

- 6.1 Lubrication system**
- 6.2 Fuel system**
- 6.3 Cooling system**
- 6.4 Combustion air filter**
- 6.5 Belt drive**
- 6.6 Setting work**
- 6.7 Add-on parts**

6.1.1 Oil change intervals

- The oil change times depend on the engine application and the quality of the lube oil.
- If the oil change times are not reached within a year, the oil change should be carried out at least **1x yearly**.
- The following conditions apply for the table
 - Sulphur content max. 0.5 % of weight for diesel fuel.
 - Constant ambient temperature ³ -10 °C (+14 °F)
- For fuels
 - with sulphur content > 0.5 to 1%
or
 - Constant ambient temperatures < -10 °C (+14 °F)
or
 - with bio-diesel fuels according to DIN 51606- FAME the oil change times should be halved.
- For fuels with a sulphur content higher than 1% ask your responsible **service representative**.
- If the lube oil change intervals are planned in terms of operating hours, the lube oil change intervals for installed engines 6.1.1.1 apply.

6.1 Lubrication system

Care and maintenance work

6.1.1.1 Lube oil change intervals for installed engines

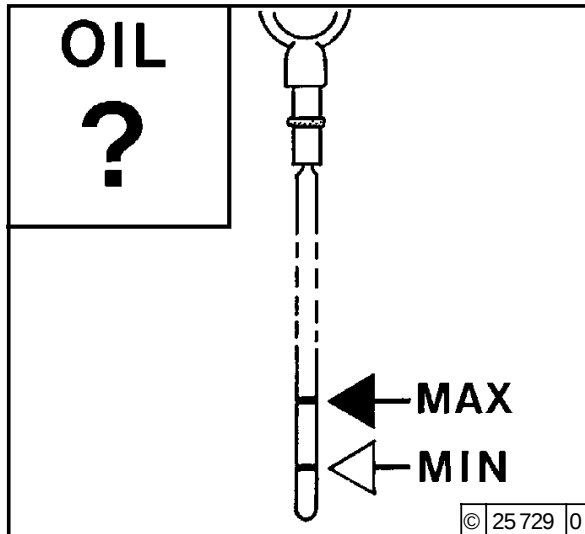
Deutz lube oil quality class		DQC I-02	Lube oil quality		
			DQC II-05	DQC III-05	DQC iV-05
ACEA specification		E2-96	E3-96/E5-02/E07-04	E4-99/E6-04 see 6.1.1.3	E4-99/E6-04 only fully synthetic
API specification		CF/CF-4	CG-4/CH-4/CI-4	-	-
worldwide specification		-	DHD-1	-	-
special DEUTZ release list		-	-	see chap. 4.1.2.1	-
Standard lubricant code designation for building machines and building vehicles		EO... EO...A, EO...B	EO...C	-	-
Engine series	Engine version		Lube oil change intervals in oh		
TCD	All engines with:				
2012 L04/06 4V	Crankcase ventilation:				
	open	-	500	500	500
	closed	-	-	500	500
2013 L04/06 4V	Crankcase ventilation:				
	open	-	500	500	500
	closed	-	-	500	500

6.1.1.2 Lube oil change intervals for vehicle engines

				Lube oil quality				
Deutz lube oil quality class				DQC I-02	DQC II-05	DQC III-05	DQC IV-05	
ACEA specification				E2-96	E3-96/E5-02/E07-04	E4-99/E6-04 see 6.1.1.3	E4-99/E6-04 only fully synthetic	
API specification				CF/CF-4	CG-4/CH-4/ CI-4	-	-	
worldwide specification				-	DHD-1	-	-	
special DEUTZ release list				-	-	see chap. 4.1.2.1	-	
Application	Engine version		Crankcase	Lube oil change intervals in km				
	TCD 2012/2013 L04/ 06 4V		ventilation					
Building site	average driving speed km/h	TCD 2012 4V	open	-	20 000	20 000	20 000	
			closed	-	-	20 000	20 000	
vehicles / city buses/		25	TCD 2013 L06 4V					
			Coach bus	closed	-	30 000	50 000	50 000
			Inter city bus	closed	-	20 000	30 000	30 000
			City busbus	closed	-	15 000	20 000	20 000
City transport		TCD 2013 L04 4V TCD 2013 L06 4V	closed	-	25 000	45 000	45 000	
			closed	-	30 000	50 000	50 000	
Local transport		40	TCD 2012 4V	open	-	30 000	30 000	30 000
				closed	-	-	30 000	30 000
			TCD 2013 L04 4V TCD 2013 L06 4V	closed	-	40 000	60 000	60 000
				closed	-	50 000	75 000	75 000
Long distance transport		60	TCD 2012 4V	open	-	40 000	40 000	40 000
				closed	-	-	40 000	40 000
			TCD 2013 L04 4V TCD 2013 L06 4V	closed	-	60 000	80 000	80 000
	closed			-	75 000	100 000	100 000	

6.1.2 Checking oil level / changing engine oil

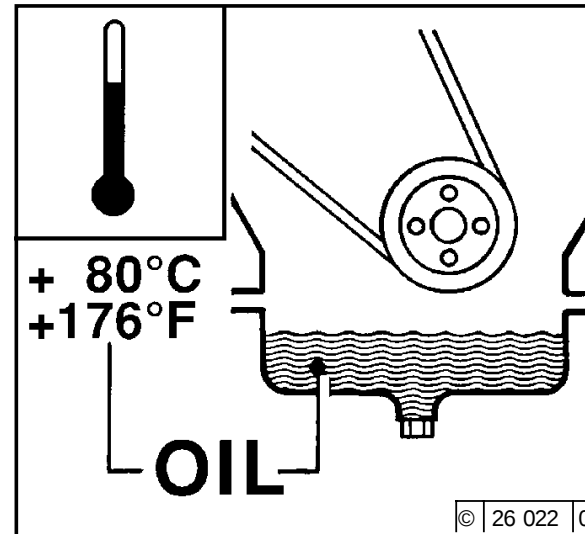
6.1.2.1 Checking oil level



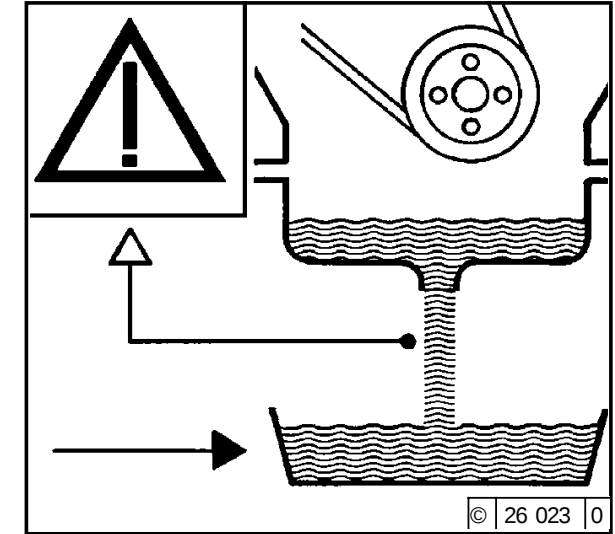
- Position the engine or vehicle so as to be level.
- – **Engine warm:**
Switch off the engine, wait for 5 minutes and check oil level.
- – **Engine cold:**
Check oil level.
- Extract oil dipstick.
- Wipe with a fibre-free, clean cloth.
- Insert until it stops and extract again.
- Check oil level and re-fill to „MAX“ if necessary.
– If the oil level lies just above the „MIN“-line marking, re-filling is necessary.

The oil level may not fall short of the „MIN“ line marking.

6.1.2.2 Changing engine oil



- Warm up engine.
- Position the engine or vehicle so as to be level.
– Lube oil temperature approx. 80 °C.
- Switch off engine.



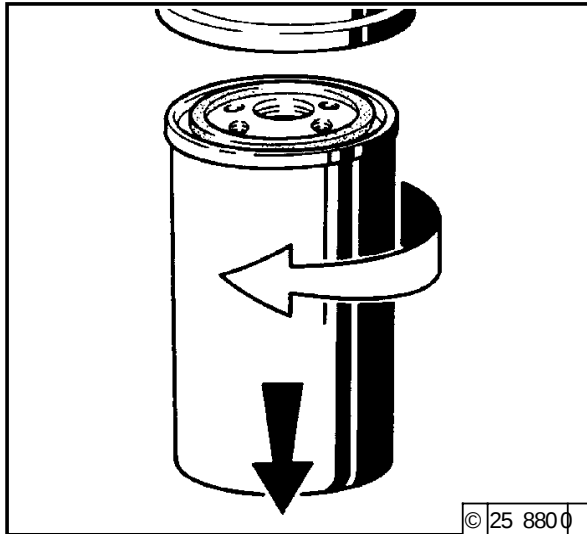
- Position oil drip cup under the engine.
- Unscrew oil drain screw.
- Drain off oil.
- Screw in oil drain screw with new sealing ring and tighten. (For tightening torque see 9.2).
- Pour in lube oil.
– For quality / viscosity data see 4.1.
– For filling quantities, see 9.1.
- Check oil level, see 6.1.2.1.



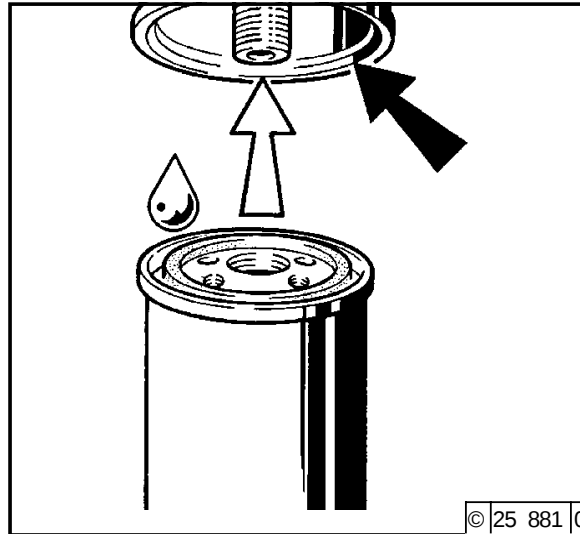
Caution when draining hot oil: danger of scalding!
Collect the used oil, do not allow to seep into floor!

Dispose of according to instructions!

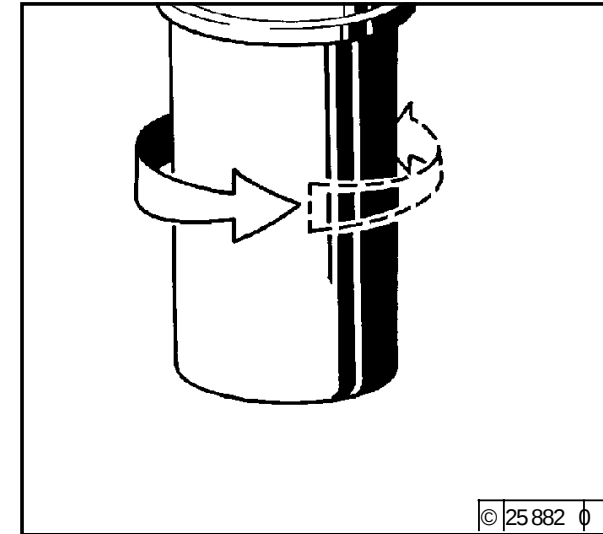
6.1.3 Changing oil filter insert



- When anti-rotation lock is installed: Loosen clamping screws and remove tightening clamps from below.
- Loosen lube oil filter cartridge with standard tool and unscrew.
- Collect any oil which may run out.



- Clean the sealing surface of the filter support for any possible dirt.
- Lightly oil the rubber seal of the new lube oil cartridge.
- Screw on the cartridge by hand until the seal makes contact.

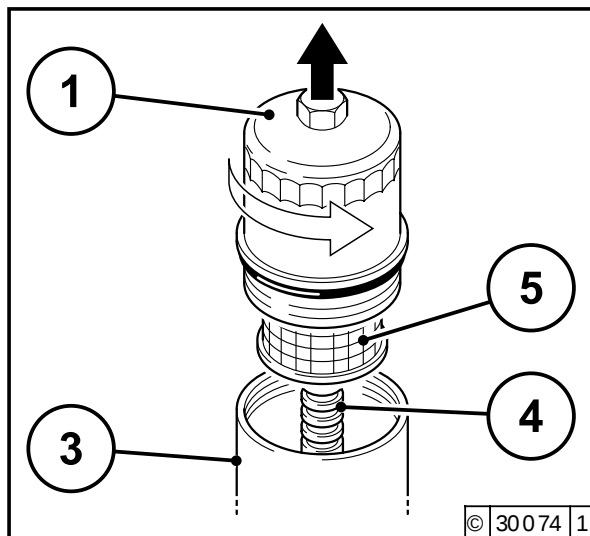


- Tighten lube oil filter cartridge three quarters of a turn (approx. 10 Nm).
- If there is an anti-rotation lock: Position the tightening clamps and tighten with clamping screws.
- Check oil level, see 6.1.2.
- Check oil pressure, see 3.3.1.
- Check the seal of the lube oil filter cartridge for tightness.

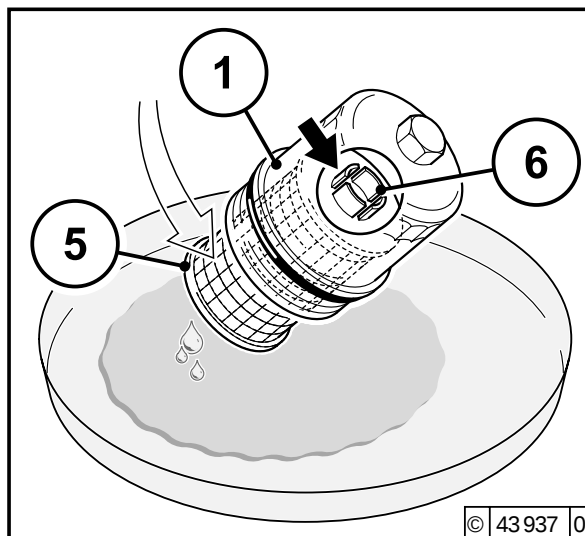


Careful with hot oil:
danger of scalding!

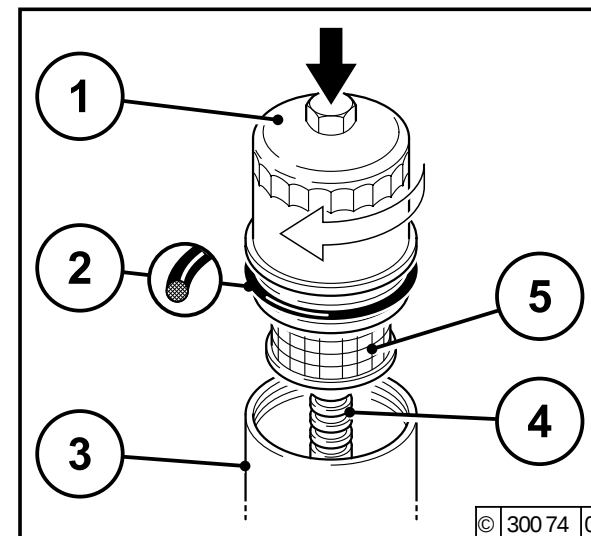
6.1.4 Cleaning / changing oil filter (cup)



- Switch off engine.
- Loosen lube oil filter cover 1 with two or three turns and wait for 30 seconds.
- Unscrew lube oil filter cover 1 with paper filter cartridge 5 in anti-clockwise direction.
- Carefully loosen paper filter cartridge 5 from the guide 4, which is inserted in the housing 3, from above.



- Collect any lube oil which may run out.
- Crease the paper filter cartridge 5 in the collection vessel slightly at the side until the cartridge is released from the clip 6.
- Clean the sealing surface of the filter support and the lube oil filter cover 1 as well as the guide 4 of any dirt there may be

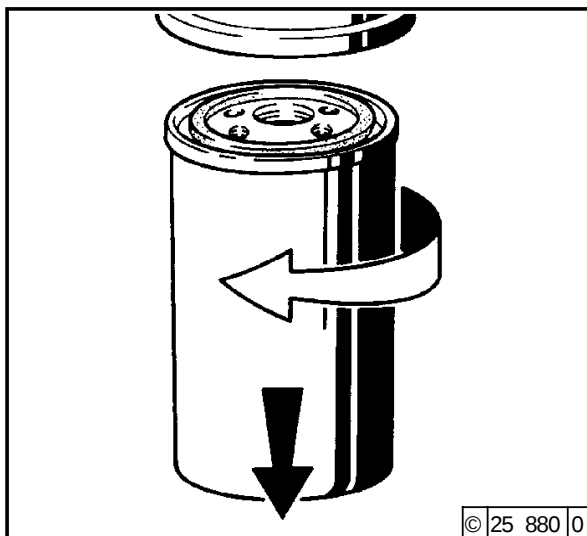


- Change the round sealing ring 2 and lightly oil.
- Press new paper filter cartridge 5 into the clip 6 and insert carefully in the guide 4 together.
- Screw the lube oil filter cover 1 tight in clockwise direction (25 Nm).
- Start the engine.
- Check lube oil filter assembly for leaks.
- Check engine oil level and top up if necessary.

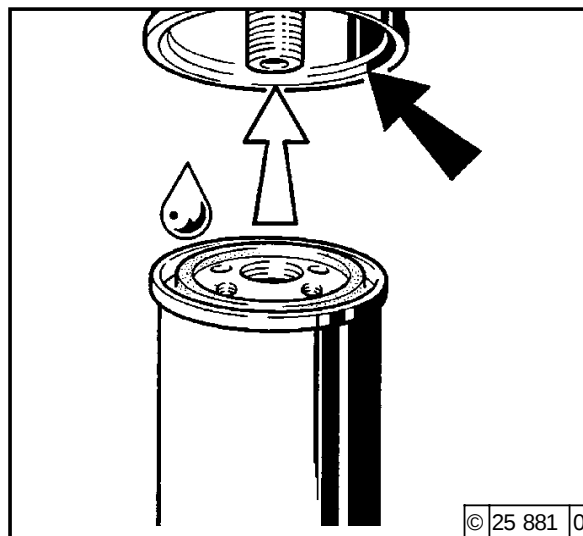


Careful with hot oil:
Danger of scalding
Dispose of used oil in an
environmentally friendly way.

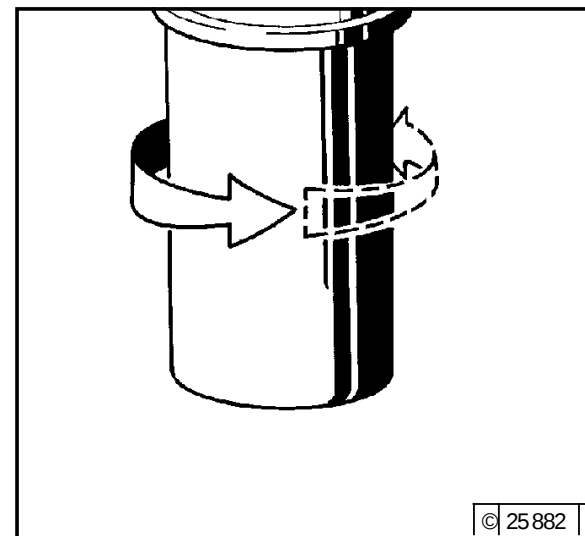
6.2.1 Changing fuel filter



- Close fuel stopcock.
- Loosen fuel filter cartridge with standard tool and unscrew.
- Collect any fuel which may run out.
- Clean the sealing surface of the filter support for any dirt there may be.
- Lightly oil the rubber seal of the new DEUTZ original fuel filter cartridge or wet with diesel fuel.



- Screw on the cartridge by hand until the seal makes contact.
- Tighten the fuel filter cartridge with one more half turn.
- Open fuel stopcock.
- Check for tightness.

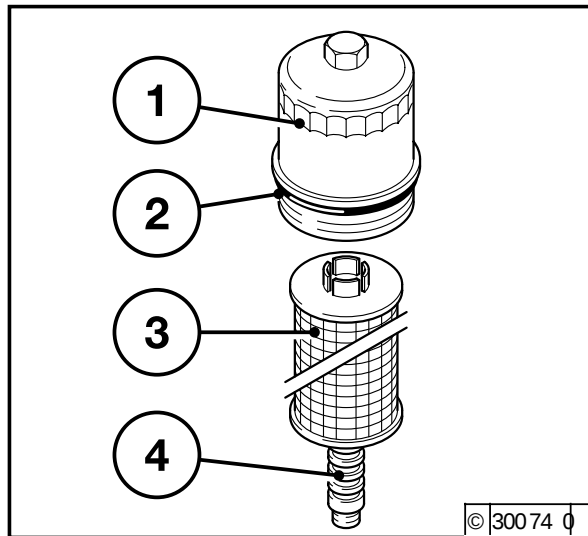


Only work on the fuel system when the engine is switched off. Wait at least 30 seconds. No open fire! Do not smoke! Pay attention to cleanliness as the fuel system (Rail) is very sensitive!!!



It is necessary to bleed the fuel system.

6.2.2 Cleaning / changing fuel filter (cup)



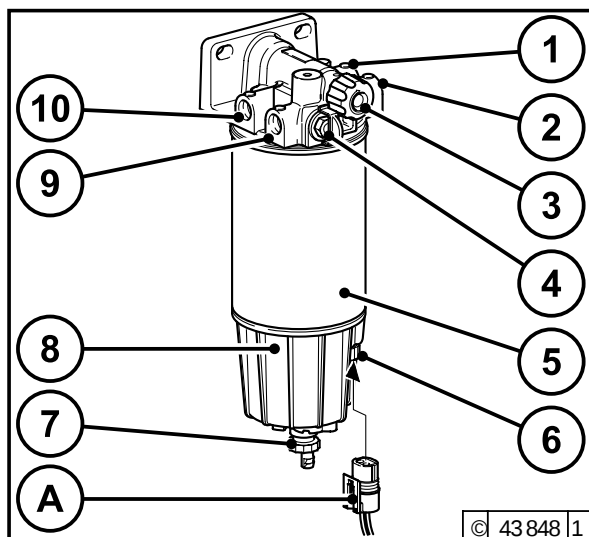
- Switch off engine
- Loosen fuel filter cover 1 and unscrew in anti-clockwise direction.
- Carefully loosen paper filter cartridge 3 from the guide 4 from above.
- Collect any fuel which may run out.
- Change paper filter cartridge 3.
- Clean the sealing surface of the filter support and the fuel filter cover 1 as well as the guide 4 of any dirt there may be.

- Change the rubber seal 2 and lightly oil.
- Carefully place new paper filter cartridge 3 in the guide 4.
- Tighten the fuel filter cover 1 in clockwise direction (25 Nm).
- Start engine.
- Check fuel filter attachment for tightness.



Only work on the fuel system when the engine is switched off (at least 30 seconds).
No open fire! Do not smoke!
Dispose of used fuel in an environmentally friendly manner.

6.2.3 Changing / bleeding fuel pre-filter, filter insert



Filter change:

- Close fuel stopcock (for high tanks).
- Position fuel collecting vessel beneath fuel pre-filter.
- Loosen drain cock (7) and drain water + fuel completely.
- Unscrew filter cartridge (5) together with water collecting vessel (8) in anti-clockwise direction and remove.
- Loosen water collecting vessel (8) from old filter cartridge (5) in anti-clockwise direction and remove.
- Empty remaining fuel into the fuel collecting vessel and clean water collecting vessel (8).
- Screw water collecting vessel (8) onto the new filter cartridge (5) in clockwise direction.

- Clean any dirt from the sealing surface of the new filter cartridge (5) and the reverse side of the filter head
- Wet the sealing surfaces of the filter cartridge (5) slightly with fuel and screw back onto the filter head in clockwise direction (17-18 Nm)
- Open the fuel stopcock and bleed the system (see „Bleeding fuel system“).
- Dispose of collected fuel and old filter cartridge (5) properly.

Bleeding fuel system:

- Unlock the bayonet plug of the fuel hand pump (3) by pressing and turning anti-clockwise at the same time. The pump plunger is now pushed out through the spring.
- ✎ Turn the shutdown lever of the thermostat valve (4) by approx. 45° in clockwise direction until it is felt to engage.
- Pump until a very strong resistance is felt and pumping becomes very slow.
- Now pump a few more times. (The return line must be filled).
- Turn the shutdown lever of the thermostat valve (4) by approx. 45° in anti-clockwise direction until it is felt to engage.
- Lock the bayonet plug of the fuel hand pump (3) by pressing and turning clockwise at the same time.

- 1 Fuel supply to pump
- 2 Fuel return from control block FCU (Fuel Control Unit)
- 3 Fuel hand pump with bayonet plug for locking and unlocking
- 4 Thermostat valve with shutdown lever
- 5 Filter cartridge
- 6 Connection facility for electrical water level sensor
- 7 Drain cock
- 8 Water collecting vessel (bowl)
- 9 Fuel inlet from fuel tank
- 10 Fuel return to fuel tank



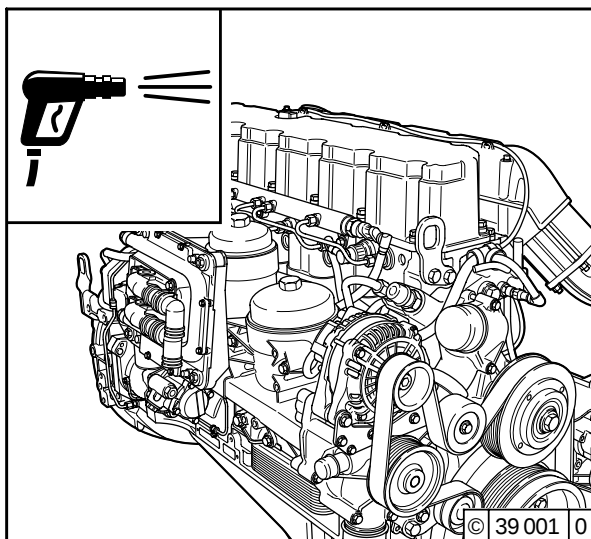
Only work on the fuel system when the engine is switched off. No open fire! Do not smoke! Dispose of used fuel in an environmentally friendly manner.

6.3.1 Cleaning intervals

- The cooling system soiling depends on the type of engine application.
- The risk of soiling is increased by oil and fuel residues on the engine. Therefore pay particular attention to tightness when operating under high dust exposure.
- Increased soiling occurs, for example, during:
 - Building site application from high dust content of air.
 - Harvesting application from high proportion of chaff and chopped straw, for example, in the area of the work machine.
- Due to the various application conditions, the cleaning intervals must be defined according to each case. Therefore, the cleaning intervals given in the table below can be used as guidelines.

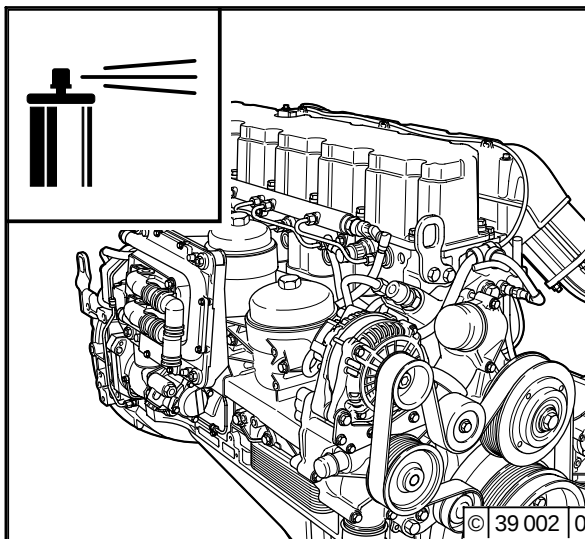
Checking or cleaning intervals	
Guideline	Engine application
2000	Ships, electronic units in enclosed spaces, pumps.
1000	Vehicles on paved roads
500	Tractors, fork lift trucks, drivable electronic units.
250	Vehicles on building sites and unpaved roads, building machines, compressors, mining equipment.
125	Agricultural machinery, tractors with harvesting application.

6.3.2 Cleaning cooling system



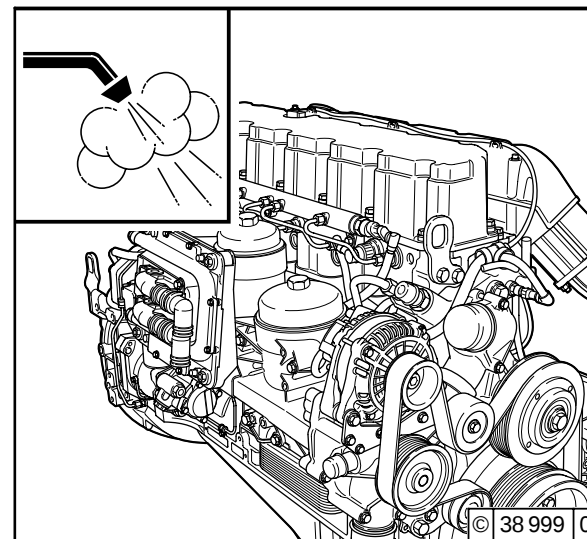
Cleaning with compressed air

- Blast out the engine with compressed air. Do not damage any components.
- Rinse out the loosened dirt with a water jet.

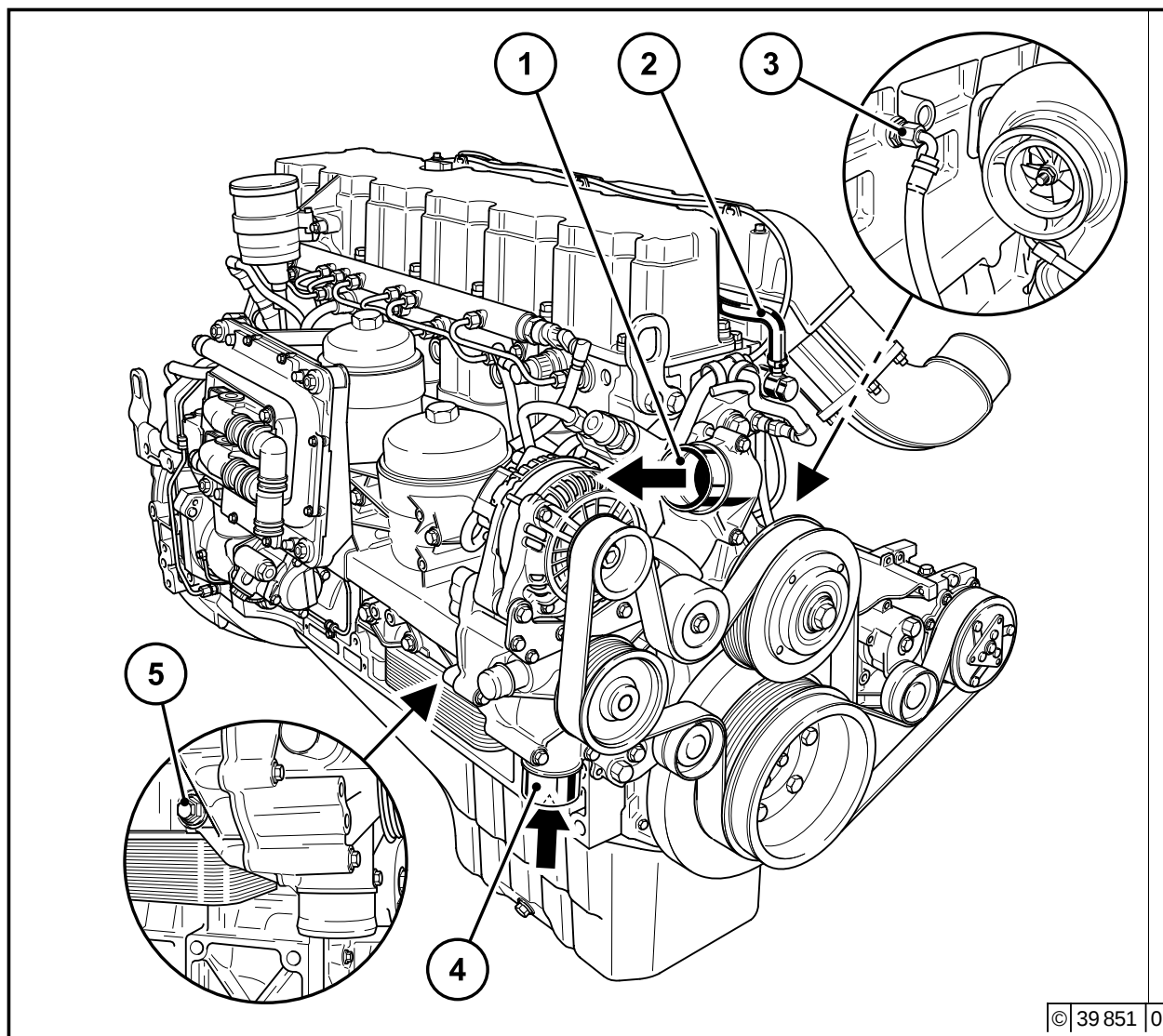


Cleaning with cold cleaner

- Spray the engine with standard cold cleaner and leave to work for approx. 10 minutes.
- Spray the engine clean with an acute water jet (do not spray the water jet directly at sensitive engine parts, e.g. generator, cabling, electronic components, fan drive).



6.3.3 Emptying / filling / bleeding cooling system



Emptying cooling system:

- Position collecting dish underneath locking screw 5 and coolant supply 4.
- Remove locking screw 5 on the crankcase and pull off hose on 4.
- Loosen bleed screw 2.
- Drain off coolant.
- Re-tighten locking screw 5 and hose on 4 and bleed screw 2.
- If locking screw 3 is not accessible, emptying may be carried out on the engine oil cooler (coolant channel).

Filling / bleeding cooling system:

- Open cooler cover.
- Loosen bleed screw item 2.
- Pour in coolant until the maximum mark or the filling limit (system heating valve must be open, if present).
- Tighten bleed screw item 2 + locking screw item 5.
- Close cooler cover.
- Start engine and warm up until the thermostat opens.
- Switch off engine.
- Check the coolant level with the engine cold and re-fill if necessary.
- Close cooler cover item 1.

Bleeding

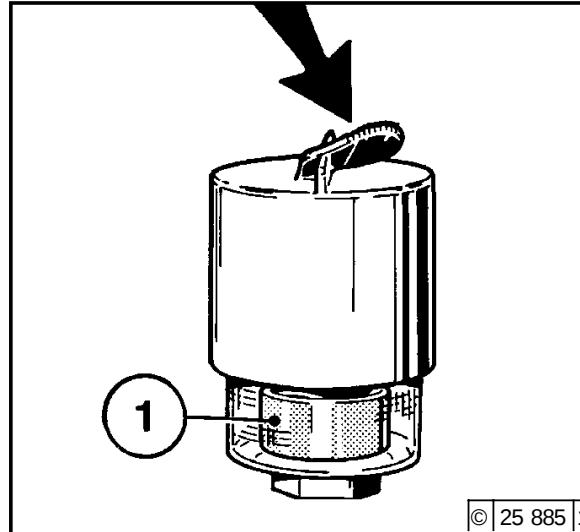
- The cooling system, which was built according to our installation guides, is bled automatically after filling.



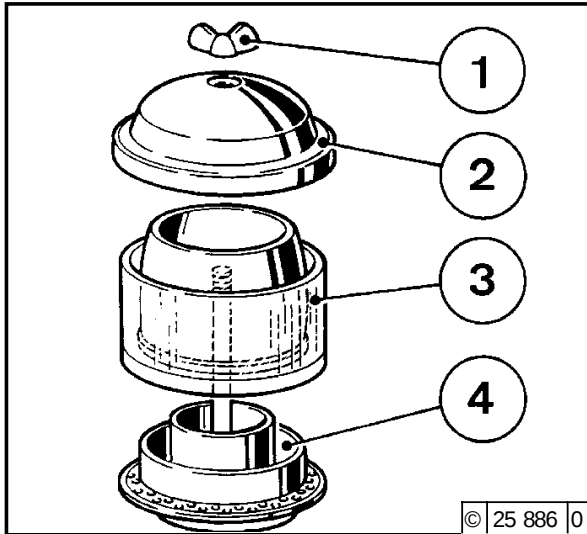
Caution when draining hot coolant: danger of scalding! Collect coolant when draining off.
Dispose of according to instructions!

6.4.1 Cleaning intervals

- The soiling of the combustion air filter depends on the dust content of the air and the selected filter size. If a high dust exposure is to be expected, a cyclone separator can be connected to the combustion air filter.
- The cleaning intervals cannot be generally defined. They must be defined depending on each case.
- If dry air filters are used, cleaning should only be carried out according to the maintenance display or maintenance switch.
- Filter maintenance is required when on the:
 - **Maintenance display**
the red service field 1 is fully visible when the engine is not running.
 - **Maintenance switch**
the yellow warning light comes on when the engine is running.
- After completion of the maintenance work push the reset button on the maintenance display. The maintenance display is ready for operation again.



6.4.2 Emptying cyclone pre-separator

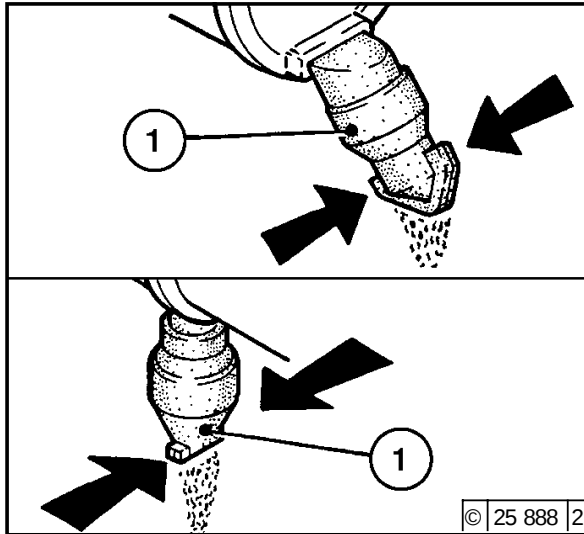


- Loosen wing nut 1 and lift housing cover 2.
- Remove the dust container 3 from the base of the cyclone 4 and empty. Clean foliage, straw and the like from the cyclone base.
- Place the dust container 3 on the base 4 and tighten the housing cover 2 with wing nut 1.

Never fill the dust container with oil, replace damaged containers!

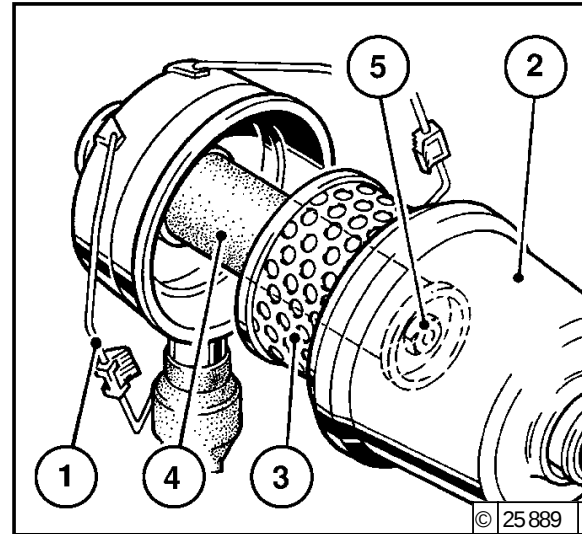
6.4.3 Dry air filter

Dust discharge valve



- Empty the dust discharge valve 1 by squeezing the discharge slot in the direction of the arrow.
- Clean the discharge slot occasionally.
- Remove any stuck on dust residues by squeezing the upper area of the valve.

Filter cartridge



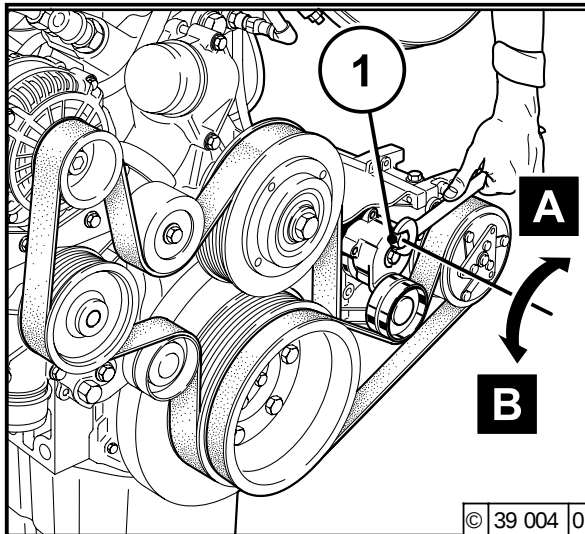
- Open clamping bracket 1.
- Remove filter hood 2 and pull out filter cartridge 3.
- Clean filter cartridge, renew after a year at the latest.
- Clean filter cartridge 3.
 - Blast out from the inside out with dry compressed air (max. 5 bar), or
 - beat out (only in extreme cases). Do not damage the cartridge, or
 - Wash according to manufacturer's specifications.
- Check filter cartridge for damage to the filter paper (shine light through) and check seals. Exchange if necessary.

- Renew the safety cartridge 4 after 5 filter maintenances, after 2 years at the latest (never clean!).
To do this:
 - Loosen the hexagonal nut 5 and pull out the cartridge 4.
 - Insert new cartridge, re-mount hexagonal nut and tighten.
- Insert filter cartridge 3, close hood 2 and secure clamping bracket 1.



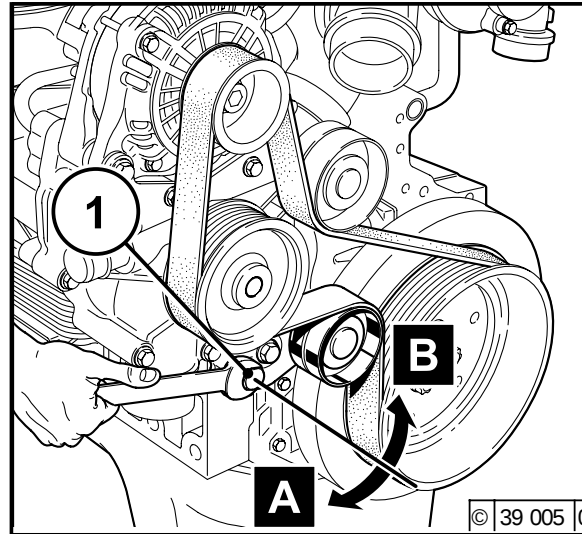
Never clean filter cartridge with petrol or hot liquids!

6.5.1 Changing V-belt V-rib belt



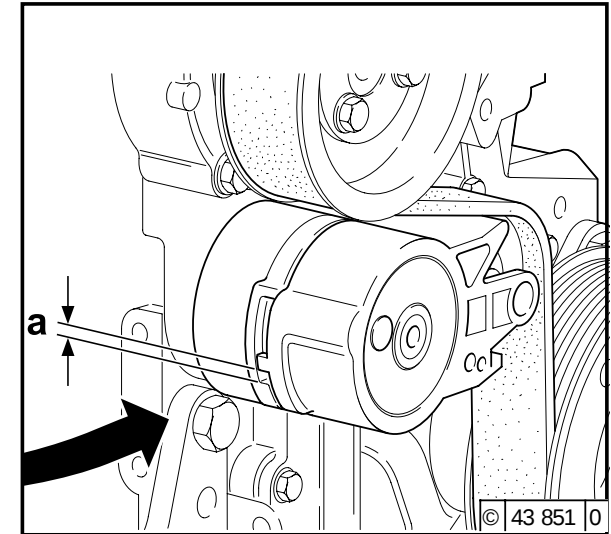
- Push tension pulley in the direction of the arrow until V-rib belt is free.
- First remove the V-rib belt from the smallest pulley.
- Put on new V-rib belt
- Loosen tension pulley in the opposite direction of the arrow until the V-rib belt is taut Whilst doing this, check that the V-rib belt is positioned correctly in your guide.

6.5.2 Changing V-belt V-rib belt



- Push tension pulley in the direction of the arrow until V-rib belt is free.
- First remove the V-rib belt from the smallest pulley.
- Put on new V-rib belt
- Loosen tension pulley in the opposite direction of the arrow until the V-rib belt is taut Whilst doing this, check that the V-rib belt is positioned correctly in your guide.

6.5.3 Checking V-rib belt wear limit

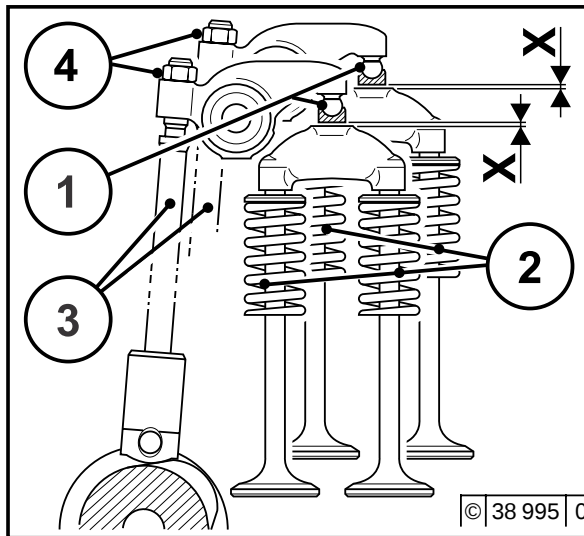


- The wear limit of the V-rib belt is checked as follows:
- Check the distance between the projection of the moving tension arm and the contact with the fixed tensioner housing.
- If „a“ is less than 3 mm the V-rib belt should be changed.



Only check/tighten/change V-belts when the engine is not running. If necessary, re-mount V-belt guard.

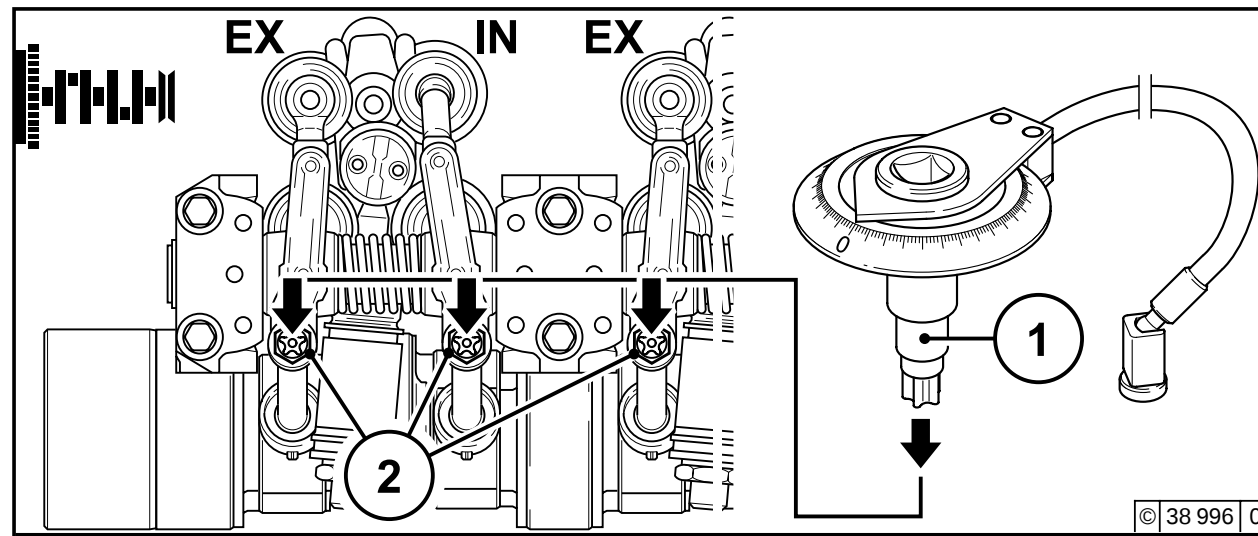
6.6.1 Checking valve clearance, setting if necessary



- Loosen bleed valve and swing aside.
- Remove cylinder head cover.
- Before setting the valve clearance allow the engine to cool down for at least 30 minutes: Oil temperature below 80 °C.
- Place the turning device over the fastening screws of the belt pulley.
- Turn over engine until the valve overlap is achieved, cylinder no. 1
- Crankshaft setting as per setting diagram, see 6.6.1.1.

Note: Valve overlap means:

Exhaust valve is not yet closed. Inlet valve begins to open. For valve setting diagram see 6.6.1.1, the table on the right.



Setting instructions:

IN= inlet valve

EX = exhaust valve

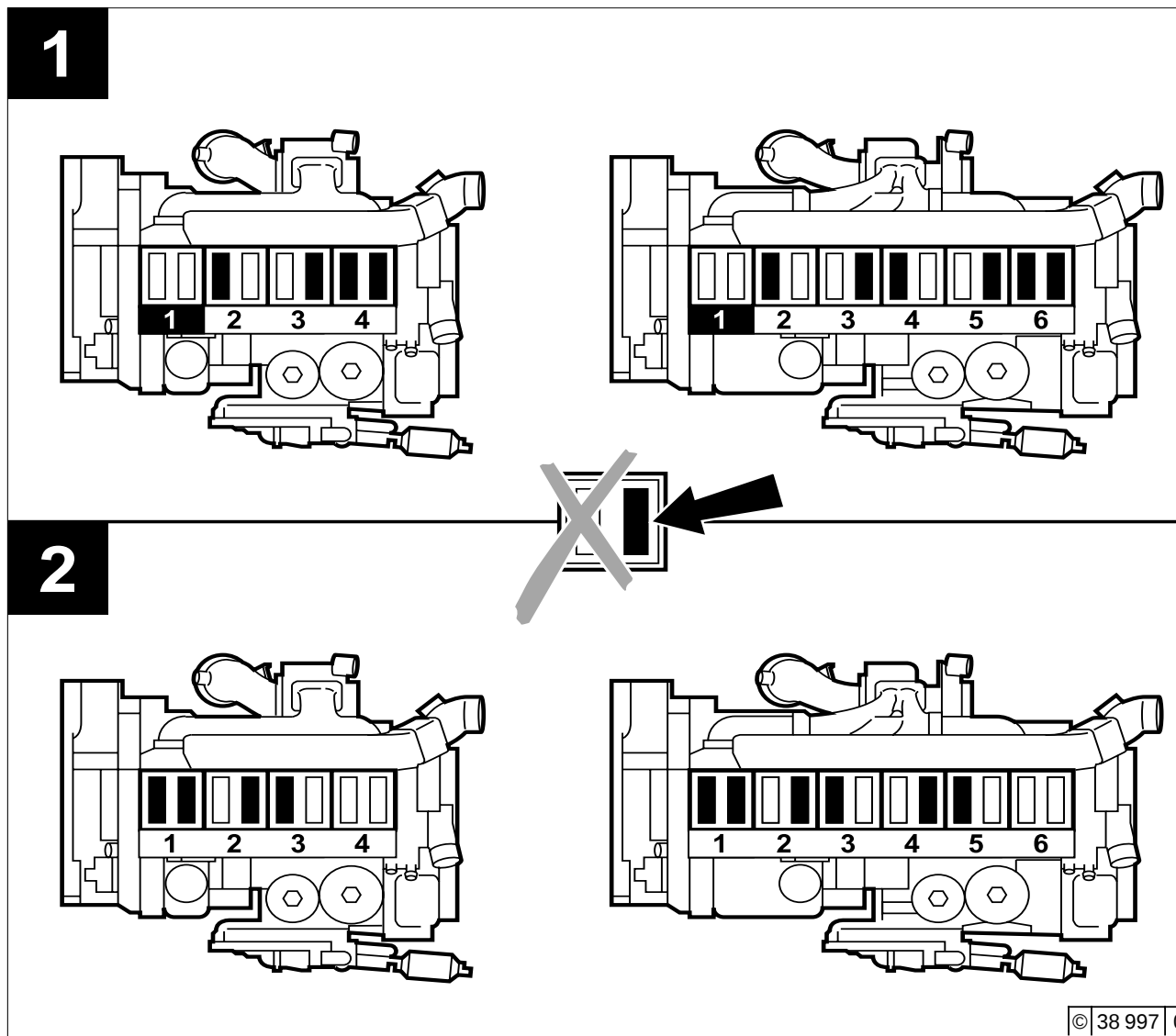
- Perform test and setting work on every cylinder.
- Re-mount cylinder head cover (if necessary with new gasket).
- Swing the bleed valve into position and fasten

Example: BF4M 2013

Valve clearance setting

- | | |
|--------------|---|
| 1. Work step | 1. Set cylinder to overlap, set cylinder 4. |
| 2. Work step | 3. Set cylinder to overlap, set cylinder 2. |
| 3. Work step | 4. Set cylinder to overlap, set cylinder 1. |
| 4. Work step | 2. Set cylinder to overlap, set cylinder 3. |

6.6.1.1 Valve clearance setting diagram



Setting the valves: (black identification)

- Perform valve clearance setting on appropriate cylinder with valve clearance setting device part no. 8190.

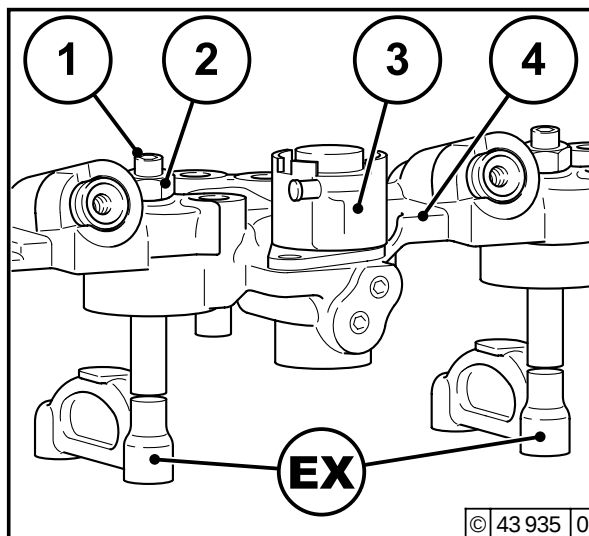
Loosen all lock nuts 2 of the rocker arm assembly to be set. Turn setting screw 1 back with the valve clearance setting device one turn in anti-clockwise direction.

On the valve to be set, turn setting screw 1 in clockwise direction so as to be free of clearance.

That means, there must not be any clearance between the rocker arm and valve and no pressure may be applied to the valve.

- Set needle of measuring plate to ⑤ , not twisting the knurled handle any more.
- Hold the measuring plate exactly in this position and turn the setting screw 1 in anti-clockwise direction with the knurled handle until the needle is on the „in“ or „ex“ marking.
- Hold the knurled handle exactly in this position and tighten lock nut 2 with a torque wrench (20 Nm).
- Put on seal (poss. new seal).
- Visual inspection of screws and rubber elements, renew if necessary.
- Put on valve mechanism cover and tighten screws according to tightening specification: 9 Nm (see 9.2).

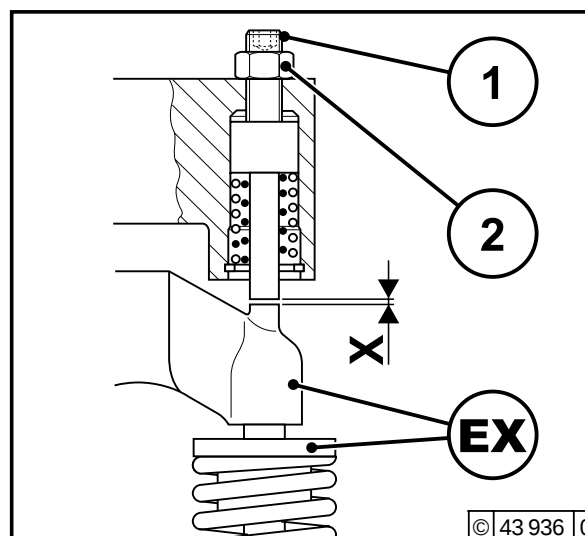
6.6.2 Checking control piston clearance at engine brake, setting if necessary



- After the valve clearance has been set.
- Control unit for engine brake is already mounted.
- Set the clearance on the control unit as follows.
- Turn engine until reaching the valve overlap is reached, cylinder no. 1
- Set control piston clearance on every exhaust valve.
- Proceed as for valve clearance.

Note

Valve overlap means:
Exhaust valve is not yet closed. Inlet valve begins to open, see valve setting diagram.



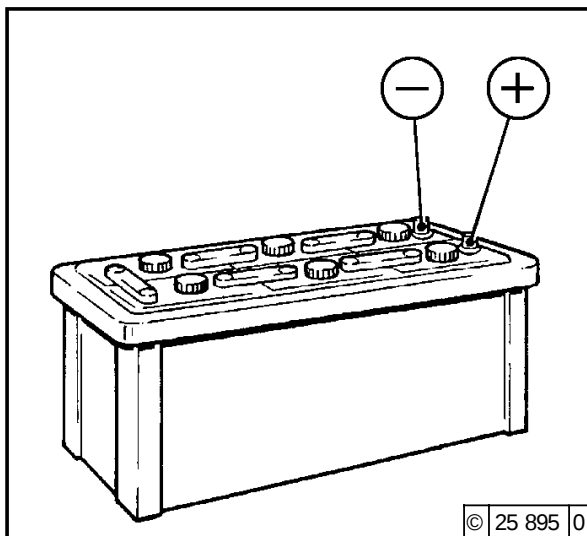
- Set control piston clearance if necessary, by:
 - Loosening the lock nut 2.
 - Mount the control piston clearance X on setting screw 1 (see 6.6.1) with setting device in EX and set as follows:
 - Fix the magnet
 - Turn the setting device without clearance until the control piston contacts with the valve bridge, set scale to „0“.
 - Then turn back angle degree 432° (by hand or torque wrench):
- EX** = exhaust valve 432° for M8 thread (corresponds to 1.5 mm clearance)
- Tighten lock nut 4.

- Perform test and setting work on every cylinder.
- Replace cylinder head cover (if necessary with new gasket).
- Swing the bleed valve into position and fasten.

IN= Inlet valve
EX= Exhaust valve

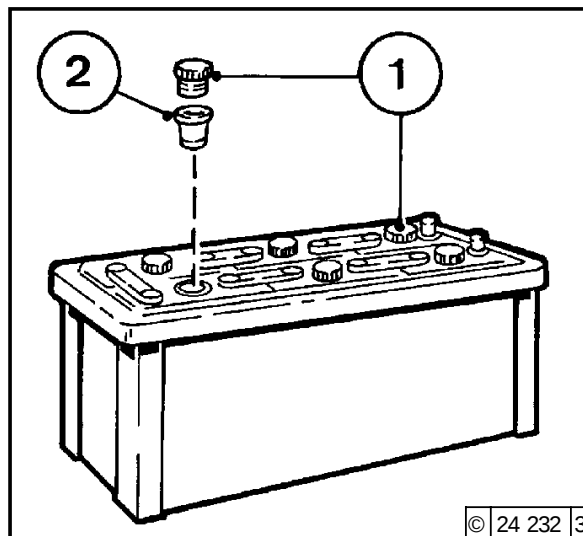
- 1 Setting screw
- 2 Lock nut
- 3 Solenoid valve (electronic control)
- 4 Control board

6.7.1.1 Testing battery and cable connections



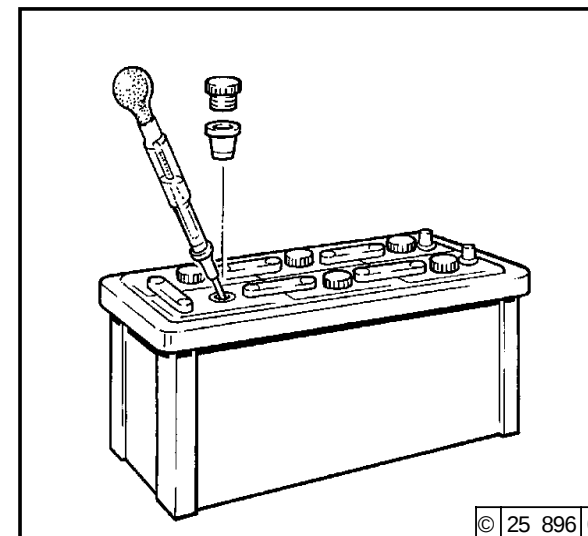
- Keep the battery clean and dry.
- Loosen soiled connection terminals.
- Clean the battery poles (+ and -) and terminals, and grease with an acid-free and acid-resistant grease.
- Ensure that the terminal connections contact well when assembling. Tighten the clamping screws by hand.

6.7.1.2 Checking the acid level



- Remove sealing cap 1.
- If checking inserts 2 are available:
The liquid level should reach to their bottom.
- Without checking inserts:
The liquid level should reach 10-15 mm above the upper edge of the plate.
- If necessary, re-fill with distilled water.
- Screw sealing cap back on.

6.7.1.3 Checking acid density



- Measure the acid density of individual cells with a standard acid testing device.

The measured values (see table overleaf) indicate the charge status of the battery. The acid temperature when measuring should be 20 °C if possible.

Acid density in [kg/ l]		in [°Bé (Baumé degree)*]		Charge level
Normal	Tropics	Normal	Tropics	
1,28	1,23	32	27	well charged
1,20	1,12	24	16	half charged, re-charge
1,12	1,08	16	11	discharged, charge immediately

* The data for acid density in °Bé (Baumé degree) is out of date and rarely still in use.



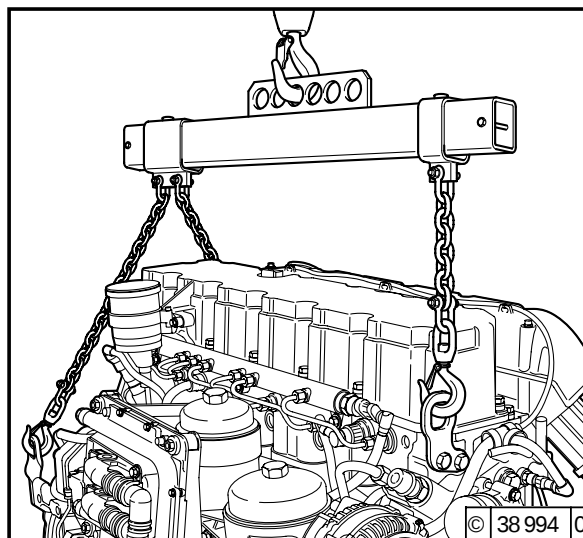
The gases released by the battery are explosive! Avoid sparks and open fire in the vicinity of the battery! Do not allow acid to get on skin or clothes!
Wear protective glasses!
Do not place any tools on the battery!

6.7.2 Three-phase current generator

Notes on three-phase current system:

- Do **not** interrupt the connections between the battery, generator and governor when the engine is running.
- If, however, an engine must be started and operated without battery, the connection governor / generator is to be separated before starting.
- Do not swap battery connections.
- Replace defective charging warning light immediately.
- When cleaning engine: Do not spray water/ steam jet directly at generator!
Warm up the engine so that the water residues evaporate.
- Under no circumstances may the voltage of a three-phase current system be tested by tapping against the earth cable.
- When carrying out electrical welding work, clamp the earth terminal of the welding device directly to the part to be clamped.

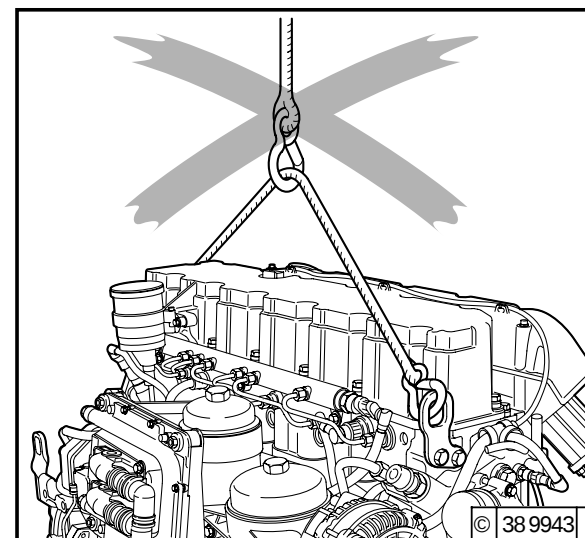
6.7.3 Transportation suspension



- Only use the correct suspension equipment for engine transportation. Suspension equipment must be adjustable for the engine centre of gravity.



Only use correct suspension equipment!



- Fastening devices cannot be fixed safely over the centre of gravity.
- Fastening devices can slip, engine capsizes.
- Short fastening devices cause bending moments in the suspension. This can damage the suspension.



Engine can fall.
Danger to life!