures

All safety instructions in this manual are designated by the accompanying symbol. Please follow them carefully.

Pass the safety instructions to other persons operating the engine as well.

General regulations and laws for safety and accident prevention must also be observed.

- Never attempt to touch moving parts when the engine is running.
- Never touch hot parts of the engine, and keep flammable materials well away from the engine.
- Always stop the engine before checking or adjusting components. Ensure that the engine can not be started by accident.
- Always stop the engine before checking or topping up the coolant or oil.
- NEVER open cap on top of header tank when the engine is at operating temperature.
- Always carry out maintenance safely by only using tools well matched in size.
Engine description

Model (A), Deutz engine serial number (B) and performance data are stamped on the engine data tag. Model and engine serial number must be given when ordering spare parts.

The Deutz engine data tag (C) is attached to the crankcase. The Vetus engine data tag (D) is attached to the flywheel housing.

The Deutz engine serial number is also stamped on the crankcase itself (arrow).
Cylinder numbering

Cylinders are numbered consecutively, beginning at the flywheel end.
Engine description

1. Oil filler cap
2. Lifting eye
3. Alternator
4. Pressure filler cap for cooling system
5. Expansion tank
6. Filler cap for cooling system
7. Water heater connection 'IN'
8. V-belt alternator
9. Coolant pump
10. V-belt fuel pump / coolant pump
11. P.T.O. (Mounting facility for extra belt pulley)
12. Fuel lift pump
14. Fuel filter
15. Lube Oil filter
16. Oil dipstick
17. Lube oil cooler
18. P.T.O. (Mounting facility for hydraulic pumps)
19. Raw water inlet 32 mm diam.
20. Raw water pump
21. Circuitbreaker
22. Electrical system connector
23. Connection for throttle push-pull cable
Identification of engine parts

Starter side DT43, DT64

Engine description

24 Manual operated stop
25 Fuel return pipe connection 10 mm diam.
26 Water heater connection ‘OUT’
27 Starter motor
28 Lifting eye
29 Exhaust injection bend
30 Turbocharger
31 Speed governor
32 Air intake filter
33 Gearbox lube oil cooler
34 Gearbox oil dipstick/filler cap
35 Connection for gearbox push–pull cable
36 Gearbox
37 Oil sump drain pump
38 Cooling system drain plug, heat exchanger cover
39 Cooling system drain plug, heat exchanger
40 Cooling system drain plug, block
41 Heat exchanger
Engine description

1. Oil filler cap
2. Lifting eye
3. Alternator
4. Pressure filler cap for cooling system
5. Expansion tank
6. Filler cap for cooling system
7. Water heater connection 'IN'
8. V-belt alternator
9. Coolant pump
10. V-belt fuel pump / coolant pump
11. P.T.O. (Mounting facility for extra belt pulley)
12. Fuel lift pump
14. Fuel filter
15. Lube Oil filter
16. Oil dipstick
17. Lube oil cooler
18. P.T.O. (Mounting facility for hydraulic pumps)
19. Raw water inlet 32 mm diam.
20. Raw water pump
21. Circuitbreaker
22. Electrical system connector
23. Connection for throttle push-pull cable

Identification of engine parts

Service side DTA43, DTA64
Identification of engine parts

Starter side DTA43, DTA64

Engine description

24 Aftercooler
25 Manual operated stop
26 Fuel return pipe connection 10 mm diam.
27 Water heater connection ‘OUT’
28 Starter motor
29 Lifting eye
30 Exhaust injection bend
31 Turbocharger
32 Speed governor
33 Air intake filter
34 Gearbox lube oil cooler
35 Gearbox oil dipstick/filler cap
36 Connection for gearbox push-pull cable
37 Gearbox
38 Oil sump drain pump
39 Cooling system drain plug, heat exchanger cover
40 Cooling system drain plug, heat exchanger
41 Cooling system drain plug, block
42 Heat exchanger

* See drawing on page 8 for identification; part numbers are identical.
Engine description

1. Oil filler cap
2. Lifting eye
3. Alternator
4. Pressure filler cap for cooling system
5. Expansion tank
6. Water heater connection 'IN'
7. V-belt alternator
8. Coolant pump
9. V-belt fuel pump / coolant pump
10. P.T.O. (Mounting facility for extra belt pulley)
11. Fuel lift pump
13. Fuel filter
14. Lube Oil filter
15. Oil dipstick
16. Lube oil cooler
17. P.T.O. (Mounting facility for hydraulic pumps)
18. Raw water inlet 32 mm diam.
19. Raw water pump
20. Circuitbreaker
21. Electrical system connector
22. Connection for throttle push-pull cable
23. Manual operated stop
Identification of engine parts

Starter side DT67

Engine description

24 Fuel return pipe connection 10 mm diam.
25 Water heater connection ‘OUT’
26 Starter motor
27 Lifting eye
28 Exhaust injection bend
29 Turbocharger
30 Speed governor
31 Air intake filter
32 Gearbox lube oil cooler
33 Gearbox oil dipstick/filler cap
34 Connection for gearbox push-pull cable
35 Gearbox
36 Oil sump drain pump
37 Cooling system drain plug, heat exchanger cover
38 Cooling system drain plug, heat exchanger
39 Cooling system drain plug, block
40 Heat exchanger
Engine description

1. Oil filler cap
2. Lifting eye
3. Alternator
4. Pressure filler cap for cooling system
5. Expansion tank
6. Water heater connection ‘IN’
7. V-belt alternator
8. Coolant pump
9. V-belt fuel pump / coolant pump
10. P.T.O. (Mounting facility for extra belt pulley)
11. Fuel lift pump
13. Fuel filter
14. Lube Oil filter
15. Oil dipstick
16. Lube oil cooler
17. P.T.O. (Mounting facility for hydraulic pumps)
18. Raw water inlet 32 mm diam.
19. Raw water pump
20. Circuitbreaker
21. Electrical system connector
22. Connection for throttle push–pull cable
23. Manual operated stop

Identification of engine parts

Service side DTA67
Identification of engine parts

Starter side DTA67

Engine description

24 Fuel return pipe connection 10 mm diam.
25 Water heater connection ‘OUT’
26 After-cooler
27 Vent plug after-cooler
28 Lifting eye
29 Starter motor
30 Exhaust injection bend
31 Turbocharger
32 Speed governor
33 Air intake filter
34 Gearbox lube oil cooler
35 Gearbox oil dipstick/filler cap
36 Connection for gearbox push-pull cable
37 Gearbox
38 Drain plugs raw water after-cooler
39 Oil sump drain pump
40 Cooling system drain plug, heat exchanger cover
41 Cooling system drain plug, heat exchanger
42 Cooling system drain plug, block
43 Heat exchanger
44 Lifting hook

* See drawing on page 13, part number 27, for identification.
Engine description

Basic panel (model 34)

Fly-bridge panel (model 22)

Control panels
**Control panels**

1. Tachometer/Operating hours counter
2. Voltmeter
3. Starter pre-heat switch/lock
4. Warning light high raw water temperature
5. Warning light low oil pressure
6. Warning light high coolant temperature
7. Warning light battery charging
8. Indicator light pre-heating
9. Warning light gearbox low oil pressure *

**Engine description**

10. Temperature gauge, coolant
11. Oil pressure gauge
12. On push button switch
13. Pre-heating push button switch
14. Starter push button switch
15. Stop push button switch

* This is an option, not fitted as standard.
General guidelines for use

Implementing the following recommendations will result in longer life and better performance and more economical operation of your engine.

- Carry out the maintenance described regularly, including the 'Daily procedures before starting'.

- Use anti-freeze in the engine coolant all year long, this helps prevent corrosion as well as protecting against frost damage. For specifications see page 78.

- Never run the engine without a thermostat.

- Use a good quality lubricating oil. For specifications see page 76.

- Use a good quality diesel fuel that is free of water and other pollutants.

- Always stop the engine immediately if one of the warning lamps for oil pressure, high coolant temperature, high raw water temperature or battery charging lights up.
Preparation

Preparation the engine for use

Before starting the engine for the first time, the following procedures must be carried out:

**Filling with engine oil**

- As a rule, engines are delivered empty of oil.
- Fill the engine with oil through the filler neck on top of the valve cover, for quantity and specification see page 76.
- Check the oil level with the dipstick*, see page 32.

* The dipstick must be calibrated see installation manual.

**Filling gearbox with oil**

- Fill the gearbox with oil, for quantity and specification, see page 76.
- Check the oil level with the dipstick, see page 46.
Use

Filling the cooling system DT43, DTA43, DT64, DTA64

Remove both the cap of the filler neck on the top of the header tank and the cap on top of the expansion tank.
Fill the cooling system up to the lower edge of filler neck.
Use a mixture of 40% antifreeze (ethylene-glycol based) and 60% tap water or use a special coolant.
For specifications see page 78.
Replace filler cap on header tank.

Continue filling into expansion tank; fill up to the 'MAXI' mark.
Replace the filler cap on expansion tank.
Bleeding will take place automatically during filling!

After the engine has run for the first time and has reached operating temperature and has cooled down again to ambient temperature, check the coolant level in the expansion tank. If necessary, add coolant.

Preparation

Water heater

If a water heater is connected to the engine and this heater is positioned above the upper side of the engine than bleeding of the heater will not take place automatically! Fill the heater separately to bleed the cooling system completely.

Never fill the cooling system with sea water or brackish water.
Preparation

Remove the cap of the filler neck on the top of the header tank.
Fill the cooling system.
Use a mixture of 40% antifreeze (ethylene-glycol based) and 60% tap water or use a special coolant.
For specifications see page 78.

The level of the coolant must be approx. 1 cm (3/8") below the lower edge of the filler neck on the header tank.
Replace the filler cap on header tank.
Bleeding will take place automatically during filling!

After the engine has run for the first time and has reached operating temperature and has cooled down again to ambient temperature, check the coolant level in the header tank. If necessary, add coolant.

Use

Water heater

If a water heater is connected to the engine and this heater is positioned above the upper side of the engine than bleeding of the heater will not take place automatically! Fill the heater separately to bleed the cooling system completely.

Never fill the cooling system with sea water or brackish water.
Use

Ensure that the fuel tank is filled with diesel fuel.
Use only clean, water-free, commercial approved diesel fuel.
For fuel grade see page 77.
The fuel system is self-bleeding.

Never fill the fuel tank while the engine is running. Do not spill fuel. Prevent unnecessary pollution.

Fuel

Other preparations

- Check battery and cable connections.
- Start the engine, see page 23, and let it run for about 10 minutes without load.
  Check the engine and all connections (fuel, cooling water and exhaust) for leaks.

Running-in

In order to ensure a long life for your engine, please observe the following for the first 50 operating hours:
- Allow the engine to reach operating temperature before applying a load.
- Avoid fast acceleration.
- Do not allow the engine to run faster than 3/4 of maximum RPM.

Preparation

Running-in
Starting

Before starting, **ALWAYS** check the following points:

- Engine oil level
- Coolant level
- Sea cock open
- Main switch 'ON'
- Gearbox in 'NEUTRAL' position.

**After repair work:**
Check that all guards have been replaced and that all tools have been removed from the engine.
When starting with glow plugs, do not use any other substance (e.g. injection with start pilot). Doing so could result in an accident.

**Electric starting**

Before starting the engine, always check that the control lever(s) is (are) in the **neutral position**.


Use

Set the control lever to 'half throttle' without engaging the gearbox.

**Never start the engine with the speed governor removed. Disconnect battery.**
Use

Starting, without pre-heating

Turn the start key on the instrument panel clockwise; the warning lights for oil pressure and alternator will now light up and the alarm buzzer will sound.

As standard Vetus Deutz engines are not equipped with a pre-heating system, therefore both the pre-heating indicator light and the pre-heating position of the key switch on the operating panel can be ignored.

Starting

Now turn the key further to the 'START' position.

Release the key as soon as the engine fires (the key will return to the 'ON' position) and throttle back. Leave the key in this position while the engine is running.
Starting

**WARNING**
Release the key if the engine does not fire within 10 seconds.
Wait until the starter motor has stopped running completely before turning the key to the 'START' position again.
Never allow the starter motor to run for more than 20 seconds consecutively.

Check that the indicator lights for oil pressure and alternator are off. Cooling water should now flow out of the exhaust; if this is not the case, stop the engine immediately.
Before submitting the engine to full load it should be brought up to operating temperature as quickly as possible by running at 3/4 of maximum revs.
NEVER turn the main switch off while the engine is running.

In case your Vetus Deutz engine is equipped with the optional automatic pre-heating system:
Turn the start key on the instrument panel clock-wise; the warning lights for oil pressure and alternator will now light up and the pre-heating indicator light will be lit now.
Leave to pre-heat until the pre-heating indicator light goes out.

Now turn the key further to the 'START' position.
Due to the automatic timer of the pre-heating system the pre-heating position of the key switch on the operating panel can be ignored.
Release the key as soon as the engine fires (the key will return to the 'ON' position) and throttle back.
Leave the key in this position while the engine is running.
Use

The instrument panel is provided with the following instruments (Depending of the type of panel, see page 16 and 17).

**WARNING**

NEVER turn the key to the 'START' position while the engine is running. Doing so will damage the starter motor.

**Tachometer**

Indicating the number of revolutions per minute of the engine.
Avoid idling for more than 10 minutes. Also the number of running hours is indicated.

Idling speed,
- DT43, DTA43: 720 - 770 rpm
- DT64, DTA64: 650 - 700 rpm
- DT67, DTA67: 600 - 650 rpm

**Voltmeter**

Indicating the battery voltage.
When the engine is running, the battery voltage should be between 12 and 14 Volts resp. between 24 and 28 Volts.
With the engine stopped and the start key in the first position, the voltmeter should indicate 12 Volts resp. 24 Volts.

**Cruising**
**Cruising**

**Temperature gauge**

Indicating the temperature of the internal cooling system.
The operating temperature is 83 - 85 °C.
In case the engine is overheated; turn off the engine and establish the cause, see fault finding table, page 65 .. 69.

**Oil pressure gauge**

With the engine at operating temperature the oil pressure is:
When idling: at least 0.8 bar (6 psi).
In case the oil pressure is too low; turn off the engine and establish the cause, see fault finding table, page 65 .. 69.

**Warning lights**

None of the five warning lights should light up while the engine is running. Oil pressure, battery charging and temperature indicator lights are all connected to an alarm buzzer. If this alarm buzzer sound while running, STOP THE ENGINE IMMEDIATELY!
Use

Reduce engine speed to idle and shift the gearbox to 'NEUTRAL'. Turn the key to the left to the 'OFF' position. If the engine is not to be used for some time, it is recommended that the sea cock is closed and the main switched off.

Never stop the engine immediately after it has been in operation for a long time. Allow the engine to idle for a few minutes before stopping.

N.B. The 'STOP' position, left of the 'OFF' position on the control panel, has normally no function for this engine. When 2 control panels are connected to one engine, the engine can always be stopped by turning the key to the 'STOP' position, no matter what the position is of the key on the other panel.

Stopping

On the engine itself stopping is possible by operating the mechanical shutdown lever on the fuel injection pump until the engine comes to a stand-still. If the fuel supply is not shut off by the electrically operated fuel solenoid stopping of the engine can be done this way.
Routine Maintenance

Introduction

The following guidelines should be observed for daily and periodic maintenance. Perform each function at the indicated time interval. The intervals stated are for normal operational conditions. Service the unit more frequently under severe conditions. Neglecting maintenance can result in faults and permanent damage to the engine.
## Routine Maintenance

<table>
<thead>
<tr>
<th>Every 10 hours or daily, before starting</th>
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<tr>
<td>Check coolant level</td>
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<tr>
<td>Check water strainer</td>
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<table>
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<th>After the first 50 hours 1)</th>
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<tr>
<td>Drain water from fuel filter</td>
<td>37</td>
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<tr>
<td>Engine oil change</td>
<td>40</td>
</tr>
<tr>
<td>Replace oil filter</td>
<td>40</td>
</tr>
<tr>
<td>Check V-belts</td>
<td>42</td>
</tr>
<tr>
<td>Check flexible engine mounts</td>
<td>45</td>
</tr>
<tr>
<td>Check gearbox oil level</td>
<td>46</td>
</tr>
<tr>
<td>Replace fuel filter</td>
<td>47</td>
</tr>
<tr>
<td>Check valve clearance</td>
<td>52</td>
</tr>
<tr>
<td>Check tightness of all fasteners, bolts and nuts 2)</td>
<td></td>
</tr>
<tr>
<td>Check engine for leaks</td>
<td></td>
</tr>
<tr>
<td>Check glow plugs (if installed)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Every 125 hours, at least once every year</th>
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</thead>
<tbody>
<tr>
<td>Drain water from fuel filter</td>
<td>37</td>
</tr>
<tr>
<td>Battery, cables and cable connections</td>
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</table>

## Maintenance schedule

<table>
<thead>
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<th>Every 500 hours, at least once every year</th>
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<tbody>
<tr>
<td>Engine oil change</td>
<td>40</td>
</tr>
<tr>
<td>Replace oil filter</td>
<td>40</td>
</tr>
<tr>
<td>Check V-belts</td>
<td>42</td>
</tr>
<tr>
<td>Check flexible engine mounts</td>
<td>45</td>
</tr>
<tr>
<td>Check gearbox oil level</td>
<td>46</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Every 1000 hours, at least once every 2 years</th>
<th>Page</th>
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<tr>
<td>Replace fuel filter</td>
<td>47</td>
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<tr>
<td>Raw water pump inspection</td>
<td>48</td>
</tr>
<tr>
<td>Gearbox oil change</td>
<td>50</td>
</tr>
<tr>
<td>Replace air cleaner</td>
<td>51</td>
</tr>
<tr>
<td>Check glowplugs (if installed), replace if required</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Every 1500 hours, at least once every 2 years</th>
<th>Page</th>
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</thead>
<tbody>
<tr>
<td>Check valve clearance</td>
<td>52</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Every 2000 hours, at least once every 2 years</th>
<th>Page</th>
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</thead>
<tbody>
<tr>
<td>Replace coolant 3)</td>
<td>54</td>
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</tbody>
</table>
Maintenance chart

The maintenance chart shown here is supplied as self-adhesive label with each engine. It should be affixed on the engine where it can be seen clearly. Check that this is the case.

If necessary, ask your engine supplier for another label.

Routine work should be carried out according to the schedule.

1) Commissioning new or overhauled engine
2) Re-tightening of cylinder head bolts is not required!
3) Cleaning of heat exchanger and aftercooler (if installed) is not required.

Stop the engine before carrying out any maintenance work.
**Maintenance**

**Check oil level**

Turn the engine off. The dipstick is located on the starboard side of the engine.

**Checking engine oil level**

Daily, before starting.

**Oil level**

The oil level must be between the two marks on the dipstick*. If necessary top up with the same brand and type of oil.

* The difference between the two oil level marks is:

- DT43, DTA43 : 1.5 litre
- DT64, DTA64 : 2 litres
- DT67, DTA67 : 3 litres
Checking engine oil level
Daily, before starting.

Topping up oil
The oil filling cap is on top of the valve cover.
Maintenance

Checking coolant level  DT43, DTA43, DT64, DTA64

Daily, before starting.

Check the coolant level in the expansion tank.
This has to be checked when the engine is cold.

Coolant level

The level of the coolant must be between the two marks 'MAXI' and 'MINI'.

Topping up coolant

If necessary, top up.
The internal cooling system can be filled with a mixture of anti-freeze (40 %) and tap water (60 %) or with a special coolant. For specification, see page 78

Warning

Never open the cap on the header tank when the engine is at operating temperature.

Never fill the cooling system with sea water or brackish water.
Checking coolant level  DT67, DTA67
Daily, before starting.

Check the coolant level in the header tank.
This has to be checked when the engine is cold.
Remove the cap of the filler neck on the header tank.

Warning
Never open the cap on the header tank when the engine is at operating temperature.

Coolant level
The level of the coolant must be approx. 1 cm (3/8") below the lower edge of the filler neck.

Topping up coolant
If necessary, top up. The internal cooling system can be filled with a mixture of anti-freeze (40 %) and tap water (60 %) or with a special coolant. For specification, see page 78.

Maintenance

Warning
Never fill the cooling system with sea water or brackish water.
Maintenance

Checking the raw water strainer

Check daily whether there is any dirt in the raw water strainer.

Cleaning the strainer

Close the seacock before removing the lid of the water strainer.

Clean the raw water strainer as often as is necessary, depending on the pollution of the waterways, but at least once every 6 months.

A clogged raw water strainer will result in excessive temperatures or overheating of the engine coolant.

Check the sealing between the lid and housing after cleaning and re-assembling the strainer.

An improperly sealed lid will result in air sucked in by the sea water pump which again will result in overheating of the engine.
Draining of water from the water separator/fuel filter

Every 125 operating hours.

Empty water separator

Empty the separately installed water separator/fuel filter:
- Open the drain plug at the lower side of the filter.
- Drain the water and close the drain plug.

Note: The water separator is not within the scope of supply but installation is required!

Bleeding

The system doesn't need to be bled after the water separator/fuel filter has been drained.

The fuel system is self-bleeding. Operate the starter switch until the engine fires; release the starter switch if the engine does not fire within 20 seconds. Wait until the starter motor has stopped before making a new attempt to start the engine. Repeat the above if the engine cuts out after a short time.
**Maintenance**

Keep battery clean and dry.

Remove battery cables (negative first).

Clean battery posts (+ and –) and clamps and grease with acid-free and acid-resistant grease.

Ensure that clamps make good contact after reassembling. Hand tighten the bolts only.

---

**Battery, cables and connections**

Every 125 operating hours.

Vetus maintenance-free batteries

Every Vetus Maintenance-free battery has a hydrometer built into the cover. Visual inspection of the hydrometer will show one of three conditions:

- **Green dot visible** – State of charge 65 % or more.
- **Dark** – State of charge less than 65 %.

Recharge immediately.

- **Clear or light yellow** – Electrolyte level low.

In case of low level, caused by overcharging the battery for a long period of time with a voltage too high, replace battery. Check alternator and/or voltage regulator.

---

**Hydrometer operation**
Battery, cables and connections
Every 125 operating hours.

Conventional batteries
Checking electrolyte level
For conventional batteries it is required to check the electrolyte level regularly.
Remove vent caps (taking care no spark or open flame is nearby) and inspect the level.
Fluid should be 10 to 15 mm above top of all plates. If necessary top up with distilled water. Replace vent caps and charge the battery for 15 minutes at 15 - 25 Amps to mix electrolyte.

Conventional batteries
Checking specific gravity
Measure the electrolyte specific gravity of the individual cells with a commercial hydrometer.
The hydrometer reading (see table) indicates the state of charge.
Hydrometer reading of all cells should be at least 1.200 kg/l and show less than 0.050 kg/l between high and low. If not, recharge or replace battery.
During checking the temperature of the electrolyte should preferably be 20°C (68°F).

Maintenance

<table>
<thead>
<tr>
<th>Specific gravity</th>
<th>State of charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.28 kg/l</td>
<td>100 %</td>
</tr>
<tr>
<td>1.20 kg/l</td>
<td>50 %</td>
</tr>
<tr>
<td>1.12 kg/l</td>
<td>recharge</td>
</tr>
</tbody>
</table>

The gases emitted by the battery are explosive! Keep sparks and naked flames away from the battery!
Do not allow battery acid to come into contact with skin or clothing!
Wear protective goggles!
Do not rest tools on the battery!
Maintenance

Engine oil change

Change the engine oil every 500 hours of operation (together with engine oil filter replacement).

If the engine runs less than 500 hours during the year the oil should be changed at least once a year.

Run the engine for a few minutes before changing the oil; warm oil can be pumped out more easily.

Change the oil with a switched off engine at operation temperature. (Lube oil temperature approx. 80°C.)

Be aware of the risk of skin burning during draining the hot oil!

Used oil must be collected in a container for proper disposal according to laws and regulations.

Draining the oil

The pump for the oil sump is (normally) located at the heat exchanger side of the engine.
As an option, for twin engine installation, the pump may be located on the other side at one of the engines.

Removing the oil filter

Unscrew the oil filter, with commercial available tool, when all the oil has been pumped out.

Catch any dripping oil.

Beware of burns from hot oil.

40
Engine oil change

Every 500 operating hours.

Oiling the oil seal

Clean the contact surface of the gasket. Lubricate the oil seal of the new filter element with clean engine oil.

Oil filter installation

Install the filter in accordance with the instructions printed on the filter element housing.

Maintenance

Refilling with oil

Refill the engine with new oil (for specification see page 76) through the filler opening in the valve cover. For required amount of oil (oil filter included) see page 72.

Operate the engine at idling speed for a short period of time. Check for oil leaks whilst the engine is running.

Stop the engine. Allow 5 minutes for the oil to return to the sump. Check the oil level with the dipstick.
Maintenance

Inspect the belt for wear and tear (fraying and cracking). Belts which are in poor condition should be replaced.

Check tension and change belts only with the engine off. Refit belt guard, if provided.

Checking the V-belts
Every 500 operating hours.

Checking tension of the V-belt by applying moderate finger and thumb pressure. If the deflection of the belt is more than 9 - 11 mm (± 3/4"), using about 10 kg (20 lbs) thumb pressure, it should be tensioned.

Tensioning alternator V-belt
• First loosen both the alternator mounting bolts 1 and 2; then loosen the bolt 3 of the adjustment bracket and simultaneously keep the pinion 4 in the same position.
• Rotate the pinion 4 counter-clockwise until the tension of the belt is correct. Never apply a torque to the pinion of more than 28 Nm (max. belt force is achieved at about 22 Nm).
Checking the V-belts
Every 500 operating hours.

- Re-tighten the bolt ③ of the adjustment bracket.
- Then re-tighten both the alternator mounting bolts ① and ②.

⚠️ Check, tension and change belts only with the engine off. Refit belt guard, if provided.

Replacing alternator V-belt

- First loosen both the alternator mounting bolts ① and ⑦; then loosen the bolt ③ of the adjustment bracket and rotate the pinion ④ clockwise.
- Remove and replace belt.
- Tension the belt by rotating the pinion ④ counter-clockwise until the tension of the belt is correct. Never apply a torque to the pinion of more than 28 Nm (max. belt force is achieved at about 22 Nm).
- Re-tighten the bolt ③ of the adjustment bracket.
- Then re-tighten both the alternator mounting bolts ① and ②.
Maintenance

Tensioning V-belt of coolant and fuel pump
- Loosen bolts ① and ②.
- Rotate the tension device with the fuel pump in the direction of the arrow using a key in ③, square "3⁄16", until the tension of the belt is correct.
- Re-tighten bolts ① and ②.

Changing V-belt of coolant and fuel pump
- Loosen bolts ① and ②.
- Turn the tension device with the fuel pump in the direction of the arrow using a key in ③, square "3⁄16".
- Remove and replace belt.
- Rotate the tension device with the fuel pump in the opposite direction of the arrow using a key in ③, square "3⁄16", until the tension of the belt is correct.

Checking the V-belts
Every 500 operating hours.

Check, tension and change belts only with the engine off. Refit belt guard, if provided.
Flexible engine mounts
Every 500 operating hours.

Check the bolts which secure the damper element, de mount bolts to engine bed and the nuts at the adjustment spindle for tightness.

Inspect the rubber element of the engine support for cracks.
Also check the deflection of the damper element, the deflection influences the alignment of engine and propshaft! Re-align engine in case of doubt.
Maintenance

Unscrewing the dipstick

Unscrew the dipstick out of the gearbox housing.

Checking the oil level

Check the oil level by cleaning the dipstick and lowering it into the hole, without screwing it in. The oil level should be between the end and the notch in the dipstick. If necessary top up by pouring oil in the dipstick hole.

For oil type and specification, see page 76.

Gearbox oil level check

Every 500 operating hours.

As standard Vetus engines are equipped with Hurth gearboxes. Consult the Hurth Owners Manual for more details about care and maintenance.

In case your engine is equipped with another brand of gearbox follow the instructions given in the supplied owners manual for checking the oil level and other care and maintenance.
Fuel filter replacement
Every 1000 operating hours.

The fuel filter is to be replaced as a unit.

- Close the fuel stopcock.
- Remove the fuel filter, use a filter wrench.
- Catch any fuel.

Keep naked flames away when working on the fuel system. Do not smoke!

Fuel filter installation

- Clean any debris from the filter carrier rim.
- Lubricate the rubber gasket sparingly with clean engine oil.
- Fill the new filter with clean diesel fuel.
- Install the filter. When the rubber gasket touches the housing, apply another tightening of a half to three quarters of a turn by hand.
- Open fuel stopcock.
- Check for leaks.

Bleeding
After replacing the fuel filter, the system doesn’t need to be bled.
The fuel system is self-bleeding.
Maintenance

Raw water pump inspection

The rubber impeller of the outboard water pump is **not** proof against running dry. If the water supply has been blocked, it may be necessary to replace the impeller. Always carry a spare impeller on board.

Raw water pump inspection

Every 1000 operating hours.

Impeller removal

- Close the sea cock.
- Remove the cover of the pump by unscrewing the screws out of the housing.

Pump cover removal

Inspection where appropriate changing is as follows:

- Slide the impeller off of the shaft using a waterpump plier.
- Mark the impeller to ensure correct re-installation if it is to be re-used. The impeller must be installed in the same position as removed.
**Raw water pump inspection**

Every 1000 operating hours.

- Inspect the impeller for damage.
- Replace the impeller if necessary.

**Impeller inspection**

- Fit the impeller to the pump shaft. (if an existing impeller is re-used, install it in the same position as removed).
- The impeller should be lubricated with glycerin or a non-petroleum based lubricant such as a silicone spray before fitting it into the impeller housing.

**Re-install the impeller**

- Replace the cover with a new gasket.
- Check the water filter and open the sea cock.

**Replacing the pump cover**
Maintenance

Draining the oil

- Remove the dipstick.
- Drain the oil with the aid of a separate sump pump. Insert the suction hose of the sump pump in the dipstick hole. Push down the pump handle quickly and pull it up slowly.
- Remove the sump pump when all the old oil has been pumped out.

Changing the gearbox oil

Every 1000 operating hours.

Filling with new oil

- Refill the gearbox to the correct level via the dipstick opening. For oil specification see page 76.

As standard Vetus engines are equipped with Hurth gearboxes. Consult the Hurth Owners Manual for more details about care and maintenance.

In case your engine is equipped with another brand of gearbox follow the instructions given in the supplied owners manual for changing oil and other care and maintenance.
Combustion air intake
Every 1000 operating hours.

Air cleaner replacement
- The air cleaner is to be replaced as a unit.
- Loosen the clamp, securing the air cleaner housing, and loosen the hose clamp at the air intake.
- Install a new air cleaner and tighten the clamp again.

Inspection hose connections
- Inspect all hose connections of the air intake system.
  (Cracked hoses, loose hose clamps)

Maintenance

Never clean the air cleaner with petrol (gasoline) or hot fluids.
Maintenance

Checking/adjusting valve clearance

- Remove the two bolts out of the breather valve and swing the breather valve aside. (For convenience first remove the air cleaner.)
- Remove the air intake from after cooler (if installed).
- Remove rocker cover.
- Position crankshaft as per schematic.
- Before adjusting the valve clearance, allow the engine to cool down for at least 30 minutes. The oil temperature should be below 80°C (176°F).

Valve clearance:
- Inlet 0.3 ±0.1 mm
- Exhaust 0.5 ±0.1 mm

- Check valve clearance ① between rocker lever ② and valve stem ③ with feeler gauge ④.
Note: The clearance is correct if some resistance is felt when the feeler gauge is slipped in between the valve stem and rocker lever.

- Adjust valve clearance if necessary:
  - Release locknut ⑤.
  - Use screwdriver ⑥ to turn setscrew ⑦ so that the correct clearance is obtained after locknut ⑤ has been tightened.

- Check and adjust valve clearance on all remaining cylinders.
- Re-install rocker cover (use new cover if needed).
- Re-install air intake from aftercooler.
- Re-install breather valve.
Valve Clearance Adjustment Schematic

Crankshaft Position 1
Turn crankshaft until both valves in cylinder 1 overlap (exhaust valve about to close, inlet valve about to open). Adjust clearance of valves marked in black on schematic. Mark respective rocker arm with chalk to show that adjustment has been done.

Crankshaft Position 2
Turn crankshaft one full revolution (360°). Adjust clearance of valves marked in black on schematic.

Maintenance
Maintenance

Coolant replacement

The coolant has to be replaced every 2000 operating hours or at least once every two years.

N.B. Replacing the coolant may also be necessary as part of the winter storage procedure; in case that the coolant present in the cooling system offers insufficient protection for the winter.

Be aware of the risk of skin burning during draining the hot coolant! Used coolant must be collected in a container for proper disposal according to laws and regulations.

Coolant replacement

Every 2000 operating hours.

Draining of coolant

Remove the drain plugs from the engine block ① and heat exchanger ②. Remove the filler cap to vent the cooling system and check that all the coolant has been drained. After draining replace the drain plugs.
Coolant replacement DT43, DTA43, DT64, DTA64
Every 2000 operating hours.

Filling the cooling system
Remove both the cap of the filler neck on the top of the header tank and the cap on top of the expansion tank.
Fill the cooling system up to the lower edge of filler neck.
Use a mixture of 40% antifreeze (ethylene–glycol based) and 60% tap water or use a special coolant.
For specifications see page 78.
Replace filler cap on header tank.

Continue filling into expansion tank; fill up to the 'MAXI' mark.
Replace the filler cap on expansion tank.
Bleeding will take place automatically during filling!

Water heater
If a water heater is connected to the engine and this heater is positioned above the upper side of the engine than bleeding of the heater will not take place automatically! Fill the heater separately to bleed the cooling system completely.

Maintenance
After the engine has run for the first time and has reached operating temperature and has cooled down again to ambient temperature, check the coolant level in the expansion tank. If necessary, add coolant.

Never fill the cooling system with sea-water or brackish water.
Maintenance

Coolant replacement

The coolant has to be replaced every 2000 operating hours or at least once every two years.

N.B. Replacing the coolant may also be necessary as part of the winter storage procedure; in case that the coolant present in the cooling system offers insufficient protection for the winter.

Be aware of the risk of skin burning during draining the hot coolant! Used coolant must be collected in a container for proper disposal according to laws and regulations.

Draining of coolant

Remove the drain plugs from the engine block 1 and heat exchanger 2. Remove the filler cap to vent the cooling system and check that all the coolant has been drained. After draining replace the drain plugs.
Coolant replacement  \textit{DT67, DTA67}

Every 2000 operating hours.

Filling the cooling system

Remove the cap of the filler neck on the top of the header tank.
Fill the cooling system.
Use a mixture of 40\% antifreeze (ethylene-glycol based) and 60\% tap water or use a special coolant.
For specifications see page 78.

The level of the coolant must be approx. 1 cm (3/8") below the lower edge of the filler neck on the header tank.
Replace filler cap on header tank.
Bleeding will take place automatically during filling!

Water heater

If a water heater is connected to the engine and this heater is positioned above the upper side of the engine then bleeding of the heater will not take place automatically! Fill the heater separately to bleed the cooling system completely.

After the engine has run for the first time and has reached operating temperature and has cooled down again to ambient temperature, check the coolant level in the header tank. If necessary, add coolant.

Never fill the cooling system with sea-water or brackish water.
Winter lay-up

Fuel system

Drain the water from the water separator/fuel filter and the fuel tank. Ensure that the tank is completely filled with fuel.

Running with protective fuel mixture

Connect the fuel supply pipe to a can filled with a mixture of one (1) part of engine oil* to nine (9) parts of clean fuel**. Use this mixture to run the engine at no load for approx. 10 minutes. Stop the engine.

Winter storage procedure

* Engine oil with protective properties. E.g. Shell Super Diesel T 10W40
** Preferably water-free fuel. Collect some fuel from the return pipe, while engine is running.

Never run the engine under load with this mixture of fuel and oil.
Winter storage procedure

Lubrication system

With the engine still at operating temperature:
(If not, run the engine until warm, then turn off.)

Replace the oil filter and change the engine oil; use oil with protective properties. See page 76.

Raw water cooling system

Close the seacock before removing the lid of the water strainer.
If necessary, clean the raw water strainer.
Pour 1 litre (1/4 Imp.gal.) of anti-freeze into the water strainer and run the engine until the anti-freeze has disappeared into the cooling system. Take care that no anti-freeze is spilled into the waterway (anti-freeze is poisonous).

Check the seal between the lid and housing after cleaning and re-assembling the strainer.
An improperly sealed lid will result in air sucked in by the raw water pump which again will result in overheating of the engine.
Winter lay-up

Fresh water cooling system

To avoid corrosion during winter storage the cooling system must be filled with an antifreeze/water mixture (or a coolant). For specifications see page 78.

N.B. Replacing the coolant is only necessary if the coolant present in the cooling system offers insufficient protection for the winter.

For coolant replacement see page 54.

Electrical system

Disconnect the battery cables.

Charge batteries during winter lay-up regularly if required!
Recommissioning after winter storage

1. Check that the lid of the raw water strainer is reinstalled.

2. Check that the lid of the raw water pump and drain plugs are reinstalled. (pages 48, 49)

3. Re-tighten possible loose hose clamps.

Winter lay-up

4. Open the sea cock.

5. Check the coolant level. (page 34)

6. Check the engine oil level. (page 32)
**Winter lay-up**

1. Drain the water from the water separator/fuel filter. (page 37)
2. Drain the water from the fuel tank.
3. Install a new fuel filter. (page 47)

**Recommissioning after winter storage**

1. Open the fuel valve.
2. Make sure that the batteries are fully charged. (page 38)
3. Connect the batteries.
Recommissioning after winter storage

13
Start the engine.
Check the fuel system, the cooling system and the exhaust for leakage.

14
Stop the engine and change the oil of the gearbox. (page 50)

15
Check the operation of the instruments, the remote control and the gearbox.

Winter lay-up
Troubleshooting

Engine faults are in most cases caused by improper operation or insufficient maintenance.

In case of a fault, always check first that the operation and maintenance instructions have been followed.

In the following tables is information given about the possible causes of faults and suggested remedies. Please note that this tables can never be complete.

If you are unable to identify the cause of the fault or to rectify it yourself, then contact the nearest service representative.

Before starting, make sure that nobody is in the immediate vicinity of the engine.
When carrying out repair, never start the engine with speed governor removed. Disconnect battery!
Fault finding table

1 Engine will not crank

<table>
<thead>
<tr>
<th>Possible fault</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faulty or discharged battery.</td>
<td>Check / recharge battery and check engine alternator and/or battery charger.</td>
</tr>
<tr>
<td>Loose or corroded connections in starting circuit.</td>
<td>Clean and tighten connections.</td>
</tr>
<tr>
<td>Faulty starter-switch or faulty starter-relay.</td>
<td>Check / replace.</td>
</tr>
<tr>
<td>Faulty starter-motor or pinion does not engage.</td>
<td>Check / replace starter-motor.</td>
</tr>
</tbody>
</table>

Troubleshooting

2 Engine cranks but will not start, no smoke from exhaust

<table>
<thead>
<tr>
<th>Possible fault</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel stop valve closed.</td>
<td>Open.</td>
</tr>
<tr>
<td>(Nearly) Empty fuel tank.</td>
<td>Refill.</td>
</tr>
<tr>
<td>Air in fuel system.</td>
<td>Check and bleed.</td>
</tr>
<tr>
<td>Fuel filter clogged with water and/or contamination.</td>
<td>Check or replace.</td>
</tr>
<tr>
<td>Leaking fuel supply line or fuel injection line.</td>
<td>Check / replace.</td>
</tr>
<tr>
<td>Faulty injector/injection pump.</td>
<td>Check, replace if required.</td>
</tr>
<tr>
<td>Engine shutdown lever in stop position, faulty fuel solenoid.</td>
<td>Check / replace.</td>
</tr>
<tr>
<td>Faulty V-belt fuel pump.</td>
<td>Replace V-belt.</td>
</tr>
<tr>
<td>Vent line of fuel supply tank clogged.</td>
<td>Check / clean.</td>
</tr>
<tr>
<td>Exhaust restricted.</td>
<td>Check.</td>
</tr>
</tbody>
</table>
### Troubleshooting

#### 3 Engine cranks but will not start, smoke from exhaust

<table>
<thead>
<tr>
<th>Possible fault</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Air in fuel system.</td>
<td>• Check and bleed.</td>
</tr>
<tr>
<td>• Faulty injector/injection pump.</td>
<td>• Check, replace if required.</td>
</tr>
<tr>
<td>• Faulty glow plugs (if installed) or below starting limit temperature.</td>
<td>• Check / replace.</td>
</tr>
<tr>
<td>• Incorrect valve clearance.</td>
<td>• Adjust.</td>
</tr>
<tr>
<td>• Incorrect injection timing.</td>
<td>• Check / adjust.</td>
</tr>
<tr>
<td>• Insufficient intake air.</td>
<td>• Check / replace air intake filter.</td>
</tr>
<tr>
<td>• Wrong fuel quality or contaminated fuel.</td>
<td>• Check fuel. Drain and flush fuel tank. Replace with new fuel.</td>
</tr>
<tr>
<td>• Incorrect lube oil SAE class or quality for ambient temperature.</td>
<td>• Replace.</td>
</tr>
</tbody>
</table>

### Fault finding table

#### 4 Engine starts but runs unevenly (rough idling) or stalls

<table>
<thead>
<tr>
<th>Possible fault</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>• (Nearly) Empty fuel tank.</td>
<td>• Refill.</td>
</tr>
<tr>
<td>• Air in fuel system.</td>
<td>• Check and bleed.</td>
</tr>
<tr>
<td>• Fuel filter clogged with water and/or contamination.</td>
<td>• Check or replace.</td>
</tr>
<tr>
<td>• Leaking fuel supply line or fuel injection line.</td>
<td>• Check / replace.</td>
</tr>
<tr>
<td>• Faulty injector/injection pump.</td>
<td>• Check, replace if required.</td>
</tr>
<tr>
<td>• Faulty V-belt fuel pump.</td>
<td>• Replace V-belt.</td>
</tr>
<tr>
<td>• Vent line of fuel supply tank clogged.</td>
<td>• Check / clean.</td>
</tr>
<tr>
<td>• Fuel supply line restricted.</td>
<td>• Check / clean.</td>
</tr>
<tr>
<td>• Incorrect valve clearance.</td>
<td>• Adjust.</td>
</tr>
<tr>
<td>• Idle setting too low.</td>
<td>• Check / adjust.</td>
</tr>
<tr>
<td>• Exhaust restricted.</td>
<td>• Check.</td>
</tr>
<tr>
<td>• Wrong fuel quality or contaminated fuel.</td>
<td>• Check fuel. Drain and flush fuel tank. Replace with new fuel.</td>
</tr>
</tbody>
</table>
## Fault finding table

<table>
<thead>
<tr>
<th>Possible fault</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>· Air in fuel system.</td>
<td>· Check and bleed.</td>
</tr>
<tr>
<td>· Fuel filter clogged with water and/or contamination.</td>
<td>· Check or replace.</td>
</tr>
<tr>
<td>· Leaking fuel supply line or fuel injection line.</td>
<td>· Check / replace.</td>
</tr>
<tr>
<td>· Faulty injector/injection pump.</td>
<td>· Check, replace if required.</td>
</tr>
<tr>
<td>· Engine shutdown lever in stop position, faulty fuel solenoid.</td>
<td>· Check / replace.</td>
</tr>
<tr>
<td>· Faulty V-belt fuel pump.</td>
<td>· Replace V-belt.</td>
</tr>
<tr>
<td>· Oil level too high.</td>
<td>· Lower level.</td>
</tr>
<tr>
<td>· Incorrect valve clearance.</td>
<td>· Adjust.</td>
</tr>
<tr>
<td>· Exhaust restricted.</td>
<td>· Check / clean.</td>
</tr>
<tr>
<td>· Charge air (after)-cooler contaminated.</td>
<td>· Check / clean.</td>
</tr>
<tr>
<td>· Insufficient intake air.</td>
<td>· Check / clean.</td>
</tr>
<tr>
<td>· Faulty 'charge air pressure operated max. power output device'.</td>
<td>· Check or replace air intake filter.</td>
</tr>
<tr>
<td>· Leaking air intake manifold.</td>
<td>· Check / replace.</td>
</tr>
<tr>
<td>· Wrong fuel quality or contaminated fuel.</td>
<td>· Check fuel.</td>
</tr>
<tr>
<td>· Oil level too high.</td>
<td>· Drain and flush fuel tank. Replace with new fuel.</td>
</tr>
<tr>
<td>· Incorrect valve clearance.</td>
<td></td>
</tr>
<tr>
<td>· Exhaust restricted.</td>
<td></td>
</tr>
<tr>
<td>· Faulty quadruple.'charge air pressure operated max. power output device'.</td>
<td></td>
</tr>
<tr>
<td>· Leaking air intake manifold.</td>
<td></td>
</tr>
<tr>
<td>· Wrong fuel quality or contaminated fuel.</td>
<td></td>
</tr>
</tbody>
</table>

## Troubleshooting

### 6 Engine overheats

<table>
<thead>
<tr>
<th>Possible fault</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>· Faulty injector/injection pump.</td>
<td>· Check, replace if required.</td>
</tr>
<tr>
<td>· Oil level too high.</td>
<td>· Lower level.</td>
</tr>
<tr>
<td>· Oil level too low.</td>
<td>· Increase level.</td>
</tr>
<tr>
<td>· Faulty oil filter.</td>
<td>· Replace.</td>
</tr>
<tr>
<td>· Faulty turbocharger.</td>
<td>· Check / replace.</td>
</tr>
<tr>
<td>· Coolant pump defective.</td>
<td>· Check / clean.</td>
</tr>
<tr>
<td>· Coolant heat exchanger dirty.</td>
<td>· Clean.</td>
</tr>
<tr>
<td>· Vent pipe blocked.</td>
<td>· Check / clean.</td>
</tr>
<tr>
<td>· Coolant level too low.</td>
<td>· Check / top up.</td>
</tr>
<tr>
<td>· Sea cock closed.</td>
<td>· Open.</td>
</tr>
<tr>
<td>· Raw water strainer clogged.</td>
<td>· Check / clean.</td>
</tr>
<tr>
<td>· Leaking raw water intake system.</td>
<td>· Check / replace.</td>
</tr>
<tr>
<td>· Faulty thermostat.</td>
<td>· Check / replace.</td>
</tr>
<tr>
<td>· Faulty impeller raw water pump.</td>
<td></td>
</tr>
<tr>
<td>· Insufficient intake air.</td>
<td></td>
</tr>
<tr>
<td>· Leaking air intake manifold.</td>
<td></td>
</tr>
</tbody>
</table>

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Uitgevoerd Met DMC

CALAMUS® SL
### Troubleshooting

#### 7 Engine not firing on all cylinders

<table>
<thead>
<tr>
<th>Possible fault</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air in fuel system.</td>
<td>Check and bleed.</td>
</tr>
<tr>
<td>Fuel filter clogged with water and/or contamination.</td>
<td>Check or replace.</td>
</tr>
<tr>
<td>Leaking fuel supply line or fuel injection line.</td>
<td>Check / replace.</td>
</tr>
<tr>
<td>Faulty injector/injection pump.</td>
<td>Check, replace if required.</td>
</tr>
<tr>
<td>Faulty V-belt fuel pump.</td>
<td>Replace V-belt.</td>
</tr>
<tr>
<td>Fuel supply line restricted.</td>
<td>Check / clean.</td>
</tr>
<tr>
<td>Faulty glow plugs (if installed) or below starting limit temperature.</td>
<td>Check / replace.</td>
</tr>
<tr>
<td>Incorrect valve clearance.</td>
<td>Adjust.</td>
</tr>
</tbody>
</table>

#### 8 Engine has little or no oil pressure

<table>
<thead>
<tr>
<th>Possible fault</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil level too low.</td>
<td>Increase level.</td>
</tr>
<tr>
<td>Excessive inclination of engine.</td>
<td>Check / Adjust.</td>
</tr>
<tr>
<td>Incorrect lube oil SAE class or quality for ambient temperature.</td>
<td>Replace.</td>
</tr>
</tbody>
</table>

### Fault finding table

#### 9 Engine oil consumption excessive

<table>
<thead>
<tr>
<th>Possible fault</th>
<th>Remedy</th>
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<tbody>
<tr>
<td>Oil level too high.</td>
<td>Lower level.</td>
</tr>
<tr>
<td>Excessive inclination of engine.</td>
<td>Check / Adjust.</td>
</tr>
<tr>
<td>Incorrect lube oil SAE class or quality for ambient temperature.</td>
<td>Replace.</td>
</tr>
</tbody>
</table>
### Fault finding table

#### 10A Blue exhaust smoke (idling)

**Possible fault**
- Oil level too high.
- Excessive inclination of engine.
- Leaking turbocharger oil seal.

**Remedy**
- Lower level.
- Check / Adjust.
- Check / replace oil seal.

#### 10B Black exhaust smoke (at load)

**Possible fault**
- Faulty turbocharger.
- Charge air (after)—cooler contaminated.
- Insufficient intake air.
- Faulty 'charge air pressure operated max. power output device'.
- Leaking air intake manifold.

**Remedy**
- Check / replace.
- Check / clean.
- Check / replace air intake filter.
- Check / replace.
- Check / replace.

### Troubleshooting

#### 10C White exhaust smoke (at full load)

**Possible fault**
- Air in fuel system.
- Faulty injector/injection pump.
- Water in fuel system.
- Faulty glow plugs (if installed) or below starting limit temperature.
- Incorrect valve clearance.
- Incorrect injection timing.
- Wrong fuel quality or contaminated fuel.

**Remedy**
- Check and bleed.
- Check, replace if required.
- Check water separator.
- Adjust.
- Check / adjust.
- Check fuel. Drain and flush fuel tank. Replace with new fuel.
### Technical data

<table>
<thead>
<tr>
<th>Model</th>
<th>DT43</th>
<th>DTA43</th>
<th>DT64</th>
<th>DTA64</th>
<th>DT67</th>
<th>DTA67</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make</td>
<td>Vetus Deutz</td>
<td>BF4M 1012 E</td>
<td>BF4M 1012 EC</td>
<td>BF6M 1012 E</td>
<td>BF6M 1012 EC</td>
<td>BF6M 1013 E</td>
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<td>Number of cylinders</td>
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<td>6</td>
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<tr>
<td>Based on Type</td>
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<td>BF4M</td>
<td>BF6M</td>
<td>BF6M</td>
<td>BF6M</td>
<td>BF6M</td>
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<td>Injection</td>
<td>4-stroke diesel, in-line</td>
<td>Direct</td>
<td></td>
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<tr>
<td>Aspiration</td>
<td>Turbo-charged</td>
<td>Turbo-charged/After cooled</td>
<td>Turbo-charged</td>
<td>Turbo-charged/After cooled</td>
<td>Turbo-charged</td>
<td>Turbo-charged/After cooled</td>
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<tr>
<td>Bore</td>
<td>94 mm</td>
<td>94 mm</td>
<td>94 mm</td>
<td>94 mm</td>
<td>108 mm</td>
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<tr>
<td>Stroke</td>
<td>115 mm</td>
<td>115 mm</td>
<td>115 mm</td>
<td>115 mm</td>
<td>130 mm</td>
<td>130 mm</td>
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<tr>
<td>Total displacement</td>
<td>3192 cm³</td>
<td>3192 cm³</td>
<td>4788 cm³</td>
<td>4788 cm³</td>
<td>7146 cm³</td>
<td>7146 cm³</td>
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<tr>
<td>Compression ratio</td>
<td>17.5 : 1</td>
<td>17.5 : 1</td>
<td>17.5 : 1</td>
<td>17.5 : 1</td>
<td>17.6 : 1</td>
<td>17.6 : 1</td>
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<tr>
<td>Idling speed</td>
<td>720 rpm</td>
<td>720 rpm</td>
<td>650 rpm</td>
<td>650 rpm</td>
<td>600 rpm</td>
<td>600 rpm</td>
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<tr>
<td>Max. no. of revolutions at no load</td>
<td>2950 rpm</td>
<td>2950 rpm</td>
<td>2950 rpm</td>
<td>2950 rpm</td>
<td>2900 rpm</td>
<td>2900 rpm</td>
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<td>Valve Clearances (cold)</td>
<td>Inlet 0.3 ±0.1 mm</td>
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<tr>
<td>Weight (with standard gearbox)</td>
<td>480 kg</td>
<td>505 kg</td>
<td>605 kg</td>
<td>630 kg</td>
<td>695 kg</td>
<td>755 kg</td>
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### Engine specifications

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<th>Model</th>
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<th>DTA64</th>
<th>DT67</th>
<th>DTA67</th>
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</thead>
<tbody>
<tr>
<td><strong>Maximum Output</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Heavy Duty (ISO 3046/ICFN)</td>
<td>58 kW (78 hp)</td>
<td>72 kW (97 hp)</td>
<td>85 kW (114 hp)</td>
<td>106 kW (142 hp)</td>
<td>123 kW (165 hp)</td>
<td>148 kW (198 hp)</td>
</tr>
<tr>
<td>at no. of revolutions</td>
<td>2500 rpm</td>
<td>2500 rpm</td>
<td>2500 rpm</td>
<td>2500 rpm</td>
<td>2300 rpm</td>
<td>2300 rpm</td>
</tr>
<tr>
<td>Light Duty Commercial (ISO 3046/IOFN)</td>
<td>65 kW (87 hp)</td>
<td>78 kW (105 hp)</td>
<td>98 kW (131 hp)</td>
<td>118 kW (158 hp)</td>
<td>141 kW (189 hp)</td>
<td>174 kW (233 hp)</td>
</tr>
<tr>
<td>at no. of revolutions</td>
<td>2500 rpm</td>
<td>2500 rpm</td>
<td>2500 rpm</td>
<td>2500 rpm</td>
<td>2444 rpm</td>
<td>2444 rpm</td>
</tr>
<tr>
<td>Special Light Duty (ISO 3046/IOFN)</td>
<td>78 kW (105 hp)</td>
<td>94 kW (126 hp)</td>
<td>117 kW (157 hp)</td>
<td>141 kW (189 hp)</td>
<td>170 kW (228 hp)</td>
<td>210 kW (282 hp)</td>
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<tr>
<td>at no. of revolutions</td>
<td>2650 rpm</td>
<td>2650 rpm</td>
<td>2650 rpm</td>
<td>2650 rpm</td>
<td>2600 rpm</td>
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### Technical data

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<tr>
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<tr>
<td>At max. power and max. rpm for Heavy Duty</td>
<td>230 g/kWh</td>
<td>225 g/kWh</td>
<td>230 g/kWh</td>
<td>225 g/kWh</td>
<td>220 g/kWh</td>
<td>215 g/kWh</td>
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## Technical data

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<th>DTA64</th>
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<tbody>
<tr>
<td><strong>Fuel System (Self-bleeding)</strong></td>
<td></td>
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</tr>
<tr>
<td>Injection pump</td>
<td></td>
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<tr>
<td>Injectors</td>
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<tr>
<td>Injector opening pressure</td>
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<td>1-5-3-6-2-4</td>
<td>1-5-3-6-2-4</td>
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<td>Injection timing</td>
<td>11° BTDC</td>
<td>11° BTDC</td>
<td>9° BTDC</td>
<td>11° BTDC</td>
<td>9° BTDC</td>
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<td>Fuel lift pump</td>
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<td>Suction height</td>
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</tr>
<tr>
<td>Pressure loss</td>
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<tr>
<td>Fuel supply connection</td>
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<tr>
<td>Length fuel line</td>
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</tr>
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<td>Return flow</td>
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<td></td>
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<tr>
<td><strong>Oil Lubrication System</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Oil capacity, max.</td>
<td>8.5 litres</td>
<td>8.5 litres</td>
<td>14 litres</td>
<td>14 litres</td>
<td>16 litres</td>
<td>16 litres</td>
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<td>15.5 litres</td>
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<tr>
<td>Oil temperature in oil pan</td>
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## Engine specifications

<table>
<thead>
<tr>
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<tbody>
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<td><strong>Fuel System (Self-bleeding)</strong></td>
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<tr>
<td>Injectors</td>
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</tr>
<tr>
<td>Injector opening pressure</td>
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<td>Firing order</td>
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<td>Injection timing</td>
<td>11° BTDC</td>
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<tr>
<td>Return flow</td>
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<tr>
<td><strong>Oil Lubrication System</strong></td>
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<tr>
<td>Oil capacity, max.</td>
<td>8.5 litres</td>
<td>8.5 litres</td>
<td>14 litres</td>
<td>14 litres</td>
<td>16 litres</td>
<td>16 litres</td>
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<tr>
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<td>9.5 litres</td>
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<tr>
<td>Oil pressure with warm oil (120°C) and low idle</td>
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<tr>
<td>Oil temperature in oil pan</td>
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8
## Engine specifications

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<tr>
<th>Model</th>
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<th>DTA64</th>
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<tbody>
<tr>
<td><strong>Cooling system</strong></td>
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<tr>
<td>Capacity, with heat exchanger</td>
<td>8 litres</td>
<td>8 litres</td>
<td>10.5 litres</td>
<td>10.5 litres</td>
<td>13.5 litres</td>
<td>13.5 litres</td>
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<tr>
<td>engine only (keelcooler version)</td>
<td>5.6 litres</td>
<td>—</td>
<td>7.3 litres</td>
<td>—</td>
<td>9.8 litres</td>
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<tr>
<td>Thermostat</td>
<td>opening at 83°C, fully opened at 95°C</td>
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<tr>
<td>Coolant pump,</td>
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</tr>
<tr>
<td>Flow</td>
<td>195 l/min</td>
<td>206 l/min</td>
<td>213 l/min</td>
<td>216 l/min</td>
<td>241 l/min</td>
<td>275 l/min</td>
</tr>
<tr>
<td>Total head</td>
<td>1.2 bar</td>
<td>1.3 bar</td>
<td>1.2 bar</td>
<td>1.2 bar</td>
<td>1.2 bar</td>
<td>2.0 bar</td>
</tr>
<tr>
<td>Raw water pump,</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Flow at max. engine rpm</td>
<td>85 l/min</td>
<td>85 l/min</td>
<td>105 l/min</td>
<td>105 l/min</td>
<td>125 l/min</td>
<td>125 l/min</td>
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<tr>
<td>Total head at max. flow</td>
<td>0.5 bar</td>
<td>0.6 bar</td>
<td>0.5 bar</td>
<td>0.6 bar</td>
<td>0.5 bar</td>
<td>0.6 bar</td>
</tr>
<tr>
<td>Impeller</td>
<td>STM8246</td>
<td>STM8246</td>
<td>STM8246</td>
<td>STM8246</td>
<td>STM8246</td>
<td>STM8246</td>
</tr>
<tr>
<td>Inlet connection</td>
<td>for hose 32 mm I.D.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater connection</td>
<td>M26 x 1.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Technical data

<table>
<thead>
<tr>
<th>Model</th>
<th>DT43</th>
<th>DTA43</th>
<th>DT64</th>
<th>DTA64</th>
<th>DT67</th>
<th>DTA67</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Combustion air system / Exhaust system</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intake vacuum pressure</td>
<td>max. 65 mbar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turbo pressure at full load</td>
<td>max. 1.6 bar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exhaust diameter</td>
<td>90 mm</td>
<td>90 mm</td>
<td>100 mm</td>
<td>125 mm</td>
<td>125 mm</td>
<td>150 mm</td>
</tr>
<tr>
<td>Exhaust back pressure</td>
<td>at specified output max. 75 mbar</td>
<td></td>
<td>absolute maximum 150 mbar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td>DT43</td>
<td>DTA43</td>
<td>DT64</td>
<td>DTA64</td>
<td>DT67</td>
<td>DTA67</td>
</tr>
<tr>
<td>--------------</td>
<td>------</td>
<td>-------</td>
<td>------</td>
<td>-------</td>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td><strong>Electrical System</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td></td>
<td></td>
<td>12 Volts / 24 Volts, see alternator data plate</td>
<td>14 Volts, 95A /28 Volts, 55 A, see alternator data plate.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Battery capacity</td>
<td></td>
<td></td>
<td>min. 88 Ah, max. 176 Ah (at 12 Volts) / min. 2 x 66 Ah, max. 2 x 110 Ah (at 24 Volts)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>V-belts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternator</td>
<td>VD40067</td>
<td>VD40067</td>
<td>VD40067</td>
<td>VD40067</td>
<td>VD40067</td>
<td>VD40067</td>
</tr>
<tr>
<td>Tension</td>
<td>Pre-tension 400 N / Re-tension 250 ±50 N</td>
<td>Pre-tension 400 N / Re-tension 250 ±50 N</td>
<td>Pre-tension 400 N / Re-tension 250 ±50 N</td>
<td>Pre-tension 400 N / Re-tension 250 ±50 N</td>
<td>Pre-tension 400 N / Re-tension 250 ±50 N</td>
<td>Pre-tension 400 N / Re-tension 250 ±50 N</td>
</tr>
<tr>
<td>Fuel pump – Coolant pump</td>
<td>VD40069</td>
<td>VD40069</td>
<td>VD40069</td>
<td>VD40069</td>
<td>VD40068</td>
<td>VD40068</td>
</tr>
<tr>
<td>Tension</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Engine installation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. installation angle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. athwartships angle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 degrees backwards</td>
<td>25 degrees continuously, 30 degrees intermittend</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gearbox, standard</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hurth type</td>
<td>HSW450</td>
<td>HSW450</td>
<td>HSW450</td>
<td>HSW630</td>
<td>HSW800</td>
<td>HSW800</td>
</tr>
<tr>
<td>Gear ratio</td>
<td>1.25/1.5/2.0 :1</td>
<td>1.25/1.5/2.0 :1</td>
<td>1.25/1.5/2.0 :1</td>
<td>1.2/1.6/2.0/2.5 :1</td>
<td>1.2/1.6/2.0 :1</td>
<td>1.57/1.96 :1</td>
</tr>
</tbody>
</table>
## Torque wrench settings

<table>
<thead>
<tr>
<th>Screw connection</th>
<th>Size</th>
<th>Class</th>
<th>Torque [Nm]</th>
<th>Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil pan</td>
<td>M8x16</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil drain plug</td>
<td>M18x1.5</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cylinder head,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- long bolts</td>
<td>M12x200</td>
<td>10.9</td>
<td>30/80 90°</td>
<td></td>
</tr>
<tr>
<td>- short bolts</td>
<td>M12x120</td>
<td>10.9</td>
<td>30/80 90°</td>
<td></td>
</tr>
<tr>
<td>Lifting eye / Cyl.head</td>
<td>M8x20</td>
<td>8.8</td>
<td>40.5 ±10%</td>
<td></td>
</tr>
<tr>
<td>Rocker cover</td>
<td>M6x75</td>
<td>10.9</td>
<td>8.5 ±10%</td>
<td></td>
</tr>
<tr>
<td>Rocker arm set-screw</td>
<td>M8x60</td>
<td>8.8</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Flange injection pump</td>
<td>M8x30</td>
<td>10.9</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Injector holder (Torx)</td>
<td>M6x50</td>
<td>10.9</td>
<td>16 ±5</td>
<td></td>
</tr>
<tr>
<td>Fuel lift pump / Clamping strap</td>
<td>M8x20</td>
<td>10.9</td>
<td>21 ±2</td>
<td>A4C</td>
</tr>
<tr>
<td>Pulley fuel lift pump</td>
<td>M8x20</td>
<td>8.8</td>
<td>21 ±2</td>
<td></td>
</tr>
<tr>
<td>Screw, banjo connector fuel line</td>
<td>M14x1.5</td>
<td>39</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Injection line mounting</td>
<td>M14x1.5</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermostat housing</td>
<td>M8x35</td>
<td>10.9</td>
<td>21 ±10%</td>
<td></td>
</tr>
<tr>
<td>Air Intake Manifold (AIM)</td>
<td>M6x75</td>
<td>10.9</td>
<td>8.5 ±10%</td>
<td></td>
</tr>
<tr>
<td>Cover (AIM),</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- pre-tightening</td>
<td>M6x25</td>
<td>15</td>
<td>±10%</td>
<td></td>
</tr>
<tr>
<td>- re-tightening</td>
<td>M6x25</td>
<td>15</td>
<td>±10%</td>
<td></td>
</tr>
<tr>
<td>Plugs (AIM)</td>
<td>M10x1</td>
<td>13</td>
<td>±10%</td>
<td></td>
</tr>
<tr>
<td>Plugs (AIM)</td>
<td>M16x1.5</td>
<td>38</td>
<td>±10%</td>
<td></td>
</tr>
<tr>
<td>Plugs (AIM)</td>
<td>M18x1.5</td>
<td>50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Technical data

<table>
<thead>
<tr>
<th>Screw connection</th>
<th>Size</th>
<th>Class</th>
<th>Torque [Nm]</th>
<th>Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exhaust manifold / Cyl. head</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Stud</td>
<td>M10</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Lock nut</td>
<td>M8</td>
<td>25 ±10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turbocharger / Exhaust manifold</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 4 cyl.</td>
<td>M8 nuts</td>
<td>21 ±10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 6 cyl.</td>
<td>M8x35 heat resistant</td>
<td>21 ±10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turbocharger / Exhaust injection bend</td>
<td>M8 heat resistant</td>
<td>22 ±10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternator mounting</td>
<td>M8x80</td>
<td>10.9</td>
<td>21 ±10%</td>
<td></td>
</tr>
<tr>
<td>Starter</td>
<td>M10x55</td>
<td>10.9</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Engine bracket front</td>
<td>M16x75</td>
<td>8.8</td>
<td>187 ±10%</td>
<td></td>
</tr>
<tr>
<td>Engine bracket rear</td>
<td>M12x40</td>
<td>8.8</td>
<td>80 ±10%</td>
<td></td>
</tr>
<tr>
<td>Flywheel housing</td>
<td>M12x150</td>
<td>10.9</td>
<td>99 ±10%</td>
<td></td>
</tr>
<tr>
<td>Flywheel housing</td>
<td>M16x140</td>
<td>10.9</td>
<td>243 ±10%</td>
<td></td>
</tr>
</tbody>
</table>
Operating media

**Engine Lubricating Oil**

Only use a recognised brand of oil for lubricating the engine. Lube oils are differentiated according to their performance and quality class. In common use are specifications named after API (American Petroleum Institute) and CCMC (Committee of Common Market Automobile Constructors).

Approved API Oils: CD, CF, CE and CF4
Approved CCMC Oils: D4, D5

As the viscosity of lube oil is dependent on temperature, the oil viscosity (SAE grade) should be selected according to the ambient temperature when the engine is started. To avoid oil changes dictated by the seasons we advise one of the following multi-grade oils.

- SAE 10W40 for temperatures of -25°C up to +30°C
- SAE 15W40 for temperatures of -20°C up to +35°C

For example: Vetus Marine Inboard Motor Oil
Shell Super Diesel T

**Gearbox Lubricating Oil**

Only use a recognised brand of oil for lubricating the gearbox.

**Hurth:**
Transmission Oil Type A, Suffix A ATF (Automatic Transmission Fluid).

For example: Vetus Marine Gearbox Oil
Shell Donax T6
Gulf Dextron

Hurth type HSW450: 2.0 litres
Hurth type HSW630: 2.5 litres
Hurth type HSW800: 4.0 litres

**Other brands of gearboxes:**
See supplied owners manual for oil type and quantities.
Fuel

Fuel Quality Grade

Use commercially available diesel fuel with less than 0.5% sulfur content.
If the sulfur content is higher than 0.5%, the intervals between oil changes should be halved, e.g., change oil every 250 hours.
Don't use fuel with more than 1% sulfur!
The following fuel specifications/standards are approved:
• CEN EN 590 or DIN/EN 590 (under development)
• DIN 51 601 (Feb. 1986)
• BS 2869 (1988): A1 and A2
• ASTM D975–88; D1 and D2
• NATO Code F–54 and F75

The exhaust emission levels determined during certification by the supervising authority are always based on the reference fuel described by law.

Operating media

Winter-grade fuel

Waxing may occur at low temperatures, clogging the fuel system and reducing engine efficiency. If the ambient temperature is less than 0°C (+32°F), winter-grade fuel—suitable down to −15°C (+5°F)—should be used. This fuel is usually available from filling stations well in advance of the cold months. Diesel fuel containing additives (Super Diesel) is often on sale as well, for use down to −20°C (−4°F).
Operating media

Coolant fluid

The preparation and monitoring of coolant in inter-cooled engines is especially important because corrosion, cavitation and freezing can lead to engine damage. Use as coolant a mixture of a cooling system protective liquid (anti-freeze, ethylene glycol based) and tap water. The concentration of the cooling system protective liquid in the coolant should not fall below/exceed the following limits:

<table>
<thead>
<tr>
<th>Cooling system protective liquid (Anti-freeze)</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>max. 45 vol%</td>
<td>55%</td>
</tr>
<tr>
<td>min. 35 vol%</td>
<td>65%</td>
</tr>
</tbody>
</table>

Cooling system protection

<table>
<thead>
<tr>
<th>Cooling system protective liquid (Anti-freeze)</th>
<th>Protection against freezing to</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 vol%</td>
<td>−22 °C</td>
</tr>
<tr>
<td>40 vol%</td>
<td>−28 °C</td>
</tr>
<tr>
<td>45 vol%</td>
<td>−35 °C</td>
</tr>
</tbody>
</table>
Coolant

Cooling system protective liquid

As cooling system protective liquid use a ethylene-glycol based anti-freeze. This will give an adequate protection against corrosion, cavitation and frost damage.

In tropical climates, where anti-freeze availability may be limited, use a corrosion inhibitor to protect the engine cooling system.

The level of the cooling system must be monitored continuously, see page 34.

The protective liquid concentration must be maintained under all circumstances. Therefore if coolant must be added always use the same mixture of anti-freeze and tap water.

⚠️ Cooling system protective liquids must be disposed of in accordance with environmental regulations.

Never use sea-water or brackish water.

Operating media

Water quality for coolant preparation

Use preferably tap water.

If an other available fresh water is used; the values given below must not be exceeded.

<table>
<thead>
<tr>
<th>Water quality</th>
<th>min.</th>
<th>max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH-value at 20°C (68°F)</td>
<td>6.5</td>
<td>8.5</td>
</tr>
<tr>
<td>Chloride ion content [mg/dm³]</td>
<td>–</td>
<td>100</td>
</tr>
<tr>
<td>Sulfate ion content [mg/dm³]</td>
<td>–</td>
<td>100</td>
</tr>
<tr>
<td>Total hardness [degrees]</td>
<td>3</td>
<td>12</td>
</tr>
</tbody>
</table>

Never use sea-water or brackish water.
Options, panel 'model 22"

Starter switch

Tachometer/hour counter

Voltmeter

Electrical Circuit Diagram

Warning lights

- Battery charging
- Raw water temperature
- Oil pressure
- Coolant temperature
- Gearbox oil pressure

Pre-heating

Alarm buzzer

Plug

red
yellow
orange
purple
white
grey
white/brown
white/green
white/blue
black
pink
brown
green
blue
yellow/green

Voltmeter
Options, T-Connector & Cold Start Aid

Electrical Circuit Diagram

Panel side

Engine side

Glow plugs
Overall Dimensions

FUEL RETURN ø10

FUEL SUPPLY ø12

EXHAUST ø90
SEAWATER INTAKE ø32

HURTH HSW 450AII

DT43
Overall Dimensions

1:10
Overall Dimensions

EXHAUST Ø90
SEAWATER INTAKE Ø32

FUEL RETURN Ø10
FUEL SUPPLY Ø12

HURTH
HSW450AII 1120

1120
800
1197

86
Overall Dimensions

1 : 10
Overall Dimensions

- FUEL RETURN Ø10
- EXHAUST Ø100
- SEAWATER INTAKE Ø32
- HURTH HSW450AII

Dimensions:
- Fuel Supply: 520 mm
- Total Length: 1425 mm
- Engine Width: 760 mm
- Engine Height: 240 mm
- Intake Diameter: 32 mm
- Exhaust Diameter: 100 mm
- Fuel Return Diameter: 10 mm
Overall Dimensions

FUEL RETURN Ø10

EXHAUST Ø125
SEAWATER INTAKE Ø32

HURTH HSW630A

1425
1365
1028
940
90

240
810
570

FUEL SUPPLY Ø12
Overall Dimensions

1: 10
Overall Dimensions

- FUEL RETURN Ø10
- FUEL SUPPLY Ø12
- EXHAUST Ø125
- SEAWATER INTAKE Ø32
- HURTH HSW630A

Dimensions:
- Width: 290 mm
- Height: 580 mm
- Length: 1497 mm
Overall Dimensions

1 : 10
Overall Dimensions

- Fuel Return Ø10
- Exhaust Ø150
- Seawater Intake Ø32
- HURTH HSW 800A

Dimensions:
- 1504 mm
- 1147 mm
- 1059 mm
- 90 mm
- 140 mm
- 290 mm
- 915 mm
- 625 mm
Overall Dimensions

Overall Dimensions

1 : 10

95