DOOSAN

MX532099-1
August 2014

ADT

Operation & Maintenance Manual

DA30 / DA40

DA30 - Serial Number 7X0504 and Up

DA40 - Serial Number 8X0502 and Up

DA30 T2 and DA40 T2 - These engines have a optimised cylinder block containing wet cylinder liners that can easiliy be exchanged. Individual cylinder heads with 4 valves per cylinder promotes repairability and fuel economy.
The engine is equipped with a Scania developed Engine Management System, EMS, in order to ensure the control of all aspects related to engine performance. The injection system is based on electronically controlled unit injectors that gives low exhaust emissions with good fuel economy and a high torque.

Electrical System

The machine has three control units. The Gauge Panel for the instrumentation is integrated with the display unit and also warning lights and instruments and provides the operator with information via there. The VCU(vehicle control unit) for the machine, receives signals from sensors on the machine and these are passed to the main screen . The E-ECU controls the engine.

Transmission

The transmissions ZF ErgoPower L II 8 EP 320(DA30) and 8 EP 420(DA40) consist of a multi-speed powershift transmission with integrated transfer case and front-mounted hydrodynamic torque converter. The torque converter is a wear-free starting device which is continuously variable adapting itself to the given situations (necessary input torque). Input by direct mounting via diaphragm to the engine, or by using a joint-shaft with mechanic.

Brakes

Service brakes

All hydraulic operated wet multiple disc brake on each wheel. There are two separate circuits. Self adjusting system.

Engine brake

Electronically operated, speed dependent brake which, gives high performance engine braking.
Efficient only when lock-up clutch is connected.

Retarder brake

The integrated hydrodynamic retarder is installed in the basic transmission between converter and gear box.

Praking brake

Spring actuated, hydraulic released single disc brake on the rear prop. shaft. Self-adjusting system.

7. Miscellaneous items used in the above systems:
   A. Electronic control unit (ECU), sensors, wiring harnesses
   B. Hoses, belts, connectors, assemblies, clamps, fittings tubing, sealing gaskets or devices and mounting hardware
   C. Pulleys, belts and idlers
   D. Emission control information labe

IMPORTANT

This list does not include all expendable maintenance parts.

- **Expendable emission related parts requiring scheduled maintenance are warranted until their first scheduled replacement point.**
- **Emission related parts scheduled for inspection and replacement only as necessary are not considered expendable and if repaired or replaced under warranty shall be warranted for the remaining warranty period.**

See Specific Warranty Exclusions below.

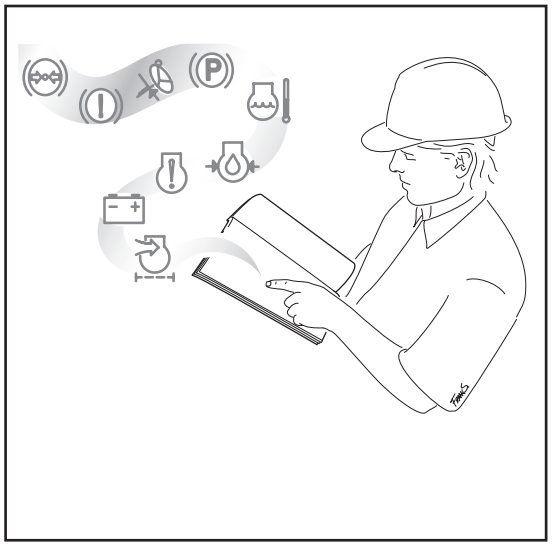
General Warranty Limitations

To retain the dependability of the exhaust emission control originally built into your Scania industrial diesel engine, it is essential that engine is installed according to Scania installation instructions and emission certificates. Your engine is designed to operate on diesel fuel only. Use of any other fuel can result in your engine no longer operating in compliance with state or federal emissions requirements. The use of alternative fuels shall not void the warranties on any engine certified to use such fuel.

In addition, as the engine owner, You are responsible for the performance of all scheduled maintenance listed in your owner's manual, and all necessary repairs, on your new Scania industrial diesel engine. Scania may deny a warranty claim if the engine or part has failed because of abuse, neglect, improper maintenance or unapproved modifications.

Receipts covering the performance of regular maintenance should be retained in the event questions arise concerning maintenance. The receipts should be transferred to each subsequent owner of the engine with the emission warranted engine. Scania cannot, however, deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

The Warranty covers the cost of diagnosis, repair and replacement parts and services of warranted components and systems performed by an authorized Scania distributor or dealer using genuine Scania parts. You may elect to have maintenance, replacement or repair of these components and systems performed by any repair establishment or individual without invalidating the Warranty.

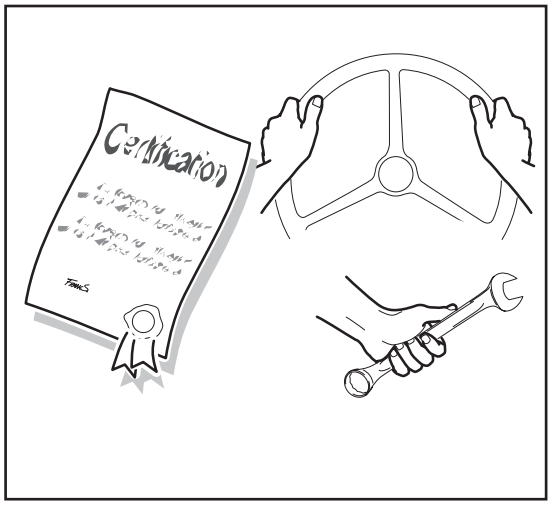


1. Dump truck knowledge

Learn how to use the control devices, instruments and warning devices. Be sure you understand the meaning of the WARNING signs and other cautionary messages. Always know the dimension and performance limits of your dump truck.

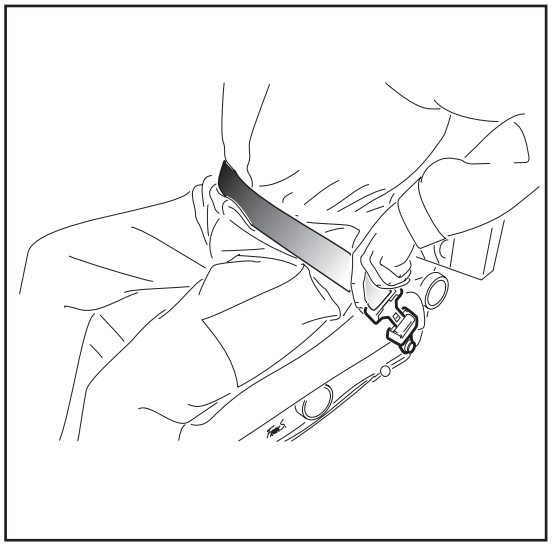
Remember the check points and checking method of fluid levels.

2. General precautions.
(See also precautions for Maintenance and Operating instructions).



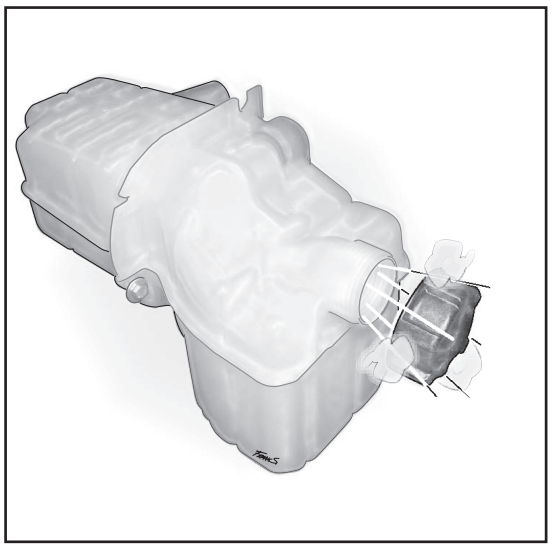
2.1. Safety rules

- ONLY trained and qualified personnel can operate and maintain the dump truck.
- Follow all safety rules, precautions and instructions when operating or performing maintenance on the dump truck.
- ALWAYS USE SEAT BELT DURING DRIVING!
  If there is instructor or passenger in the cab, be sure that they are seated on the instructor seat and are using their seat belt!
- Never operate the dump truck if you are under the influence of alcohol, medicines or other drugs.
- When working with other operators or persons on work site traffic duty, be sure all personnel understand all hand signals that are to be used.



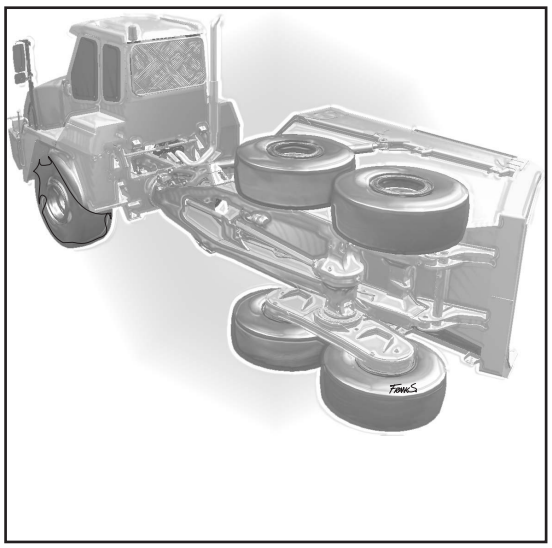
8. Rules to follow when filling fuel or oil

- Spilt fuel and oil may cause you to slip, so always clean up immediately.
- Slowly loosen the caps to relieve pressure before removing the caps.
- Always check fuel/oil specifications (chapter 6, lubricants) before refilling.
- Always refill fuel and oil in a well-ventilated place.
- Always tighten the cap of fuel and oil fillers securely.
- Never use fuel for washing any parts.



9. Expansion tank coolant level

1. If it is necessary to refill coolant to the expansion tank, stop the engine and allow the engine and the expansion tank to cool down before refilling coolant.
2. Slowly loosen the caps to relieve pressure before removing the caps.
3. Always refill using pre-mixed coolant.
   (See chapter 7, maintenance)

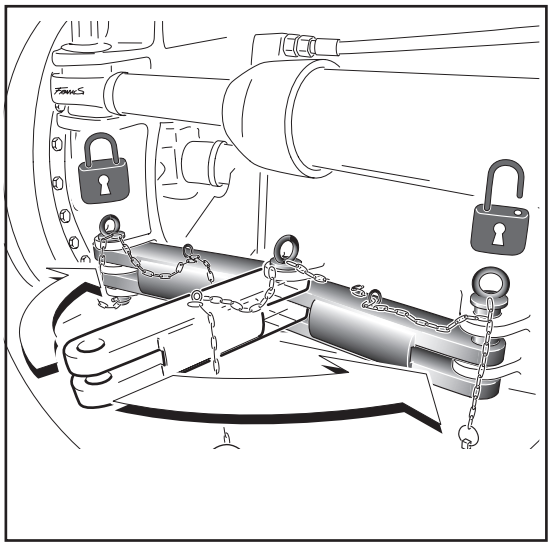


10. Machine turning

This articulated dump truck has two frames and the design allows unrestricted turning between front and rear chassis. Overturn of one frame while the other remains level is possible.

It is possible that the operator will not receive warning signs of an overturn, therefore:

- Avoid high speed turning and hard braking in curves.
- Reduce speed, avoid sudden turning if travelling across slopes.
- The rear chassis stability decreases when tipping. Be alert when body is raised.
  Do not under any circumstances drive with raised body!



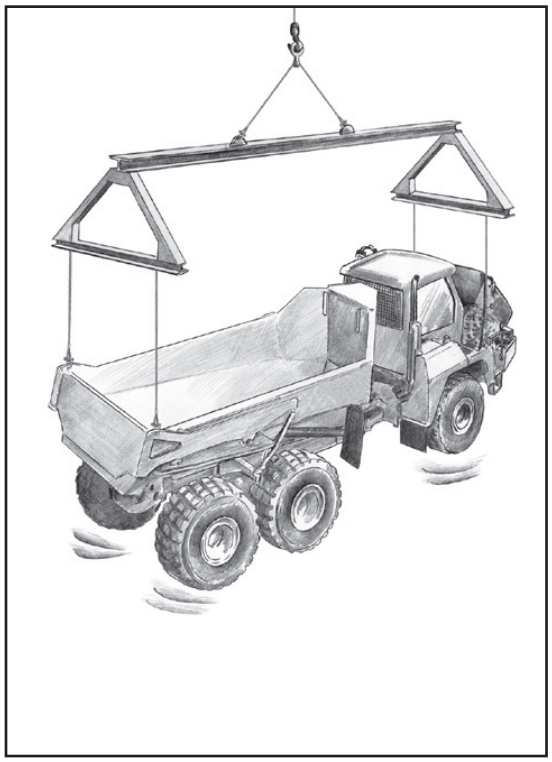
24. Articulation lock

The lock prevents the dump truck turning when applied.

- Apply the lock:
  1. Take out the spring cotter, lift the pin and swing the linkage forward into the hinge ear.
  2. Insert the pin through linkage and ear and refit the spring cotter.
- Release the lock:
  1. Take out the spring cotter, and remove the pin through the linkage and ear.
  2. Swing the linkage backwards, insert the pin through the link age and ear, and refit the spring cotter.

The lock must always be applied:

- During maintenance, greasing and other work.
- When lifting or hoisting the truck, see item 25.
- During dump truck transportation, see item 26.



25. Lifting / hoisting

1. Apply the articulation lock (see item 24).
2. Open and secure (see item 19) the bonnet.
3. Fit suitable lifting wires or chains to the hoisting points at both sides of the body and engine, and use a suitable lifting beam as shown.

Machine net weight: DA30: approx. 23,400 kg

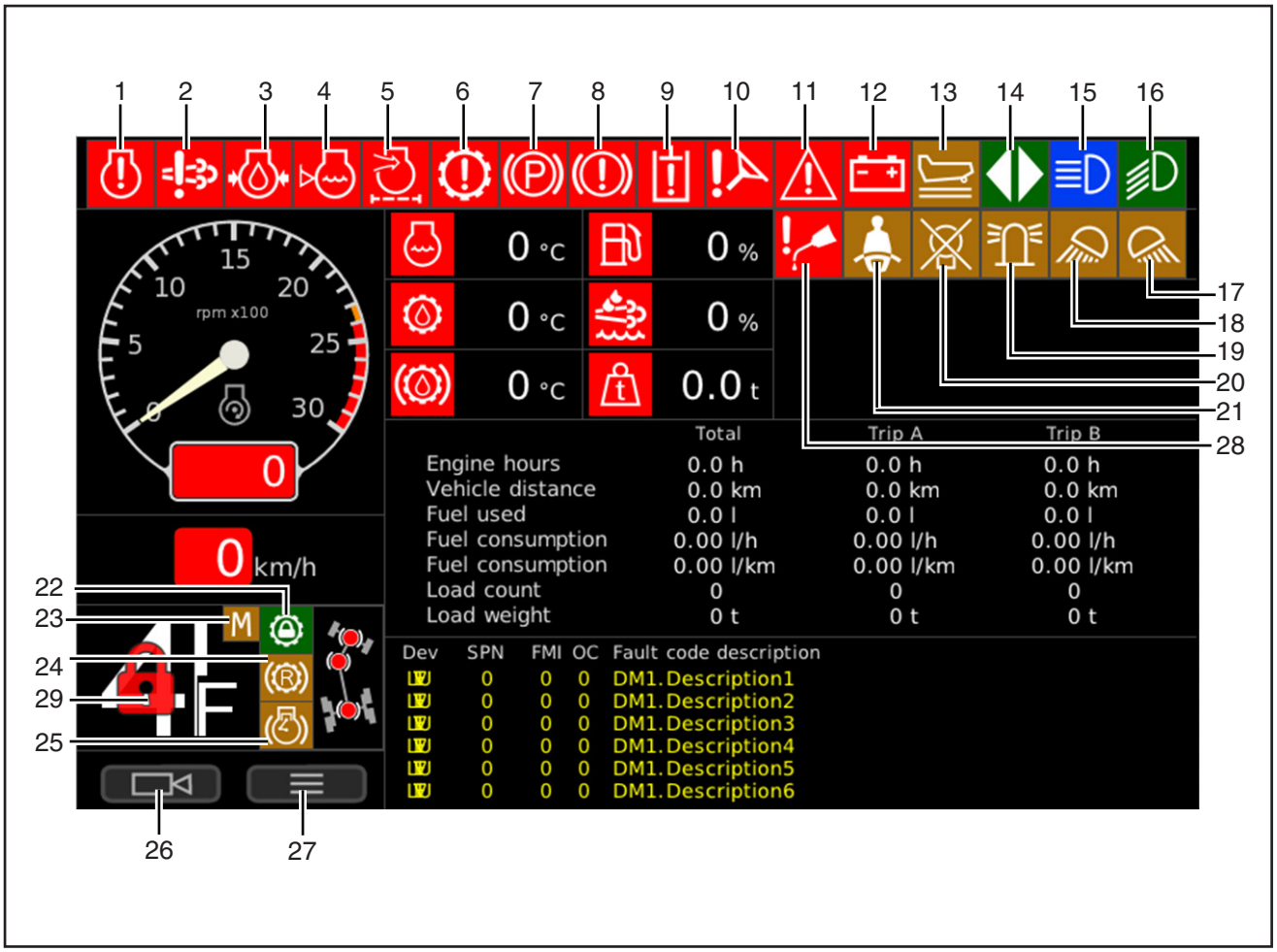
DA40: approx. 30,300 kg

WARNING

Never lift or hoist a loaded truck, the points are intended for an empty dump truck only!

Monitor warning / indicator symbols and lights

Warning / Indicator symbols and lights are displayed on the main page of the Display



Pos.	Description	Page
1.	Engine failure warning	3-10
2.	SCR failure warning	3-10
3.	Low engine oil pressure warning	3-10
4.	Low coolant level warning	3-10
5.	Air filter warning indicator	3-10
6.	Transmission failure warning	3-11
7.	Parking brake activated indicator	3-11
8.	Brake failure warning	3-11
9.	Hydraulic system failure warning	3-12
10.	Emergency steering warning	3-12
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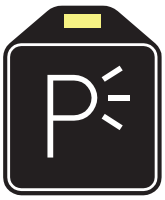
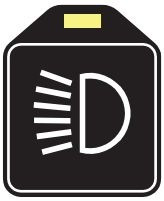
13.	Body down indicator	3-13
14.	Direction light indicator	3-13
15.	High beam indicator	3-13

Pos.	Description	Page
16.	Main light indicator	3-13
17.	Rear working lights	3-13
18.	Working lights and extra high beam	3-13
19.	Rotating beacon light	3-13
20.	Lamp fault	3-14
21.	Seat belt warning	3-14
22.	Transmission Lock-up indicator	3-14
23.	Automatic/Manual Transmission status	3-14
24.	Retarder brake indicator	3-14
25.	Engine brake indicator	3-14
26.	Rear camera view button/Main	3-14
27.	Menu button	3-14
28.	Lubrication system warning	3-15
29.	Gear shift restriction	3-15

Keypad, buttons and switches



1. Parking lights button



2. Main lights button

3. Controls the engine rated speed

- F1 inactive = 2100 rpm
- F1 active = 1950 rpm

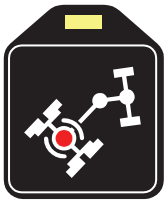
Not available after the software update 1.095

4. No function

5. Hazard lights button

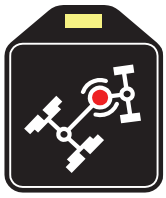
6. Override button

Stopps engine immediate when ignition key switch off.



7. Rear inter-axle differential lock button

Only for DA30 T2/T4, this is automatic engaged on DA40 T2/T4



8. Inter-axle diferential lock

9. Etarder reducing button

If this is engaged, operation of the retarder and engine exhaust brake are reduced to 50%.

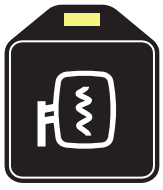
10. Fuel heating (Only T4)

11. Electrically heated driver's seat button

Push the switch to activate the heating of driver's seat.

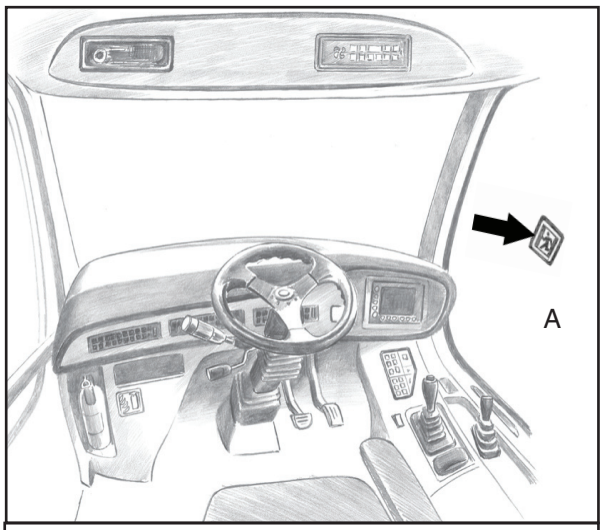
NOTE

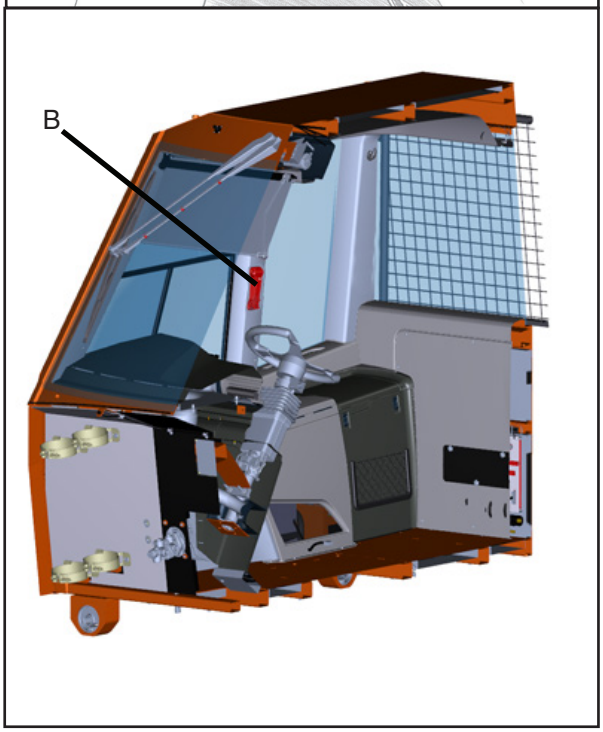
This is optional button and used only if the driver seat is not equipped with such



12. Heated mirrors button

Controls





Emergency exit

- This dump truck is fitted with two emergency exits.
- Left door and front side window on right hand side (A).
- If the door is blocked, you can get out through the front side window.
- Remove hammer (B) from storage location and break front side window.

Wet, swampy or muddy areas
(see also chapter 2, item 15 - Wading)

- The wear of the sealings will also increase when driving in wet or swampy areas, check and replace sealings as often as necessary.
- If mud sticks to the callipers or discs on parking brake, and the brakes are left in that condition, the wear of the lining will increase, therefore always wash the area well with water after operations. E.g. when clay is dried up it is hard as concrete, this will cause breakage and wear of the machine.
- Do not let the water flow through the grill or into the different breathers and air filters.
- Do not operate the dump truck in water/rivers permanently for along period.
  And do not under no circumstances let the water flow through the grill.

Seashore or salty areas

- Before starting working, check the tightness of plugs and valves.
- Spray exposed areas with anti-corrosive.
- Check the parking brake linings more often (see 500 hours service for procedure). When driving in wet salty/sandy areas the wear of the lining will increase.
- Check the sealings more often. The wear will increase in salty/sandy areas.
- Lubricate components more frequently than usual.
- Do not operate the dump truck in water/rivers for a long period of time.
- It is important to wash the machine immediately after use to protect the components from rusting and to remove dirt and sand.
  See also item above "Wet, swampy or muddy areas"

High altitude (above 2000 m)

- Be aware that the engine power and torque will be reduced due to low air density.
- Do not remove the air filter!

NOTE

The graphs of altitude power reduction are in chapter 8

2.6. Brakes

There are four different brake systems on the dump truck. Check the brakes every day to ensure function.

Service brake (main brake)

All hydraulic operated wet multiple disc brake on each wheel. There are two separate circuits. If a fault occurs in one of the circuits, the dump truck can still brake with the intact circuit. Self adjusting system.

Engine brake

Electronically operated, speed dependent brake which uses solenoids to alter cylinder compression internally and gives high performance engine braking.

Efficient only when lock-up clutch is connected.

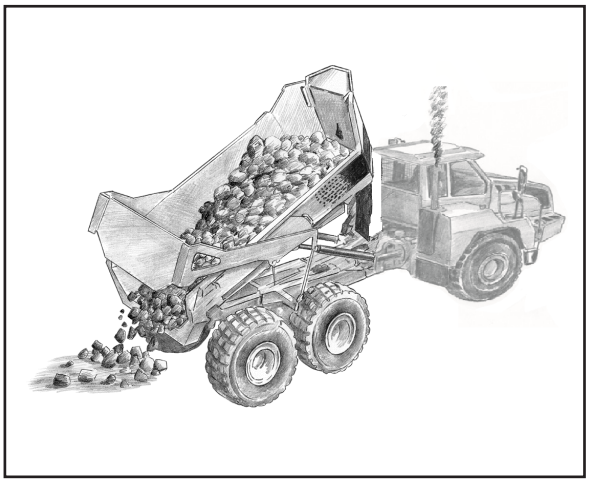
Retarder brake

The integrated hydrodynamic retarder is installed in the basic transmission between converter and gear box.

The installation position of the retarder at the transmission input (so-called primary retarder) increases the brake torque at the output by the given transmission ratio. Thus a high retarder brake torque is available in the lower speeds which can be used almost until standstill of the vehicle. The retarder is usually controlled by actuating the brake pedal, a hand lever or automatically.

Parking brake

Spring actuated, hydraulic released single disc brake on the rear prop. shaft. Self-adjusting system.



6.2. Tipping

1. Place the dump truck on a level ground. Check that the tipping may take place safely.
2. The gear selector must be in neutral position, and the parking brake must be applied.
3. Move the tip control lever to body “up” position and increase the engine speed. The body will raise. The tipping speed is proportional with the engine speed.
4. Reduce the engine speed before the body reaches the top position.
5. To stop the tipping movement, release the tip control lever. It will then automatically return to hold position.
6. Move the tip control lever to “down”, and the body will go down. The tip lever will magnetically hold in position. The tipping cylinders are double acting. The lowering speed is proportional with the engine speed.
7. The tip control lever shall stay in hold (float) position when not operated.

NOTE

For safety reasons, the system slows down the tipping speed when the load starts to pull the hoist cylinders backwards. This feature notifies the operator and reduces chance for “sticky” load lifting the front half of the truck.

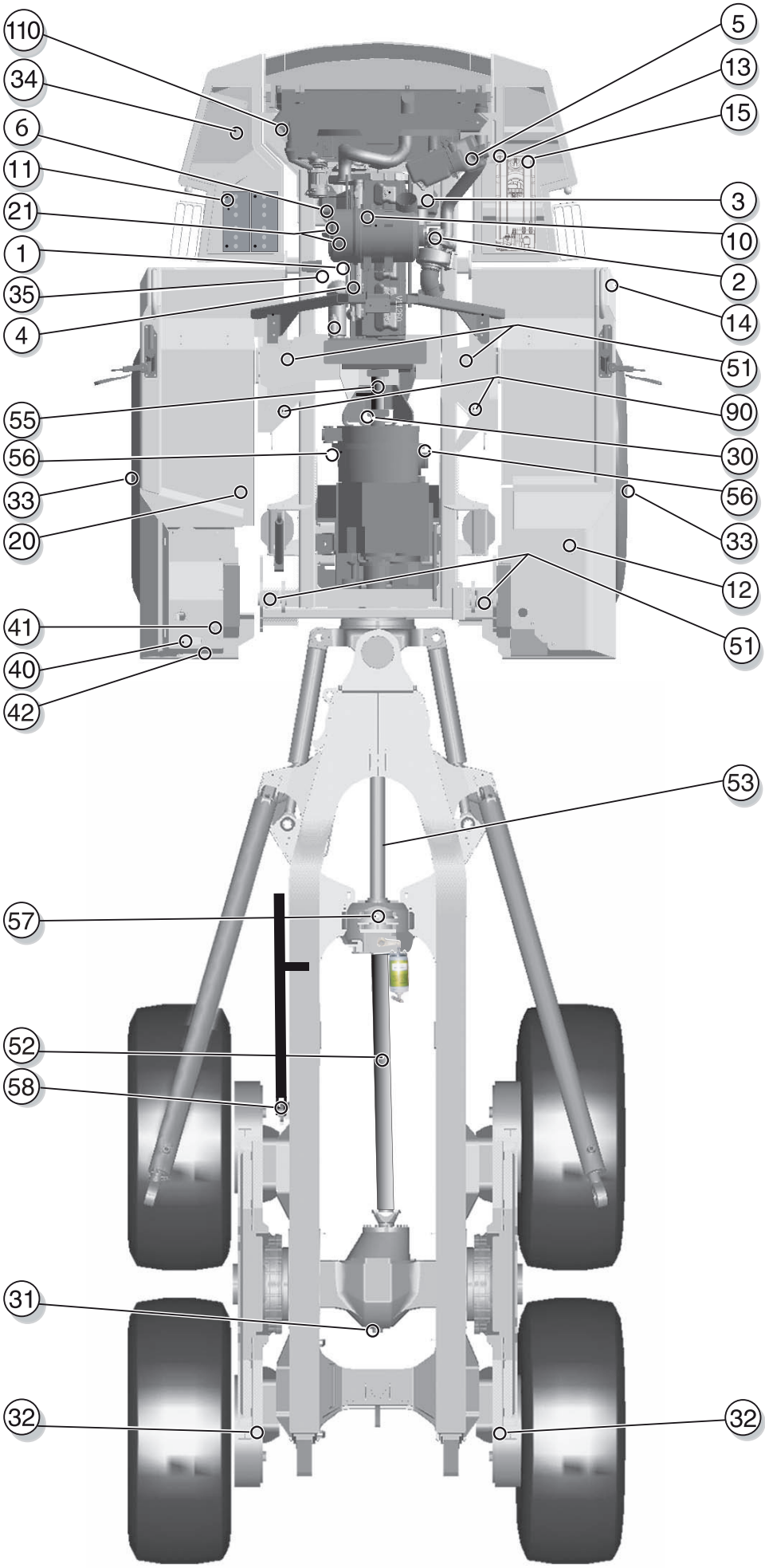
WARNING

- **Reduce tipping speed when dumping large rocks!**
- **Do not load material into the body if the body is raised!**
- **Do not drive a empty or loaded truck with a raised body!**
- **Do not raise body near electrical power lines! See Chapter 2. SAFETY INSTRUCTIONS**
- **Avoid tipping on cross-gradients!**

Area of dump truck	Symptom/Problem	Cause	Remedy/Solution
Brakes	Poor braking effect or truck pull to one side when braking	Insufficient oil pressure	Check charging and system*
		Worn out brakes	Overhaul/replace *
Hydraulic system	Emergency steering light	No oil flow from emergency pump	Check and repair *
	Truck will not go straight ahead, uneven steering movement or periodically sticking	Low hydraulic pressure	Add oil, check for leakage
		Air trapped in hydraulic system	Bleed system *
		Contaminated oil	Change oil and flush system *
		Incorrect oil type	Change to correct oil type *
		Steering cylinders internal leak	Overhaul *
		Orbitrol or steering valve failure	Check and repair *
	Not possible to tip or activate slow tipping	Low hydraulic oil level	Add oil, check for leakage
		Clogged oil filter	replace
		Clogged tank strainer or breather	Replace/clean
		Low oil pressure	Check/repair *
		Worn oil pump	Check/repair *
		Tip valve failure	Overhaul *
	Main warning light illuminates	Hydraulic failure	Stop the dump truck at a safe place, and check the error codes on the main display and contact your Doosan dealer.
Lubrication system	Main warning light illuminates	Lubrication system failure	Check the error codes on the main display
Electrical system	No electrical power	Main switch disconnected	Turn on
		Batteries discharged	Recharge
		Battery terminals/wiring defective	Repair *
	Charge warning light on	Fan belt problem	Tighten/replace
		Defective/worn alternator	Replace *
		Defective wiring	Check connections, wires *
Chassis	Uncomfortable travel (jumping)	Defective shock absorber	Replace *
		Defective rubber suspension	Replace (DA30) *
		Articulation turning ring worn	Overhaul *
	Vibrations	Engine or transmission mountings	Replace
		Fan or flywheel loose/imbalance	Check/repair *
		Defective elastic coupling	Check/repair *
		Prop. shaft failure	Check/repair *
		Drive line problem	Check/repair *

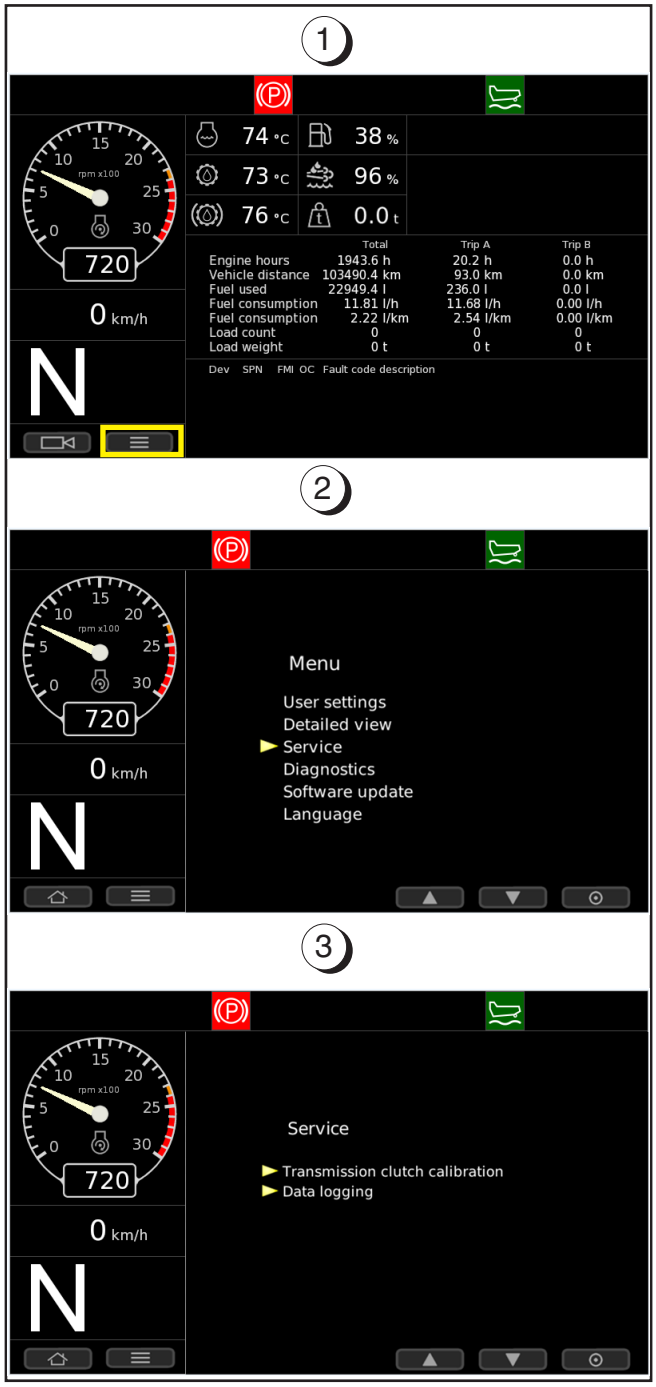
Overview of oil and lubrication points DA40 T2/T4/Stage 3B

The numbers refer to table on previous page.



Initial 100 Hours Service

Maintenance to be performed after the first 100 hours only.



1.2. Run the Transmission Clutch Calibration (AEB)
AEB = Automatic Filling Parameter Adjustment

To optimise the transmission, run the AEB-Tester.

1. Pusch MENU on the display screen.
2. Select SERVICE.
3. Select Transmission Clutch Calibration (AEB).
4. Follow the procedure described on the display screen.

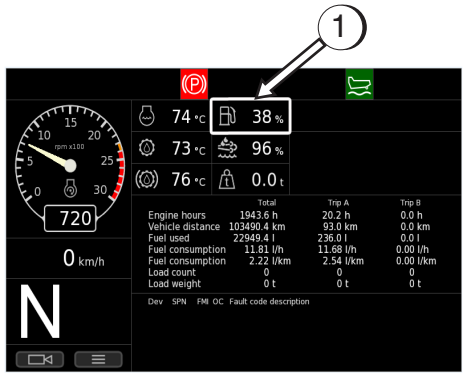
NOTE

- **Transmission Clutch Calibration must be performed after every oil change in transmission!**

* Numbers refer to positions on the lubrication schedule, chapter 6

8 Hours / Daily Service

To be perfomed every 8 hours of operation or daily.

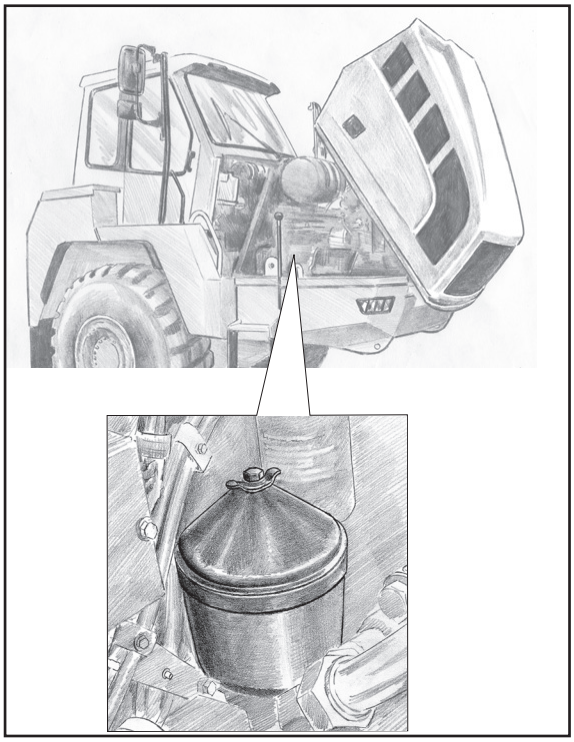


2.5. Check fuel level, before start 12*

1. Turn on the starter switch key (to pos. 1) and check on the fuel gauge (display screen) that there is enough fuel (1).
2. Fill up with fuel if necessary (2).

NOTE

Always make sure that there is enough fuel in the tank. NEVER run out of fuel, fuel injectors (T2 only) will be damaged.



2.6. Function check of the centrifugal cleaner, after operation 2*

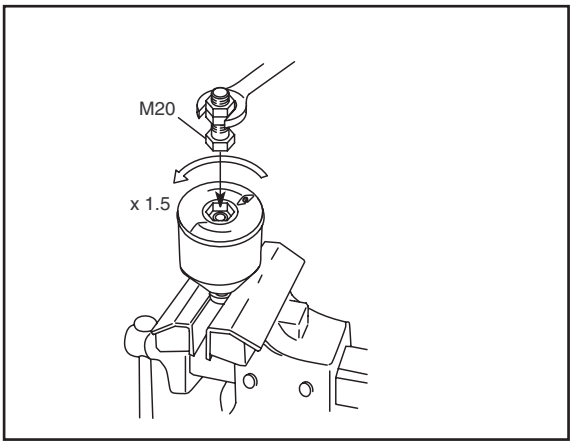
The rotor rotates very fast, and will normally carry on rotating after the engine is stopped.

1. Stop the engine when it is hot.
2. Listen for spinning sound from rotor, or feel if cleaner housing vibrates.
3. The rotor normally rotates **30 - 60 seconds** after the engine has stopped.
4. If not, dismantle and check the cleaner, see 500 hours service.

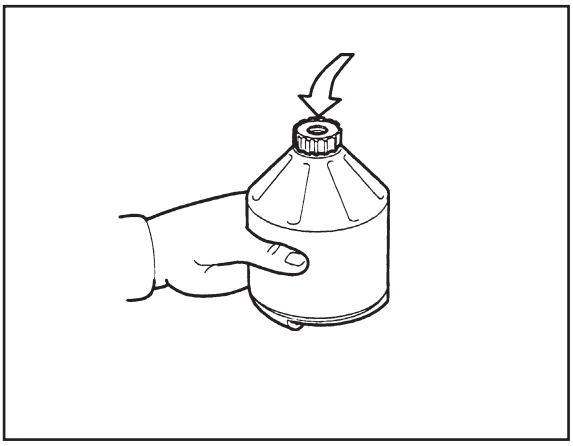
* Numbers refer to positions on the lubrication schedule, chapter 6

500 Hours Service

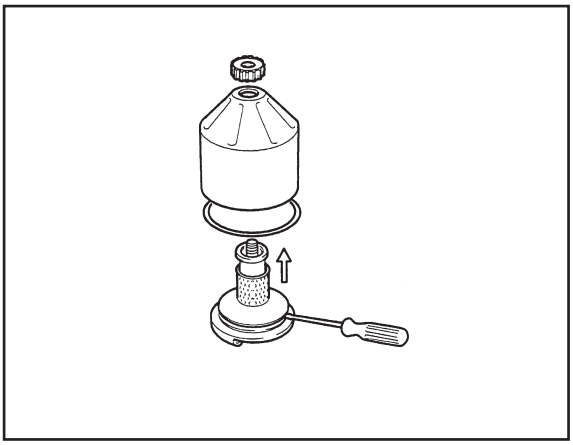
Maintenance to be performed every 500 hours of operation.



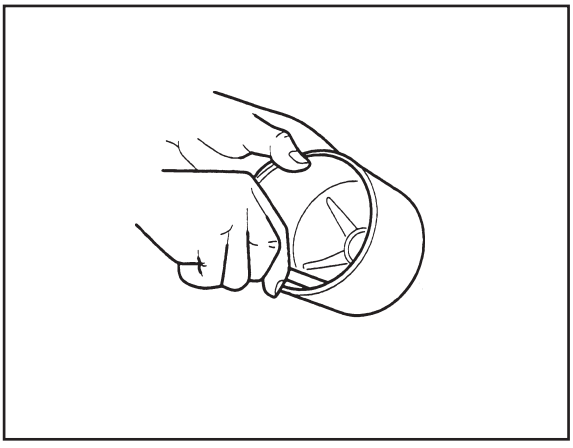
3. If the rotor nut is jammed: Turn the rotor upside down and fasten the nut in a vice. Turn the rotor approximately one and a half turns anticlockwise by hand or use an M20 bolt as illustrated.



4. Gently tap the nut with the hand or with a plastic hammer to separate the rotor from bottom plate.



5. Undo the nut and remove the rotor cover.
6. Carefully prise the strainer loose from the bottom plate.

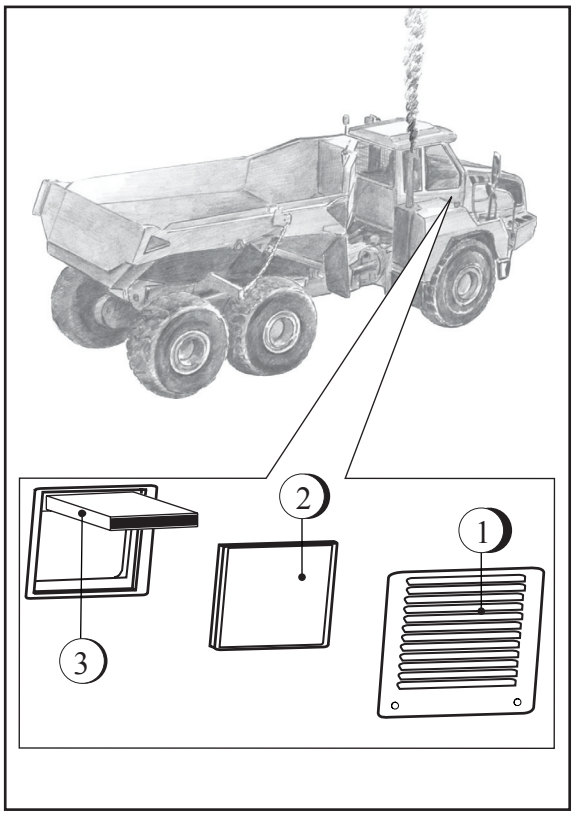


7. Scrape off the deposits from the inside of rotor cover.
   - *If there are no deposits, this shows that the cleaner is not working.*
   - *Clean more frequently if deposits are thicker than 20 mm.*
8. Clean all parts in diesel fuel.

** Numbers refer to positions on the lubrication schedule, chapter 6*

500 Hours Service

Maintenance to be performed every 500 hours of operation.



6.2. Check/replace cab ventilation filters 70*, 100*

1. Open cover (1) by removing 2 screws.
2. Remove the pre-filter (2)
   - Replace if necessary.
3. Remove cab ventilation filter element (3) and replace
4. Reassemble the opposite way.
5. Adjust the check interval if another requirement is experienced.

** Numbers refer to positions on the lubrication schedule, chapter 6*

1000 Hours Service

Maintenance to be performed every 1000 hours of operation.

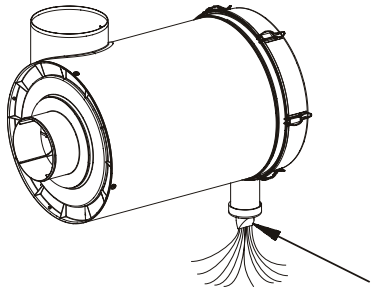


Fig. 5

Servicing the dust cap

The dust cap require very little maintenance. Possible dust packs to be removed by squeezing the cap (fig. 5).

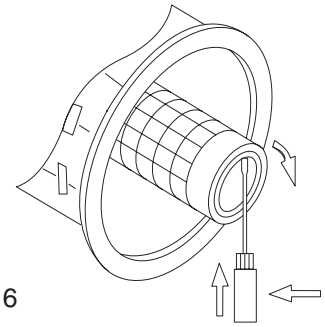


Fig. 6

Inner element (safety element)

- Replace element every 5th cleaning of the outer element, or after 2 years.
- *Do not clean the inner element and do not reuse it after it has been taken out.* **Only open the seal in order to replace the inner element.**

1. Loosen all clamps and remove the cover.
2. Remove outer element.
3. Remove the inner element; Use a suitable tool (e.g. screwdriver) to push through the seal of the inner elementfrom the inside to the outside and pull both the straps upwards (fig. 6).
4. Use both straps to take hold of the inner element and then pull out with a light turning movement (fig. 7).
5. Install a new inner element into the housing.
6. Install a new or cleaned outer element.
7. Reinstall the cover, and fasten all the clamps. Turn the cover so that the dust cap is pointed downwards (max angle: 15°).

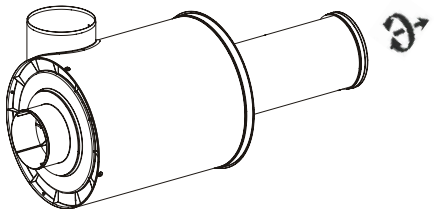


Fig. 7

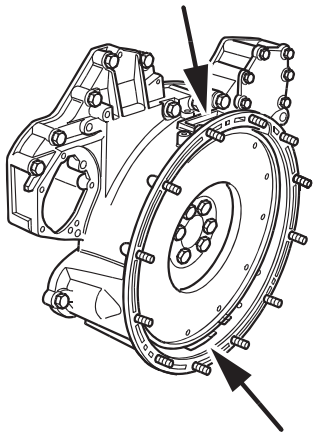
CAUTION

- **Do not attempt to reinstall a cleaned inner element.**
- **Do not clean or replace the elements when the engine is running.**
- **Replace the outer element if small holes or thinner parts are found on the element when it is checked with an electric bulb after cleaning.**
- **Do not use an element in which folds, gasket or seal are damaged.**
- **When cleaning the element, do not hit or hammer it.**
- **Do not dismantle the inner element unnecessarily.**
- **Punch a mark in the edge of the inner element each time the outer element is cleaned.**

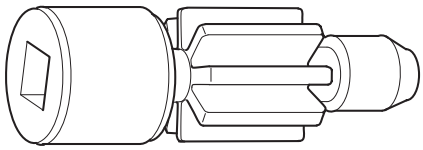
** Numbers refer to positions on the lubrication schedule, chapter 6*

2000 Hours Service

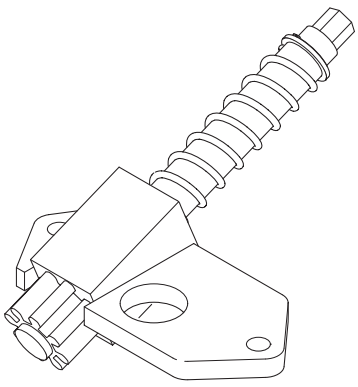
Maintenance to be performed every 2000 hours of operation



Openings for taking readings on the flywheel housing.



Special tool is used when turning from below.



Special tool is used when turning from above.

1.1. Checking and adjusting valve clearance (6 cylinders) (DA40)

- Checking/adjusting valve clearance shall also be carried out after the first 500 hours of operation.
- Contact Doosan Dealer for checking/adjusting of the valve clearance.
- The checking/adjusting of the valve clearance must only be carried out by qualified personnel.
- The air filter and air filter bracket has to be removed before adjustment takes place.

Adjust if necessary:
- Inlet: 0,45 mm
- Exhaust: 0,70 mm
  see instruction sign on one of the rocker covers.

Valves should be adjusted when the engine is cold, at least 30 minutes after operation.

Readings can be taken from the flywheel through openings in the flywheel housing either from above or below depending on access when fitting.

“TDC up” or “TDC down” is found on the flywheel. Both openings are fitted with a blanking piece at delivery.

Option 1

From below	Valve transition	Valve adjustment	From above
TDC down	1	6	TDC up
120/480	5	2	300/660
240/600	3	4	60/420
TDC down	6	1	TDC up
120/480	2	5	300/600
240/600	4	3	60/420

- Turn in the engine’s direction of rotation so that TDC down or TDC up is visible in the flywheel housing window.
- Check the valve transition and start adjusting as indicated in the table.

Tightening torque for adjusting screw 35 Nm (26 lbf ft).

NOTE

Checking and adjusting the valve clearances should also be done after first 500 hours of operation.

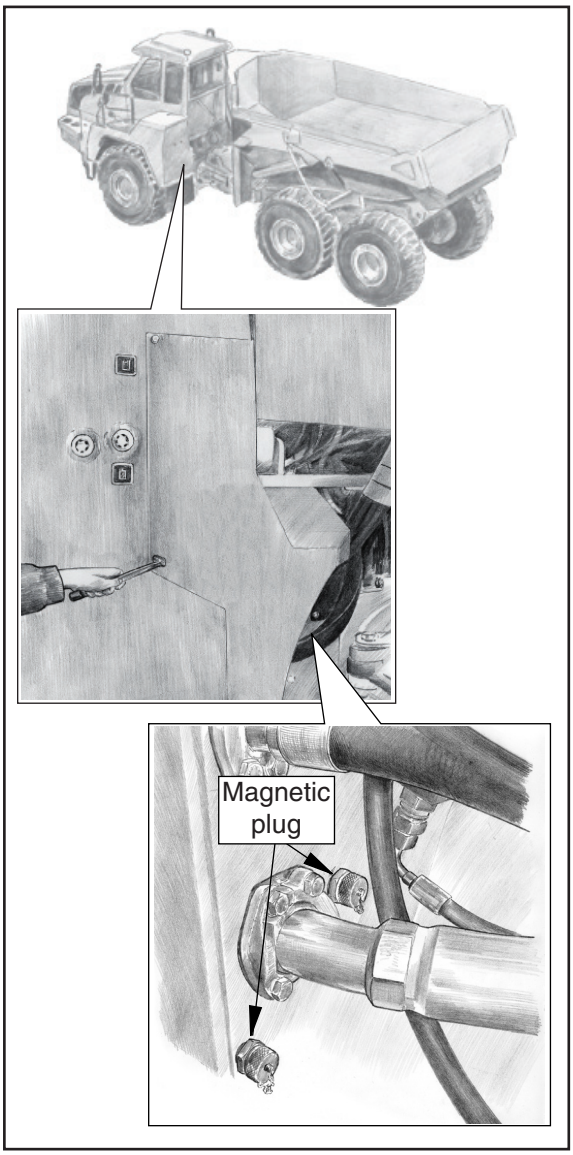
WARNING

Remove ignition key when working on the engine! To avoid a SERIOUS RISK OF INJURY!

* Numbers refer to positions on the lubrication schedule, chapter 6

4000 Hours Service

Maintenance to be performed every 4000 hours of operation

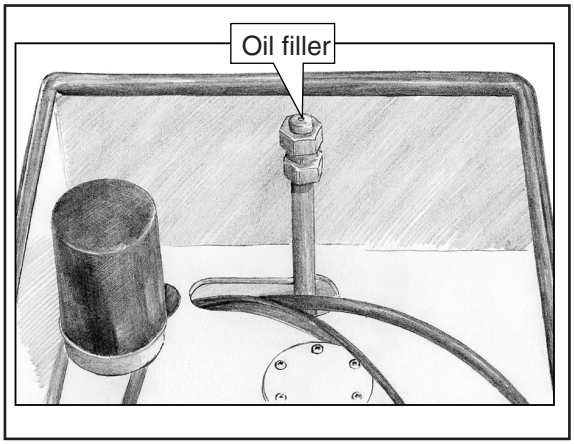


2. Hydraulic system

2.1. Change oil 40*

1. Accumulators contain oil under high pressure! Empty the accumulators, before draining the hydraulic oil. Procedure is described in chapter 2, item 27.
2. The drain plugs both for the main reservoir and the emergency steering reservoir are to be found on the right hand side of the hydraulic tank (on the bottom). Remove the cover to get into the magnetic plugs.
3. Place a suitable container to catch spillage.
4. Remove the cap from both drain plugs.
5. Install the draining hose with nipple to the first drain plug and drain the oil into the container.
6. Install the draining hose to the second drain plug and drain the oil into the container.
7. Remove the draining hose and reinstall both caps.
8. The oil filler is located on the top of the hydraulic filter unit under the cover on the top of the hydraulic tank.
9. Fill new oil through the oil filler, according to the oil specification sheet, chapter 6.

- The accumulators will be recharged with oil when the engine is re-started.



* Numbers refer to positions on the lubrication schedule, chapter 6

Electrical system

	DA30	DA40
System voltage	24 V	
Battery	2x 12 V, 140 Ah	2x 12 V, 225 Ah
Grounding	Negative earth cable	
Alternator	28 V, 100 A	
Starter motor	5.5 Kw	

Fuses and relays:

The fuses are located behind the cover on the backwall. Be sure to use fuses of correct size. Never install larger fuses than specified! If a certain fuse blows several times, the circuit must be checked and failure corrected.

Relays

K1	88
• Engine heater • Engine fuel	• Webasto

Fuses:

F10 / 5A	F11 / 5A	F12 / 5A	F13 / 5A
VCU internal	Sat + diag U30	LCD + other	LCD + ign U30

F14 / 5A	F15 / 10A	F16 / 10A	F17 / 10A	F18 / 10A	F19 / 10A
Joystick + instr.	Aux U30	Extra #8	Extra #7	Radio / CD	CB

F20 / 15A	F21 / 15A	F22 / 10A	F23 / 15A
Beacon + mark	Roof work light	Extra #6	Wiper + washer

F24 / 15A	F25 / 15A
Extra #5	Seat

F26 / 7,5A	F27 / 15A	F28 / 7,5A	F29 / 7,5A
HVAC system	HVAC fan	T/M + other	T/M U30

F30 / 15A	F31 / 7,5A	F32 / 10A	F33 / 10A
PWM 1-4	PWM 5-8	Solenoid 1-4	Solenoid 5-8

F34 / 15A	F35 / 15A	F36 / 10A	F37 / 15A	F38 / 15A	F39 / 15A
Engine U30A	Engine U30B	Engine other	Mirror heat	Mirror work light	Mirror low beam

F40 / 7,5A	F41 / 10A	F42 / 15A	F43 / 10A
Front parking + direction light	Front low beam	Front high beam	Horn

F44 / 10A	F45 / 10A	F46 / 10A	F47 / 15A	F48 / 5A	F49 / 10A
Extra #2	Extra #3	Lubrication	Rear work light	A/C Clutch	Rear light +other