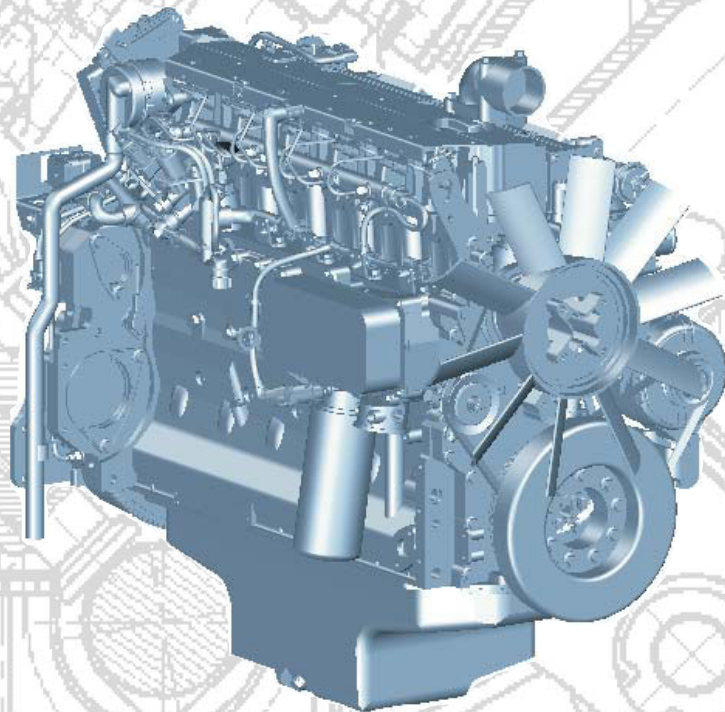


Operation Manual

**TD/TCD 2012 L04/06 2V/m**

**TCD 2013 L04/06 2V/m**



# Notes

## Notes

- This engine is defined exclusively for purpose according to the scope of delivery and built by the equipment manufacturer (use for the intended purpose). Any other use above and beyond this will be considered as misuse. The manufacturer will not accept any liability for damages resulting from this. The user bears the sole risk.
- Use for the intended purpose also includes observance of the operating, maintenance and repair conditions specified by the manufacturer. The engine should only be operated, serviced and repaired by personnel trained in its use and the hazards involved.

The pertinent rules for the prevention of accidents and other generally recognised safety and industrial medicine rules must be observed.
- When the engine is running there is a danger of injury caused by:
  - rotating and hot components
  - on motors with external ignition (high electrical voltage). Contact must be avoided!
- Unauthorised engine modifications will invalidate any liability claims against the manufacturer for resultant damage.
- Equally, manipulations to the injection and control system can affect the engine's performance and the exhaust characteristics. Adherence to legislation on pollution can no longer be guaranteed under such conditions.
- Do not change the cooling air feed area to the blower of fan. An unobstructed cooling air supply must be guaranteed.

The manufacturer will accept no liability for damage resulting from this.
- When carrying out maintenance work on the en-

gine, the use of DEUTZ original parts is prescribed. These are specially designed for your engine and guarantee perfect operation.

Non-compliance results in the expiry of the warranty!

Maintenance/cleaning work on the engine may only be carried out when the engine is not running and has cooled down.

When doing this, make sure that the electrical system is switched off (remove ignition key).

The specifications for accident prevention with electrical systems (e.g. VDE-0100/-0101/-0104/-0105 Electrical protective measures against dangerous contact voltages) must be observed.

Cover all electrical components tightly when cleaning with liquids.

- Do not work on the fuel system while the engine is running - **Danger to life!**

Wait for the pressure to drop after the engine has come to a standstill (in engines with DEUTZ Common Rail about 5 minutes, otherwise 1 minute) because the system is under high pressure - **Danger to life!**

During the first trial run do not stand in the danger area of the engine.

Danger due to high pressure in case of leaks - **Danger to life!**

- In case of leaks immediately contact workshop.
- When working on the fuel system, make sure that the engine is not started inadvertently during repairs - **Danger to life!**

**Dear customer,**

Congratulations on the purchase of your DEUTZ engine.

DEUTZ air/liquid-cooled engines are developed for a broad spectrum of applications. Consequently, a wide range of variants is offered to meet the requirements of specific cases.

The engine is equipped accordingly for the particular installation situation, i.e. not all the components described in the operating manual are installed in your engine.

We have endeavoured to highlight any differences so that you will be able to locate the operating and maintenance instructions applicable to your engine more quickly and easily.

Please make sure that this operating manual is available to everyone involved in the operation, maintenance and repair of the engine and that they have understood the contents.

If you have any queries, please contact us, we'll be happy to advise you.

Sincerely,

DEUTZ AG

**Engine serial number**

Please enter the engine serial number here. This will simplify the handling of customer service, repair and spare parts queries.

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**Notes**

We reserve the right to make technical changes to the descriptions and data in this operating manual in the interest of further development of the engines.

This document may only be reprinted and reproduced, even in part, with our express permission.

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## DEUTZ diesel engines

DEUTZ diesel engines are the product of years of research and development. Profound know-how combined with high quality requirements are the guarantee for the production of engines with a long life, high reliability levels and low fuel consumption. Obviously the high requirements for the protection of the environment are also met.

## Safety precautions when the engine is running

Maintenance work or repairs may only be performed on the shut-down engine. Make sure that the engine cannot be started inadvertently - **Danger of accident!**

After repair work: Check that all guards have been replaced and that all tools have been removed from the engine.

Observe industrial safety regulations when running the engine in an enclosed space or underground.

When working on the running engine, work clothing must be close fitting.

Never fill the fuel tank while the engine is running.

## Service and Maintenance

Service and maintenance are also decisive for whether the engine satisfactorily meets the set demands. Recommended service intervals must therefore be observed and service and maintenance work must be carried out conscientiously.

Special care should be taken under abnormally demanding operating conditions.

## Original DEUTZ parts

Original DEUTZ parts are subject to the same strict quality demands as the DEUTZ engines. Further de-

velopments for improving the engines are also introduced in the original DEUTZ parts of course. Only the use of original DEUTZ parts manufactured according to the state-of-the-art can guarantee perfect functioning and high reliability.

## DEUTZ Xchange components

DEUTZ replacement parts are a low-cost alternative. Of course, the quality standards here are just as high as for new parts. DEUTZ replacement parts are equal to the original DEUTZ parts in function and reliability.

## Asbestos

The gaskets used in this engine contain no asbestos. Please use the appropriate original DEUTZ parts for maintenance and repair work.

## Service

We want to preserve the high performance of our engines, and with it the confidence and satisfaction of our customers. We are therefore represented worldwide by a network of service branches.

The DEUTZ name does not merely stand for engines that are the products of extensive development work, DEUTZ also stands for complete service packages that ensure optimum operation of our engines, and for customer services operations that you can count on.

Please contact your DEUTZ-partner in case of malfunctions and spare parts inquiries. Our specially trained personnel will ensure fast, professional repairs using original DEUTZ spare parts in case of damage.

The DEUTZ home page gives you a continuously up-to-date overview of the service partners in your vicinity

with notes on product responsibilities and services. Or you can use another fast, convenient way via the Internet under [www.deutzshop.de](http://www.deutzshop.de). The DEUTZ P@rts Online parts catalogue gives you a direct contact to your nearest local service partner.

## California

### Proposition 65 Warning

Diesel engines and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

## Masthead

DEUTZ AG

Ottostraße 1

51149 Köln

Germany

Phone: +49 (0) 221-822-0

Fax: +49 (0) 221-822-3525

E-Mail: [info@deutz.com](mailto:info@deutz.com)

[www.deutz.com](http://www.deutz.com)

### Danger



This symbol is used for all safety instructions which, if not observed, present a direct danger to life and limb for the person involved. Observe these carefully. The attention of operating personnel should be drawn to these safety instructions. Furthermore, the legislation for "general regulations for safety and the prevention of accidents" must be observed.

### Caution



This symbol indicates a danger to the part and engine. The relevant instructions must be observed, failure to do so can lead to destruction of the part and the engine.

### Notes



This symbol accompanies notes of a general kind.

## Engine type designation

This manual covers the following engine types

TD 2012 L04 2V m

TCD 2012 L04 2V      TCD 2013 L04 2V

TCD 2012 L06 2V      TCD 2013 L06 2V

TCD 2012 L04 2V m      TCD 2013 L04 2V m

TCD	
T	Exhaust gas turbocharger
C	Charge air cooler
D	Diesel

2012/2013	
2012	Series
2013	Series

L04/L06	
L	in series
04	No. of cylinders
06	No. of cylinders

2V	
2V	Number of valves

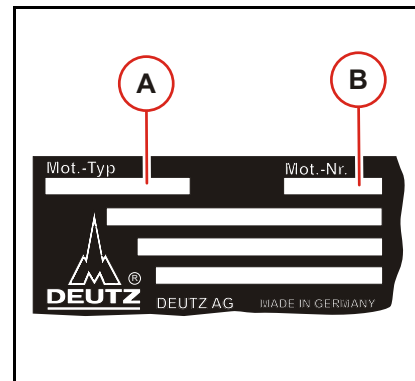
m	
m	Mechanical injection system Pump-pipe-nozzle

## Emissions legislation

The engines of these operating instructions fulfill the following exhaust emissions regulations

USA    EPA Tier III

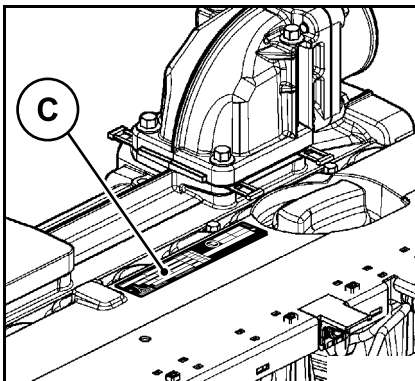
EU      Stage IIIA



## Rating plate

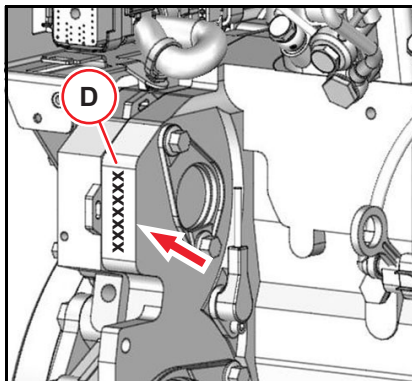
The type (A), engine number (B) and performance data are stamped on the rating plate.

The engine type and number must be stated when purchasing spare parts.



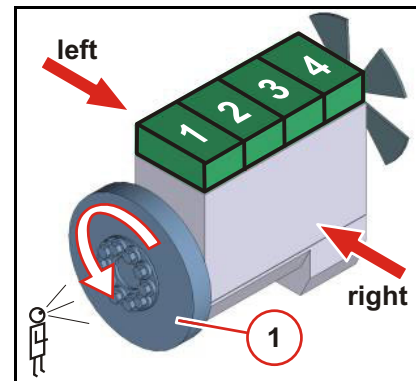
**Location of the rating plate**

The rating plate (C) is fixed to the cylinder head cover or the crankcase.



**Engine serial number**

The engine number (D) is stamped onto the crankcase (arrow) and onto the rating plate.



**Cylinder numbering**

**Cylinder arrangement**

The cylinders are counted consecutively starting from flywheel (1).

**Direction of rotation**

Looking onto the flywheel.  
rotating to the left: counter-clockwise.

**Engine sides**

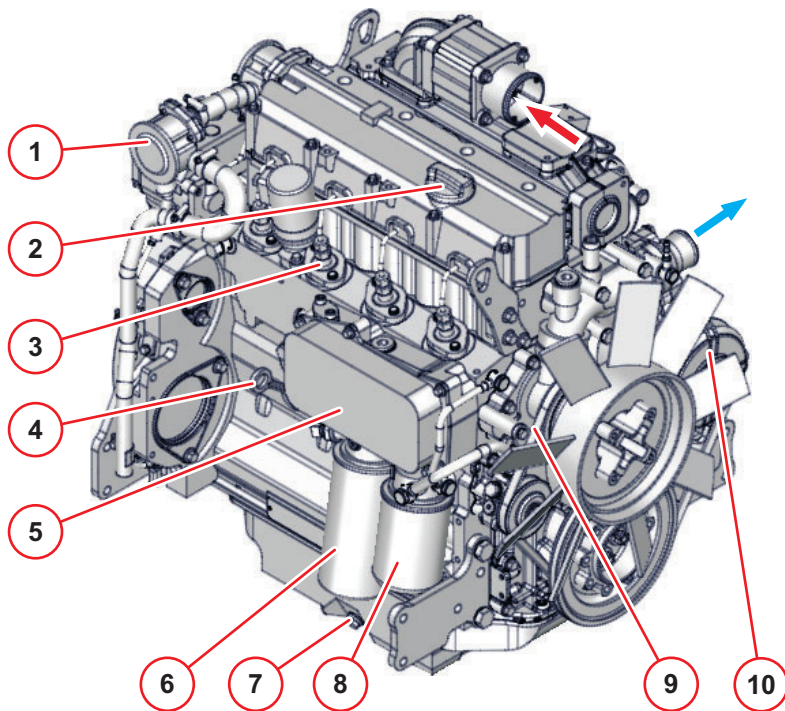
Looking onto the flywheel.

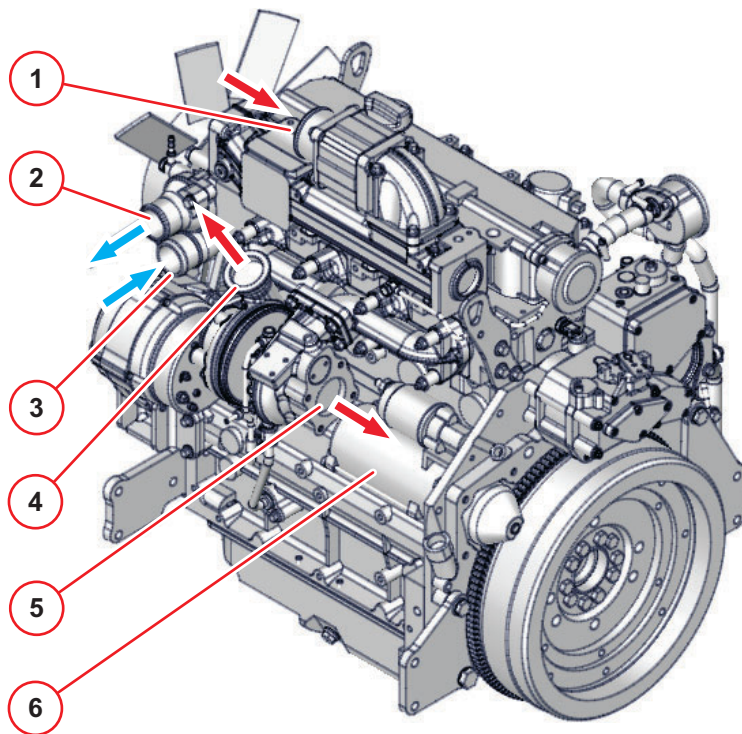


## TCD 2012 L04 2Vm

View from right (example)

- 1 Crankcase breather
- 2 Lubricating oil filling
- 3 Injection pump
- 4 Lubricating oil dipstick
- 5 Lube oil cooler
- 6 Lube oil replacement filter
- 7 Lubricating oil drain plug
- 8 Exchangeable fuel filter
- 9 V-belts
- 10 Generator





TCD 2012 L04 2Vm

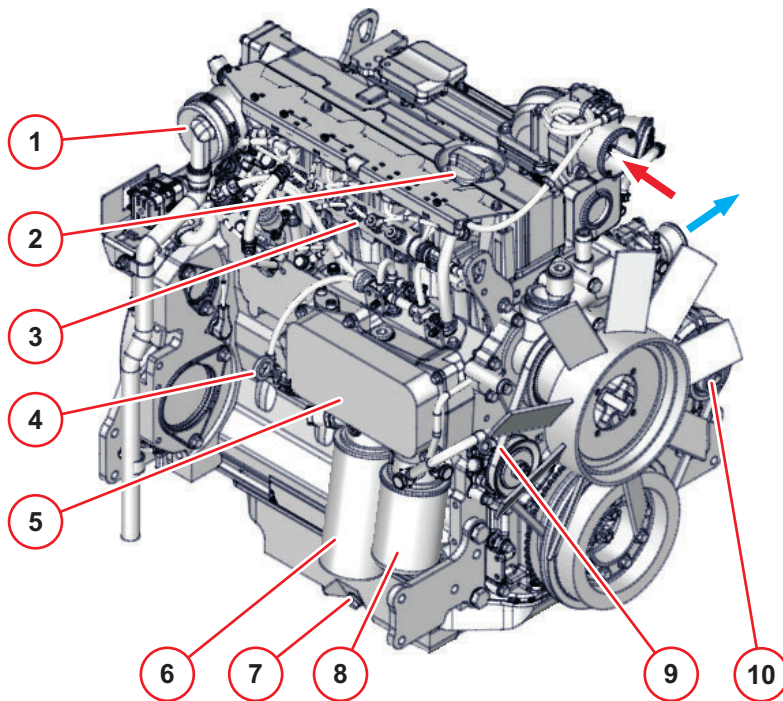
View from left (example)

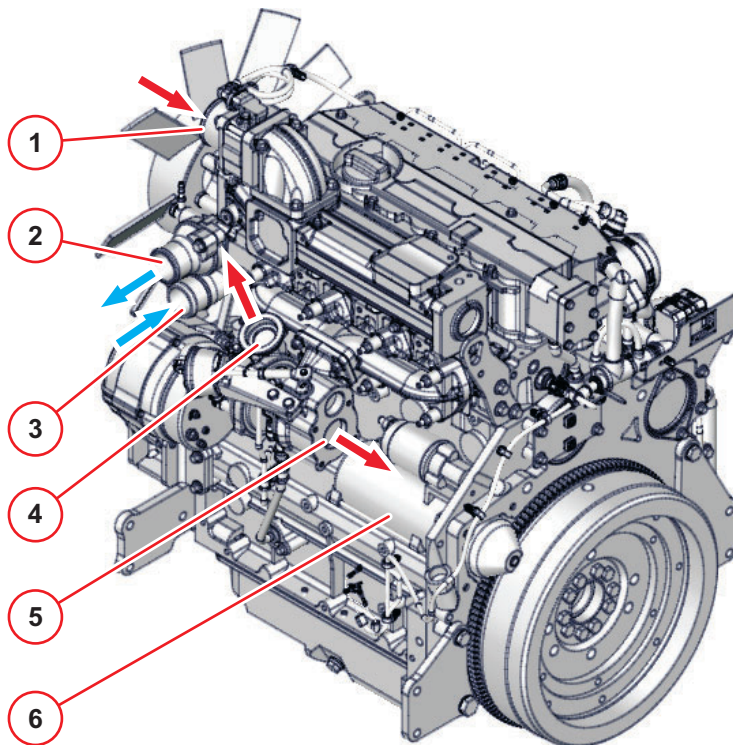
- 1 Combustion air inlet
- 2 Coolant outlet
- 3 Coolant inlet
- 4 Connections charge air cooler
- 5 Exhaust outlet
- 6 Starter

## TCD 2012 L04 2V

View from right (example)

- 1 Crankcase breather
- 2 Lubricating oil filling
- 3 Rail
- 4 Lubricating oil dipstick
- 5 Lube oil cooler
- 6 Lube oil replacement filter
- 7 Lubricating oil drain plug
- 8 Exchangeable fuel filter
- 9 V-belts
- 10 Generator





TCD 2012 L04 2V

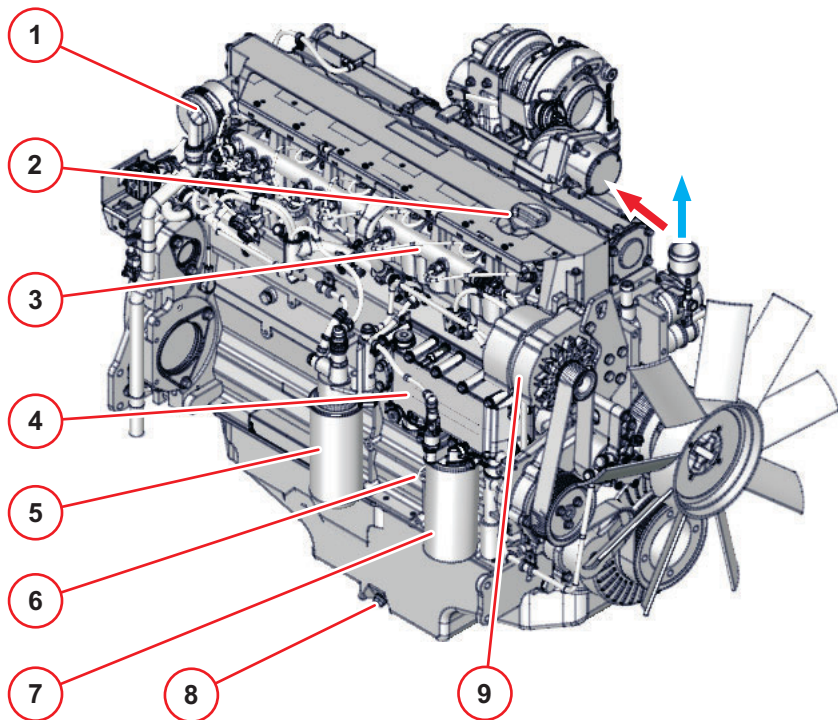
View from left (example)

- 1 Combustion air inlet
- 2 Coolant outlet
- 3 Coolant inlet
- 4 Connections charge air cooler
- 5 Exhaust outlet
- 6 Starter

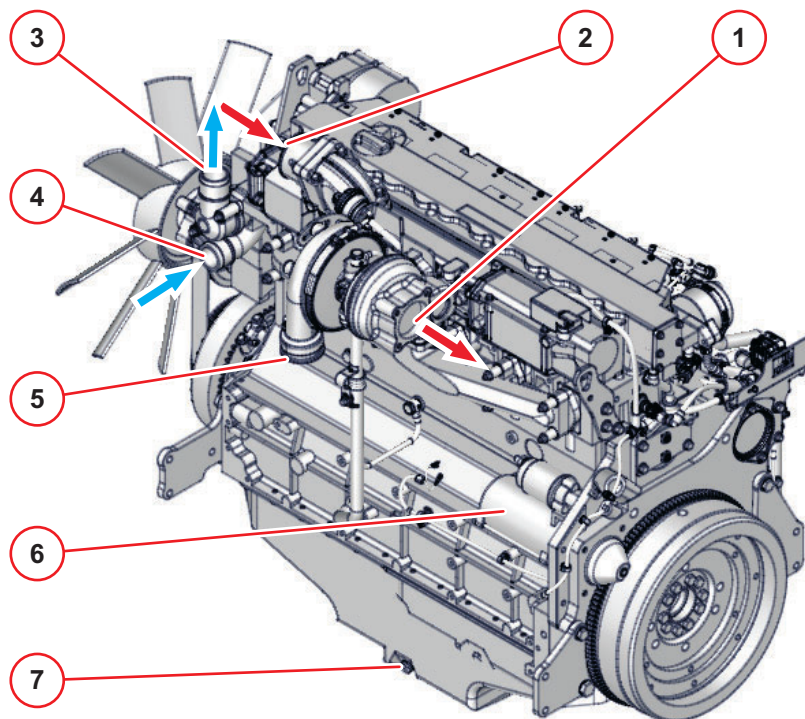
## TCD 2013 L06 2V

View from right (example)

- 1 Crankcase breather
- 2 Lubricating oil filling
- 3 Rail
- 4 Lube oil cooler
- 5 Lube oil replacement filter
- 6 Lubricating oil dipstick
- 7 Exchangeable fuel filter
- 8 Lubricating oil drain plug
- 9 Generator







TCD 2013 L06 2V

View from left (example)

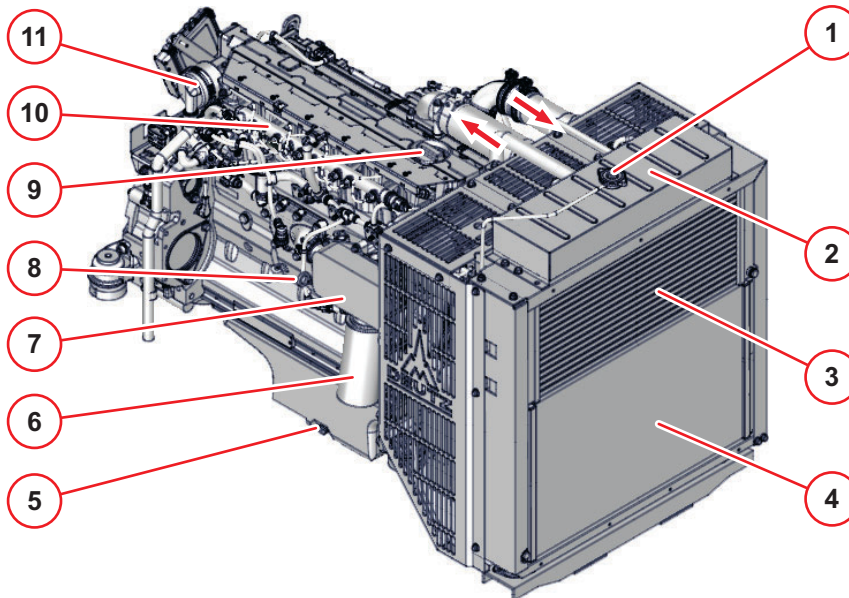
- 1 Exhaust outlet
- 2 Combustion air inlet
- 3 Coolant outlet
- 4 Coolant inlet
- 5 Connections charge air cooler
- 6 Starter
- 7 Lubricating oil drain plug

## TCD 2012 L06 2V

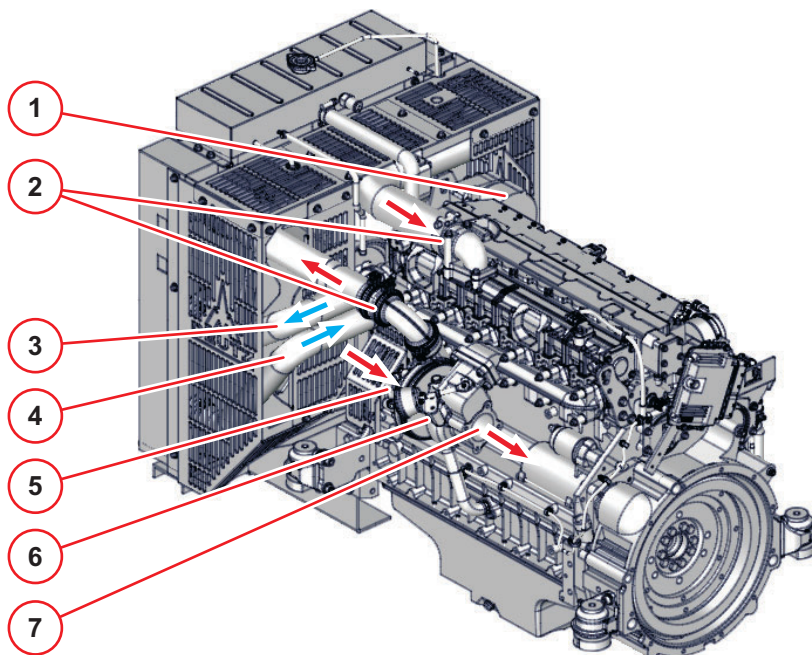
### PowerPack

The complete solution of engine and cooling system offered by DEUTZ is called PowerPack

View from right (example)



- 1 Coolant inlet
- 2 Compensation tank
- 3 Charge air cooler
- 4 Cooler
- 5 Lubricating oil drain plug
- 6 Lube oil replacement filter
- 7 Lube oil cooler
- 8 Lubricating oil dipstick
- 9 Lubricating oil filling
- 10 Rail
- 11 Crankcase breather



### TCD 2012 L06 2V

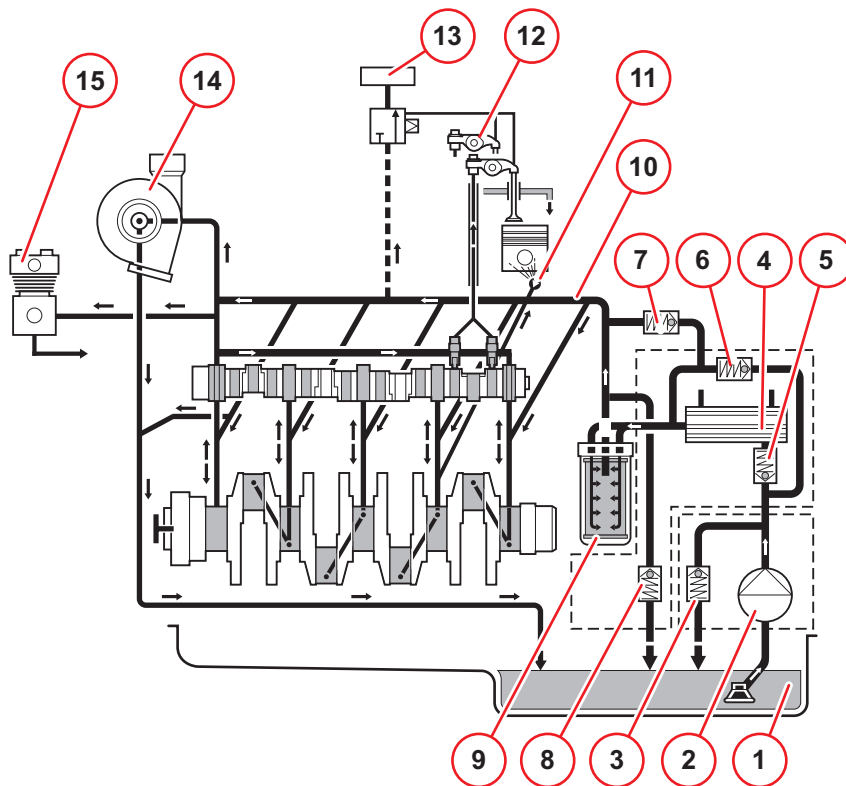
#### PowerPack

The complete solution of engine and cooling system offered by DEUTZ is called PowerPack

View from left (example)

- 1 Generator
- 2 Connections charge air cooler
- 3 Coolant outlet
- 4 Coolant inlet
- 5 Combustion air inlet
- 6 Turbocharger
- 7 Exhaust outlet

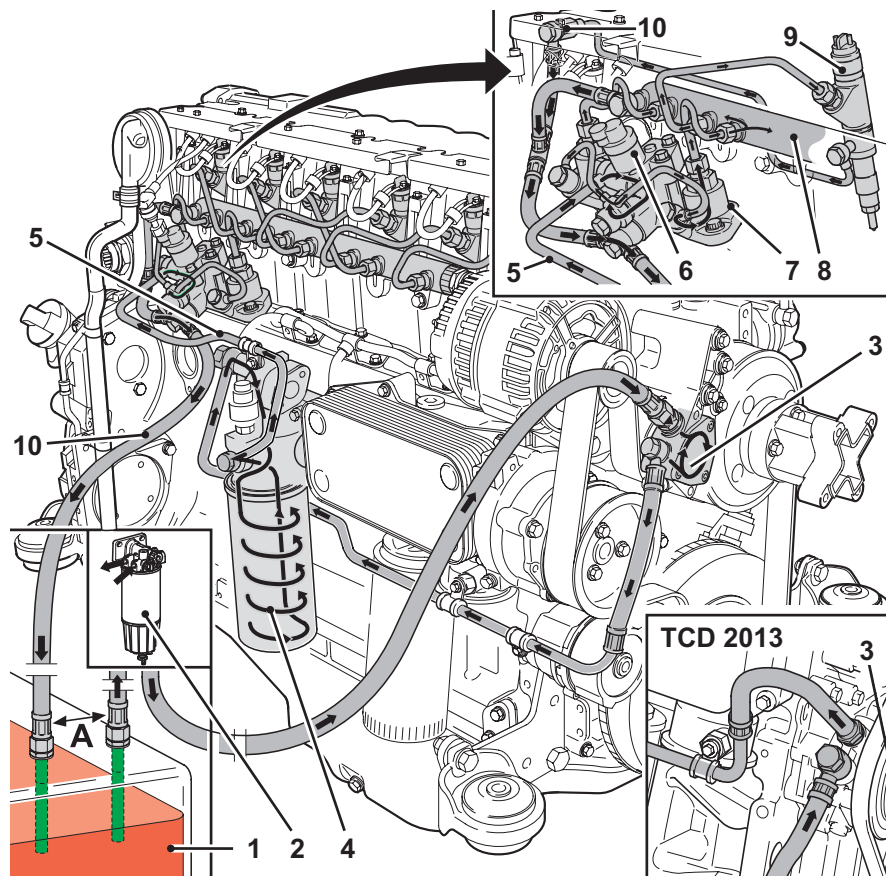




## Lubricating oil system

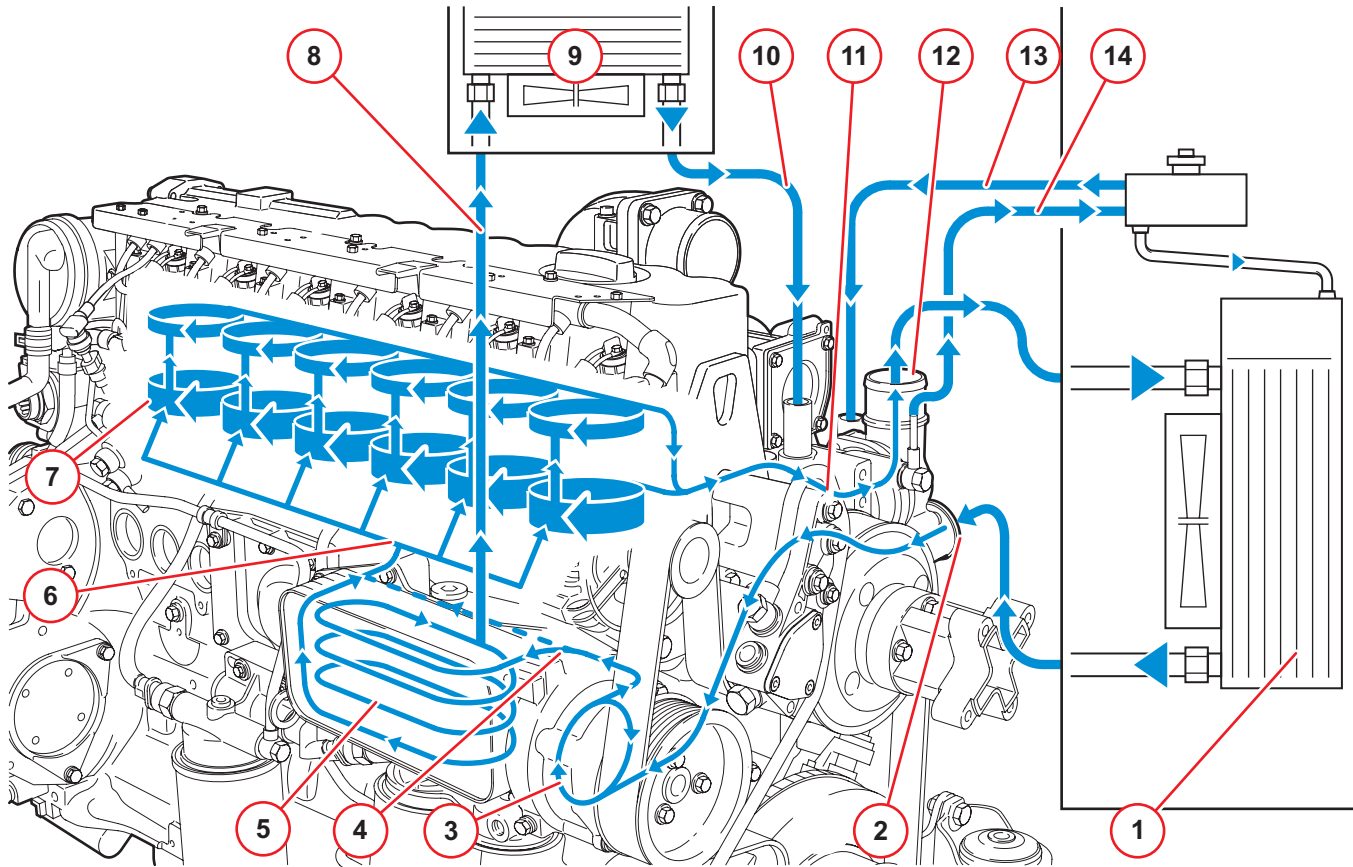
(example)

- 1 Lubricating oil sump
- 2 Lubricating oil pump
- 3 Pressure limiting valve  
TD/TCD 2013
- 4 Lube oil cooler
- 5 Check valve  
TD/TCD 2012
- 6 Bypass valve
- 7 Bypass valve
- 8 Pressure control valve
- 9 Lubricating oil filter
- 10 Main lube oil channel
- 11 Piston cooling nozzle
- 12 Rocker arm
- 13 Internally switched exhaust gas return  
TCD 2012/2013L06
- 14 Turbocharger
- 15 Air compressor



### Fuel schematic (example)

- 1 Fuel tank
- 2 Fuel pre-filter
- 3 Fuel pump
- 4 Exchangeable fuel filter
- 5 Fuel supply line to the control block FCU (Fuel Control Unit)
- 6 Control block FCU (Fuel Control Unit)
- 7 High-pressure pump
- 8 Rail
- 9 Injector
- 10 Fuel return to fuel tank



#### Coolant schematic (example)

- 1 Cooler
- 2 Coolant inlet
- 3 Coolant pump
- 4 Coolant partial flow to the lubricating oil cooler
- 5 Lube oil cooler
- 6 Coolant supply for engine cooling
- 7 Cylinder pipe/head cooling
- 8 Connection possibility for cab heating
- 9 Heat exchanger
- 10 Return line
- 11 Coolant return to thermostat
- 12 Coolant outlet
- 13 Compensation line
- 14 Venting pipe

## Internal exhaust gas recirculation

### 1 Additional cams for exhaust gas recirculation

#### TD/TCD 2012/2013L04

Inlet valve opens briefly during the outlet cycle and emits an exhaust gas partial flow to the suction system.

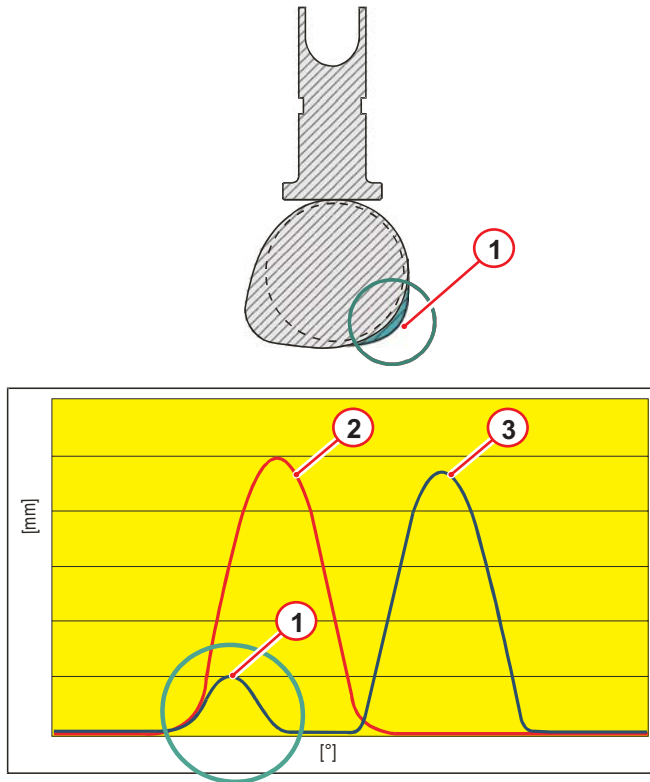
This partial volume is sucked back in in the next suction cycle.

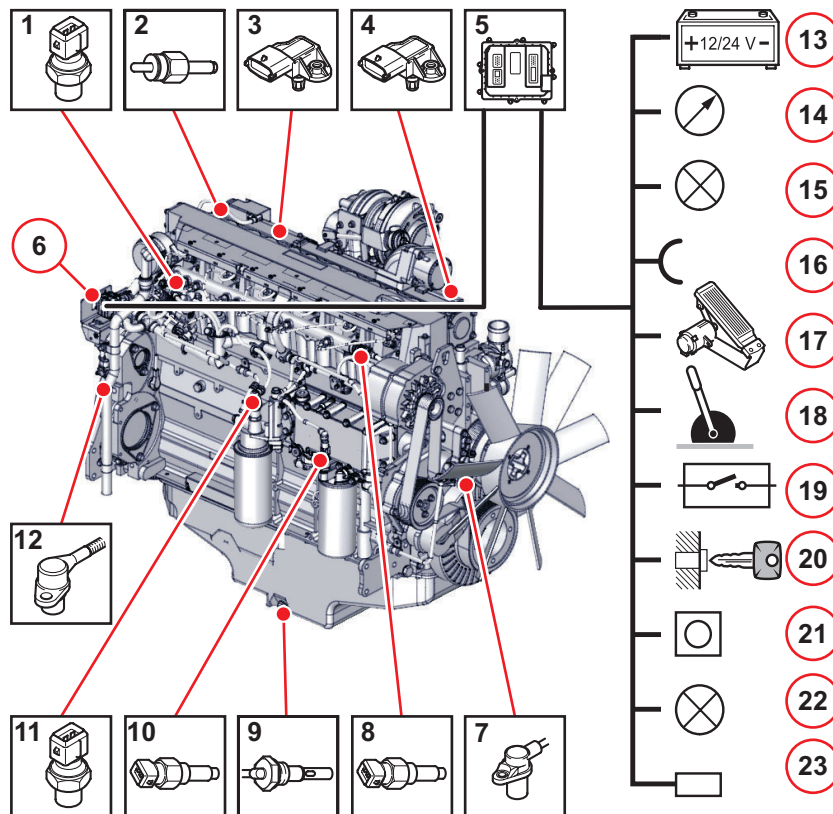
#### TCD 2012/2013L06

The outlet valve opens briefly in the intake stroke.

### 2 Outlet valve

### 3 Inlet valve





## Electronic engine control

### Engine side

- 1 Fuel transducer
- 2 Coolant temperature transmitter
- 3 Charge air pressure transmitter, charge air temperature transmitter  
TCD 2012/2013 L06
- 4 Charge air pressure transmitter, charge air temperature transmitter  
TCD 2012/2013 L04
- 5 Engine control unit
- 6 Central plug (for engine control)
- 7 Speed transmitter via crankshaft
- 8 Rail pressure sensor
- 9 Lubricating oil level transmitter (optional)
- 10 Lubricating oil pressure transmitter
- 11 Fuel transducer
- 12 Speed transmitter via camshaft

### Equipment side

- 13 Power supply (battery)
- 14 Multifunction displays
- 15 Signal outputs, e.g. for lamps, torque (PWM), speed, engine operation, etc.
- 16 Inputs (e.g. override button)
- 17 Accelerator
- 18 Hand throttle
- 19 Optional function selector switch, e.g. for P degree, type of controls, maximum curve etc.
- 20 Detachable key switch Start/Stop
- 21 Diagnosis button
- 22 Error lamp
- 23 Diagnostic interface/CAN bus

## Information about the engine electronics

This engine is equipped with an electric control unit.

The equipping of the respective system depends on the desired scope of function and the planned type of engine application.

The resultant wiring with pin assignment can be seen in the appropriate wiring diagram.

The installation regulations of the DEUTZ AG must also be taken into account.

## Precautions



The connections of the control units are only dust and water proof when the mating plugs are plugged (protection class IP69K)! The control units must be protected against spray water and moisture until plugging in the mating plugs!

Reverse polarity can lead to failure of the control unit.

To avoid damaging the control units, all the connections on the control unit must be disconnected before electric welding work. Interventions in the electrical system contrary to the DEUTZ regulations or by unqualified personnel can permanently damage the engine electronics and have serious consequences which are not covered by the manufacturer's guarantee.



It is strictly prohibited:

- a) to make changes or connections to the wiring of the electrical control devices and the data transmission cable (CAN lines).
  - b) to switch control units.
- Otherwise guarantee rights will be lost!  
Diagnostic and maintenance work may only be carried out by authorised personnel using equipment approved by DEUTZ.

## Installation instructions

The control units are calibrated to the respective engine and identified by the engine number. Every engine may only be operated with the appropriate control unit.

Setpoint transmitters (pedal value transmitters) necessary for vehicle operation must be connected to the vehicle side cable harness and calibrated with the DEUTZ diagnostic program SERDIA (SERVICE DIAGNOSIS). Wiring and cable assignment of the vehicle side cable harness must be taken from the connection diagram of the DEUTZ installation consulting.

## Supply voltage

12 Volt

24 Volt

It should be ensured that the battery is sufficiently charged. If the supply voltage is interrupted while the engine is running, this can lead to damage to the electrics/electronics. If the supply voltage fails, the engine shuts down.

Voltages above 32 Volt will destroy the control unit.

## Diagnostics

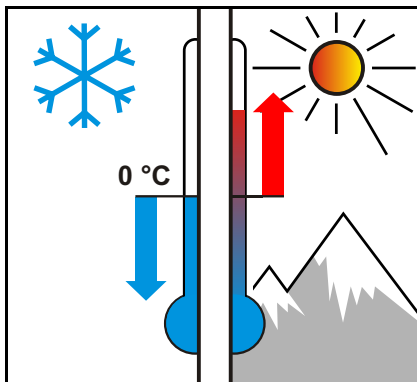
DEUTZ control units are equipped with self-diagnostics. Active and passive error entries are saved in the error memory. Active errors are displayed on error lamps/diagnostics lamps (▣ 66).

A diagnosis can be made with:

- Error lamp (flash code)
- CAN bus
- DEUTZ electronics display
- Diagnostic socket (SERIDA)

## Equipment-side wiring

The DEUTZ AG installation regulations should be adhered to. In particular, the plug contact must be crimped with the appropriate standard tools. If it is necessary to do so, plugged-in contacts may only be removed from the plug housing with the proper tools.



**Low ambient temperatures**

#### Lubricating oil

- Select the lubricating oil viscosity according to the ambient temperature.
- If cold starting occurs frequently cut the lube oil changing interval by half.

#### Fuel

- Use winter fuel below 0 °C (▮ 34).

#### Battery

- A good charging condition of the battery (▮ 59) is the prerequisite for starting the engine.
- Heating up the battery to approx. 20°C improves the starting behaviour of the engine. (Remove and store the battery in a warm room).

#### Cold start aid

- Depending on the type of engine, glow plugs, heating plugs, heating flange, flame glow system can be used as cold starting aids. (▮ 27)

#### Coolant

- Observe the mixing ratio anti-freeze/cooling water. (▮ 35)

#### High ambient temperatures, high altitude



This engine is equipped with an electric control unit.

Under the operating conditions listed below, the amount of fuel is reduced automatically, controlled by the electronic control unit.

Under the following application and operating conditions, the amount of fuel must be reduced.

- above 1000 m altitude
- above 30 °C ambient temperature

Reason: Air density decreases as altitude or ambient temperature increase. This reduces the amount of oxygen in the engine intake air and the fuel-air mixture would be too rich if the injected amount of fuel were not reduced.

- The results would be:
  - black smoke in the exhaust
  - high engine temperature
  - reduction in engine performance
  - possible impairment of starting behaviour

Consult your equipment supplier or DEUTZ partner if you have any other questions.



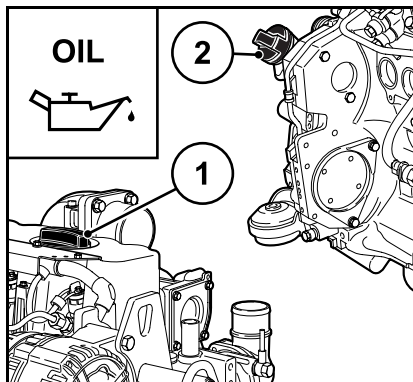
## Preparations for initial commissioning

(Maintenance schedule E 10)

- Remove engine corrosion protection
- Remove any transport devices.
- Check the battery and cable connections and mount if necessary.
- Check belt tension (▮53).
- Have the engine monitor or warning system checked by authorised personnel.
- Check the engine mounting.
- Check that all hose unions and clips fit properly.

### The following additional work must be carried out on generally overhauled engines:

- Check the fuel pre-filter and main filter and change if necessary.
- Check the intake air cleaner (if available, maintain according to maintenance indicator).
- Drain lubricating oil and condensation water from the charge air cooler.
- Fill with engine lube oil.
- Fill the coolant system (▮72).



Fill with engine lube oil

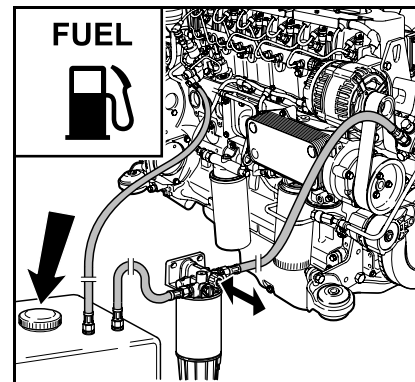


Low lubricating oil level and overfilling lead to engine damage.



The engines are generally supplied without lubricating oil filling. Select lubricating oil quality and viscosity before filling. Order DEUTZ lubricating oils from your DEUTZ partner

- Fill the engine with lubricating oil via the lubricating oil filler neck.
- Observe the lubricating oil filling level (▮72).



Pour in fuel

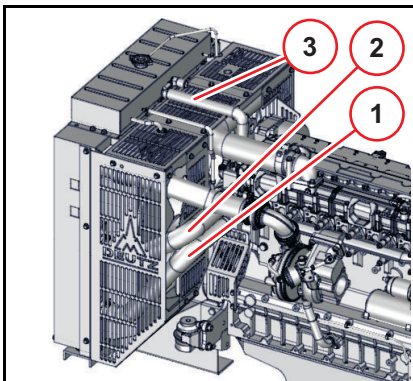


Never fill the fuel tank while the engine is running. Ensure cleanliness. Do not spill fuel. Additional venting of the fuel system by a 5 minute trial run at idle speed or on low load is absolutely essential.

- The fuel low pressure system must be vented before the first start-up after filling with the manual supply pump.

Only use clean commercially available brand diesel fuel. Observe fuel quality (▮34).

Use summer or winter-grade fuel, depending on the ambient temperature.



**Filling the coolant system**



The coolant must have a prescribed concentration of cooling system corrosion protection agent!

Never operate the engine without coolant, even for a short time!



Order coolant corrosion protection agent from your DEUTZ partner.

- Connect coolant outlet (2) and coolant inlet (1) to the cooling system. Connect the feed line of the compensation tank to the coolant pump or to the coolant inlet line (3).
- Connect ventilation line from the engine and, if necessary, from the cooler to the compensation tank.
- Fill cooling system via the compensation tank.
- Close compensation tank with valve.

- Start the engine and run up until the thermostat opens (line (2) heats up).
- Engine operation with open thermostat 2 - 3 minutes.
- Check the coolant level and top up coolant if necessary.



**Danger of scalding from hot coolant!**  
Cooling system under pressure! Only open the cap when cool!  
Observe safety regulations and national specifications when handling cooling media.

- If required, repeat procedure with engine start.
- Fill up coolant to the MAX mark on the compensation tank and close the cooling system cap.
- Switch on any available heating and set to the highest level so that the heating circuit is filled and vented.
- Observe the filling volume of the cooling system (72).

### Trial run



Additional venting of the fuel system by a 5 minute trial run at idle speed or on low load is absolutely essential.

Carry out a brief trial run up to operating temperature (approx. 90 °C) after preparations.

Do not load the engine if possible.

- Work with the engine not running:
  - Check engine for tightness.
  - Check lubricating oil level, if necessary top up.
  - Check the coolant level and top up coolant if necessary.
- Work during the trial run:
  - Check engine for tightness.

## Starting



Before starting, make sure that nobody is standing in the immediate vicinity of the engine or work machine.

After repair work: Check that all guards have been replaced and that all tools have been removed from the engine.

When starting with the flame glow plug/glow plug/heating flange system do not use any other starting aid (e.g. injection with start pilot). Risk of accident!



If the engine fails to fire and the error lamp lights, the electronic engine control has activated the start lock to protect the engine. The start lock is released by switching off the system with the ignition key for about 30 seconds.

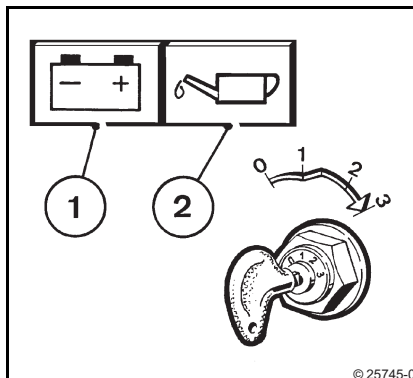
Do not actuate the starter for more than 20 seconds. If the engine does not start up, wait for one minute and then repeat the starting process.

If the engine does not start up after two attempts, determine the cause as per fault table (B 61).

Do not run up the engine immediately to high idling speed / full load operation from cold.

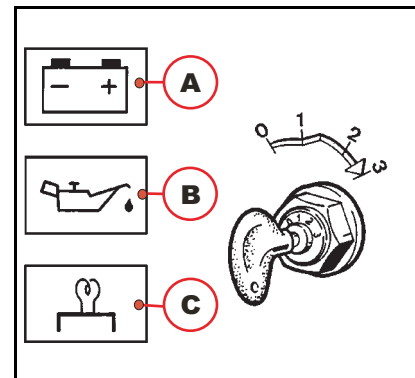


Disconnect the engine by uncoupling devices to be driven where possible.



Without cold start aid

- Insert key.
- Turn key to the right.
  - Position 1 = operating voltage.
  - Pilot lamps (1) and (2) light up.
- Push the key in and turn further clockwise against spring pressure.
  - Level 2 = no function.
  - Level 3 = start.
- release the key as soon as the engine starts up.
  - The pilot lamps will go out.



with cold starting device

- Insert key.
  - Position 0 = no operating voltage.
- Turn key to the right.
  - Position 1 = operating voltage.
  - Pilot lamps (A), (B) and (C) light up.
- stage 2 = pre-heating
  - Preheat until the glow display goes out; an error has occurred if the preheating indicator flashes; e.g. the preheating relay is stuck, which can discharge the battery completely when at a standstill.
  - Engine is ready for operation.
- Push the key in and turn further clockwise against spring pressure.
  - Level 3 = start.
- release the key as soon as the engine starts up.
  - The pilot lamps will go out.

### 3

If the starter is controlled by the electronic engine control via a relay:

- the maximum start duration is limited.
- the pause between two start attempts is specified.
  - the start is then continued automatically
- starting while the engine is running is prevented.

If the touch start function is programmed, a short start command with the ignition key in position 2 or a start button, if available, suffices.

## Electronic engine control

The statuses are displayed by the error lamp.

The system monitors the condition of the engine and itself.

- Function test
  - Ignition on, error lamp lights up for approx. 2 seconds and then goes out.
  - Check the error lamp if there is no reaction after switching on the ignition.
- The lamp does not light
  - After the lamp test an extinguished lamp indicates an error-free and trouble-free operating state within the scope of the control possibility.

- Continuous light
  - Error in the system.
  - Operation continued with restrictions.
  - The engine must be checked by a DEUTZ partner.
  - If a lamp lights steadily a monitored measuring variable (e.g. coolant temperature, lubricating oil pressure) has left the permissible value range.

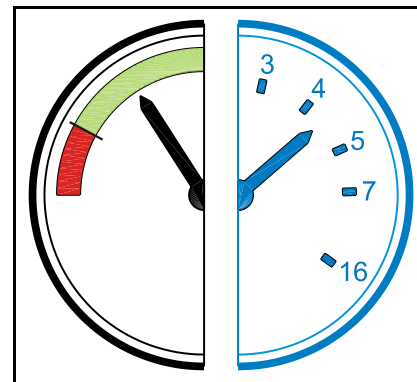
Depending on the fault, the engine power may be reduced by the electronic engine control to protect the engine.

- Flashing
  - Serious error in the system.
  - Switch off prompt for the operator. Attention: Failure to do so will lead to loss of guarantee!
  - The engine has reached switch-off condition.
  - Engine forced to run at low idle speed to cool the engine, with automatic shutdown if nec-

essary.

- The switch-off process has been accomplished.
- There may be a start lock after engine stop.
- The start lock is deactivated by turning off the system with the ignition key for approx. 30s.
- Additional control lamps, e.g. for lubricating oil pressure or lubricating oil temperature, are switched on if necessary.
- The power reduction can be bypassed, the automatic switch-off delayed or a start lock bypassed with the override key on the instrument panel to avoid critical situations. This brief deactivation of the engine protection functions is logged in the control unit.









The engine protection functions are released in co-operation with the equipment manufacturer and the DEUTZ installation consulting and may be designed individually. It is therefore absolutely essential to observe the operating instructions of the equipment manufacturer.

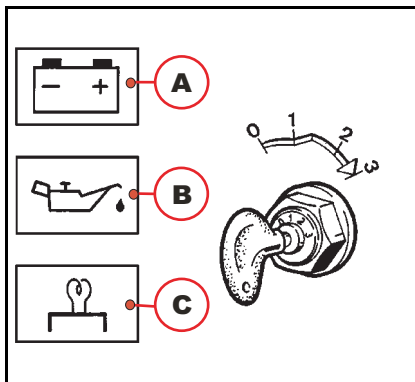


**Display instrument**

Possible displays:

- Colour scale
  - Display of operating state by coloured areas:
  - green = normal operating state
  - red = critical operating state  
Take suitable action.
- Measured value scale
  - Actual value can be read off directly. The nominal value should be taken from the Technical Data (▮ 72).

Instruments/symbols	Designation	Possible display:	Measure
	Lubricating oil pressure display	Lubricating oil pressure in the red area	Switch off engine
	Coolant temperature	Coolant temperature too high	Switch off engine
	Lubricating oil temperature	Lubricating oil temperature too high	Switch off engine
	Lubricating oil pressure pilot lamp	If the pilot lamp lights up after starting the engine or while the engine is running, the lubricating oil pressure is too low	Switch off engine
	Lube oil level	If the pilot lamp lights up after starting the engine or while the engine is running, the lubricating oil level is too low	Fill up lube oil
	Coolant level	If the control lamp lights up after the engine starts or while the engine is running, the coolant level is too low	Shut down the engine, allow to cool and top up coolant
	Operating hours counter	Indicates the previous operating time of the engine	Observe the maintenance intervals
	Horn	With acoustic signal	See fault table ( <a href="#">61</a> ).



## Shutting off



Avoid switching off from full load (coking/blockage of the remaining lubricating oil in the turbocharger bearing housing). The lubricating oil supply of the turbocharger is then no longer guaranteed! This shortens the life of the turbocharger.

Run the engine in low idling speed for approximately one minute after relieving the load.

The control unit remains active for about another 40 seconds to save the system data (lag) and then switches off automatically.

- Run engine up to idling speed.
- Move the key to position 0.  
Control lamps A+B+C go out.

### General

Modern diesel engines place very high demands on the lubricating oil to be used. The specific engine performances which have increased constantly over the last few years lead to an increased thermal load on the lubricating oil. The lubricating oil is also more exposed to contamination due to reduced oil consumption and longer oil change intervals. For this reason it is necessary to observe the requirements and recommendations described in this operating manual in order not to shorten the life of the engine.

Lubricating oils always consist of a base oil and an additive package. The most important tasks of a lubricating oil (e.g. wear protection, corrosion protection, neutralisation of acids from combustion products, prevention of coke and soot deposits on the engine parts) are assumed by the additives. The properties of the base oil are also decisive for the quality of the product, e.g. with regard to thermal load capacity.

In principle, all engine oils of the same specification can be mixed. However, mixing of engine oils should be avoided because the worst properties of the mixture are always dominant.

The lubricating oils approved by DEUTZ have been thoroughly tested for all engine applications. The active ingredients they contain are compatible with each other. Therefore, the use of additives for lubricating oils is not permitted in DEUTZ engines.

The **lubricating oil quality** has a considerable influence on the life, performance and thus also on the costs-effectiveness of the engine. It basically applies that: The better the lubricating oil quality, the better these properties.

The **lubricating oil viscosity** describes the way the

lubricating oil flows, depending on the temperature. The lubricating oil viscosity only has a small influence and effect on the quality of the oil.

**Synthetic lubricating oils** are used increasingly and offer advantages. These lubricating oils have better temperature and oxidation stability as well as relatively low cold viscosity. Since some processes which are relevant for determining the lubricating oil change times are largely dependent on the oil quality (e.g. the infiltration of soot and other contamination), the oil change time for synthetic lubricating oils may not be increased in relation to the specifications on lubricating oil change intervals.

**Biodegradable lubricating oils** may be used in DEUTZ engines if they meet the requirements of this operating manual.

### Quality

Lubricating oils are classified by DEUTZ according to their performance and quality class (DQC: DEUTZ Quality Class). Essentially, the following applies: the higher the quality class (DQC I, II, III, IV), the more effective/the better quality the lubricating oil is.

Lubricating oils according to other comparable specifications can be used as long as they meet DEUTZ requirements. In regions in which none of these qualities are available, please contact your responsible DEUTZ partner.

or see [www.deutz.com](http://www.deutz.com)

<a href="http://www.deutz.com">http://www.deutz.com</a>	
en	\\SERVICE \\Betriebsstoffe und Diagnose\\Deutz Quality Class\\DQC-Freigabeliste

<a href="http://www.deutz.com">http://www.deutz.com</a>	
en	\\SERVICE \\Operating Media and Diagnosis\\Deutz Quality Class\\DQC Release List

Minimum quality class	
DEUTZ	Others
DQC II	ACEA E3-96; E4-07; E5-02; E7-04 API CH-4/CG-4; CI-4, CI-4, CJ-4; DHD-1
The lubricating oils may only be used in conjunction with an open crankcase breather.	

The following lubricating oils are recommended for the engines in this operating manual:

Recommended quality class	
DEUTZ	Others
DQC III	Please contact your DEUTZ partner
DQC IV	

DEUTZ lubricating oils DQC III TLX - 10W40 FE	
Container	Order number:
5 litre container	0101 6335
20 litre container	0101 6336
209 litre barrel	0101 6337

DEUTZ lubricating oils DQC IV synthetic DQC IV - 5W30-UHP	
Container	Order number:
20 litre container	0101 7849
209 litre barrel	0101 7850



## Lubricating oil change intervals

- The intervals depend on:
  - lubricating oil quality
  - sulphur content in the fuel
  - type of application of engine
- The lubricating oil change interval must be halved if at least one of the following conditions applies:
  - Constant ambient temperature below -10 °C (14 °F) or lube oil temperature below 60 °C (84 °F).
  - Sulphur content in diesel fuel of >0.5 weight %.
  - operation with bio-diesel fuel
- If the lubricating oil change intervals are not reached within a year, the oil should be changed at least once a year.

## Viscosity

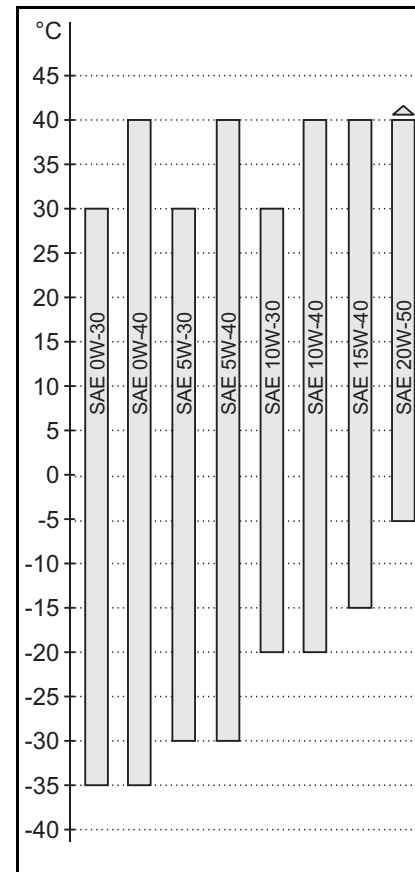
The ambient temperature at the installation site or in the application area of the engine is decisive for choosing the right viscosity class. Too high a viscosity can lead to starting difficulties, too low a viscosity can endanger the lubrication effect and cause a high lubricating oil consumption. At ambient temperatures below -40 °C, the lubricating oil must be pre-heated (e.g. by storing the vehicle or the machine in a hall).

The viscosity is classified according to SAE. Multi-purpose lubricating oils should be used basically. Single-purpose lubricating oils can also be used in enclosed, heated spaces at temperatures >5 °C.



The prescribed lubricating oil quality must be observed when selecting the viscosity class!

Depending on the ambient temperature we recommend the following common viscosity classes:



### Permissible fuels

The following fuel specifications / standards are approved:

- Diesel fuels
    - EN 590
    - NATO F-54
    - ASTM D 975 1-D
    - ASTM D 975 2-D
    - JIS K2204 Grade 1
    - JIS K2204 Grade 2
  - Jet fuels
    - NATO F34
    - NATO F35
- Only for mechanical injection system  
Pump-pipe-nozzle
- Biodiesel fuel
    - EN 14214

Use commercially available fuels with a sulphur content below 0.5 %. The lubricating oil change intervals must be halved at a higher sulphur content.

If other fuels are used which do not meet the requirements of the operating manual, the warranty will be voided.

The certification measurements for compliance with the legal emission values are made with the test fuels specified in the laws. These correspond to the diesel fuels in accordance with EN 590 and ASTM D 975 described in the operation manual. No emission values are guaranteed with the other fuels described in this operation manual.

The respective fuels prescribed by law must be used to comply with the national emission regulations (e.g. sulphur content).

Please contact your DEUTZ partner

<a href="http://www.deutz.com">http://www.deutz.com</a>	
en	\SERVICE\Betriebsstoffe und Diagnose\Kraftstoffe
en	\SERVICE\Oils, Lubricants, Diagnosis\Fuel

### Winter operation with diesel fuel



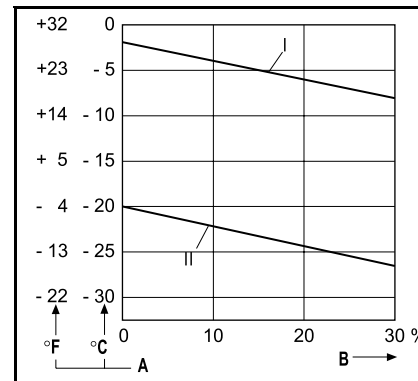
Only carry out mixing in the tank. Fill with the appropriate amount of paraffin first, then add the diesel fuel. Normal and high grade fuels may not be mixed.

At low ambient temperatures paraffin discharges can lead to blockages in the fuel system and cause operating faults. Below 0 °C ambient temperature use winter diesel (down to -20 °C) (filling stations provide this in good time before the cold season starts).

- Below -20 °C paraffin should be added. The relevant percentages are given in the adjacent diagram.
- Special diesel fuels can be used for arctic climates to -44 °C.

If it is necessary to use Summer diesel fuel below 0 °C, up to 30 % petroleum can be added according to the diagram opposite.

Usually a sufficient cold resistance can be achieved by adding a flow improver. Ask your DEUTZ partner.



I Summer-grade diesel fuel

II Winter-grade diesel fuel

A Outdoor temperature

B Percentage of paraffin to be added

## General



Never operate the engine without coolant, even for a short time!

In liquid-cooled engines, the coolant must be conditioned and monitored, otherwise the engine could be damaged by:

- corrosion
- cavitation
- freezing
- overheating

## Water quality

The right water quality is important for conditioning the coolant. Clear, clean water within the following analysis values should always be used:

Analysis values		min	max	ASTM
ph value		6,5	8,5	D 1293
Chlorine (Cl)	[mg/l]	-	100	D 512 D 4327
Sulphate (SO <sub>4</sub> )	[mg/l]	-	100	D 516
Total hardness (CaCO <sub>3</sub> )	[mmol/l]	0,54	3,56	D 1126
	[mg/l]	54	356	
	[°dGH]	3,0	20,0	-

Specifications of the water quality are made by the local water board.

The water must be conditioned if it deviates from the analysis values.

### ● pH value too low:

Addition of diluted sodium or potassium lye.  
Small trial mixtures are advisable.

### ● Total hardness too high:

Mixing with softened water (pH neutralized condensate or water softened by ion exchanger).

### ● Total hardness or carbonate hardness too low:

Mixing with harder water (harder water is usually available in the form of drinking water).

### ● Chlorides and/or sulphates too high:

Mixing with softened water (pH neutralized condensate or water softened by ion exchanger).

## Cooling system corrosion protection agent



Health damaging nitrous amines form when nitrite-based cooling system corrosion protection agents are mixed with amine-based agents!



Cooling system corrosion protection agents must be disposed of in an environmentally friendly way.

The conditioning of the coolant for liquid-cooled DEUTZ compact engines is performed by mixing an anti-freeze with corrosion protection inhibitors based on ethylene glycol into the water.

DEUTZ cooling system corrosion protection agent	
Container	Order number:
5 litre container	0101 1490
20 litre container	0116 4160
210 litre barrel	1221 1500

This cooling system corrosion protection agent is free from nitrite, amine and phosphate and is adapt-

ed to the materials in our engines. Order from your DEUTZ partner.

Please contact your DEUTZ partner if the DEUTZ cooling system corrosion protection agent is not available.

or see [www.deutz.com](http://www.deutz.com)

<a href="http://www.deutz.com">http://www.deutz.com</a>	
en	\\SERVICE\\Betriebsstoffe und Diagnose\\Kühlsystemschutz
en	\\SERVICE\\Oils, Lubricants, Diagnosis\\Cooling System Conditioner

The cooling system must be monitored regularly. This also includes checking the coolant system corrosion protection agent concentration in addition to checking the coolant level.

The cooling system corrosion protection agent concentration can be checked with conventional test instruments (e.g. refractometer).

Cooling system corrosion protection agent percentage	Water percentage	Cold protection up to
min. 35 %	65 %	-22 °C
40 %	60 %	-28 °C
max. 45 %	55 %	-35 °C

At temperatures below -35 °C, please contact your responsible DEUTZ partner.

It is possible to use other cooling system corrosion protection agents (e.g. chemical corrosion protection agents) in exceptional cases. Consult your DEUTZ partner.


## Assignment of the DEUTZ maintenance and service schedules to maintenance intervals

Standard maintenance schedule TD/TCD 2012/2013 L04/L06 2V			
Stage	Activity	To be carried out by	Maintenance interval every ..... operating hours (oh)
E10	Initial commissioning	Authorised specialists	When commissioning new or overhauled engines
E20	Daily inspection	Operator	1x daily or every 10 operating hours in continuous operation
E30	Maintenance	Qualified personnel	500 <sup>1) 2) 3)</sup>
E40	Extended maintenance I		1000
E45	Interim stage		2000
E50	Extended maintenance II	Authorised specialists	3.000

### EPA-certified engines







The EPA (Environmental Protection Agency) is a US Government organisation for the protection of the environment and human health.

Deviations from the standard maintenance schedule for engines subject to EPA certification			
Stage	Activity	To be carried out by	Maintenance interval every ..... operating hours (oh)
E60	Intermediate overhaul	Authorised specialists	6.000

Observations	
<sup>1)</sup>	The lubricating oil load may be high depending on the application. The lubricating oil change interval must be halved here (  32).
<sup>2)</sup>	For engines TD/TCD 2012 L04 2V with mechanical injection system, which are predominantly operated at a high load and a high speed, the lubricating oil change interval is reduced to 250 h.
<sup>3)</sup>	Data for lubricating oil change interval, in relation to lubricating oil quality DQC III.

## Maintenance measures

Stage	Activity	Measure	Page
E10		The measures are listed in chapter 3.	25
E20	Check	Lubricating oil level (if necessary top up)	39
		Coolant level (top up if necessary)	26
		Engine tightness (visual inspection for leaks)	
		Suction air filter/dry air filter (maintain in accordance with maintenance indicator)	52
E30	Replace	Lubricating oil An lubricating oil application/change strategy adapted optimally to the individual engine application type can be created, for example, with the DEUTZ oil diagnosis. Ask your DEUTZ partner.	32/ 39
		Lubricating oil filter/insert (every time the lubricating oil is changed)	40
	Check	Coolant (additive concentration)	48
	Clean	Fuel pre-cleaner / fuel pre-filter (change filter insert if necessary)	45
E40	Check	Charge air cooler entry area (drain lube oil/condensate)	
		Crankcase breather valve	
		Check valve in the fuel return line (for mechanical injection system)	
		Cold starting device	
		Battery and cable connectors	59
		V-belts (retension or renew if necessary)	53
		Cold starting device	
		Engine mounting (tighten, replace if damaged when necessary)	
		Fastenings, hose unions / clips (renew if damaged)	
	Replace	Fuel filter cartridge	43
		Fuel pre-filter with water trap (renew the filter insert if necessary). If the warning system responds (lamp/horn), the water trap bowl must be emptied immediately.	45
		Suction air filter/dry air filter (maintain in accordance with maintenance indicator)	52
E45	Settings	Valve clearance	56
		Control piston clearance of exhaust return (optional)	58
E50	Replace	V-belt, V-rib belt and tensioning pulley	53

Stage	Activity	Measure	Page
E60	Replace	Injection valve	
		Crankcase breather valve	
		V-belt, V-rib belt and tensioning pulley	 <a href="#">53</a>
	Clean	Charge air cooler entry area (drain lube oil/condensate)	
		Turbocharger compressor outlet	
annually	Check	Engine monitor, warning system Maintenance only to be carried out by authorised service personnel	
	Replace	Fuel pre-filter	 <a href="#">45</a>
Every 2 years	Replace	Dry air filter	 <a href="#">52</a>
		V-belt, V-rib belt and tensioning pulley	 <a href="#">53</a>
		Coolant	 <a href="#">35</a>  <a href="#">48</a>
	Check	Crankcase breather valve	

### Maintenance work outside the DEUTZ maintenance and service schedules

\*If the water level warning system (lamp/siren) responds, the fuel pre-filter must be emptied immediately.

### Maintenance profile

A self-adhesive maintenance diagram is delivered with every engine. It should be stuck in a well visible location on the engine or equipment.

Order number: 0312 3712 (TD/TCD 2012 2V) / 0312 3713 (TCD 2013 2V)

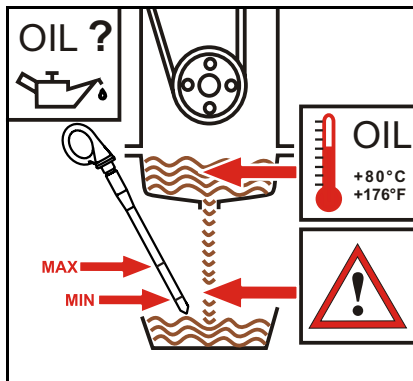
## Regulations for working on the lubricating oil system



Do not work when the engine is running!  
Smoking and naked lights prohibited!  
Be careful of hot lubricating oil. Danger of scalding!



Pay attention to utmost cleanliness when working on the lubricating oil system. Clean the area around the components concerned carefully. Blow damp parts dry with compressed air. Observe the safety regulations and national specifications for handling lube oils. Dispose of leaking lubricating oil and filter elements properly. Do not allow used oil to seep away into the ground. Perform a trial run after all work. Pay attention to tightness and lubricating oil pressure and then check the engine oil level. In case of fuels containing more than 1% sulphur, contact your corresponding DEUTZ partner.



## Checking the lubricating oil level



Low lubricating oil level and overfilling lead to engine damage.

The lubricating oil level may only be checked with the engine in a horizontal position and switched off.

If the engine is warm, switch off the engine and check the lubricating oil level after 5 minutes. If the engine is cold you can check it immediately.



Be careful of hot lubricating oil. Danger of scalding!

Do not pull out the dipstick while the engine is running. Danger of injury!

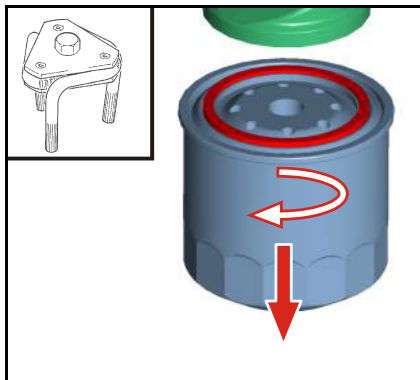
- Pull out the lubricating oil dipstick and wipe off with a lint-free, clean cloth.
- Insert the lubricating oil dipstick as far as it will go.

- Extract the lubricating oil dipstick and read off the oil level.
- The oil level must always be between the MIN and MAX marks! Top up to the MAX mark if necessary.

## Changing the lubricating oil

- Warm up the engine (lubricating oil temperature > 80 °C).
- Ensure that the engine or vehicle is in a level position.
- Switch off the engine.
- Place a collecting receptacle underneath the lube oil drain screw.
- Unscrew the lube oil drain screw, drain oil.
- Fit a new sealing ring to the lube oil drain screw, insert and tighten. (tightening torque 100 Nm).
- Pour in lube oil.
  - Quality/viscosity data (▣33).
  - Filling volume (▣72).
- Warm up the engine (lubricating oil temperature > 80 °C).
- Ensure that the engine or vehicle is in a level position.
- Check lubricating oil level, if necessary top up.

6

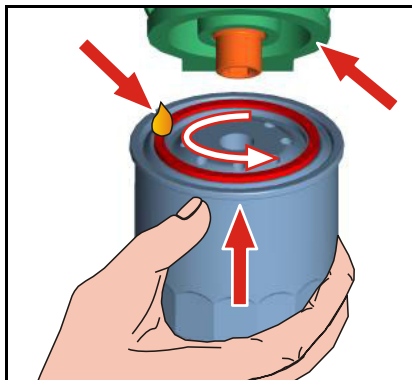


**Change lubricating oil filter**



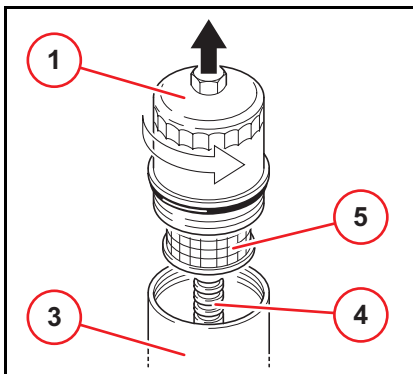
The filter cartridge should never be pre-filled. There is a danger of dirt contamination!

- Remove clamps when twist protection mounted (optional).
- Loosen and unscrew filter cartridge with tool (**order number: 170050**).
- Collect draining lubricating oil
- Clean the sealing surface of the filter support with a lint-free, clean cloth.



- Oil the gasket of the new DEUTZ original filter cartridge lightly.
- Screw on new filter by hand until the gasket is touching and tighten with a torque of: 15-17 Nm
- Fasten clamps of the twist protection (optional).





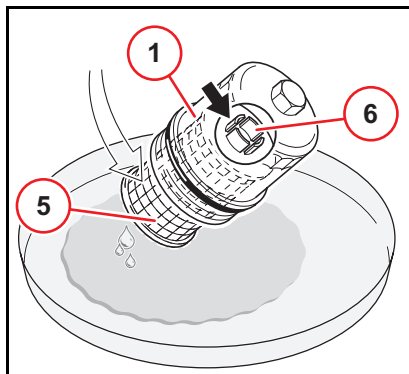
**Replace lubricating oil filter cartridge**



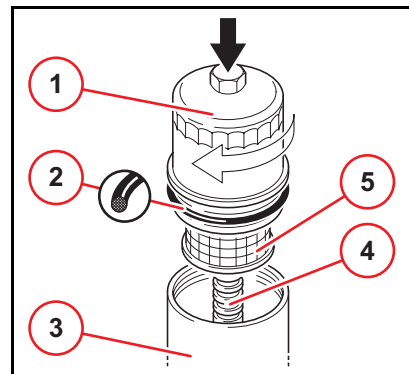
The filter cartridge should never be pre-filled. There is a danger of dirt contamination!

- 1 Cover
- 2 Sealing ring
- 3 Housing
- 4 Guide
- 5 Filter insert
- 6 Bracket

- Switch off the engine.
- Loosen cover by turning 2-3 times and wait for 30 seconds.
- Unscrew cover with filter cartridge anti-clockwise.
- Loosen the filter cartridge carefully out of the guide in the housing and upwards.



- Collect draining lubricating oil
- Bend the filter cartridge in the collecting container slightly to the side until the cartridge comes out of the bracket.
- Clean components.



- Replace gasket and oil lightly.
- Press new filter cartridge into bracket and place them carefully into the guide.
- Screw the cover clockwise (25 Nm).
- Start engine.

#### Specifications when working on the fuel system



Engine must be switched off!  
Smoking and naked lights prohibited!  
No injection/high pressure pipes may be disconnected while the engine is running.  
Caution when handling hot fuel!  
Pay attention to utmost cleanliness when refuelling and working on the fuel system.  
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.  
Observe the safety regulations and national specifications for handling fuels.  
Dispose of leaking fuel and filter elements properly. Do not allow fuel to seep away into the ground.  
After all work on the fuel system, the system should be vented, a trial run performed and the tightness checked.  
It will be necessary to vent the fuel system when commissioning for the first time, after maintenance work or if the tank has been run dry.



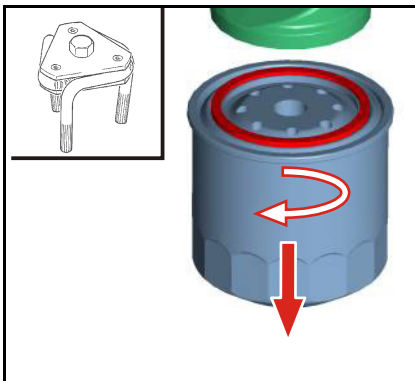
Additional venting of the fuel system by a 5 minute trial run at idle speed or on low load is absolutely essential.  
Pay attention to utmost cleanliness due to the high production accuracy of the system!  
The fuel system must be tight and closed.  
Make a visual inspection for leaks/damage in the system.



Clean and dry the engine and engine compartment thoroughly before beginning work.

Areas of the engine compartment from which dirt could be loosened must be covered with a fresh, clean foil.

Work on the fuel system may only be carried out in an absolutely clean environment. Contamination of the air such as dirt, dust, moisture etc. must be avoided.

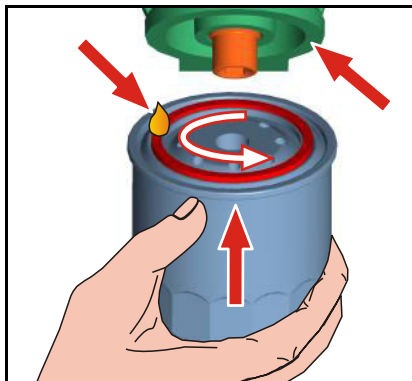


**Change the fuel filter cartridge**

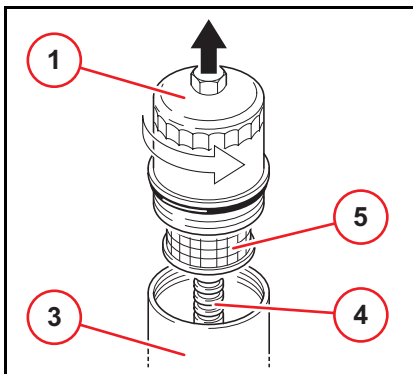


The filter cartridge should never be pre-filled. There is a danger of dirt contamination!

- Remove clamps when twist protection mounted (optional).
- Loosen and unscrew filter cartridge with tool (**order number: 170050**).
- Catch any escaping fuel.
- Clean the sealing surface of the filter support with a lint-free, clean cloth.



- Oil the gasket of the new DEUTZ original filter cartridge lightly.
- Screw on new filter by hand until the gasket is touching and tighten with a torque of: 10-12 Nm
- Fasten clamps of the twist protection (optional).
- Vent the fuel system.



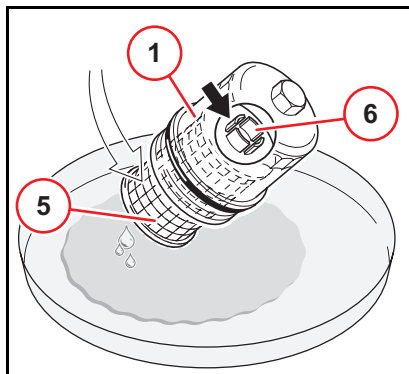
**Replace fuel filter cartridge**



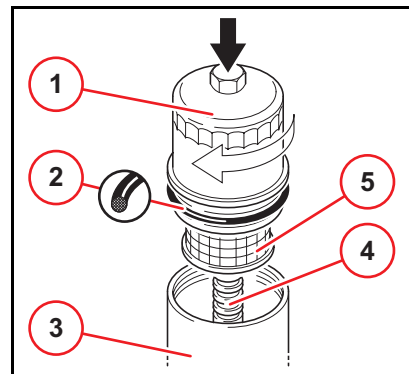
The filter cartridge should never be pre-filled. There is a danger of dirt contamination!

- 1 Cover
- 2 Sealing ring
- 3 Housing
- 4 Guide
- 5 Filter insert
- 6 Bracket

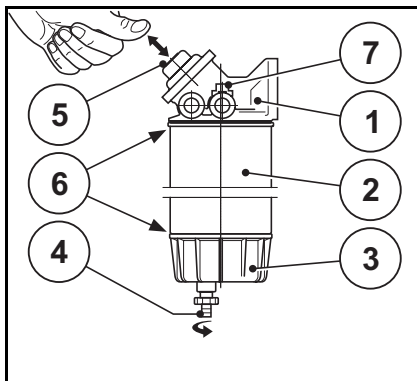
- Switch off the engine.
- Loosen cover by turning 2-3 times and wait for 30 seconds.
- Unscrew cover with filter cartridge anti-clockwise.
- Loosen the filter cartridge carefully out of the guide in the housing and upwards.



- Catch any escaping fuel.
- Bend the filter cartridge in the collecting container slightly to the side until the cartridge comes out of the bracket.
- Clean components.



- Replace gasket and oil lightly.
- Press new filter cartridge into bracket and place them carefully into the guide.
- Screw the cover clockwise (25 Nm).
- Start engine.




## Clean/change/vent the fuel pre-filter

- 1 Fuel pre-filter holder
  - 2 Fuel filter insert
  - 3 Water collection vessel
  - 4 Water drain tap
  - 5 Fuel pump
  - 6 Sealing surface
  - 7 Venting screw
- Shut off the fuel supply to the engine (with high-level tank).
  - Place a vessel under the drain plug.
  - Open the drain cock and drain liquid.
  - Unscrew the filter insert (2) together with the water collection vessel (3).
  - Empty emulsion in the water collection vessel (3) and clean the vessel.
  - Mount the filter insert (2) and water collection vessel (3). Wet the sealing surfaces (6) of the filter insert (2) and the water collection vessel (3)

with fuel.

- Assembly in clockwise direction.
- Open the fuel shutoff tap and vent the system, see venting the fuel system.
- Start engine.
- Check for leaks after starting the engine.

## Change the fuel pre-filter insert

- Shut off the fuel supply to the engine (with high-level tank).
- Place a vessel under the drain plug.
- Open the drain cock and drain liquid.
- Unscrew the filter insert (2) together with the water collection vessel (3).
- Unscrew the water collection vessel (3) from the filter insert (2).
  - The special tool can be ordered under part number **8192** (  76).
- Clean the water collection vessel (3) and all the existing sealing surfaces (6) with a brush and diesel fuel.
- Oil the gaskets and sealing surfaces (6) of the new DEUTZ original filter insert (2) lightly or wet with diesel fuel.
- Screw the water collection vessel (3) to the filter insert (2).
- Screw a new filter insert (2) with water collection vessel (3) onto the filter carrier 1 (tightening torque 17-18 Nm)
- Open the fuel supply to the engine.
- Vent the fuel system.

## Vent the fuel pre-filter.

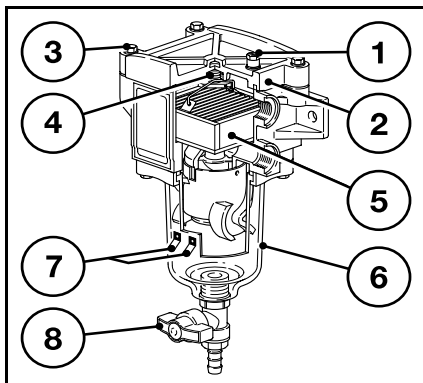
- Loosen vent screws slightly.
- Operate the pump until fuel emerges without

bubbles.

- Catch any escaping fuel.
- Tighten vent screw.

## Vent the fuel system

- Bring engine control to stop position.
- Position fuel collecting vessel below the constant-pressure valve in the crankcase/filter housing.
- Open constant-pressure valve in the crankcase/fuel stopcock in the filter housing.
- Turn over the engine with starter (max. 20 Sec.) until bubble-free fuel emerges at the constant-pressure valve in the crankcase/filter housing.
- Screw in ventilation screws (tightening torque 25-5 Nm) and constant-pressure valve.
- Bring engine control to the start position and start.
- Check for leaks after starting the engine.



#### Clean/change/vent the fuel pre-filter

- 1 Venting screw
- 2 Cover
- 3 Screw
- 4 Spring cassette
- 5 Filter insert
- 6 Water collection vessel
- 7 Electrical connection
- 8 Water drain tap



A warning system (lamp/horn) should be installed via the electric connections. If the warning system is triggered, immediate maintenance is required.

#### Cleaning/purging, draining of water

- Switch off the engine or switch over to the other filter in case of switchable filter.
- Shut off the fuel supply to the engine (with high-

level tank).

- Place suitable collecting containers underneath.
- Loosen vent screws slightly.
- Open the drain cock and drain liquid.
  - To open, the drain cock must be pressed lightly and turned.
- Close the drain cock.
- Tighten vent screw.
- Vent the fuel system.

#### Change the fuel pre-filter insert

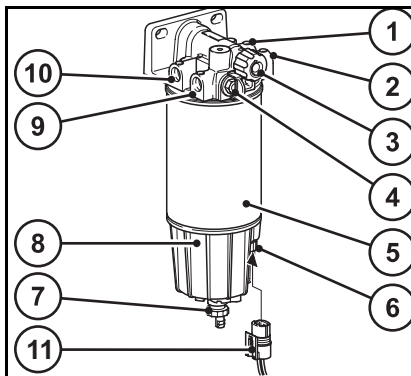
Change after maintenance interval, loss of power, or annually.

- Switch off the engine or switch over to the other filter in case of switchable filter.
- Shut off the fuel supply to the engine (with high-level tank).
- Loosen screws diagonally.
- Remove cover.
- Remove spring cassette.
- Change filter cartridge
- Place spring cassette on the filter cartridge.
- Check the cover gasket for correct fit and damage (change if necessary).
- Tighten cover with screws diagonally (tightening torque 6Nm).
- Check for leaks after starting the engine.
- Vent the fuel system.

#### Vent the fuel system

- Shut down engine
- Position fuel collecting vessel below the constant-pressure valve in the crankcase/filter housing.

- Open constant-pressure valve in the crankcase/fuel stopcock in the filter housing.
- Start engine.
  - Turn over the engine with starter (max. 20 Sec.) until bubble-free fuel emerges at the constant-pressure valve in the crankcase/filter housing.
- Shut down engine
  - Screw in ventilation screws (tightening torque 25-5 Nm) and constant-pressure valve.
- Start engine.
  - Bring engine control to the start position and start.
  - Check for leaks after starting the engine.




## Clean/change/vent the fuel pre-filter

### Deutz Common Rail (DCR)

- 1 Fuel supply flow to the pump
- 2 Fuel return flow from the control block FCU (Fuel Control Unit)
- 3 Fuel pump
- 4 Thermostat valve with stop lever (optional)
- 5 Filter insert
- 6 Electrical connection for water level sensor
- 7 Water drain tap
- 8 Water collection vessel
- 9 Fuel inlet from the fuel tank
- 10 Fuel return to fuel tank
- 11 Connection for electrical warning lamp/horn

### Change the fuel pre-filter insert

- Shut off the fuel supply to the engine (with high-level tank).
- Place suitable collecting containers underneath.

- Open the drain cock and drain liquid.
- Unscrew the filter cartridge together with the water collection vessel in anticlockwise direction and remove.
- Loosen the water collection vessel from the old filter cartridge by turning anti-clockwise and remove.
  - The special tool can be ordered under part number **8192** (  76).
- Empty any fuel remaining in the fuel collection vessel and clean the water collection vessel.
- Screw the water collection vessel clockwise onto the new filter cartridge.
- Clean any dirt off the sealing surfaces of the new filter cartridge and opposite side of filter head.
- Wet the sealing surfaces of the filter cartridge slightly with fuel and screw back on to the filter head, clockwise (17-18 Nm).
- Open the fuel shutoff tap and vent the system, see venting the fuel system.

### Vent the fuel system

- Unlock the bayonet connection of the fuel supply pump by pressing upwards and simultaneously turning anticlockwise. The pump pistons are now pressed out through the spring.
- Keep pumping until a very strong resistance can be felt and the pumping only progresses very slowly.
- Now continue pumping several times. (The return line must be filled).
- Lock the bayonet connection of the fuel supply pump by pressing upwards and simultaneously turning clockwise.
- Start the engine and operate approx. 5 minutes

in idling mode or at low load. Check the pre-filter for leaks while doing this.

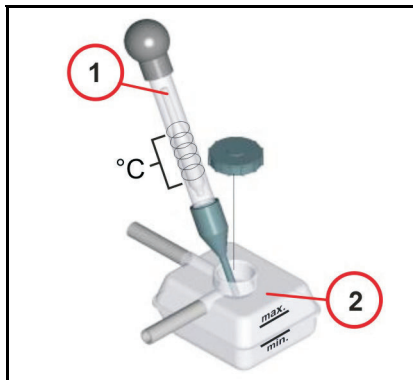
#### Specifications when working on the cooling system



**Danger of scalding from hot coolant!**  
Cooling system under pressure! Only open the cap when cool!  
The coolant must have a prescribed concentration of cooling system corrosion protection agent!  
Observe safety regulations and national specifications when handling cooling media.  
Observe the manufacturer's specifications for an external cooler.  
Dispose of leaking liquids properly and do not allow them to seep into the ground.  
Order coolant corrosion protection agent from your DEUTZ partner.  
Never operate the engine without coolant, even for a short time!

#### Checking the coolant level with an external cooler

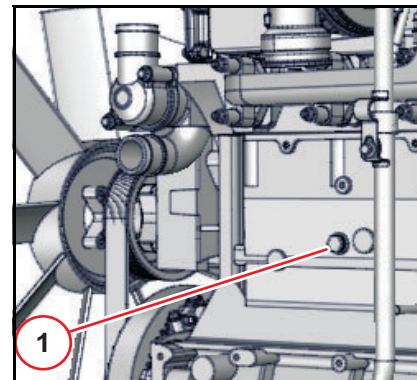
- Fill in new coolant and vent the system according to the specifications of the cooling system manufacturer.
- Open the cooling system cap (1) carefully.
- The coolant level must always be between the MIN and MAX marks of the compensation tank! Fill up to the MAX mark if necessary.



#### Check coolant additive concentration

- Open the cooling system cap (1) carefully.
- Check the coolant additive concentration in the cooler/compensation tank (2) with a conventional antifreeze measuring device (1) (e.g. hydrometer, refractometer).
- Necessary coolant additive concentration Coolant mixing ratio (▮ 35).

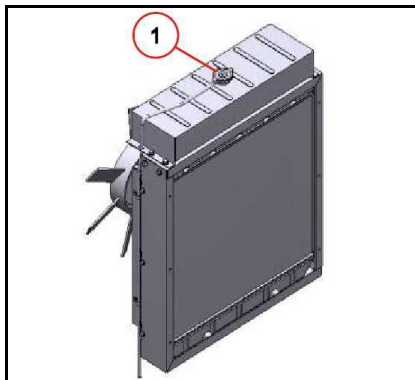
You can order the appropriate test instrument from your DEUTZ partner under order number 1824.



#### Emptying the cooling system

- Open cooler locking cap carefully.
- Place suitable collecting containers underneath.
- Remove the locking screw (1) in the crankcase.
- Drain coolant.
- If the locking screw is not accessible, the drainage can be carried out at the engine oil cooler (coolant duct).
- Insert screw again with sealant.
- Close cooler locking cap.



**Fill and ventilate cooling system**

Danger of scalding from hot coolant!  
Cooling system under pressure! Only open  
the cap when cool!

- Open the cooling system cap (1) carefully.
- Loosen the cooler venting screw if necessary.
- Fill coolant up to the max. mark or filling limit.
- Switch on any available heating and set to the highest level so that the heating circuit is filled and vented.
- Close cooler locking cap.
- Run engine up to operating temperature (opening temperature of the thermostat).
- Switch off the engine.
- Check coolant level in cooled engine and top up to the MAX mark or filling level on the compensation tank if necessary.

**Cleaning work**

For all cleaning work, make sure that no parts are damaged (e.g. bent cooler mesh). Cover electrical/electronic parts and connections to clean the engine (e.g. control units, generator, solenoid valves etc.). Do not aim the water/steam jet directly at them. Allow engine to warm up.



Only carry out cleaning work on the engine when it is not running!  
Remove the engine cover and cooling air cover if available and remount after cleaning.

**General**

The following causes of soiling make it necessary to clean the engine:

- High dust content in the air.
- Chaff and chopped straw in the area of the engine.
- Coolant leaks
- Lubricating oil leakage
- Fuel leaks

Because of the different application conditions, cleaning depends on the degree of dirt contamination.

**Cleaning with compressed air**

- Blow dirt off or out. Always blow out the cooler and cooling fins from the exhaust air side to the fresh air side.

**Cleaning with cold cleaner**

- Spray the engine with cold cleaner and leave it for about 10 minutes to take effect.
- Spray the engine clean with a high pressure water jet.
- Warm up the engine so that the water residues evaporate.

**Cleaning with a high pressure cleaner**

- Clean the engine with a steam jet (maximum spray pressure 60 bar, maximum steam temperature 90 °C, distance at least 1m).
- Warm up the engine so that the water residues evaporate.
- Always clean the cooler and cooling fins from the exhaust air side to the fresh air side.

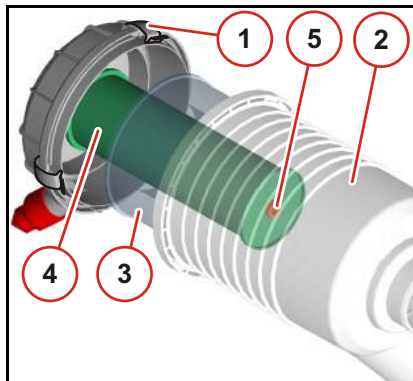
## Regulations for working on the intake system



Do not work when the engine is running!



Pay attention to utmost cleanliness when working on the intake system, close intake openings if necessary. Dispose of old filter elements properly.



## Maintaining the dry air filter



Do not clean the filter element (3) with petrol or hot liquids!  
Renew damaged filter elements.

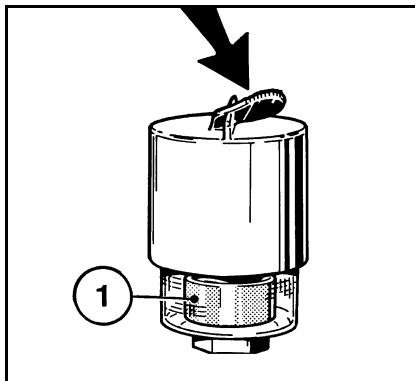
- Maintain the filter element (3) according to the interval in the maintenance schedule
- Lift up the clamping yoke (1).
- Remove the filter hood (2) and pull out the filter element (3).
- Filter element (3):
  - blow out with dry compressed air (max. 5 bar) from the inside to the outside if soiling is only slight,
  - renew if heavily soiled.

## Renewing the safety cartridge of the dry air filter



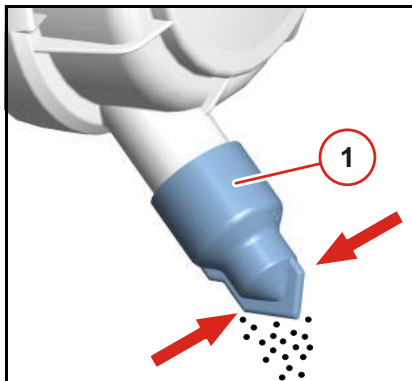
Never clean the safety cartridge (4).

- Renew safety cartridge (4) according to the interval in the maintenance schedule
- To do this:
  - Unscrew hexagon nut (5), pull out safety cartridge (4).
  - Insert new safety cartridge, screw on hexagonal nut.
- Insert filter element (3), mount hood (2) and fix with clamping yoke (1).



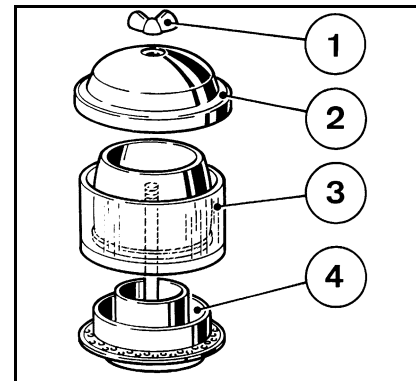
**Maintenance indicators for dry air filter**

- The dry air filter is maintained according to a maintenance switch or maintenance indicator.
- Maintenance is necessary when:
  - the yellow warning light of the **maintenance switch** lights up when the engine is running.
  - the red field (1) of the **maintenance indicator** is fully visible.
- After carrying out maintenance work, reset the signal by pressing the button on the maintenance indicator. The maintenance indicator is now ready for operation again.

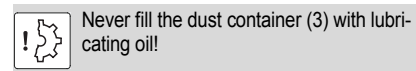


**Clean the dust discharge valve of the dry air filter**

- Empty the dust discharge valve (1) by pressing together the discharge slit.
- Remove any caked dust by pressing together the upper section of the valve.
- Clean the discharge slit.

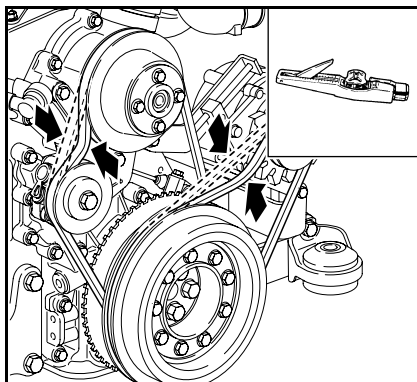


**Emptying the cyclone precleaner**



Never fill the dust container (3) with lubricating oil!

- Loosen wing nut (1) and lift off housing cover (2).
- Remove the dust container (3) from the base (4) and empty it. Clean the container using a brush and clean diesel fuel. Then dry.
- Place the dust container (3) on the base (4) and tighten the housing cover (2) with wing nut (1).



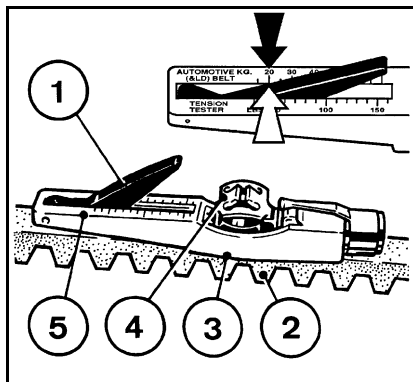
Checking the belt drive



Only carry out work on the belt drive with the engine at a standstill!  
Always change both belts in sets in case of wear on the double belts or damage to one V-belt.

After repair work: Check that all guards have been replaced and that all tools have been removed from the engine.

- Check the whole belt drive visually for damage.
- Renew damaged parts.
- Remount protective devices if necessary.
- Pay attention to correct fit of new belts, check the tension after running for 15 minutes.

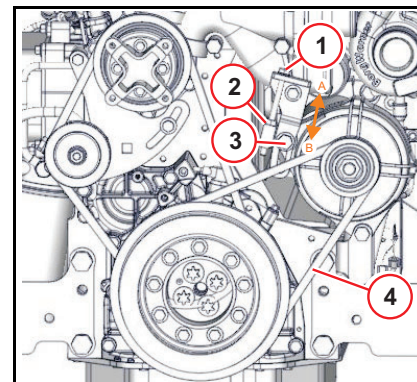


Checking the belt tension

- Lower indicator arm (1) into the measuring device.
- Place guide (3) between two belt pulleys on the V-belt (2). The stop have to be at the side.
- Press the button (4) at right angles to the V-belt (2) evenly until you hear or feel the spring snap in.
- Lift the measuring device carefully without altering the position of the indicator arm (1).
- Read the measured value at the point of intersection (arrow), scale (5) and indicator arm (1).
- If necessary, re-tension belt and measure again.

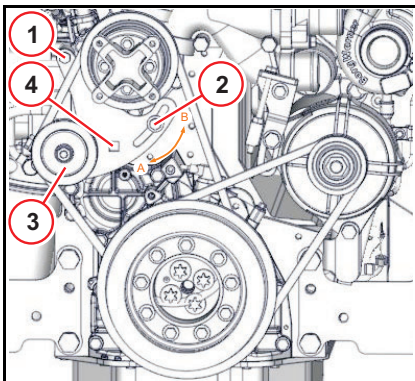
## Tools

Belt tension measuring device (**order number: 8115**) can be obtained from your DEUTZ partner.



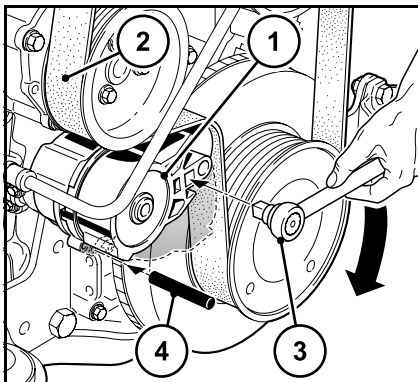
Change generator V-belts

- 1 Setting screw
  - 2 Lock nut
  - 3 Screw
  - 4 V-belts
- Remove screw and lock nut.
  - Move the generator over the setting screw in direction (B) until the V-belt is slack.
  - Remove belt and fit new one.
  - Move the generator over the setting screw in direction (A) until the V-belt has attained the correct tension.
  - Tighten screw and lock nut again.



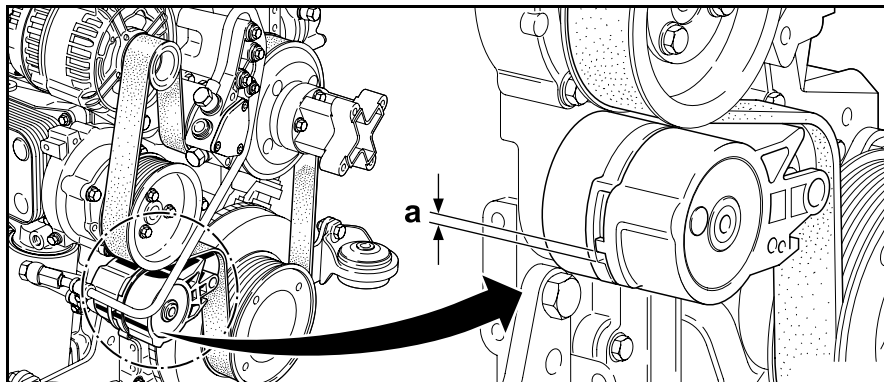
#### Change the belt

- Remove generator V-belts.
- Loosen screws (1) and (2) and (3).
- Move the tensioning pulley (3) in the direction of the arrow (B).
- Remove belt and fit new one.
- Plug socket wrench insert of the torque wrench into the opening (4) of the tensioning pulley (3).
- Move the tensioning pulley (3) with the torque wrench in the direction of the arrow (A) until the correct belt tension is reached.
- Retighten the screws (1) and (2).
- Checking the belt tension (▮ 53).
- Mount generator V-belts.



**Replace V-rib belt**

- Press tensioning pulley (1) with pin wrench (3) in the direction of the arrow until a holding pin Ø 6 mm (4) can be fixed in the assembly bore. The V-rib belt (2) is now free of tension.
- First remove the V-rib belt (2) from the smallest pulley or from the tensioning pulley.
- Mount V-rib belt (2).
- Retain tensioning pulley using the pin wrench and remove the holding pin.
- Re-tension using the tensioning pulley and pin wrench (3). Check whether the V-rib belt is correctly in its guide.



**Check belt length**

- Measure the gap between the journal of the movable tensioning arm and the stop of the fixed housing.
- If gap "a" is less than 3 mm, the belt must be replaced.

#### Check valve clearance, adjust if necessary

- Let the engine cool down for at least 30 minutes before setting the valve clearance: Lubricating oil temperature below 80 °C.
- Release screws.
- Remove the cylinder head hood.
- Remove gasket.
- Place turning gear over fastening screws of the belt pulleys.
- Turn the crankcase until reaching valve overlap.

Outlet valve is not yet closed, inlet valve begins to open.

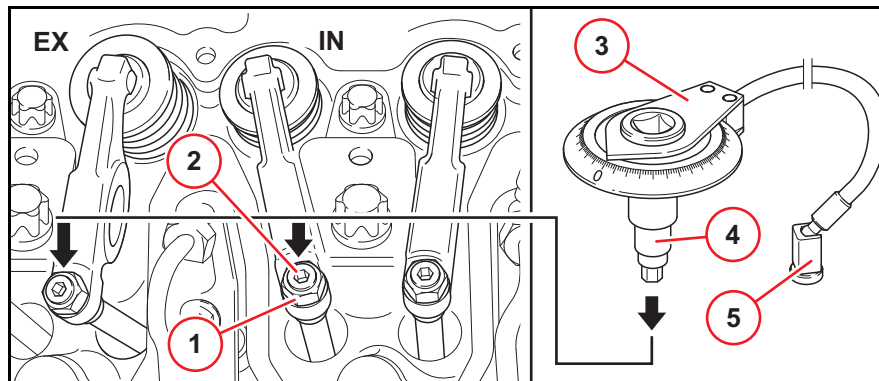
The cylinders to be set can be seen in the setting schematic.

TD/TCD2012/2013L04 2V

Valve overlap	Settings
1	4
3	2
4	1
2	3

TCD2012/2013L06 2V

Valve overlap	Settings
1	6
5	2
3	4
6	1
2	5
4	3



#### Set valve clearance (inner exhaust recirculation)

- 1 Lock nut
  - 2 Setting screw
  - 3 Rotary angle disc
  - 4 Insert
  - 5 Magnet
- Fit the rotary angle disc with socket wrench inset on the setting screw.
  - Fix magnet of the rotation angle disc.
  - Turn rotation angle disc clockwise to the stop (rocker arm without clearance) and set scale to zero.
  - Turn rotation angle disc anticlockwise until reaching the specified rotation angle:

Valve clearance	IN	Inlet valve	75° + 10°
TD/TCD 2012	EX	Outlet valve	120° + 10°

Valve clearance	IN	Inlet valve	90° + 10°
TD/TCD 2013	EX	Outlet valve	150° + 10°

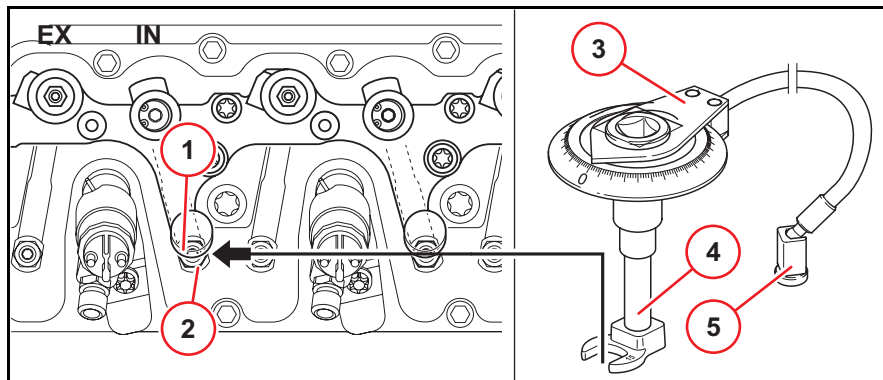
- Secure the rotation angle disc against twisting.
- Turn rotation angle disc clockwise to the stop (rocker arm without clearance) and set scale to zero.
- Tighten locking nut.

Tightening torque 20 Nm

- Then set the second valve on the rocker arm as described above.
- Perform the setting procedure on every cylinder.
- Remount the cylinder head cover with a new gasket in the reverse order of disassembly.
- Tighten screws.

Tightening torque 22 Nm





Tightening torque 22 Nm

## Set valve clearance (with internal exhaust gas recirculation EGR connected)

- 1 Lock nut
- 2 Setting screw
- 3 Rotary angle disc
- 4 Insert
- 5 Magnet

The same setting regulation applies for the outlet valves as for engines without exhaust gas recirculation.

## Set inlet valve

- Fit the rotary angle disc with socket wrench inset on the setting screw.
- Fix magnet of the rotation angle disc.
- Turn rotation angle disc clockwise to the stop (rocker arm without clearance) and set scale to zero.
- Turn rotation angle disc anticlockwise until reaching the specified rotation angle:

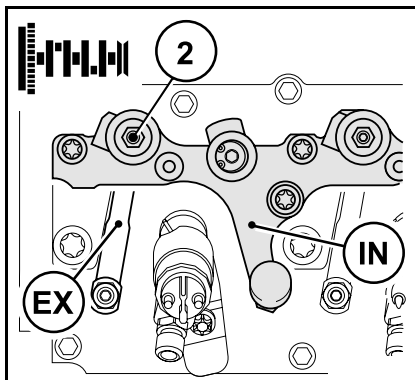
Valve clearance	<b>IN</b>	Inlet valve	$75^{\circ} + 10^{\circ}$
TD/TCD 2012	<b>EX</b>	Outlet valve	$120^{\circ} + 10^{\circ}$

Valve clearance	<b>IN</b>	Inlet valve	$90^{\circ} + 10^{\circ}$
TD/TCD 2013	<b>EX</b>	Outlet valve	$150^{\circ} + 10^{\circ}$

- Secure the rotation angle disc against twisting.
- Turn rotation angle disc clockwise to the stop (rocker arm without clearance) and set scale to zero.
- Tighten locking nut.

Tightening torque 20 Nm

- Then set the second valve on the rocker arm as described above.
- Perform the setting procedure on every cylinder.
- Remount the cylinder head cover with a new gasket in the reverse order of disassembly.
- Tighten screws.

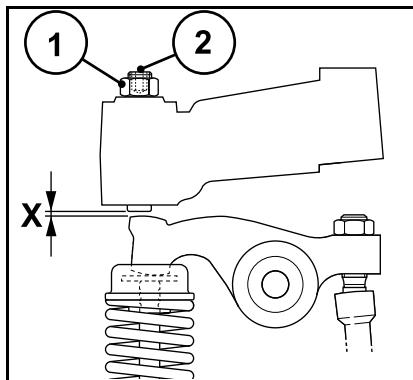


**Set control piston clearance (with internal exhaust gas recirculation EGR connected)**

- 1 Lock nut
- 2 Setting screw

After setting the valve clearance, the control piston clearance should be set as follows:

- Turn the crankcase until reaching valve overlap of the first cylinder.  
Outlet valve is not yet closed, inlet valve begins to open.  
The cylinders to be set can be seen in the setting schematic.



- Loosen lock nut.
- Fit the rotary angle disc with socket wrench inset on the setting screw.
- Fix magnet of the rotation angle disc.
- Turn rotation angle disc clockwise to the stop (control piston without clearance) and set scale to zero.
- Turn rotation angle disc anticlockwise until reaching the specified rotation angle:

Control piston clearance 144°

- Tighten locking nut.
- Perform the setting procedure on every control piston.

## Regulations for working on the electrical system



Do not touch the voltage conducting parts, faulty warning lamps should be immediately replaced.



Pay attention to correct polarity of the connections.

Cover electrical/electronic parts and connections to clean the engine (e.g. control units, generator, solenoid valves etc.). Do not aim the water/steam jet directly at them. Allow engine to warm up.

Touching a lead against the frame to check whether it is live must not, under any circumstances, be carried out.

For electrical welding work, the ground terminal of the welding gear must be clamped directly to the part being welded.

Three-phase current generator: Never disconnect the cables between battery, generator and regulator while the engine is running.

## Battery



Electronically stored data could be lost if the battery is disconnected.

Keep battery clean and dry.

Make sure the battery is fitted correctly and securely.

Dispose of old batteries in an environmentally friendly way.



Danger of explosion! The gases emitted by the battery are explosive!

Fire, sparks, smoking and naked lights are prohibited!

Danger of acid burns! Wear protective gloves and glasses! Avoid contact with skin and clothing!

Danger of short circuit! Do not rest tools on the battery!

## Checking the voltage

- Check the battery voltage with a standard voltmeter. The voltage gives information about the charge status.

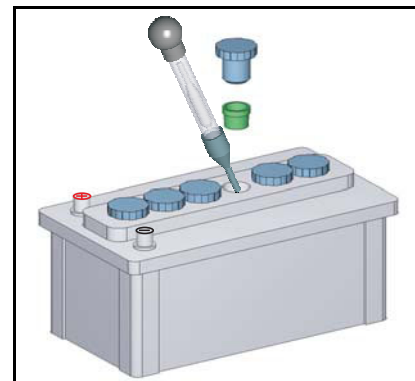
Battery	Charge status (Volt)
12 Volt	12-14,4
24 Volt	24-28,4

## Check acid level

- Unscrew caps.
- Note the manufacturer's specifications concerning the liquid level.

The liquid should normally be 10-15 mm above the top edge of the plate or reach up to any available control device.

- Only use distilled water to top up the battery.
- Screw in caps.



## Check acid density

- Unscrew caps.
- Measure the electrolyte density of individual cells with a commercial hydrometer. Hydrometer reading indicates battery's state of charge. The acid temperature when measuring should be 20 °C if possible.
- Check the acid level before recharging.
- Screw in caps.

Acid density [kg/ l]		Charge status	Measure
Normal	Tropical		
1,28	1,23	good	none
1,20	1,12	half	charge
1,12	1,08	empty	charge

### 6

#### Removing the battery

- Always disconnect the minus pole first when removing the battery. Otherwise there is a danger of short-circuit!
- Remove the fastenings and take out the battery.

#### Charging the battery

- Unscrew caps.
- Charge the battery with a conventional battery charger. Observe the manufacturer specifications!
- Screw in caps.

#### Installing the battery

- Insert new or charged battery and attach the fastenings.
- Clean the terminals and battery poles with fine emery paper.
- Connect the plus pole first and then the minus pole. Otherwise there is a danger of short-circuit! Make sure the terminals have good contact. Tighten clamp bolts hand-tight.
- Grease the assembled terminals with an acid-free, acid-resistant grease.

## Faults and remedies

Faults	Causes	Measures
Engine does not start or is difficult to start	Not disconnected (if possible)	Check coupling
	Fuel tank empty	Vent fuel system
	Fuel suction pipe blocked	Check
	Below starting limit temperature	Check
	Cold starting device	Check/replace
	Wrong SAE viscosity class of the engine lubricating oil	Change the lubricating oil
	Fuel quality does not comply with operating manual	Change the fuel
	Battery defective or discharged	Check battery
	Cable connection to starter loose or oxidized	Check cable connections
	Starter defective or pinion does not engage	Check starter
	Engine stop lever still in stop position	Check/replace
	Mechanical injection system	
	Stop magnet defective (release circuit)	Check/replace
	Incorrect valve clearance	Check valve clearance and set if necessary
	Air filter clogged / turbocharger defective	Check/replace
	Air in fuel system	Vent fuel system
	Compression pressure too low	Check compression pressure
	Exhaust gas backpressure too high	Check
	Injection line leaks	Check injection line
Engine does not start and diagnostic lamp flashes	Engine electronics prevents starting	Check error according to error code and eliminate error if necessary

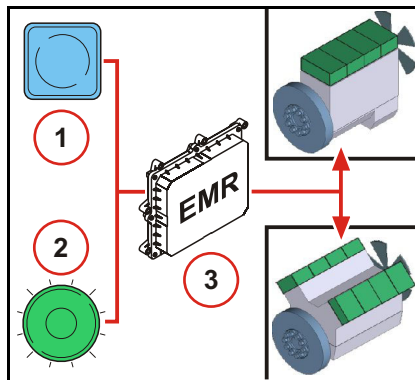
Faults	Causes	Measures
Engine starts, but runs irregularly or fails	Belt/V-rib belt (fuel pump in belt drive)	Check whether torn or loose
	Incorrect valve clearance	Check valve clearance and set if necessary
	Compression pressure too low	Check compression pressure
	Cold starting device	Check/replace
	Glow plugs defective	Change
	Air in fuel system	Vent
	Fuel filter contaminated	Clean
	Fuel quality does not comply with operating manual	Change the fuel
	Injector defective	Change
	Injection line leaks	Check injection line
Speed changes are possible and diagnostic lamp lights up	Engine electronics has detected a system error and activates an equivalent speed	Check error according to error code and eliminate error if necessary

Faults	Causes	Measures
Engine becomes excessively hot. Temperature warning system activates	Vent line blocked	Clean
	Wrong SAE viscosity class of the engine lubricating oil	Change the lubricating oil
	Lube oil cooler defective	Check/replace
	Lube oil filter contaminated on the air or lube oil side	Change
	Lube oil level too high	Check lube oil level, if necessary drain off.
	Lubricating oil level too low	Fill up lube oil
	Incorrect valve clearance	Check valve clearance and set if necessary
	Injector defective	Change
	Coolant heat exchanger soiled	Clean
	Defective cooling water pump (torn or loose V-belt)	Check whether torn or loose
	Low coolant	Fill up
	Resistance in cooling system is too high / flow volume too low	Check the cooling system
	Cooling fan or exhaust thermostat defective, V-belt torn or loose	Check/replace/tension
	Charge air line leaking	Check charge air line
	Charge air cooler soiled	Check/clean
	Air filter clogged / turbocharger defective	Check/replace
	Air filter maintenance switch / maintenance indicator defective	Check/replace
	Fan defective/V-rib belt torn or loose	Check fan/V-belt, change if necessary

Faults	Causes	Measures
Engine output is deficient	Lube oil level too high	Check lube oil level, if necessary drain off.
	Lubricating oil cooler fins soiled	Clean
	Engine stop lever still in stop position Mechanical injection system	Check/replace
	Fuel suction temperature too high	Check the system
	Fuel quality does not comply with operating manual	Change the fuel
	Air filter clogged / turbocharger defective	Check/replace
	Air filter maintenance switch / maintenance indicator defective	Check/replace
	Fan defective/V-rib belt torn or loose	Check fan/V-belt, change if necessary
	Charge air line leaking	Check charge air line
	Charge air cooler soiled	Clean
	Resistance in cooling system is too high / flow volume too low	Check the cooling system
	Injection line leaks	Check injection line
	Injector defective	Change
Engine performs poorly and diagnostic lamp lights	Engine electronics reduce performance	Please contact your DEUTZ partner
Engine does not run on all cylinders	Injection line leaks	Check injection line
	Injector defective	Change
	Charge air line leaking	Check charge air line
	Lube oil level too high	Check lube oil level, if necessary drain off.
Engine lubricating oil pressure is non-existent or excessively low	Lubricating oil level too low	Fill up lube oil
	Excessive inclination of engine	Check engine mounting / reduce inclination
	Wrong SAE viscosity class of the engine lubricating oil	Change the lubricating oil
Engine lubricating oil consumption excessive	Lube oil level too high	Check lube oil level, if necessary drain off.
	Excessive inclination of engine	Check engine mounting / reduce inclination
	Crankcase breather	Check/replace
Lubricating oil in the exhaust system	Engine operated continuously with too low a load (< 20-30%)	Check load factor



Faults	Causes	Measures
Engine producing blue smoke	Lube oil level too high	Check lube oil level, if necessary drain off.
	Excessive inclination of engine	Check engine mounting / reduce inclination
Engine producing white smoke	Below starting limit temperature	Check
	Cold starting device	Check/replace
	Incorrect valve clearance	Check valve clearance and set if necessary
	Fuel quality does not comply with operating manual	Change the fuel
	Injector defective	Change
Engine producing black smoke	Air filter clogged / turbocharger defective	Check/replace
	Air filter maintenance switch / maintenance indicator defective	Check/replace
	Charge air pressure-dependent full load stop defective	Check
	Incorrect valve clearance	Check valve clearance and set if necessary
	Charge air line leaking	Check charge air line
	Injector defective	Change



**Engine protection function of the electronic engine control**

1	Diagnosis button
2	Error lamp
3	Electronic engine control (EMR)



The error lamp goes out when all the errors have been eliminated. For some errors, it is necessary to switch off the ignition, wait 30 s and only then switch back on the ignition. The appropriate monitoring functions are switched off when a sensor fails. Only the sensor failure is documented in the error memory.

Depending on the design of the monitoring functions, the electronic engine control can protect the engine in certain problematical situations by monitoring important limit values during operation and checking the correct function of the system components.

Depending on the seriousness of a recognised fault, the engine can continue to operate with limitations, during which the error lamp lights up continuously or indicates a serious system error by flashing. In this case, the engine should be switched off as soon as safely possible.

## Error lamp

The error lamp is located in the vehicle drive stand.

The error lamp can release the following signals:

- **Function test**
  - Ignition on, error lamp lights up for approx. 2 seconds and then goes out.
  - Check the error lamp if there is no reaction after switching on the ignition.
- **The lamp does not light**
  - After the lamp test an extinguished lamp indicates an error-free and trouble-free operating state within the scope of the control possibility.
- **Continuous light**  
Error in system.
  - Operation continued with restrictions.
  - The engine must be checked by a DEUTZ partner.
  - If a lamp lights steadily a monitored measuring variable (e.g. coolant temperature, lubricating oil pressure) has left the permissible value range.  
Depending on the fault, the engine power may be reduced by the electronic engine control to protect the engine.
- **Flashing**  
Serious error in system.

- Switch off prompt for the operator. Attention: Failure to do so will lead to loss of guarantee!
  - The engine has reached switch-off condition.
  - Engine forced to run at low idle speed to cool the engine, with automatic shutdown if necessary.
  - The switch-off process has been accomplished.
  - There may be a start lock after engine stop.
  - The start lock is deactivated by turning off the system with the ignition key for approx. 30s.
  - The power reduction can be bypassed, the automatic switch-off delayed or a start lock bypassed with the override key on the instrument panel to avoid critical situations. This brief deactivation of the engine protection functions is logged in the control unit.
- Please contact your DEUTZ-partner in case of malfunctions and spare parts inquiries. Our specially trained personnel will ensure fast, professional repairs using original DEUTZ spare parts in case of damage.

## Diagnosis button

The diagnosis button allows the errors currently saved in the error memory of the electronic engine control to be visualised in the form of a flash code. The flash codes permit:

- Errors that may occur can be classified.
- Clear display of the error as visual signal.
  - The blink codes can only be interpreted by a DEUTZ partner.

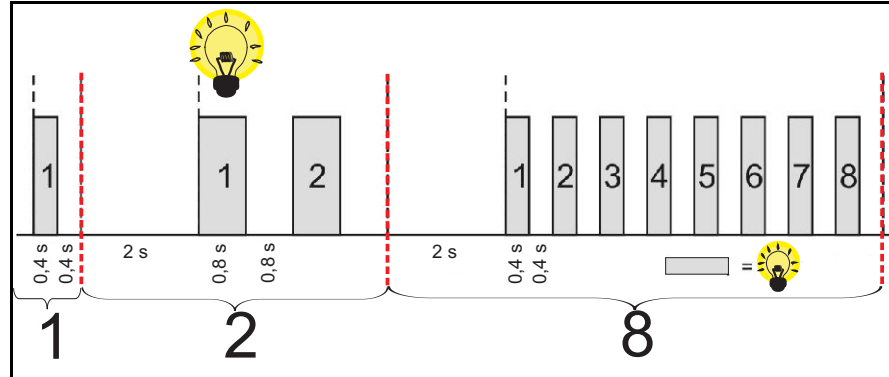
## Use of the diagnostic key

The flash code displays all errors in the error memory, this means active as well as passive ones.

The control unit must be switched off to start the enquiry (ignition off). Then the diagnosis button should be pressed for approx. 1s during the start (ignition on).

Then the next error (i.e. the following one in the error memory) can be displayed by pressing the diagnostic key again. If the last error was displayed, the first error is displayed again on pressing the diagnostic key again.

After the display of the error flash code, the error lamp goes out for five seconds.



## Display system error by flash code

Example:

Flash code 1-2-8

1 x short flash

2 x long flash

8 x short flash

This flash code indicates a break or short circuit in the wiring of the charge air temperature sensor. The temporal sequence of the flash signals is shown in the illustration.

- The blink codes can only be interpreted by a DEUTZ partner.



**DEUTZ Electronic Display**

In order to show measured values and error messages of the EMR control unit, a CAN display is optionally available, which can be integrated into the dashboard of the driver's position of working machines.

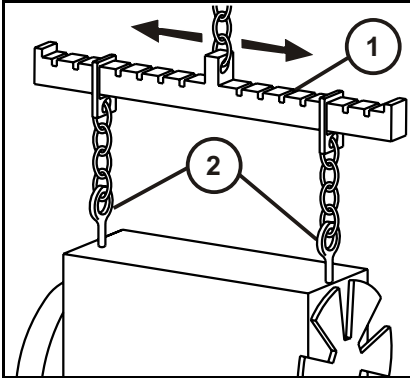
All data sent from the EMR control unit through CAN can be displayed.

- Engine speed
- Engine torque (current)
- Lubricating oil temperature
- Coolant temperature
- Suction intake air temperature
- Exhaust gas temperature
- Gear oil temperature
- Lubricating oil pressure
- Coolant pressure
- Charge air pressure
- Fuel pressure

- Gear oil pressure
- Battery voltage
- Accelerator position
- Fuel consumption
- Operating hours

Error messages are displayed in clear text and acoustically; the error memory of the control unit can be read out.

For a detailed description, refer to the operating instructions enclosed with the DEUTZ Electronic Display.

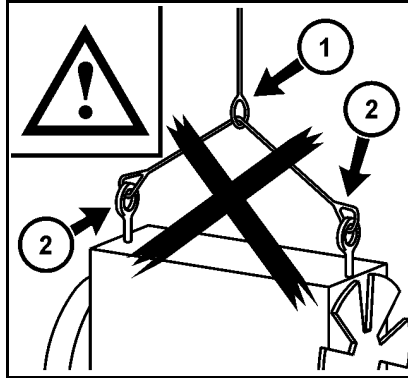


**Suspension equipment**



The transport devices mounted on this engine are adapted to the engine weight. If the engine is transported with add-on components, the transport devices must be designed accordingly.

- Always use proper suspension equipment when transporting the engine.
- The suspension device (1) must be adjustable for the engine's centre of gravity.
- After transportation and before commissioning of engine: remove attachment eyes (2).



**Danger to life!**  
The engine may tip over or fall down if suspended incorrectly!

- The fastening attachment cannot be fixed securely above the centre of gravity (1).
- The fastening attachment can slip, the engine swings backwards and forwards (1).
- Too short a fastening attachment causes bending torques in the transport device (2) and can damage it.

## General

Engines contain the following types of corrosion protection:

- Interior corrosion protection
- Exterior corrosion protection



Your DEUTZ partner has the right corrosion protection agent for your needs.

The following measures for corrosion protection **after taking the engine out of operation** meet the requirements for 12 months corrosion protection.

The following corrosion protection work may only be carried out by persons familiar with it and instructed in the potential dangers.

If these measures are deviated from by exposing the corrosion-protected engines or parts to unfavourable conditions (installation outdoors or storage in damp, badly aired places) or damage to the corrosion protection layer, a shorter corrosion protection duration is to be expected.

The engine corrosion protection should be checked about every 3 months by opening the covers. If corrosion is detected, the corrosion protection should be renewed.

At the end of the corrosion protection work the crank drive may no longer be turned so that the corrosion protection agent in the bearings, bearing liners and cylinder liners is not scraped off.

Before operating a corrosion protected engine, the corrosion protection must be removed.

### Interior corrosion protection

- Interior corrosion protection is always provided

by wetting of the walls with the implemented corrosion protection agent in a corrosion protection run of the engine.

- The corrosion protection run can be performed once to protect the different systems:

### Fuel system



Close the fuel/tank/supply line to the engine so that the system is protected against dirt and dust. Protect the electronics against moisture and corrosion.

- Fill the fuel tank with a mixture of:
  - 90 % distilled fuel
  - 10 % corrosion protection oil.
- Perform a corrosion protection run with no load for at least 5 minutes.

### Lubricating oil system

- Drain lubricating oil from warm engine.
- Thoroughly clean lube oil tray, cylinder head with rocker arms, valves, valve springs with diesel fuel or cleaning agent.
- Fill the engine with corrosion protection oil up to the MAX mark and perform a corrosion protection run for at least 5 minutes so that all the components of the lubricating oil system are wetted or wet all accessible parts with corrosion protection oil and pump corrosion protection oil through the engine with a separate pump until all bearings and bearing liners are wetted.

### Cooling system

- Depending on the series the engines are equipped with cooling air, cooling oil or cooling fluid system (cooling water with cooling system

protection agent).

- Cooling air system, see the Exterior corrosion protection section.
- In engines of the oil-cooled series the circulating lubricating oil serves simultaneously for cooling. The cooling chambers are protected automatically against corrosion with the lube oil system.
- If a coolant with corrosion protection properties is poured into liquid-cooled engines, no further action is necessary after draining.
- If not, the coolant must be drained and, to ensure the formation of a covering layer on the inside surfaces of the cooling system, a corrosion protection run performed with a mixture of:
  - 95 % treated water
  - 5 % corrosion protection agent
- The duration of the corrosion protection run and the concentration of the corrosion protection agent are specified by the manufacturer of the corrosion protection agent.
- Then drain the coolant.

### Air intake pipes

- After the corrosion protection run, remove the cylinder head cover and deinstall injectors. The respective piston must be set to LT.
- The accessible part of the cylinder liner should be coated with corrosion protection oil with a spray lance through the opening.
- Spray corrosion protection lubricating oil into the suction intake pipe.

### Exterior corrosion protection

- The engine must be cleaned thoroughly with a cleaning agent before exterior corrosion protection. Any signs of corrosion and damage to the

paintwork must be removed.

## Bare exterior surfaces and parts

- Coat or spray all bare exterior parts and surfaces (e.g. flywheel, flange faces) with corrosion protection agent.

## Rubber parts

- Rubber parts (e.g. mufflers) which are not painted over must be rubbed down with talcum powder.

## Belt drive

- Remove V-belts and V-rib belts and store packed.
- Spray V-belt pulleys and tension rollers with corrosion protection agent.

## Engine openings

- All engine openings must be fitted with air-tight, water-tight covers to delay the vapourisation process of the corrosion protection agents.
- With installed air compressor, the suction and pressure connection must be sealed by a cap.
- Air should be excluded to avoid ventilation of the engine (chimney effect) for the suction from an air supply pipe.

## Storage and packaging

- After being protected against corrosion, the engine must be stored in a dry, ventilated hall and suitably covered.
- The cover must be placed loosely over the engine so that the air can circulate around it to prevent condensation from forming. Use a desiccant if necessary.

## Removal of corrosion protection

- The corrosion protection must be removed from the corrosion protected engine before starting.
- The packaging and all covers over the closed openings must be removed.
- Any corrosion deposits and paint damage should be remedied.

## Fuel system

If there is a mixture of diesel fuel/corrosion protection oil in the fuel tank, drain it.

- Connect fuel/tank/supply line to the engine. Pay attention to cleanliness.
- Fill the fuel tank and fuel system with the proper fuel.

## Lubricating oil system

- Unscrew the lube oil drain screw, drain oil.
- Fill the engine with lubricating oil via the lubricating oil filler neck.

## Coolant system

- If the implemented corrosion protection agent is compatible with the intended cooling system protection agent, this can be filled directly into the coolant system as specified.
- If it is uncertain whether the implemented corrosion protection agent is compatible with the cooling system protection agent, the cooling system should be purged with fresh water for about 15 minutes before filling.

## Removal of exterior corrosion protection

- All areas and components coated with corrosion protection agent must be washed off with dis-

tilled fuel or a suitable cleaning agent.

- Wash out grooves of V-belt pulleys if necessary.
- Mount V-belts or V-rib belts as specified.
- Fill with coolant.

## Corrosion protection agent / cleaning agent

Please ask your DEUTZ partner for reference products for the corrosion protection agents/cleaning agents to be used which meet DEUTZ requirements.

or see [www.deutz.com](http://www.deutz.com)

<a href="http://www.deutz.com">http://www.deutz.com</a>	
en	\\SERVICE\\Betriebsstoffe und Diagnose\\ <b>Motorconservierung</b>
en	\\SERVICE\\Oils, Lubricants, Diagnosis\\ <b>Engine Corrosion Protection</b>

### General technical data

Engine type	Dimension	TD 2012 L04 2Vm	TCD 2012 L04 2Vm	TCD 2012 L04 2V	TCD 2012 L06 2V
Working principle		Four-stroke diesel engine			
Charging		Exhaust gas turbo-charger	Turbocharger with charge air cooling		
Type of cooling		water-cooled			
Cylinder arrangement		in series			
No. of cylinders		4			6
Bore/stroke	[mm]	101/126			
Total displacement	[cm <sup>3</sup> ]	4038			6067
Combustion process		Direct injection			
Injection system		Mechanical injection system		Deutz Common Rail (DCR)	
Exhaust gas recirculation		internal			
Valves per cylinder		2			
Valve clearance: Inlet/outlet	[mm]				
Setting with rotary angle disc	[°]	75° +10°/120° +10°			
Firing order of the engine		1-3-4-2			1-5-3-6-2-4
Direction of rotation looking onto the flywheel		left			
Engine power rating according to ISO 3046	[kW]	see engine rating plate			
Speed (nominal revolutions)	[rpm]	see engine rating plate			
Injection timing	[°BTDC]	see engine rating plate			
Coolant volume (only engine content without cooler / hoses and pipes)	≈ [l]	5,6			7,3
Coolant volume DEUTZ PowerPack cooler	≈ [l]	18,5			22,7
Permissible continuous coolant temperature	[°C]	max. 110			
Temperature difference between coolant inlet/outlet	[°C]	4 - 8			
Start of thermostat opening	[°C]	86			
Thermostat fully open	[°C]	102			



Engine type	Dimension	TD 2012 L04 2Vm	TCD 2012 L04 2Vm	TCD 2012 L04 2V	TCD 2012 L06 2V
Lubricating oil change volume (with filter)	≈ [l]	15,5*			26,5*
Lube oil temperature in the lube oil tray, maximum	[°C]	125			
Lubricating oil pressure minimum (low idle, engine warm)	[kPa/bar]	80/0,8			
Permissible maximum combustion air temperature after charge air cooler	[°C]		50		
V-belt tension		Pre-tensioning/Re-tensioning			
V-belts AVX 11 (width: 11 mm)	[N]	650±50/400±50			
V-rib belt tensioning		Automatic tensioning spring-loaded clamping roller			
Weight without cooling system according to DIN 70020-A	≈ [kg]	380	400	400	510
*specified lubricating oil filling volumes apply for standard versions. In engines which deviate from the standard, for example different lubricating oil pans/dipstick variants and/or special inclined versions, the lubricating oil volume may vary. <b>The lubricating oil dipstick mark is always decisive.</b>					

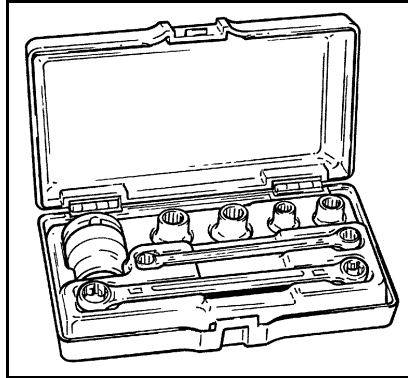
Engine type	Dimension	TCD 2013 L04 2Vm	TCD 2013 L04 2V	TCD 2013 L06 2V
Working principle		Four-stroke diesel engine		
Charging		Turbocharger with charge air cooling		
Type of cooling		water-cooled		
Cylinder arrangement		in series		
No. of cylinders		4		6
Bore/stroke	[mm]	108/130		
Total displacement	[cm <sup>3</sup> ]	4761		7142
Combustion process		Direct injection		
Injection system		Mechanical injection system	Deutz Common Rail (DCR)	
Exhaust gas recirculation		internal		
Valves per cylinder		2		
Valve clearance: Inlet/outlet	[mm]			
Setting with rotary angle disc	[°]	90° +10°/150° +10°		
Firing order of the engine		1-3-4-2		1-5-3-6-2-4
Direction of rotation looking onto the flywheel		left		
Engine power rating according to ISO 3046	[kW]	see engine rating plate		
Speed (nominal revolutions)	[rpm]	see engine rating plate		
Injection timing	[°BTDC]	see engine rating plate		
Coolant volume (only engine content without cooler / hoses and pipes)	≈ [l]	7,2		9,8
Coolant volume DEUTZ PowerPack cooler	≈ [l]	22,7		24,9
Permissible continuous coolant temperature	[°C]	max. 105		
Temperature difference between coolant inlet/outlet	[°C]	4 - 8		
Start of thermostat opening	[°C]	86		
Thermostat fully open	[°C]	102		
Lubricating oil change volume (with filter)	≈ [l]	15,5*		26,5*
Lube oil temperature in the lube oil tray, maximum	[°C]	125		

Engine type	Dimension	TCD 2013 L04 2Vm	TCD 2013 L04 2V	TCD 2013 L06 2V
Lubricating oil pressure minimum (low idle, engine warm)	[kPa/bar]	80/0,8		
Permissible maximum combustion air temperature after charge air cooler	[°C]	50		
V-belt tension		Pre-tensioning/Re-tensioning		
V-belts AVX 11 (width: 11 mm)	[N]	650±50/400±50		
V-rib belt tensioning		Automatic tensioning spring-loaded clamping roller		
Weight without cooling system according to DIN 70020-A	≈ [kg]	500		610
*specified lubricating oil filling volumes apply for standard versions. In engines which deviate from the standard, for example different lubricating oil pans/dipstick variants and/or special inclined versions, the lubricating oil volume may vary. <b>The lubricating oil dipstick mark is always decisive.</b>				

### Tool ordering

The special tools described in this chapter can be ordered from:

Please contact your DEUTZ partner

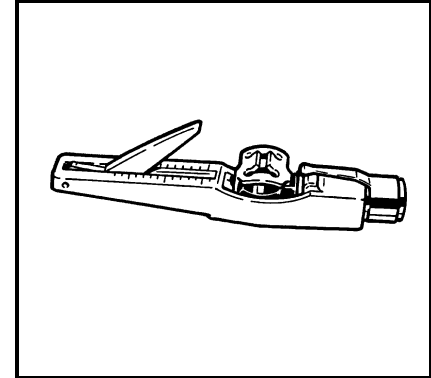


**Torx tool**

Order number:  
8189

The Torx screw system is used in engines in this series among other things. This system was introduced for a number of reasons:

- Excellent accessibility
- High force transmission when loosening and tightening
- Slipping or breaking of the key and risk of injury are practically excluded.



**V-belt tension measuring instrument**

Order number:  
8115

Measuring instrument for checking the specified V-belt tensions.

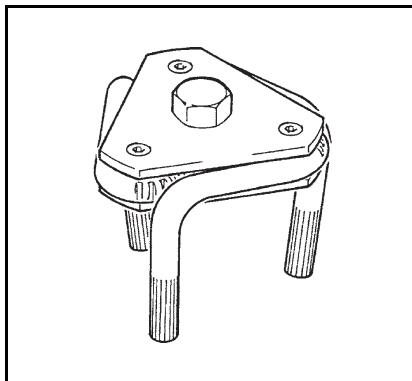


**Special tools for removing the water collection vessel.**

Order number:

8192

On Racor filters, only loosen the water collection vessel with a special tool.

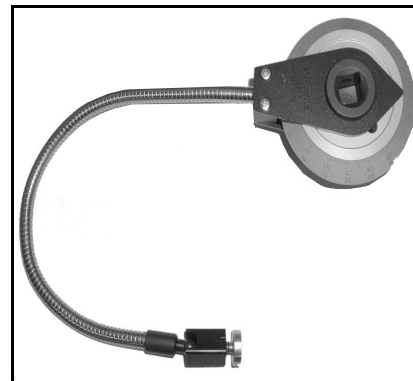


**Special wrench for loosening exchangeable filters**

Order number:

170050

For loosening changeable filters.

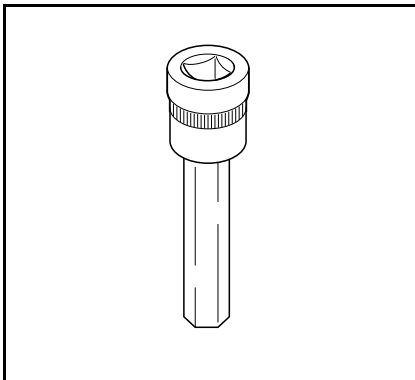


**Rotation angle disc**

Order number:

8190

Rotation angle disc for setting the valve and control piston clearance



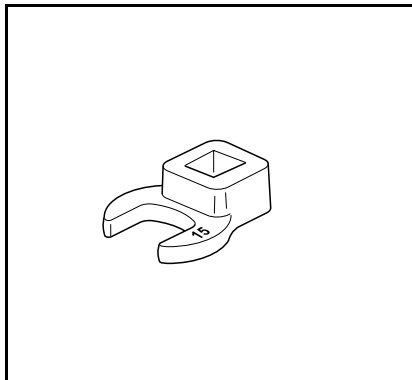
**Pin wrench insert**

Order number:

8193

8194

Pin wrench inserts for rotation angle disc

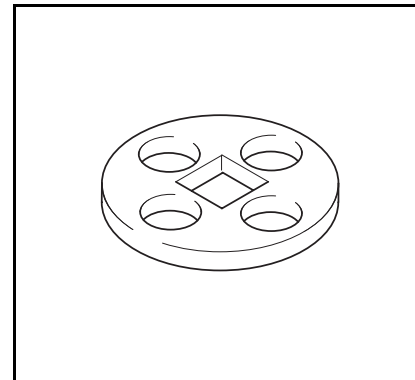


**Crow foot wrench**

Order number:

8190

Crow foot wrench for rotation angle disc in connection with conventional square bar extension.



**Turning gear**

Order number:

100 330

For turning over the engine as an attachment for the torsional vibration damper

# DEUTZ Oil



## DEUTZ Oil DQC II-05

ACEA E5-02 / E3-96 / B3-04  
API CG-4

TLS-15W40D (DQC II-05)	
5 L	0101 6331
20 L	0101 6332
209 L	0101 6333



## DEUTZ Oil DQC III-05

ACEA E7-04 / E5-02 / E3-96 / B4-04 / A3-04  
API CI-4 / SL GLOBAL DHD-1

TLX-10W40FE (DQC III-05)	
5 L	0101 6335
20 L	0101 6336
209 L	0101 6337



## DEUTZ Oil DQC IV-05 (Synthetic)

ACEA E7-04 / E5-02 / E4-99

DEUTZ Oil DQC IV-5W30 (DQC IV-05)	
5 L	-
20 L	0101 7849
209 L	0101 7850



**The engine company.**

DEUTZ AG  
Information Systems Sales & Service  
Ottostraße 1  
51149 Köln  
Germany  
Phone: +49 (0) 221-822-0  
Fax: +49 (0) 221-822-3525  
E-Mail: [info@deutz.com](mailto:info@deutz.com)  
[www.deutz.com](http://www.deutz.com)

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Order number:

0312 3761 en

Original operating instructions