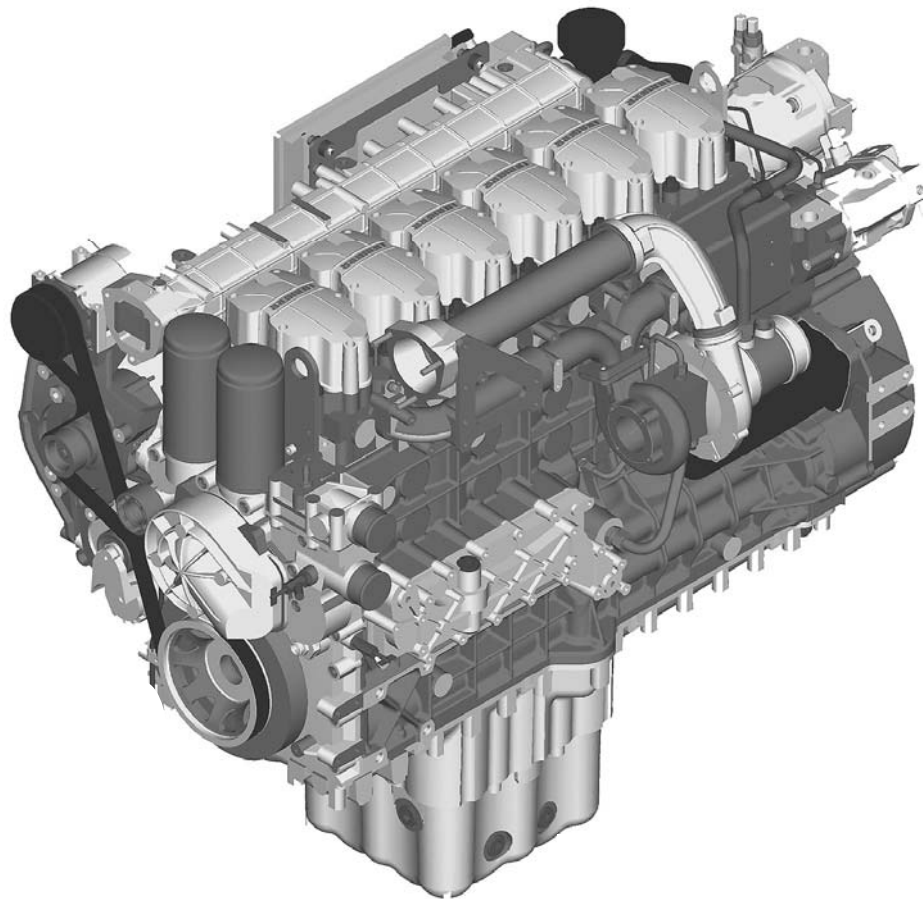


# LIEBHERR Diesel engine

**D934 - D936 - D946**

BAL: 10115602-07-en

## Operating manual



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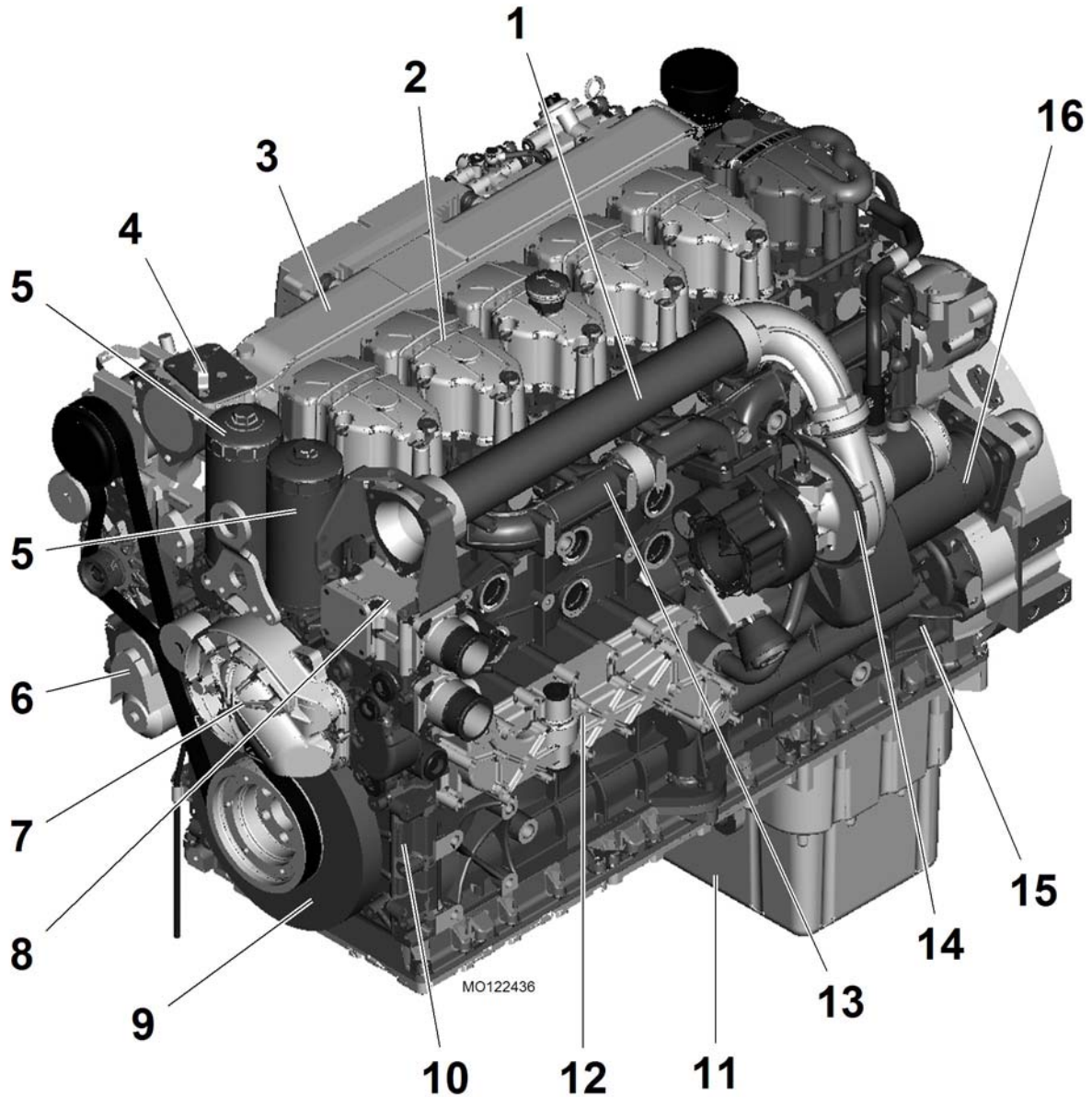
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# 1 Product description

## Equipment layout

This section features a summary of the diesel engine including a description of the components represented.



*Components of the diesel engine featuring iAGR / as viewed from the left*

- |                            |                                 |                         |
|----------------------------|---------------------------------|-------------------------|
| 1 Charge air duct          | 7 Water pump                    | 13 Exhaust gas pipe     |
| 2 Cylinder head            | 8 Thermostat housing            | 14 Exhaust turbocharger |
| 3 Air induction pipe       | 9 Crankshaft / vibration damper | 15 Crankcase            |
| 4 Heater flange            | 10 Aggregate carrier            | 16 Starter              |
| 5 Oil filter               | 11 Oil sump                     |                         |
| 6 Automatic tension pulley | 12 Oil cooler                   |                         |

# 2 Safety regulations

Working on the diesel engine is extremely hazardous to user, machine operator or maintenance technician. Dangers and accidents can be avoided if the various notes on safety are frequently read and adhered to. This applies in particular for personnel carrying out maintenance tasks opportunely on the diesel engine.

Conscientious adherence of the safety guidelines, specified as follows, will guarantee the safety of yourself and others, as well as safeguarding against damage to the diesel engine.

All necessary safety precautions relevant to the description of tasks which could cause injury to personnel, or damage to the diesel engine, are described in this book.

They are indicated with the references **Danger**, **Warning** or **Caution**.

## 2.1 Introduction

1. The terms represent the following meaning throughout this book:



**"Danger"**

signifies an immediately dangerous situation which could result in fatalities or serious injury if it is not prevented.



**"Warning"**

signifies a dangerous situation which could result in fatalities or serious injury if it is not prevented.



**Caution** signifies a dangerous situation which could result in minor or significant injury if it is not prevented.



**"Note"**

signifies useful notes and tips.

2. **Observation of these points does not exempt you from the adherence of additional rules and regulations!**

All safety regulations valid for the application site are also to be adhered to.

## 2.2 General safety guidelines

1. Familiarise yourself with the operating and maintenance instructions before starting up the machine.

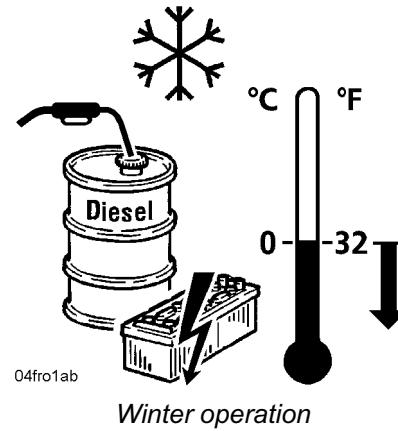
Make sure that you possess, have read, and have understood any additional instructions relevant to the machine's optional features.

2. Only expressly authorised personnel may operate, maintain or repair the diesel engine.

Observe the legal, permissible minimum age!

3. Employ only trained or instructed personnel and allocate definitive responsibility for personnel regarding operation, setting up, maintenance and repair.

4. Personnel who are still undergoing training, or are involved with a general apprenticeship, should only be allowed to work on the diesel engine while under constant supervision of an experienced person.



- Check the charge of the battery.
- If the battery is not sufficiently charged:  
Recharge the battery.
- Use winter fuel (see the chapter, “Fuels and Lubricants“ under winter operation).
- Preheat the diesel engine, see documentation of the manufacture.

### 3.2.5 Shutting down

#### Switching off the diesel engine.

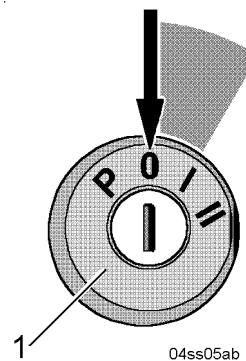


#### Caution

Risk of the diesel engine becoming damaged!

When switching off the diesel engine, the turbocharger continues to run briefly with no supply of oil.

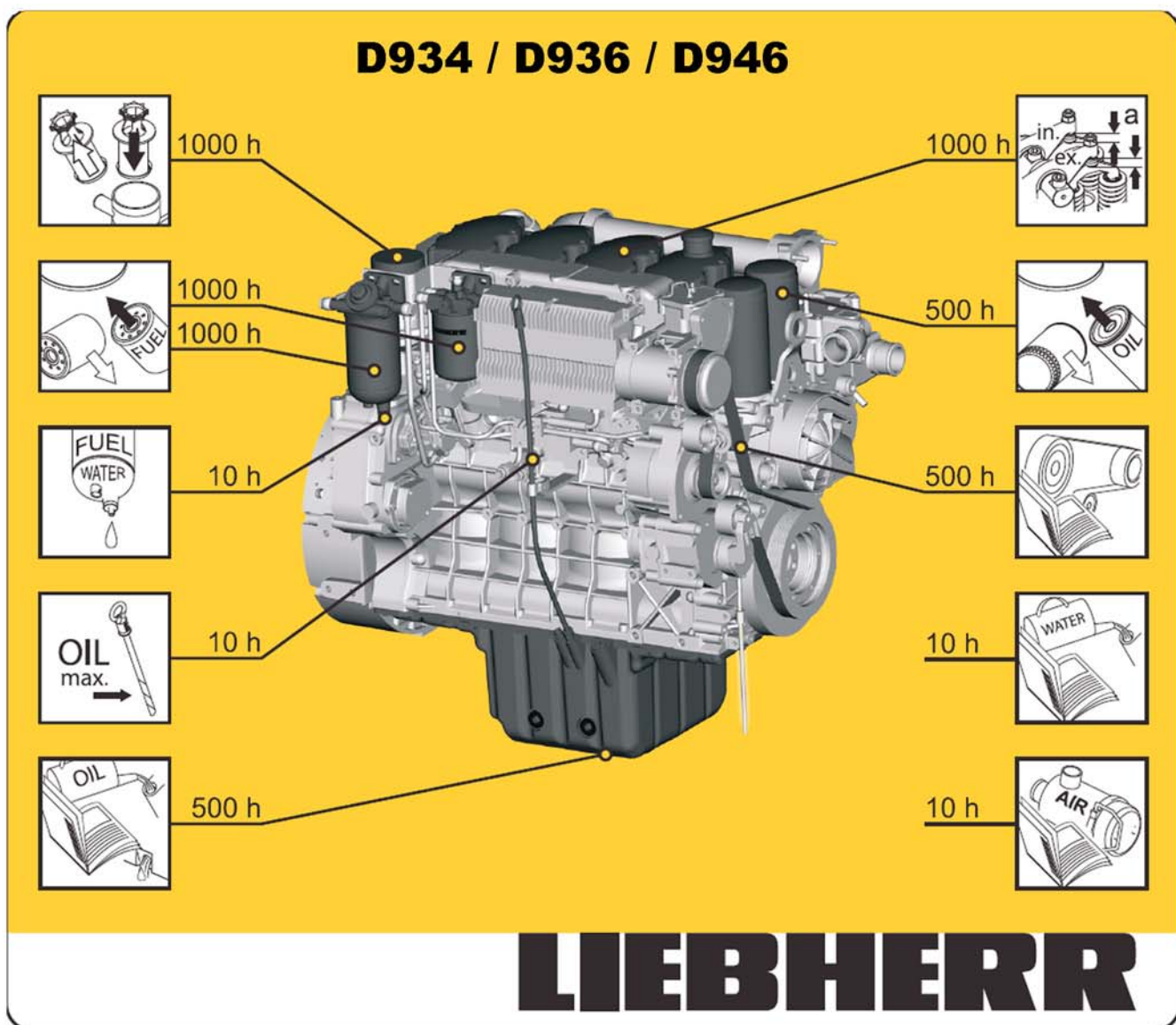
! Never switch off the diesel engine directly from running at full load.



Start switch – 0-position

- Reduce the diesel engine speed to idle.
- Allow the diesel engine to continue to run briefly, approx. 10 to 15 seconds, without load in idle.
- Turn the ignition key to the -0- position and remove.

The diesel engine has been shut down.



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**Note**

The standard interval is at 1000 operating hours!

! These maintenance tasks are only to be carried out once after 500 operating hours.

### Checking lubrication system and fuel system for leaks and for sound condition

- Check the suction lines between air filter and diesel engine for sound condition, leaks and secure fastening.
- Check exhaust lines for sound condition, leaks and secure fastening.
- Check oil sump, oil filter, fuel delivery pump and fuel filter for leaks.
- Check all lines and hoses of the oil and fuel systems, ensure that they are correctly arranged without abrading one another, are free of damage and are securely fastened.

**Troubleshooting**

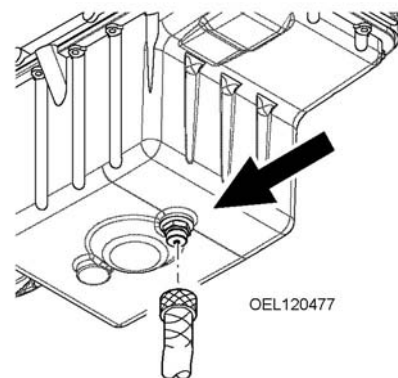
Determine any leaks in the oil and fuel system:

- Do not start the diesel engine.
- Determine and remedy the cause and replace any damaged parts.

### Replacing the diesel engine oil

The oil drain valve is beneath the diesel engine on the oil sump. It must be ensured that:

- the diesel engine is in the maintenance position
- the diesel engine is switched off
- the diesel engine is warm
- a suitable container with approx. 40 l volumetric capacity, as well as an oil drain hose and the diesel engine oil which complies with the specifications are on-hand



*Drain valve with drainage hose*

- Unscrew the sealing cap on the oil drain valve on the oil sump.
- Screw the oil drain hose onto the oil drain valve.
- Allow the oil to drain into the container provided.
- Unscrew the oil drain hose and screw the sealing cap onto the oil drain valve.

- Check all sensors and cable connections for secure fastening and sound condition
- Ensure sound condition without indication of damage, correct arrangement without the occurrence of wear and correct fastening of all cables and cable harness.

### Troubleshooting

Should damage to cable connections, cable harness or sensors be determined:

- Do not start the diesel engine.
- Replace faulty parts.

## 5.3.6 Maintenance Tasks, every 1000 operating hours

Before carrying out the 1000 operating hours maintenance tasks:

- carry out the daily operating tasks, see the section “Carry out the maintenance tasks (daily) every 10 operating hours”.
- the weekly maintenance tasks, see the section “Carry out the maintenance tasks (weekly) every 50 operating hours,”.
- the 500 operating hours maintenance tasks, see the section “Maintenance tasks every 500 operating hours ”.

### Checking induction and exhaust system for sound condition and for leaks

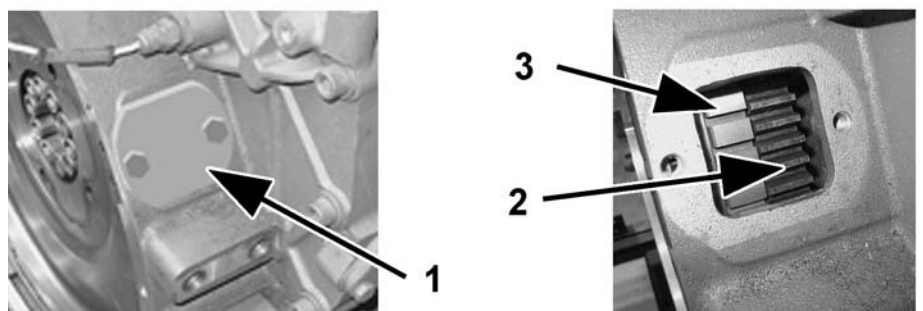
- Check the suction lines between air filter and diesel engine for sound condition, leaks and secure fastening.
- Check exhaust lines for sound condition, leaks and secure fastening.

### Lubricating starter ring gear on the flywheel

The maintenance cover is mounted on the right-hand side of the diesel engine on flywheel housing.

It must be ensured that:

- the diesel engine is in the maintenance position



SC120531

Maintenance cover — starter ring gear

- Unscrew the maintenance cover 1 from the flywheel housing
- Grease flywheel starter ring gear 2 only, the sensor ring gear 3 must remain free of grease.  
Check ring gear and, if necessary, grease lightly with standard lubricating grease
- Screw on the maintenance cover again.

### 5.3.7 Maintenance tasks every 2000 operating hours

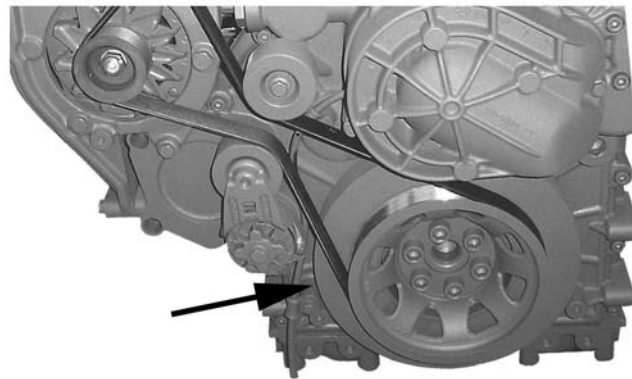
Carry out all maintenance tasks in the same way as is described for 1000 operating hours.

### 5.3.8 Maintenance Tasks every 3000 operating hours

Before carrying out the 3000 operating hours maintenance tasks:

- carry out the daily operating tasks, see the section “Carry out the maintenance tasks (daily) every 10 operating hours”.
- the weekly maintenance tasks, see the section “Carry out the maintenance tasks (weekly) every 50 operating hours”.
- the 500 operating hours maintenance tasks, see the section “Maintenance tasks every 500 operating hours”.
- carry out the 1000 operating hours maintenance tasks, see the section “Maintenance Tasks, every 1000 operating hours”.
- carry out the 2000 operating hours maintenance tasks, see the section “Maintenance Tasks, every 2000 operating hours”.

#### Checking vibration damper for deformation



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*Vibration damper*

- Check vibration damper for distortion

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#### Troubleshooting

If distortion of the vibration damper is determined:

- Do not start the engine
  - Replace vibration damper.
-

### 5.3.11 Confirmation of maintenance tasks which have been performed

#### Maintenance details

Diesel engine - type:	.....
Diesel engine - no.:	.....
Start-up on:	.....
Customer:	.....
Location:	.....
Street:	.....
Liebherr - subsidiary:	.....
Location:	.....
Street:	.....
Telephone/Fax:	.....



#### Note

Operation and maintenance are decisive as to whether a diesel engine remains ready for operation at all times and is constantly in fully-working order

- ! We strongly recommend that the prescribed maintenance tasks are performed punctually and thoroughly. Warranty claims only remain valid if this point is strictly adhered to. Under no circumstances may lead seals which have been fitted on the diesel engine be removed!
- ! The correct carrying out of maintenance tasks must be entered and confirmed in the following maintenance chart.
- ! The maintenance tasks for daily and 50 operating hours maintenance intervals must be performed by service personnel authorised by the customer.
- ! The first oil-change and replacement of the oil filter, as well as all further maintenance tasks, must be carried out by a LIEBHERR-trained, authorised mechanic.

### 5.3.12 Every 500 operating hours / at least once a year

- With more difficult operating conditions
  - repeated cold-starts,
  - fuel sulphur content above 0.5 %,
  - application temperature below -10 °C,

the prescribed oil-change interval may have to be reduced depending on the difficulty factor, see "Fuel and Lubricants"

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